Naval Facilities Engineering Systems Command Mid-Atlantic
Norfolk, Virginia

Basis of Design Report
Phase III – Groundwater Treatment System

Site 00001 – Former Drum Marshalling Area, OU2 Groundwater

Naval Weapons Industrial Reserve Plant
Bethpage, New York

Issued for Bid - February 2026

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Acronyms and Abbreviations

°F	degrees Fahrenheit
1,1,2-TCA	1,1,2-Trichloroethane
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AOP	Advanced Oxidation Process
ASTM	American Society for Testing and Materials
bgs	below ground surface
CAT	category
BWS	Back Wash Supply
BWW	Back Wash Waste
CMU	concrete mason unit
COC	chemical of concern
CPP	Control Power Plant
CTO	Contract Task Order
Freon 113	1,1,2-trichloro-1,2,2-triflouroethane
FSD	fire separation distance
GAC	granular activated carbon
gpm	gallon per minute
GWTS	Groundwater Treatment System
HDPE	high-density polyethylene
HMI	human machine interface
HP	horsepower
hr	hour
HSC	Hydraulic System Center
HVAC	Heating, Ventilation, and Air Conditioning
i/o	input/output
IBC	International Building Code
KW	kilowatts
LED	light emitting diode
LGAC	liquid phase granular activated carbon
LOX	liquid oxygen
mA	milliamp
MCC	motor control center
mg/L	milligram per liter
MMF	multimedia filter
NAPL	non-aqueous phases liquid
NAVFAC	Naval Facilities Engineering Systems Command
Navy	Department of the Navy
NFPA	National Fire Protection Association
NPDES	National Pollutant Discharge Elimination System
NWIRP	Naval Weapons Industrial Reserve Plant

NYCRR	New York Code, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OIT	operational interface terminal
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
OU	Operable Unit
P&ID	piping and instrumentation diagram
PLC	programmable logic controller
PSA	pressure swing adsorption
PSEGLI	Public Service Electric and Gas Company Long Island
psf	pounds per square foot
psi	pounds per square inch
ROD	Record of Decision
RW	recovery well
RPZ	Reduced Pressure Zone
SCADA	supervisory control and data acquisition
SCFH	standard cubic feet per hour
SCFM	standard cubic feet per minute
SPR	standard penetrative resistance
SPT	Standard Penetration Test
TDH	total dynamic head
Tetra Tech	Tetra Tech, Inc.
µg/L	microgram per liter
UFC	United Facilities Criteria
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
V	volt
VFD	variable frequency drive
VGAC	vapor phase granular activated carbon
VOC	volatile organic compound
VOIP	voice over internet protocol
VPN	virtual private network
W	watt

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1.0 Introduction

This Basis of Design Report was prepared to develop a groundwater extraction, treatment, and discharge system to address the migration of the leading edge of a volatile organic compound (VOC)- and/or 1,4-dioxane-impacted groundwater plume associated with the former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage Operable Unit 2 (OU2) groundwater in Nassau County, Long Island, New York (see Figure 1-1). Groundwater from the former NWIRP Bethpage flows to the south southeast. This report was prepared by Tetra Tech, Inc. (Tetra Tech) for Naval Facilities Engineering Systems Command (NAVFAC) – Mid-Atlantic under Contract N6247216D9008, Contract Task Order (CTO) WE24.

1.1 Background

As a result of operations at the former NWIRP Bethpage, the groundwater has been impacted with several chlorinated solvents, including tetrachloroethene, trichloroethene, and 1,1,1-trichloroethane. Starting in the early 1990s, the Navy has been conducting groundwater investigations, implementing soil and groundwater remedies, and evaluating options for remediating the groundwater plume and protecting human health and the environment.

In 2003, the Navy prepared the NWIRP Bethpage OU2 Record of Decision (ROD) which identified actions that the Navy can take to address VOC-impacted groundwater that is located downgradient of the former NWIRP Bethpage, including the extraction, treatment, and discharge of groundwater (Navy, 2003). The current understanding (conceptual site model) for the OU2 plumes is presented as the background in Figure 1-2. The horizontal and vertical boundaries of the OU2 plumes are mostly defined by the presence of trichloroethene and to a lesser extent along the southern edge of the plume by 1,4-dioxane.

One part of the 2003 OU2 ROD was the extraction and treatment of the more contaminated groundwater in the area (i.e., VOCs greater than 1,000 micrograms per liter [µg/L]). Since 2003, two OU2 hotspots were identified, the GM38 Area Hotspot and the RE108 Area Hotspot. The GM38 Area Hotspot Groundwater Treatment System (GWTS) started operation in 2009 and has eliminated over 80 percent of the associated contamination. Remediation of the RE108 Area Hotspot was divided into phases.

Phase I addresses the northern portion of this hotspot and consists of two recovery wells (RW4 and RE137). The associated treatment systems are in operation. Recovery well RW4 and RE137 groundwaters are pumped to the GM38 GWTS. An upgrade to increase capacity at the GM38 GWTS is ongoing. The Phase II GWTS is intended to address the balance of the RE108 Area Hotspot (recovery wells RW5 and RW6). This system is under construction, with initial startup and testing in 2025 and continuous operation in 2026.

In 2021, the 2003 ROD was modified by an Explanation of Significant Differences (ESD) (Navy, 2021). This ESD allows for groundwater extraction and treatment of groundwater with lower concentrations of VOCs (e.g., 150 µg/L) and incorporated an extension of the Phase II (recovery well RW7). In addition, the ESD identified 1,4-dioxane as a chemical of concern and the installation and operation of up to four recovery wells and one or two treatment systems to

capture, or intercept, as practicable, the OU2 plumes to maintain their approximate current footprint. An area near the Southern State Parkway was identified as the location of these recovery wells and treatment plant(s). The recovery wells and treatment plant(s) are referred to the Phase III GWTS and include recovery wells RW8, RW9, RW10A, and potentially RW11. This report develops the design of the Phase III GWTS. In addition, one interim groundwater treatment system is currently operating at RW8 well location and a second interim groundwater treatment system at the RW9 well location is anticipated to start operation in Spring 2026.

Because the Phase III recovery wells are located downgradient of the OU2 plumes, the concentrations of VOCs and 1,4-dioxane in the extracted groundwater are anticipated to start low, increase over time, and eventually decrease to less than cleanup levels. For the first 10 to 20 years of operation, the VOCs in the extracted groundwater may remain undetected, or at very low concentrations relative to the cleanup goals. Based on the effectiveness of groundwater activities being conducted to the north, VOC concentrations are estimated to increase to a maximum concentration of 10 µg/L, before decreasing.

Initially, the 1,4-dioxane concentration is anticipated to be approximately 0.5 µg/L, peak at 1.5 µg/L, and then decrease to less than 1 µg/L. In addition, although iron is naturally present and not a chemical of concern in the OU2 plume, the Phase III GWTS will need to remove it to control adverse impacts to the treatment equipment and sedimentation in the recharge basins.

During early stages of operation, groundwater monitoring of the Phase III recovery wells and other wells in the area will be conducted. This data will be used to help evaluate the plume migration into the area. Based on an evaluation of this data, pumping rates at individual recovery wells may be reduced or suspended, until the OU2 plumes move into the area.

As discussed in Section 2.0, Table 2-1 summarizes the anticipated average and maximum concentrations of organics and inorganics in the Phase III groundwater.

1.2 Objective

The objective of the Phase III GWTS is to capture, or intercept, as practicable, the OU2 plumes to maintain their approximate current footprint. These activities would be conducted in close proximity to the Southern State Parkway. This report documents the basis for this design.

1.3 Report Organization

This report is divided into five sections and is organized as follows:

- Section 1.0 - Introduction
- Section 2.0 - Provides the design basis and describes the plume characteristics
- Section 3.0 - Develops the extraction, treatment, and discharge system
- Section 4.0 - Provides a summary of the process design
- Section 5.0 - Provides details on the layout and design of the treatment building

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GENERAL LOCATION MAP
NWIRP BETHPAGE, NEW YORK

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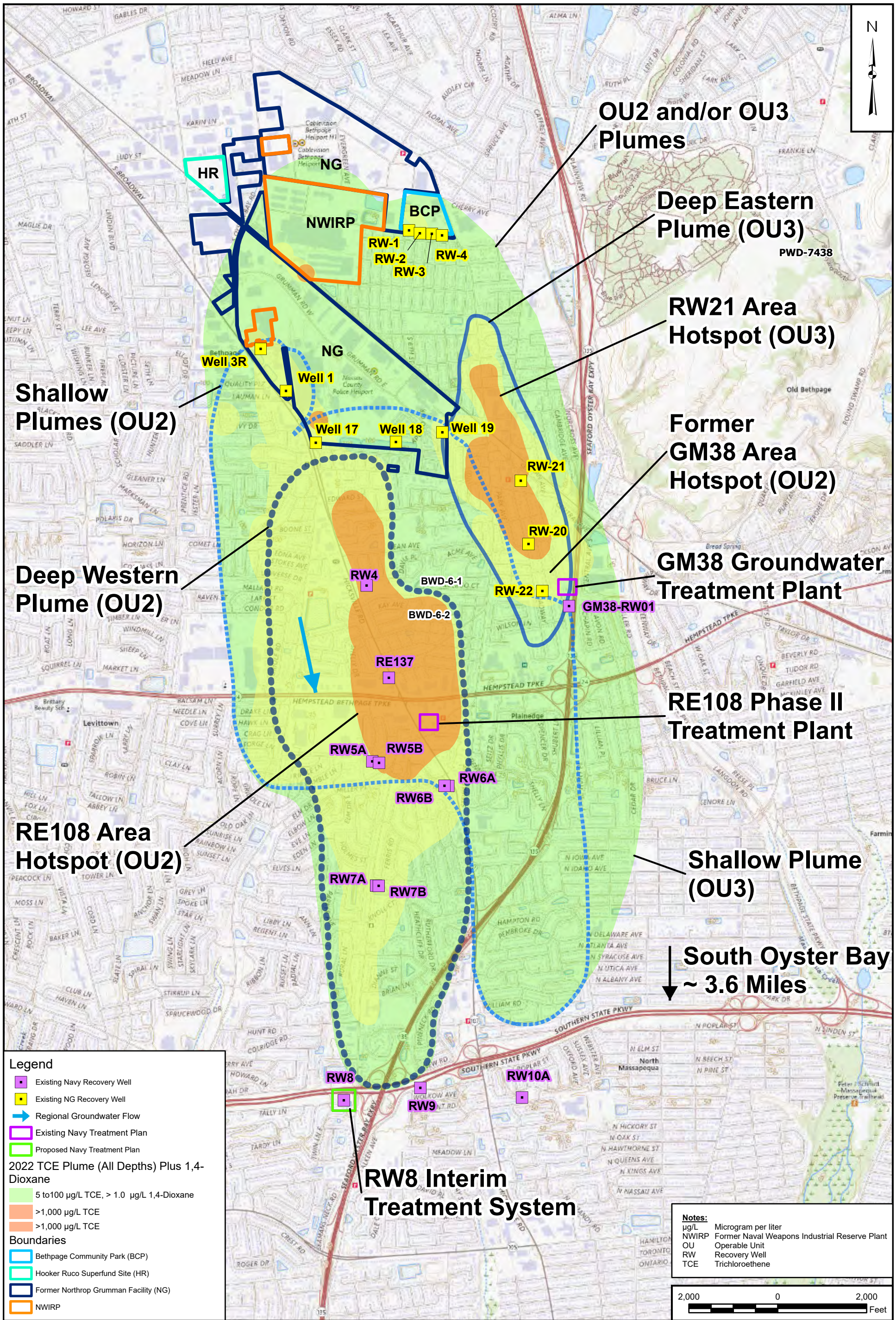

EXISTING AND PROPOSED OU2 AND OU3 GROUNDWATER INFRASTRUCTURE
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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2.0 Design Basis

This section presents and summarizes environmental investigations that describe plume characteristics. Also presented are criteria and guidelines used to establish treatment requirements for the extracted groundwater.

2.1 Plume Characterization

Vertical profile borings in the area are used to establish the geology and horizontal and vertical distribution of VOCs in groundwater. Analysis of groundwater samples from monitoring wells are then used to confirm the vertical profile boring data and to monitor plume migration. In addition, measured and estimated hydrogeological parameters are used to calculate plume migration direction and rates. This data in combination with groundwater modeling is used to define the boundaries of the OU2 Plume (Figure 1-2) and project contaminant migration.

The quality of groundwater projected to migrate into and be captured by the Phase III GWTS are characterized by several monitoring wells in the area identified below (see Figure 2-1 for all of the area wide monitoring wells). For those wells identified as current, associated data represents groundwater that is in the area and depth of the recovery wells. For those wells identified as future, groundwater is anticipated to require 10 to 30 years to reach the recovery wells. Recent analytical data for these wells, one vertical profile boring, and the RW8 interim groundwater treatment system are presented in Appendix A.

Recovery Wells RW8 and RW9 (Deep Western Plume): Recovery Wells RW8 and RW9 target an area that is an extension of the RE108 Area Hot Spot plume not captured by the Phase I, Phase II, or Phase II Extension recovery wells or water supply wells. The groundwater in the area of recovery wells RW8 and RW9 is currently free of VOCs but may contain 1,4-dioxane at a concentration up to 0.5 µg/L (one half the New York State Department of Health [NYSDOH] drinking water standard).

During pumping tests for RW8 and RW9, the groundwater was tested for VOCs, 1,4-dioxane, and inorganic constituents. VOCs and 1,4-dioxane were not detected in this groundwater. Except for iron, the concentrations of each of inorganics was low enough that treatment is not required. The iron concentrations ranged from 0.605 to 1.44 milligrams per liter (mg/L). A secondary NYSDOH drinking water standard for iron is 0.3 mg/L. Also important for the Phase III GWTS is that precipitates of iron can foul advanced oxidation process (AOP) lamps, plug granular activated carbon units, and reduce infiltration rates in recharge basins.

In the future, the 1,4-dioxane concentration is anticipated to increase to a maximum of 1.5 µg/L. VOCs are anticipated to be limited to several chlorinated compounds, primarily trichloroethene. These VOCs are present in narrow and thin finger of the plume moving at depth of 730 to 755 feet below ground surface (bgs), typical of groundwater in monitoring well RE117D1. The peak trichloroethene concentration in this well was 150 µg/L. Because of the large capture zone of the recovery wells relatively to the plume associated with RE117D, this maximum concentration is anticipated to reduce by a factor of at least 6 for an individual recovery well and then further reduced via dilution from the other recovery wells.

Representative Monitoring Wells for RW8 and RW9 Characterization:

- BPOW 5-1 through 5-7 (future)
- BPOW 6-1 through 6-6 (current)
- RE117D1 and D2 (future)
- RW8-MW01D1 through D3 (current)
- RW9-MW01D1 through D3 (current)
- RW8-PT-IN01 and IN02 (current)
- RW9PT-IN01 and IN02 (current)
- TT102D1 and D2 (current)

Recovery Well RW10A: Recovery Well 10A targets a relatively wide area of VOC- and 1,4-dioxane-impacted groundwater. The plume is relatively thin, approximately 20 to 50 feet thick and found at a depth of approximately 200 to 250 feet bgs. Under current conditions (see VPB-RW10), several chlorinated VOCs are present in the area of RW10A, including tetrachloroethene and breakdown products. The maximum concentration detected in one of the vertical profile boring groundwater grab samples was tetrachloroethene at 8.8 µg/L. The corresponding 1,4 -dioxane concentration was 0.22 µg/L. Groundwater upgradient of this area contains similar concentrations of VOCs and the 1,4-dioxane concentrations vary from not detected to one half the NYSDOH drinking water standard (0.5 µg/L).

Representative Vertical Profile Boring and Monitoring Well for RW10A Characterization:

- VPB-RW10 (current)
- TT119S1 (future)

2.2 Treatment Goals

The primary treatment goals for the Phase III GWTS are based on the NYSDOH drinking water standards as shown in Table 2-1. Under current conditions, the extracted groundwater is not anticipated to exceed these drinking water standards. Overtime, as the OU2 plume continues to migrate southward, several OU2 plume-related VOCs, including trichloroethene, tetrachloroethene, Freon 113 (1,1,2-trichlorotrifluoroethane), 1,1-dichloroethene, cis-1,2-dichlorothane, and 1,4-dioxane may be detected in the extracted groundwater. Over time, some of these constituents may exceed discharge goals.

In addition, the New York State Department of Environmental Conservation (NYSDEC) has established groundwater quality standards for the local aquifer. The local aquifer is classified as Class GA, with its primary use as a supply of drinking water. For the VOCs, the NYSDEC groundwater (Class GA) and NYSDOH drinking water standards are the same. For 1,4-dioxane, the NYSDOH drinking water standard is 1.0 µg/L and the NYSDEC groundwater standard is 0.35 µg/L. Practical target treatment levels for the VOCs will be 1 µg/L and for 1,4-dioxane will be 0.1 to 0.3 µg/L. These treatment goals are coordinated with the NYSDEC through a State Pollutant Discharge Elimination System permit equivalent.

Iron, which is natural in this area, is evaluated as a secondary drinking water standard. The NYSDOH has established a goal of 0.3 mg/L, with the primary basis of the standard is staining. The Phase III Groundwater Treatment Plant is being designed to achieve this goal, but with an emphasis on protecting downstream equipment and the recharge basins from the buildup of suspended solids and reduced efficiency. In practice, the iron levels should be controlled to much lower concentrations (e.g., less than 0.1 mg/L).

The Phase III GWTS is anticipated to operate until site related VOCs and 1,4-dioxane have stabilized at concentrations less than the NYSDOH drinking water standards in upgradient groundwater, such that the mass of residual contaminants in the groundwater would not result in the exceedance of NYSDOH drinking water standards in downstream public water supplies.

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TABLE 2-1
RECOVERY WELL WATER QUALITY AND TREATMENT GOALS

Parameter	Unit	RW8 (Avg/Max)	RW9 (Avg/Max)	RW10A (Avg/Max)	Combined (Avg/Max)	Treatment Goal[1]
Organics						
Trichloroethene	µg/L	1/5	5/25	0.2/1	1.8/10	5
Tetrachloroethene	µg/L	ND	ND	0.2/5	ND/1	5
Freon 113	µg/L	ND	0.2/0.5	ND	ND/0.5	5
1,1-Dichloroethene	µg/L	ND	0.2/0.5	ND	ND/0.5	5
cis-1,2-Dichloroethene	µg/L	ND	0.2/0.5	0.5/2	ND/0.5	5
1,4-Dioxane	µg/L	0.5/1.5	0.5/1.5	0.5/1.5	0.5/1.5	0.35
Inorganics						
pH (Range)	Standard Unit	4.8 to 5.5	4.6 to 5.4	4.5 to 5.5	4.5 to 5.5	6.5 to 8.0
Sodium	mg/L	NA	NA	NA	3/10	NA
Calcium	mg/L	NA	NA	NA	3/6	NA
Iron	mg/L	NA	NA	NA	1.5/2.5	0.6
Manganese	mg/L	NA	NA	NA	0.02/0.03	NA
Alkalinity	mg/L	NA	NA	NA	4/15	NA
Chloride	mg/L	NA	NA	NA	5/12	NA
Ammonia	mg/L	NA	NA	NA	ND/0.2	NA
Nitrate/Nitrite	mg/L	NA	NA	NA	0.2/0.5	NA
Sulfate	mg/L	NA	NA	NA	7/15	NA
Total Dissolved Solids	mg/L	NA	NA	NA	25/60	NA
Total Organic Carbon	mg/L	NA	NA	NA	0.6/1.5	NA
Total Suspended Solids	mg/L	NA	NA	NA	1/2	NA
Phosphorus	mg/L	NA	NA	NA	0.04/0.06	NA

1. The treatment goals presented are based on New York State Department of Health drinking water standards and New York State Department of Environmental Conservation Class GA groundwater standards. Practical target treatment levels for VOCs will be 1 µg/L and for 1,4-dioxane 0.1 to 0.3 µg/L.

µg/L - Microgram per liter. mg/L - Milligrams per liter.
RW - Recovery Well. GPM - Gallon per minute.
NA - Not applicable. ND - Not detected.

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3.0 System Development

3.1 Recovery Well System

The objective of the Phase III GWTS is to capture, or intercept, as practicable, the OU2 plumes to maintain their approximate current footprint. These activities would be conducted in close proximity to the Southern State Parkway.

As presented in Section 2.0, delineation of the OU2 plume Hotspot is based on analytical data from groundwater samples collected through 2025. The location of the recovery well and treatment plant are based on the current delineation of the OU2 plumes coupled with its migration, and the availability of space within that area, see Figure 1-2.

The extraction system design is based on the hydraulic properties of the aquifer coupled with the width and thickness of the OU2 plume (s). These factors allow a calculation of the plume flow-through rate and serves as the basis for the minimum required pumping rates. Additional factors are applied to the estimate to account for uncertainties in the aquifer properties and the need to intercept OU2 plume. Pumping at higher rates will intercept groundwater that has not been impacted, but is in close horizontal and vertical proximity to the impacted groundwater. These calculations are supported by computer modeling efforts coordinated for the larger OU2 plume area. The layout for the recovery wells is presented in Figure 3-1. The exact location, screen depth, and pumping rates of the recovery wells are based on numerical modeling. Using the numeric model results (Appendix A) and estimated OU2 properties, associated hydraulic calculations are summarized in Table 3-1.

Table 3-1: Hydraulic Calculation Summary

Parameter	Deep Western Plume	Shallow Eastern Plume
Associated Recover Wells	RW8 and RW9	RW10A
Plume Width (feet)	3,300	2,800
Plume Thickness (feet)	200	40
Hydraulic Conductivity (feet/day)	103[1]	70
Hydraulic Gradient (foot-V/foot-H)	0.002	0.002
Calculated Plume Flow Through Rate (each well, gallons per minute)	350	80
Design Extraction Rate (each well, average/maximum, gallons per minute)	450/600	600/700

1. Thickness-weighted average using 200 feet per day using a 50-foot-thick gravel zone and 70 feet per day using a 150-foot-thick sand zone.

A comparison of the design extraction rate with the calculated plume flow through rates for recovery wells RW8 and RW9 provides an approximate safety factor of 1.3 to 1.7 (i.e., over

pumping of 30 to 70 percent). These two wells work together to incept the Deep Western Plume. RW10A has a safety factor of approximately 7.5 to 8.8, (i.e., over pumping of 650 to 780 percent). This magnitude of over pumping is required because one single well will be used to capture a relatively thick portion of the aquifer in order to capture the thin Shallow Plume.

The Phase III GWTS is anticipated to operate until site related VOCs and 1,4-dioxane have stabilized at concentrations less than the NYSDOH drinking water standards in upgradient groundwater, such that the mass of residual contaminants in the groundwater would not result in the exceedance of NYSDOH drinking water standards in downstream public water supplies. The treatment duration is based on groundwater extraction rates, the groundwater seepage velocity, VOC retardation within the plume, and on limited biodegradation mechanisms. Based on these factors, the amount of groundwater plume to be extracted and treated, and the limited viability of degradation, the treatment system is expected to operate for more than 30 years.

3.2 Description of Treatment System

The treatment elements selected from the Phase III GWTS consist of the following processes (See Figure 4-1 in Section 4.0).

- Flow rate and water quality equalization: A tank will be used to blend groundwater from the three recovery wells (RW8, RW9, and RW10A), as well as water from the building sump, and potentially recycle water from the process units.
- Iron oxidation: Air- and sodium hypochlorite-based oxidation of iron at a neutral pH to convert soluble ferrous iron to insoluble ferric hydroxide.
- pH adjustment: Ventilation and carbon dioxide off gassing coupled with the addition of sodium hydroxide. A neutral pH is required for aquifer discharge and iron oxidation.
- Filtration: Multimedia units to remove precipitated iron hydroxide and other suspended solids. Also, cartridge filters will be used to protect downstream equipment from the potential release of suspended solids from the multimedia filters.
- Advanced oxidation process: Unit is used to remove 1,4-dioxane and most of the VOCs anticipated to be in the extracted groundwater. Because of the presence of iron in the water and likely staining of the UV lamp sleeves, ozone- and hydrogen-peroxide based units will be required. If practical, a UV- and hydrogen peroxide-based AOP system may be evaluated during startup.
- Ventilation/Mixing: To remove low levels of VOCs (e.g., Freon 113) that may not be effectively removed by the AOP system or granular activated carbon (GAC).
- Granular activated carbon: Polishing to remove residual ozone, hydrogen peroxide, hypochlorite, and VOCs prior to discharge.

3.3 Treatment Building Common Elements

A building is used to house the equipment and chemicals, and would consist of several components, as follows:

- The treatment building and support structures size as per design drawings.

- The building is provided with lighting, a security system, workspace, telemetry system, heater, and vent fans.
- Equipment is installed with secondary containment and sump, with associated precautions and containment required for chemical feed systems.
- Standard instrumentation and controls including flow and pressure switches, alarms, and level switches are included.

3.4 Discharge

Following treatment, existing storm water (recharge) basins will be used to re-infiltrating treated groundwater back into the aquifer. In order to minimize interference with the recovery wells, the treated water should be injected downgradient of the recovery wells. For the Phase III GWTS, five planned discharge basins are presented in Figure 3-1.

Recharge basins are large open depressions in the ground surface used to infiltrate water into the aquifer. In the Hempstead area, basins are commonly used to manage stormwater (stormwater basins). As a stormwater basin, it provides a reservoir to initially accumulate storm surges and then allow infiltration of accumulated water into the aquifer. Recharge basins are used to infiltrate clean (non-contact) or treated water on a continuous basis at production and groundwater remediation facilities.

In preparation for this system, short-term and long-term infiltration testing on four of these basins were conducted in 2022.

The short-term double ring tests found no evidence of shallow soils that would inhibit infiltration. While these short-term tests provide valuable information, the primary method for determining continuous high rate is by conducting infiltration rates uses high volume storm water events.

For the long-term tests, piezometers were set into the bottom of the basin and data loggers were used to measure water level during and after storm events. This data then allowed infiltration rates to be directly measured as the water level decreased in the basin after the storm event.

During these long-term tests, water levels were measured in Basins 3 and 4 (identified as Basins 2 and 3 in the Appendix) during one or more events. These tests found infiltration rates of approximately 12 feet per day. Based on the area of each basin, the calculated infiltration rate for these basins are 940 gpm and 1,300 gpm, respectively. Basin 2 and Basin 4 (identified as Basins 1 and 3 in the Appendix) did not have any measurable water levels recorded during the testing. Therefore, the capacity of these basins is uncertain.

Basin 1 was not originally considered as a viable basin because of its small size. During pumping tests of recovery well RW8, this basin was found to be able to effectively infiltrate 1,000 gpm over three consecutive days. In addition, this basin has been consistently infiltrating approximately 400 to 500 gpm on a continuous basis for several months without issue, which is equal to approximately 14 feet per day.

3.5 Discharge Piping and Routing

Discharge pipe routing is presented on Figure 3-1. This routing shows five recharge basins south of the Phase III Groundwater Treatment Plant. Basin 1 is just south of the east of the GWTS building. Basins 2 and 3 are 900 and 1600 feet south of the GWTS building in the neighborhood off Ruth Court and Twin Lane East and Basins 4 and 5 are 2800 feet southeast of the GWTS building near the corner of Seamans Neck Road and Jerusalem Avenue. To maintain the existing capacity of the storm water basins, two feet would be removed from the bottom of each basin. There would be three discharge lines from the GWTS building. One gravity discharge line would discharge directly to Basin 1. The second gravity line would divert the water to Basins 2 and 3, with a diversion manhole used to split the flow. The third discharge line would discharge into Basin 4 and 5. These basins would be interconnected to allow flow to both basins.

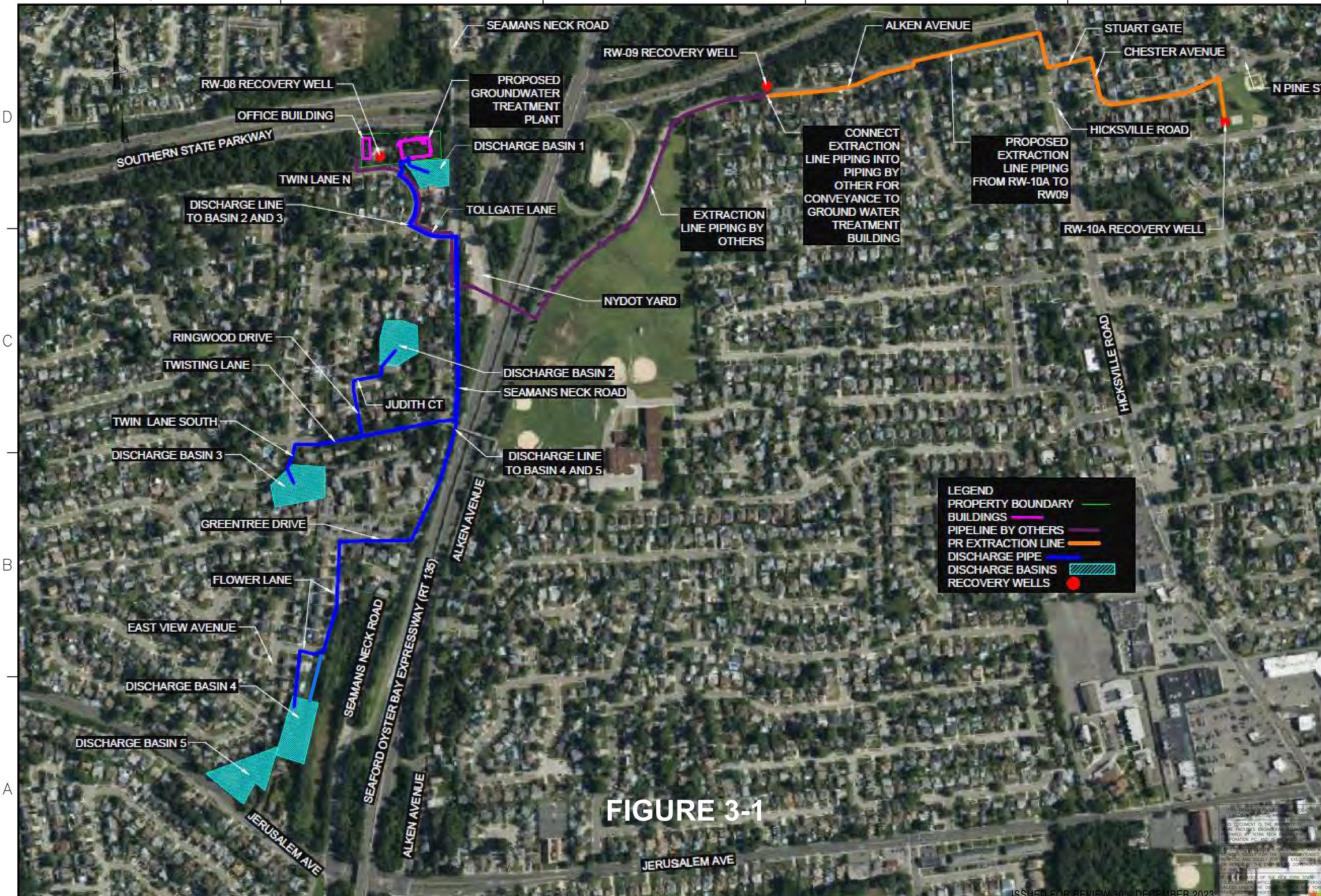

FIGURE 3-1

ISSUED FOR REVIEW 30% DECEMBER 2023

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TETRA TECH
www.tetratech.com
4433 CORPORATION LANE, SUITE 300
VIRGINIA BEACH, VA 23462
PHONE: (757) 461-3768 FAX: (757) 461-4148
A/E INFO

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PHASE III - TREATMENT PLANT

PROPOSED WORK LOCATION MAP

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G-002

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4.0 Treatment Process and Design Basis

This section describes the processes that will be used for treatment of groundwater at the site and presents the design basis for these processes. Calculations used in this design are presented in Appendix B and key equipment cut sheets are presented in Appendix C. The specifications are provided in Appendix D and the design drawings are presented in Appendix E.

4.1 Process Summary

The Phase III GWTS consists of three (3) new recovery wells (RW8, RW9, RW10A), a treatment system, and a discharge system using up to five existing storm water basins. The process flow schematic for the Phase III GWTS is presented in Figure 4-1

Within the new treatment building, there will be the following processes:

- Equalization Tank, with agitation and active venting
- Iron Oxidation
- Multi Media and Cartridge Filtration
- Advance Oxidation Process (AOP) system, using ozone and hydrogen peroxide
- Liquid-Phase Granular Activated Carbon (LGAC)
- Tank Ventilation and Treatment System to control off gas emissions.

The building layout is presented in Figure 4-2. The new building will be approximately 145 feet by 85 feet (12,300 square feet).

Groundwater from the aquifer will be extracted using three recovery wells. Based on modeling, over the long term, RW8 and RW9 will pump at an average flow rate of 450 gpm each and RW10A will pump at an average rate of 600 gpm, resulting in a design average flow rate of 1,500 gpm. Information on the recovery wells and associated pumps are presented in Table 4-1

Because the OU2 plumes will move through the target capture area at different rates and times, the recovery wells will be designed to pump at a maximum rate of 600 gpm (RW8 and RW9) and 700 gpm (RW10A). The combined peak flow from all three (3) recovery wells be 1800 gpm, i.e., not all of the pumps will be able to pump at the maximum rate at the same time. Existing monitoring wells, coupled with modeling, will serve to monitor the capture of the groundwater by the recovery wells. Some existing monitoring wells also serve to monitor water quality. The locations of the wells are shown on Figure 2-1.

The Phase III GWTS building will be located on New York State-owned property adjacent to Southern State Parkway, within the Navy easement. The setback for the new site and Phase III GWTS building and layout plan for the Phase III GWTS is shown in Appendix E.

The groundwater influent pipes from the recovery wells enter the Phase III GWTS building through the floor in the southwest corner (Figure 4-2). The Equalization Tank is also located in the south-west corner of the building. The Equalization Tank will include a side mounted aerator

that will help with oxygen transfer and reduce any chemical oxidant demand downstream for iron removal. Active venting of the Equalization Tank will also assist in stripping out any excess carbon dioxide (CO2) to raise the pH and Freon 113 that might be present in the recovery wells raw water. Approximately 200 cubic feet per minute (CFM) of continuous air flow through the Equalization Tank will be required. Sodium hydroxide (25 percent) will be fed upstream of the Equalization Tank to provide enough contact time for pH adjustment from 4.5 to 5.0 to approximately 7.0. This will assist with iron removal through oxidation.

The multimedia filter (MMF) feed pumps (P-100A/100B) are mounted on a pad at finished floor elevation. These pumps convey flow from Equalization Tank into three (3) high-rate vertical MMF containing anthracite, sands, and gravels operating in parallel. Iron hydroxide-based suspended solids are removed using these MMF. An optimal dose of sodium hypochlorite (12 percent chlorine) will be fed upstream of the MMF as an oxidant to convert any residual iron from soluble ferrous to insoluble ferric state prior to feeding into the MMF. The sodium hypochlorite system is backup in the event the Equalization Tank ventilation is insufficient to oxidize all of the iron. A set of cartridge filters will be used downstream of the MMF to remove any remaining solids or particulates. The flow is then fed into the AOP Reactor.

The AOP system consists of a reactor, hydrogen peroxide feed system, and an ozone generation and feed system. Because local road conditions, liquid oxygen cannot be delivered to site. As a result, relatively pure and dry oxygen will be generated onsite using a compressor, air receiver tank, dryer/filter, pressure swing adsorption oxygen concentrator system, and oxygen buffer tank. From the dried and concentrated oxygen, the ozone will also be generated on site and consist of an ozone generator and distributor (feed system). Both the compressors and ozone generators produce excess heat. The compressors require moderate rate room ventilation to remove the heat and the ozone generator uses a water chiller.

The hydrogen peroxide tank (containing 27 percent peroxide) with chemical feed pumps is used to feed it upstream of the AOP reactor, whereas the ozone is fed in one or more injection points in the reactor. Following the reactor, the water is depressurized to allow residual ozone and oxygen to off gas. This off gas is treated with an ozone destructor prior to venting to the atmosphere. The AOP system is designed to treat for 1,4-dioxane and other organics to meet the treatment goals maximum contaminant limit drinking water standards as listed in Table 2-1.

The LGAC feed pumps (P-400A/400B) are mounted on a pad at finished floor elevation. Treated flow from the AOP contact tank is fed into a LGAC feed tank from where the LGAC feed pumps convey flow into three (3) LGAC vessels operating in parallel. The LGAC vessels contain virgin coconut based granular activated carbon media that will be used to remove any residue peroxide, ozone, hypochlorite, organics and suspended solids prior to final discharge.

The building sump will be located adjacent to the equalization tank, with sump pumps as shown in the mechanical plan layout in Appendix E. Curbing for the plant serves as secondary building containment and is designed to store a major leak of the largest process tank.

All doors and exits will have a 4-inch-high sloped ramp. All rooms have a 6-inch-high step. The building containment calculations are provided in Appendix B.

The building is equipped with high overhead doors to the south of the building. There will be access doors to the outside for chemical, mechanical, control, electrical and storage rooms in the building. A separate 85-foot by 25-foot (2,125 square foot) office building will be located on west of the treatment plant.

A summary of the recovery wells pump, motor horsepower and flow rate information are provided in Table 4-1.

The new treatment facility design drawings are in Appendix E.

4.2 Design Flow and Influent Conditions

Expected design flows, influent groundwater quality conditions, and rationale for selection of those parameters for the new groundwater treatment system are discussed in Section 2.0.

The design influent concentrations are presented in Table 2-1 and are the basis for design of the groundwater treatment system. The design VOC, 1,4-dioxane, and iron influent concentrations are based on maximum anticipated concentrations. During the initial years of operation, actual concentrations may be less. In the event that higher concentrations occur, the GWTS includes units that provide redundant removal ability, plus there is excess capacity in the chemical treatment equipment to allow better performance. For example, the Equalization Tank ventilation, AOP unit, and LGAC all provide removal of VOCs and higher hydrogen peroxide and/or ozone dosages would improve removals.

The maximum capacity of the new groundwater treatment system is 1800 gpm, the treatment performance was evaluated at a maximum operating capacity of 1800 gpm. This flow consists of an anticipated maximum flow of 550 gpm from RW8 and RW9 (each) and 700 gpm from RW10A.

A summary of the targeted treatment train concentrations for unit processes is presented in Table-4-2 and the key process equipment list is presented in Table 4-3.

4.3 Groundwater Extraction System

The groundwater extraction system for recovery wells RW8, RW9 and RW10A consists of three (3) 6-inch recovery well submersible pumps inside a 12-inch well casing. Recovery wells RW8 and RW9 are screens at 595 to 790 feet bgs and 650 to 865 feet bgs, respectively. Recovery well 10A is screened at 217 to 310 feet bgs.

The pumps are to be installed 120 feet from the top of the well casing and the static water surface is 25 to 30 feet bgs. With a pump extraction drawdown (accounting for well fouling) of 50 feet, the water level in the well would be approximately 80 feet bgs. Groundwater pumps for the extraction system are anticipated to run at maximum flow rate of 550 to 700 gpm per pump with a motor rating of 25 to 40 horsepower (HP). The recovery wells will be equipped with submersible electric pumps (e.g., Grundfos 625S type) or equal.

More information on the recovery wells and pumps are provided in Table 4-1. Details on recovery well pumps are included in Appendices B and C.

4.4 Plant Process Flow

The three (3) recovery well discharge pipes convey groundwater to the Phase III GWTS. The discharge piping from these three recovery wells were designed and will be installed under a separate project. Each recovery well has a dedicated well pump, valve vault and discharge pipe.

The discharge pipe from the recovery well runs independently using various fittings underground before conveying flow to the Phase III GWTS. Therefore, there are a total of three (3) influent pipes entering the treatment building. Each recovery well extraction pipe includes adequate access through a valve vault. This valve vault is a precast concrete structure with an approximate 20 feet by 7 feet outside dimensions.

Each recovery well valve vault houses the recovery well that includes a fitting to bring the recovery well piping inside the valve vault. This fitting is on top of the well cap and provides means to access the level transmitter and recovery well pumps inside the well casing. Equipment along each line also includes a sampling port, a check valve, butterfly valves, a combination air/vacuum release valve, a flow meter to measure the flow from each individual well, and flexible coupling inside the valve vault walls. A 2-inch drain line with drain ball valve is provided underneath the discharge pipe so the entire pipe can drain back to the well casing.

The top of the valve vault includes two (2) 36-inch by 36-inch aluminum access hatch with lifting handle and a side hinge, and a 12-inch by 12-inch opening for well pump as shown on design drawings. These hatches are H-20 loading rated for vehicular traffic.

At the Phase III GWTS, each of the three (3) influent pipes individually convey flow into the Equalization Tank and include a totalizer to indicate flow totals.

A process flow diagram is in Figure 4-1. Inside the building, the Equalization Tank receives flow from three (3) recovery well pipes individually that discharge from the top side of the tank.

The Equalization Tank includes ventilation (off gassing) and pH adjustment using sodium hydroxide. A mixer mounted on top of the Equalization Tank, or an inline three element static mixer will assist in chemical mixing and to bring the pH level at the desired level for iron oxidation and precipitation. The upstream ventilation provides for reduced dosage of chemical oxidant for iron removal using the multimedia filters. This oxidation process will be supplemented with use of optimal amount of oxidant (sodium hypochlorite) The groundwater is then pumped using MMF feed pumps into to a set of vertical MMF for the oxidized iron removal prior to being pumped into cartridge filters for removal of any solids or particulates.

The treated flow is then conveyed into the AOP reactor. The AOP reactor uses ozone and hydrogen peroxide for treating the VOCs and 1,4- dioxane below the desired target treatment goals. The ozone is generated and distributed into the AOP reactor by an air preparation, oxygen and ozone generation system. Excess ozone (unused ozone) is separated and removed by the ozone destructor downstream of the AOP reactor and LGAC units.

The flow from the AOP reactor is then conveyed into a pumping tank. The LGAC feed pumps are used to send flow into the LGAC polishing adsorbers (LGAC-410, LGAC-420, and LGAC-430) operating in parallel to remove residual VOCs, ozone, and hydrogen peroxide present in the groundwater. The treated effluent is tested to meet the effluent goals and monitoring requirements prior to being discharged into the recharge basins.

The AOP treatment system is downstream of the MMF and upstream of the LGAC vessels. Piping from the AOP reactor includes a provision to recycle flow from the downstream of AOP reactor back into the reactor during start-up time.

A backwash supply (BWS) tank and a backwash waste (BWW) tank are provided to provide backwash flow for the backwash operations of the MMF and LGAC vessels and for storage for the backwash waste generated through each backwash cycle.

A building sump is provided as secondary containment. Water collected in the building sump is pumped to the Equalization Tank by two (2) submersible type pumps.

4.5 Equalization Tank

The Equalization Tank (T-100) is a prefabricated single wall fiberglass tank with a 12-foot diameter, 18-foot height, and a capacity of 15,200 gallons and flanged nozzle pipe connections, with an access manway on top. The Equalization Tank is on a concrete pad, 6 inches above the finished floor elevation. Adequate working space is provided around and above the tank to service and maintain the piping and pumps associated with the Equalization Tank.

The influent from the recovery well pipes discharge into and near the top of the Equalization Tank.

The Equalization tank will include a 8-inch line that will vent off gases from the tank through a carbon cannister C-100 prior to discharge to the atmosphere. These off gases may at times contain VOCs, ozone, and chlorine. This carbon cannister will be rated for 1200 CFM with 1000 pounds of carbon. The outlet from carbon cannister will be an exhaust vent with a bird screen. The Equalization Tank will also include a 12-inch line from outside the building to the atmosphere to allow fresh air to enter the tank and to prevent a positive pressure from developing in the tank (e.g., during tank filling). This fresh air will provide oxygen for iron oxidation, off gassing of carbon dioxide, and removal of VOCs.

The Equalization Tank is designed to handle the internal and external pressures and vacuum conditions during operation and is fabricated with appropriate resin material. The tank is capable of handling plus or minus 10 inches of water column pressure.

The Equalization Tank is equipped with the following:

- Level monitoring and transmitter system
- A dual stage, backup level switch for Low-Low and High-High level detection
- Containment area access ladder
- Manway opening for inspection

- Drainpipe
- Liquid level gauge

See Appendices C and E for more information on the Equalization Tank and the associated layout.

4.6 Mixing System

The Equalization Tank will include a side mounted mixing system. This system will promote oxidization of iron present in the raw influent water. It is anticipated that the raw water from recovery wells will include iron in the 1 to 2.5 mg/L range. This step will assist in providing oxidization of iron to a smaller extent prior to complete removal downstream using chemical oxidant (sodium hypochlorite) and multimedia vertical filters. This process will help optimize chemical oxidant dosage rates and assist in keeping any solids in suspension inside the Equalization Tank until they are conveyed and removed in the vertical multimedia filters, as well as removal of a portion of the VOCs.

The mixing system will include a 3 HP, 3-phase, 60 Hz, 460V TEFC Severe Duty Motor rated for 365 RPM. The mixer will be pedestal mounted with 6-inch flange connection and include a mechanical seal and shut-off valves for ease of maintenance and removing the drive without the need for draining the tank.

4.7 MMF Feed Pumps

Two multimedia filter feed pumps (P-100A and P-100B) will be used to convey groundwater from the Equalization Tank (T-100) to the MMF (MMF-210, MMF-220,MMF-230) operating in parallel. These will be horizontal split case centrifugal pumps. There is a dedicated flowmeter for the influent piping.

Transfer pumps are designed to operate continuously using variable frequency drive [VFD] and deliver a maximum flow rate of 1800 gpm to the MMF. One pump will be used to operate, a second pump is used as standby. These pumps are rated for a design point of 1600 gpm at 150 feet total discharge head (TDH) with a motor rating of 75 HP and ¼-inch solids handling capability. The pumps operate using VFD to help maintain a constant liquid level in the Equalization Tank.

More details on pump calculations are in Appendix B.

4.8 Multimedia Filters

Three (3) vertical filters MMF-210, MMF-220, MMF-230 will be used for parallel operation. These filters will include a layer of various anthracite, quartz, sand and gravel media for iron removal. Each sand filter will be 10 feet in diameter, with surface area of 78 square feet and a loading rate of 7 gpm per square foot at design flow rate of 1500 gpm flow rate. These pressure filters are high-rate filters capable of a hydraulic loading rate (HLR) of 8 gpm per square foot at maximum flow rate of 1800 gpm.

The system will make use of electric valves for operation and include a dedicated control panel.

Between 390 gpm and 1,180 gpm of water will be required for backwashing each vessel over an approximate 15-minute cycle. All three (3) MMFs will be backwashed automatically one after another generating a total backwash waste volume of approximately 25,000 gallons. This backwash waste will be conveyed and stored inside a glass-lined steel tank that will be located outside the building.

The MMF filter system will also include an air wash blower that will be used for conveying air for re-stratification of media during the backwash cycle. This air wash blower will be regenerative type rated for approximately 471 SCFM with 15 HP TEFC motor at 5 psi pressure.

The MMFs will have a Y-strainer or a basket strainer that will capture oversize solids before conveying flow to the BWS tank. Under normal operation all three filters will operate in parallel with an automated backwash system. Two filters will provide service at a reduced plant flowrate while the third filter is backwashed.

All filters and related piping and motor operated valving will be a skid system. The vertical pressure filters will be backwashed with plant effluent water based on either a timer or pressure drop (usually 15 pounds per square inch [psi]). Effluent from these multimedia filters will flow downstream into a set of cartridge filters and then into the AOP-reactor.

More information on MMF product dimension and parts is provided in Appendix C.

4.9 Backwash Supply and Waste Tanks

The backwash water for the backwash cycle on the MMF filters and LGAC vessels will be supplied from the Backwash Supply (BWS) Tank and conveyed from the filters and filters into a Backwash Waste (BWW) Tank outside the GWTP building.

The backwash supply tank (BWS) (T-500) will be prefabricated single wall fiberglass tank 12-foot diameter and 20 feet tall with a total capacity of 17,000 gallons. This tank will provide sufficient volume of water for two of the three MMF filter backwashes and one of the three LGAC vessel backwashes. This tank will be refilled automatically with treatment plant effluent at a minimum rate of 250 gpm.

The backwash waste from the backwash cycle from MMF filters and LGAC vessels will be conveyed into a backwash BWW outside the GWTP building. This BWW tank will be

approximately 17 foot in diameter, 26 feet high with a nominal capacity of 42,000. This tank is sized to hold one day of MMF backwash plus room for a decanter system and sludge storage and concentration.

The BWW Tank will contain a stainless steel floating weir decanter for returning clarified water to the building sump. This decanter will include vertical mooring posts and 4-inch flexible hose with flange connection that will convey the decant flow into the building sump by gravity through a valve vault containing a motorized valve. The floating decanter will be adjusted to the water level inside the tank and have a maximum decant discharge capacity of 100 gpm. The BWW will be decanted after every backwash cycle so the tank capacity is available before the start of the next backwash cycle.

The settled/concentrated solids at the bottom of the BWW Tank will be conveyed periodically into the sewer system through the same valve vault and a motorized valve. An ultrasonic transducer with Parshall flume inside manhole will be used to monitor the flow rate going into the sewer system.

The BWW Tank will have a level transmitter and level switch to monitor the high level and low level in the tank. A side top overflow piping and bottom drain will be provided that will drain to floor trench.

This tank will be field fabricated and include a caged ladder, platform, access manways and other appurtenances. The tank will include a 12-inch vent pipe that vents outside the building to the atmosphere.

The waste in the BWW Tank will be allowed to settle for 12 to 16 hours. A decanter will allow the clear water to be returned to the system. A more concentrated suspended solids will be discharged by gravity into the sanitary sewer.

The BWW and BWS Tank will be equipped with the following:

- Level monitoring and transmitter system
- A dual stage, backup level switch for Low-Low and High-High level detection
- Vent system for oxygen off gassing
- Access ladder
- Manway opening for inspection
- Drain pipe
- Liquid level gauge

4.10 Cartridge Filters

The water from the MMFs will be pumped into one (1) manual duplex horizontal cartridge filter system on skid. The filter vessel housing shall be stainless steel and designed to hold 60-inch-long and 7.2 inch in diameter polypropylene filter media elements. Each filter will hold 13 cartridge elements.

These filters will operate in parallel to remove any particulates in the water. One filter will operate whereas the second filter will serve as standby. An access platform will be provided to access these filters for maintenance.

The two (2) filters will be 36 inches in diameter rated for a maximum of 1800 gpm per filter. The filter cartridge elements will be rated for 5 to 10 microns. The cartridge elements will require a change out at 12 to 15 psi pressure drop. The filter vessels shall have 10-inch inlet and outlet connections rated for 150 psi pressure.

Water from the filters will be conveyed into the AOP-reactor. More information on filter product dimension and parts is provided in Appendix C.

4.11 Advanced Oxidation Process (AOP) – Ozone Generation and Reactor

The Phase III GWTS requires advanced oxidation process (AOP) for treatment of organics and 1,4-dioxane. Due to the presence of iron ozone-hydroxide treatment process was considered. This ozone-hydrogen peroxide system is designed to treat low levels of VOC to <0.1 µg/L, and 1,4-dioxane from 1.5 µg/L to treatment goal of 0.1 to 0.3 µg/L.

Option 2: Pressure Swing Adsorption (PSA) based Ozone Generation

Because of site access issues and residential setting for the system, a pressure swing adsorption (PSA) ozone generation system will be used (instead of liquid oxygen) and consists of the following components:

- AOP-Reactor
- Two (2) Oil Free Air compressor (one backup)
- Two (2) Air coolers (one backup)
- Two (2) Heatless Desiccant Air Dryers (one backup)
- Air Buffer tank
- PSA Oxygen Generator
- Oxygen Buffer tank
- Ozone Generator
- Side stream skid
- Ozone Destructor skid
- Chiller

The PSA based is a feed gas system that uses ambient air and oxygen concentrators. Air contains 21 percent oxygen and 78 percent nitrogen. The ambient air first passes through an air preparation system to generate oxygen. This system comprises of the oil free air compressors, receivers, air coolers, heatless desiccant air dryers, filters, dew point monitoring, Air receiving tank, oxygen concentrator, and buffer tank on a skid.

The air compressor will have a pressure range of 90 psi and flow rate 247 CFM with motor power rating of 50 HP. The air temperature off the air compressors will likely be in the 200 to 250 F range and saturated with water.

The air compressors shall use an internal heat exchange system to cool the compressed air to approximately 100 F prior to feeding into air dryer. The water flow for heat exchange stream will be fed from a 175-gallon capacity break tank T-650 located on top of the compressor room. Water will be discharged to compressor heat exchange system based on the operation of the compressor. This break tank will have a 1” potable water line and a 2” treated effluent water line connection from LGAC entering from top. Each pipe will have a solenoid valve to open/close these lines based on the level in tank T-650. The solenoid valve on the treated effluent water line will open at EL 14.5' and close at EL 16.25'. The solenoid valve on the potable water line will open at EL 14' and close at EL 15'.

A level transmitter (LT) and level switch (LSH) will be used to control the level in tank T-650 and a 3" overflow nozzle at 5' above tank bottom (or elev. 17'). The overflow piping connection will be provided for overflow into floor drain. A high-level alarm will be provide and the set points will be adjustable.

The condensate from compressor heat exchange process and the heat exchange waste stream will be conveyed by gravity into the building sump via 2” drain pipes and floor drains. Since these are oil free compressors it is anticipated that any oil water separator or filters downstream of compressors will not be required

The heatless desiccant air dryer will work via adsorption. This dryer will be rated for inlet flow of 165 CFM at 100 psi pressure rating. The wet compressed air will enter one of the two towers of the desiccant dryer, and the dryer adsorbs the moisture onto the surface of the desiccant. The moisture will remain trapped on the desiccant beads. The dry compressed air will be fed to the filters and air receiving tanks downstream of oxygen generation. The dryer will operate on a 3- to 4-minute cycle.

Once the desiccant is saturated enough it will switch towers via a timer. The original tower shall vent to atmosphere and begin its regeneration cycle. During the regeneration cycle, the air dryer will divert about 10 to 20 percent of the dry air from the drying tower to the regenerating tower, where the air is used to dry the saturated desiccant beads. This dry air desorbs the moisture from the desiccant, releasing it into the atmosphere. This purged air from the dryer will tie into the 8-inch vent line from the EQ tank and LGAC feed tank that is fed to the carbon cannister vessel.

One set will be used for regular operation and the second set will be provided as redundancy at time of repair or maintenance.

Oxygen concentration systems separate oxygen from compressed air through a process known as pressure swing adsorption (PSA). This process employs molecular sieves which adsorbs nitrogen from air at high pressure and releases the nitrogen at low pressure. This system employs two tanks filled with the absorbent. As compressed air flows through one tank, the nitrogen is adsorbed. The oxygen passes through the system to the ozone generator. When the

tank begins to saturate with nitrogen, the flow is switched to the other tank. At that point the pressure in the first tank is lowered releasing the adsorbed nitrogen. It is then purged with oxygen from the other tank. This process is repeated when the second tank is saturated with nitrogen. The result will be a constant flow of gas with 90 to -95 percent oxygen content.

Considering that the total loading for ozone at design flow of 1500 gpm will be approximately 110 pound per day, the oxygen demand for generating it will be approximately 1100 pound per day which is equivalent to 70,000 SCF per day. Therefore, a PSA based oxygen generator system with a capacity of 3,000 SCFH will be designed to meet the ozone generation needs.

The oxygen generation and ozone generation system will be located in separate rooms inside Phase III GWTS building whereas the chiller system will be located outside the building on a concrete pad.

More information on PSA based ozone generation system and its components is provided in Appendix C.

AOP Reactors

Some AOP reactors operate by reacting ozone with hydrogen peroxide to form the hydroxyl radical. This radical then oxidizes various organics, including 1,4-dioxane and trichloroethene. Destruction of residual ozone (liquid and gas phase) and hydrogen peroxide (liquid phase) is required. Because of the aggressive nature of the chemicals, stainless steel and Teflon materials are commonly used.

Option 1: Plug Flow Reactors

This option is an advanced oxidation process (AOP) reactor system that utilizes the generated ozone and hydrogen peroxide under a moderate pressure in a plug flow reactor. Due to the configuration, and restriction on minimum flow rates, a dual reactor will be employed. For a design system flow rate for 500 to 1800 gpm, each reactor unit will have an operating 500 to 1000 gpm flow rate. This system includes direct injection into the reactor at several points to optimize system efficiency.

More information on a plug flow reactor system, components, product dimension and parts are provided in Appendix C.

Option 2: Ozone Reaction Tank

This system will consist of one 5,300-gallon (or two 3,000-gallon) reaction tanks. The tank will operate under a relatively low pressure compared to the other option and will have intermediate baffles and ozone gas injectors with isolation valves and include flow and pressure local indicators as well as an overpressure valve on top of the contact tank.

More information on the Ozone reaction tank, components, product dimension and parts are provided in Appendix C.

4.12 Bench-scale testing for Ozone-Hydrogen Peroxide AOP Reactor System

Bench scale testing to determine appropriate chemical dosages are complete.

The analytical results from the bench test support using Ozone-Hydrogen Peroxide technology for the treatment of 1,4-Dioxane in the groundwater at the NWIRP Bethpage NY site. 1,4-Dioxane concentration was successfully reduced to below the treatment objective of 0.3 µg/L, with analytical result from lab below detection limits.

The bromide in the water samples were 71 µg/L. The bromate concentration in treated samples were controlled to well below < 10 µg/L (all below detection limit of 5 µg/L).

The following design dosage rates are recommended that based on the analytical results of the Round 1 tests (SP1–4) and Bromate Control and Optimization Round 2 tests (SP5 – 6):

For the HiPOx system at NWIRP Bethpage NY site: Parameter (Units)	Influent	Effluent
Ozone (mg/L)	1.25	-
Hydrogen Peroxide (mg/L)	1.3	-
Mole Ratio (H2O2 : O3)	1.5	-
Flow Rate (gpm)	1800	1800
1,4-Dioxane (ug/L)	1.5	< 0.3

Despite the present iron concentration in groundwater, it was observed that it does not significantly impact the ozone reaction efficiency. While there may be a slight increase in ozone consumption, the iron will ultimately be oxidized and precipitate out from the groundwater.

As hypochlorite pretreatment is used, there may be hypochlorite residuals that might react with the hydrogen peroxide increasing hydrogen peroxide consumption. Through the hypochlorite dosing pretreatment step, the precipitated iron content will be filtered by MMF. This has the potential to simplify the overall chemical dosing, reduce costs, and enhance control operation.

The bench scale testing report and analytical results are included in Appendix A.

4.13 AOP Reactor Startup and Bypass

The AOP treatment system ties into process water piping after the multimedia/cartridge filtration system and before the LGAC adsorbers. The AOP reactor treatment system is anticipated to discharge up to 3.5 mg/L of hydrogen peroxide to the LGAC treatment system. The residual hydrogen peroxide is degraded by the LGAC. The LGAC units must be regularly inspected and reevaluated for potential replacement or rehabilitation.

It is also anticipated that the AOP reactors will take approximately several minutes to warmup and achieve optimum performance levels for treatability. During this time, 1,4-dioxane and organics is not effectively treated. Therefore, it is necessary to install an AOP start up recycle

line that prevents untreated water being discharged. The recycle line from the AOP reactor outlet (downstream of the reactor) is connected into the Equalization Tank at the headworks of the plant. This piping is sized to accommodate the maximum flow rate of 1800 gpm. The AOP recycle line will be controlled with automated motorized valves.

The MMF feed pumps (P-100A and P-100B) will be used to divert the flow from the outlet of AOP reactor to the Equalization Tank during the initial startup period. The flow will circulate in this loop until the AOP reactors are ready to begin treatment. The design allows sending the flow to the Equalization Tank using automated valves with non-modulating actuators based on the operation status of the AOP reactors.

4.14 LGAC Feed Tank and LGAC Feed Pumps

The LGAC feed tank will be a fiber glass reinforced polyethylene approximately 12 feet diameter by 16 feet high. The LGAC feed tank will include an 8-inch vent line that will direct VOC and ozone residue into through a carbon cannister C-100 before discharge to the atmosphere. This carbon cannister will be rated for 1200 CFM with 1000 pounds of carbon. The outlet from carbon cannister will be an exhaust vent with a bird screen.

Two LGAC feed pumps (P-400A and P-400B) will be used to convey groundwater from the LGAC feed tank into the LGAC vessels downstream. The LGAC feed pumps will be horizontal split case centrifugal pumps. These transfer pumps are designed to operate continuously using VFDs and deliver a maximum flow rate of 1800 gpm to the LGAC vessels. Only one pump is used to operate, a second pump is used as standby. These pumps are rated for design point of 1600 gpm at 45 feet TDH with a motor rating of 25 HP. These pumps will be designed to keep a constant liquid level in the AOP reactor.

More details on pump calculations are in Appendix B.

4.15 Liquid-Phase Granular Activated Carbon Polishing

Liquid-phase granular activated carbon (LGAC) polishing is performed in three (3) vessels operating in parallel (LGAC-410, LGAC-420, LGAC-430) and is used to remove residual VOCs, ozone, hypochlorite, and hydrogen peroxide from the water. Each vessel is 10 feet in diameter and rated for a maximum flow of approximately 700 gpm, with 20,000 pounds of coconut based activated carbon (or equivalent) per vessel. The Estimated Bed Contact Time (EBCT) is approximately 12 minutes per vessel with a hydraulic loading rate of 8.9 gpm per square foot at a flow rate of 700 gpm.

Each of the three (3) 10-foot diameter vessels are steel vessels or equal. This LGAC system will include a piping manifold with inlet, outlet and backwash piping connections. All valves on manifold will be electric operated.

More information on product dimension and parts is provided in Appendix C.

LGAC Backwash System:

Backwashing of the LGAC units is expected to be an infrequent activity. Since the LGAC and MMF units use the same BWS tank and pumps and BWW tank, these activities will need to be coordinated.

The LGAC vessels can be backwashed through the fluffing process. The backwash process is a manual operation process. It is also carried out when an excessive pressure drop is observed. LGAC vessels are backwashed at a rate of at least 12 gpm per square foot. Since the 10-foot diameter vessels have a surface area of 78.5 square foot, it requires about 950 gpm to backwash each vessel. The LGAC vessel that requires backwash is taken offline. The plant effluent water is used as a source for backwashing the LGACs. Prior to backwashing, a portion of the effluent water is manually diverted using a butterfly valve to fill up the backwash supply tank (T-500) installed inside the building. This tank supplies the backwash flow using two (2) backwash pumps (P-500A and P-500B). These pumps are rated at 950 gpm at 61 feet TDH and 20 HP motor. This tank will include a 12-inch vent pipe that will vent outside to the atmosphere.

Water from the BWS tank (T-500), with a capacity of 17,000 gallons will be used. Since the backwash cycle is 12 to 5 minutes and the required backwash flow rate is 950 gpm, this 17,000-gallon tank provides sufficient volume to backwash LGAC vessel.

The backwash waste from this cycle is sent to the BWW tank, with a capacity of 42,000 gallons.

The entire backwash cycle of one LGAC can be completed in about 30 to 45 minutes and all LGAC vessels can be backwashed in a period of 2 to 3 hours.

4.16 Gas-Phase Activated Carbon Vessel and Blower

The vent from Equalization tank and LGAC feed tank off-gases will be conveyed to a gas-phase activated carbon vessel for treatment prior to discharge to atmosphere. A 6-inch air makeup line from outside will be provided on both tanks to allow atmospheric air to enter the tank. Another 6-inch active vent pipe will be connected from both tanks to a gas-phase activated carbon vessel along with a set of blowers on the downstream end of the carbon vessel.

Based on a maximum flow rate of 1800 gpm, it is anticipated that a standard conversion would displace about 240 CFM of air from each tank. Therefore, a total of 480 cfm of air would have to be conveyed and treated in the vessel. The system is designed for flow rate of 600 CFM with a total system pressure drop of up to 18” WC.

The gas-phase activated carbon vessel will be 46” in diameter and rated for up to 1200 CFM. This vessel will contain 1000 lbs of 4mm pellet carbon media. The use of 4mm pellet media (in lieu of 4 x 8 mesh) will reduce the overall system pressure loss thereby lowering energy usage and cost in long run. It is anticipated that at the design flow rate of 600 CFM the dense packed 4mm pellet carbon media will generate a pressure drop of 6” WC.

Two (2) inline air handling wheel type blowers will be provided that will operate under negative pressure to pull air from both tank vents through the gas-phase carbon vessel media. This

treated air flow will be discharged downstream of the blower and a pitot tube-type flow meter will be used to monitor the air flow rate. The blowers will be designed for flow rate of 600 CFM with a 3 HP, 460 V, 60 Hz motor rating. The blower impeller, motor, and RPM will be designed to generate a fan curve that meets the air flow rate and system pressure drop requirements.

The blowers will also include a 3 phase, 60 Hz, 460 v motor starter for operation. One blower will be used for operation and other will be spare. The blower will be designed for continuous critical operation so it can be controlled to be in operation for the entire system to run.

The purge valve included with the heatless desiccant dryer (downstream of the compressor) will discharge up to 20% of the total air flow from compressor. It is anticipated that approximately 40 to 50 CFM of this air will be discharged directly into atmosphere.

More details on blower calculations and equipment are in Appendix B and Appendix C.

4.17 Building Sump and Sump Pumps

Two submersible building sump pumps (P-800A/800B) will be used to convey wastewater from building sump into the Equalization Tank. The building sump will be approximately 10 feet wide by 10 feet long by 10 feet deep and will house both submersible pumps.

These pumps will be capable of pumping any building runoff from floor drains or waste collected in the building sump back to head of the Equalization Tank. Only one pump is used to operate, a second pump is used as standby. These pumps are rated for design point of 150 gpm at 40 feet TDH with a motor rating of 5 HP and ¼-inch solids handling capability.

More details on pump calculations are in Appendix B.

4.18 Chemical Storage Tanks and Unloading Station

Sodium Hydroxide Tank

The sodium hydroxide (NaOH) will be fed upstream of the Equalization Tank for pH adjustment. The process design requires pH adjustment in raw water from 4.5 to 5.5 to about 6.8 to 7.0. A chemical dose of approximately 10 to 20 mg/L at 25 percent will be used to raise the pH to allow for oxidation or iron. The chemical storage tank will have a nominal capacity of 4400 gallons with a working volume of approximately 4000 gallons and is sized to provide approximately 30 days of sodium hydroxide supply. The storage tank will be 10 feet diameter by 10.5 feet high made up of high-density polyethylene (HDPE) and mounted on a concrete pad 6 inches above finished floor elevation. The storage tank will be a dual containment tank which will serve as secondary containment to protect workers and minimize potential release to the environment.

The tank will be installed inside a separate chemical storage room, which includes a chemical sump and a sump pump capable of operating at 30 gpm at 15 feet TDH, 0.5 HP. The chemical tank will fill up from a truck tank port during storage tank fill operations at the chemical unloading pad located adjacent to the building. A door is provided to provide access to allow a connection during the fill up operation. A containment pad is designed outside the building access door to contain small to moderate leaks (i.e., maximum of 100 gallons) from the truck tank port during

storage tank fill operations. Chemical signage will be provided inside the building. The tank includes a 6-inch vent pipe that vents outside the building to the atmosphere.

Pump sizing is based on minimum and maximum concentrations of 3 to 20 mg/L. Two (2) manually adjustable sodium hydroxide (25 percent) chemical metering pumps with a pumping range of 0.6 to 4.0 gallons per hour are provided. One pump is used for service and the other pump is spare. Standard chemical metering pumps rated for 100 psi provide adequate pressure to feed chemical upstream of the Equalization Tank. Secondary containment is on the suction and pressure side of the piping and pumps. The secondary containment drains to a container for periodic manual inspection for leakage.

Because of the anticipated short distance and associated contact time between the process water and sodium hydroxide before the Equalization Tank, a mixer will be provided inside the Equalization Tank for complete mixing to allow for any pH adjustment. A process water flow switch interlocked with the sodium hydroxide pumps will be provided to ensure water flow prior to the startup of the chemical pump.

More details on chemical tank calculations are in Appendix B.

Sodium Hypochlorite Tank

The sodium hypochlorite (NaOCl) will be fed upstream of the MMF as an oxidant to oxidize the soluble ferrous iron into insoluble ferric iron for removal in the MMF. This oxidation will require pH adjustment which will be accomplished with sodium hydroxide as discussed in earlier section. Based on an influent maximum concentration of iron at 2.5 mg/L the dosage for NaOCl (12 percent chlorine) oxidant is estimated to be approximately 2 mg/L. At the design flow of 1500 gpm approximately 30 gpd will be required for oxidation of iron. The chemical storage tank will have a nominal capacity of 1000 gallons with a working volume of approximately 800 gallon and is sized to provide approximately 30-day supply. The storage tank will be 6.5 feet diameter by 5.5 feet high made up of high density polyethylene (HDLPE) and mounted on a concrete pad 6 inches above finished floor elevation. The storage tank will be a dual containment tank which will serve as secondary containment to protect workers and minimize potential release to the environment.

Two (2) manually adjustable sodium hypochlorite (12 percent chlorine) chemical metering pumps with a pumping range of 0.6 to 4.0 gallons per hour are provided. One pump is used for service and the other pump is spare. Because of the anticipated short distance and associated contact time between the process water and sodium hypochlorite before the MMF filters, an inline three element static mixer (SM-200) is provided just downstream of the chemical injection. Standard chemical metering pumps rated for 100 psi provide adequate pressure to feed chemical upstream of the MMF. Secondary containment is on the suction and pressure side of the piping and pumps. The secondary containment drains to a container for periodic manual inspection for leakage.

The tank will be installed inside a separate chemical storage room, which includes a chemical sump and a sump pump capable of operating at 30 gpm at 15 feet TDH, 0.4 HP. The chemical

tank will fill up from a truck tank port during storage tank fill operations at the chemical unloading pad located adjacent to the building. A door is provided to provide access to allow a connection during the fill up operation. A containment pad is designed outside the building access door to contain small to moderate leaks (i.e., maximum of 100 gal) from the truck tank port during storage tank fill operations. Chemical signage will be provided inside the building. The tank includes a 6-inch vent pipe that vents outside the building to the atmosphere.

More details on chemical tank calculations are in Appendix B.

Hydrogen Peroxide tank

The hydrogen storage tank is sized based on the hydrogen peroxide feed rate, the hydrogen peroxide concentration, and tank refilling rate. The AOP reactor design requires 6 mg/L of hydrogen peroxide in process water at 27 percent. The chemical storage tank has a nominal capacity of 3,000 gallon, a working volume of approximately 2,300 gallons, and is sized to provide approximately 45 days of hydrogen peroxide supply. The storage tank will be 8.5 feet diameter by 9 feet high made up of HDPE and mounted on a concrete pad 6 inches above finished floor elevation. The hydrogen peroxide storage tank is a dual containment tank which serves as secondary containment to protect workers and minimize potential release to the environment.

The tank will be installed inside a separate chemical storage room, which includes a chemical sump and a sump pump capable of operating at 30 gpm at 15 feet TDH, 0.5 HP. The hydrogen peroxide tank fills up from a truck tank port during storage tank fill operations. A door is provided to allow access to a connection during the fill up operation. The A containment pad is designed outside the building access door to contain small to moderate leaks (i.e., maximum of 100 gallon) of the hydrogen peroxide from the truck tank port during storage tank fill operations. Chemical signage is provided inside the building. The tank includes a 6-inch vent pipe that vents outside the building to the atmosphere.

The dual containment chemical storage tank also has the following:

- Leak detection system
- Level monitoring and transmitter system
- A dual stage, backup level switch for Low-Low and High-High level detection
- Cover for ultraviolet protection of tank and hydrogen peroxide
- Vent pipe system for oxygen off gassing
- Access Ladder
- Manway opening for inspection
- Fill line
- Drain pipe
- Liquid level gauge

Pump sizing is based on minimum and maximum hydrogen peroxide concentrations of 3 to 20 mg/L in the process water.

Two (2) manually adjustable hydrogen peroxide (27 percent) chemical metering pumps with a pumping range of 0.6 to 4.0 gallons per hour are provided. One pump is used for service and the other pump is spare. Standard chemical metering pumps rated for 100 psi provide adequate pressure to feed chemical upstream of the AOP reactor. Secondary containment is on the suction and pressure side of the piping and pumps. The secondary containment drains to a container for periodic manual inspection for leakage. Because of the anticipated short distance and associated contact time between the process water and hydrogen peroxide before the reactor, an inline three element static mixer (SM-300) is provided just downstream of the chemical injection. A process water flow switch interlocked with the hydrogen peroxide pumps are provided to ensure water flow prior to the startup of the chemical pump.

More details on chemical tank calculations are in Appendix B.

4.19 Treated Groundwater Discharge

The treatment plant final effluent will be discharged from the LGAC vessels into three (3) separate single wall HDPE piping. Once in the street, the piping will be reinforced concrete pipe. This discharge system will mainly be a gravity system with piping and diversion manholes leading to the retention basins. The pipelines will include primary (manual) flow control at the treatment plant with flow meters on each of the three lines.

The treated plant flow will be discharged into five (5) retention basins Basin 1 thru Basin 5. Basins 2 and 3 and Basins 4 and 5 will serve as the primary discharge locations. Basins 1 will be used for excess flow and backup operations.

The discharge line to Basins 2, and 3 will include a manhole control structure with manual gate valves or stop logs for controlling the flow distribution into each basin.

The flow rates of the treated groundwater pumped to the basins will be recorded by magnetic flow meters. These flow measurements are totalized and transmitted to the programable logic controller (PLC). Retention basins will be monitored for water level on a continuous basis and include a high-water level alarm. The monitoring signal is transmitted to the PLC.

The treated effluent is tested to achieve the equivalent of State Pollutant Discharge Elimination System effluent equivalent limitations and monitoring requirements before discharge to the stormwater basins.

More details on the location of the treated groundwater discharge basins are included in Appendix E.

4.20 Process Control System

The control system consists of a main process PLC mounted in a panel located in the GWTS building control room and with remote I/O (Input/Output) panels, distributed throughout the plant on an Ethernet IP control network. There will be remote I/O panels located at remote Recovery Wells RW9 and RW10A and these panels will be housed internal to the local Motor Control

Center (MCC) at each well. Using a distributed control architecture provides an effective way to reduce the costs of wiring all the plant I/O to a central location.

The Distributed I/O, for the GWTS system, will consist of several Remote I/O panels:

1. Electrical Room I/O Panel (IOP-1) – This panel houses the GWTS's PLC and includes I/O from the Control Room, Electrical Room, and BWW Tank.
2. Process Area Panel (IOP-2) – This I/O panel, located on the west side of the plant, includes the I/O for interfacing with Recovery Well RW8, Equalization Tank, BWS, , Building Sump, Influent Piping, and Effluent Piping.
3. Chemical Area Panel (IOP-3) – This I/O panel, located near the chemical rooms, includes the I/O for interfacing with chemical skids/feed systems, Multimedia Filter skid, and Cartridge Filters.
4. Reactor/Ozone Room (IOP-4) - This I/O panel, located near the Reactor/Ozone Room, includes the I/O for interfacing with the LGAC skid, LGAC Feed Tank, LGAC Feed Pumps, Reactor/Ozone Room equipment and Compressor Room equipment.
5. Recovery Well RW9 (IOP-5) – This I/O panel, located at Recovery Well #9, includes the I/O for interfacing with the remote well pump and discharge piping vault and manhole level switches.
6. Recovery Well RW10A (IOP-6) – This I/O panel, located at Recovery Well #10A, includes the I/O for interfacing with the remote well pump and discharge piping vault and manhole level switches.

The PLC controls the Phase III System processes via hard-wired or ethernet input/output to instrument devices located in the GWTS and recovery wells. All Remote I/O panel enclosures will be stainless-steel NEMA 4X enclosures, suitable for use in potentially damp or corrosive areas.

The control system network infrastructure shall be coordinated to ensure all GWTS equipment can properly communicate with the main PLC / supervisory control and data acquisition (SCADA) system. This includes coordination of IP addresses, networking equipment, required gateways to bridge various control protocols (Modbus, Ethernet IP, etc.). There shall be coordination with all vendor's supplied equipment / skids to ensure they are configured and programmed to allow for connectivity to the GWTS network and required data for the main PLC / SCADA system is clearly identified.

The SCADA system will be a server based, redundant system with the Primary / Backup SCADAs and SCADA Client Workstation located in the Control Room. The SCADA will require vendor supplied license for connections between the SCADA Client Workstation and remote human machine interfaces (HMIs). There will be two (2) remote HMIs located within the GWTS at the chemical area and the reactor/ozone room. A portable remote HMI display will be used at remote Recovery Wells RW9 and RW10A. The process can be monitored and controlled locally at the site. Only monitoring of the process control system will be available from off-site locations.

The SCADA utilizes dual monitors to display the process information, trend process variables, and process alarms. Alarm notification is handled by the SCADA and WIN-911 (industrial alarm notification software) and sent via internet connection (FIOS) in the form of an email and text message. The SCADA operator station is used for site monitoring and making changes to the control system. Alarms and historical trending data can be downloaded by the operator for analytics as needed. The SCADA and historian are configured and maintained on virtual machines located on a main server.

A Historian / Engineering Workstation (EWS), located in the Control Room, provides for storage of Historical data, PLC programming and Microsoft Office programs. The EWS also provides an access point for remote viewing/maintenance of the GWTS control system through an installed instance of software such as TeamViewer or LogMeIn. Remote Desktop (RDP) will be used to connect to the SCADA Client Workstation once a user logs into the EWS workstation.

Communications between the GWTS PLC, the remote I/O panels, and SCADA is via category (CAT)-6 ethernet cable. CAT-6 ethernet cable also provides communication with the VFDs and starters located in the MCC, the AOP control panel, chemical pump skids, ozone/reactor system, and MMF skid. Communications between the main process PLC with recovery wells RW9 and RW10A remote I/O panels are over ethernet fiber optic cable.

Remote access security is implemented by means of a virtual private network (VPN) router. VPN security incorporates an approved group of users and login passwords while implementing strategies such as two-factor authentication. Remote access will be limited to monitoring of the process control system.

The new groundwater treatment system has the interlocks and alarms necessary to control the treatment processes in either a manual fashion or continuously in an automatic mode. An eWON VPN router is used in conjunction with eCatcher software to configure security and user rights for remote access. User permissions are assigned, in which certain users are only able to monitor process parameters.

4.21 Building Services

The treatment site will include a Ground Water Treatment System (GWTS) and a small office building. There will be two (2) FIOS internet connections provided by Verizon, one for each building. Separate internet connections are utilized to prevent internet traffic crossover between the control system and office network.

The GWTS will include a process area, control room, chemical storage, mechanical room, electrical room, and locker room. The GWTS Control Room will have a VPN router (firewall), FIOS internet router, and printer. A network attached storage device will be used to back up the control system data.

The office building will include a conference room and several offices. The office building will have a VPN router (firewall), FIOS internet router, and printer. The conference room will have a smart TV/monitor and laptop. There will be a laptop shared between the engineering offices

and the lab. Remote access to the GWTS control system will be via the Control Room EWS / VPN router.

4.22 General Logic and Alarms

The Piping and Instrumentation Diagrams (P&ID) details the control system elements and functions. An I/O list and Process Control Description are presented in the technical specifications.

General Notification Alarms

These alarm conditions do not cause a forced system shutdown but require operator notification and may necessitate additional actions such as a site visit to assess and rectify a problem. WIN-911 software is configured to utilize the local internet connection (FIOS) and notify authorized operators via computer (email) and telephone (VOIP, Microsoft text to speech voice mail) when a general notification alarm occurs.

System Shutdown Alarms

Various critical alarm conditions will trigger a shutdown of the treatment processes and require onsite operator involvement to clear the alarms and restart the system. The treatment process will not be allowed to restart remotely, an operator must be onsite to restart the system. This list is provided under Process Control Description. WIN-911 software will be configured to utilize the local Internet connection (FIOS) and notify authorized operators via computer (email) and/or telephone (VOIP, Microsoft text to speech voice mail) when system shutdown alarms occur.

System Status Monitoring

Authorized users will monitor the system status remotely over the internet (FIOS). The process information (flowrates and pressures, extraction wells status, alarms condition, all power equipment status) will be monitored by logging into the Engineering Workstation (EWS) and using Remote Desktop (RDP) to access the SCADA client workstation.

Historical Data Logging

All data collected by the Historian software shall be permanently maintained on the Historian / EWS and available as needed for Trend Chart display and Reporting purposes.

Alarms History

Each alarm event will be logged and recorded. Each alarm record will contain the alarm name, type, date, and time. The alarm historical records will be available for download by authorized remote users at any time during system operation.

Reporting

Weekly and monthly report will be prepared to include all process data (flow, pH readings, etc.) and critical alarm history.

4.23 Process Control Description

GWTS Pump Control

The process pumps in the GWTS are provided as primary / backup pump pairs. Only one pump is used a time with the second pump providing 100 percent backup. Selection of primary / backup pump is made at PLC. If the primary pump fails, the backup pump becomes the new primary pump. Each pump has a local disconnect, local Start/Stop station, and a Hand-Off-Auto selector and pump run indicator at the MCC. Pump monitoring and Start/Stop functions are hard-wired from the pump to the VFDs/FVNRs.

The PLC monitors the GWTS pump status and computes runtimes for each pump.

GWTS Flow Monitoring

Process flows in the GWTS are measured using Magnetic Flow meters (mag meters) with 4 to 20 milliamp (mA) and totalizer output. The mag meters measure/display both the process flow and totalized process flow. The PLC reads in this data, the SCADA collects the data from the PLC and the Historian stores the data for both trending and reporting purposes.

A mag meter will be included on the influent line to the Equalization Tank that represents combined raw water flow from Recovery Wells RW8, RW9, and RW10A. The flow meter will have a local display and 4-20 mA/totalizer outputs.

GWTS Tank Level Control

The process tank levels are measured using ultrasonic level transmitters with 4 to 20 mA output to the PLC. Discharge pumps from each tank are controlled based on tank level. If the pump is equipped with a VFD, the pump is controlled to maintain a constant supply tank level (MMF Feed Pumps and LGAC Feed Pumps)

If the pump is a constant speed pump, the PLC starts/stops the pump based on the supply tank Start / Stop level setpoints (Treatment Plant Sump Pumps).

The BWS are controlled to maintain a flow rate for a fixed backwash time, as requested by the MMF control panel, if there is sufficient level in the BWS and enough capacity in the BWW Tank to contain the backwash.

The BWS Pumps are operated manually to maintain a flow rate to backwash the LGAC vessels by the operator. The operator will be allowed to proceed with the backwash provided there is sufficient level in the BWS Tank and enough capacity in the BWW Tank to contain the backwash.

Each process tank will be equipped with a High-High level switch to shut down the tank supply pumps to prevent tank overflow. At various process tanks that supply water to a pumping system, a Low-Low level switch will be supplied to shut down the discharge pumps and prevent the pumps from running dry.

Groundwater Recovery Wells

The water level in the Recovery Wells (RW) will be measured using submersible pressure transmitters with 4-20mA output to the PLC. The recovery wells will be controlled to maintain a constant level (VFD controlled wells). Water from the recovery wells is pumped to the GWTS Equalization Tank in three (3) separate pipes (one from each well). The flow rates from each of the three influent pipes, as well as the combined plant influent flow, is measured and totalized by magnetic flow meters. The PLC records both the flow rate and the totalized flow though the magnetic flow meter HART interface.

The pressure transmitters in the Recovery Well Valve Vaults and inlet piping at the Treatment Building will be monitored by the PLC system and an alarm is generated when there is a high differential pressure, indicating a leak in the influent piping.

All piping heat tracing within the well vault are monitored by the control system PLC and a general notification alarm is generated when there is heat trace power failure.

The level switches in the Recovery Well Valve Vaults are monitored by the control system PLC and a general notification alarm is generated when any level switch is activated.

Equalization Tank Mixer

There is a side-mounted mixer on the Equalization Tank that will be used to agitate the water in the tank to allow for mixing of the Caustic for pH adjustment of the incoming groundwater. The mixer will run continuously provided the water level is sufficient to cover the mixer.

MMF Feed Pumps

There are two (2) MMF Feed pumps that pump water from the Equalization Tank to the MMF skid. The MMF Feed pumps are configured as primary and standby with only one pump used at a time. The primary/standby selection is made at the PLC.

The Equalization Tank level is monitored and used to control the Equalization Tank pump VFDs to maintain a constant level in the Equalization Tank. Additional level setpoints are used to start/stop the Recovery Well feeds to Equalization tank and to prevent Equalization tank overflow.

A recycle line from the MMF Feed pumps back to the Equalization Tank is used to maintain a minimum flow though the pumps. The MMF Feed pumps will shut-down on Low-Low Equalization Tank Level. The pump discharge flow to the MMF skid is monitored by a mag-meter.

Multi-Media Pressure Filters

There are three (3) The Multi-Media Pressure Filters (MMF) that operate in parallel. The MMF skid has a vendor junction box for control wiring to the MMF valves and pressure differential switches. The plant PLC will monitor the pressure differential switches, control the backwash cycle and MMF valves a backwash is required. Plant PLC will verify that the BWS Tank has

enough water for backwash and that there is capacity in the BWW Tank to contain the backwash wastewater before allowing the operator to initiate the backwash cycle. All three (3) MMFs will be backwashed automatically one after another (one backwash while two operate). The Treatment Plant PLC will run the backwash pump for a timed interval and a preset flow rate (the interval time and flow rate are preset constants in the PLC). Plant PLC will record the backwash time, duration and the starting and ending pressure values.

MMF Blower

The Air-Wash Blower will supply conveying air for re-stratification of media during the backwash cycle at a constant rate to the Multi-Media Pressure Filters. The Air-Wash blower will run for the duration of the backwash cycle provided one of the BWS pumps is running.

Cartridge Filters

There are two cartridge filters, one filter is on-line with the second filter in standby. The Filter differential pressure is monitored and recorded by the PLC. When the differential pressure across the filter exceeds a preset limit, an alarm will sound, and the operator will need to switch the flow from to standby filter. Operator changes out dirty cartridges manually.

Advanced Oxidation Process (AOP) – Ozone Generation and AOP Reactor

The AOP system uses ozone gas in combination with hydrogen peroxide to optimize the treatment of the process water prior to sending to the LGAC vessels. The ozone system and AOP have a package control system (by vendor) to monitor and control all the ozone system equipment. There is an Ethernet IP communication interface between the Ozone system and the GWTS PLC control system for remote enable/monitoring of the system and to enable operation of the system's discharge and recycle valves.

Hydrogen Peroxide Feed System

The hydrogen peroxide system has a packaged control system (by vendor) for optimization of the ultraviolet treatment of the process water prior to sending to the LGAC vessels. The hydrogen peroxide system consists of a double-wall tank with leak detection, high-high and low-low level detection, and a continuous ultrasonic tank level measurement. There are two (2) chemical metering pumps for injection of hydrogen peroxide prior to the AOP system at the static mixer. One chemical pump is used for hydrogen peroxide addition and the second pump is standby. The AOP system provides a chemical addition pacing signal based on the flow rate through the AOP. The hydrogen peroxide feed system will communicate with the AOP control system as part of the overall AOP control package. The hydrogen peroxide feed system will also have a low-level alarm that will notify plant personnel to order more peroxide.

LGAC Feed Pumps

There are two (2) LGAC Feed pumps that pump water from the LGAC Feed Tank to the LGAC skid. The LGAC Feed pumps are configured as primary and standby with only one pump used at a time. The primary/standby selecting is made at the PLC.

The LGAC Feed Tank level is monitored and used to control the LGAC Feed pump VFDs to maintain a constant level in the LGAC Feed Tank. Additional level setpoints are used to start/stop the feeds to LGAC Feed tank and to prevent LGAC Feed overflow.

The LGAC Feed pumps will shut-down on Low-Low LGAC Feed Tank Level. The pump discharge flow to the LGAC skid is monitored by a mag-meter.

Liquid Phase Granular Activated Carbon

There are three (3) LGAC vessels that operate in parallel. The PLC monitors and records the differential pressure for all LGAC vessels. If the LGAC vessels exceed the recommended differential pressure, the operator can manually backwash the LGAC units manually one after another (one backwash while two operate). These units can be backwashed manually on as need basis, and the backwash flow rate is controlled by the PLC.

Plant Effluent Discharge

Plant effluent from the LGAC vessels is sent to five existing storm water basins. The manual butterfly valves in the plant effluent line divide the plant effluent between the discharge basin 1, basins 2/3 and basins 4/5. The plant effluent to each basin is monitored by a mag-meter. The Plant effluent pH is monitored by the operator.

The level switches in the first discharge manhole for each basin are monitored by the control system PLC and a general notification alarm is generated when any level switch is activated.

An automated butterfly valve diverts a portion of the treated plant effluent to fill the BWS Tank for the MMF and LGAC backwash as needed.

Caustic Feed System

The caustic feed system will include a double wall feed tank and two metering pumps. The metering pump will inject caustic in the influent line to the Equalization Tank via secondary contained and heat traced tubing. Since caustic starts crystalizing at 55 degrees F, the tank and all caustic feed piping will be electrically heat traced to maintain a temperature of 75°F. There are two (2) chemical metering pumps for injection of caustic. One pump is used for caustic addition and the second pump is standby. The PLC will start/stop the pump and vary pump speed to maintain a pH set point in the Equalization Tank.

The tank level is measured using an ultrasonic level transmitter with 4-20mA output to the PLC. The chemical tank will be equipped with a backup High level switch to alarm on high level to prevent tank overflow. A Low-Low level PLC setpoint will be used to shut down the metering pump. A Low level setpoint will be used for chemical order level alarm. A leak detection sensor will be installed in the interstitial space of the double wall tank.

Sodium Hypochlorite Feed System

The sodium hypochlorite feed system will include a double wall feed tank and two metering pumps. The metering pump will supply hypochlorite solution to MMF feed line via a contained

tubing. There are two (2) chemical metering pumps for injection of sodium hypochlorite. One pump is used for sodium hypochlorite addition and the second pump is standby. The pump rate is contained by flow rate out of the Equalization Tank.

The tank level is measured using an ultrasonic level transmitter with 4 to 20mA output to the PLC. The chemical tank will be equipped with a backup High level switch to alarm on high level to prevent tank overflow. A Low-Low level PLC setpoint will be used to shut down the chemical pump. A Low level setpoint will be used for chemical order level alarm. A leak detection sensor will be installed in the interstitial space off the double wall tank.

Treatment Plant Sump Pumps

There are two (2) Sump pumps that pump water from the Treatment Plant Sump to the Equalization Tank. The sump pumps will be configured as lead/lag and will operate automatically based on the sump level. The primary/standby selecting is made at the PLC.

The Treatment Plant Sump level is monitored and used to start/stop the pumps. Additional level setpoints are used to alarm on High-High sump level.

The Sump pumps shall be interlocked (not allowed to run) on High-High Equalization Tank Level.

Chemical Unloading

An Alarm Panel located at the Chemical Unloading Area will alert the delivery driver that a high level has been reached in any chemical tank during the unloading process.

Chemical Room Sump Pump and Exhaust Fan

Each chemical room will have a level switch to detect a leak within the room. The level switches are monitored by the control system PLC and a general notification alarm is triggered when any level switch is activated. The Operator will then check the chemical room for the reason of the alarm. If a chemical leak has occurred, the Operator will cleanup the leak and washdown the room.

Each chemical room will have a sump pump that may be used for pumping the leaked chemical into drums, depending on the chemical. The Operator will wash down the room after the leak has been cleaned up and will manually pump the washdown water into the Treatment Building's sump.

Each chemical room will have an exhaust fan for ventilating the rooms interior when the Operator enters. The fan will run for a preset time when the chemical room door is opened. An override switch will allow the Operator to manually override the timer control.

Building and Control Panel Monitoring

The Treatment Plant Control System I/O Panels (IOP) E-Stop, power supply, And UPS will be monitored, and an alarm will be generated as needed.

The Treatment Plant interior temperature will be monitored at several locations within the building and an alarm will be generated on low or high temperature.

The Treatment Plant's Utility Monitoring and Control System (UMCS) will be monitored for building fire related alarms and will generate a remote alarm notification as needed.

The entire plant serves as secondary building containment and is designed to store a major leak of the largest process tank. There are two (2) leak detection switches located in the process area (East & West). Either floor mounted leak detection switch or the High-High level switch in the building sump would indicate a major leak and shut the system down.

Eyewash / Safety Showers

There will be several eyewash/safety showers located throughout the Treatment Plant and these will be monitored, and an alarm will be generated if the shower is activated.

Non-Potable Water System

A non-potable water system feeds the hose bibs within the GWTS that will be used for cleaning and washdown of equipment. The non-potable water pump will cycle on/off as needed based on the header pressure. This water will also be used to provide cooling water for the oxygen system compressor and cooler. The PLC will provide an enable signal to the pump and provide run indication monitoring of the pump.

Carbon Canister and Blowers

The Equalization Tank and LGAC Feed Tank will operate under a slight negative pressure by piping their tank vent connections through a Carbon Canister and blowers. There are two (2) Carbon Canister blowers that pull air through the Eq. and LGAC tanks, through the Carbon Canister and exhausts outside the building. The Carbon Canister blowers are configured as primary and standby with only one blower used at a time. The primary/standby selection is made at the PLC. A pressure transmitter monitors the vent header to the canister.

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TABLE 4-1
RECOVERY WELL PARAMETERS

Parameter	Unit			
Recovery Well ID		**RW-8**	**RW-9**	**RW-10A**
Flow Rate (Average/Maximum)	gpm	450/600	450/600	600/700
Wells distance to GWTP	ft	100	3150	5,800
Well grade elevation	ft	46	54	TBD
Static water level	ft bgs	-25	-32	TBD
Well draw down	ft bgs	-50	-50	TBD
Equalization Tank inlet elevation	ft	70	70	70
Lowest groundwater elevation	ft	-29	-28	-28
TDH	ft	99	98	98
Calculated Pump Power	**hp**	**30**	**30**	**40**

1.Current water level elevation in the area is approximately 25 to 32 feet above mean sea level.
2. Likely draw down in the well during pumping is 10 to 20 feet, use 50 feet to account for well fouling.

gpm - Gallons per minute.
TDH - Total discharge head.
TBD - To be determined.
ft - Feet.
bgs - Below ground surface.
GWTP - Groundwater Treatment Plant.
hp - horsepower.

TABLE 4-2
TREATMENT PLANT UNIT PROCESS GOALS

Parameters	Units	Equalization Tank with Neutralization, Iron Oxidation, and Aeration		Multi Media Filtration		Advanced Oxidation Process Technology		Liquid Granular Activated Carbon	
		Influent [(a)]	Effluent	Influent	Effluent	Influent	Target Effluent	Influent	Target Effluent
Organics									
Trichloroethene	ug/L	1.8/5	<5	<5	<5	<5	<1	<1	<1
Tetrachloroethene	ug/L	ND/1	<1	<1	<1	<1	<1	<1	<1
Freon 113	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
1,4-Dioxane	ug/L	0.5/1.5	0.5/1.5	0.5/1.5	0.5/1.5	0.5/1.5	0.1 to 0.3	0.1 to 0.3	0.1 to 0.3
Inorganics									
Iron - dissolved	mg/L	1.5/2.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Iron - total	mg/L	1.5/2.5	1.5/2.5	1.5/2.5	<0.3	<0.3	<0.3	<0.3	<0.3
Suspended Solids	mg/L	<1	3 to 5	3 to 5	<1	<1	<1	<1	<1
Ozone	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	6	2	<0.1
Hydrogen Peroxide	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	6	2	<0.1
Sodium Hypochorite	mg/L	<0.1	<0.1	1 to 2	<1	<1	<1	<1	<0.1
pH	Standard Unit	4.5 to 5.5	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2

(a) Average/maximum.

< - Less than.

µg/L - Microgram per liter.

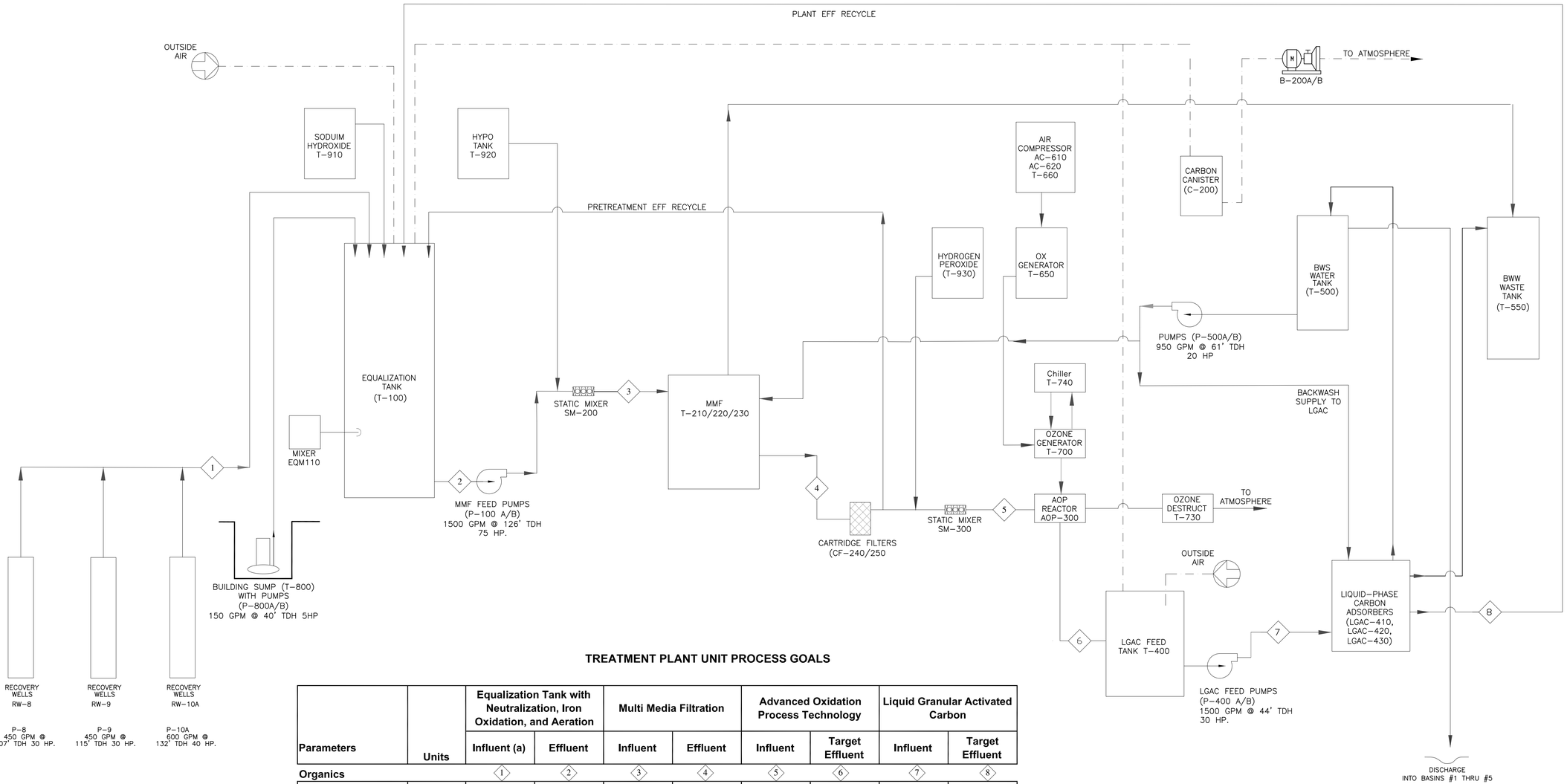
mg/L - Milligram per liter.

TABLE 4-3
KEY PROCESS EQUIPMENT LIST

Item	Equipment ID	Power Req.	Quantity	Size/Description	Capacity
PROCESS TANKS					
Equalization (EQ) Tank	T-100	No	1	12' diameter x 18' high (single wall FRP)	Nominal = 15,000 gallons ; Useful/Working = 12,000 gallons
LGAC Pumping Tank	T-400	No	1	12' diameter X 18' high (single wall FRP)	Nominal = 15,000 gallons ; Useful/Working = 12,000 gallons
Backwash Supply Tank	T-500	No	1	12' diameter x 16' high (single wall FRP)	Nominal = 14,000 gallons; Useful/Working = 10,000 gallons
Backwash Waste Tank (outside bldg)	T-550	No	1	20' diameter x 26' high (steel tank)	Nominal = 56,000 gallons; Useful/Working = 53,000 gallons
CHEMICAL TANKS					
Caustic (25% Sodium Hydroxide) tank (inside bldg separate room)	T-910	No	1	10' diameter tank X 10.5' height (Double wall HDPE)	Nominal = 4400 gallons ; Useful/Working = 4000 gallons; 30 day storage
Sodium Hypochlorite (12% Cl2) tank (inside bldg)	T-920	No	1	6.5' Diameter x 5.5' Height (Double wall HDPE)	Nominal = 1000 gallons ; Useful/Working = 800 gallons; 30day storage
Hydrogen Peroxide (27%) tank (inside bldg separate room)	T-930	No	1	8.5' diameter tank X 9' height (Double wall HDPE)	Nominal = 3000 gallons ; Useful/Working = 2100 gallons; 46 day storage
AOP SYSTEM					
AOP - Ozone-Peroxide - Contact tank/ Reactor	AOP-300	Yes	1	22' long x 9' wide x 10' deep (carbon steel/SS) / 15' long x 4.5' wide x 10' high reactor with seperator	1500 gpm design flow ; 1800 gpm max flow
Air compressor	AC-610/620	Yes	2	98” W X 64 5/8” D X 84 ½” H	140 cfm compressed air required, 50 HP motor
Heatless Dessicate Air Dryer	T-630A/B	Yes	2	48" X 38" X 57"	165 SCFM @ 100 psi, 4.5 kW nominal / 1.5 kW average
Air Buffer tank	T-640	No	1	2' diameter	
PSA Oxygen Generator	T-650	Yes	1	3.5' long x 2.5' wide	621 SCFH oxygen required
Oxygen Buffer tank	T-660	No	1	2' diameter	
Ozone Generator	T-700	Yes	1	8.5' long x 3.5' wide	24.6 kW at nominal production
Side stream skid	T-720	No	1	5' long x 3' wide	
Destructor skid	T-730	No	1	3' long x 1.5' wide	
Chiller (outside bldg)	T-740	Yes	1	4' long x 2' wide	6.7 Tons of cooling, nominal power is 12.84 kW
FILTRATION SYSTEM					
Vertical Multimedia Filters (MMF)	MMF-210, 220, 230	Yes	3	10' diameter x 11.5' high (each)	Filter area = 78.5 ft2/filter; HLR = 7 gpm/ft2 @1600 gpm; Side wall height 6.0'
LGAC system	LGAC-410, 420, 430	No	3	10' diameter X 18' high (each)	Filter area = 78.5 ft2/vessel ; HLR = 8.9 gpm/ft2 @ 700 gpm/vessel; EBCT = 12 min/vessel @ 700 gpm; Side wall height 10'

TABLE 4-3
KEY PROCESS EQUIPMENT LIST

Item	Equipment ID	Power Req.	Quantity	Size/Description	Capacity
Duplex Horizontal Cartridge Filters (skid)	CF-240/250	No	2	36" diameter x 122" long (each), 60" long element, 13 elements, 7.2 inch diameter element, 5 micron rating, Polypropylene media	1600 gpm /vessel, max flow capacity = 1800 gpm/vessel, 304 SS housing, Buna N gasket and seal, 150 psi
RECOVERY WELL PUMPS					
RW-8 (Average)	P-8	Yes	1	450 gpm @ 107' TDH, 30 HP Motor, submersible pump (with VFD), 460V, 60Hz, 3 Phase	
RW-9 (Average)	P-9	Yes	1	450 gpm @ 115' TDH, 30 HP Motor, submersible pump (with VFD) 460V, 60Hz, 3 Phase	
RW-10A (Average)	P-10A	Yes	1	600 gpm @ 145' TDH, 40 HP Motor, submersible pump (with VFD) 460V, 60Hz, 3 Phase	
PROCESS PUMPS					
MMF Feed Pumps (Average)	P-100A/B	Yes	2	1500 gpm @84' TDH; 50 HP Motor; horizontal centrifugal end-suction (with VFD ; 1/4" solids handling) 460V, 60Hz, 3 Phase	
LGAC Feed pumps (Average)	P-400A/B	Yes	2	1500 gpm @ 44' TDH; 30 HP Motor; horizontal centrifugal end-suction (with VFD ; 1/4" solids handling) 460V, 60Hz, 3 Phase	
Backwash supply pumps (BWS)	P-500A/B	Yes	2	950 gpm @ 61' TDH; 20 HP Motor; horizontal centrifugal end-suction 460V, 60Hz, 3 Phase	
Building Sump Pumps	P-800A/B	Yes	2	150 gpm @ 40' TDH; 5 HP Motor; submersible (1/4" solids handing) 460V, 60Hz, 3 Phase	
Caustic Chemical Sump Pump	P-911	Yes	1	30 gpm @ 15' TDH, 0.4 HP Motor, 115V, 60 Hz, 1 Phase , 3450 RPM	
Sodium Hypochlorite Chemical Sump Pump	P-921	Yes	1	30 gpm @ 15' TDH, 0.4 HP Motor, 115V, 60 Hz, 1 Phase , 3450 RPM	
Hydrogen Peroxide Chemical Sump Pump	P-931	Yes	1	30 gpm @ 15' TDH, 0.4 HP Motor, 115V, 60 Hz, 1 Phase, 3450 RPM	
CHEMICAL METERING PUMPS					
Caustic (25% Sodium Hydroxide) metering pump	P-910A/B	Yes	2	0.6 to 8 gph	
Sodium Hypochlorite (12% Cl2) metering pump	P-920A/B	Yes	2	0.6 to 8 gph	
Hydogen Peroxide (27%) metering pump	P-930A/B	Yes	2	0.6 to 8 gph	
AERATOR/MIXER/DECANTER					
EQ tank mixer (side mounted)	EQM-110	Yes	1	3.0 HP 3/60/230-460V TEFC Severe Duty, Reducer Helical Gear 365 rpm SF 1.5, Synthetic Lubricant	
Static mixer	SM-200	No	1	3 element inline static mixer for Sodium Hypochlorite	
Static mixer	SM-300	No	1	3 element inline static mixer for Hydrogen Peroxide	
Floating Weir Decanter		No	1	220 gpm floating weir decanter, 4" flex hose, Stainless steel	
Carbon Cannister	C-100	No	1	32" OD x 7' H, 500 CFM, 1000 lbs Carbon	



TREATMENT PLANT UNIT PROCESS GOALS

Parameters	Units	Equalization Tank with Neutralization, Iron Oxidation, and Aeration		Multi Media Filtration		Advanced Oxidation Process Technology		Liquid Granular Activated Carbon	
		Influent (a)	Effluent	Influent	Effluent	Influent	Target Effluent	Influent	Target Effluent
Organics		1	2	3	4	5	6	7	8
Trichloroethene	ug/L	1.8/5	<5	<5	<5	<5	<1	<1	<1
Tetrachloroethene	ug/L	ND/1	<1	<1	<1	<1	<1	<1	<1
Freon 113	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
1,1-Dichloroethene	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
cis-1,2-Dichloroethene	ug/L	ND/0.5	<1	<1	<1	<1	<1	<1	<1
1,4-Dioxane	ug/L	0.5/1.5	0.5/1.5	0.5/1.5	0.5/1.5	0.5/1.5	0.1 to 0.3	0.1 to 0.3	0.1 to 0.3
Inorganics									
Iron - dissolved	mg/L	1.5/2.5	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Iron - total	mg/L	1.5/2.5	1.5/2.5	1.5/2.5	<0.3	<0.3	<0.3	<0.3	<0.3
Suspended Solids	mg/L	<1	3 to 5	3 to 5	<1	<1	<1	<1	<1
Ozone	mg/L	<0.1	<0.1	<0.1	<0.1	6	2	2	<0.1
Hydrogen Peroxide	mg/L	<0.1	<0.1	<0.1	<0.1	6	2	2	<0.1
Sodium Hypochorite	mg/L	<0.1	<0.1	1 to 2	<1	<1	<1	<1	<0.1
pH	Standard Unit	4.5 to 5.5	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2

(a) Average/maximum.

< - Less than.

µg/L - Microgram per liter.

mg/L - Milligram per liter.

Flow Rate - 1500

FIGURE 4-1

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NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND - MID - ATLANTIC
NAVAL INDUSTRIAL RESERVE ORDNANCE PLANT
GM38
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK
PHASE III - TREATMENT PLANT

PROCESS FLOW DIAGRAM

SCALE: AS NOTED

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5.0 Treatment System Building

5.1 Summary

Selected process equipment such as LGAC and pumps do not require a high level of protection or special environmental conditions aside from seasonal weather. However, the treatment building must be designed per Navy codes and desired architectural styles (as appropriate).

The treatment system building includes following the general parameters:

- One-story building with a typical internal clearance height of approximately 20 feet, with an overall roof height of approximately 35 feet above grade.
- Approximately 12,300-square foot building.
- Reinforced concrete floor slab on grade with one sump measuring approximately 10 feet by 10 feet, by 8 feet deep.
- Exhaust ventilation with adjustable-speed fans and louvers to remove heat.
- Insulated and heated building walls and roof per DoD UFC's and referenced codes.
- An air-conditioned control room (operator area) with adequate space for file cabinets.
- Separate air-conditioned electrical room to house all motor control center and panels.
- A toilet facility.
- Two 12-foot by 14-foot garage-type doors and several man-door entrances.

Adjacent office building includes following the general parameters:

- One-story building with a typical internal clearance height of approximately 17 feet, with an overall roof height of approximately 24 feet above grade.
- Approximately 2,125 square foot-building.
- Reinforced concrete slab floor.
- Exhaust ventilation with louvers to remove heat.
- Insulated and heated building walls and roof per DoD UFC's and referenced codes.
- Open office area to accommodate (4-5) occupants.
- (1) Enclosed office area
- Conference room for (6-8) occupants
- Kitchenette and toilet facility
- One 12-foot by 14-foot garage-type doors and several man-door entrances.

5.2 Site Civil

The treatment system facility will be between Twin Lane North, Southern State Parkway and Seamans Neck Road, Hempstead, New York. The site is currently partially cleared for the installation of recovery well RW8. The site is located within the Town of Hempstead and Nassau County. The site will be subject to the Town of Hempstead Building Zone Ordinance.

The ground water treatment system building is approximately 12,300 square feet. and located to the east side of the parcel. There is also a one-story 2,125 square feet office and storage

building on the western side of the parcel. Both buildings are to be clear of the existing RW8 extraction and monitoring wells located on the site. A 6-foot-high berm and fence will be on the north of the parcel between the building and the ground water treatment facility. The site layout is shown in the drawings in Appendix E. Included are two turning radius sheets showing the ability for a DOT WB-50 tractor trailer to maneuver around the site for deliveries. The site will be paved and has adequate room for parking spaces. Stormwater management and site security measures will be determined in the next phase of the design.

5.3 Geotechnical

A geotechnical subsurface investigation for the groundwater treatment plant was conducted. The report is provided in Appendix A. The purpose of the study is to investigate subsurface conditions within the project site, formulate foundation design criteria for the site development, and offer pertinent geotechnical site recommendations for construction. The geotechnical subsurface investigation report provides recommendations based on an exploration of subsurface soil conditions by means of Standard Penetration Test (SPT) Borings (ASTM International [ASTM] D1586). The scope of the investigation includes a field test boring program, laboratory testing of representative soil samples, engineering analyses of the available data, and preparation of the engineering report.

5.4 Structural and Architectural

Functional Requirements

The treatment building and structures support and house the treatment plant equipment. The office building will act as a hub for engineers and workers at the treatment building.

Technical Requirements

The water treatment system equipment will be housed in a new, free-standing building system that is approximately 12,300 square feet in size, constructed in accordance with applicable local and State of New York Building Codes and the 2018 amended International Building Code. This brick and masonry clad building will be constructed of perimeter load bearing, reinforced concrete masonry unit (CMU) walls supporting open web steel roof joists and wide-flange beams spanning from exterior load-bearing CMU walls to a single line of steel columns/girders dividing the shorter span of the building in half, thus creating an open floor plan with minimal interior columns. These interior columns will be spaced at approximately 20 feet on-center.

In addition to the water treatment facility, there will be a separate office structure constructed on the same site. The office is to be a new, free-standing building system that is approximately 2,125 square feet in size, constructed in accordance with applicable local and State of New York Building Codes and the 2018 amended International Building Code. This brick and masonry clad building will be constructed of perimeter load bearing, reinforced CMU walls supporting cold formed steel roof joists spanning from exterior load-bearing CMU walls.

Both buildings' roof systems will consist of a standing seam metal roof and continuous insulation with a minimum R-value of 30, supported by 1 ½-inch deep, galvanized steel wide-ribbed roof deck (minimum 20 gage) supported by open web steel roof joists and steel wide-flange beams spaced at a maximum 6 feet on-center. These roof joists and beams will span in the short direction of the building and will bear on reinforced CMU exterior walls, and steel wide flange girders at the mid-span of the building. The steel girders will be supported by structural steel tube columns spaced at approximately 20 feet on-center. The reinforced exterior CMU walls will also be utilized as shear walls to resist all lateral forces. The specific support system requirements, and associated loading conditions, will be provided in the Construction Drawings. Steel design will be in compliance with AISC Manual of Steel Construction. All roof steel framing will be shop primed with a primer or galvanized to help resist against corrosion due to moisture and chemical exposure.

A typical shallow foundation system comprised of reinforced concrete continuous footings and foundation walls around the building perimeter, as well as reinforced concrete spread footings at interior columns, shall be utilized to support the structure at the site. The reinforced exterior load-bearing CMU walls will be supported directly on top of the reinforced concrete foundation walls that extend 4 inches above the finished floor for containment, and which will transfer all loads to the footings and native soil below. Concrete members will be designed to ACI 318 requirements, and exterior perimeter footings will have adequate depth to be below the frost line, which is 48 inches below finished exterior grade for the Project Site.

The interior wall system enclosing individual rooms within the building will consist of painted reinforced CMU, which will be supported by below grade continuous reinforced concrete foundation walls and footings. These load-bearing CMU walls will support a raised mezzanine storage area above the interior enclosed rooms, and will contain grouted cores at all vertical reinforcing locations. In addition, a reinforced continuous bond beam will be provided at the top of all walls. Masonry control joints will be provided at maximum 20 feet intervals, and at 10 feet to either side of corners. The raised mezzanine area will be constructed of a 5-inch-thick concrete slab over galvanized steel composite decking, which will be supported by steel wide flange beams spanning between the load-bearing concrete masonry walls. This mezzanine area will be used to store spare parts and equipment.

The interior slab on grade and foundation system is designed for loads associated with future expansion of the processing equipment, while keeping the concept of uniformity and ease of construction in mind. This is accomplished by designing the entire interior concrete floor slab for the worst case loading conditions. The floor slab will be a reinforced concrete slab on grade, and will be sloped towards the nearest floor drain or sump. At areas of equipment, additional reinforced concrete housekeeping pads will be installed. At the sump and areas, reinforced concrete slabs on grade will be recessed as required. Reinforced concrete walls around these sump areas will be designed as retaining walls to resist the lateral pressures associated with the adjacent soil and ground water.

Design will also include all applicable equipment and piping foundations, sumps, structural supports, pipe supports, containment slabs/curbs and walls and floor drains, waterstops, and

concrete housekeeping pads. Concrete for containment and environmental structures will comply with the requirements of ACI 350. Also, a chemical-resistant coating will be applied to all interior floor slab surfaces for additional protection. Chemical-resistant containment coating and waterstops, where required, will be products designed specifically for the material being contained and the substrate being covered. If multiple systems are used, they shall be compatible and from a single supplier.

Risk Category:

Risk Category = III

Snow:

Ground snow load, p_g = 30 pounds per square foot (psf)
Importance Factor, I_S = 1.1 (Risk Category III)
Thermal Factor, C_t = 1.0
Exposure Factor, C_e = 1.0 (Exposure Category C, partially exposed)

Wind:

Ultimate Design Wind Speed = 136 miles per hour
Exposure Category = B
Enclosure Classification = Enclosed Building (+/- 0.18)

Seismic:

Building Risk Category III
Site Class D
Short Period Spectral Response Acceleration, S_S = 0.233 g
1-Second Spectral Response Acceleration, S_1 = 0.066 g
Importance factor, I_E = 1.25 (Risk Category III)
Seismic Design Category = B

The following criteria that apply to the design of the building's structure and foundation system associated with this project:

- Load combinations: Per American Society of Civil Engineers (ASCE) 7-16.
- Roof dead load: Total material weight, in pounds per square foot, of final items to be supported by roof structural system.
- Total Collateral load = 10 psf
  - Above listed collateral load is associated with supporting typical mechanical, electrical and plumbing items.
  - The 10 psf collateral loading will not be used to resist the available roof dead load used in wind uplift calculations.
- Roof live load (minimum) = 20 psf
- Floor live load (minimum):

  - Office = 50 psf; 2,000 pounds concentrated point load
  - First Floor Corridor = 100 psf; 2,000 pounds concentrated point load
  - Light Storage = 125 psf
  - Equipment platform = 200 psf
- Floor moving live load:
  - Large capacity pneumatic tire forklift (Toyota, Model 8FD7OU)
- Load capacity = 15,500 pounds
- Frost depth = 48 inches below finished grade elevations.
- Occupational Safety and Health Administration (OSHA) Requirements.
  - Coefficient of friction for floor surfaces will meet criteria in the American National Standards Institute (ANSI) A137.1
- All materials used meets OSHA performance standards.
- A chemical storage cabinet.
- Based on the size and usage, this building does not require a fire sprinkler system; though fire extinguishers will be provided.

Building Thermal Profile:

The thermal requirements are established in UFC 1-200-02 High Performance and Sustainable Building Requirements. The building thermal profile will therefore meet the referenced requirements for ASHRAE 90.1.

Table 5.5-4 of this UFC requires nonresidential “Mass” buildings in climate zone 4 with insulation above the roof deck to meet the following minimum requirements. R-30 continuous insulation for the roof and R-9.5 Continuous Insulation for walls above grade. The roof of this building will have a minimum thickness of 5.5 inches of Poly Iso rigid insulation with a minimum R value of R-30. The exterior cavity walls will have a 4-inch-thick cavity with a 4-inch brick veneer facade. The wall cavity will have continuous insulation with a minimum R value of R 9.5.

Openings:

- The passage doors in these buildings have fiberglass reinforced plastic (FRP) frames, and the door panels will also be of FRP finished and construction.
- The overhead door is coiling type and has insulated slats. Finish is an organic polyvinylidene difluoride (PVDF) resin coating such as Kynar 500.
- Exterior glazing will be translucent panels and aluminum windows.

Field Surface Coating:

- All wall, exposed structure, and floor surfaces include epoxy-based coatings. The floor coating must have a non-slip texture.

Downspout Sizing:

Water treatment facility:

- Area of roof = 12,300 square feet.
- The 100-year one-hour rainfall for Bethpage is 3.25 inches per hour.
- A 3-inch x 4.25-inch downspout handles 4,400 sq. feet. of roof area. This building has (8) 3-inch x 4.25-inch downspouts (three on each side of the lower sloped roof and two on each side of the upper sloped roof portion).

Office facility:

- Area of roof = approximately 2,125 square feet.
- The 100-year one-hour rainfall for Bethpage is 3.25 inches per hour.
- A 3-inch x 4.25-inch downspout handles 4,400 square feet of roof area. This building has (4) 3-inch x 4.25-inch downspouts (two on each side).

Accessibility:

The primary users of the water treatment facility will be able-bodied personnel maintaining and monitoring the process equipment for short durations on a daily basis. On occasion the facility may be visited by limited segments of the public. The office building will have staff that uses the facility on a continual basis. Because of this both buildings will be accessible per DoD memo "Access for People with Disabilities" dated 31 October 2008.

Antiterrorism Standards:

As a DoD facility, these buildings must meet the requirements of UFC 4-010-01 DoD Minimum Antiterrorism Standards for Buildings. Based upon the actual number of occupants required to monitor the water treatment facility and the duration of their time on-site at both locations. These buildings are considered a low occupancy and are therefore exempt from the requirements of UFC 4-010-01.

Acoustics:

The requirements in UFC 3-101-01 Architecture, do not address these facility types and therefore no acoustical mitigation methods are being used for these buildings.

Mechanical and Plumbing Code Review

The systems are designed to the 2018 International Codes as amended by Uniform Code Supplements. These codes are listed in the following:

- UFC 3-410-01
- NFPA 54
- UFC 3-420-01
- UFC 3-410-04

5.5 Heating, Ventilation, and Air Conditioning

The Heating, Ventilation, and Air Conditioning (HVAC) system will be provided to protect the process piping and equipment from damage due to environmental conditions such as freezing or high ambient temperatures.

Natural gas is unavailable to the site; therefore, the heating systems for the GWTP and Office Building will be electric.

The GWTP building will be heated with a combination of infrared units in the plant and unit heaters in the storage rooms. A make-up air unit (MAU) will provide heated and ventilated air to the plant. Exhaust fans located in the storage rooms and the plant will pull the air from the MAU through the building and discharge to the exterior of the building.

The control room and electrical rooms will be cooled and heated with split-system heat pumps with direct expansion (DX) cooling and electric back up heat.

The toilet, locker and shower areas will be served by wall mounted electric cabinet unit heaters. An exhaust fan and undercut doors will allow for ventilation air to be pulled from the plant and discharged to the exterior of the building.

The office building will be served by an indoor air handling unit with direct expansion cooling and electric heating. Exhaust fans will be provided for the break room, toilet, and storage spaces. The storage room is served by an electric unit heater.

5.6 Plumbing

The GWTP and office building will each be served by a 2” water line and 4” sanitary drain line. The water line will be metered. The discharge will be connected to the site's main sanitary piping.

Multiple floor drains will be provided within the facility and will be routed to a process sump pump pit.

The toilet rooms will be equipped with a lavatory, a low-capacity 1.28-gallons per flush water closet, shower, and a floor drain. A 120-gallon electric water heater will provide domestic hot water for the facility. The system will include a recirculating pump and piping to ensure prompt hot water delivery to the lavs and sinks.

Natural gas is unavailable to the site; therefore, the domestic water heaters will be electric.

Emergency eye washes and emergency showers are strategically located throughout the facility per UFC and OSHA criteria.

Roof rainwater will be handled by gutters and downspouts. Refer to architectural section for details.

A 2-inch domestic cold-water pipe will be run from the GWTP to serve the office building.

The office building toilet room will be equipped with a lavatory sink, a low-capacity 1.28 gallons per flush water closet and a floor drain. A kitchen sink will be provided for the Break Room and a utility sink will be provided for the Storage A 6-gallon electric water heater will provide domestic hot water for the office building.

5.7 Electrical

The electrical load for the new Phase III GWTS System is estimated based on the new process equipment shown in the P&ID drawings with an electrical load of 900A at 480V, 3-phase power system. Considering 25 percent future growth, the estimated load is 1125A, so the nearest overcurrent device is 1200A.

With the above load condition, a 1200A, 277/480V, 3-phase, 4 Wire Service Entrance Type MCC will be provided. This MCC will need to be served by a utility transformer, which must be designed and provided by the local utility company, Public Service Electric and Gas Company Long Island (PSEGLI). The contractor is responsible for the coordination of the transformer pad, meter base and appurtenances provided by PSEGLI. Power will be served from the Overhead Utility Pole on Seamans Neck Rd. which will serve as the power pole for the new pad mount utility transformer. The approximate size is 1,000 kilovolt amps. This utility transformer can be located on the southeast side of the building on a concrete pad. A utility meter is located on the transformer-mounted current transformer cabinet. PSEGLI must be contacted with a “load letter” to coordinate a new power service. However, the final decision to feed the utility transformer or the location is decided by PSEG-LI. 3 sets of 4 - 500KCMIL XHHW Conductors will be run in schedule 80 PVC in a 4-way duct bank to the main building.

The service rated MCC will be located in the designated electrical room. The MCC will be equipped with a 1200A-rated main Breaker integrated with an electronic trip unit capable of providing ST, LT, Instantaneous and ground fault interruption. A power meter will also be provided in the MCC capable of monitoring Voltage, Current, Power and Demand. The MCC consists of nine sections, each section is 20 inches wide by 20 inches deep by 91.5 inches high. This MCC will have VFDs Equalization Tank pumps and air stripper pumps. Other loads for the MCC are indicated in the P&ID drawings. The MCC feeds a 400A, 277/480V, 3-phase, 4-wire panel board to serve required loads for lighting, other 480V, 3-phase equipment, or single-phase loads. A 225A, 120/208V, 3-phase, 4-wire (W) panel board also receives feed from the MCC via a dry-type transformer. This panelboard feeds all 120V receptacles and other 208V, 3-phase or 1-phase equipment/devices. The MCC will also be equipped with a 160KA Surge Protection Device. All wiring inside of plant will be installed in RGS conduit. EMT may be used where conduit is not subject to damage or 10 feet-0 inches AFF. Use liquid-tight conduit for motor connections or washdown areas.

The control room will have an enclosure containing a PLC, SCADA system, and internet/cellular gateway to enable off-the-site System process parameters to be monitored and controlled by users authorized by the Navy. A VPN router is used in conjunction with software to configure security and user rights for remote access. The remote pump motors (capable of being controlled locally from their respective VFDs) shall also be controlled and monitored by internet-based software via the PLC/SCADA system. The facility will be designed for unattended operations with remote monitoring software and alarm callout via internet VPN. Internet access, security level, firewall and VPN access will be defined in cooperation with the Authorizing Official.

Lighting in the open areas will be manual on the switch with a 50 percent vacancy dimmer. The occupancy sensor manually turns the lights on upon entering the space and upon sensing vacancy, switches off or dims luminaires to 50 percent of full light output. Lighting in work areas will be manual on/off switch.

There are three (3) recovery wells (RW), one (1) on the building site and two (2) in different remote areas to be shown on the drawings. Each RW well will be equipped with a submersible pump. Discharges of the pumps are connected through a valve before discharging to the next process. One power source serves each of the RWs, which is approximately 250A, 277/480V, 3-Phase. The power system at each of the remote locations is used for the RWs and other controlling equipment such as the PLC/ SCADA system. Lighting will also be provided as needed at each well location with on/off controls inside of MMC enclosure.

Lightning Protection System

The building will be equipped with a lightning protection system and designed in accordance with all the provisions of the Unified Facilities Criteria (UFC-575-01) and NFPA 780. Lightning protection system consists of a series of air terminals that carry the lightning strike along the copper ring down the conductors and eventually away from the building to the grounding electrodes. Refer to electrical drawings for more details.

5.8 Fire Protection Life Safety Design Analysis

Qualified Fire Protection Engineer

The contractor shall provide the services of a qualified registered fire protection engineer (QFPE) during construction. Note that the contractor's QFPE is separate from the fire protection Designer of Record (DOR). A qualified registered fire protection engineer shall be a registered Professional Engineer who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveying (NCEES) and has relevant fire protection engineering experience that can be verified with documentation. The fire protection engineer shall be an integral part of the design team and shall be involved in every aspect of the design, construction and testing/commissioning as it relates to fire protection and life safety. This includes, but is not limited to, building code analysis, life safety code analysis, design of automatic fire alarm, detection, and suppression systems, water supply analysis, a multi-discipline review of the entire project, construction inspections and witnessing of fire protection acceptance testing/commissioning.

Use of Occupancy

The main building occupancy classification shall be in accordance with the IBC and NFPA 101.

- IBC Occupancy Classification: Group F-1, Moderate-Hazard Factory Industrial
- NFPA 101 Occupancy Classification: Special-Purpose Industrial (Chapter 40)
- The separate office building occupancy classifications:
- IBC Occupancy Classification: Group B, Business, and accessory Group S-2, Low-Hazard Storage
- NFPA 101 Occupancy Classification: New Business (Chapter 38), and incidental New Storage (Chapter 42)

Building code requirements are based on the IBC. The use of occupancy for the facility is determined in accordance with IBC Chapter 3. The building contains the following occupancy in accordance with IBC §303: Industrial, Group F-1.

Life safety and egress requirements are based on NFPA 101. The use of occupancy is determined in accordance with NFPA 101 Chapter 6. The building contains the following occupancy in accordance with NFPA 101: Industrial (Chapter 40).

Accessory/incidental occupancies are those occupancies that are ancillary to the main occupancy of the building, shall not occupy more than 10 percent of the floor area, and shall meet the requirements for the main occupancy of the building (IBC §508.2).

Construction Type

In accordance with the UFC the construction type must conform to the requirements of the IBC. The building is constructed of Type IIB Construction. Type IIB construction consists of non-combustible building elements.

Building Height

The main building occupancy is Group F-1, fully sprinklered building of Type IIB construction and is permitted to be a height of 75 feet and 3 stories above grade per IBC Tables 504.3 and 504.4, respectively. The actual overall building height is 25 feet 0 inches and one story above grade. The mechanical platform mezzanine does not exceed one-third of the overall area of the building and therefore is considered a portion of the story below (IBC §505).

The separate office building is Group B, non-sprinklered building of Type IIB construction and is permitted to be a height of 55 feet and 3 stories above grade per IBC Tables 504.3 and 504.4, respectively. The actual overall building height is approximately 24 feet and one story above grade.

Building Area

The main building occupancy of Group F-1, fully sprinklered, single-story building of Type IIB construction is permitted to have a maximum footprint of 62,000 square feet per IBC Table 506.2. The area of the main building is approximately 12,300 square feet and does not exceed the limitations noted.

The separate office building occupancy of Group B, non-sprinklered, single-story building of Type IIB construction is permitted to have a maximum footprint of 23,00 square feet per IBC Table 506.2. The area of the separate office building is approximately 2,125 square feet and does not exceed the limitations noted.

Fire Separation

The building consists of Type IIB construction, which requires the fire-resistance ratings listed in Table 5-1 for building elements in accordance with IBC Table 601:

Table 5-1: Fire Resistance for Building Elements
Type IIB Construction (IBC Table 601)

Building Element	Duration (Hours [hr])
Structural Frame	0-hr
Bearing Walls	0-hr
Exterior Non-Bearing Walls and Partitions	See Table 5-2
Internal Non-Bearing Walls and Partitions	0-hr
Floor Construction	0-hr
Roof and Roof Framing	0-hr

Exterior Walls

The required exterior wall ratings and allowable openings are determined based on the measured fire separation distance. Fire separation distance (FSD) is defined as follows:

"The distance measured from the building face to one of the following:

1. The closest interior lot line;
2. To the centerline of a street, an alley or public way; or
3. To an imaginary lot line between two buildings on the property.

The distance shall be measured at right angles from the face of the wall." (IBC §202)

Type IIB construction requires the following fire resistance ratings for exterior walls (see Table 5-2) in accordance with IBC Table 602. Where a rated wall with an FSD of 10 feet or less is required, it must be rated for exposure to fire from both sides per IBC §705.5.

Table 5-2: Fire Resistance Rating Requirements for Exterior Walls Based on Fire Separation Distance (IBC Table 705.5)

Fire Separation Distance (feet)	Wall Rating (Hours) Group F-1
0 to less than 5	2-hr
5 to less than 10	1-hr
10 or greater	0-hr

Allowable exterior wall openings are based on the distance from a "lot line" per IBC §705.8. Unlimited unprotected openings are permitted in buildings whose exterior bearing walls, exterior non-bearing walls and exterior primary structural frame are not required to be fire-resistance rated (IBC §705.8.1 exception 2).

The building has a fire separation distance of 30 feet or more on all sides of the building. Accordingly, the exterior walls do not require a fire-resistance rating and are permitted unlimited openings.

Interior Walls

The sprinkler riser room is required to be enclosed with a 1-hour fire resistance rating and accessible from the exterior in accordance with NFPA 24 §6.2.9(6). In-lieu of a fire-resistance rated sprinkler riser room, a post-indicator valve (PIV) shall be installed a minimum distance of 40 feet from the building, or as far from the building as the height of the wall facing the PIV, whichever is shorter (NFPA 24 §6.2.9(1)). Alternatively, a wall-post indicator valve is permitted (NFPA 24 §6.2.9(2)).

Means of Egress

Occupant Load

As required by UFC 3-600-01, the occupant load must be calculated in accordance with National Fire Protection Association (NFPA) 101 Chapter 7, including the occupant load factors found in NFPA 101 Table 7.3.1.2, except as noted in Table 10-1 of UFC 3-600-01. The occupant load is determined for each space based on the intended use of that space and not the overall building occupancy classification. The occupant load is based on the occupant load factors listed in Table 5-3.

Table 5-3: Occupant Load Factor

Use	Occupant Load Factor (Square Foot Per Person)
Industrial	100 gross
Business areas	150 gross
Concentrated Business	50 gross
Mechanical, Electrical, Building Equipment	500 gross
Storage	500 gross

Number of Exits

A minimum of two (2) exits must be provided from any story, or portion thereof, based on an occupant load of 500 people or less per NFPA 101 §7.4.1.2.

The primary building is provided with four (4) primary exits, and six (6) exits serving individual spaces.

Exit Capacity

The exit capacity of each floor must be sufficient for the calculated occupant load for that floor. Exit capacity is calculated using the capacity factors found in NFPA 101 Table 7.11.3. The capacity factor is 0.7 inches of the exit width per person for components like doors and corridors for Group F-1 occupancies.

The means of egress arrangement provides sufficient capacity for the calculated occupant load for the building.

Travel Distance and Exit Arrangement

Travel distance is measured from the most remote point to an approved exit along the natural and unobstructed line of travel. The length of egress travel distance, common paths, and dead ends are limited based on occupancy type. The requirements are summarized in Table 5-4.

Table 5-4: Egress Requirements per NFPA 101

Use	Maximum Travel Distance (feet)	Maximum Dead End (feet)	Maximum Common Path (feet)
Industrial (Special Purpose)	400 feet (Table 40.2.6.1)	50 feet (Table 40.2.5.1)	100 feet (Table 40.2.5.1)

Where more than one exit, exit access, or exit discharge is required from a building or portion thereof, such exits, exit accesses, or exit discharges shall be located from one another not less than one-third (1/3) the length of the maximum overall diagonal dimension of the building or area served per NFPA 101 §7.5.1.3.3.

The means of egress comply with the travel distance provisions in accordance with NFPA 101.

Exit Discharge

All exits lead directly to the exterior of the building and are compliant with NFPA 101.

Illumination of Means of Egress

Illumination of means of egress includes designated aisles, corridors, ramps, and passageways leading to an exit. Illumination of means of egress is continuous during the time that the conditions of occupancy require that the means of egress be available for use (NFPA 101 §7.8.1.2). Automatic lighting control devices are permitted to temporarily turn off the illumination within the means of egress provided each lighting control device complies with the seven conditions listed in NFPA 101 §7.8.1.2.2.

Egress paths are provided with a minimum of 1 foot-candle in accordance with NFPA 101 §7.8.1.3. Per IBC 1008.2.3 the egress path includes the exterior path from the exit discharge to the public way. 1 foot-candle minimum must be maintained along this path.

Emergency Lighting

Emergency lighting is required for industrial occupancies per NFPA 101 §40.2.9.1. The emergency lighting must be designed to provide not less than an average of 1 foot-candle and, at any point, not less than 0.1 foot-candle, measured along the path of egress at floor level.

Emergency lighting for means of egress are provided in accordance with NFPA 101 §7.9.

Marking of Means of Egress

Access to exits must be marked by readily visible signs where the exit or way to reach the exit is not readily apparent to occupants in accordance with NFPA 101 §7.10.1.5. Sign placement within corridors must be located such that no point exceeds 100 feet to the nearest sign.

Exit signs are located as required throughout the facility.

Interior Finishes

Interior finishes must conform to the requirements of NFPA 101 Chapter 10.

The interior wall and ceiling finishes are classified in accordance with ASTM E 84 or UL 723 as:

Class A:	Flame spread index, 0-25;	Smoke developed index, 0-450
Class B:	Flame spread index, 26-75;	Smoke developed index, 0-450
Class C:	Flame spread index, 76-200;	Smoke developed index, 0-450

Spaces within this facility may have a Class A, B, or C finish.

Hazardous Materials

Hazardous materials shall be governed by NFPA 400 in accordance with UFC 3-600-01 §4-20. The following chemicals and quantities are to be used as part of the groundwater treatment process:

1. Sodium Hydroxide (NaOH): 25 percent concentration, 4000 gallons.
   a. Hazard Classification: None. Concentrations less than 50 percent are not considered water reactive in accordance with NFPA 400 §B.5.1(11). There is no limit to the maximum allowable quantity.
2. Sodium Hypochlorite (NaOCl): 12 percent chlorine concentration, 1000 gallons.
   a. Hazard Classification: None. Concentrations less than 20 percent are not considered an oxidizer in accordance with NFPA 400 §G.4.1.5. There is no limit to the maximum allowable quantity.
3. Hydrogen Peroxide: 27 percent concentration. 3000-gallon tank (8.5 feet diameter by 9 feet high)
   a. Hazard Classification: Class 1 Oxidizer (NFPA 400 §G.2.2(7)). There is no limit to the maximum allowable quantity when the building is protected throughout with an automatic sprinkler system (NFPA 400 Table 5.2.1.1.3 footnote n.).

Ozone Gas Generator Room

The GWTS contains an ozone gas generator room that feeds an advanced oxidation process (AOP) reactor, with a maximum loading of approximately 110 pounds per day of ozone. Per process engineering, the ozone is consumed within minutes of generation. At any given time, there is likely less than 1 pound of ozone within the piping system.

Ozone is classified as an oxidizing gas with a maximum allowable quantity (MAQ) of 150 pounds within closed-use systems in accordance with NFPA 400 Table 5.2.1.1.3. The MAQ is permitted to be increased by 100 percent where used in separate gas rooms, and accumulatively increased by another 100 percent where used in buildings equipped throughout with an automatic sprinkler system. Since the maximum loading does not exceed the MAQ of 450 pounds within closed-use systems, the facility and ozone gas generator room do not require a high hazard designation.

All the equipment and piping systems related to this process are located in a separate ozone generator room. This room shall comply with the requirements of NFPA 1 Chapter 54 (UFC 3-600-01 §1-4.2.3), including all the following:

- Mechanically ventilated to provide a minimum six (6) air changes per hour.
- Exhausted air shall be directed to a treatment system designed to reduce the discharge concentration of the gas to one-half of the IDLH value at the point of discharge to the atmosphere, or the ozone generator room shall be equipped with a continuous gas detection system that will shut off the ozone generator and sound a local alarm when concentrations above the permissible exposure limit occur.
    - For this facility, exhausted air is directed to a treatment system, i.e., ozone destruction system, prior to discharge to the atmosphere. Therefore, a gas detection system is not required.
- Ozone generator rooms shall not normally be occupied, and such rooms shall be kept free of combustible and hazardous materials storage.
- Room access doors shall display an approval sign stating: “OZONE GAS GENERATOR – HIGHLY TOXIC – OXIDIZER.”

Secondary containment must be provided for all piping, valves, fittings, and related components, unless piping is welded stainless steel (NFPA 1 §54.3.2).

Ozone generators shall be designed to automatically shut down when any one of the following occurs in accordance with NFPA 1 §54.4:

- The dissolved ozone concentration in the water being treated is above saturation when measured at the point where the water is exposed to the atmosphere.
- The process using generated ozone is shut down.
- The ventilation system for the ozone generator room fails.
- The gas detection system fails (if provided).

In addition, manual shutdown controls shall be provided within 10 feet. of all exit doors in the ozone generator room (NFPA 1 §54.5).

Fire Protection Systems

Fire Alarm System

The main building is required to be provided with a fire alarm system in accordance with NFPA 101 Chapter 40 and UFC Section 9-18. Fire alarm systems must be provided when required by NFPA 101 or when automatic detection or suppression systems are required.

A mass notification system is not required since the building is considered uninhabited in accordance with UFC 4-021-01. An inhabited building is defined by UFC 4-010-01 as a building that is routinely occupied by 11 or more personnel and has a population density greater than one person per 430 gross square feet. The number of operational personnel is not expected to exceed 10 personnel.

A complete, addressable Fire Alarm System shall be provided with initiating devices, notification appliances, and monitoring and control devices as indicated on the drawings and specified herein. The fire alarm system will report to the local fire department via two telephone lines. The following signals, at a minimum, will be transmitted to the fire alarm reporting system in accordance with UFC 3-600-01 §9-18.3.3: alarm signal by device type, general supervisory signal, and general trouble signal.

A new, addressable Fire Alarm Control Unit (FACU) will be provided with full control, alarm, supervisory, trouble, signal, display, and battery backup features. Power to the FACU shall be from a locking circuit breaker that is painted or integrally colored red and is clearly marked "FIRE ALARM CONTROL PANEL." The system circuits shall be Class B and provided in dedicated fire alarm conduit. Battery backup for the fire alarm system shall be provided under supervisory conditions for 48 hours and all alarm devices for an additional 15 minutes. The fire alarm remote signaling device shall be via two (2) phone lines using a Digital Alarm Communicator Transmitter (DACT).

Addressable, double-action manual pull stations shall be provided within 5 feet of all building exits, regardless of occupancy (UFC 3-600-01 §9-18.7.4). The 200-foot travel distance to a manual pull station noted in NFPA 101 is not applicable.

Flow and tamper switches shall be provided for the new fire sprinkler system, including an electric, weatherproof fire alarm bell above the FDC that shall be activated through the FACU upon detection of water flow in the sprinkler system.

Smoke detection is provided above the FACU, notification appliance circuit power extender (if applicable), transmitting equipment, and where specifically required by UFC 3-600-01.

The notification system appliance network consists of horns and strobes. Audible notification appliances (horns) are provided throughout the facility in accordance with NFPA 72. Visual notification appliances are provided in all normally occupied, public, and common use areas, unoccupied areas greater than 900 square feet in area, and in unoccupied areas where the ambient noise is loud enough to require hearing protection. Visual notification appliances shall conform to the applicable requirements of UL 1971, the Americans with Disabilities Act – Accessibility Guidelines, and NFPA 72.

Note that the separate office building is not required to be provided with a fire alarm system since it is a non-sprinklered building and does not meet the 15,000 square feet area threshold requirement of UFC 3-600-01 §9-7.2.1.1, the 500 people occupant load threshold requirement of IBC §907.2.2, or the 3-story building height and 300 people occupant load threshold requirements of NFPA 101 §38.3.4.1.

Automatic Sprinklers

The installation of an automatic sprinkler system is governed by the provisions of UFC 3-600-01 §9-7. Where required, sprinkler systems are designed in accordance with NFPA 13, unless specifically modified by UFC 3-600-01. Where installed, sprinklers will provide coverage throughout the entire facility in accordance with NFPA 13.

Sprinkler design density, design area, hose stream allowance, duration of supply, and minimum sprinkler k-factors will be in accordance with UFC 3-600-01 Tables 9-3 and 9- 4 for each hazard classification defined in NFPA 13. The design area reductions allowed by NFPA 13 for quick response sprinklers are not permitted (UFC 3-600-01 §9- 7.3.7).

A wet-pipe sprinkler system shall be provided throughout the main facility. A single sprinkler riser shall be equipped with a backflow preventer, shutoff valve, check valve, test/drain valve, flow switch, and tamper switch. The sprinkler system shall be designed and installed in accordance with UFC 3-600-01 and NFPA 13.

The fire sprinkler riser shall be provided with an exterior post-indicator valve or wall-post indicator valve. A fire department connection (FDC) compatible with the responding fire department's equipment shall be provided within 150 feet of a fire hydrant.

All aboveground sprinkler piping 2-inches and less in diameter shall be minimum Schedule 40 black steel pipe. All aboveground sprinkler piping larger than 2-inches in diameter shall be minimum Schedule 10 black steel pipe in order to minimize the weight of the pipe.

All sprinklers located in finished areas with ceilings shall be recessed or concealed pendant type. Sprinklers located in unfinished rooms with no ceilings shall be upright type. Extended coverage sprinklers are not allowed. Minimum sprinkler k-factor shall be in accordance with UFC 3-600-01. The use of flexible sprinkler hose with fittings intended for direct connection to sprinklers must be approved by the AHJ.

The Seismic Design Category for the facility is to be determined by the Geotech report and structural engineer. The sprinkler system is not required to be provided with seismic bracing in Seismic Design Categories A and B in accordance with UFC 3-600-01 and NFPA 13.

The separate office building is not required to be provided with an automatic sprinkler system since it does not meet the 15,000 square feet area threshold requirement of UFC 3-600-01 §9-7.2.1.1.

Fire Pump

A fire pump shall be provided in accordance with UFC 3-600-01 and NFPA 20. An electric, horizontal split case fire pump rated for 1,000 gpm at 40 psi with a 30hp motor shall be provided.

The maximum fire sprinkler demand must not exceed 140 percent of the rated pump capacity in accordance with UFC 3-600-01 §9-5.1.7. The fire pump shall be provided with a soft start controller.

A pressure maintenance (jockey) pump is provided in accordance with NFPA 20. The isolation valves serving the pressure maintenance pump are not required to be supervised in accordance with NFPA 20 §4.27.6.7.

A test header and flow meter shall be provided to permit testing of the fire pump in accordance with NFPA 20. The flow meter is piped to discharge back to the pump suction and to the test

header. The number and size of hose valves used for pump testing shall be as specified in NFPA 20 §4.28 (NFPA 20 §4.22.3.1.2).

Fire Extinguishers

Portable fire extinguishers are required per UFC 3-600-01 §9-17.1. For Class B, Extra Hazards, NFPA 10 Table 6.3.1.1 limits the maximum travel distance to 30 feet when extinguishers with a 40-B or higher rating are used or 50 feet when extinguishers with 80-B or higher rating is used. Extinguishers with a 40-B or higher rating will be provided. Fire extinguishers will typically be 4A:80B:C extinguishers, except in the peroxide tank room which will have a water-based extinguisher because the peroxide is a class 1 oxidizer.

Extinguisher(s) provided in the ozone generator room shall be dry chemical or CO2 type extinguishers.

Fire Department Access and Fire Protection Sitework

Fire Hydrants

All parts of the building must be within 350 feet of a hydrant (UFC 3-600-01 §9-3.5.8.2). At least one hydrant must be located within 150 feet of the fire department connection (UFC 3-600-01 §9-3.5.8.4.a). The nearest existing hydrant does not provide adequate coverage. A new hydrant shall be provided to meet the requirements above.

Fire Department Vehicle Access

Fire department vehicle access must be provided in accordance with UFC 3-600-01. One path of all-weather ground access must be provided to allow emergency vehicles unimpeded access to any facility over 5,000 square feet. The all-weather access must start from a road and terminate no farther than 33 feet from an exterior door of the building (UFC 3-600-01 §9-1.1).

Dimensions of fire lanes and turnarounds must be in accordance with NFPA 1. Fire department access roads must have an unobstructed width of not less than 20 feet with an unobstructed vertical clearance of 13 feet, 6 inches. (NFPA 1 §18.2.3.5.1). The maximum length of a dead-end vehicle access lane cannot exceed 150 feet without an approved vehicle turnaround.

Fire Water Supply

Fire flow for sprinklered facilities must be in accordance with NFPA 1 or 1,000 gpm at 20 psi, whichever is greater. The fire water supply shall provide a minimum usable quantity of water equal to the maximum fire water demand (sprinkler demand), or the fire flow demand, whichever is greater.

NFPA 1 Table 18.4.5.2.1 provides the required fire flow for facilities based on area and construction type. The GWTP requires a fire flow of 2,250 gpm for 2 hours for a building of Type II (000) construction with an area between 9,801 and 12,600 square feet. Since the building will be fully sprinklered, the fire flow can be reduced to a minimum of 1,000 gpm for 2 hours in

accordance with NFPA 1 §18.4.5.3.2. Hydraulic calculations show a sprinkler demand of 1,160 gpm, including hose allowance, which exceeds the minimum fire flow demand.

A hydrant flow test was performed IAW NFPA 291 on the municipal water system to evaluate the existing water supply available at the building. The results of the flow test are as follows:

- Test Date: January 24, 2024
- Test Location: Twin Ln N, Wantagh, NY
- Flow Hydrant: #319 (Twin Ln N)
- Gauge Hydrant: #317 (Tally Ln)
- Performed by: Liberty Utilities
- Witnessed by: N. Martin, PE (Tetra Tech)
- Test Results:
    - Static Pressure: 46 psi
    - Residual Pressure: 36 psi
    - Residual Flow: 920 gpm
    - Expected Flow @ 20 psi: 1,540 gpm

The maximum fire flow demand of the facility is 1,160 gpm, driven by the fire sprinkler demand. The hydrant flow test results indicate the water supply is capable of providing 1,540 gpm at 20 psi and is sufficient to serve the GWTP without a dedicated fire water storage tank. However, a dedicated fire pump will be required to provide adequate pressure to the system based on preliminary hydraulic calculations.

The fire protection contractor is responsible to perform a new flow test IAW NFPA 291 and perform hydraulic calculations based on the new flow test results.

A new 8-inch incoming fire service lateral shall be provided for the building and connected to the existing site water piping in accordance with the requirements of UFC 3-600-01 §9-3 and NFPA 24. The fire sprinkler riser room and pump room shall be protected with a 1-hour rated fire barrier in accordance with NFPA 24 §6.2.9(6) and NFPA 20 §4.14.1.1.3.

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Appendix A
Groundwater Data, Computer Modeling, Basin Infiltration Testing, AOP Bench-Scale Testing, and Geotechnical Investigation

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APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-1	BPOW5-1	BPOW5-1	BPOW5-1	BPOW5-1	BPOW5-2	BPOW5-2
SAMPLE DATE		20220301	20220512	20220912	20221107	20230216	20220301	20220512
TOP DEPTH		480	480	480	480	-9999	540	540
BOTTOM DEPTH		510	510	510	510	-9999	580	580
OS	Units							
1,4-DIOXANE	UG/L	--	--	--	--	0.429	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1 U	1 U	1.0 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5 U	5 U	5.0 UJ	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-2	BPOW5-2	BPOW5-2	BPOW5-3	BPOW5-3	BPOW5-3	BPOW5-3
SAMPLE DATE		20220912	20221107	20230216	20220301	20220512	20220912	20220912
TOP DEPTH		540	540	-9999	620	620	620	620
BOTTOM DEPTH		580	580	-9999	660	660	660	660
OS	Units							
1,4-DIOXANE	UG/L	--	--	0.817	--	--	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1.0 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5.0 UJ	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-3	BPOW5-3	BPOW5-4	BPOW5-4	BPOW5-4	BPOW5-4	BPOW5-4
SAMPLE DATE		20221107	20230216	20220302	20220519	20220914	20221115	20230220
TOP DEPTH		620	-9999	545	545	545	545	-9999
BOTTOM DEPTH		660	-9999	570	570	570	570	-9999
OS	Units							
1,4-DIOXANE	UG/L	--	1.95	--	--	--	--	1.07
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1.0 U	1 U	1 U	1 U	1 U	1.0 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5.0 UJ	5 U	5 U	5 U	5 U	5.0 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-5	BPOW5-5	BPOW5-5	BPOW5-5	BPOW5-5	BPOW5-6	BPOW5-6
SAMPLE DATE		20220303	20220512	20220913	20221115	20230215	20220303	20220512
TOP DEPTH		515	515	515	515	-9999	585	585
BOTTOM DEPTH		540	540	540	540	-9999	610	610
OS	Units							
1,4-DIOXANE	UG/L	--	--	--	--	1.82	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1 U	1 U	1.0 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5 U	5 U	5.0 U	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-6	BPOW5-6	BPOW5-6	BPOW5-7	BPOW5-7	BPOW5-7	BPOW5-7
SAMPLE DATE		20220913	20221115	20230215	20220302	20220302	20220519	20220519
TOP DEPTH		585	585	-9999	525	525	525	525
BOTTOM DEPTH		610	610	-9999	550	550	550	550
OS	Units							
1,4-DIOXANE	UG/L	--	--	0.974	--	--	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1.0 U	1 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5.0 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW5-7	BPOW5-7	BPOW5-7	BPOW6-1	BPOW6-1	BPOW6-1	BPOW6-1
SAMPLE DATE		20220914	20221115	20230220	20220304	20220512	20220512	20220915
TOP DEPTH		525	525	-9999	550	550	550	550
BOTTOM DEPTH		550	550	-9999	575	575	575	575
OS	Units							
1,4-DIOXANE	UG/L	--	--	0.20 U	--	--	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1.0 U	1 U	1 U	1 U	1 U	1 UJ
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
ACETONE	UG/L	5 U	5.0 U	5 U	5 U	5 U	5 U	5 UJ
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW6-1	BPOW6-1	BPOW6-2	BPOW6-2	BPOW6-2	BPOW6-2	BPOW6-2
SAMPLE DATE		20221108	20230215	20220304	20220512	20220915	20221108	20230215
TOP DEPTH		550	550	755	755	755	755	755
BOTTOM DEPTH		575	575	780	780	780	780	780
OS	Units							
1,4-DIOXANE	UG/L	--	0.316	--	--	--	--	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1.0 U	1 U	1 U	1 U	1 U	1.0 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5.0 U	5 U	5 U	5 U	5 U	5.0 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW6-3	BPOW6-3	BPOW6-3	BPOW6-3	BPOW6-3	BPOW6-4	BPOW6-4
SAMPLE DATE		20220310	20220512	20220919	20221108	20230214	20220310	20220310
TOP DEPTH		750	750	750	750	750	545	545
BOTTOM DEPTH		775	775	775	775	775	570	570
OS	Units							
1,4-DIOXANE	UG/L	--	--	--	--	0.20 U	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1 U	1 U	1.0 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5 U	5 U	5.0 U	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW6-4	BPOW6-4	BPOW6-4	BPOW6-4	BPOW6-5	BPOW6-5	BPOW6-5
SAMPLE DATE		20220512	20220919	20221108	20230214	20220308	20220519	20220920
TOP DEPTH		545	545	545	545	525	525	525
BOTTOM DEPTH		570	570	570	570	550	550	550
OS	Units							
1,4-DIOXANE	UG/L	--	--	--	0.407	--	--	--
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U	1 U	1.0 U	1 U	1 U	1 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5 U	5 U	5.0 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		BPOW6-5	BPOW6-5	BPOW6-6	BPOW6-6	BPOW6-6	BPOW6-6	BPOW6-6
SAMPLE DATE		20221110	20230214	20220308	20220519	20220920	20221110	20230214
TOP DEPTH		525	525	770	770	770	770	770
BOTTOM DEPTH		550	550	795	795	795	795	795
OS	Units							
1,4-DIOXANE	UG/L	--	0.20 U	--	--	--	--	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 UJ	0.50 U	0.50 U	0.50 U	0.50 U	0.50 UJ	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1.0 U	1 U	1 U	1 U	1 U	1.0 U	1 U
1,1-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	5.0 UJ	5 U	5 U	5 U	5 U	5.0 UJ	5 U
CARBON DISULFIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	1.1 JN	--
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RE117D1	RE117D1	RE117D1	RE117D1	RE117D1	RE117D1	RE117D1
SAMPLE DATE		20220317	20220615	20220615	20220816	20220816	20221121	20221121
TOP DEPTH		730	730	730	730	730	730	730
BOTTOM DEPTH		755	755	755	755	755	755	755
OS	Units							
1,4-DIOXANE	UG/L	0.34 J	0.10 J	0.11 J	0.34	0.32	0.40	0.33
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.37 J	0.50 U	0.50 U	0.59 J	0.62 J	0.42 J	0.36 J
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.88 J	0.50 U	0.50 U	1.1	1.1	1.1	1.1
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	1.4	1.4	1.3	1.1
ACETONE	UG/L	5 U	3.8 U	3.8 U	5 U	5 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
CARBON TETRACHLORIDE	UG/L	1.1 J	0.75 U	0.75 U	1.4	1.4	1.1	1.1
CHLOROFORM	UG/L	0.75 U	0.75 U	0.75 U	0.35 J	0.39 J	0.30 J	0.75 U
CIS-1,2-DICHLOROETHENE	UG/L	0.89 J	0.75 U	0.75 U	1.1	1.2	1	1.1
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	78.4 J	14.3	13.5	99.5	150	84.9	93

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RE117D1	RE117D1	RE117D2	RE117D2	RE117D2	RE117D2	RE117D2
SAMPLE DATE		20230313	20230515	20220317	20220615	20220816	20221121	20230313
TOP DEPTH		-9999	-9999	780	780	780	780	-9999
BOTTOM DEPTH		-9999	-9999	805	805	805	805	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.45	0.42	0.20 U	0.20 U	0.2 U	0.20 U	0.21 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.39 J	0.49 J	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	1.1	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	UG/L	1.1	1.3	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
CARBON TETRACHLORIDE	UG/L	0.97 J	1.4	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CHLOROFORM	UG/L	0.26 J	0.35 J	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 J	1	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	83	99.2	0.50 U	0.50 U	0.5 U	0.50 U	0.75 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RE117D2	RE117D2	RW8-MW01D1	RW8-MW01D1	RW8-MW01D1	RW8-MW01D1	RW8-MW01D1
SAMPLE DATE		20230515	20230515	20220320	20220517	20220816	20221119	20230312
TOP DEPTH		-9999	-9999	550	550	550	550	-9999
BOTTOM DEPTH		-9999	-9999	570	570	570	570	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.21 U	0.21 U	0.11 J	0.11 J	0.14 J	0.12 J	0.15 J
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	3.8 U	3.8 U	5 U	5 U	5 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 UJ	0.75 U	0.75 U	0.75 U	0.75 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.37 J	0.75 U	0.50 U	0.50 U	0.29 J	0.50 U	0.75 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RW8-MW01D1	RW8-MW01D2	RW8-MW01D2	RW8-MW01D2	RW8-MW01D2	RW8-MW01D2	RW8-MW01D2
SAMPLE DATE		20230518	20220320	20220517	20220821	20221120	20230312	20230518
TOP DEPTH		-9999	785	785	785	785	-9999	-9999
BOTTOM DEPTH		-9999	790	790	790	790	-9999	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.24	0.20 U	0.20 U	0.2 U	0.20 U	0.21 U	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	3.8 U	3.8 UJ	5 U	3.8 U	3.8 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 UJ	0.75 UJ	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 UJ
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.47 J	0.50 U	0.50 U	1 U	0.50 U	0.75 U	0.75 U

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RW8-MW01D2	RW8-MW01D3	RW8-MW01D3	RW8-MW01D3	RW8-MW01D3	RW8-MW01D3	RW8-MW01D3
SAMPLE DATE		20230518	20220320	20220517	20220821	20221120	20230312	20230312
TOP DEPTH		-9999	820	820	820	820	-9999	-9999
BOTTOM DEPTH		-9999	855	855	855	855	-9999	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.20 U	0.20 U	0.20 U	0.2 U	0.20 U	0.29	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.32 J
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	3.8 U	5 U	5 U	3.8 U	3.8 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 UJ	0.75 UJ	0.75 U	0.75 U	0.75 U	0.75 U	0.75 UJ
CARBON TETRACHLORIDE	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	0.48 J	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.32 J	0.50 U	0.50 U	3.1	0.50 U	0.75 U	0.37 J

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RW8-MW01D3	RW8-PT-IN01	RW8-PT-IN02	RW9-MW01D1	RW9-MW01D1	RW9-MW01D1	RW9-MW01D1
SAMPLE DATE		20230518	20221101	20221101	20220510	20220821	20221120	20230312
TOP DEPTH		-9999	-9999	-9999	552	552	552	-9999
BOTTOM DEPTH		-9999	-9999	-9999	572	572	572	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.20 U	0.20 U	0.20 U	0.42	0.46	0.33	0.43
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	2.1 J	3.80 U	3.80 U	2.6 J	3.8 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 U	1.1	0.35 J	0.75 U	0.75 UJ
CARBON TETRACHLORIDE	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1.00 U	1.00 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 UJ	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.32 J	0.50 U	0.50 U	0.50 U	1.2 J+	0.50 U	0.75 U

Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RW9-MW01D1	RW9-MW01D2	RW9-MW01D2	RW9-MW01D2	RW9-MW01D2	RW9-MW01D2	RW9-MW01D2
SAMPLE DATE		20230522	20220510	20220510	20220821	20221120	20230312	20230312
TOP DEPTH		-9999	740	740	740	740	-9999	-9999
BOTTOM DEPTH		-9999	770	770	770	770	-9999	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.48	0.20 U	0.20 U	0.2 U	0.20 U	0.21 U	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.35 J	0.50 U
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	2 J	2.9 J	3.1 J	3.3 J	3.8 U	3.8 U	3.8 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 UJ
CARBON TETRACHLORIDE	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CHLOROFORM	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.75 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.75 U	0.50 U	0.50 U	1 U	0.50 U	0.26 J	0.75 U

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		RW9-MW01D2	RW9-MW01D3	RW9-MW01D3	RW9-MW01D3	RW9-MW01D3	RW9-PT-IN01	RW9-PT-IN02
SAMPLE DATE		20230522	20220510	20220821	20221120	20230312	20221128	20221130
TOP DEPTH		-9999	820	820	820	-9999	-9999	-9999
BOTTOM DEPTH		-9999	840	840	840	-9999	-9999	-9999
OS	Units							
1,4-DIOXANE	UG/L	0.20 U	0.20 U	0.2 U	0.20 U	0.21 U	0.20 U	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
ACETONE	UG/L	3.8 U	2.7 J	3.8 U	3.8 U	3.8 U	3.80 U	3.80 U
CARBON DISULFIDE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
CARBON TETRACHLORIDE	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.50 U	0.75 U	0.75 U
CHLOROFORM	UG/L	0.50 U	0.75 U	0.75 U	0.75 U	0.50 U	0.75 U	0.75 U
CIS-1,2-DICHLOROETHENE	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
M+P-XYLENES	UG/L	1 U	1 U	1 U	1 U	1 U	1.00 U	1.00 U
METHYL TERT-BUTYL ETHER	UG/L	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
TETRACHLOROETHENE	UG/L	0.50 U	0.50 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
TOLUENE	UG/L	0.50 U	0.50 U	0.5 U	0.46 J	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	0.75 U	0.50 U	0.89 J	0.50 U	0.69 J	0.50 U	0.50 U

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		TT102D1	TT102D1	TT102D1	TT102D2	TT102D2	TT102D2	TT119S1
SAMPLE DATE		20220404	20220504	20221026	20220404	20220504	20221026	20231108
TOP DEPTH		560	560	560	740	740	740	220
BOTTOM DEPTH		600	600	600	770	770	770	240
OS	Units							
1,4-DIOXANE	UG/L	0.47	--	0.52	0.23 U	--	0.24 UJ	0.20 U
OV	Units							
1,1,2-TRICHLOROETHANE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	--	1 U	1.0 U	--	1 U	1.0 U	1.0 U
1,1-DICHLOROETHENE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
ACETONE	UG/L	--	5 U	5.0 U	--	5 U	5.0 U	5.0 U
CARBON DISULFIDE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
CARBON TETRACHLORIDE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
CHLOROFORM	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
CIS-1,2-DICHLOROETHENE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
M+P-XYLENES	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
METHYL TERT-BUTYL ETHER	UG/L	--	--	--	--	--	--	--
TETRACHLOROETHENE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.58 J
TOLUENE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	0.50 U
TRICHLOROETHENE	UG/L	--	0.50 U	0.50 U	--	0.50 U	0.50 U	3.3

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Parameter has at least one positive detection.

APPENDIX A
BASIS OF RECOVERY WELL QUALITY DATA

LOCATION		VPB-RW10
SAMPLE DATE		20230117
TOP DEPTH		203
BOTTOM DEPTH		240
OS	Units	
1,4-DIOXANE	UG/L	0.22
OV	Units	
1,1,2-TRICHLOROETHANE	UG/L	1 U
1,1,2-TRICHLOROTRIFLUOROETHANE	UG/L	1 U
1,1-DICHLOROETHENE	UG/L	1 U
ACETONE	UG/L	1 U
CARBON DISULFIDE	UG/L	1 U
CARBON TETRACHLORIDE	UG/L	1 U
CHLOROFORM	UG/L	1 U
CIS-1,2-DICHLOROETHENE	UG/L	3.3
M+P-XYLENES	UG/L	1 U
METHYL TERT-BUTYL ETHER	UG/L	3.2
TETRACHLOROETHENE	UG/L	8.8
TOLUENE	UG/L	1 U
TRICHLOROETHENE	UG/L	1.4

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Parameter has at least one positive detection.

APPENDIX A
PUMPING TEST RESULTS - INORGANICS

LOCATION		RW8-PT-IN01	RW8-PT-IN02	RW8-PT-OUT01	RW8-PT-OUT02	RW9-PT-IN01	RW9-PT-IN02
SAMPLE DATE		20221101	20221101	20221101	20221101	20221128	20221130
M	Units						
ALUMINUM	UG/L	59.8000	34.9000 J	153.0000	19.2000 J	--	--
ANTIMONY	UG/L	6.2500 U	2.9400 J	2.7600 J	6.2500 U	--	--
ARSENIC	UG/L	8.0000 U	8.0000 U	8.0000 U	8.0000 U	--	--
BARIUM	UG/L	25.0000 U	25.0000 U	25.0000 U	25.0000 U	--	--
BERYLLIUM	UG/L	0.7500 U	0.7500 U	0.7500 U	0.7500 U	--	--
CADMIUM	UG/L	0.7500 U	0.7500 U	0.7500 U	0.7500 U	--	--
CALCIUM	UG/L	1720	1720	1900	1830	--	--
CHROMIUM	UG/L	3.1000 J	1.2100 J	2.5000 U	2.5000 U	--	--
COBALT	UG/L	3.2200 J	3.2000 J	3.1100 J	3.1500 J	--	--
COPPER	UG/L	6.0700 J	8.0000 U	8.0000 U	8.0000 U	--	--
IRON	UG/L	619.0000	605.0000	104.0000	115.0000	1440	1050
LEAD	UG/L	4.8000 U	4.8000 U	4.8000 U	4.8000 U	--	--
MAGNESIUM	UG/L	617.0000 J	637.0000 J	702.0000 J	659.0000 J	--	--
MANGANESE	UG/L	8.2800 J	7.6300 J	10.5200	8.7200 J	12.0000	6.4500 J
MERCURY	UG/L	0.1600 U	0.0800 J	0.0900 J	0.0770 J	--	--
NICKEL	UG/L	8.7500 J	4.4800 J	3.3100 J	3.4000 J	--	--
POTASSIUM	UG/L	250.0000 U	250.0000 U	124.0000 J	250.0000 U	--	--
SELENIUM	UG/L	8.0000 U	8.0000 U	8.0000 U	8.0000 U	--	--
SILVER	UG/L	2.5000 U	2.5000 U	2.5000 U	2.5000 U	--	--
SODIUM	UG/L	4610	4770	4860	4820	--	--
THALLIUM	UG/L	10.0000 U	10.0000 U	10.0000 U	10.0000 U	--	--
VANADIUM	UG/L	10.0000 U	10.0000 U	10.0000 U	10.0000 U	--	--
ZINC	UG/L	32.9000	15.0000 J	7.4800 J	5.3900 J	--	--
MISC	Units						
CHLORIDE	MG/L	9.5000	9.4000	9.0000	9.5000	--	--
NITRITE/NITRATE-N	MG/L	0.2300 J	0.2300 J	0.2500 U	0.2500 U	--	--
SULFATE	MG/L	8.3000	8.3000	6.5000	6.9000	--	--
MISC	Units						
PH	S.U.	4.8400 J	5.3100 J	5.5200 J	5.5000 J	5.2700 J	5.2100 J

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Parameter has at least one positive detection.

APPENDIX A
PUMPING TEST RESULTS - INORGANICS

LOCATION		RW9-PT-IN03	RW9-PT-OUT01	RW9-PT-OUT01	RW9-PT-OUT02
SAMPLE DATE		20221209	20221128	20221209	20221130
M	Units				
ALUMINUM	UG/L	23.4000 J	--	22.4000 J	--
ANTIMONY	UG/L	6.2500 U	--	6.2500 U	--
ARSENIC	UG/L	8.0000 U	--	8.0000 U	--
BARIUM	UG/L	25.0000 U	--	25.0000 U	--
BERYLLIUM	UG/L	0.7500 U	--	0.7500 U	--
CADMIUM	UG/L	0.7500 U	--	0.7500 U	--
CALCIUM	UG/L	2400	--	2470	--
CHROMIUM	UG/L	11.6000	--	6.3600	--
COBALT	UG/L	3.5600 J	--	3.6200 J	--
COPPER	UG/L	4.3600 J	--	8.0000 U	--
IRON	UG/L	1170	66.2000	48.0000 J	422.0000
LEAD	UG/L	4.8000 U	--	4.8000 U	--
MAGNESIUM	UG/L	908.0000 J	--	924.0000 J	--
MANGANESE	UG/L	7.2600 J	24.1000	8.0400 J	8.8800 J
MERCURY	UG/L	0.1230 J	--	0.1180 J	--
NICKEL	UG/L	9.1600 J	--	8.1800 J	--
POTASSIUM	UG/L	543.0000 J	--	524.0000 J	--
SELENIUM	UG/L	8.0000 U	--	8.0000 U	--
SILVER	UG/L	2.5000 U	--	2.5000 U	--
SODIUM	UG/L	5910	--	5950	--
THALLIUM	UG/L	10.0000 U	--	10.0000 U	--
VANADIUM	UG/L	10.0000 U	--	10.0000 U	--
ZINC	UG/L	12.3000 J	--	6.9100 J	--
MISC	Units				
CHLORIDE	MG/L	8.4000	--	8.5000	--
NITRITE/NITRATE-N	MG/L	0.2500 U	--	0.2500 U	--
SULFATE	MG/L	13.6000	--	13.5000	--
MISC	Units				
PH	S.U.	5.0100 J	5.4200 J	4.5900 J	4.9700 J

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Parameter has at least one positive detection.

TECHNICAL MEMORANDUM
EXTRACTION WELLS RW8 AND RW9 AQUIFER TESTING EVALUATION
NWIRP BETHPAGE, NEW YORK
MARCH 2023

This Technical Memorandum prepared by Tetra Tech, Inc. for the Naval Facilities Engineering Systems Command (NAVFAC) Atlantic Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract Number N6247016D9008 Task Order WE13, presents the analysis of the aquifer testing performed in October – December 2022 near Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York. The testing was performed to estimate aquifer hydraulic parameters for subsequent evaluation of the capture of contaminated groundwater by recently installed groundwater extraction wells RW8 and RW9, and to support development of the hydrogeologic conceptual site model and future groundwater remediation-related activities.

1.0 SCOPE

The pumping tests were conducted in the fall of 2022 at recovery well locations RW8 and RW9, located just south of the Southern State Parkway approximately 2.6 miles south of the southeastern property boundary for NWIRP Bethpage. A total of 33 wells in the area (see Tables 1 and 2 and Figure 1) were monitored for water levels before, during, and after the tests, using electronic data loggers. The objectives of the test were to obtain operating data for the extraction wells for determination of pumping capacities, to estimate the radius of influence of the wells, and to generate transmissivity estimates for the deep portion of the Magothy aquifer in the area for use in subsequent groundwater extraction system/capture zone evaluations for containment/capture of the OU2 deep VOC plume associated with the NWIRP.

2.0 AQUIFER TESTING METHODOLOGY

Aquifer testing included the performance of step-drawdown tests and follow-up constant rate pumping tests for RW8 and RW9. RW8 and RW9 are located hydraulically downgradient (south) of the leading edge of the OU2 deep VOC plume. Groundwater data collected from monitoring wells located at the recovery well sites also indicate the underlying groundwater has not been impacted by OU2 site contaminates. Regardless, a temporary treatment system was constructed prior to the start of the aquifer test at RW8 and RW9 to treat pumped water prior to discharge to a local a Nassau County recharge basin. The temporary treatment system consisted of particulate filters and granulated activated carbon. Influent and effluent samples were collected from the system during both tests. Water level observation wells (see Tables 1 and 2) were selected from currently existing wells located in the general vicinity (the same network of observation wells was used for both tests) and were selected to provide areal coverage as well as depth-specific data regarding recovery well pumping influences.

2.1 Water Level Trend Monitoring

Water level trends were monitored in 33 wells before, during, and after the pumping tests at one-minute intervals, using pressure transducers and electronic data loggers. Variable, cyclical pumping influences of several water supply wells in the area were observed throughout the

duration of water level monitoring, including during the pumping tests, as shown on the water level graphs prepared for each well (provided in Attachment A). For each set of wells graphed, two graphs were prepared; a small scale graph that provides data over the entire range of data collected for the test (to provide longer term trend information and to identify cyclical outside pumping influences), and a larger scale graph that focuses in on the timeframe from immediately before the step test to 1 to 2 days after completion of the constant rate test, to provide more detail regarding the active testing data.

2.2 RW8 Pumping Test

The RW8 pumping test consisted of two distinct operations: a step-drawdown test over a 1-day period; followed by a constant rate test over a 54-hour period. The pumping test was conducted in accordance with procedures outlined in the Letter Work Plan *Phase III Southern Plume Intercept System Recover Well – RW8 Aquifer Testing and Analysis, Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York, September 2022 (Tetra Tech, 2022).*

Groundwater level data was collected from 31 existing groundwater monitoring wells and 2 recovery wells (see Table 1) during this field event; all wells were within 3,607 feet of the RW8 recovery well.

Water levels were monitored continuously using in-well pressure transducers and compared to manually collected measurements collected every two hours at RW8 and its four associated monitoring wells; every four hours at the monitoring wells within 2,000 ft of RW8; and twice a day for the entire 33 well network during the tests. Pressure transducers consisted of Solinst® Levelogger Jr's and a Solinst® Barologger Edge that was used to collect barometric pressure data. The barometric pressure data was utilized to correct/adjust observation well pressure head data for fluctuations due to influences from barometric pressure. Manual groundwater level measurements were collected using an electric water level meter. The Solinst® transducer units in the monitoring wells and recovery wells were set to collect data simultaneously at a 5-minute interval for a minimum of 10 days prior to the pumping test and 10 days after the pumping tests.

The step test at RW8 was conducted on October 24th, 2022, starting at 7:36 a.m. and ending at 3:36 p.m. The test consisted of four "steps" at pumping rates: 400, 650, 900, and 1,140 gallons per minute (GPM). Each "step" lasted 120 minutes followed by an increase in the pumping rate to the next "step" rate. The calculated specific capacity of RW8 for each step of the test is as follows:

Pumping Rate (gpm)	Drawdown (foot)	Specific Capacity (GPM/foot)
400	9.05	44.20
650	15.55	41.80
900	22.76	39.54
1140	29.20	39.04

The constant rate test was started on October 25th, 2022, at 9:30 a.m. and lasted 54 hours ending on October 27th,2022 at 3:30 p.m. The constant rate pump test consisted of pumping groundwater at RW8 at a rate of approximately 1,000 gpm for 54 consecutive hours. Water level data was collected before, during, and after the constant rate test.

The pump was also turned-on October 20th, 2022 five times for approximately 10 minutes each for testing of the pumping system and turned on at 9:40am on October 28th for approximately 20 minutes to backwash the carbon filters. On November 1st, 2022 the pump was turned on at 9:20am to 9:34am followed by being turned back on at 9:47am. The pump was on from 9:47am pumping at a rate of 1,000 gpm for 4 hours to collect groundwater samples and was turned off at 1:36pm.

Analytical data collected from the temporary treatment system at RW8 is provided in Attachment B.

2.3 RW9 Pumping Test

The RW9 pumping test consisted of two distinct operations: a step-drawdown test over a 1-day period; followed by a constant rate test over a 48-hour period. The pumping test was conducted in accordance with procedures outlined in the Letter Work Plan *Phase III Southern Plume Intercept System Recover Well – RW9 Aquifer Testing and Analysis, Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York, September 2022 (Tetra Tech, 2022).*

Groundwater level data was collected from 31 existing groundwater monitoring wells and 2 recovery wells (Table 2) during this field event, all wells were within 2,485 feet of the RW9 recovery well.

Water levels were monitored continuously using in-well pressure transducers and compared to manually collected measurements collected every two hours at RW9 and its four associated monitoring wells; every four hours at the monitoring wells within 2,000 feet of RW9; and twice a day for the entire 33 well network during the tests. Pressure transducers consisted of Solinst® Levelogger Jr's and a Solinst® Barologger Edge that was used to collect barometric pressure data. The barometric pressure data was utilized to correct/adjust observation well pressure head data for fluctuations due to influences from fluctuations in barometric pressure. Manual groundwater level measurements were collected using an electric water level meter. The Solinst® transducer units in the monitoring wells and recovery wells were set to collect data simultaneously with a 5-minute interval for a minimum of 10 days prior to the pumping test and 10 days after the pumping tests.

The step test at RW9 was conducted on November 28th, 2022, starting at 7:36 a.m. and ending at 4:24 p.m. The test consisted of four "steps" at pumping rates: 400, 650, 900, and 1,150 gallons per minute (GPM). The pump was reduced to 950 gpm at 03:45pm due to rising water levels in the frac tank Each "step" lasted 120 minutes followed by an increase in the pumping rate to the next "step" rate. The calculated specific capacity of RW8 for each step of the test is as follows:

Pumping Rate (gpm)	Drawdown (feet)	Specific Capacity (GPM/foot)
400	8.23	48.60
650	14.47	44.92
900	20.45	44.01
1150	25.92	44.37

The pump was originally turned on from November 29th, 2022, at 09:45 a.m. and operated till 07:00 p.m. on December 1st. This was the initial attempt for the constant rate test. Although the pump operated successfully during this period, numerous pressure transducers failed to collect data during the entirety of this constant rate test due to a malfunction in the pressure transducer firmware. The firmware issue was resolve and the next attempt for the constant rate test was scheduled and conducted successfully during the week of December 5th, 2022. The pump was also turned-on December 5th, 2022 for approximately 30 minutes while the pumping system was tested.

The pump was restarted on December 6th, 2022, at 09:30 a.m. but turned off at 5:30 a.m. on December 7th when the generator tripped off. The pump was turned back on at 1:00 p.m. on December 7th to continue the constant rate test and was turned off on December 9th at 1:00 p.m. ending the test. The constant rate pumping test consisted of pumping groundwater at RW9 at a rate of approximately 1,000 gpm for 48 consecutive hours. Water level data was collected before, during, and after the constant rate test.

Analytical data collected from the temporary treatment system at RW9 is provided in Attachment B.

3.0 RESULTS

The water level data collected during the RW-8 and RW-9 pumping tests were evaluated to estimate the aquifer characteristics for deeper portions of the Magothy Aquifer in the areas of the pumping wells. Upon initial review of the water level data, it was evident that pumping of other unidentified water supply wells in the area throughout the tests affected the water levels in the observation wells to varying degrees, limiting the usefulness of the data for aquifer test analysis to some extent and constraining the approaches that could be taken. In addition, the early interruption of the RW9 pumping test for 7.5 hours due to some equipment malfunctions also compromised the test data quality to some extent. The following sections describe the evaluation process and results for each of the two pumping tests. The following sections summarize the data evaluation activities and results.

3.1 General Water Level Trends

Water level trends for the observation wells over the time period of the field program are presented on the graphs in Attachment A. For the RW8 test, a long-term trend of rising groundwater levels was observed overall, however for the two days leading up to the RW8 pumping test to two days following the test water levels were generally stable aside from time periods of pumping activities. For the RW9 test, a long-term trend of increasing rising groundwater levels was also observed.

Precipitation data over the time period of the pumping tests was generally minor; precipitation data is provided in Attachment C.

Shallow wells generally showed little response to local pumping influences. The water level data indicates that pumping from intermediate and deep portions of the Magothy aquifer have minimal impact on shallow groundwater in the study area. In addition to the responses observed from the pumping of RW8 and RW9, intermediate and deep wells had discrete non test-related water level responses to the intermittent/cyclical pumping of multiple local production wells. The responses to pumping varied based on each well's location with respect to the well(s) that were pumping at any given point in time. Individual well responses to the pumping of nearby water supply wells are discussed in more detail in Sections 3.2 and 3.3.

3.2 RW8 Pumping Test Data Evaluation

The RW8 pumping test was started at 9:30 a.m. on October 25 and ended at 3:30 p.m. on October 27 (54 hours). RW8 was pumped at a constant rate of 1,000 gpm throughout the test. A review of the water level graphs (see Attachment A.1) identified two (and likely other) unknown water supply wells that operated periodically during each day of the test, creating additional cyclical drawdown and recovery in the observation wells during and after each time the water supply wells turned on and off. Observed impacts include:

- The time-water level graphs for wells RE129D1/D2, RE117D1/D2, the RW9 cluster, TT102D1/D2, RE118D1, and BPOW 5-5 and 5-6, and RE118D1 (listed in order of increasing distance from RW8) in particular show strong responses to the pumping of an unknown water supply well that turned on at around 9:00 a.m. on 10/25, 4:00 a.m. on 10/26, and 9:00 a.m. on 10/27, and ran for approximately 3-5 hours. In general, the magnitude of water level changes increased with increasing distance from RW8 to the north and east, with a maximum change of about 1.5 feet in the wells furthest to the east and northeast from RW8. The RW8 monitoring well cluster also showed a very minor effect from the pumping of this well.
- The time-water level graphs for clusters DEC1 D1/D2, RE133D1/D2, BPOW 6-1/6-2, BPOW 6-3/6-4, and BPOW 6-5/6-6 (listed in order of increasing distance from RW8) in particular show strong responses to the pumping of the unknown water supply well that turned on around 3:00 a.m. on 10/25, 10/26, and 10/27 and ran for about 12 hours each time it turned on. In general, the magnitude of water level changes increased with increasing distance from RW8 to the southeast, with a maximum change of about 0.8 feet in the wells furthest to the southeast from RW8. The RW8 monitoring well cluster did not have a discernable response the pumping of this well.

The magnitude of RW8-induced drawdowns was also depth-dependent within each well cluster. In general, wells screened within the 550- to 850-foot-depth interval showed relatively strong responses to the pumping of RW8 in comparison to wells at the same cluster location that were screened >900 feet or less than 500 ft below ground surface, which was expected given the screened interval of RW8 (595- to 790-foot below ground). Some responses were observed in the deeper and more shallow wells, however, indicating hydraulic communication with strata

above and below the units screened by RW8. Table 3 summarizes the relative responses observed in observation wells to the pumping of RW8.

Due to the on and off extraneous and varying pumping influences of unknown wells observed throughout the test, a time-drawdown type curve fitting approach was not considered appropriate for evaluation of the data. Given the generally short recovery timeframes observed for water levels when the unknown water supply wells ceased operation, an alternate approach involving selection of a timeframe of minimal outside influences (i.e., no or minimal outside pumping) for application of a distance-drawdown approach to evaluating the data was selected. The time-drawdown graphs for the observation wells were evaluated to select a consistent time period where external pumping influences were minimal in order to identify the most representative drawdown data for use in the semi-log distance-drawdown evaluation of the test. Based on a review of the graphs, 12:00 a.m. on October 27 [2310 minutes (38.5 hours) into the test] was selected as the time for the distance-drawdown analysis. Estimates of drawdowns at 2310 minutes were generated by using the pre- and post-test water level data trends on the water level graphs to estimate a background water level for each well, then the water level at 2310 minutes was visually estimated from the graphs and subtracted from the estimated background water levels to estimate the drawdowns at 2310 minutes. For the distance-drawdown analysis, the well in each cluster that exhibited the most and clearest response to RW8 pumping (strongest hydraulic connection) was selected for the analysis and was plotted on a semi-log distance-drawdown graph and the transmissivity of the aquifer calculated using the Jacob method for an unsteady-state confined aquifer (Cooper and Jacob, 1946). Based on the distance-drawdown analysis a transmissivity of 26,100 square feet per day was calculated, along with an estimated radius of influence (at 2310 minutes) of between 5,000 and 6,000 feet (note that a well's radius of influence is typically much larger than the well's capture zone). The distance-drawdown graph and associated transmissivity calculation is presented in Attachment D.

3.3 RW9 Pumping Test Data Evaluation

The RW9 pumping test was started at 9:30 a.m. on December 6, shut down temporarily at 5:30 on December 7 due to equipment issues, restarted at 1:00 p.m. on December 7, and ended at 1:00 p.m. on December 9 (75.5 hours). RW9 was pumped at a constant rate of 1,000 gpm while in operation. A review of the water level graphs (see Attachment A.2) identified that two (and likely more) unknown water supply wells operated periodically during each day of the test, creating additional cyclical drawdown and recovery in the observation wells during and after each time the water supply wells turned on and off. Observed impacts include:

- The time-water level graphs for almost all of the well clusters showed some level of response to the pumping of an unknown water supply well that turned on at around 9:00 a.m. each day and ran for 3-5 hours. Wells at the RW-9 cluster, TT102D1/D2, RE117D1/D2, and BPOW 5-5 and 5-6 (listed in order of increasing distance from RW8) in particular show the strongest responses to the pumping of the unknown water supply well (water level changes of approximately 1 foot or more); these wells are located east and north of RW9. Well clusters to the south, southeast, and west showed lesser responses to the pumping of the unknown water supply well (generally less than 1 foot).

- In addition to the well that operated starting at around 9:00 a.m. each day, there was also some minor influence of another well observed at some well clusters starting around 5 or 6 p.m. each day and continuing for 3-5 hours. The time-water level graphs for the BPOW well clusters in particular showed this pumping effect.

The magnitude of RW9-induced drawdowns was also depth-dependent within each well cluster. In general, wells screened within the 600- to 850- foot depth interval showed relatively strong responses to the pumping of RW9 in comparison to wells at the same cluster location that were screened >900 feet or less than 550 feet below ground surface, which was expected given the screened interval of RW9 (650- to 865-fot below ground). Some responses were observed in the deeper and more shallow wells, however, indicating hydraulic communication with strata above and below the units screened by RW9. Table 4 summarizes the relative responses observed in observation wells to the pumping of RW9.

Due to the on and off extraneous and varying pumping influences of unknown wells observed throughout the test, a time-drawdown type curve fitting approach was not considered appropriate for evaluation of the data. Given the generally short recovery timeframes observed for water levels when the unknown water supply wells ceased operation, an alternate approach involving selection of a timeframe of minimal outside influences (i.e., no or minimal outside pumping) for application of a distance-drawdown approach to evaluating the data was selected. The time-drawdown graphs for the observation wells were evaluated to select a consistent time period where external pumping influences were minimal in order to identify the most representative drawdown data for use in the semi-log distance-drawdown evaluation of the test. Based on a review of the graphs, 8:00 a.m. on December 9 [4230 minutes (70.5 hours) into the test] was selected as the time for the distance-drawdown analysis. Estimates of drawdowns at 4230 minutes were generated by using the pre- and post-test water level data trends on the water level graphs to estimate a background water level for each well, then the water level at 4230 minutes was visually estimated from the graphs and subtracted from the estimated background water levels to estimate the drawdowns at 4230 minutes. For the distance-drawdown analysis, the well in each cluster that exhibited the most and clearest response to RW9 pumping (strongest hydraulic connection) was selected for the analysis and was plotted on a semi-log distance-drawdown graph and the transmissivity of the aquifer calculated using the Jacob method for an unsteady-state confined aquifer (Cooper and Jacob, 1946). Based on the distance-drawdown analysis a transmissivity of 20,727 square feet per day was calculated, along with an estimated radius of influence (at 4230 minutes) of slightly under 4,000 feet (note that a well's radius of influence is typically much larger than the well's capture zone). The distance-drawdown graph and associated transmissivity calculation is presented in Attachment D.

4.0 SUMMARY AND CONCLUSIONS

Based on the pumping test data analyses, the average transmissivity for the deep portion of the Magothy aquifer in the RW8 – RW9 area is approximately 23,400 square feet per day. Based on a review of the geophysical logs for the two wells (and confirmed by the pumping test evaluations) RW8 appears to be screened across a portion of the aquifer with slightly higher transmissivity than RW9, however the overall average transmissivity from the two pumping tests

is likely a better overall indicator of the deep aquifer transmissivity in the area rather than focusing on the individual test evaluations, especially considering the significant amount of outside pumping influences observed during both of the tests.

REFERENCES

Cooper and Jacob, 1946. A Generalized Graphical Method for Evaluating Formation Constants and Summarizing Well Field History. American Geophysical Union Transactions, V. 27, pp. 526 – 534.

ATTACHMENT A

TEMPORARY TREATMENT SYSTEM ANALYTICAL RESULTS

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO.
QUOTE NO. N5420
COC Number 2036099

9
9.1

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: Tetra Tech
ADDRESS: 4433 Corporation Lane, Ste 300
CITY Virginia Beach STATE: VA ZIP: 23462
ATTENTION: Ernie Wu
PHONE: 757-466-4901 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWIRP Bethpage
PROJECT NO.: 112608005 LOCATION: Bethpage, NY (RW)
PROJECT MANAGER: Ernie Wu
e-mail: Ernie.wu@tetratech.com
PHONE: 757-466-4901 FAX:

CLIENT BILLING INFORMATION

BILL TO: (see contact) PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) Standard DAYS*
HARDCOPY (DATA PACKAGE): Standard DAYS*
EDD: Standard DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ❑ Level 1 (Results Only)
- ❑ Level 2 (Results + QC)
- ❑ Level 3 (Results + QC + Raw Data)
- ❑ Level 4 (QC + Full Raw Data)
- ❑ NJ Reduced ❑ US EPA CLP
- ❑ NYS ASP A ❑ NYS ASP B
- ❑ Other
- ❑ EDD FORMAT

ANALYSIS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 VOCs	2 1,4-dioxane	3 TAL metals	4 Anions	5 pH	6	7	8	9	COMMENTS
PRESERVATIVES								HCl			HNO3						← Specify Preservatives A-HCl D-NaOH B-HN03 E-ICE C-H2SO4 F-OTHER
1.	~~RW8-PT-IN~~ TB01-11012022	Aq		X	11/1/22	0800	2	2									Trip Blank
2.	RW8-PT-IN01-11012022					1120	6	1	1	1	1	1					
3.	RW8-PT-OVT01-11012022					1130											
4.	RW8-PT-IN02-11012022					1320											
5.	RW8-PT-OVT02-11012022					1330											
6.																	
7.																	
8.																	
9.																	
10.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	11/1/22 15:30	1.
2.	11/2/22 936	2. [signature]
3.		3.

Conditions of bottles or coolers at receipt: ❑ COMPLIANT ❑ NON COMPLIANT ❑ COOLER TEMP 3.1 °C
Comments: Tel-Con [illegible]

Page ____ of ____

CLIENT: ❑ Hand Delivered ❑ Other
CHEMTECH: ❑ Picked Up ❑ Field Sampling

Shipment Complete ❑ YES ❑ NO

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	TB01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-01	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
VX032532.D	1		11/02/22 12:56	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.90	J	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	TB01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-01	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
VX032532.D	1		11/02/22 12:56	VX110222

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	48.7		81 - 118		97%	SPK: 50
1868-53-7	Dibromofluoromethane	46.3		80 - 119		93%	SPK: 50
2037-26-5	Toluene-d8	47.8		89 - 112		96%	SPK: 50
460-00-4	4-Bromofluorobenzene	46.2		85 - 114		92%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	126000	5.556				
540-36-3	1,4-Difluorobenzene	208000	6.763				
3114-55-4	Chlorobenzene-d5	184000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	87400	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	TB01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-01	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
VX032532.D	1		11/02/22 12:56	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032533.D	1		11/02/22 13:20	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032533.D	1		11/02/22 13:20	VX110222

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	48.9		81 - 118		98%	SPK: 50
1868-53-7	Dibromofluoromethane	45.9		80 - 119		92%	SPK: 50
2037-26-5	Toluene-d8	48.0		89 - 112		96%	SPK: 50
460-00-4	4-Bromofluorobenzene	46.3		85 - 114		93%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	116000	5.556				
540-36-3	1,4-Difluorobenzene	190000	6.763				
3114-55-4	Chlorobenzene-d5	165000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	75500	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032533.D	1		11/02/22 13:20	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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
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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

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032534.D	1		11/02/22 13:43	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032534.D	1		11/02/22 13:43	VX110222

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	49.2		81 - 118		98%	SPK: 50
1868-53-7	Dibromofluoromethane	46.2		80 - 119		92%	SPK: 50
2037-26-5	Toluene-d8	48.0		89 - 112		96%	SPK: 50
460-00-4	4-Bromofluorobenzene	47.5		85 - 114		95%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	118000	5.556				
540-36-3	1,4-Difluorobenzene	195000	6.763				
3114-55-4	Chlorobenzene-d5	175000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	82800	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX032534.D	1		11/02/22 13:43	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	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
VX032535.D	1		11/02/22 14:06	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	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
VX032535.D	1		11/02/22 14:06	VX110222

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	48.2		81 - 118		96%	SPK: 50
1868-53-7	Dibromofluoromethane	45.8		80 - 119		92%	SPK: 50
2037-26-5	Toluene-d8	48.1		89 - 112		96%	SPK: 50
460-00-4	4-Bromofluorobenzene	46.2		85 - 114		92%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	119000	5.556				
540-36-3	1,4-Difluorobenzene	195000	6.763				
3114-55-4	Chlorobenzene-d5	172000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	79600	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	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
VX032535.D	1		11/02/22 14:06	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	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
VX032536.D	1		11/02/22 14:30	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	1.30	J	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	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
VX032536.D	1		11/02/22 14:30	VX110222

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	48.9		81 - 118		98%	SPK: 50
1868-53-7	Dibromofluoromethane	45.3		80 - 119		91%	SPK: 50
2037-26-5	Toluene-d8	47.6		89 - 112		95%	SPK: 50
460-00-4	4-Bromofluorobenzene	44.0		85 - 114		88%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	114000	5.556				
540-36-3	1,4-Difluorobenzene	189000	6.763				
3114-55-4	Chlorobenzene-d5	162000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	69200	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	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
VX032536.D	1		11/02/22 14:30	VX110222

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	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
BN022489.D	1	11/03/22 09:20	11/03/22 22:23	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.23		30 - 150		57%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		81%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.24		55 - 111		59%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.24		53 - 106		60%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.34		58 - 132		86%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2350	7.921				
1146-65-2	Naphthalene-d8	9110	10.752				
15067-26-2	Acenaphthene-d10	6000	14.6				
1517-22-2	Phenanthrene-d10	13100	17.35				
1719-03-5	Chrysene-d12	11100	21.555				
1520-96-3	Perylene-d12	10000	24.005				

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	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
BN022490.D	1	11/03/22 09:20	11/03/22 23:00	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.24		30 - 150		59%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.33		30 - 150		82%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.26		55 - 111		65%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.25		53 - 106		63%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.35		58 - 132		88%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2480	7.92				
1146-65-2	Naphthalene-d8	9350	10.752				
15067-26-2	Acenaphthene-d10	6030	14.593				
1517-22-2	Phenanthrene-d10	13300	17.354				
1719-03-5	Chrysene-d12	11300	21.555				
1520-96-3	Perylene-d12	10100	24.005				

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N = Presumptive Evidence of a Compound
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	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
BN022499.D	1	11/03/22 09:20	11/04/22 05:46	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.18		30 - 150		45%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		75%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.21	*	55 - 111		53%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.22		53 - 106		56%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.34		58 - 132		84%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2820	7.921				
1146-65-2	Naphthalene-d8	9150	10.752				
15067-26-2	Acenaphthene-d10	5510	14.589				
1517-22-2	Phenanthrene-d10	13300	17.35				
1719-03-5	Chrysene-d12	11200	21.555				
1520-96-3	Perylene-d12	9540	24.005				

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
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	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
BN022500.D	1	11/03/22 09:20	11/04/22 06:23	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.26		30 - 150		65%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		79%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.23		55 - 111		58%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.38		58 - 132		94%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2070	7.921				
1146-65-2	Naphthalene-d8	9700	10.752				
15067-26-2	Acenaphthene-d10	6230	14.589				
1517-22-2	Phenanthrene-d10	13700	17.35				
1719-03-5	Chrysene-d12	10800	21.555				
1520-96-3	Perylene-d12	8620	24.008				

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MDL = Method Detection Limit
LOD = Limit of Detection
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M = MS/MSD acceptance criteria did not meet requirements

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B = Analyte Found in Associated Method Blank
N = Presumptive Evidence of a Compound
* = Values outside of QC limits
D = Dilution
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	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
BN022499.D	1	11/03/22 09:20	11/04/22 05:46	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.18		30 - 150		45%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		75%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.21	*	55 - 111		53%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.22		53 - 106		56%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.34		58 - 132		84%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2820	7.921				
1146-65-2	Naphthalene-d8	9150	10.752				
15067-26-2	Acenaphthene-d10	5510	14.589				
1517-22-2	Phenanthrene-d10	13300	17.35				
1719-03-5	Chrysene-d12	11200	21.555				
1520-96-3	Perylene-d12	9540	24.005				

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LOD = Limit of Detection
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	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
BN022500.D	1	11/03/22 09:20	11/04/22 06:23	PB148780

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.26		30 - 150		65%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		79%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.23		55 - 111		58%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.38		58 - 132		94%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	2070	7.921				
1146-65-2	Naphthalene-d8	9700	10.752				
15067-26-2	Acenaphthene-d10	6230	14.589				
1517-22-2	Phenanthrene-d10	13700	17.35				
1719-03-5	Chrysene-d12	10800	21.555				
1520-96-3	Perylene-d12	8620	24.008				

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	59.8		1	16.1	40.0	50.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-36-0	Antimony	6.25	U	1	2.33	6.25	25.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-39-3	Barium	25.0	U	1	7.79	25.0	50.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-70-2	Calcium	1720		1	75.3	250	1000	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-47-3	Chromium	3.10	J	1	1.04	2.50	5.00	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-48-4	Cobalt	3.22	J	1	0.90	3.75	15.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-50-8	Copper	6.07	J	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7439-89-6	Iron	619		1	16.9	40.0	50.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7439-92-1	Lead	4.80	U	1	1.64	4.80	6.00	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7439-95-4	Magnesium	617	J	1	70.0	250	1000	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7439-96-5	Manganese	8.28	J	1	0.92	2.50	10.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7439-97-6	Mercury	0.16	U	1	0.070	0.16	0.20	ug/L	11/06/22 08:55	11/06/22 12:01	SW7470A
7440-02-0	Nickel	8.75	J	1	1.57	5.00	20.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-09-7	Potassium	250	U	1	123	250	1000	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7782-49-2	Selenium	8.00	UN	1	3.53	8.00	10.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-23-5	Sodium	4610		1	250	500	1000	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-62-2	Vanadium	10.0	U	1	2.65	10.0	20.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010
7440-66-6	Zinc	32.9		1	2.44	5.00	20.0	ug/L	11/08/22 12:30	11/09/22 23:47	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
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MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	153		1	16.1	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-36-0	Antimony	2.76	J	1	2.33	6.25	25.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-39-3	Barium	25.0	U	1	7.79	25.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-70-2	Calcium	1900		1	75.3	250	1000	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-47-3	Chromium	2.50	U	1	1.04	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-48-4	Cobalt	3.11	J	1	0.90	3.75	15.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-50-8	Copper	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7439-89-6	Iron	104		1	16.9	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7439-92-1	Lead	4.80	U	1	1.64	4.80	6.00	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7439-95-4	Magnesium	702	J	1	70.0	250	1000	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7439-96-5	Manganese	10.5		1	0.92	2.50	10.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7439-97-6	Mercury	0.090	J	1	0.070	0.16	0.20	ug/L	11/06/22 08:55	11/06/22 12:18	SW7470A
7440-02-0	Nickel	3.31	J	1	1.57	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-09-7	Potassium	124	J	1	123	250	1000	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7782-49-2	Selenium	8.00	UN	1	3.53	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-23-5	Sodium	4860		1	250	500	1000	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-62-2	Vanadium	10.0	U	1	2.65	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010
7440-66-6	Zinc	7.48	J	1	2.44	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:11	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
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J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	34.9	J	1	16.1	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-36-0	Antimony	2.94	J	1	2.33	6.25	25.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-39-3	Barium	25.0	U	1	7.79	25.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-70-2	Calcium	1720		1	75.3	250	1000	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-47-3	Chromium	1.21	J	1	1.04	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-48-4	Cobalt	3.20	J	1	0.90	3.75	15.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-50-8	Copper	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7439-89-6	Iron	605		1	16.9	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7439-92-1	Lead	4.80	U	1	1.64	4.80	6.00	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7439-95-4	Magnesium	637	J	1	70.0	250	1000	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7439-96-5	Manganese	7.63	J	1	0.92	2.50	10.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7439-97-6	Mercury	0.080	J	1	0.070	0.16	0.20	ug/L	11/06/22 08:55	11/06/22 12:20	SW7470A
7440-02-0	Nickel	4.48	J	1	1.57	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-09-7	Potassium	250	U	1	123	250	1000	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7782-49-2	Selenium	8.00	UN	1	3.53	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-23-5	Sodium	4770		1	250	500	1000	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-62-2	Vanadium	10.0	U	1	2.65	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010
7440-66-6	Zinc	15.0	J	1	2.44	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:15	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
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CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	19.2	J	1	16.1	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-36-0	Antimony	6.25	U	1	2.33	6.25	25.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-39-3	Barium	25.0	U	1	7.79	25.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-70-2	Calcium	1830		1	75.3	250	1000	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-47-3	Chromium	2.50	U	1	1.04	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-48-4	Cobalt	3.15	J	1	0.90	3.75	15.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-50-8	Copper	8.00	U	1	3.08	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7439-89-6	Iron	115		1	16.9	40.0	50.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7439-92-1	Lead	4.80	U	1	1.64	4.80	6.00	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7439-95-4	Magnesium	659	J	1	70.0	250	1000	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7439-96-5	Manganese	8.72	J	1	0.92	2.50	10.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7439-97-6	Mercury	0.077	J	1	0.070	0.16	0.20	ug/L	11/06/22 08:55	11/06/22 12:23	SW7470A
7440-02-0	Nickel	3.40	J	1	1.57	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-09-7	Potassium	250	U	1	123	250	1000	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7782-49-2	Selenium	8.00	UN	1	3.53	8.00	10.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-23-5	Sodium	4820		1	250	500	1000	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-62-2	Vanadium	10.0	U	1	2.65	10.0	20.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010
7440-66-6	Zinc	5.39	J	1	2.44	5.00	20.0	ug/L	11/08/22 12:30	11/10/22 00:19	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
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N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 11:20
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-02	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	10.0	OR	1	0.097	0.30	0.60	mg/L		11/02/22 13:56	300.0
Nitrate	0.23	J	1	0.050	0.25	0.50	mg/L		11/02/22 13:56	300.0
Sulfate	8.30		1	0.18	1.50	3.00	mg/L		11/02/22 13:56	300.0
pH	4.84	H	1	0	0	0	pH		11/02/22 13:35	9040C

Comments: pH result reported at temperature 20.7 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 11:20
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN01-11012022DL	SDG No.:	N5420
Lab Sample ID:	N5420-02DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.50	D	2	0.19	0.60	1.20	mg/L		11/02/22 18:01	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 11:30
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-03	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.60	OR	1	0.097	0.30	0.60	mg/L		11/02/22 14:27	300.0
Nitrate	0.25	U	1	0.050	0.25	0.50	mg/L		11/02/22 14:27	300.0
Sulfate	6.50		1	0.18	1.50	3.00	mg/L		11/02/22 14:27	300.0
pH	5.52	H	1	0	0	0	pH		11/02/22 13:36	9040C

Comments: pH result reported at temperature 20.3 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 11:30
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT01-11012022DL	SDG No.:	N5420
Lab Sample ID:	N5420-03DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.00	D	2	0.19	0.60	1.20	mg/L		11/02/22 18:32	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 13:20
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-04	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	10.1	OR	1	0.097	0.30	0.60	mg/L		11/02/22 14:57	300.0
Nitrate	0.23	J	1	0.050	0.25	0.50	mg/L		11/02/22 14:57	300.0
Sulfate	8.30		1	0.18	1.50	3.00	mg/L		11/02/22 14:57	300.0
pH	5.31	H	1	0	0	0	pH		11/02/22 13:40	9040C

Comments: pH result reported at temperature 20.7 °C

U = Not Detected
LOQ = Limit of Quantitation
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LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 13:20
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-IN02-11012022DL	SDG No.:	N5420
Lab Sample ID:	N5420-04DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.40	D	2	0.19	0.60	1.20	mg/L		11/02/22 19:02	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 13:30
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022	SDG No.:	N5420
Lab Sample ID:	N5420-05	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.70	OR	1	0.097	0.30	0.60	mg/L		11/02/22 15:28	300.0
Nitrate	0.25	U	1	0.050	0.25	0.50	mg/L		11/02/22 15:28	300.0
Sulfate	6.90		1	0.18	1.50	3.00	mg/L		11/02/22 15:28	300.0
pH	5.50	H	1	0	0	0	pH		11/02/22 13:42	9040C

Comments: pH result reported at temperature 20.6 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/01/22 13:30
Project:	CTO WE13	Date Received:	11/02/22
Client Sample ID:	RW8-PT-OUT02-11012022DL	SDG No.:	N5420
Lab Sample ID:	N5420-05DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	9.50	D	2	0.19	0.60	1.20	mg/L		11/02/22 19:33	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
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N =Spiked sample recovery not within control limits

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO.
QUOTE NO. 115800
COC Number 2035616

9
9.1

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: Tetra Tech
ADDRESS: 5029 Corporate Woods Dr.
CITY Virginia Beach STATE: VA ZIP: 23462
ATTENTION: Ernie Wu
PHONE: (757)619-5406 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWIRP Bethpage RWA Pump Test
PROJECT NO.: 112608005-WE13 LOCATION: Bethpage, NY
PROJECT MANAGER: Ernie Wu
e-mail: ernie.wu@tetratech.com
PHONE: (757)619-5406 FAX:

CLIENT BILLING INFORMATION

BILL TO: PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) Standard DAYS*
HARDCOPY (DATA PACKAGE): Standard DAYS*
EDD: Standard DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ☐ Level 1 (Results Only)
- ☐ Level 2 (Results + QC)
- ☐ Level 3 (Results + QC + Raw Data)
- ☐ EDD FORMAT
- ☐ Level 4 (QC + Full Raw Data)
- ☐ NJ Reduced ☐ US EPA CLP
- ☐ NYS ASP A ☐ NYS ASP B
- ☐ Other

ANALYSIS

1 VOCs 2 1,4-Dioxane 3 Fe manganese 4 pH 5 6 7 8 9

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	PRESERVATIVES 1	2	3	4	5	6	7	8	9	COMMENTS
								A	E	B	E						← Specify Preservatives A-HCl D-NaOH B-HN03 E-ICE C-H2SO4 F-OTHER
1.	RWA-PT-IN01-11282022	GW		✓	11/28/22	1040	5	2	1	1	1						
2.	RWA-PT-OUT01-11282022	GW		✓	11/28/22	1055	5	2	1	1	1						
3.	TB01-11282022	~~GW~~ AQ		✓	11/28/22	0930	2	2									
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	1100 11/28/22	1.
2.	9:42 11/29/22	2.
3.		3.

Conditions of bottles or coolers at receipt: ☐ COMPLIANT ☐ NON COMPLIANT ☐ COOLER TEMP 2.4°C
Comments:

Page ____ of ____

CLIENT: ☐ Hand Delivered ☐ Other
CHEMTECH: ☐ Picked Up ☐ Field Sampling

Shipment Complete ☐ YES ☐ NO

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-IN01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-01	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:	RXI-624 ID : 0.25	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VN075468.D	1		11/29/22 12:04	VN112922

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-IN01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-01	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:	RXI-624 ID : 0.25	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VN075468.D	1		11/29/22 12:04	VN112922

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	57.1		81 - 118		114%	SPK: 50
1868-53-7	Dibromofluoromethane	55.0		80 - 119		110%	SPK: 50
2037-26-5	Toluene-d8	51.5		89 - 112		103%	SPK: 50
460-00-4	4-Bromofluorobenzene	51.9		85 - 114		104%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	148000	8.23				
540-36-3	1,4-Difluorobenzene	248000	9.106				
3114-55-4	Chlorobenzene-d5	212000	11.865				
3855-82-1	1,4-Dichlorobenzene-d4	84200	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
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

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-OUT01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-02	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
VN075469.D	1		11/29/22 12:28	VN112922

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-OUT01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-02	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
VN075469.D	1		11/29/22 12:28	VN112922

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	58.4		81 - 118		117%	SPK: 50
1868-53-7	Dibromofluoromethane	54.2		80 - 119		108%	SPK: 50
2037-26-5	Toluene-d8	48.9		89 - 112		98%	SPK: 50
460-00-4	4-Bromofluorobenzene	47.7		85 - 114		95%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	130000	8.23				
540-36-3	1,4-Difluorobenzene	229000	9.106				
3114-55-4	Chlorobenzene-d5	191000	11.865				
3855-82-1	1,4-Dichlorobenzene-d4	73000	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
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

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	TB01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-03	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
VN075471.D	1		11/29/22 13:16	VN112922

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	TB01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-03	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
VN075471.D	1		11/29/22 13:16	VN112922

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	51.1		81 - 118		102%	SPK: 50
1868-53-7	Dibromofluoromethane	50.6		80 - 119		101%	SPK: 50
2037-26-5	Toluene-d8	45.9		89 - 112		92%	SPK: 50
460-00-4	4-Bromofluorobenzene	44.6		85 - 114		89%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	123000	8.23				
540-36-3	1,4-Difluorobenzene	210000	9.106				
3114-55-4	Chlorobenzene-d5	179000	11.865				
3855-82-1	1,4-Dichlorobenzene-d4	70000	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
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

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-IN01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Moisture:	100
Sample Wt/Vol:	980 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
BN023042.D	1	12/01/22 08:40	12/02/22 07:21	PB149367

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.23		30 - 150		57%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.24		30 - 150		60%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.35		55 - 111		86%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.57	*	53 - 106		143%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.41		58 - 132		101%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	5050	8.057				
1146-65-2	Naphthalene-d8	13400	10.872				
15067-26-2	Acenaphthene-d10	6520	14.688				
1517-22-2	Phenanthrene-d10	12700	17.439				
1719-03-5	Chrysene-d12	6700	21.625				
1520-96-3	Perylene-d12	4700	24.1				

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CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-OUT01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Moisture:	100
Sample Wt/Vol:	990 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
BN023043.D	1	12/01/22 08:40	12/02/22 07:57	PB149367

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.22		30 - 150		54%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.24		30 - 150		61%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.35		55 - 111		86%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.47	*	53 - 106		118%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.43		58 - 132		108%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	5000	8.057				
1146-65-2	Naphthalene-d8	13300	10.872				
15067-26-2	Acenaphthene-d10	6200	14.688				
1517-22-2	Phenanthrene-d10	11700	17.439				
1719-03-5	Chrysene-d12	6420	21.616				
1520-96-3	Perylene-d12	4720	24.097				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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B = Analyte Found in Associated Method Blank
N = Presumptive Evidence of a Compound
* = Values outside of QC limits
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() = Laboratory InHouse Limit
A = Aldol-Condensation Reaction Products

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-IN01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-01	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7439-89-6	Iron	1440	1	16.9	40.0	50.0		ug/L	12/01/22 09:40	12/01/22 12:55	SW6010
7439-96-5	Manganese	12.0	1	0.92	2.50	10.0		ug/L	12/01/22 09:40	12/01/22 12:55	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	Metals Group 10				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-OUT01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-02	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7439-89-6	Iron	66.2	1		16.9	40.0	50.0	ug/L	12/01/22 09:40	12/01/22 12:59	SW6010
7439-96-5	Manganese	24.1	1		0.92	2.50	10.0	ug/L	12/01/22 09:40	12/01/22 12:59	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	Metals Group 10				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
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CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22 10:40
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-IN01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-01	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
pH	5.27	H	1	0	0	0	pH		11/29/22 12:36	9040C

Comments: pH result reported at temperature 20.1 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/28/22 10:55
Project:	CTO WE13 - OU2 GW	Date Received:	11/29/22
Client Sample ID:	RW9-PT-OUT01-11282022	SDG No.:	N5800
Lab Sample ID:	N5800-02	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
pH	5.42	H	1	0	0	0	pH		11/29/22 12:40	9040C

Comments: pH result reported at temperature 20.2 °C

U = Not Detected
LOQ = Limit of Quantitation
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LOD = Limit of Detection
D = Dilution
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H = Sample Analysis Out Of Hold Time

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B = Analyte Found in Associated Method Blank
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N =Spiked sample recovery not within control limits

CHEMTECH
CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO.
QUOTE NO. N5828
COC Number 2035620

9
9.1

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: Tetra Tech
ADDRESS: 5029 Corporate Woods Dr.
CITY Virginia Beach STATE: VA ZIP: 23462
ATTENTION: Eric Wu
PHONE: (757)619-5406 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWIRP Bethpage RW9 Pump Test
PROJECT NO.: 112G0005-WE LOCATION: Bethpage, NY
PROJECT MANAGER: Eric Wu
e-mail: eric.wu@tetratech.com
PHONE: (757)619-5406 FAX:

CLIENT BILLING INFORMATION

BILL TO: PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) Standard DAYS*
HARDCOPY (DATA PACKAGE): Standard DAYS*
EDD: Standard DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ❑ Level 1 (Results Only)
- ❑ Level 2 (Results + QC)
- ❑ Level 3 (Results + QC + Raw Data)
- ❑ EDD FORMAT
- ❑ Level 4 (QC + Full Raw Data)
- ❑ NJ Reduced ❑ US EPA CLP
- ❑ NYS ASP A ❑ NYS ASP B
- ❑ Other

ANALYSIS

1 VOCs
2 1,4-Dioxane
3 Fe, Mn, Cl, Alk
4 ?
5 6 7 8 9

PRESERVATIVES / **COMMENTS**

← Specify Preservatives
A-HCl D-NaOH
B-HN03 E-ICE
C-H2SO4 F-OTHER

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 (A)	2 (E)	3 (B)	4 (E)	5	6	7	8	9	COMMENTS
1.	RW9-PT-IN02-11302022	GW		✓	11/30/22	0945	5	2	1	1	1						
2.	RW9-PT-OUT02-11302022	GW		✓	11/30/22	0950	5	2	1	1	1						
3.	TB02-11302022	AQ		✓	11/30/22	0900	2	2									
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1.	11/30/22 1600	1.
2.	12/1/22 930	2.
3.		3.

Conditions of bottles or coolers at receipt: ❑ COMPLIANT ❑ NON COMPLIANT ❑ COOLER TEMP 2.3°C °C
Comments: IR-Gun #1

Page ____ of ____

CLIENT: ❑ Hand Delivered ❑ Other
CHEMTECH: ❑ Picked Up ❑ Field Sampling

Shipment Complete ❑ YES ❑ NO

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-IN-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-01	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
VX033162.D	1		12/01/22 14:46	VX120122

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-IN-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-01	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
VX033162.D	1		12/01/22 14:46	VX120122

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	55.7		81 - 118		111%	SPK: 50
1868-53-7	Dibromofluoromethane	47.8		80 - 119		96%	SPK: 50
2037-26-5	Toluene-d8	52.2		89 - 112		104%	SPK: 50
460-00-4	4-Bromofluorobenzene	43.8		85 - 114		88%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	126000	5.556				
540-36-3	1,4-Difluorobenzene	202000	6.763				
3114-55-4	Chlorobenzene-d5	176000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	81300	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
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
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CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX033161.D	1		12/01/22 14:23	VX120122

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX033161.D	1		12/01/22 14:23	VX120122

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	57.0		81 - 118		114%	SPK: 50
1868-53-7	Dibromofluoromethane	47.4		80 - 119		95%	SPK: 50
2037-26-5	Toluene-d8	52.6		89 - 112		105%	SPK: 50
460-00-4	4-Bromofluorobenzene	44.5		85 - 114		89%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	126000	5.556				
540-36-3	1,4-Difluorobenzene	202000	6.763				
3114-55-4	Chlorobenzene-d5	177000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	81400	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	TB-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-03	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX033159.D	1		12/01/22 13:36	VX120122

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	2.90	J	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	TB-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-03	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:	DB-624UI ID : 0.18	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VX033159.D	1		12/01/22 13:36	VX120122

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	54.8		81 - 118		110%	SPK: 50
1868-53-7	Dibromofluoromethane	48.3		80 - 119		97%	SPK: 50
2037-26-5	Toluene-d8	52.5		89 - 112		105%	SPK: 50
460-00-4	4-Bromofluorobenzene	44.8		85 - 114		90%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	133000	5.556				
540-36-3	1,4-Difluorobenzene	212000	6.763				
3114-55-4	Chlorobenzene-d5	186000	10.055				
3855-82-1	1,4-Dichlorobenzene-d4	86900	12.024				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

U = Not Detected
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-IN-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-01	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
BN023050.D	1	12/02/22 08:58	12/02/22 17:06	PB149383

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.21		30 - 150		52%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		74%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.31		55 - 111		78%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.31		53 - 106		78%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.48		58 - 132		120%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	4700	8.057				
1146-65-2	Naphthalene-d8	12900	10.872				
15067-26-2	Acenaphthene-d10	6430	14.688				
1517-22-2	Phenanthrene-d10	12200	17.439				
1719-03-5	Chrysene-d12	6820	21.625				
1520-96-3	Perylene-d12	5130	24.103				

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	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
BN023051.D	1	12/02/22 08:58	12/02/22 17:43	PB149383

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.21		30 - 150		52%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.28		30 - 150		69%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.33		55 - 111		83%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.34		53 - 106		85%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.46		58 - 132		114%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	4480	8.057				
1146-65-2	Naphthalene-d8	12300	10.872				
15067-26-2	Acenaphthene-d10	5940	14.688				
1517-22-2	Phenanthrene-d10	11200	17.439				
1719-03-5	Chrysene-d12	6330	21.62				
1520-96-3	Perylene-d12	4800	24.101				

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-IN-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-01	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7439-89-6	Iron	1050		1	16.9	40.0	50.0	ug/L	12/02/22 11:00	12/05/22 13:09	SW6010
7439-96-5	Manganese	6.45	J	1	0.92	2.50	10.0	ug/L	12/02/22 11:00	12/05/22 13:09	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	Metals Group 10				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7439-89-6	Iron	422		1	16.9	40.0	50.0	ug/L	12/02/22 11:00	12/05/22 13:13	SW6010
7439-96-5	Manganese	8.88	J	1	0.92	2.50	10.0	ug/L	12/02/22 11:00	12/05/22 13:13	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	Metals Group 10				

U = Not Detected
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MDL = Method Detection Limit
LOD = Limit of Detection
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7439-89-6	Iron	422		1	16.9	40.0	50.0	ug/L	12/02/22 11:00	12/05/22 13:13	SW6010
7439-96-5	Manganese	8.88	J	1	0.92	2.50	10.0	ug/L	12/02/22 11:00	12/05/22 13:13	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	Metals Group 10				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22 09:45
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-IN-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-01	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
pH	5.21	H	1	0	0	0	pH		12/02/22 09:36	9040C

Comments: pH result reported at temperature 20.4 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	11/30/22 09:50
Project:	CTO WE13 - OU2 GW	Date Received:	12/01/22
Client Sample ID:	RW9-PT-OUT-02-11302022	SDG No.:	N5828
Lab Sample ID:	N5828-02	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
pH	4.97	H	1	0	0	0	pH		12/02/22 09:38	9040C

Comments: pH result reported at temperature 20.2 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

9 9.1

CHEMTECH

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO.
QUOTE NO. A59
COC Number 2030436 N6004

CLIENT INFORMATION

REPORT TO BE SENT TO:
COMPANY: Tetra Tech
ADDRESS: 5029 Corporate Woods Dr.
CITY Virginia Beach STATE: VA ZIP: 23462
ATTENTION: Ernie Wu
PHONE: (757)619-5406 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWIRP Bethpage
PROJECT NO.: 112G08005-WE13 LOCATION: Bethpage, NY
PROJECT MANAGER: Ernie Wu
e-mail: Ernie.wu@tetratech.com
PHONE: (757)619-5406 FAX:

CLIENT BILLING INFORMATION

BILL TO: PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) Standard DAYS*
HARDCOPY (DATA PACKAGE): Standard DAYS*
EDD: Standard DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ❑ Level 1 (Results Only)
- ❑ Level 2 (Results + QC)
- ❑ Level 3 (Results + QC + Raw Data)
- ❑ Level 4 (QC + Full Raw Data)
- ❑ NJ Reduced ❑ US EPA CLP
- ❑ NYS ASP A ❑ NYS ASP B
- ❑ Other
- ❑ EDD FORMAT

ANALYSIS

1 VOCs 2 1,4-Dioxane 3 TAL metals 4 Anions 5 pH 6 7 8 9

PRESERVATIVES / COMMENTS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 A	2 E	3 B	4 E	5 E	6	7	8	9	COMMENTS
1.	TB02-12092022	AQ		✓	12/9/22	0800	2	2									
2.	RW9-PT-IN03-12092022	GW		✓	12/9/22	1240	7	2	1	1	1	2					
3.	RW9-PT-OUT03-12092022	GW		✓	12/9/22	1245	7	2	1	1	1	2					
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

← Specify Preservatives
A-HCl D-NaOH
B-HN03 E-ICE
C-H2SO4 F-OTHER

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. [signature]	1500 12/9/22	1.
2.	12/10/22 9:05	2. [signature]
3.		3.

Conditions of bottles or coolers at receipt: ❑ COMPLIANT ❑ NON COMPLIANT ❑ COOLER TEMP 2-3°C °C
Comments:

Page ____ of ____

CLIENT: ❑ Hand Delivered ❑ Other
CHEMTECH: ❑ Picked Up ❑ Field Sampling

Shipment Complete ❑ YES ❑ NO

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	TB02-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-01	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:	RXI-624 ID : 0.25	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VN075819.D	1		12/15/22 15:47	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	TB02-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-01	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:	RXI-624 ID : 0.25	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VN075819.D	1		12/15/22 15:47	VN121522

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	46.8		81 - 118		94%	SPK: 50
1868-53-7	Dibromofluoromethane	47.8		80 - 119		96%	SPK: 50
2037-26-5	Toluene-d8	49.3		89 - 112		99%	SPK: 50
460-00-4	4-Bromofluorobenzene	44.6		85 - 114		89%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	356000	8.229				
540-36-3	1,4-Difluorobenzene	553000	9.106				
3114-55-4	Chlorobenzene-d5	470000	11.87				
3855-82-1	1,4-Dichlorobenzene-d4	186000	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	TB02-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-01	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:	RXI-624 ID : 0.25	Level :	LOW

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
VN075819.D	1		12/15/22 15:47	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	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
VN075821.D	1		12/15/22 16:35	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	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
VN075821.D	1		12/15/22 16:35	VN121522

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	49.0		81 - 118		98%	SPK: 50
1868-53-7	Dibromofluoromethane	48.9		80 - 119		98%	SPK: 50
2037-26-5	Toluene-d8	50.0		89 - 112		100%	SPK: 50
460-00-4	4-Bromofluorobenzene	46.9		85 - 114		94%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	342000	8.23				
540-36-3	1,4-Difluorobenzene	545000	9.106				
3114-55-4	Chlorobenzene-d5	471000	11.871				
3855-82-1	1,4-Dichlorobenzene-d4	200000	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	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
VN075821.D	1		12/15/22 16:35	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	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
VN075822.D	1		12/15/22 16:59	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
74-87-3	Chloromethane	0.75	U	0.20	0.75	1.00	ug/L
75-01-4	Vinyl Chloride	0.50	U	0.22	0.50	1.00	ug/L
74-83-9	Bromomethane	2.50	U	1.60	2.50	5.00	ug/L
75-00-3	Chloroethane	0.75	U	0.26	0.75	1.00	ug/L
75-69-4	Trichlorofluoromethane	0.50	U	0.20	0.50	1.00	ug/L
76-13-1	1,1,2-Trichlorotrifluoroethane	0.50	U	0.17	0.50	1.00	ug/L
75-35-4	1,1-Dichloroethene	0.75	U	0.23	0.75	1.00	ug/L
67-64-1	Acetone	3.80	U	1.20	3.80	5.00	ug/L
75-15-0	Carbon Disulfide	0.75	U	0.26	0.75	1.00	ug/L
1634-04-4	Methyl tert-butyl Ether	0.50	U	0.18	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	0.20	0.50	1.00	ug/L
75-34-3	1,1-Dichloroethane	0.50	U	0.20	0.50	1.00	ug/L
78-93-3	2-Butanone	2.50	U	0.82	2.50	5.00	ug/L
56-23-5	Carbon Tetrachloride	0.75	U	0.18	0.75	1.00	ug/L
156-59-2	cis-1,2-Dichloroethene	0.75	U	0.17	0.75	1.00	ug/L
67-66-3	Chloroform	0.75	U	0.18	0.75	1.00	ug/L
71-55-6	1,1,1-Trichloroethane	0.50	U	0.18	0.50	1.00	ug/L
108-87-2	Methylcyclohexane	0.50	U	0.13	0.50	1.00	ug/L
71-43-2	Benzene	0.50	U	0.16	0.50	1.00	ug/L
107-06-2	1,2-Dichloroethane	0.50	U	0.18	0.50	1.00	ug/L
79-01-6	Trichloroethene	0.50	U	0.27	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	0.18	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	0.17	0.50	1.00	ug/L
10061-02-6	t-1,3-Dichloropropene	0.50	U	0.14	0.50	1.00	ug/L
10061-01-5	cis-1,3-Dichloropropene	0.50	U	0.16	0.50	1.00	ug/L
79-00-5	1,1,2-Trichloroethane	0.50	U	0.19	0.50	1.00	ug/L
591-78-6	2-Hexanone	2.50	U	0.76	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	0.18	0.50	1.00	ug/L

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	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
VN075822.D	1		12/15/22 16:59	VN121522

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	0.17	0.50	1.00	ug/L
179601-23-1	m/p-Xylenes	1.00	U	0.33	1.00	2.00	ug/L
1330-20-7	Total Xylenes	1.50	U	0.51	1.50	3.00	ug/L
95-47-6	o-Xylene	0.50	U	0.18	0.50	1.00	ug/L
100-42-5	Styrene	0.50	U	0.13	0.50	1.00	ug/L
75-25-2	Bromoform	0.50	U	0.16	0.50	1.00	ug/L
98-82-8	Isopropylbenzene	0.50	U	0.19	0.50	1.00	ug/L
79-34-5	1,1,2,2-Tetrachloroethane	0.75	U	0.23	0.75	1.00	ug/L
103-65-1	n-propylbenzene	0.50	U	0.21	0.50	1.00	ug/L
108-67-8	1,3,5-Trimethylbenzene	0.50	U	0.20	0.50	1.00	ug/L
98-06-6	tert-Butylbenzene	0.50	U	0.20	0.50	1.00	ug/L
95-63-6	1,2,4-Trimethylbenzene	0.50	U	0.18	0.50	1.00	ug/L
135-98-8	sec-Butylbenzene	0.50	U	0.18	0.50	1.00	ug/L
541-73-1	1,3-Dichlorobenzene	0.50	U	0.20	0.50	1.00	ug/L
106-46-7	1,4-Dichlorobenzene	0.50	U	0.19	0.50	1.00	ug/L
104-51-8	n-Butylbenzene	0.50	U	0.22	0.50	1.00	ug/L
95-50-1	1,2-Dichlorobenzene	0.50	U	0.17	0.50	1.00	ug/L
SURROGATES							
17060-07-0	1,2-Dichloroethane-d4	47.7		81 - 118		95%	SPK: 50
1868-53-7	Dibromofluoromethane	48.5		80 - 119		97%	SPK: 50
2037-26-5	Toluene-d8	50.3		89 - 112		101%	SPK: 50
460-00-4	4-Bromofluorobenzene	46.3		85 - 114		93%	SPK: 50
INTERNAL STANDARDS							
363-72-4	Pentafluorobenzene	348000	8.229				
540-36-3	1,4-Difluorobenzene	552000	9.106				
3114-55-4	Chlorobenzene-d5	480000	11.87				
3855-82-1	1,4-Dichlorobenzene-d4	196000	13.794				
TENTATIVE IDENTIFIED COMPOUNDS							
75-43-4	Dichlorofluoromethane	N.D					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	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
VN075822.D	1		12/15/22 16:59	VN121522

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Moisture:	100
Sample Wt/Vol:	980 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
BN023206.D	1	12/14/22 09:45	12/14/22 18:41	PB149645

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.090	J	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.19		30 - 150		48%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		80%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.26		55 - 111		66%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.30		53 - 106		75%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.35		58 - 132		88%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	5590	8.013				
1146-65-2	Naphthalene-d8	16700	10.829				
15067-26-2	Acenaphthene-d10	9480	14.656				
1517-22-2	Phenanthrene-d10	23300	17.402				
1719-03-5	Chrysene-d12	22700	21.58				
1520-96-3	Perylene-d12	19200	24.039				

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	Matrix:	Water
Analytical Method:	SW8270SIM	% Moisture:	100
Sample Wt/Vol:	980 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
BN023207.D	1	12/14/22 09:45	12/14/22 19:18	PB149645

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.080	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.18		30 - 150		45%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.31		30 - 150		76%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.25		55 - 111		63%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.30		53 - 106		74%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.32		58 - 132		80%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	5130	8.013				
1146-65-2	Naphthalene-d8	15300	10.829				
15067-26-2	Acenaphthene-d10	8710	14.656				
1517-22-2	Phenanthrene-d10	21700	17.402				
1719-03-5	Chrysene-d12	21400	21.585				
1520-96-3	Perylene-d12	17500	24.04				

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MDL = Method Detection Limit
LOD = Limit of Detection
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J = Estimated Value
B = Analyte Found in Associated Method Blank
N = Presumptive Evidence of a Compound
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	23.4	J	1	16.1	40.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-36-0	Antimony	6.25	U	1	2.33	6.25	25.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-39-3	Barium	25.0	UN	1	7.79	25.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-70-2	Calcium	2400		1	75.3	250	1000	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-47-3	Chromium	11.6	N	1	1.04	2.50	5.00	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-48-4	Cobalt	3.56	JN	1	0.90	3.75	15.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-50-8	Copper	4.36	J	1	3.08	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7439-89-6	Iron	1170	N	1	16.9	40.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7439-92-1	Lead	4.80	U	1	1.94	4.80	6.00	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7439-95-4	Magnesium	908	J	1	70.0	250	1000	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7439-96-5	Manganese	7.26	J	1	0.92	2.50	10.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7439-97-6	Mercury	0.12	JN	1	0.070	0.16	0.20	ug/L	12/12/22 15:15	12/13/22 15:49	SW7470A
7440-02-0	Nickel	9.16	J	1	1.57	5.00	20.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-09-7	Potassium	543	JN	1	123	250	1000	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7782-49-2	Selenium	8.00	U	1	3.53	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-23-5	Sodium	5910		1	250	500	1000	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-62-2	Vanadium	10.0	UN	1	2.65	10.0	20.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010
7440-66-6	Zinc	12.3	J	1	2.44	5.00	20.0	ug/L	12/13/22 11:30	12/13/22 18:48	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	Matrix:	Water
Level (low/med):	low	% Solid:	0

Cas	Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
7429-90-5	Aluminum	22.4	J	1	16.1	40.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-36-0	Antimony	6.25	U	1	2.33	6.25	25.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-38-2	Arsenic	8.00	U	1	3.08	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-39-3	Barium	25.0	UN	1	7.79	25.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-41-7	Beryllium	0.75	UN	1	0.25	0.75	3.00	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-43-9	Cadmium	0.75	U	1	0.26	0.75	3.00	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-70-2	Calcium	2470		1	75.3	250	1000	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-47-3	Chromium	6.36	N	1	1.04	2.50	5.00	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-48-4	Cobalt	3.62	JN	1	0.90	3.75	15.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-50-8	Copper	8.00	U	1	3.08	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7439-89-6	Iron	48.0	JN	1	16.9	40.0	50.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7439-92-1	Lead	4.80	U	1	1.94	4.80	6.00	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7439-95-4	Magnesium	924	J	1	70.0	250	1000	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7439-96-5	Manganese	8.04	J	1	0.92	2.50	10.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7439-97-6	Mercury	0.12	JN	1	0.070	0.16	0.20	ug/L	12/12/22 15:15	12/13/22 15:58	SW7470A
7440-02-0	Nickel	8.18	J	1	1.57	5.00	20.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-09-7	Potassium	524	JN	1	123	250	1000	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7782-49-2	Selenium	8.00	U	1	3.53	8.00	10.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-22-4	Silver	2.50	U	1	0.82	2.50	5.00	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-23-5	Sodium	5950		1	250	500	1000	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-28-0	Thallium	10.0	U	1	3.54	10.0	20.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-62-2	Vanadium	10.0	UN	1	2.65	10.0	20.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010
7440-66-6	Zinc	6.91	J	1	2.44	5.00	20.0	ug/L	12/13/22 11:30	12/13/22 18:52	SW6010

Color Before:	Colorless	Clarity Before:	Clear	Texture:	
Color After:	Colorless	Clarity After:	Clear	Artifacts:	
Comments:	METALS-TAL				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22 12:40
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-02	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	8.60	OR	1	0.097	0.30	0.60	mg/L		12/12/22 17:27	300.0
Nitrate	0.25	HU	1	0.050	0.25	0.50	mg/L		12/12/22 17:27	300.0
Sulfate	13.6		1	0.18	1.50	3.00	mg/L		12/12/22 17:27	300.0
pH	5.01	H	1	0	0	0	pH		12/12/22 16:22	9040C

Comments: pH result reported at temperature 20.4 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22 12:40
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-IN03-12092022DL	SDG No.:	N6004
Lab Sample ID:	N6004-02DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	8.40	D	2	0.19	0.60	1.20	mg/L		12/13/22 12:36	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22 12:45
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022	SDG No.:	N6004
Lab Sample ID:	N6004-03	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	8.60	OR	1	0.097	0.30	0.60	mg/L		12/12/22 17:59	300.0
Nitrate	0.25	HU	1	0.050	0.25	0.50	mg/L		12/12/22 17:59	300.0
Sulfate	13.5		1	0.18	1.50	3.00	mg/L		12/12/22 17:59	300.0
pH	4.59	H	1	0	0	0	pH		12/12/22 16:24	9040C

Comments: pH result reported at temperature 20.1 °C

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

CHEMTECH 284 Sheffield Street, Mountainside, NJ 07092 Phone: 908 789 8900 Fax: 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	12/09/22 12:45
Project:	CTO WE13	Date Received:	12/10/22
Client Sample ID:	RW9-PT-OUT03-12092022DL	SDG No.:	N6004
Lab Sample ID:	N6004-03DL	Matrix:	WATER
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
Chloride	8.50	D	2	0.19	0.60	1.20	mg/L		12/13/22 13:08	300.0

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

TABLE 1
OBSERVATION WELL NETWORK
RW8 PUMPING TEST

Well ID	Screen Interval (feet bgs)	Distance from RW8 (feet)	Direction from RW8	RW8 Constant Rate Pumping Test						
				Starting Manual Water Level Measurements 10/25/2022			Ending (peak) Manual Water Level Measurements 10/27/2022			Maximum Change in Water Level (feet)
				Time	Water Level Measurement (ft below TOC)	Water Level Elevation (ft amsl)	Time	Water Level Measurement (ft below TOC)	Water Level Elevation (ft amsl)	
RW8	595-790	0	-	0658	15.42	29.16	1504	42.50	2.08	27.08
RW8-MW01S	262-272	109	West	0700	18.29	29.67	1502	19.55	28.41	1.26
RW8-MW01D1	550-570	91	West	0702	18.96	29.14	1503	23.07	25.03	4.11
RW8-MW01D2	740-785	50	West	0704	19.01	29.01	1505	26.13	21.89	7.12
RW8-MW01D3	820-850	71	West	0706	19.43	28.72	1504	22.91	25.24	3.48
RE117D1	730-755	1,676	North	0723	23.04	31.20	1444	24.92	29.32	1.88
RE117D2	780-805	1,674	North	0745	22.12	31.99	1445	23.87	30.24	1.75
BPOW 5-4	545-570	1,680	North	0721	23.07	30.81	1443	24.55	29.33	1.48
RE129D1	690-710	1,308	North	0730	22.85	30.78	1435	24.92	28.71	2.07
RE129D2	805-825	1,308	North	0731	22.60	30.92	1436	24.77	28.75	2.17
RE118D1	765-790	2,878	Northeast	0742	25.25	32.36	1427	26.68	30.93	1.43
BPOW 5-5	515-540	2,867	Northeast	0743	24.82	32.76	1428	26.05	31.53	1.23
BPOW 5-6	585-610	2,899	Northeast	0738	25.28	32.44	1426	26.61	31.11	1.33
DEC1-D1	695-715	940	Southeast	0716	20.32	27.11	1453	22.31	25.12	1.99
DEC1-D2	760-780	926	Southeast	0715	20.14	27.04	1452	22.22	24.96	2.08
DECHC05-MW-02	940-960	1,027	Southeast	0851	23.23	28.35	1324	24.37	27.21	1.14
RW9	650-865	1,743	East	0852	23.68	28.3	1334	25.46	26.52	1.78
RW9-MW01S	270-280	1,831	East	0849	26.26	29.86	1332	27.01	29.11	0.75
RW9-MW01D1	552-572	1,850	East	0847	27.68	28.52	1333	29.41	26.79	1.73
RW9-MW01D2	740-770	1,872	East	0845	27.35	28.53	1330	29.23	26.65	1.88
RW9-MW01D3	820-840	1,891	East	0843	27.47	28.85	1331	29.01	27.31	1.54
RE133D1	560-580	1,810	Southeast	0826	21.58	26.80	1354	22.97	25.41	1.39
RE133D2	780-800	1,801	Southeast	0828	22.58	26.14	1353	23.72	25	1.14
DECHC05-MW-03	950-970	1,797	Southeast	0858	21.00	27.58	1350	21.99	26.59	0.99
DECHC05-MW-01	950-970	2,066	Southeast	0821	21.72	27.91	1346	22.64	26.99	0.92
TT102D1	560-600	2,506	East	0835	21.83	28.13	1339	23.28	26.68	1.45
TT102D2	740-770	2,491	East	0837	15.90	28.22	1338	17.59	26.53	1.69
BPOW 6-1	550-575	2,706	Southeast	0800	17.45	25.48	1400	18.20	24.73	0.75
BPOW 6-2	755-780	2,681	Southeast	0758	17.99	25.09	1401	18.69	24.39	0.70
BPOW 6-3	750-775	3,013	Southeast	0808	13.7	26.26	1409	14.46	25.50	0.76
BPOW 6-4	545-570	3,006	Southeast	0806	13.21	26.81	1410	14.14	25.88	0.93
BPOW 6-5	525-550	3,605	Southeast	0752	16.14	26.44	1416	16.81	25.77	0.67
BPOW 6-6	770-795	3,591	Southeast	0754	16.38	25.96	1415	16.96	25.38	0.58

TABLE 2
OBSERVATION WELL NETWORK
RW9 PUMPING TEST

Well ID	Screen Interval (feet bgs)	Distance from RW9 (feet)	Direction from RW9	RW9 Constant Rate Pumping Test						
				Starting Manual Water Level Measurements 12/06/2022			Ending (peak) Manual Water Level Measurements 12/09/2022			Maximum Change in Water Level (feet)
				Time	Water Level Measurement (ft below TOC)	Water Level Elevation (ft amsl)	Time	Water Level Measurement (ft below TOC)	Water Level Elevation (ft amsl)	
RW9	650-865	0	-	0700	22.93	29.05	1100	45.75	6.23	22.82
RW9-MW01S	270-280	88	East	0702	25.98	30.14	1101	26.32	29.80	0.34
RW9-MW01D1	552-572	107	East	0703	26.86	29.34	1102	29.41	26.79	2.55
RW9-MW01D2	740-770	129	East	0704	26.79	29.09	1103	33.82	22.06	7.03
RW9-MW01D3	820-840	148	East	0705	27.06	29.26	1104	31.97	24.35	4.91
TT102D1	560-600	763	East	0713	20.85	29.11	1105	23.62	26.34	2.77
TT102D2	740-770	749	East	0714	15.31	28.81	1106	18.49	25.63	3.18
DECHC05-MW-01	950-970	1,084	South	0727	21.38	28.25	1108	22.52	27.11	1.14
RE133D1	560-580	1,229	South	0732	20.98	27.40	1111	22.25	26.13	1.27
RE133D2	780-800	1,214	South	0733	21.70	27.02	1112	23.37	25.35	1.67
DECHC05-MW-03	950-970	1,263	South	0731	20.60	27.98	1114	21.77	26.81	1.17
DECHC05-MW-02	940-960	1,089	Southwest	0910	22.87	28.61	1212	24.07	27.41	1.20
BPOW 6-3	750-775	1,606	Southeast	0740	12.79	27.17	1123	14.32	25.64	1.53
BPOW 6-4	545-570	1,591	Southeast	0738	12.52	27.50	1124	13.67	26.35	1.15
RE117D1	730-755	1,667	Northwest	0825	23.02	31.22	1149	24.60	29.64	1.58
RE117D2	780-805	1,653	Northwest	0824	22	32.11	1150	23.20	30.91	1.20
BPOW 5-4	545-570	1,682	Northwest	0827	23.06	30.82	1148	24.24	29.64	1.18
DEC1-D1	695-715	1,811	Southwest	0835	19.92	27.51	1155	20.99	26.44	1.07
DEC1-D2	760-780	1,795	Southwest	0834	19.71	27.47	1154	20.78	26.40	1.07
RW8	595-790	1,743	West	0846	15.27	29.31	1159	16.31	28.27	1.04
RW8-MW01S	262-272	1,851	West	0848	18.12	29.84	1200	18.49	29.47	0.37
RW8-MW01D1	550-570	1,833	West	0849	18.7	29.40	1201	19.60	28.50	0.90
RW8-MW01D2	740-785	1,792	West	0850	18.74	29.28	1202	19.78	28.24	1.04
RW8-MW01D3	820-850	1,813	West	0851	19.18	29.23	1203	20.25	28.16	1.07
BPOW 6-1	550-575	2,005	South	0750	16.58	26.35	1120	17.43	25.50	0.85
BPOW 6-2	755-780	1,977	South	0748	16.89	26.19	1119	18.12	24.96	1.23
RE118D1	765-790	2,109	North	0804	25.34	32.27	1136	26.75	30.86	1.41
BPOW 5-5	515-540	2,095	North	0805	24.93	32.65	1137	26.58	31.00	1.65
BPOW 5-6	585-610	2,137	North	0803	25.53	32.19	1135	27.08	30.64	1.55
BPOW 6-5	525-550	2,116	Southeast	0755	15.41	27.17	1127	16.28	26.30	0.87
BPOW 6-6	770-795	2,105	Southeast	0753	15.41	26.93	1126	16.54	25.80	1.13
RE129D1	690-710	2,468	Northwest	0816	22.78	30.85	1141	23.36	30.27	0.58
RE129D2	805-825	2,487	Northwest	0817	22.46	31.06	1142	23.29	30.23	0.83

TABLE 3
RW8 PUMPING TEST
OBSERVATION WELL RESPONSES TO PUMPING

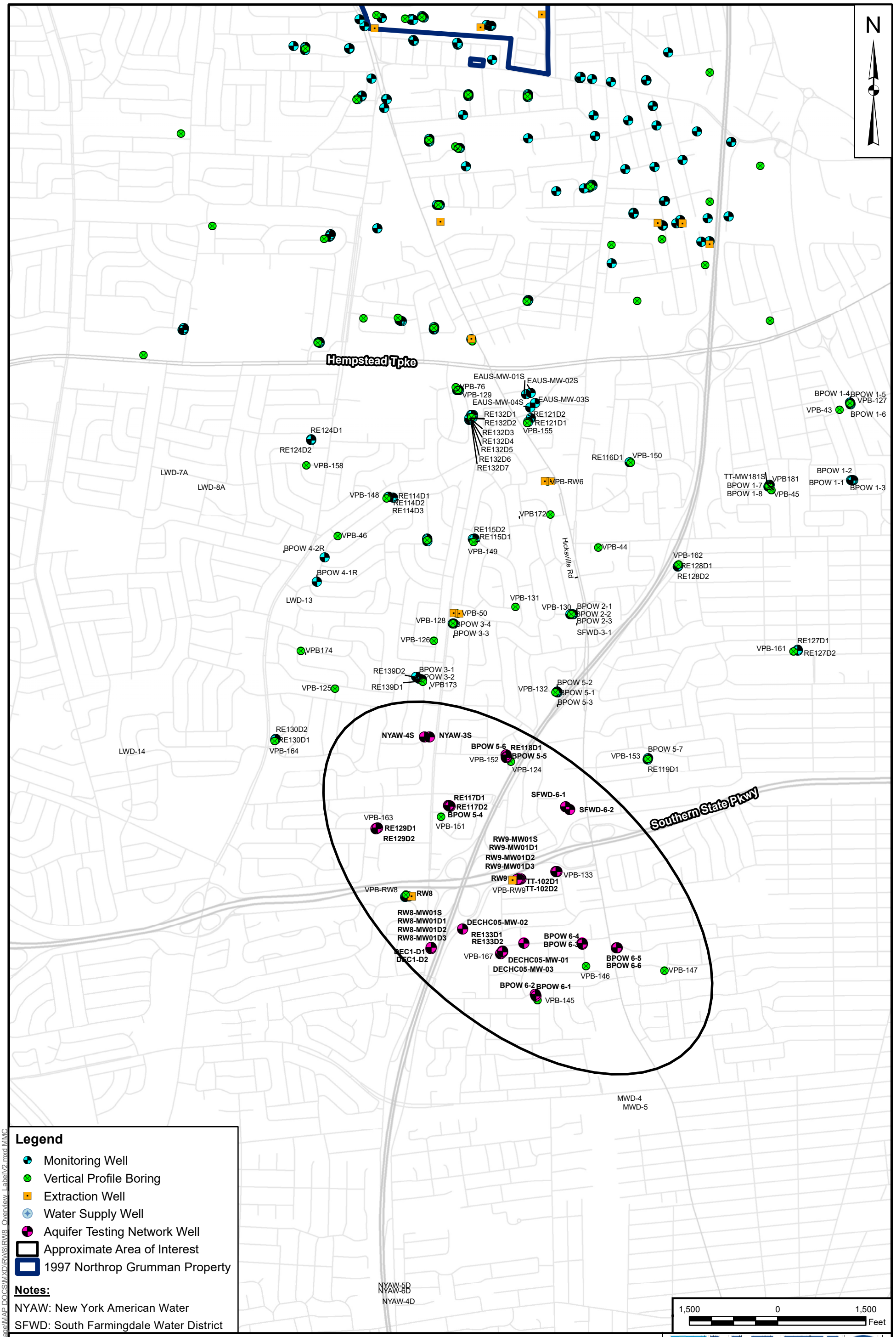
Well ID	Screen Interval (feet bgs)	Distance from RW8 (feet)	Direction from RW8	Relative Response to RW8 Pumping			Response to Other Well Pumping
				Strong	Moderate	Weak	
RW8	595-790	0	-	NA	NA	NA	NA
RW8-MW01S	262-272	109	West			X	Insignificant
RW8-MW01D1	550-570	91	West		X		Minor
RW8-MW01D2	740-785	50	West	X			Minor
RW8-MW01D3	820-850	71	West		X		Insignificant
DEC1-D1	695-715	940	Southeast	X			Insignificant
DEC1-D2	760-780	926	Southeast	X			Insignificant
DECHC05-MW-02	940-960	1,027	Southeast			X	Insignificant
RE129D1	690-710	1,308	North	X			Minor
RE129D2	805-825	1,308	North	X			Minor
RE117D1	730-755	1,676	North	X			Significant
RE117D2	780-805	1,674	North	X			Minor
BPOW 5-4	545-570	1,680	North	X			Significant
RE133D1	560-580	1,810	Southeast	X			Significant
RE133D2	780-800	1,801	Southeast	X			Significant
DECHC05-MW-03	950-970	1,797	Southeast		X		Insignificant
RW9	650-865	1,743	East	X			Significant
RW9-MW01S	270-280	1,831	East			X	Minor
RW9-MW01D1	552-572	1,850	East	X			Significant
RW9-MW01D2	740-770	1,872	East	X			Significant
RW9-MW01D3	820-840	1,891	East		X		Minor
DECHC05-MW-01	950-970	2,066	Southeast		X		Insignificant
TT102D1	560-600	2,506	East	X			Significant
TT102D2	740-770	2,491	East	X			Significant
BPOW 6-1	550-575	2,706	Southeast		X		Significant
BPOW 6-2	755-780	2,681	Southeast		X		Significant
RE118D1	765-790	2,878	Northeast		X		Significant
BPOW 5-5	515-540	2,867	Northeast		X		Significant
BPOW 5-6	585-610	2,899	Northeast		X		Significant
BPOW 6-3	750-775	3,013	Southeast		X		Minor
BPOW 6-4	545-570	3,006	Southeast		X		Minor
BPOW 6-5	525-550	3,605	Southeast		X		Minor
BPOW 6-6	770-795	3,591	Southeast		X		Minor

Note - Shaded wells were used for distance-drawdown analysis

TABLE 4
RW9 PUMPING TEST
OBSERVATION WELL RESPONSES TO PUMPING

Well ID	Screen Interval (feet bgs)	Distance from RW9 (feet)	Direction from RW9	Response to RW9 Pumping			Response to Other Well Pumping
				Strong	Moderate	Weak	
RW9	650-865	0	-	NA	NA	NA	NA
RW9-MW01S	270-280	88	East			X	Insignificant
RW9-MW01D1	552-572	107	East			X	Minor
RW9-MW01D2	740-770	129	East	X			Minor
RW9-MW01D3	820-840	148	East		X		Minor
TT102D1	560-600	763	East		X		Significant
TT102D2	740-770	749	East	X			Significant
DECHC05-MW-01	950-970	1,084	South			X	Minor
DECHC05-MW-02	940-960	1,189	Southwest		X		Insignificant
DECHC05-MW-03	950-970	1,263	South			X	Insignificant
RE133D1	560-580	1,229	South	X			Minor
RE133D2	780-800	1,214	South	X			Minor
BPOW 6-3	750-775	1,606	Southeast	X			Significant
BPOW 6-4	545-570	1,591	Southeast		X		Significant
RE117D1	730-755	1,667	Northwest	X			Significant
RE117D2	780-805	1,653	Northwest		X		Minor
BPOW 5-4	545-570	1,682	Northwest	X		X	Significant
DEC1-D1	695-715	1,811	Southwest	X			Minor
DEC1-D2	760-780	1,795	Southwest	X			Minor
RW8	595-790	1,743	West	X			Insignificant
RW8-MW01S	262-272	1,851	West			X	Minor
RW8-MW01D1	550-570	1,833	West	X			Minor
RW8-MW01D2	740-785	1,792	West	X			Minor
RW8-MW01D3	820-850	1,813	West	X			Minor
BPOW 6-1	550-575	2,005	South		X		Significant
BPOW 6-2	755-780	1,977	South	X			Significant
BPOW 6-5	525-550	2,116	Southeast		X		Significant
BPOW 6-6	770-795	2,105	Southeast	X			Significant
RE118D1	765-790	2,109	North	X			Significant
BPOW 5-5	515-540	2,095	North		X		Significant
BPOW 5-6	585-610	2,137	North		X		Significant
RE129D1	690-710	2,468	Northwest		X		Significant
RE129D2	805-825	2,487	Northwest		X		Significant

Note - Shaded wells were used for distance-drawdown analysis



AQUIFER TESTING NETWORK
RECOVERY WELLS RW8 AND RW9
PHASE III SOUTHERN PLUME INTERCEPT SYSTEM
NWIRP BETHPAGE, NEW YORK

Naval Facilities Engineering Systems Command

DRAWN BY	DATE	CTO
JRA	09/06/22	112G08005-WE13
CHECKED BY	DATE	FIGURE NUMBER
WB	09/06/22	1

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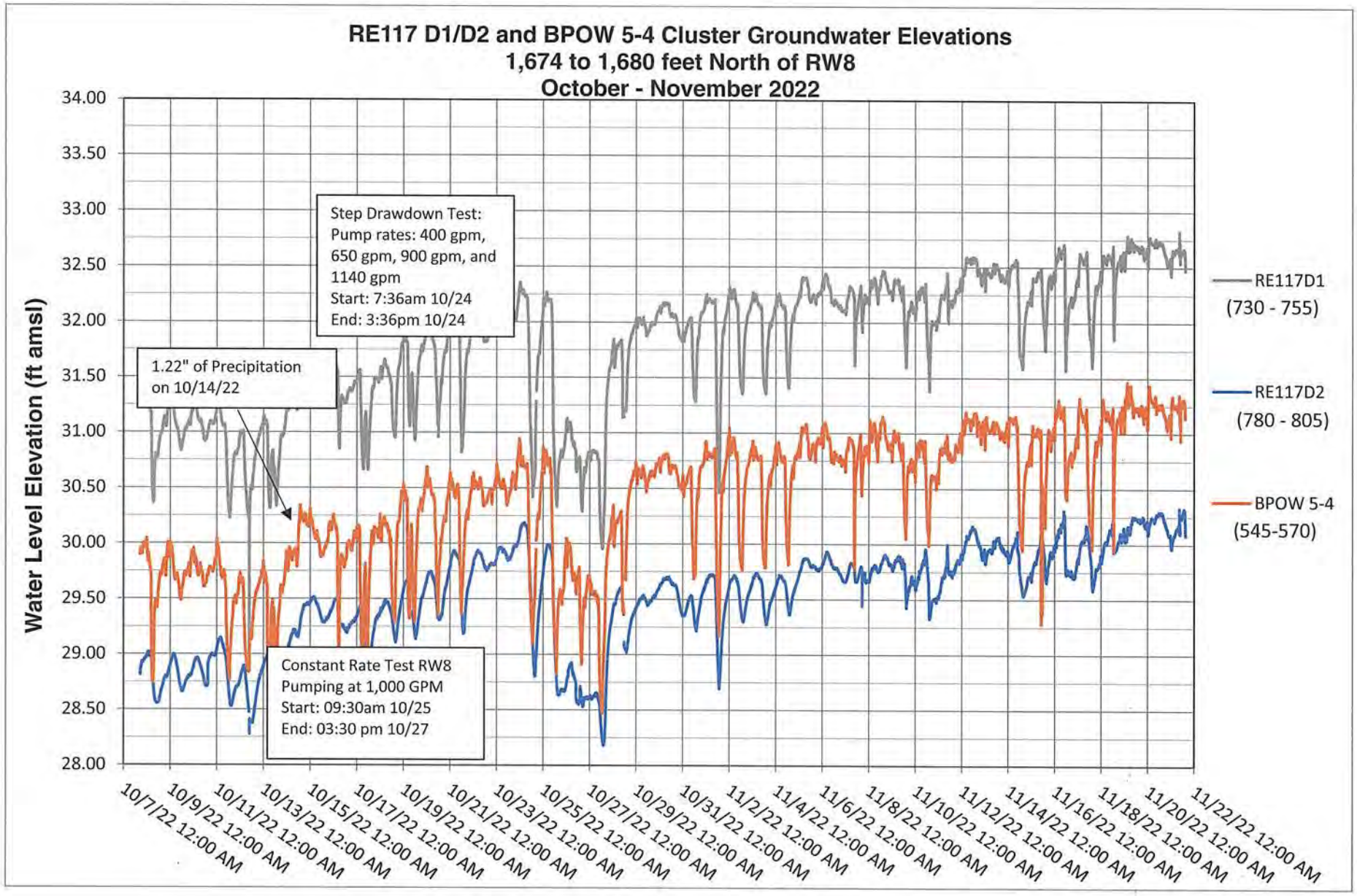
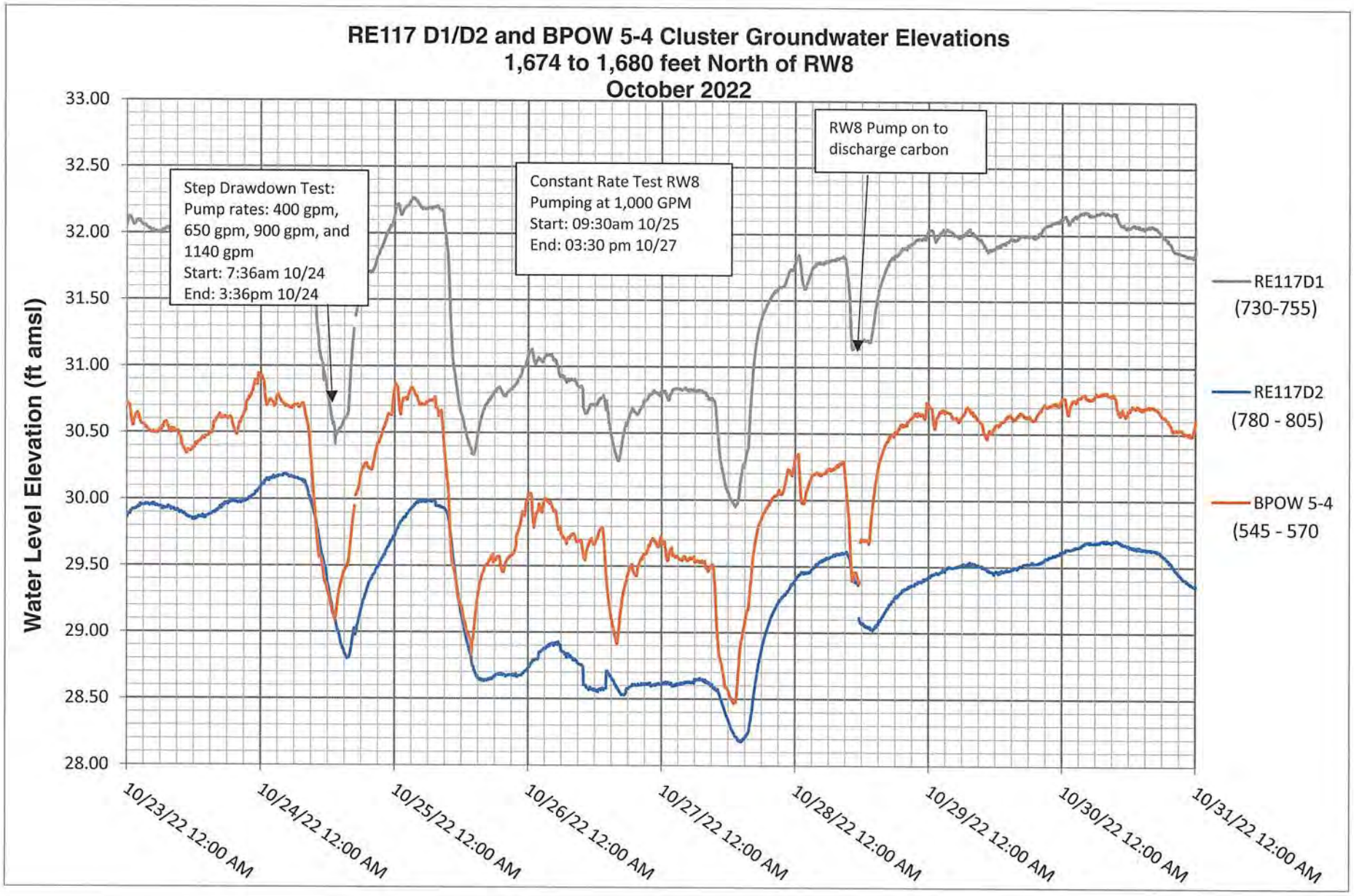
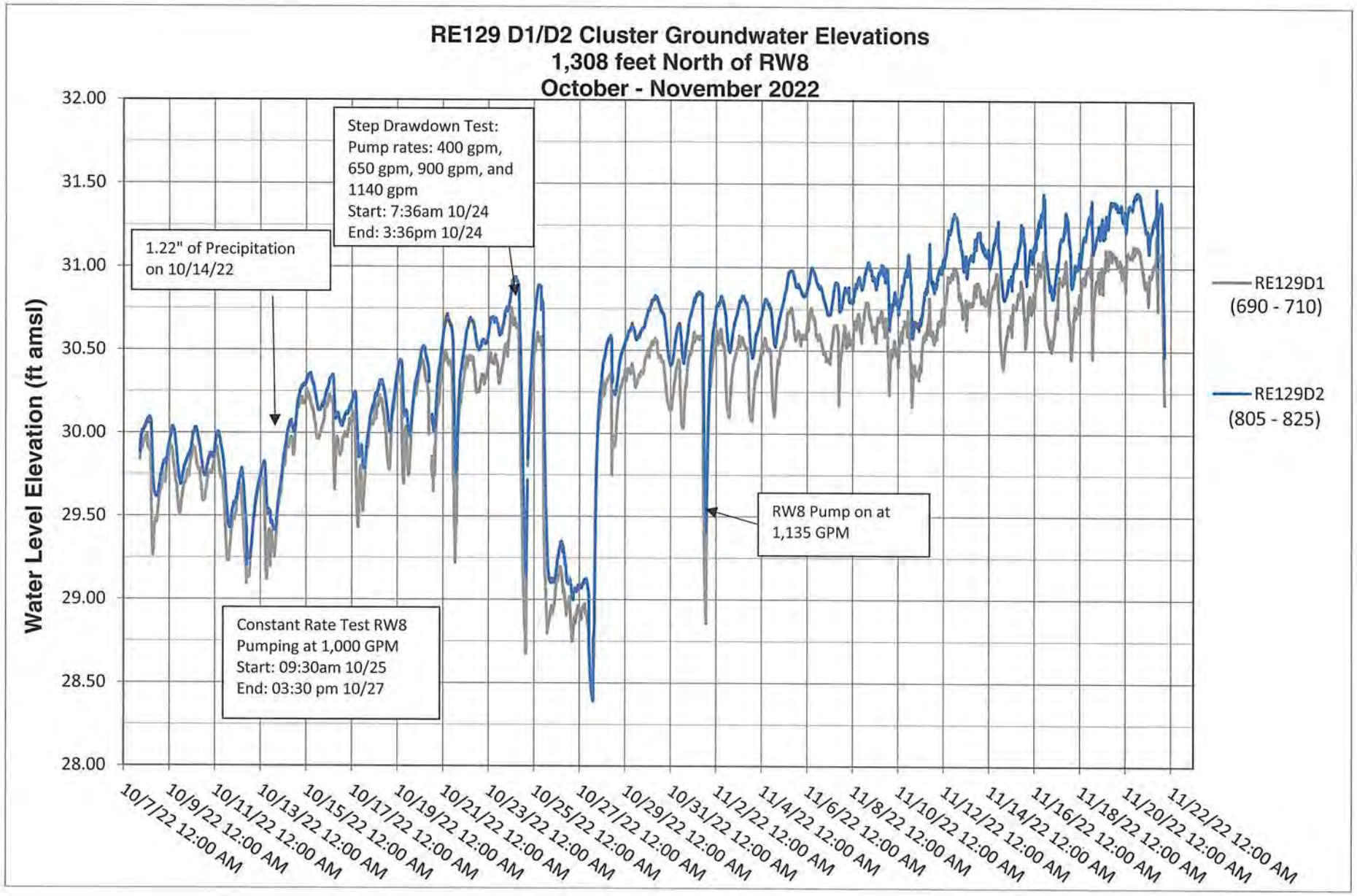
ATTACHMENT B

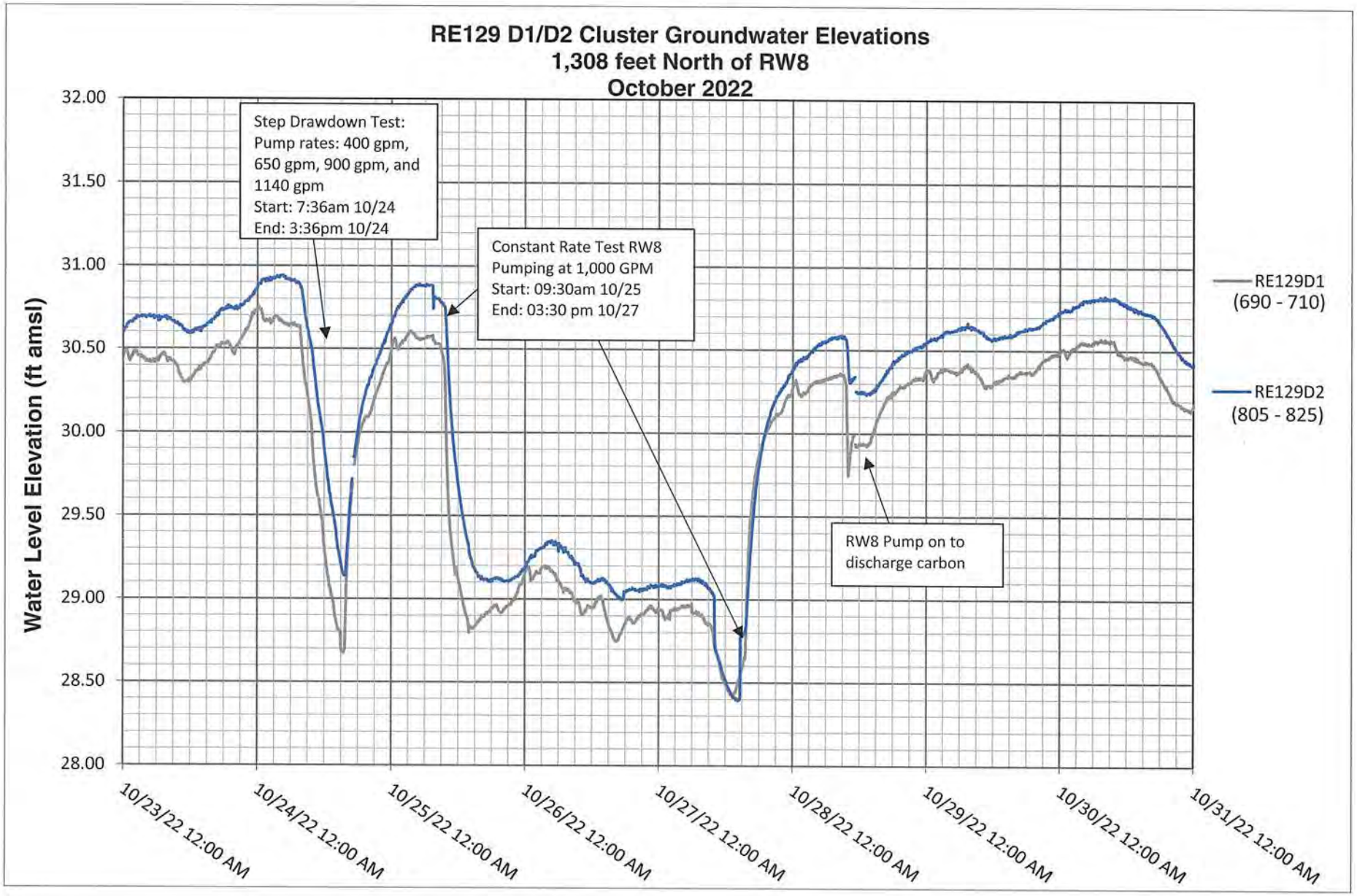
WATER LEVEL GRAPHS

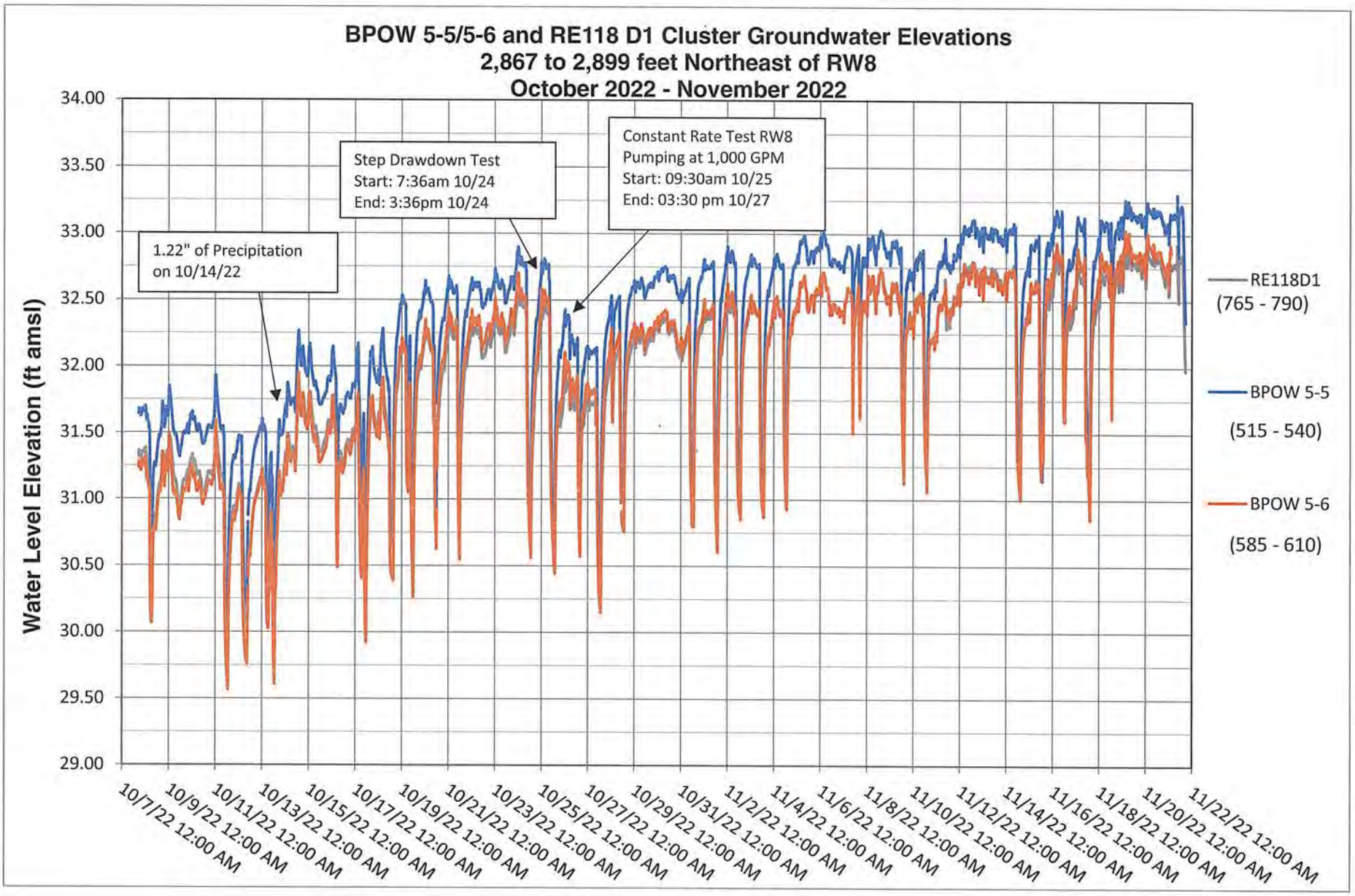
ATTACHMENT B.1 – RW8 PUMPING TEST GRAPHS

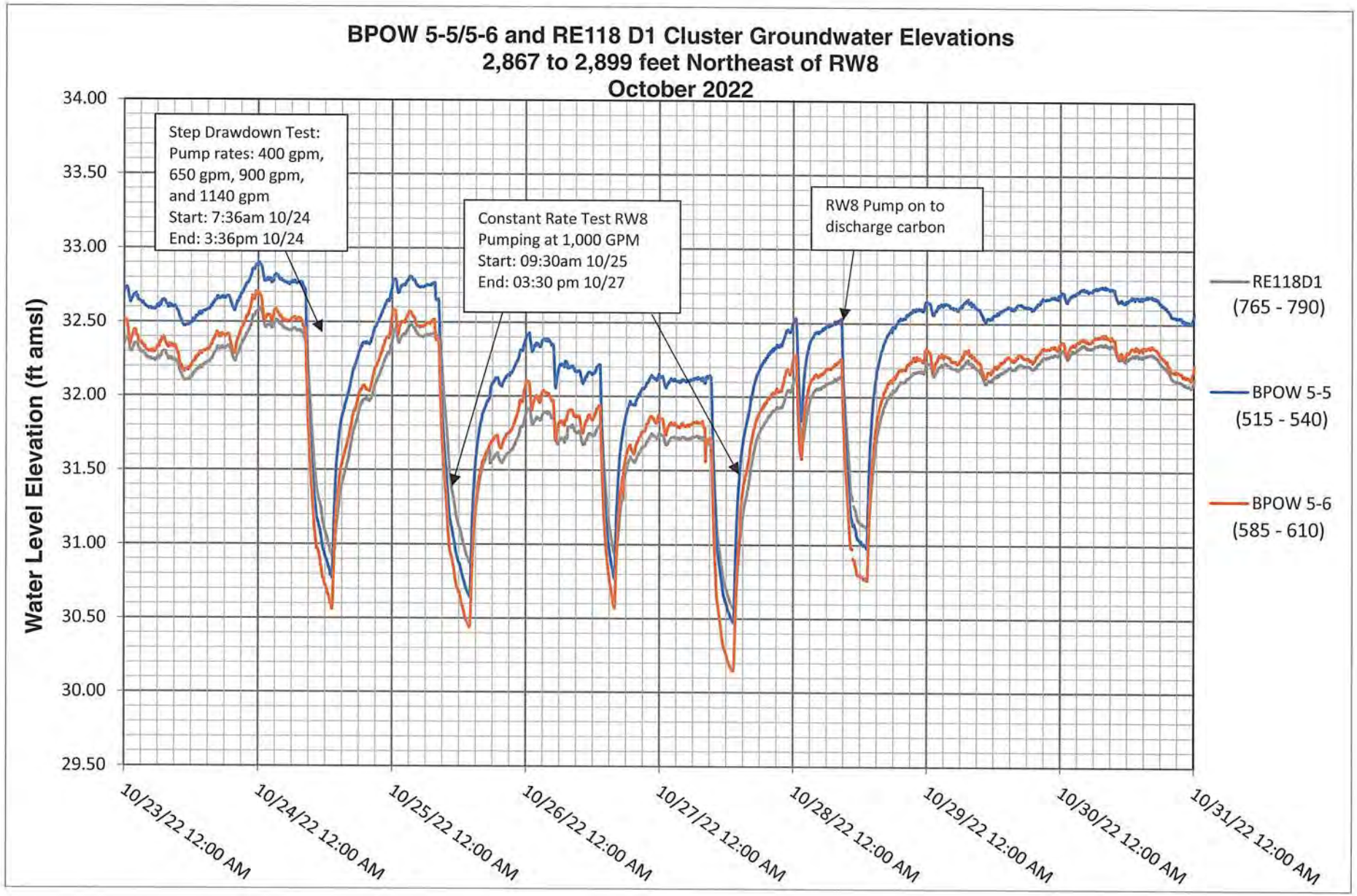

RE117 D1/D2 and BPOW 5-4 Cluster Groundwater Elevations
1,674 to 1,680 feet North of RW8
October - November 2022
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
1.22" of Precipitation on 10/14/22
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RE117D1
(730 - 755)
RE117D2
(780 - 805)
BPOW 5-4
(545-570)
10/7/22 12:00 AM
10/9/22 12:00 AM
10/11/22 12:00 AM
10/13/22 12:00 AM
10/15/22 12:00 AM
10/17/22 12:00 AM
10/19/22 12:00 AM
10/21/22 12:00 AM
10/23/22 12:00 AM
10/25/22 12:00 AM
10/27/22 12:00 AM
10/29/22 12:00 AM
10/31/22 12:00 AM
11/2/22 12:00 AM
11/4/22 12:00 AM
11/6/22 12:00 AM
11/8/22 12:00 AM
11/10/22 12:00 AM
11/12/22 12:00 AM
11/14/22 12:00 AM
11/16/22 12:00 AM
11/18/22 12:00 AM
11/20/22 12:00 AM
11/22/22 12:00 AM

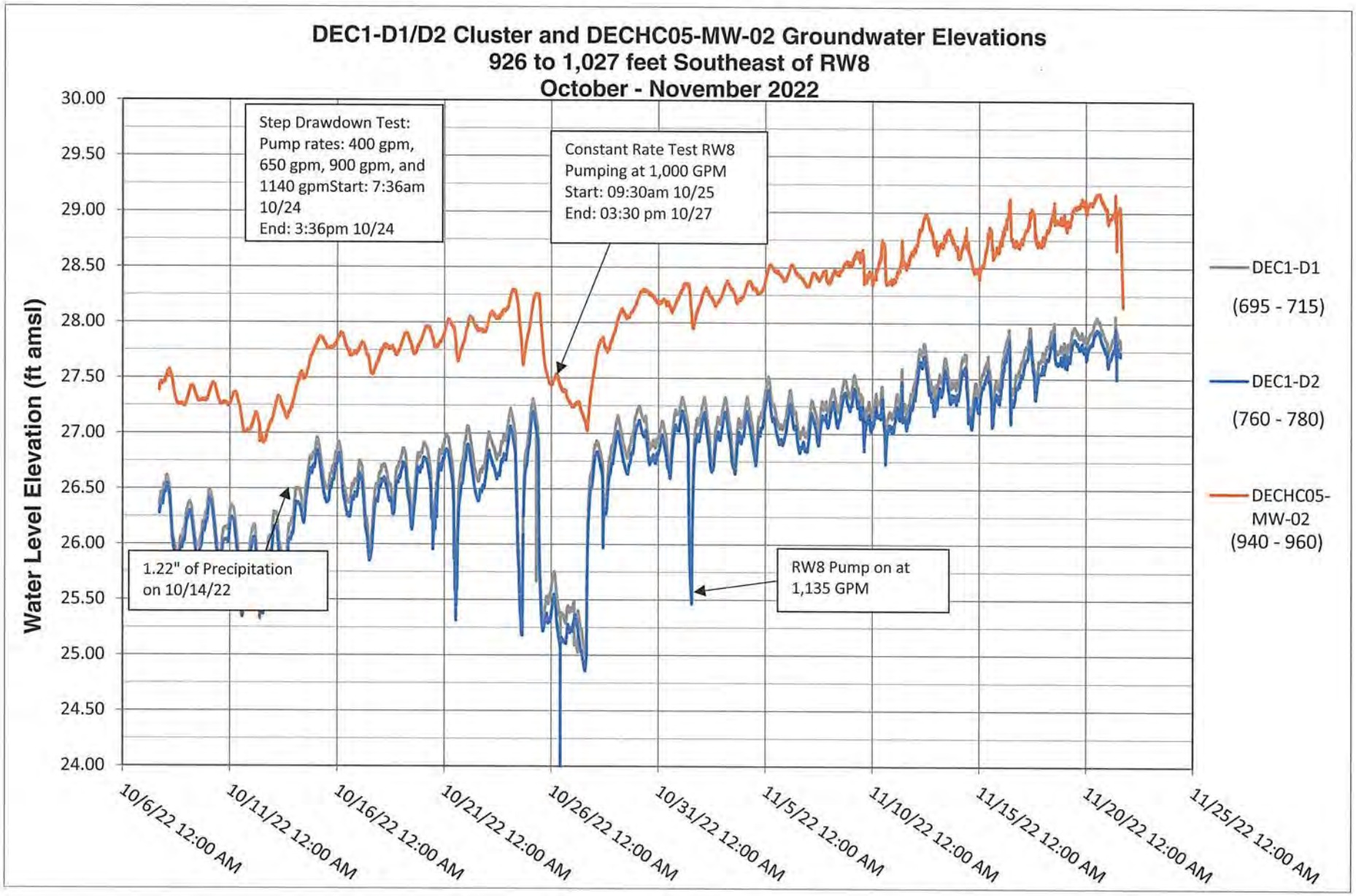

RE117 D1/D2 and BPOW 5-4 Cluster Groundwater Elevations
1,674 to 1,680 feet North of RW8
October 2022
Water Level Elevation (ft amsl)
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RW8 Pump on to discharge carbon
RE117D1 (730-755)
RE117D2 (780 - 805)
BPOW 5-4 (545 - 570
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

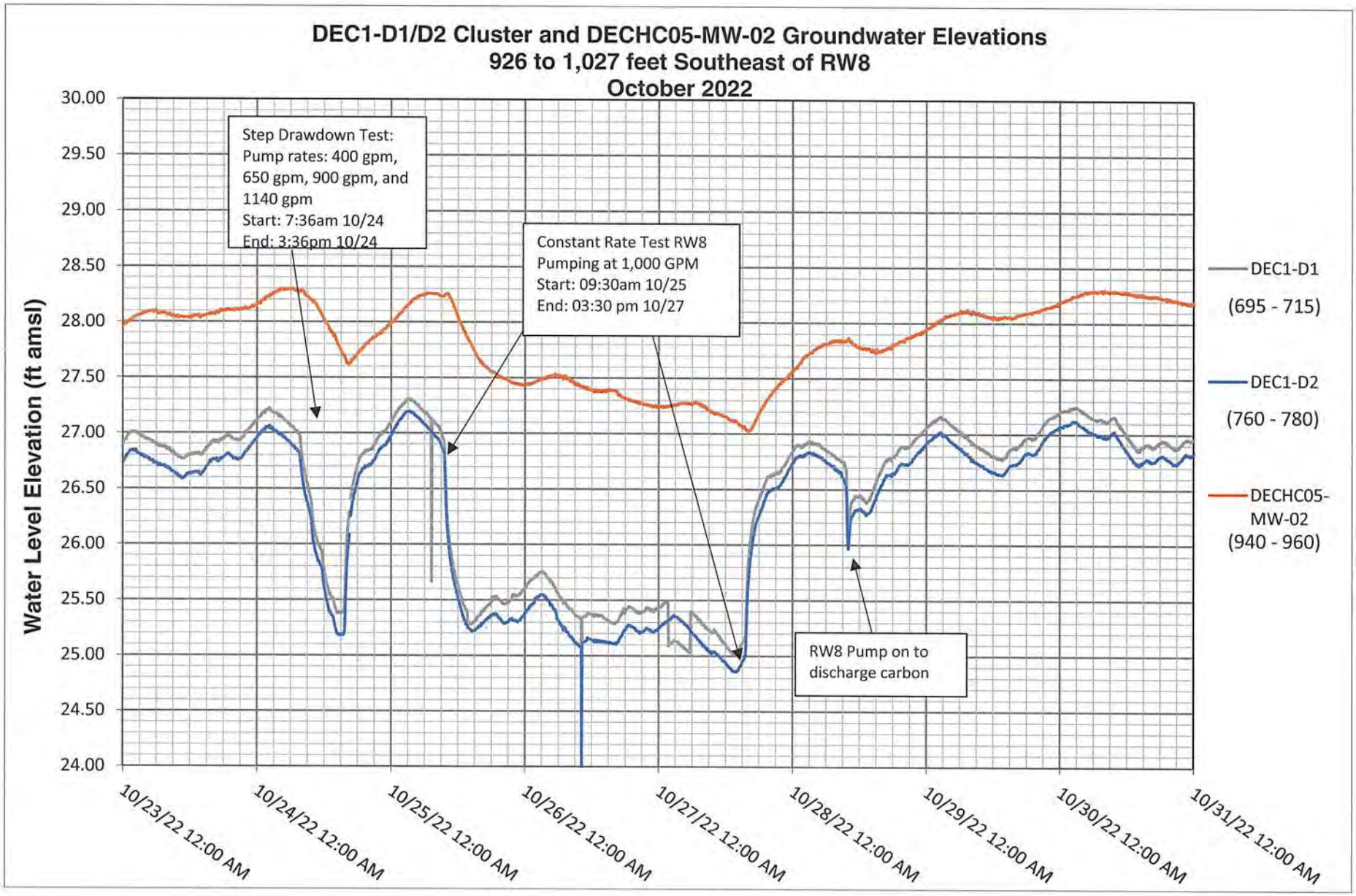

RE129 D1/D2 Cluster Groundwater Elevations
1,308 feet North of RW8
October - November 2022
Water Level Elevation (ft amsl)
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
1.22" of Precipitation on 10/14/22
RW8 Pump on at 1,135 GPM
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RE129D1 (690 - 710)
RE129D2 (805 - 825)
10/7/22 12:00 AM
10/9/22 12:00 AM
10/11/22 12:00 AM
10/13/22 12:00 AM
10/15/22 12:00 AM
10/17/22 12:00 AM
10/19/22 12:00 AM
10/21/22 12:00 AM
10/23/22 12:00 AM
10/25/22 12:00 AM
10/27/22 12:00 AM
10/29/22 12:00 AM
10/31/22 12:00 AM
11/2/22 12:00 AM
11/4/22 12:00 AM
11/6/22 12:00 AM
11/8/22 12:00 AM
11/10/22 12:00 AM
11/12/22 12:00 AM
11/14/22 12:00 AM
11/16/22 12:00 AM
11/18/22 12:00 AM
11/20/22 12:00 AM
11/22/22 12:00 AM

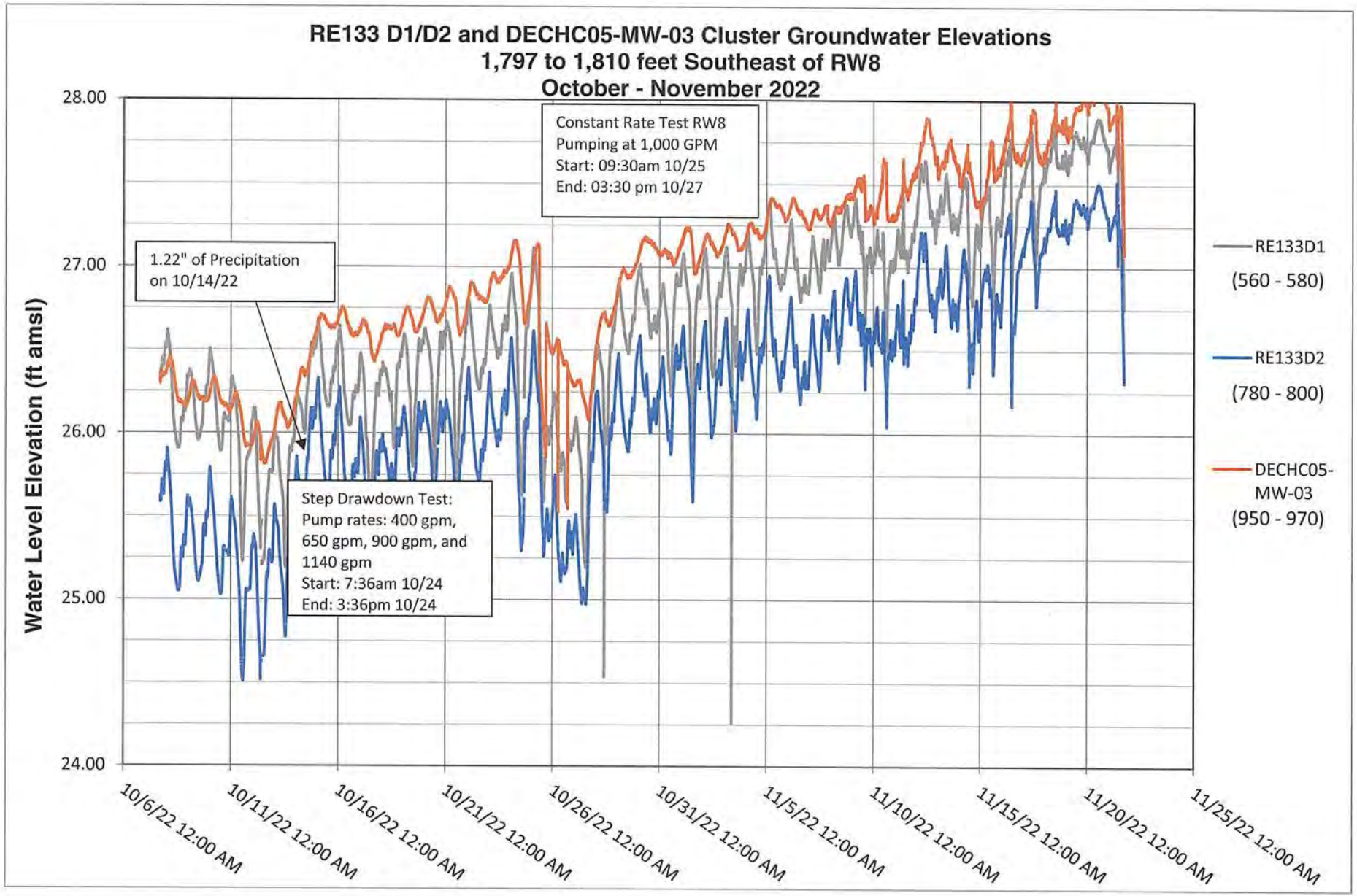

RE129 D1/D2 Cluster Groundwater Elevations
1,308 feet North of RW8
October 2022
Water Level Elevation (ft amsl)
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RW8 Pump on to discharge carbon
RE129D1 (690 - 710)
RE129D2 (805 - 825)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

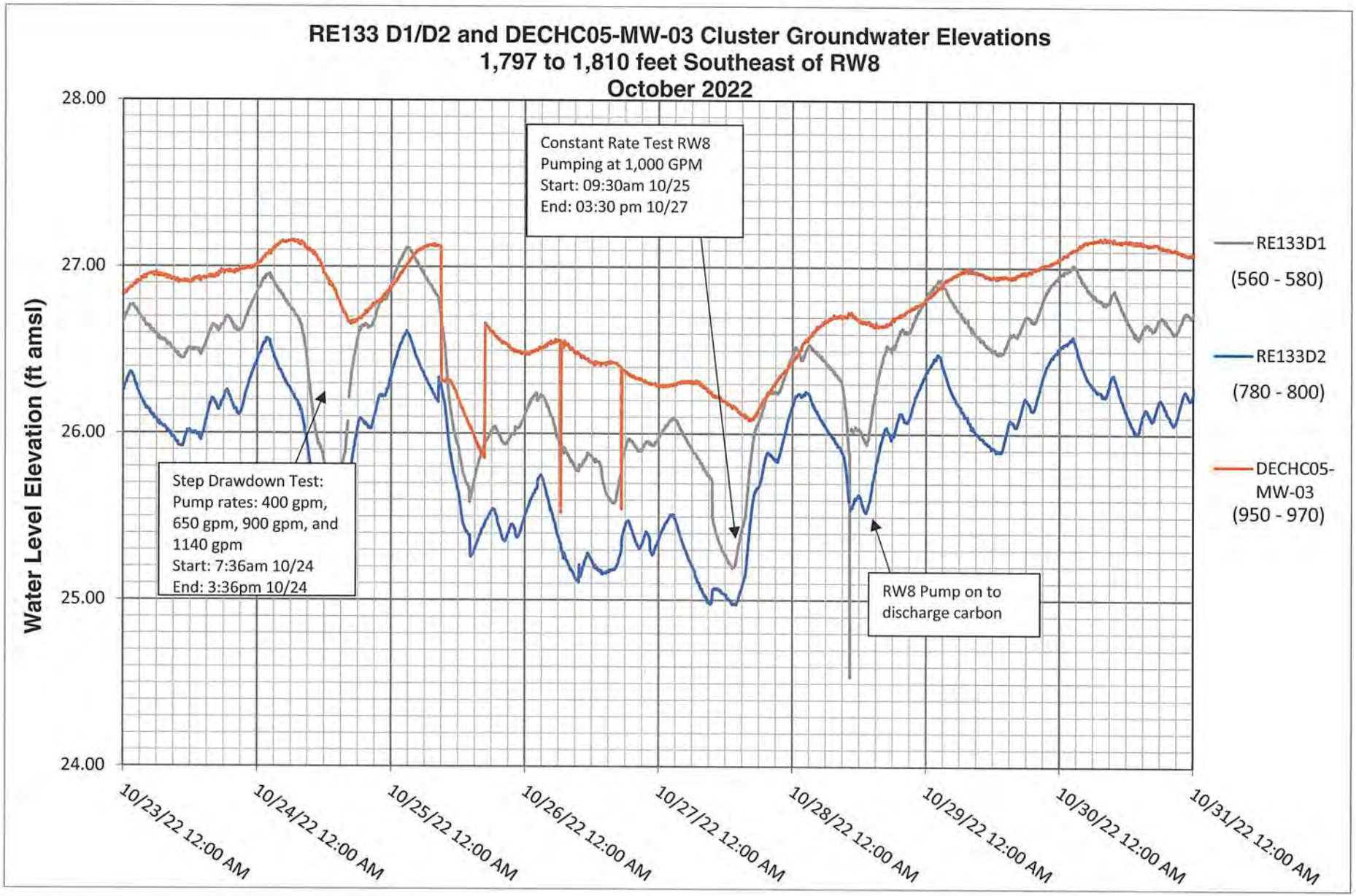

BPOW 5-5/5-6 and RE118 D1 Cluster Groundwater Elevations
2,867 to 2,899 feet Northeast of RW8
October 2022 - November 2022
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
1.22" of Precipitation on 10/14/22
Step Drawdown Test
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RE118D1 (765 - 790)
BPOW 5-5 (515 - 540)
BPOW 5-6 (585 - 610)
10/7/22 12:00 AM
10/9/22 12:00 AM
10/11/22 12:00 AM
10/13/22 12:00 AM
10/15/22 12:00 AM
10/17/22 12:00 AM
10/19/22 12:00 AM
10/21/22 12:00 AM
10/23/22 12:00 AM
10/25/22 12:00 AM
10/27/22 12:00 AM
10/29/22 12:00 AM
10/31/22 12:00 AM
11/2/22 12:00 AM
11/4/22 12:00 AM
11/6/22 12:00 AM
11/8/22 12:00 AM
11/10/22 12:00 AM
11/12/22 12:00 AM
11/14/22 12:00 AM
11/16/22 12:00 AM
11/18/22 12:00 AM
11/20/22 12:00 AM
11/22/22 12:00 AM

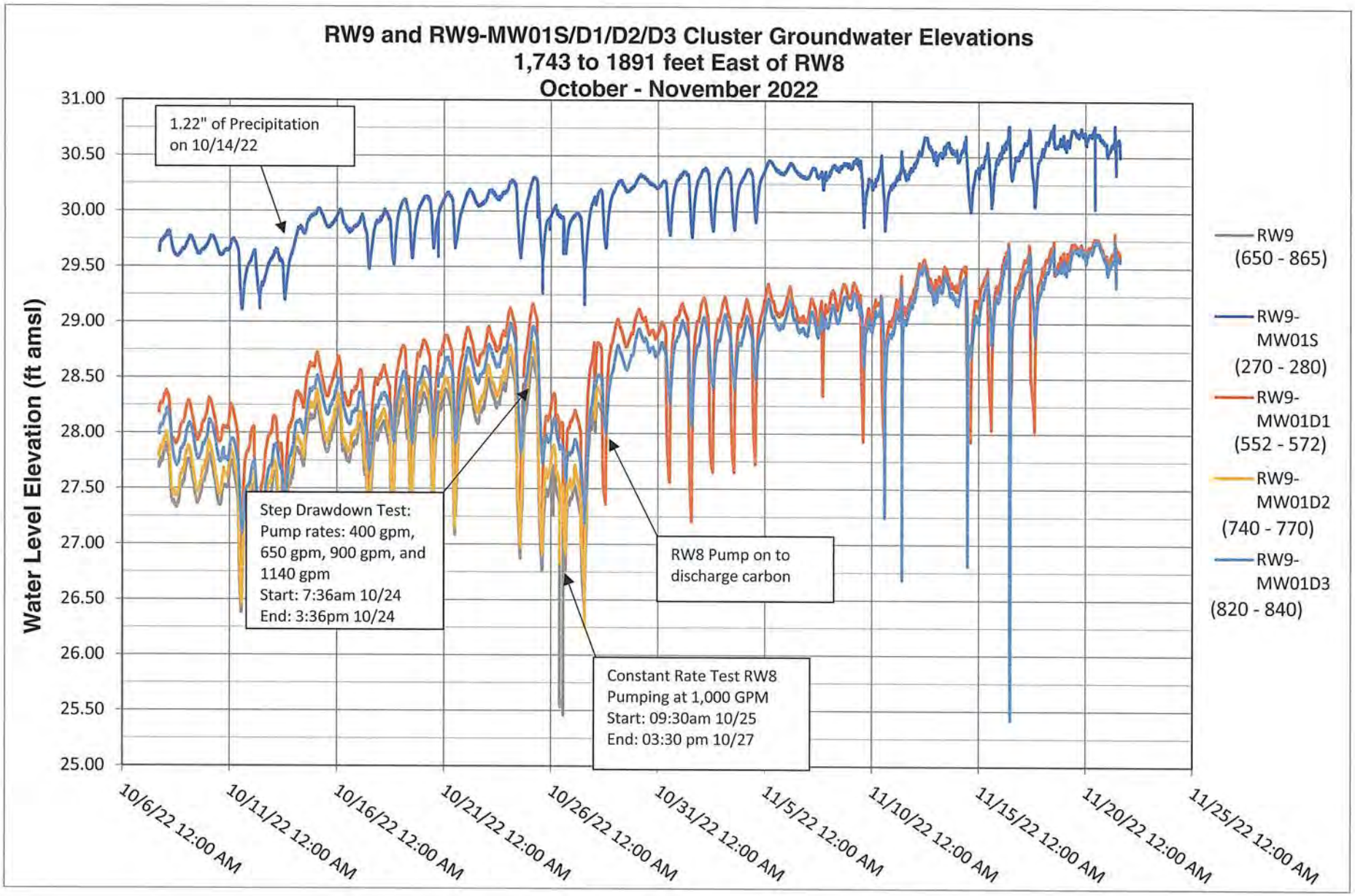

BPOW 5-5/5-6 and RE118 D1 Cluster Groundwater Elevations
2,867 to 2,899 feet Northeast of RW8
October 2022
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
Step Drawdown Test:
Pump rates: 400 gpm,
650 gpm, 900 gpm,
and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RW8 Pump on to
discharge carbon
RE118D1
(765 - 790)
BPOW 5-5
(515 - 540)
BPOW 5-6
(585 - 610)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

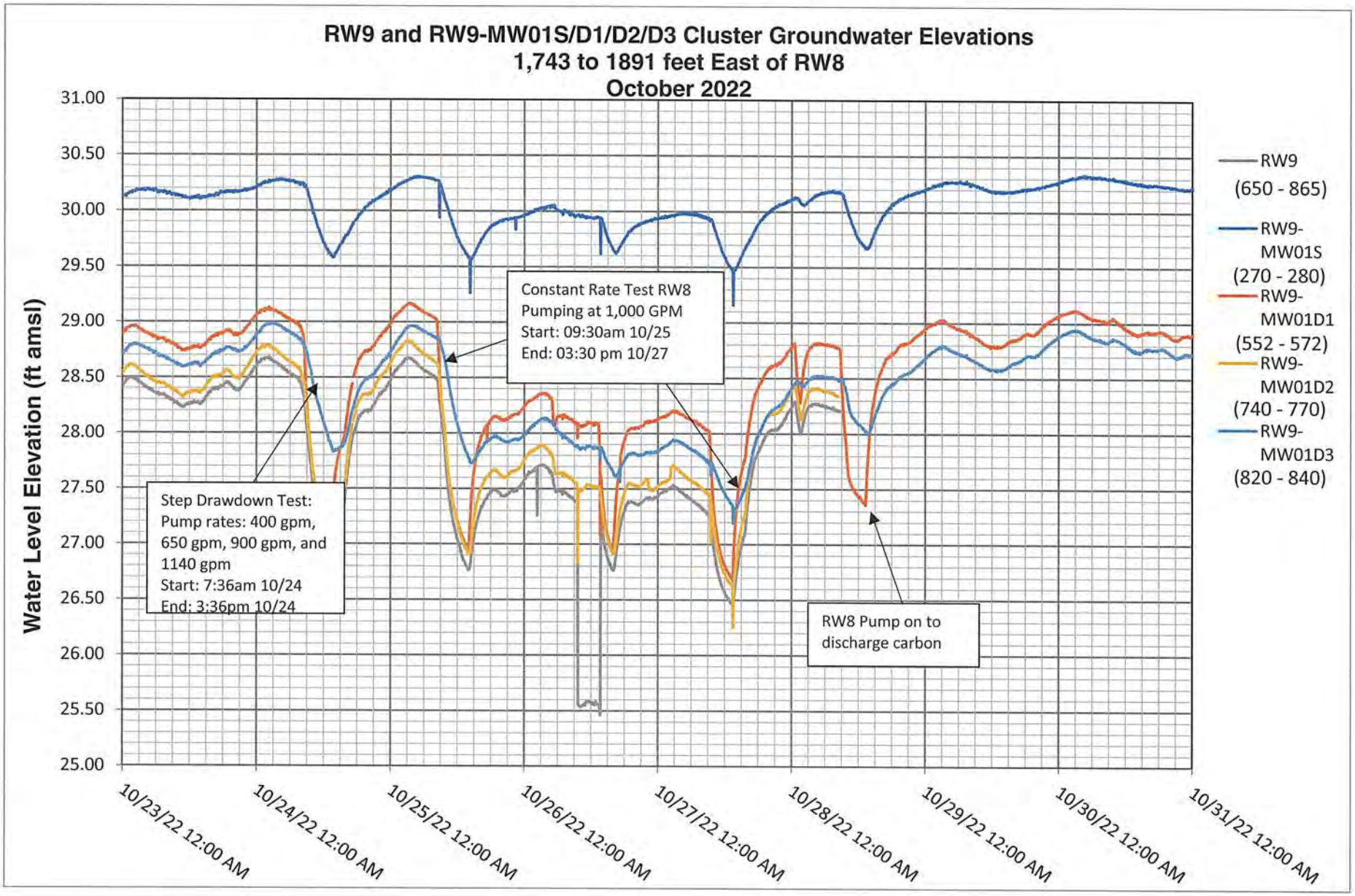

DEC1-D1/D2 Cluster and DECHC05-MW-02 Groundwater Elevations
926 to 1,027 feet Southeast of RW8
October - November 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
10/6/22 12:00 AM
10/11/22 12:00 AM
10/16/22 12:00 AM
10/21/22 12:00 AM
10/26/22 12:00 AM
10/31/22 12:00 AM
11/5/22 12:00 AM
11/10/22 12:00 AM
11/15/22 12:00 AM
11/20/22 12:00 AM
11/25/22 12:00 AM
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpmStart: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
1.22" of Precipitation on 10/14/22
RW8 Pump on at 1,135 GPM
DEC1-D1
(695 - 715)
DEC1-D2
(760 - 780)
DECHC05-MW-02
(940 - 960)

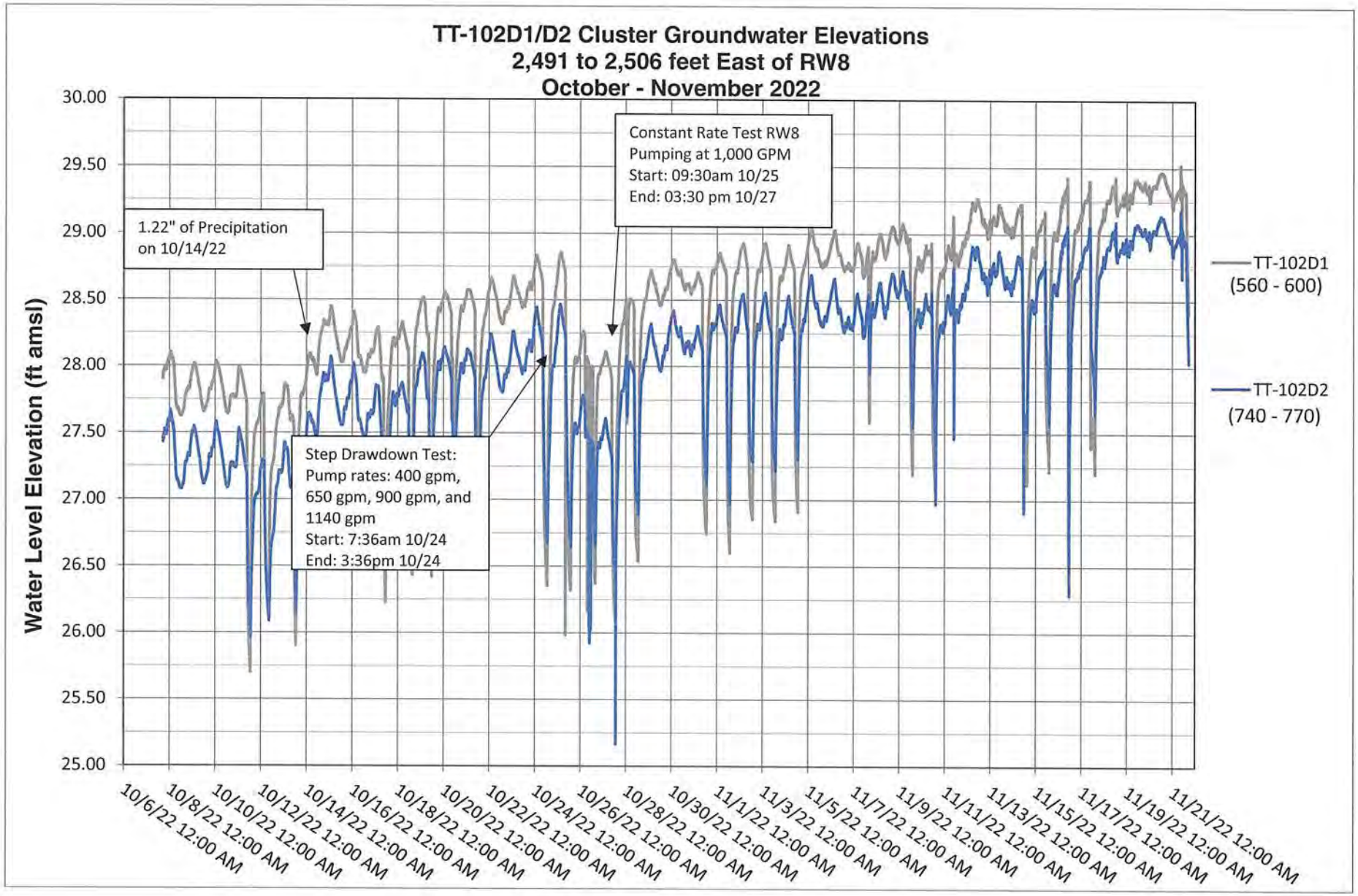

DEC1-D1/D2 Cluster and DECHC05-MW-02 Groundwater Elevations
926 to 1,027 feet Southeast of RW8
October 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RW8 Pump on to discharge carbon
DEC1-D1
(695 - 715)
DEC1-D2
(760 - 780)
DECHC05-MW-02
(940 - 960)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

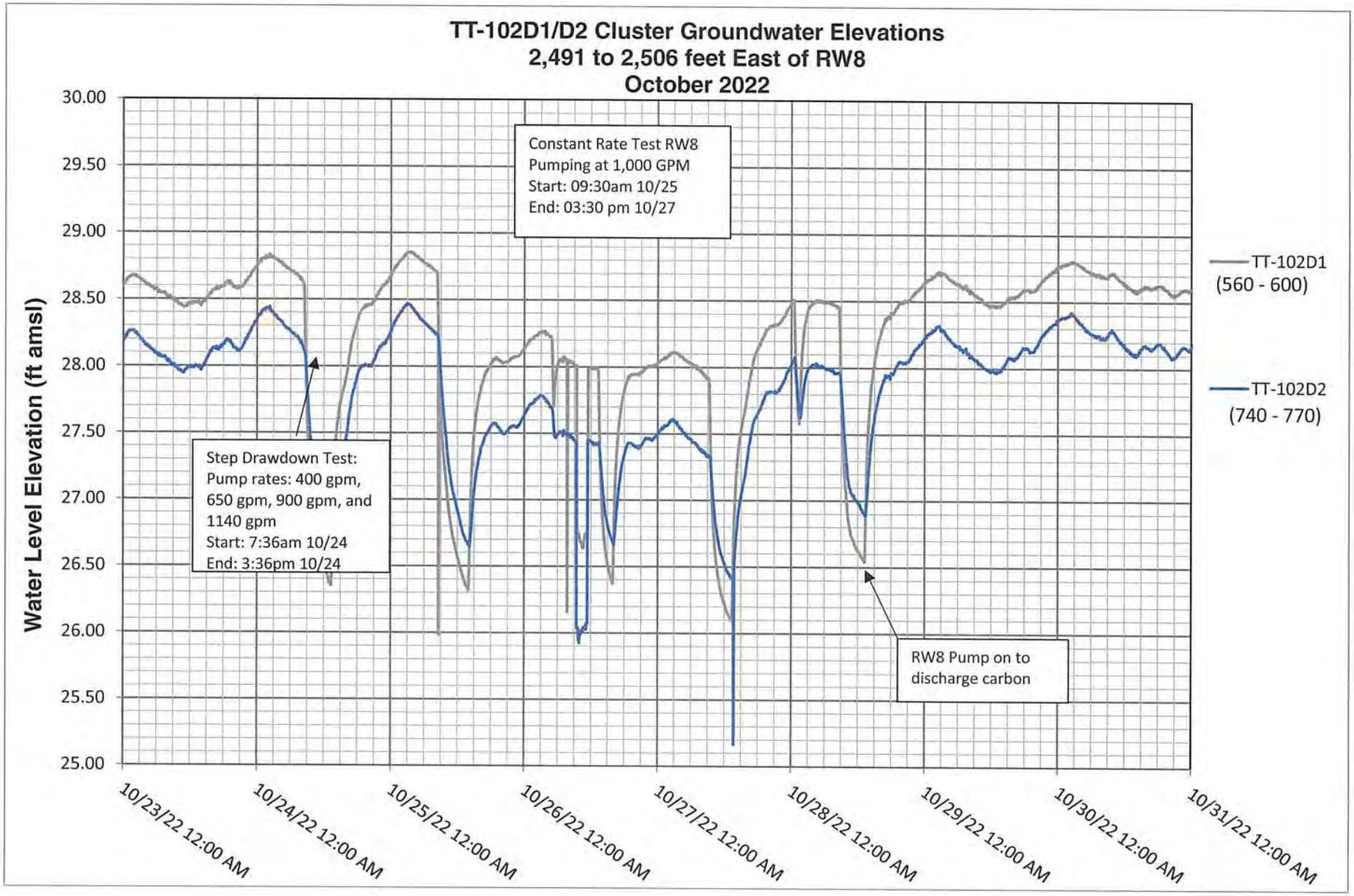

RE133 D1/D2 and DECHC05-MW-03 Cluster Groundwater Elevations
1,797 to 1,810 feet Southeast of RW8
October - November 2022
Water Level Elevation (ft amsl)
28.00
27.00
26.00
25.00
24.00
10/6/22 12:00 AM
10/11/22 12:00 AM
10/16/22 12:00 AM
10/21/22 12:00 AM
10/26/22 12:00 AM
10/31/22 12:00 AM
11/5/22 12:00 AM
11/10/22 12:00 AM
11/15/22 12:00 AM
11/20/22 12:00 AM
11/25/22 12:00 AM
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
1.22" of Precipitation
on 10/14/22
Step Drawdown Test:
Pump rates: 400 gpm,
650 gpm, 900 gpm, and
1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RE133D1
(560 - 580)
RE133D2
(780 - 800)
DECHC05-
MW-03
(950 - 970)

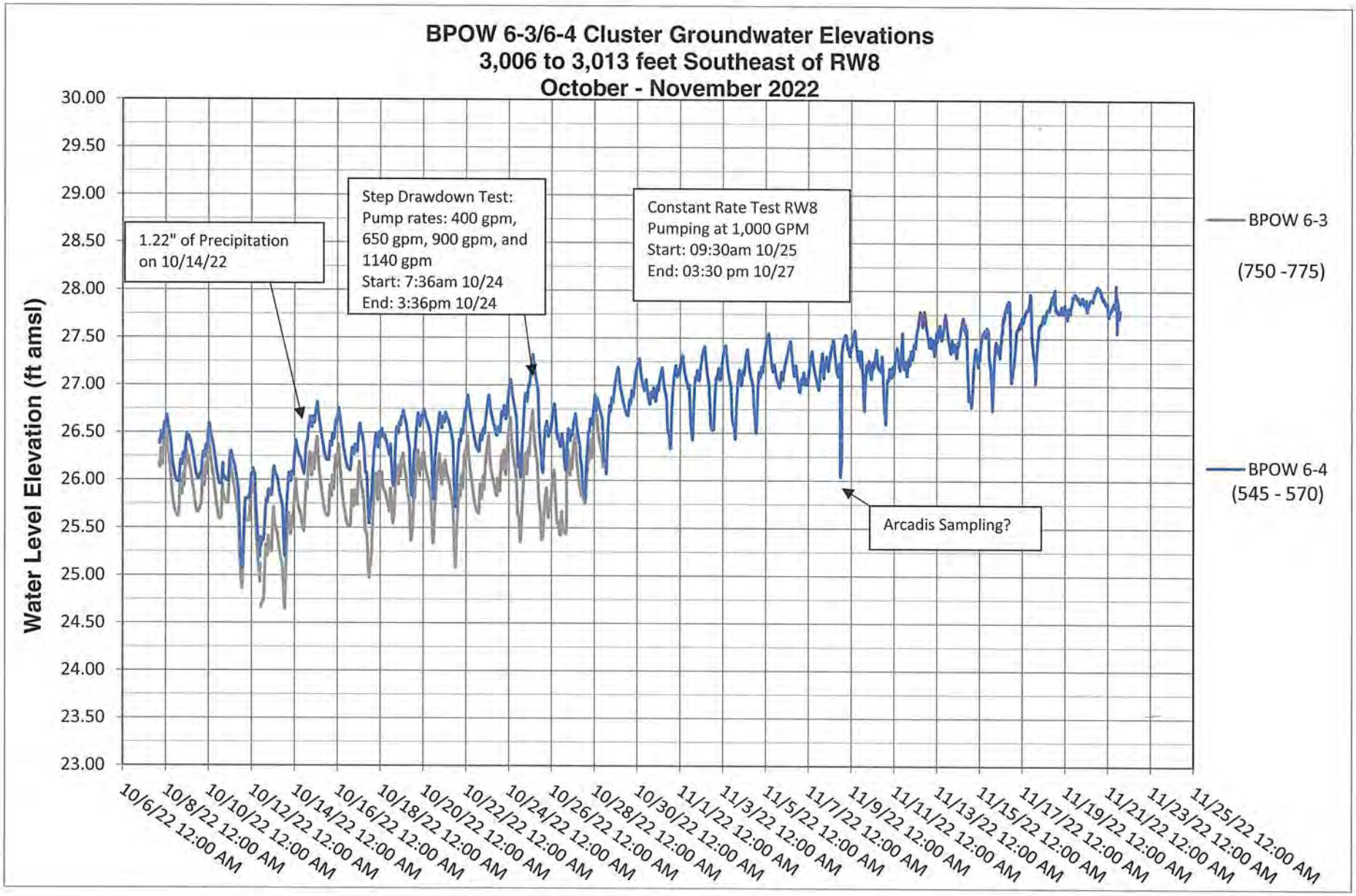

RE133 D1/D2 and DECHC05-MW-03 Cluster Groundwater Elevations
1,797 to 1,810 feet Southeast of RW8
October 2022
Water Level Elevation (ft amsl)
28.00
27.00
26.00
25.00
24.00
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RW8 Pump on to discharge carbon
RE133D1
(560 - 580)
RE133D2
(780 - 800)
DECHC05-MW-03
(950 - 970)

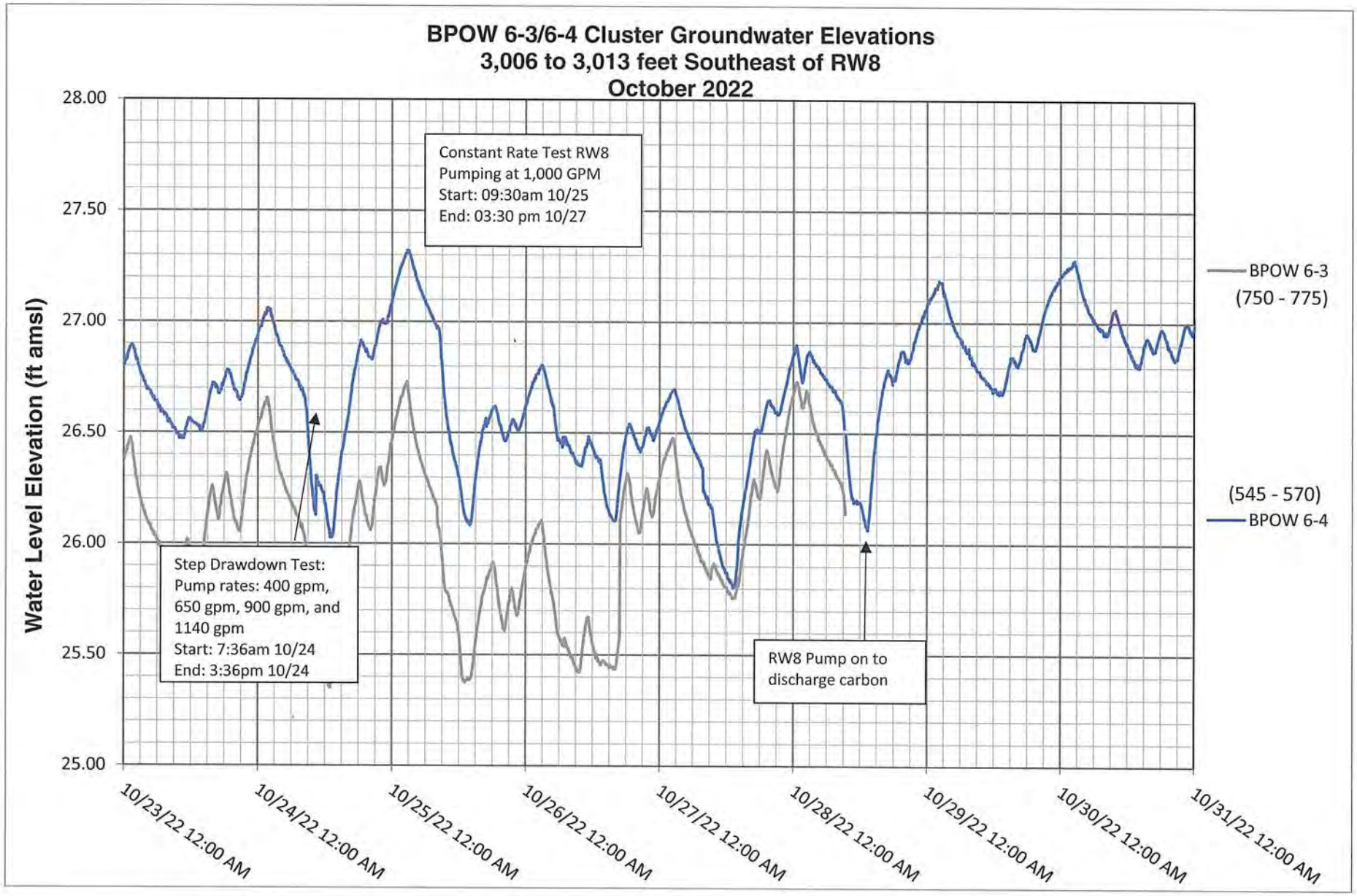

RW9 and RW9-MW01S/D1/D2/D3 Cluster Groundwater Elevations
1,743 to 1891 feet East of RW8
October - November 2022
Water Level Elevation (ft amsl)
31.00
30.50
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
10/6/22 12:00 AM
10/11/22 12:00 AM
10/16/22 12:00 AM
10/21/22 12:00 AM
10/26/22 12:00 AM
10/31/22 12:00 AM
11/5/22 12:00 AM
11/10/22 12:00 AM
11/15/22 12:00 AM
11/20/22 12:00 AM
11/25/22 12:00 AM
1.22" of Precipitation on 10/14/22
Step Drawdown Test: Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm Start: 7:36am 10/24 End: 3:36pm 10/24
RW8 Pump on to discharge carbon
Constant Rate Test RW8 Pumping at 1,000 GPM Start: 09:30am 10/25 End: 03:30 pm 10/27
RW9 (650 - 865)
RW9-MW01S (270 - 280)
RW9-MW01D1 (552 - 572)
RW9-MW01D2 (740 - 770)
RW9-MW01D3 (820 - 840)

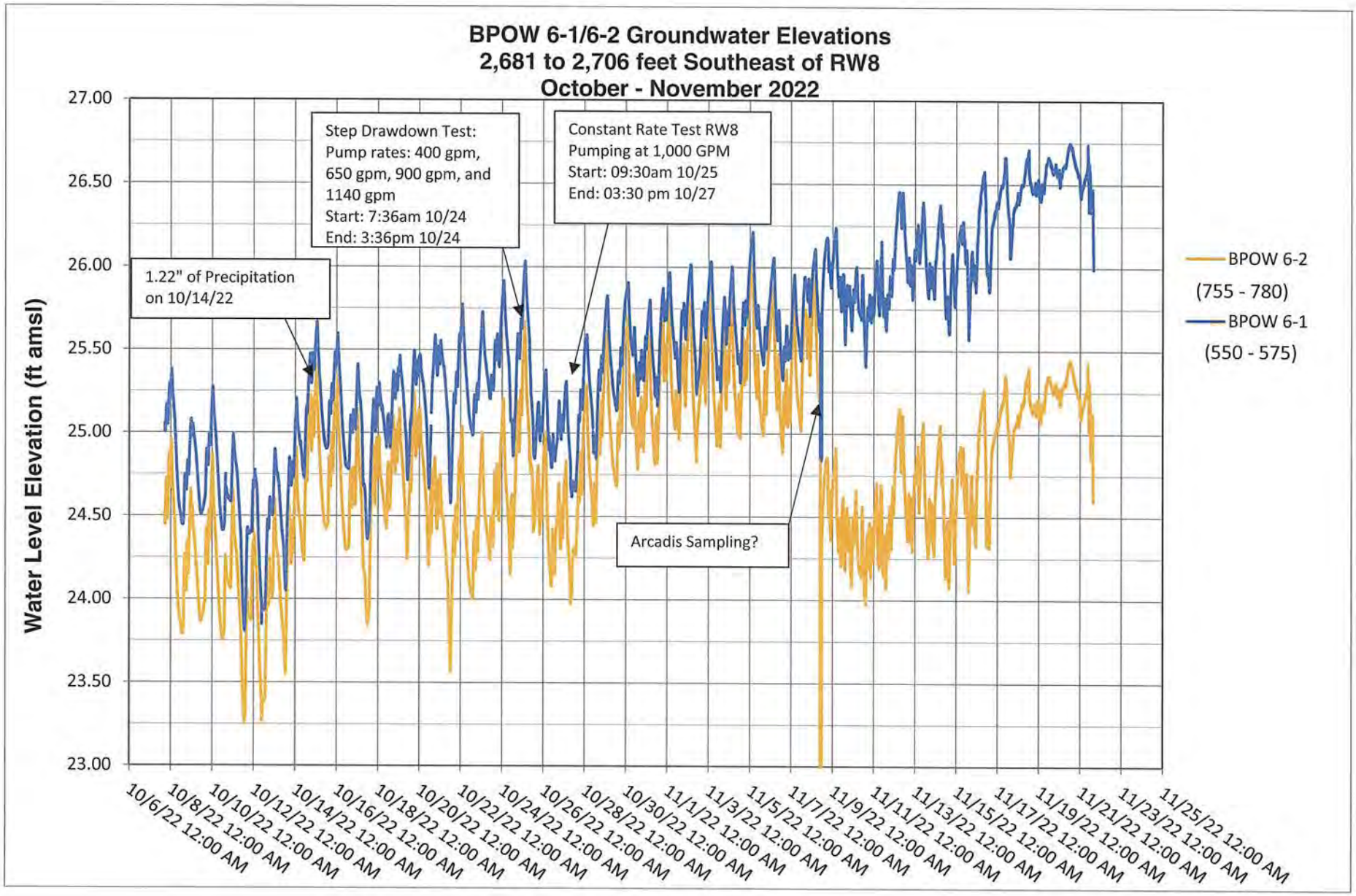

RW9 and RW9-MW01S/D1/D2/D3 Cluster Groundwater Elevations
1,743 to 1891 feet East of RW8
October 2022
Water Level Elevation (ft amsl)
31.00
30.50
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RW8 Pump on to discharge carbon
RW9 (650 - 865)
RW9-MW01S (270 - 280)
RW9-MW01D1 (552 - 572)
RW9-MW01D2 (740 - 770)
RW9-MW01D3 (820 - 840)

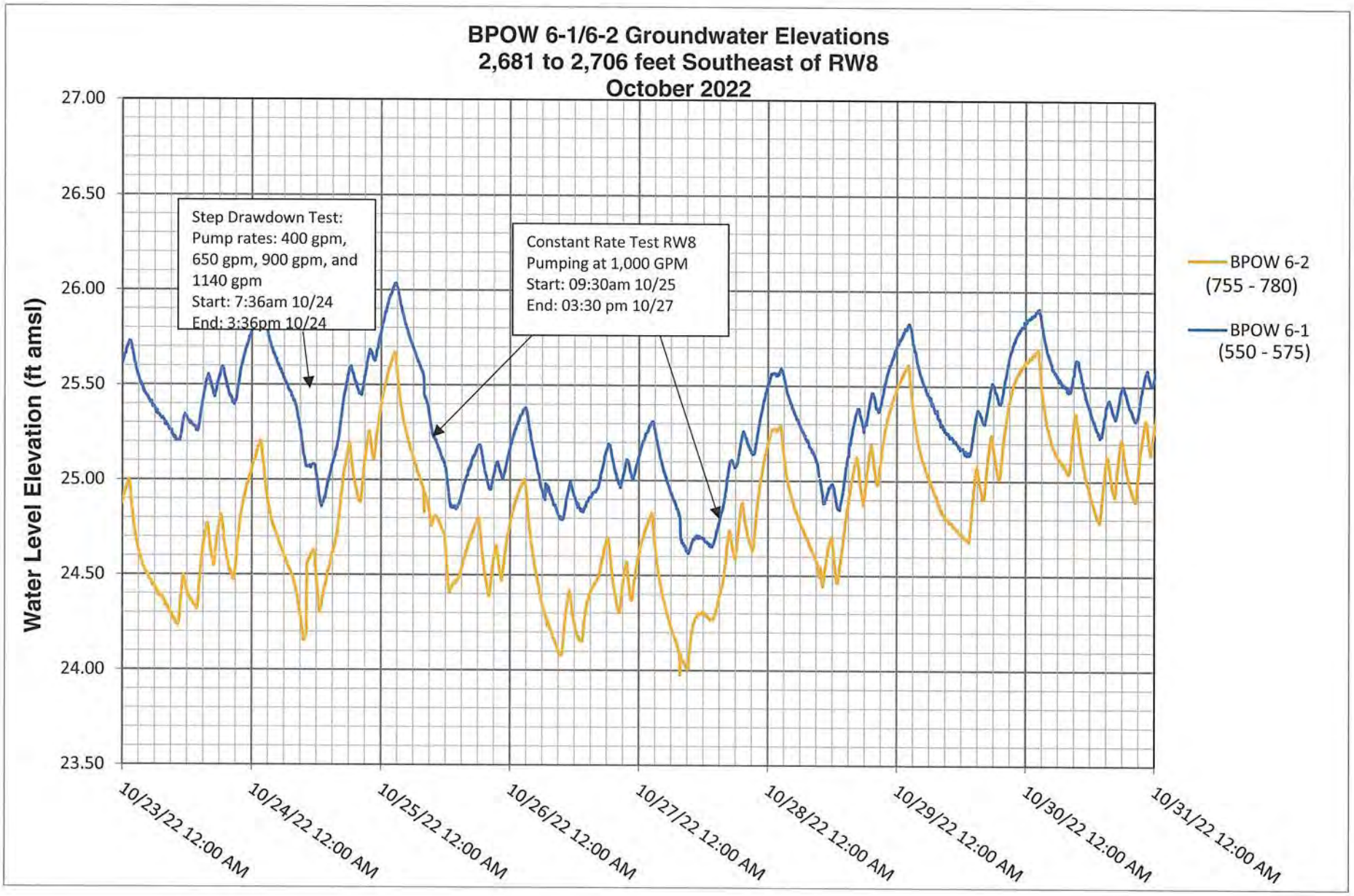

TT-102D1/D2 Cluster Groundwater Elevations
2,491 to 2,506 feet East of RW8
October - November 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
1.22" of Precipitation on 10/14/22
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
TT-102D1 (560 - 600)
TT-102D2 (740 - 770)
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM

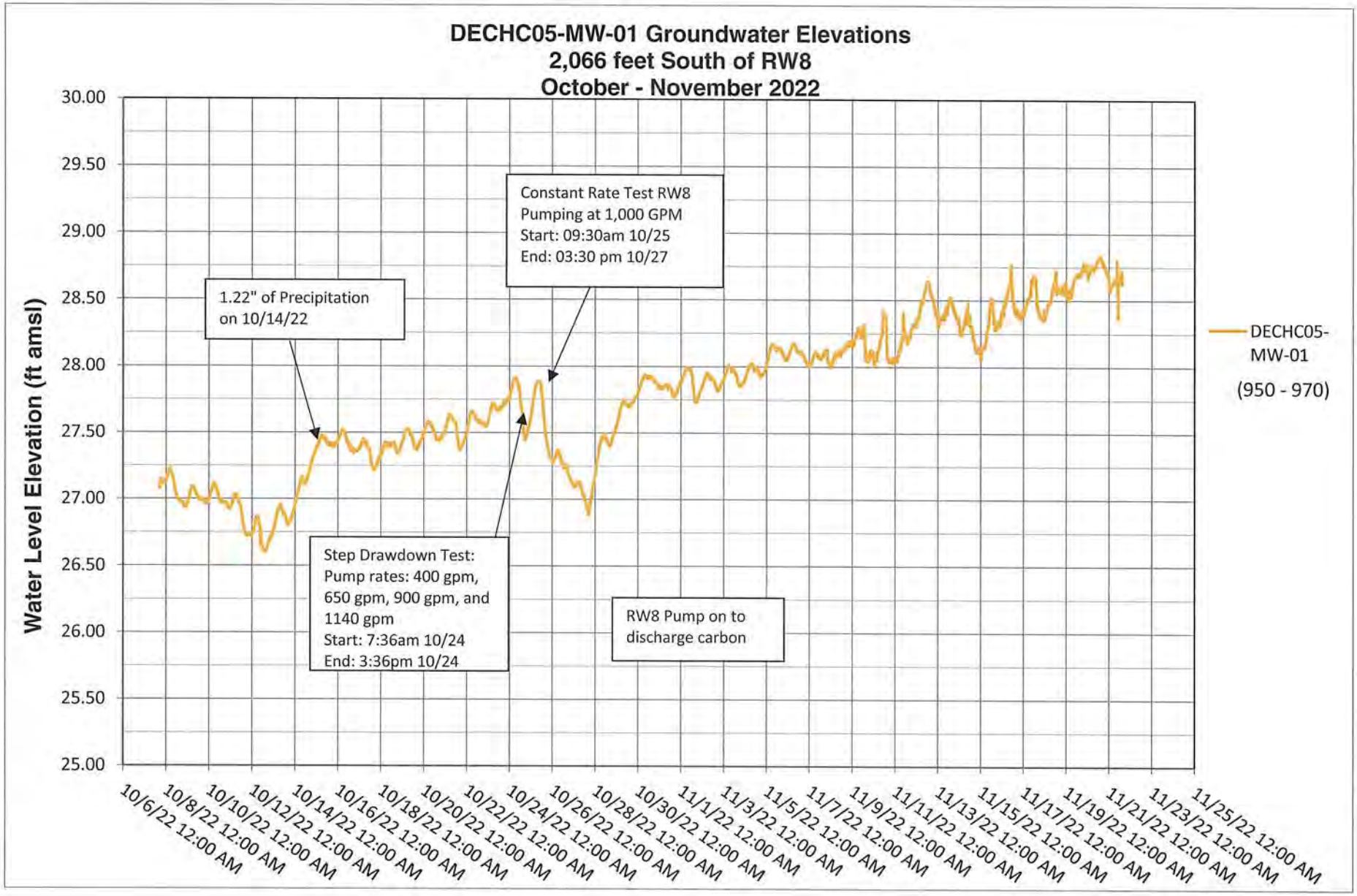

TT-102D1/D2 Cluster Groundwater Elevations
2,491 to 2,506 feet East of RW8
October 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RW8 Pump on to discharge carbon
TT-102D1 (560 - 600)
TT-102D2 (740 - 770)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

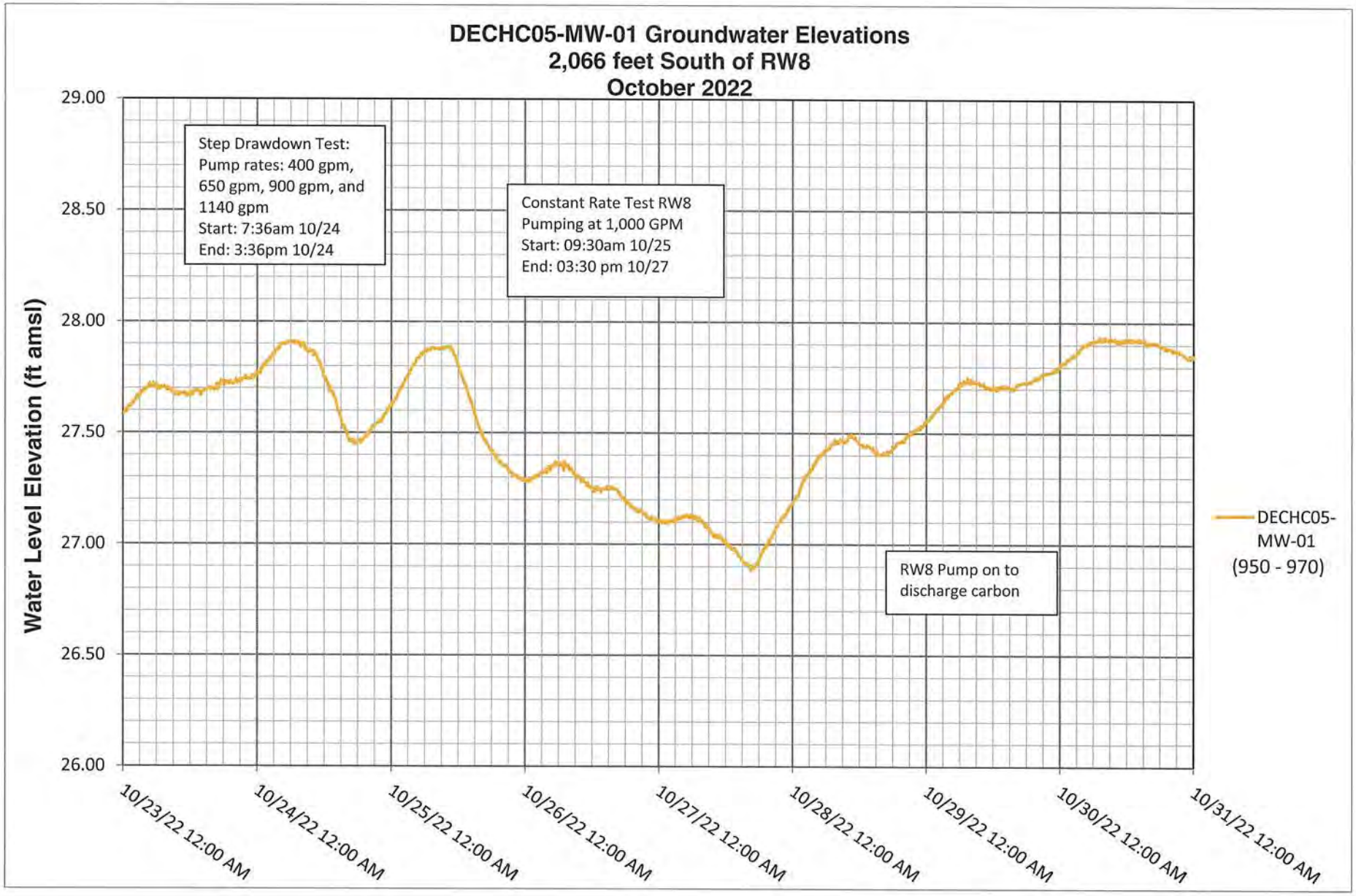

BPOW 6-3/6-4 Cluster Groundwater Elevations
3,006 to 3,013 feet Southeast of RW8
October - November 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
23.50
23.00
1.22" of Precipitation on 10/14/22
Step Drawdown Test: Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm Start: 7:36am 10/24 End: 3:36pm 10/24
Constant Rate Test RW8 Pumping at 1,000 GPM Start: 09:30am 10/25 End: 03:30 pm 10/27
Arcadis Sampling?
BPOW 6-3
(750 -775)
BPOW 6-4
(545 - 570)
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM
11/23/22 12:00 AM
11/25/22 12:00 AM

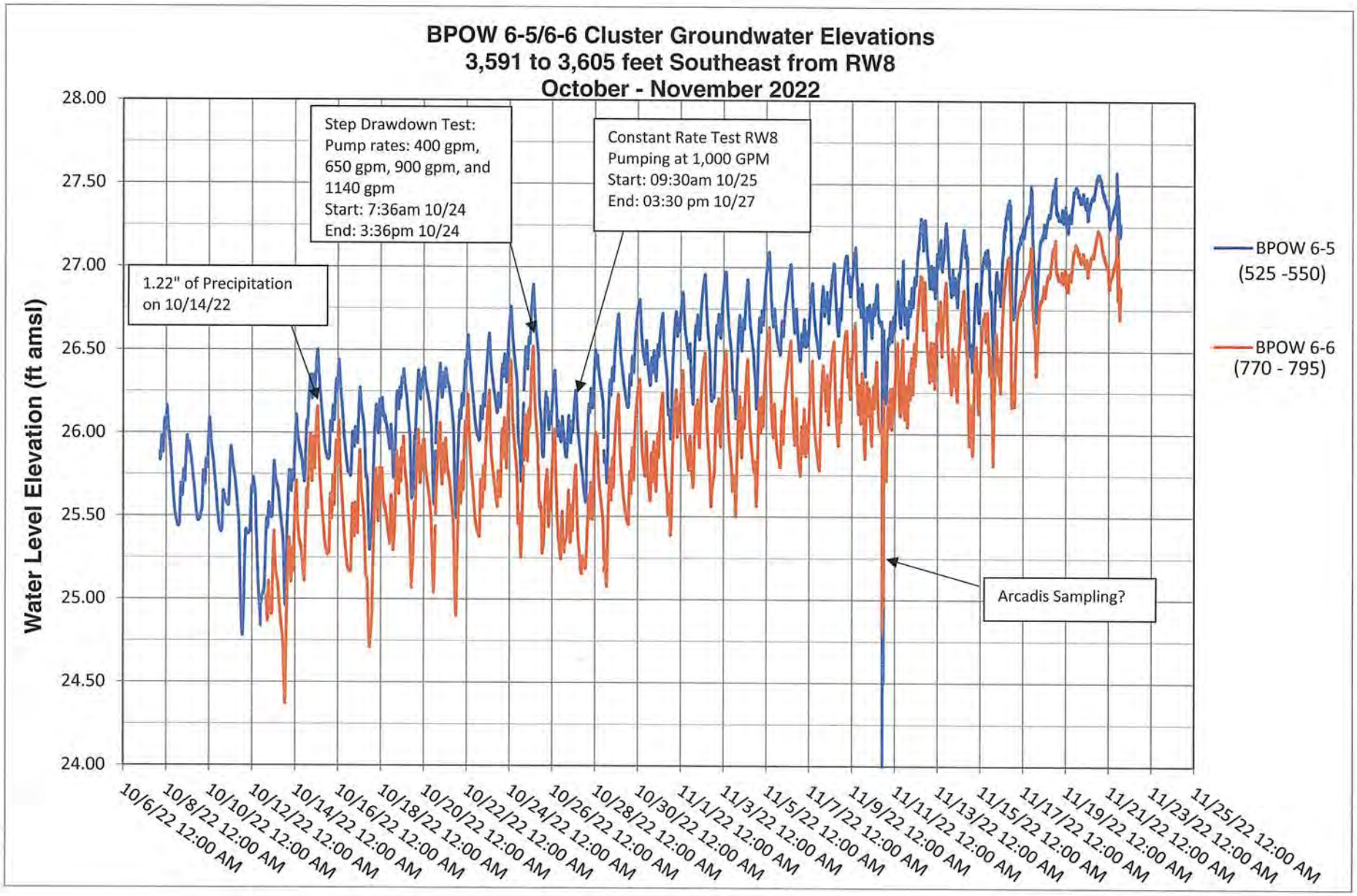

BPOW 6-3/6-4 Cluster Groundwater Elevations
3,006 to 3,013 feet Southeast of RW8
October 2022
Water Level Elevation (ft amsl)
28.00
27.50
27.00
26.50
26.00
25.50
25.00
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RW8 Pump on to discharge carbon
BPOW 6-3
(750 - 775)
(545 - 570)
BPOW 6-4
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

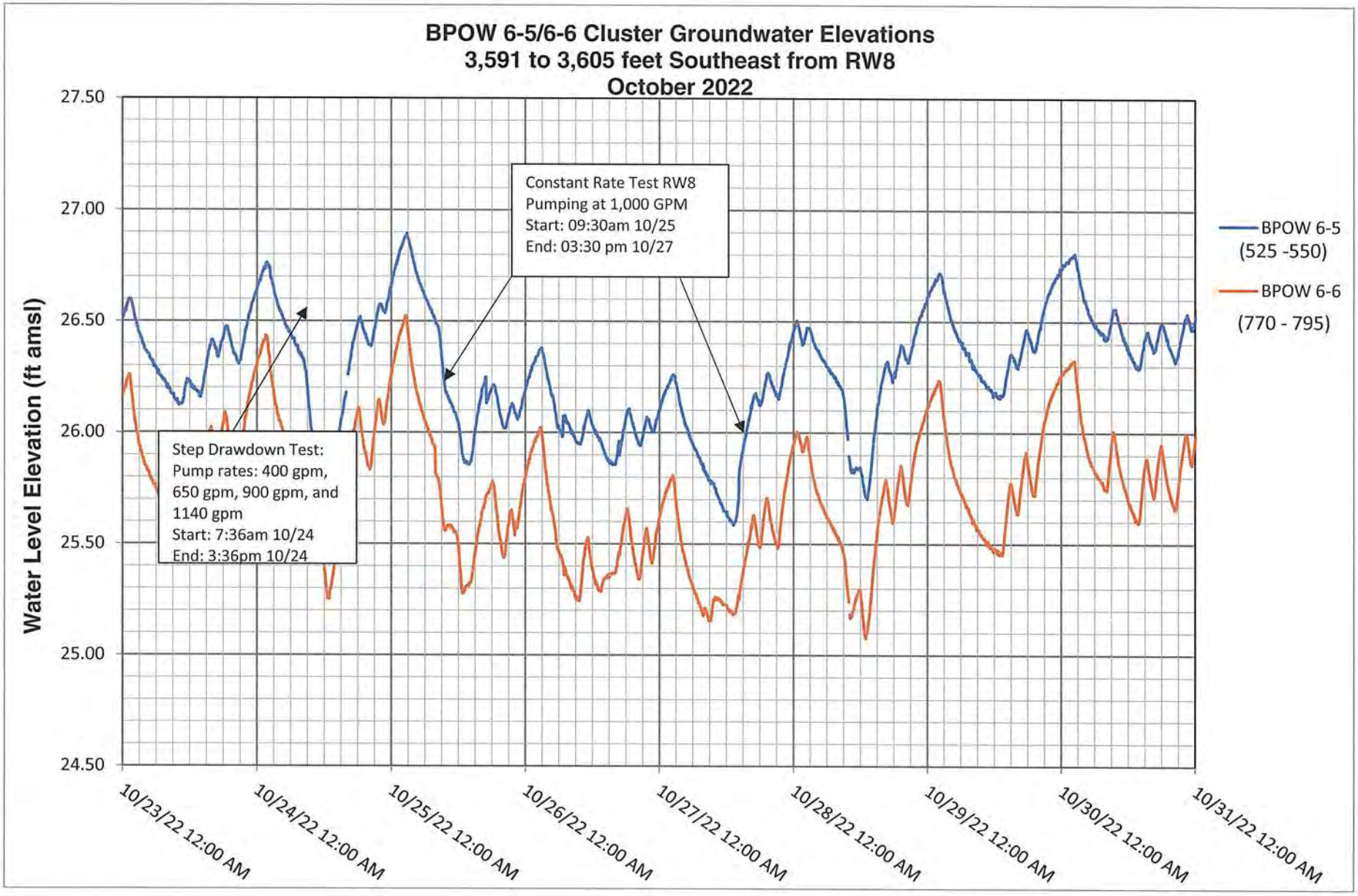

BPOW 6-1/6-2 Groundwater Elevations
2,681 to 2,706 feet Southeast of RW8
October - November 2022
Water Level Elevation (ft amsl)
27.00
26.50
26.00
25.50
25.00
24.50
24.00
23.50
23.00
Step Drawdown Test:
Pump rates: 400 gpm,
650 gpm, 900 gpm, and
1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
1.22" of Precipitation
on 10/14/22
Arcadis Sampling?
BPOW 6-2
(755 - 780)
BPOW 6-1
(550 - 575)
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM
11/23/22 12:00 AM
11/25/22 12:00 AM

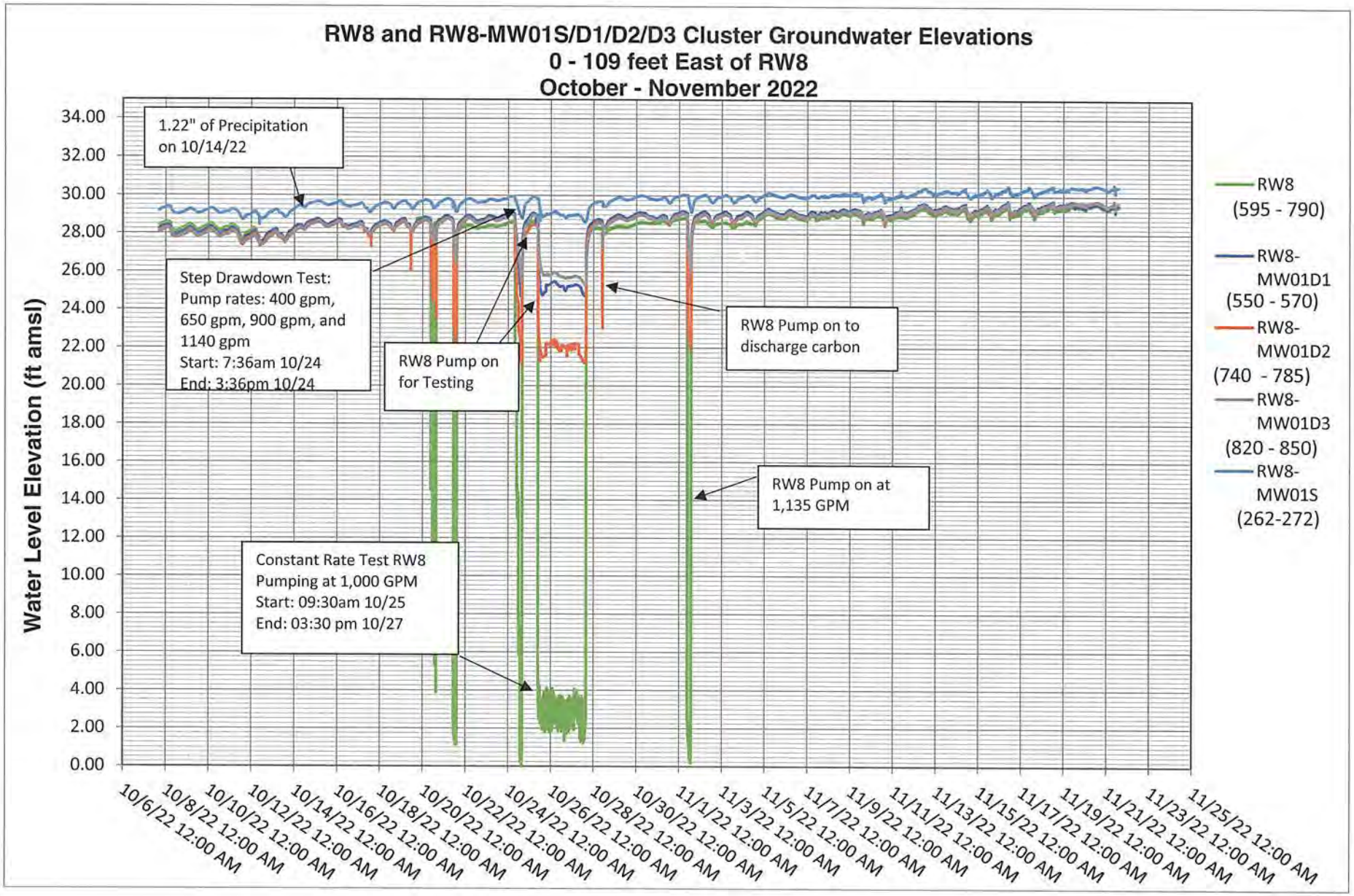

BPOW 6-1/6-2 Groundwater Elevations
2,681 to 2,706 feet Southeast of RW8
October 2022
Water Level Elevation (ft amsl)
27.00
26.50
26.00
25.50
25.00
24.50
24.00
23.50
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
BPOW 6-2 (755 - 780)
BPOW 6-1 (550 - 575)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

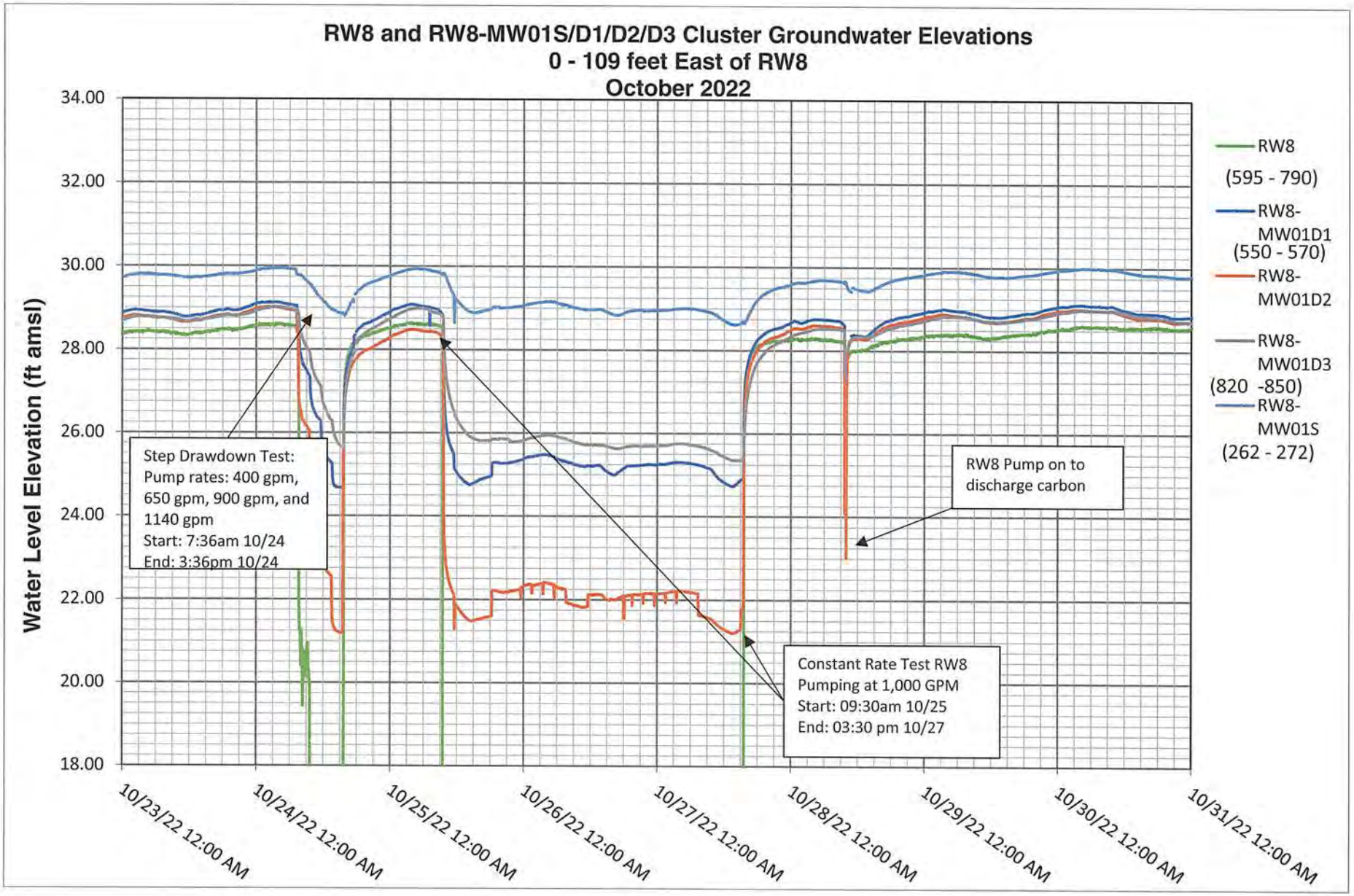

DECHC05-MW-01 Groundwater Elevations
2,066 feet South of RW8
October - November 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
1.22" of Precipitation on 10/14/22
Constant Rate Test RW8 Pumping at 1,000 GPM Start: 09:30am 10/25 End: 03:30 pm 10/27
Step Drawdown Test: Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm Start: 7:36am 10/24 End: 3:36pm 10/24
RW8 Pump on to discharge carbon
DECHC05-MW-01
(950 - 970)
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM
11/23/22 12:00 AM
11/25/22 12:00 AM


DECHC05-MW-01 Groundwater Elevations
2,066 feet South of RW8
October 2022
Water Level Elevation (ft amsl)
29.00
28.50
28.00
27.50
27.00
26.50
26.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
RW8 Pump on to discharge carbon
DECHC05-MW-01 (950 - 970)
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM

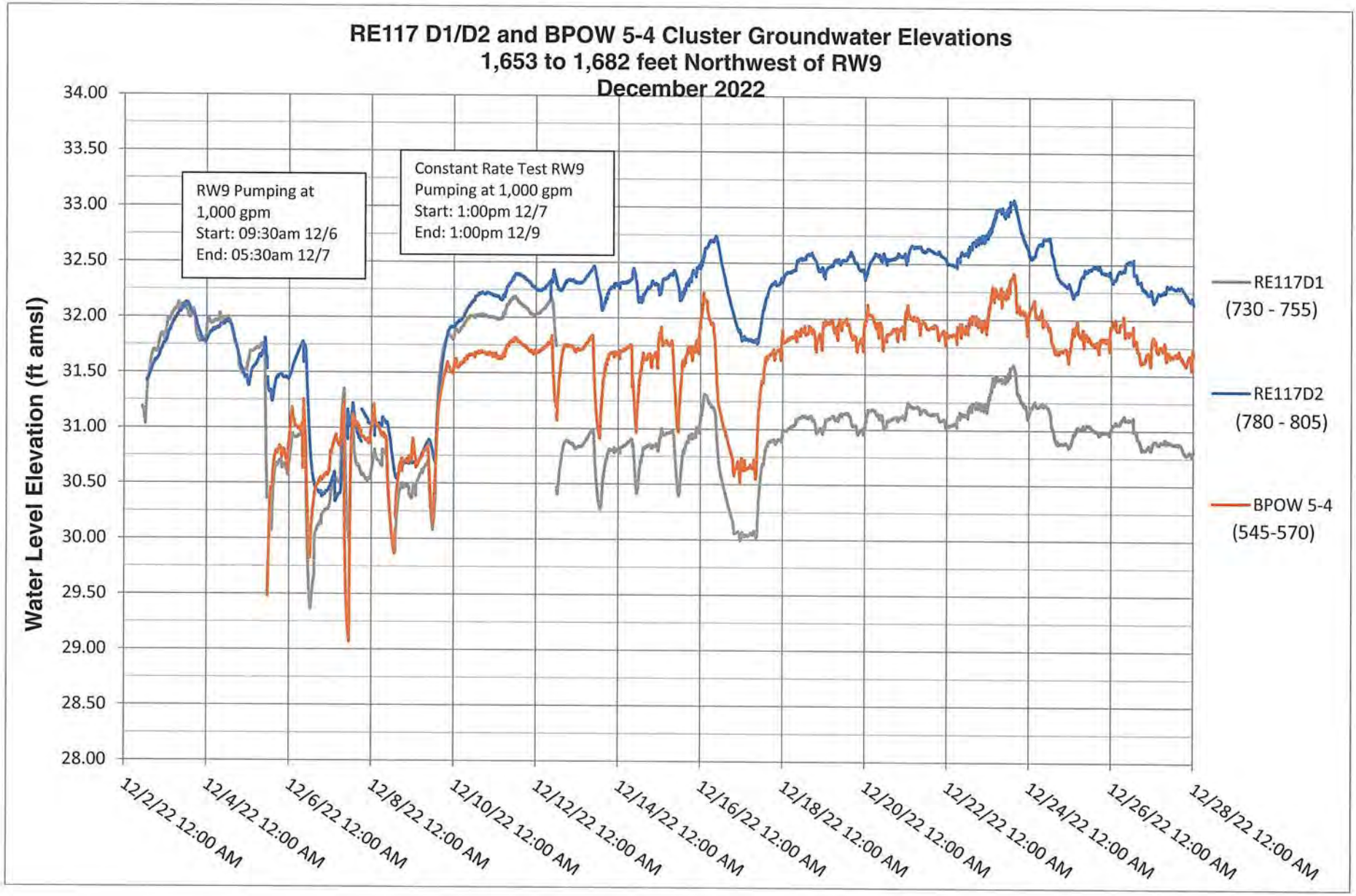

BPOW 6-5/6-6 Cluster Groundwater Elevations
3,591 to 3,605 feet Southeast from RW8
October - November 2022
Water Level Elevation (ft amsl)
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
1.22" of Precipitation on 10/14/22
Arcadis Sampling?
BPOW 6-5 (525 -550)
BPOW 6-6 (770 - 795)
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM
11/23/22 12:00 AM
11/25/22 12:00 AM

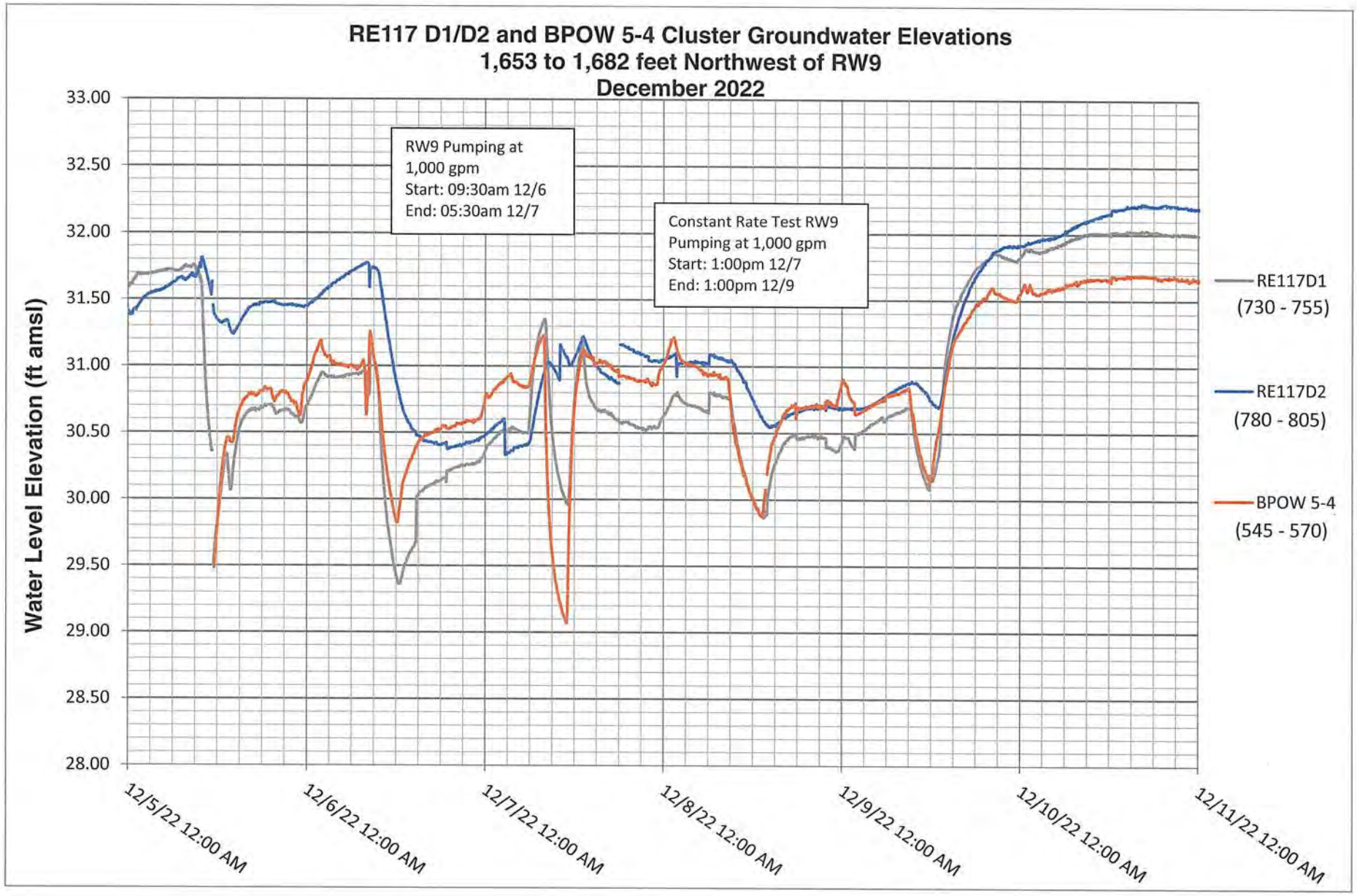

BPOW 6-5/6-6 Cluster Groundwater Elevations
3,591 to 3,605 feet Southeast from RW8
October 2022
Water Level Elevation (ft amsl)
27.50
27.00
26.50
26.00
25.50
25.00
24.50
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27
Step Drawdown Test:
Pump rates: 400 gpm,
650 gpm, 900 gpm, and
1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
BPOW 6-5
(525 -550)
BPOW 6-6
(770 - 795)

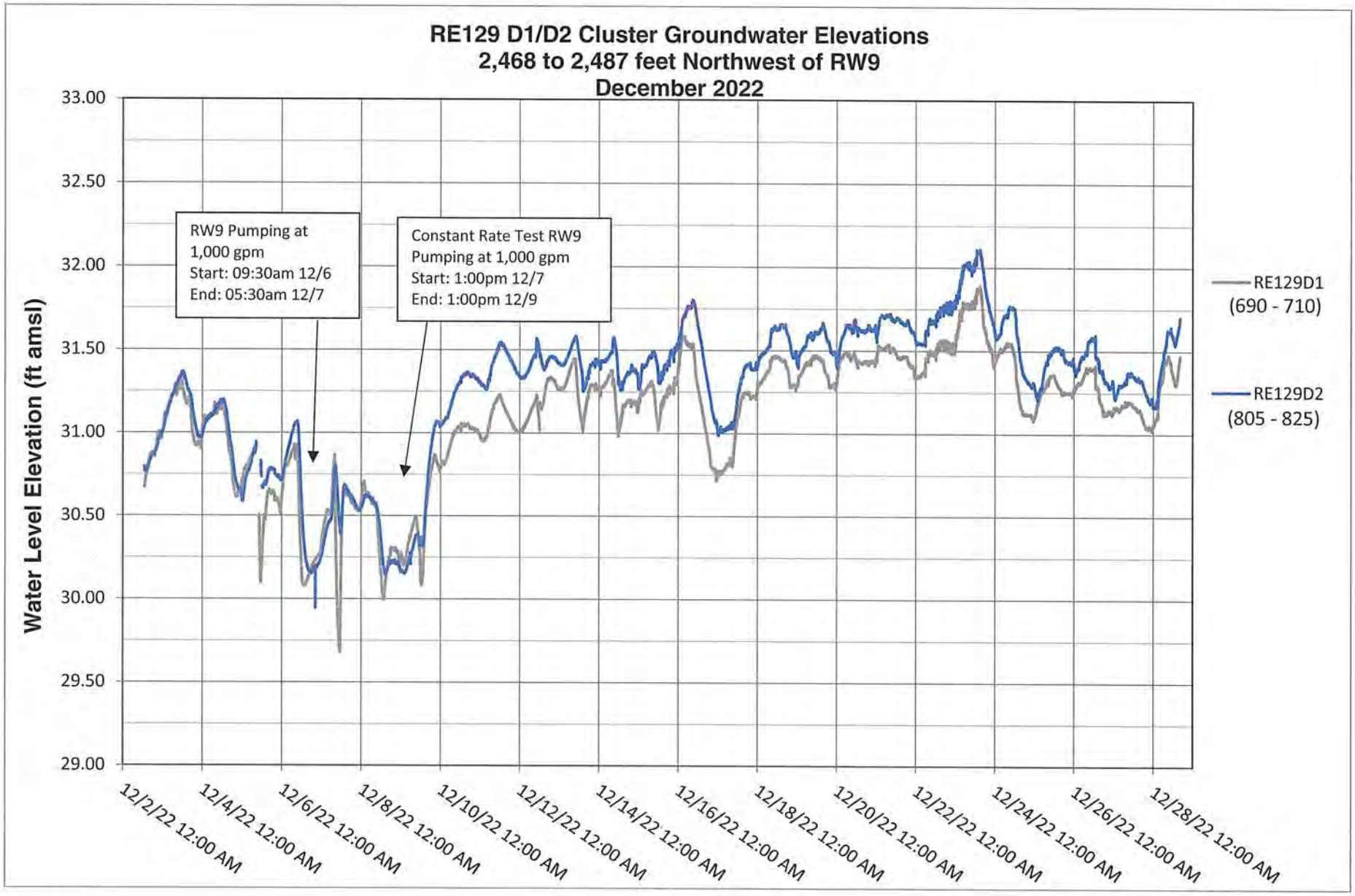

RW8 and RW8-MW01S/D1/D2/D3 Cluster Groundwater Elevations
0 - 109 feet East of RW8
October - November 2022
Water Level Elevation (ft amsl)
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1.22" of Precipitation on 10/14/22
Step Drawdown Test: Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm Start: 7:36am 10/24 End: 3:36pm 10/24
RW8 Pump on for Testing
RW8 Pump on to discharge carbon
RW8 Pump on at 1,135 GPM
Constant Rate Test RW8 Pumping at 1,000 GPM Start: 09:30am 10/25 End: 03:30 pm 10/27
10/6/22 12:00 AM
10/8/22 12:00 AM
10/10/22 12:00 AM
10/12/22 12:00 AM
10/14/22 12:00 AM
10/16/22 12:00 AM
10/18/22 12:00 AM
10/20/22 12:00 AM
10/22/22 12:00 AM
10/24/22 12:00 AM
10/26/22 12:00 AM
10/28/22 12:00 AM
10/30/22 12:00 AM
11/1/22 12:00 AM
11/3/22 12:00 AM
11/5/22 12:00 AM
11/7/22 12:00 AM
11/9/22 12:00 AM
11/11/22 12:00 AM
11/13/22 12:00 AM
11/15/22 12:00 AM
11/17/22 12:00 AM
11/19/22 12:00 AM
11/21/22 12:00 AM
11/23/22 12:00 AM
11/25/22 12:00 AM
RW8 (595 - 790)
RW8-MW01D1 (550 - 570)
RW8-MW01D2 (740 - 785)
RW8-MW01D3 (820 - 850)
RW8-MW01S (262-272)

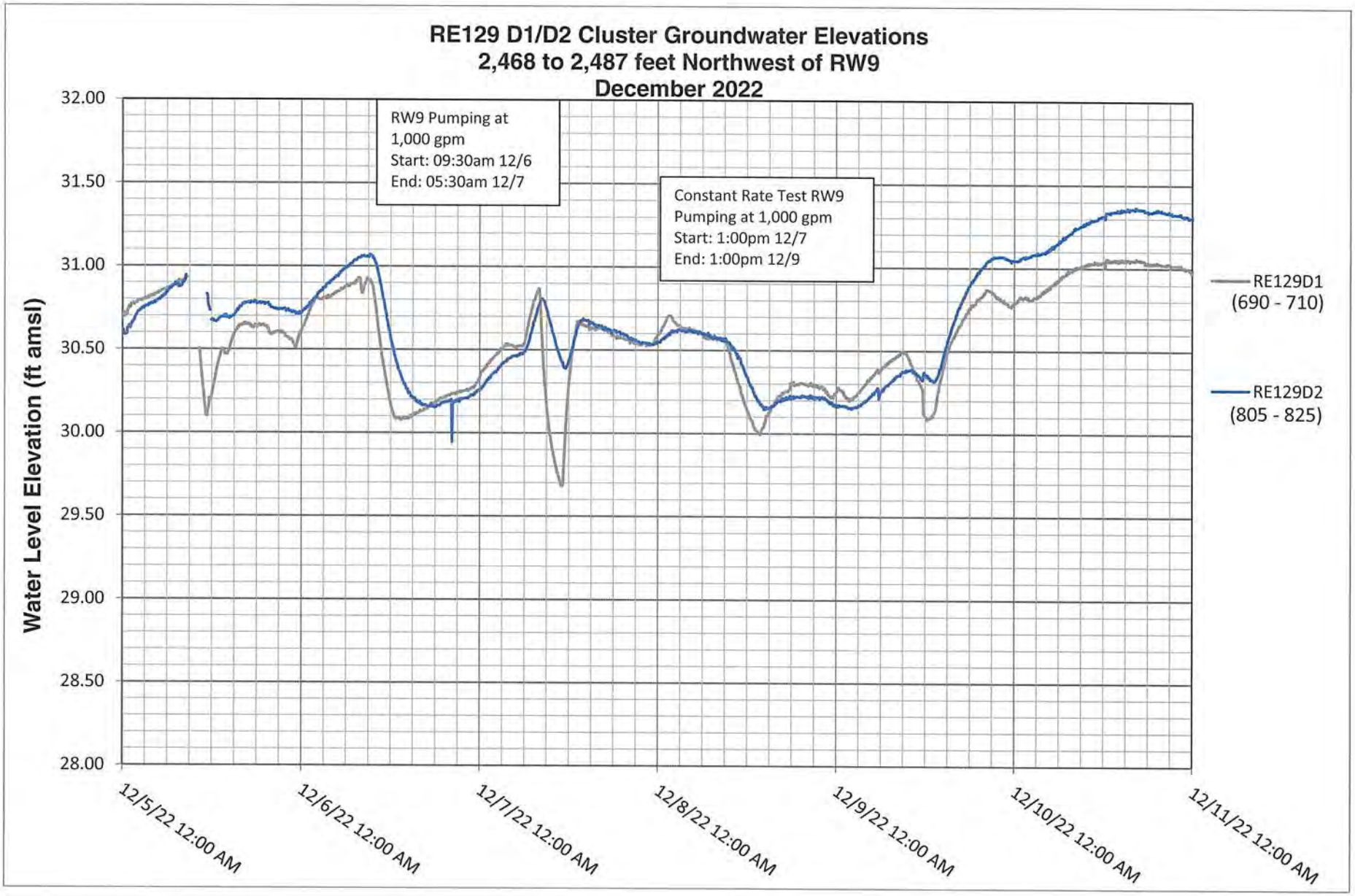

RW8 and RW8-MW01S/D1/D2/D3 Cluster Groundwater Elevations
0 - 109 feet East of RW8
October 2022
Water Level Elevation (ft amsl)
34.00
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
10/23/22 12:00 AM
10/24/22 12:00 AM
10/25/22 12:00 AM
10/26/22 12:00 AM
10/27/22 12:00 AM
10/28/22 12:00 AM
10/29/22 12:00 AM
10/30/22 12:00 AM
10/31/22 12:00 AM
RW8
(595 - 790)
RW8-MW01D1
(550 - 570)
RW8-MW01D2
RW8-MW01D3
(820 -850)
RW8-MW01S
(262 - 272)
Step Drawdown Test:
Pump rates: 400 gpm, 650 gpm, 900 gpm, and 1140 gpm
Start: 7:36am 10/24
End: 3:36pm 10/24
RW8 Pump on to discharge carbon
Constant Rate Test RW8
Pumping at 1,000 GPM
Start: 09:30am 10/25
End: 03:30 pm 10/27

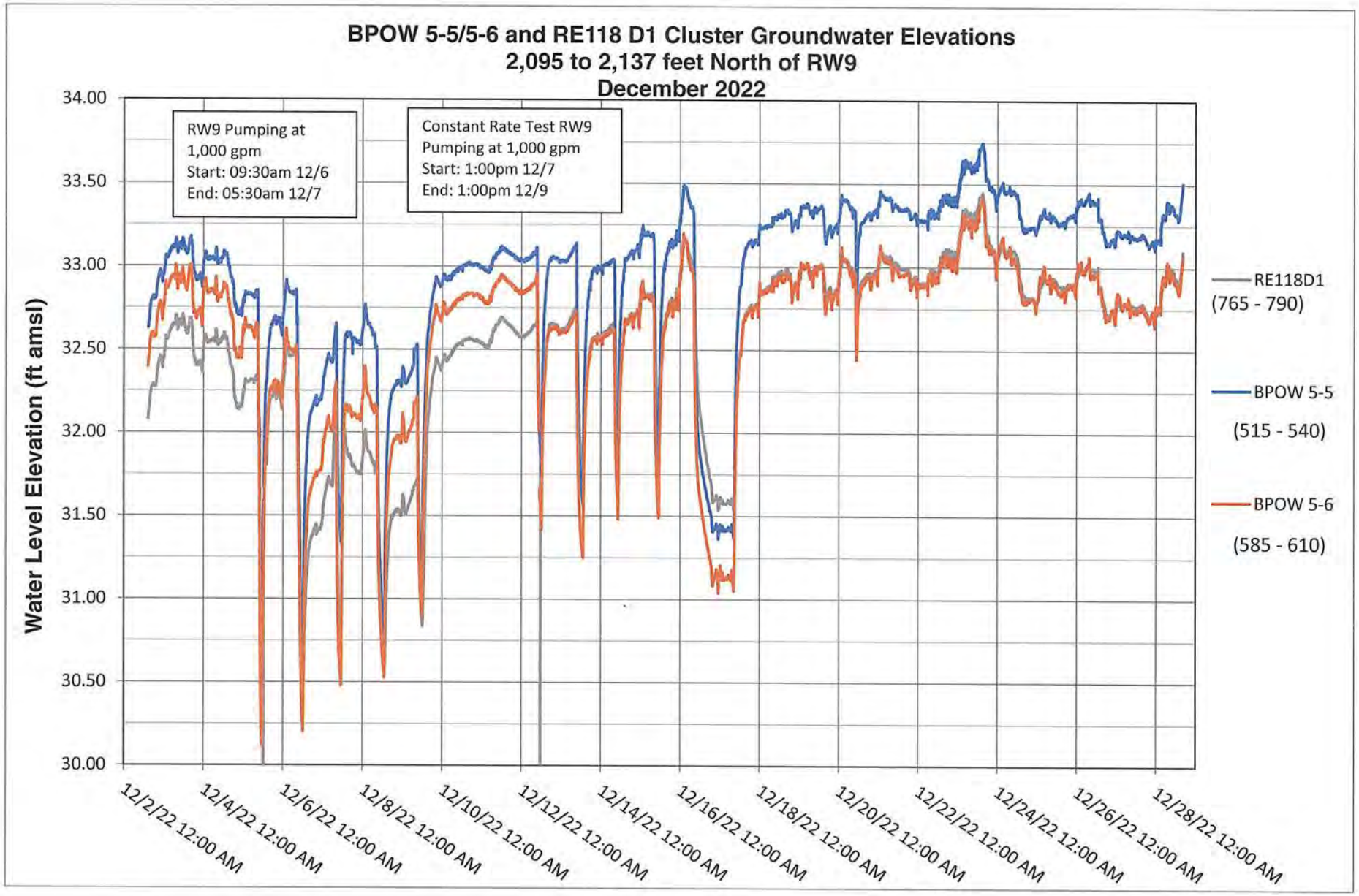
ATTACHMENT B.2 – RW9 PUMPING TEST GRAPHS

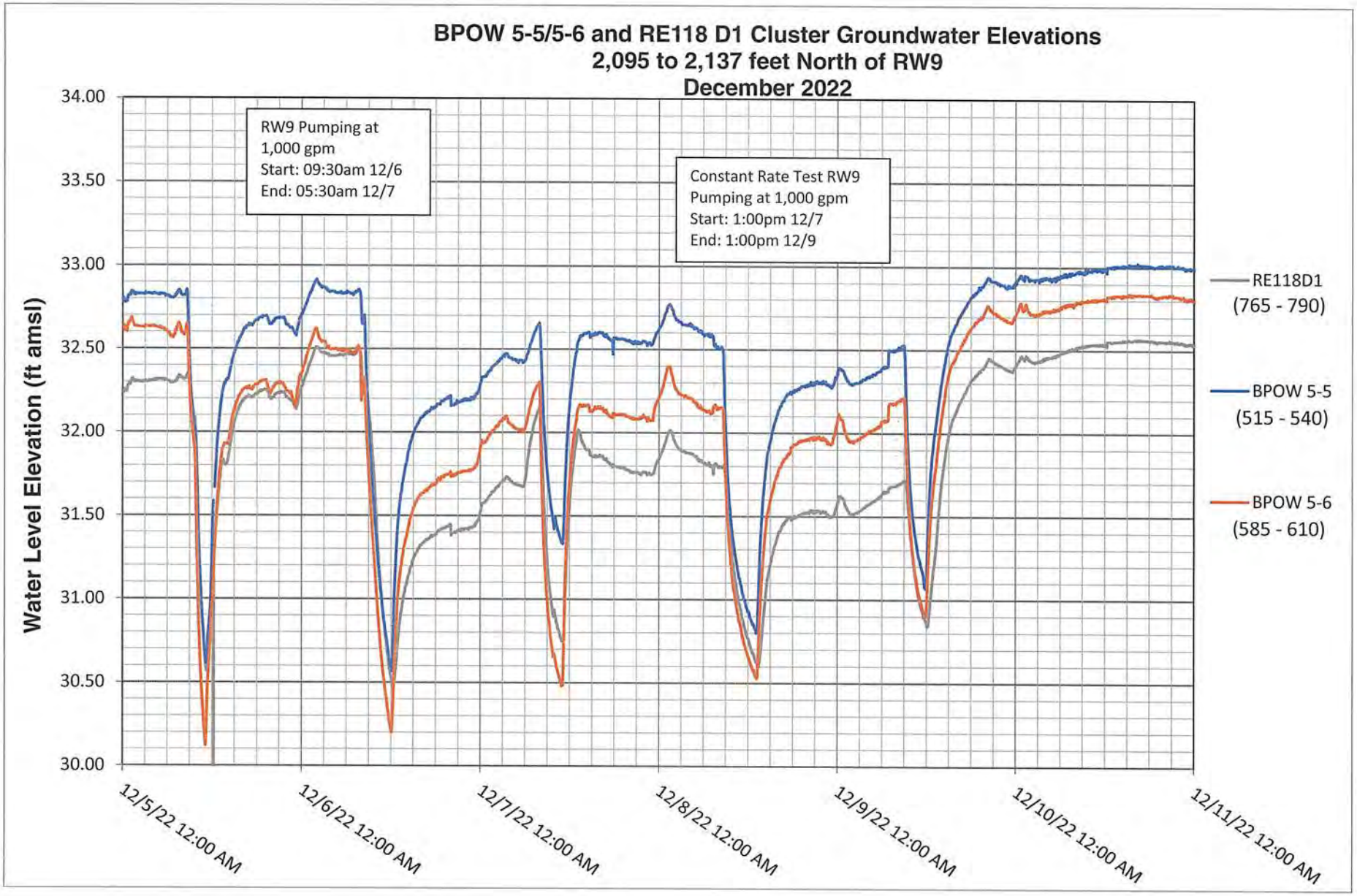

RE117 D1/D2 and BPOW 5-4 Cluster Groundwater Elevations
1,653 to 1,682 feet Northwest of RW9
December 2022
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RE117D1
(730 - 755)
RE117D2
(780 - 805)
BPOW 5-4
(545-570)

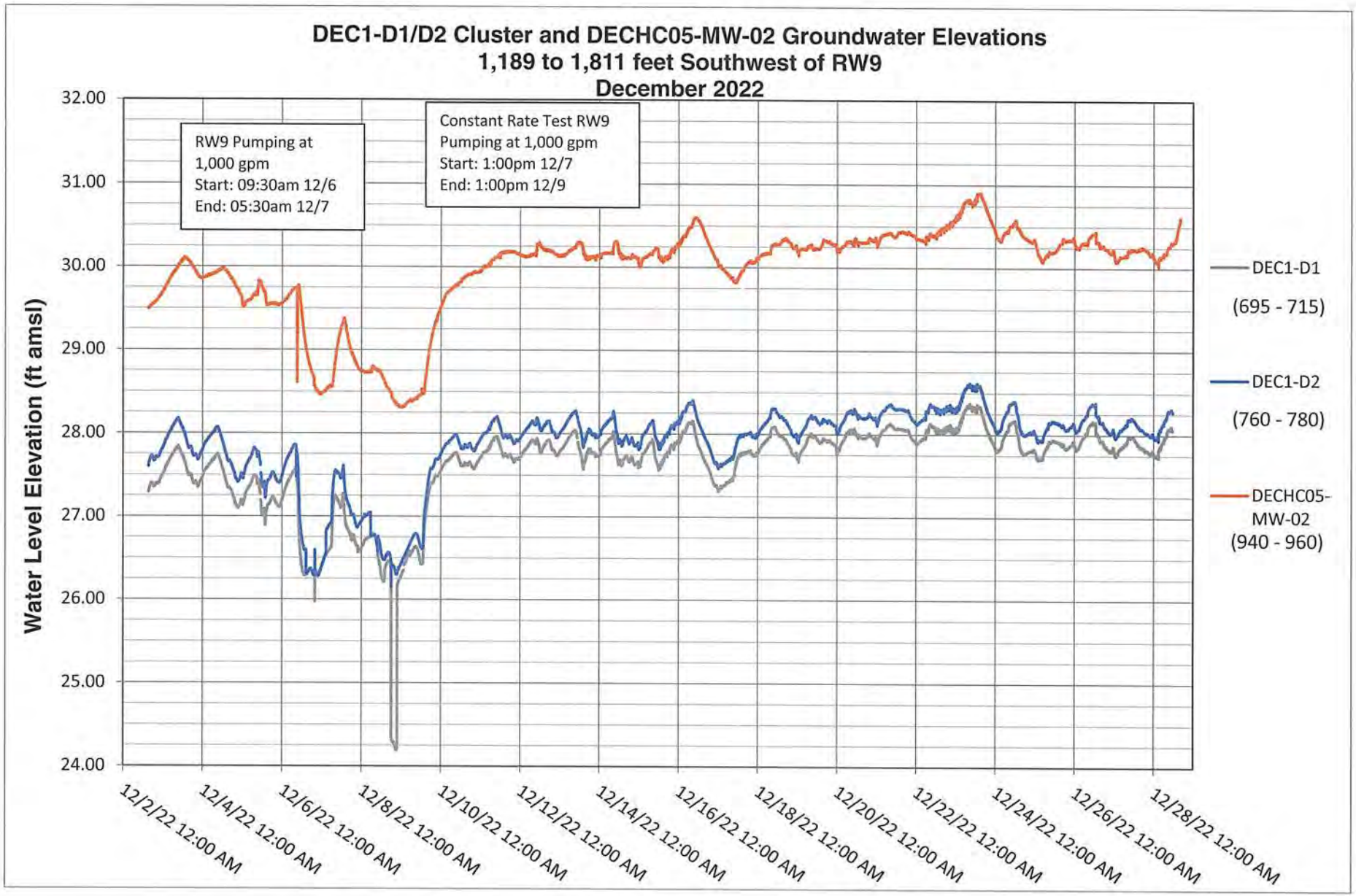

RE117 D1/D2 and BPOW 5-4 Cluster Groundwater Elevations
1,653 to 1,682 feet Northwest of RW9
December 2022
Water Level Elevation (ft amsl)
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
RE117D1
(730 - 755)
RE117D2
(780 - 805)
BPOW 5-4
(545 - 570)

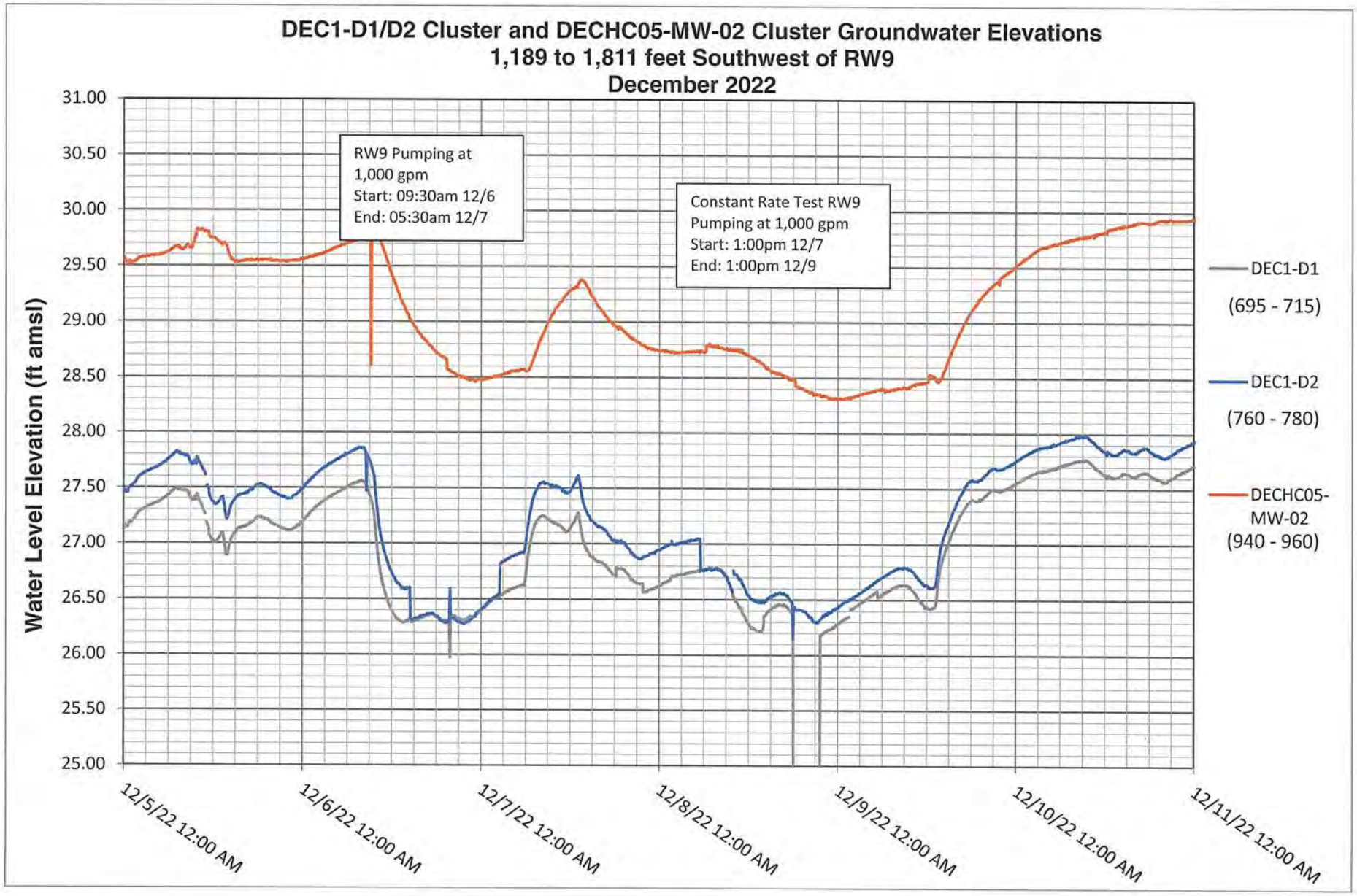

RE129 D1/D2 Cluster Groundwater Elevations
2,468 to 2,487 feet Northwest of RW9
December 2022
Water Level Elevation (ft amsl)
33.00
32.50
32.00
31.50
31.00
30.50
30.00
29.50
29.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RE129D1
(690 - 710)
RE129D2
(805 - 825)

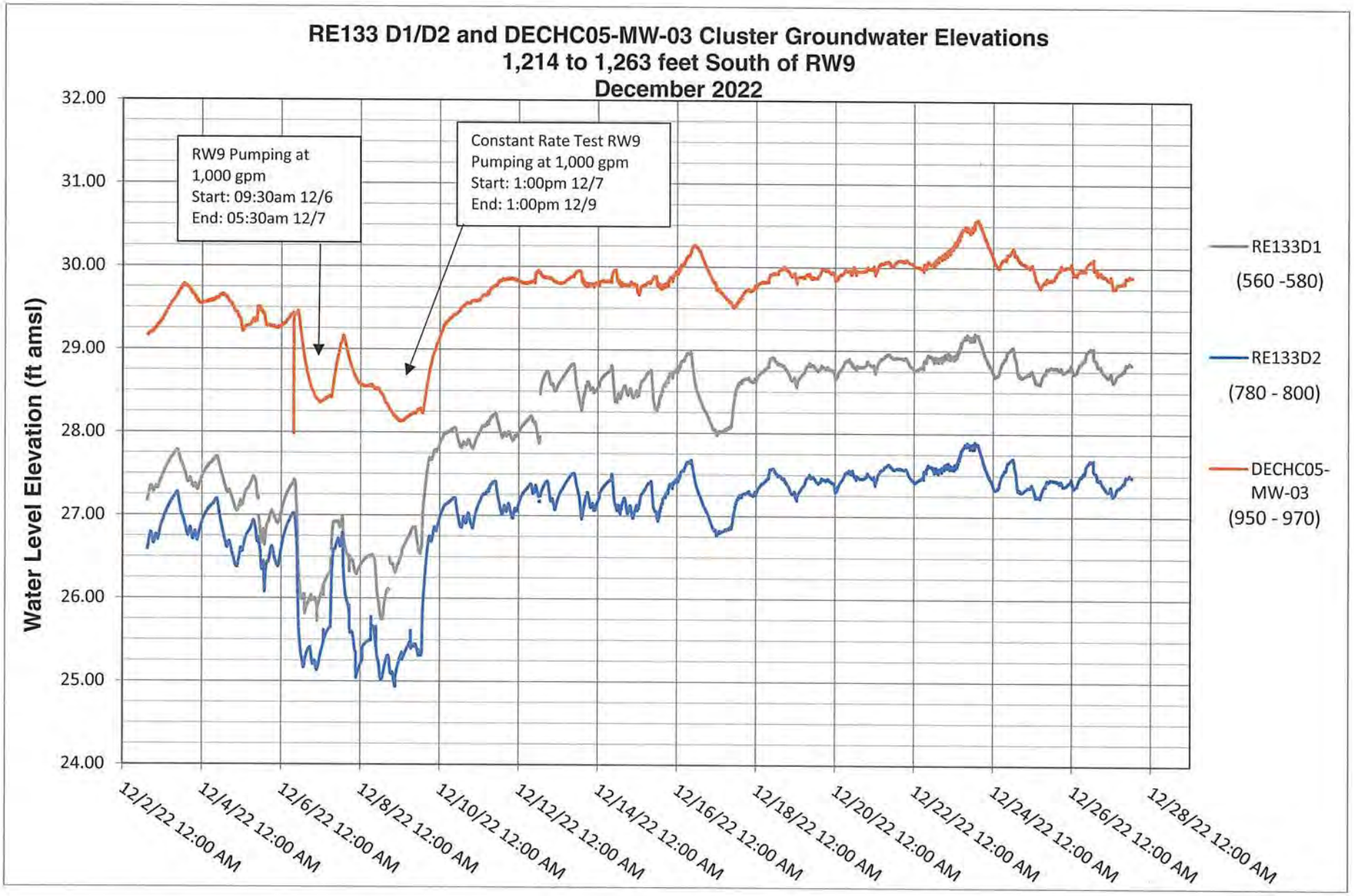

RE129 D1/D2 Cluster Groundwater Elevations
2,468 to 2,487 feet Northwest of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
32.00
31.50
31.00
30.50
30.00
29.50
29.00
28.50
28.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
RE129D1
(690 - 710)
RE129D2
(805 - 825)

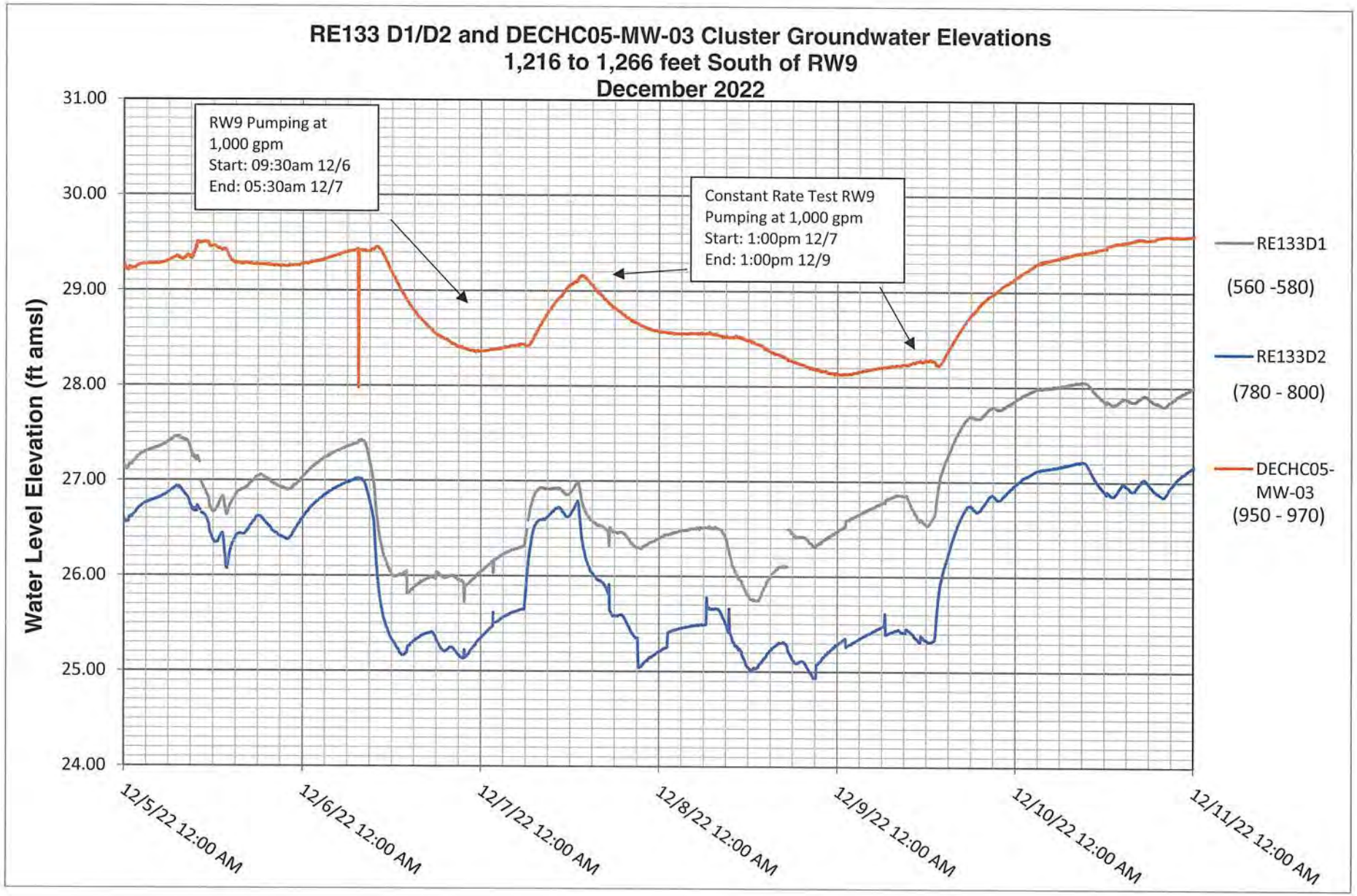

BPOW 5-5/5-6 and RE118 D1 Cluster Groundwater Elevations
2,095 to 2,137 feet North of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RE118D1
(765 - 790)
BPOW 5-5
(515 - 540)
BPOW 5-6
(585 - 610)

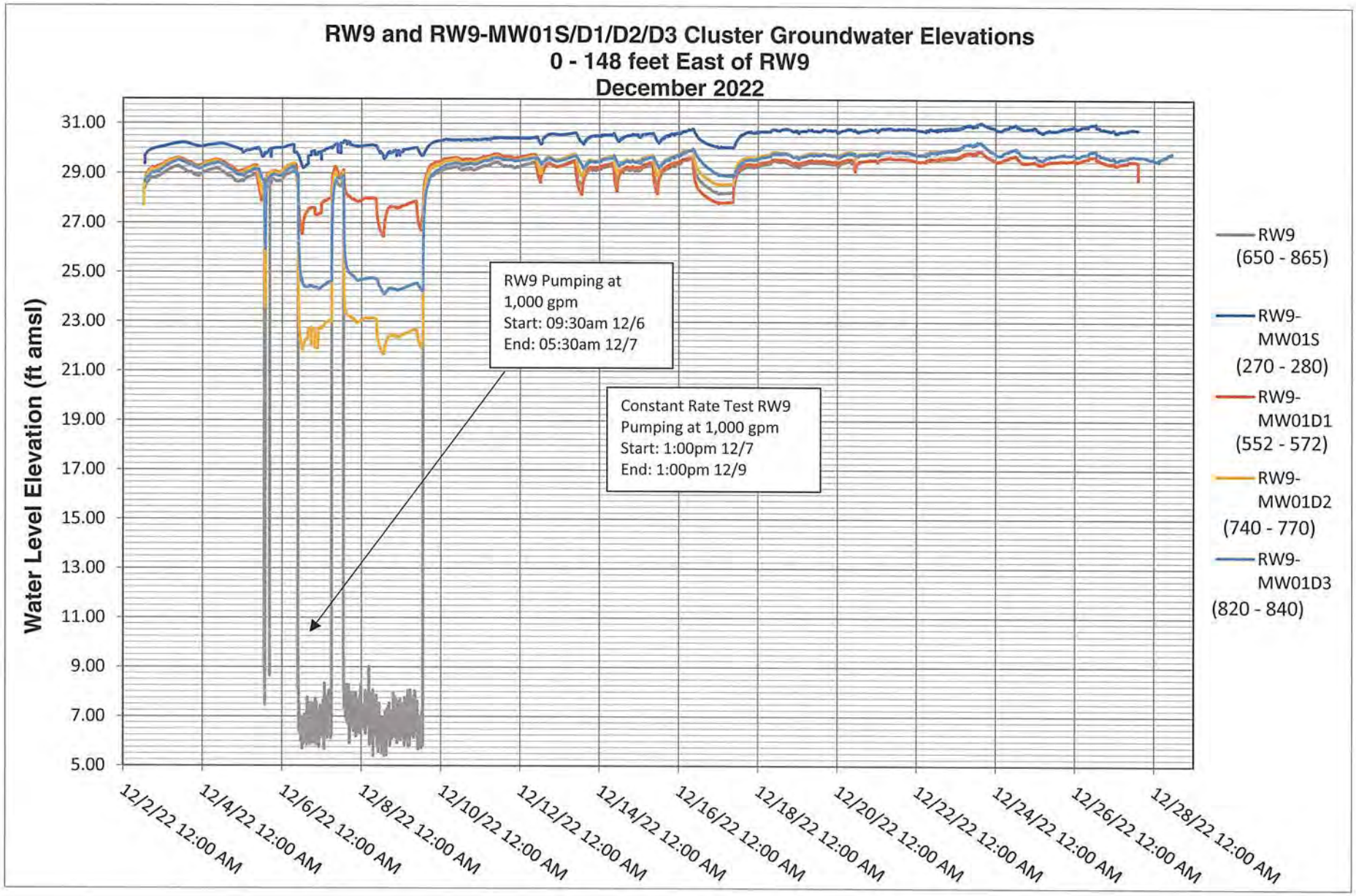

BPOW 5-5/5-6 and RE118 D1 Cluster Groundwater Elevations
2,095 to 2,137 feet North of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
34.00
33.50
33.00
32.50
32.00
31.50
31.00
30.50
30.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
RE118D1
(765 - 790)
BPOW 5-5
(515 - 540)
BPOW 5-6
(585 - 610)

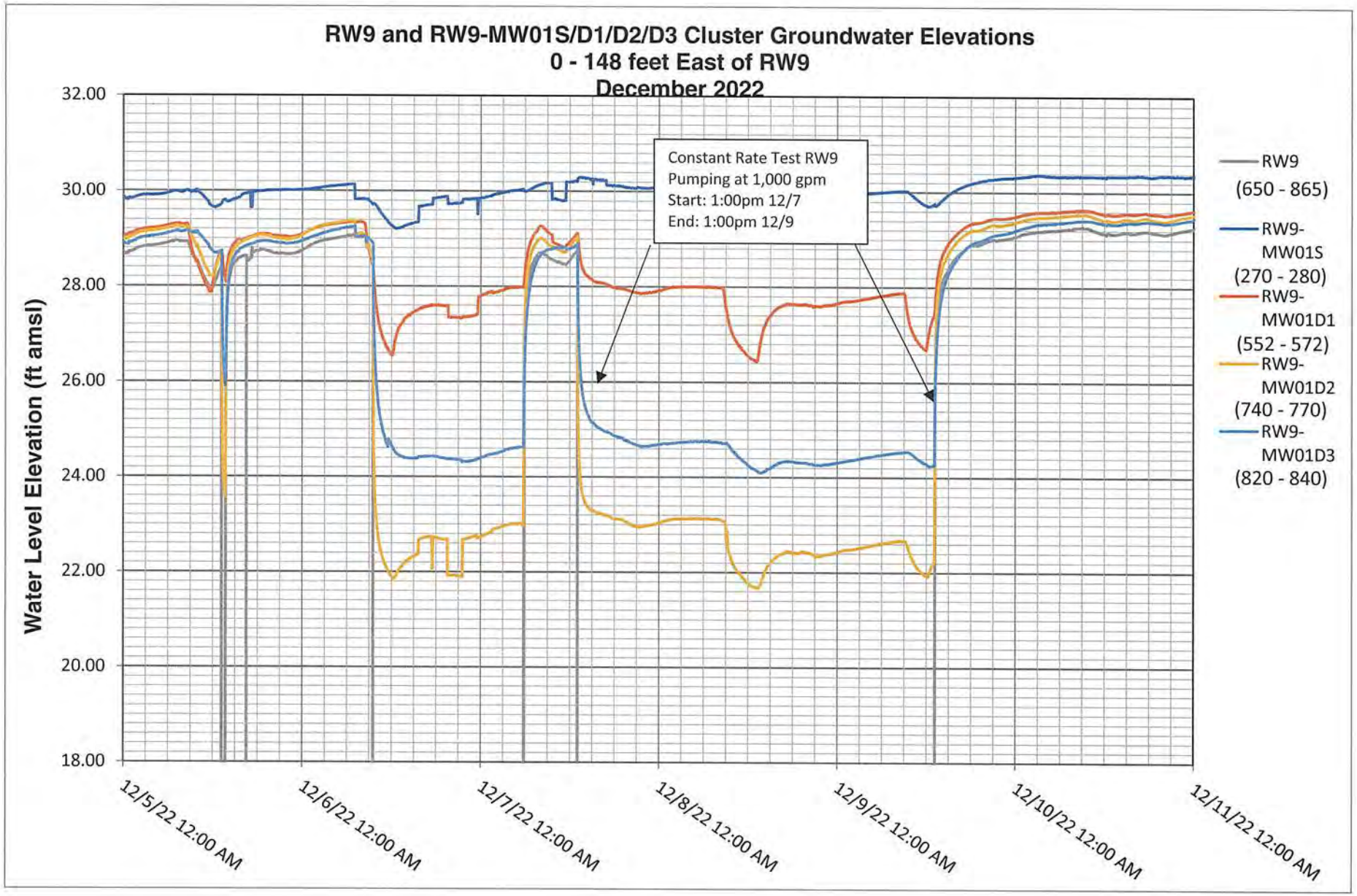

DEC1-D1/D2 Cluster and DECHC05-MW-02 Groundwater Elevations
1,189 to 1,811 feet Southwest of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
32.00
31.00
30.00
29.00
28.00
27.00
26.00
25.00
24.00
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
DEC1-D1
(695 - 715)
DEC1-D2
(760 - 780)
DECHC05-MW-02
(940 - 960)

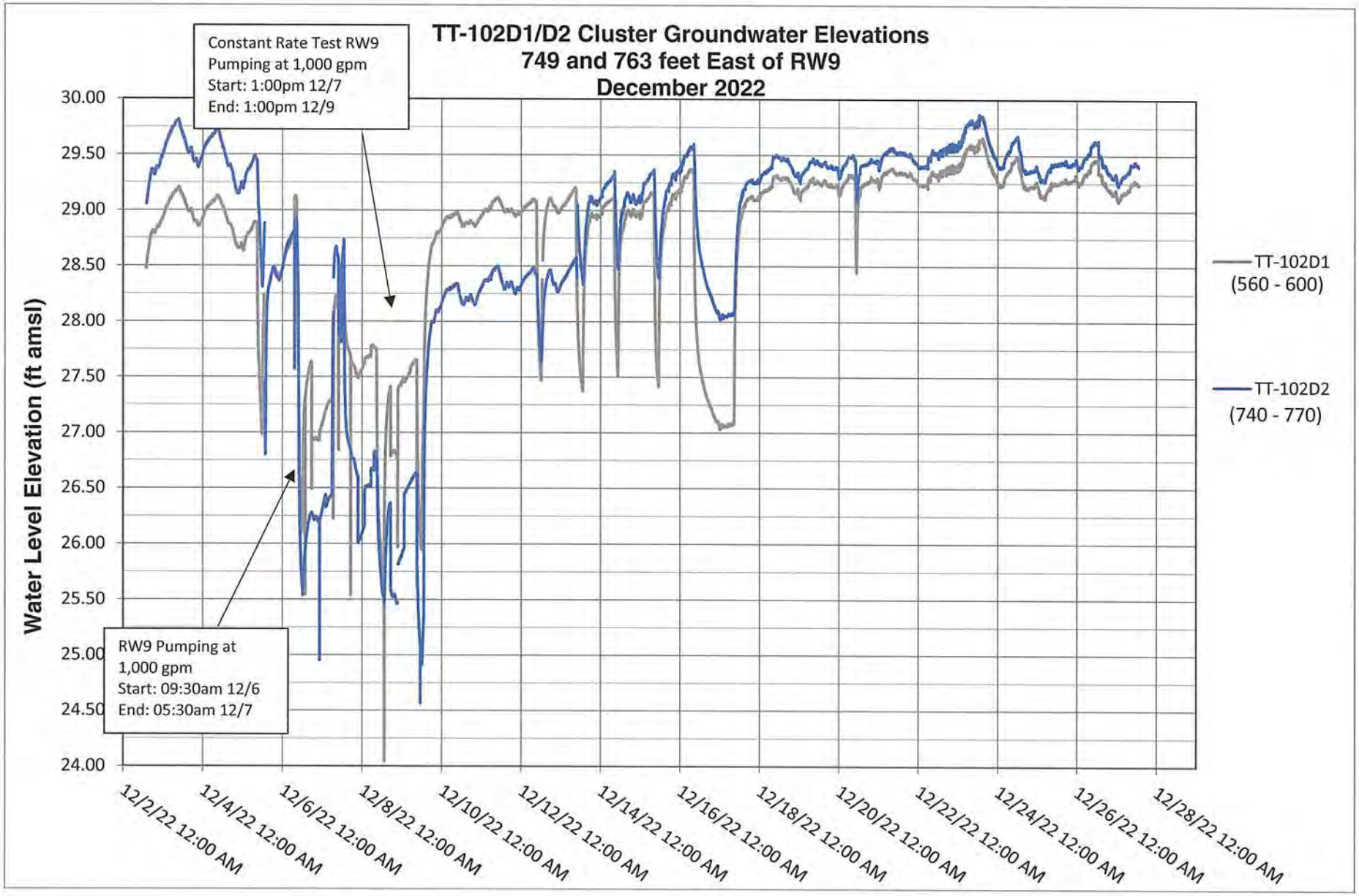

DEC1-D1/D2 Cluster and DECHC05-MW-02 Cluster Groundwater Elevations
1,189 to 1,811 feet Southwest of RW9
December 2022
Water Level Elevation (ft amsl)
31.00
30.50
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
DEC1-D1
(695 - 715)
DEC1-D2
(760 - 780)
DECHC05-
MW-02
(940 - 960)

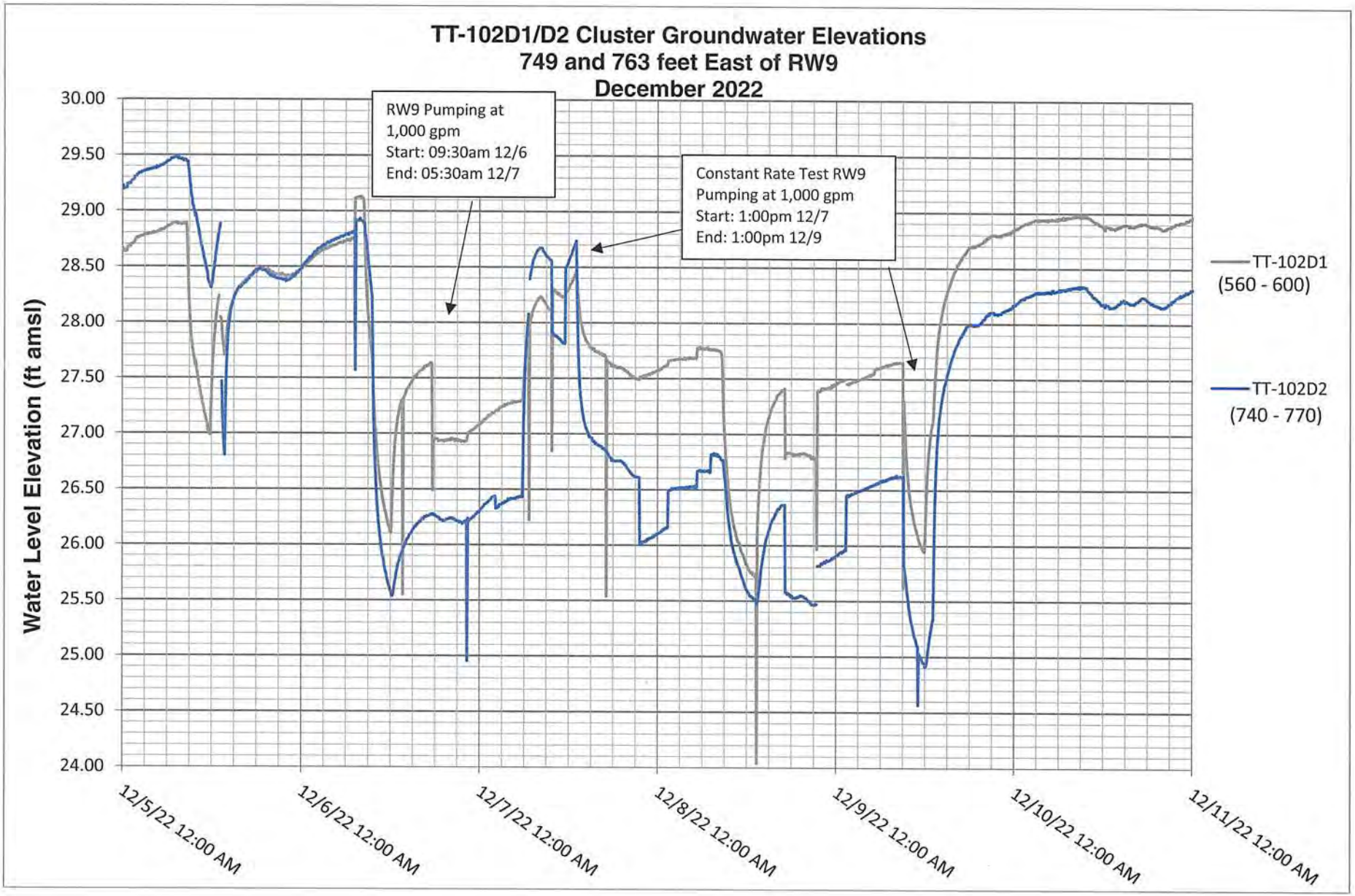

RE133 D1/D2 and DECHC05-MW-03 Cluster Groundwater Elevations
1,214 to 1,263 feet South of RW9
December 2022
Water Level Elevation (ft amsl)
32.00
31.00
30.00
29.00
28.00
27.00
26.00
25.00
24.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RE133D1
(560 -580)
RE133D2
(780 - 800)
DECHC05-
MW-03
(950 - 970)

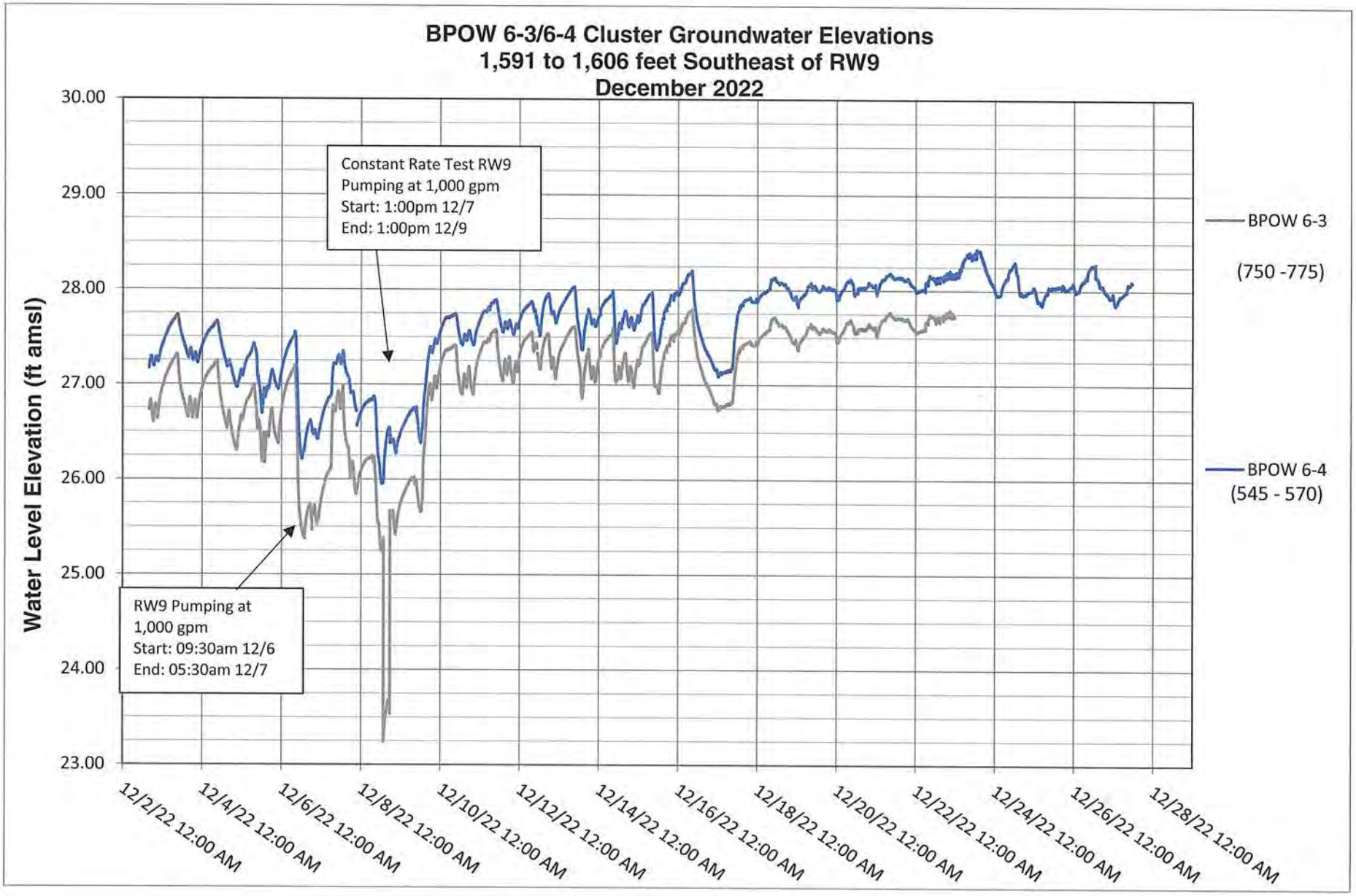

RE133 D1/D2 and DECHC05-MW-03 Cluster Groundwater Elevations
1,216 to 1,266 feet South of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
31.00
30.00
29.00
28.00
27.00
26.00
25.00
24.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
RE133D1
(560 -580)
RE133D2
(780 - 800)
DECHC05-
MW-03
(950 - 970)

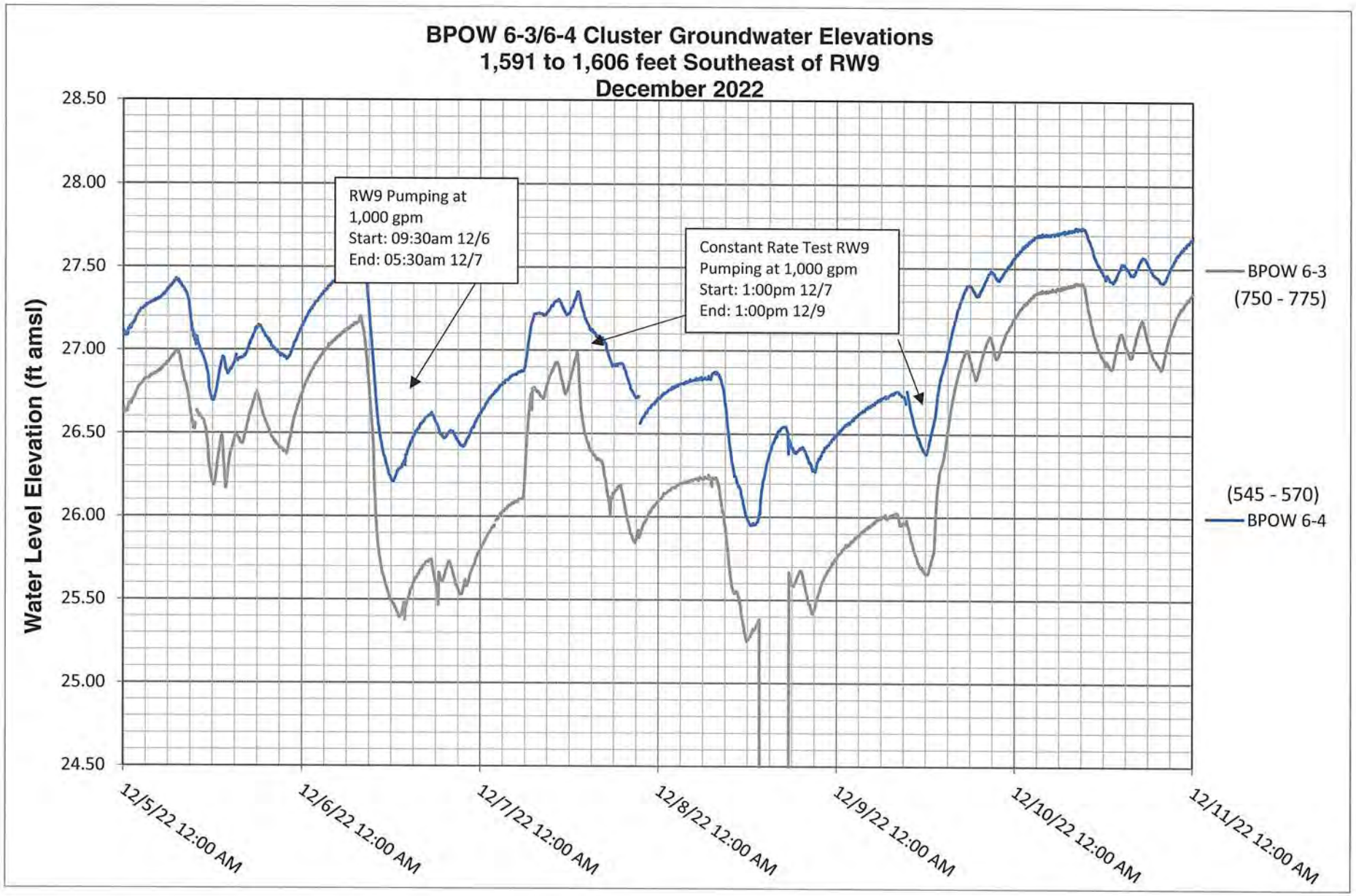

RW9 and RW9-MW01S/D1/D2/D3 Cluster Groundwater Elevations
0 - 148 feet East of RW9
December 2022
Water Level Elevation (ft amsl)
31.00
29.00
27.00
25.00
23.00
21.00
19.00
17.00
15.00
13.00
11.00
9.00
7.00
5.00
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9
(650 - 865)
RW9-
MW01S
(270 - 280)
RW9-
MW01D1
(552 - 572)
RW9-
MW01D2
(740 - 770)
RW9-
MW01D3
(820 - 840)

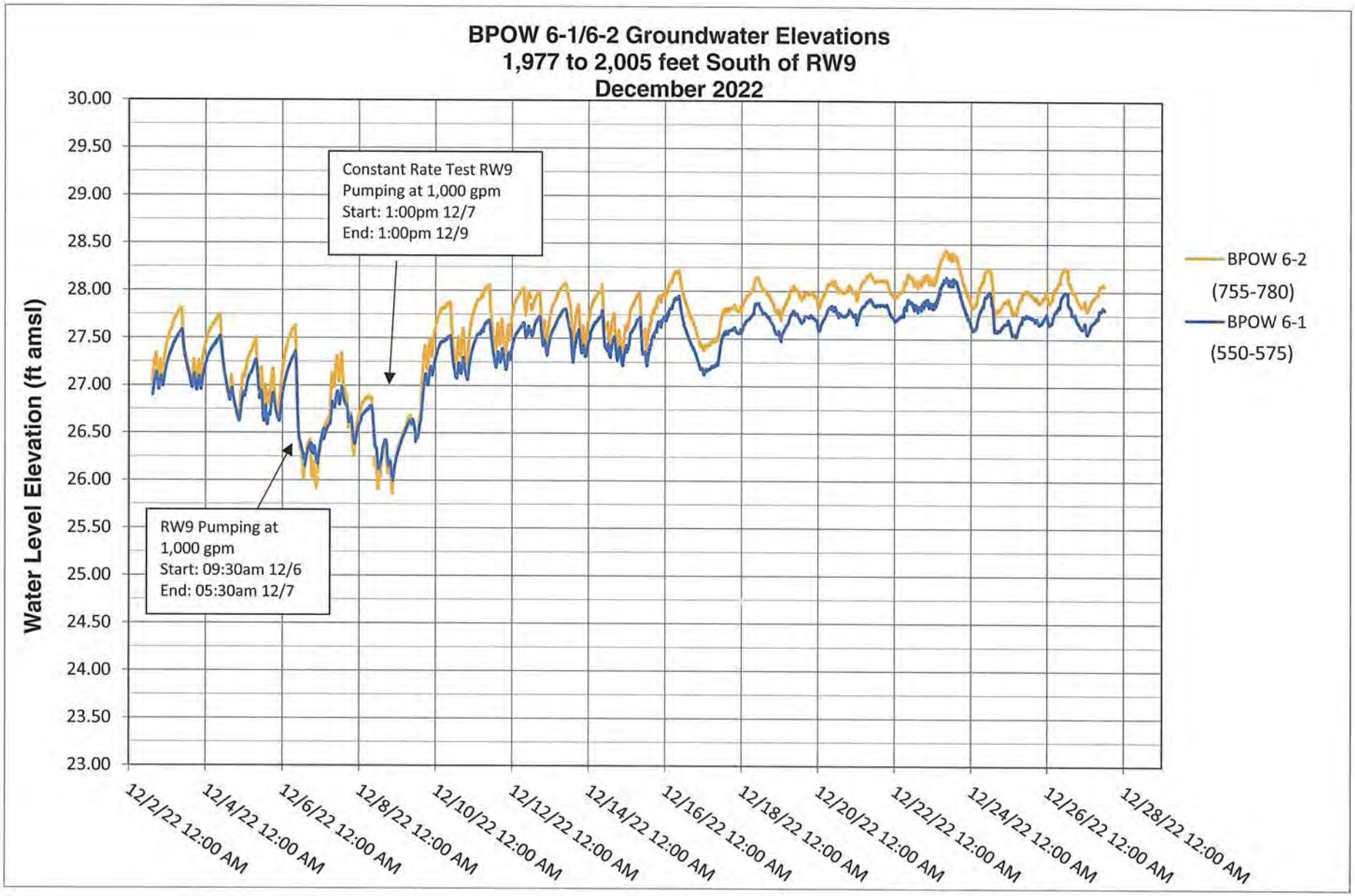

RW9 and RW9-MW01S/D1/D2/D3 Cluster Groundwater Elevations
0 - 148 feet East of RW9
December 2022
Water Level Elevation (ft amsl)
32.00
30.00
28.00
26.00
24.00
22.00
20.00
18.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 (650 - 865)
RW9-MW01S (270 - 280)
RW9-MW01D1 (552 - 572)
RW9-MW01D2 (740 - 770)
RW9-MW01D3 (820 - 840)

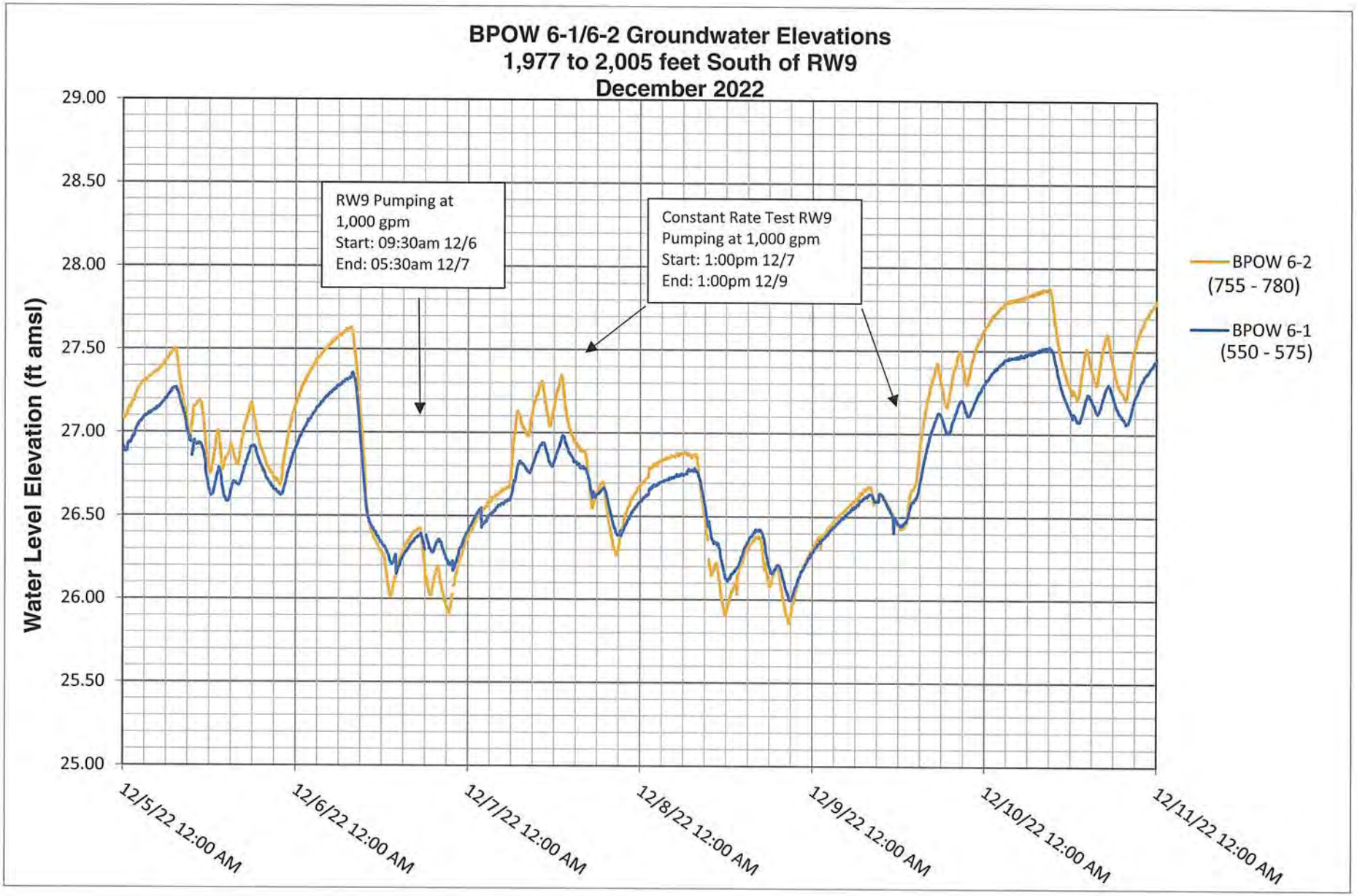

TT-102D1/D2 Cluster Groundwater Elevations
749 and 763 feet East of RW9
December 2022
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
TT-102D1
(560 - 600)
TT-102D2
(740 - 770)

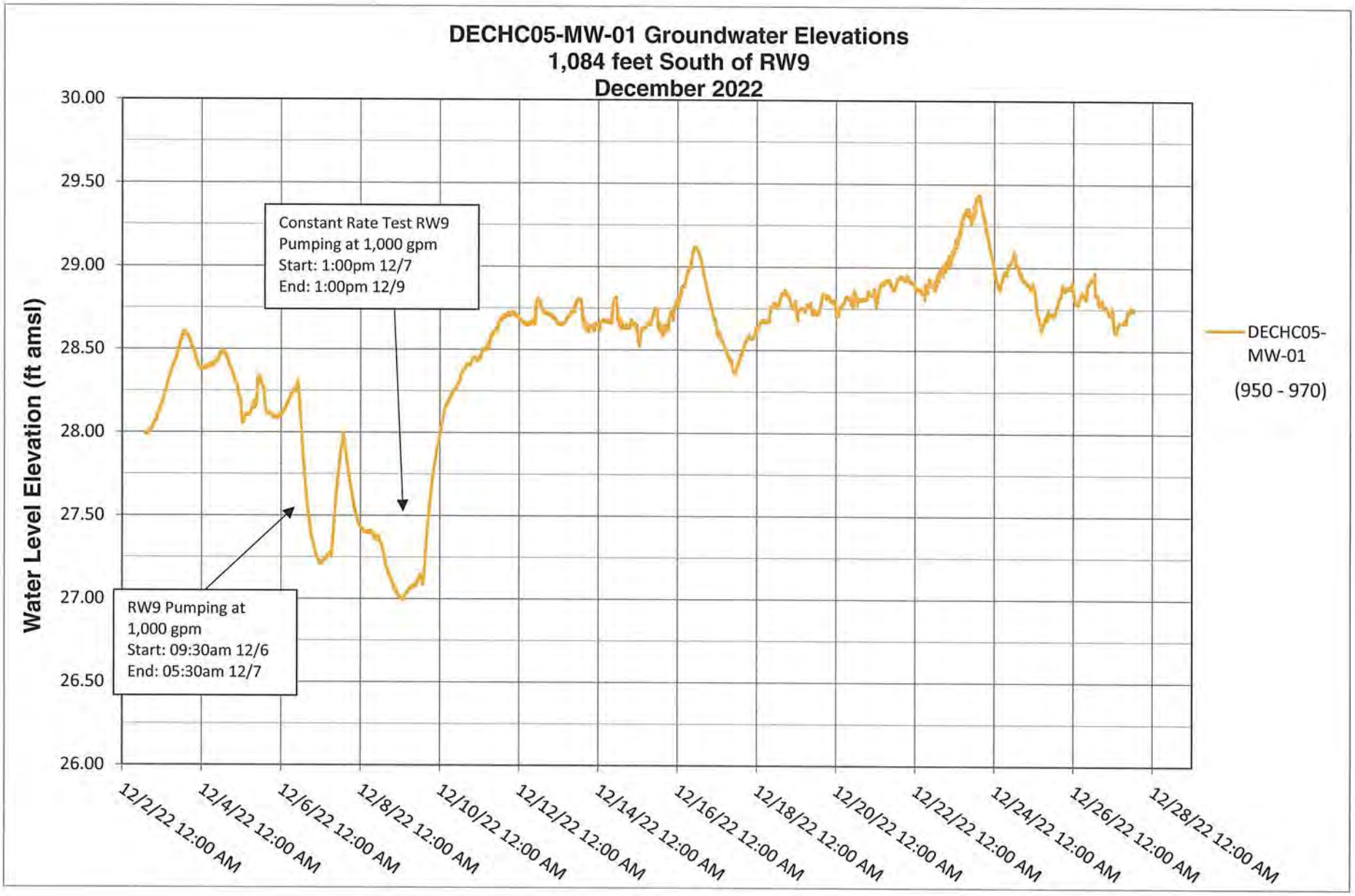

TT-102D1/D2 Cluster Groundwater Elevations
749 and 763 feet East of RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
TT-102D1
(560 - 600)
TT-102D2
(740 - 770)

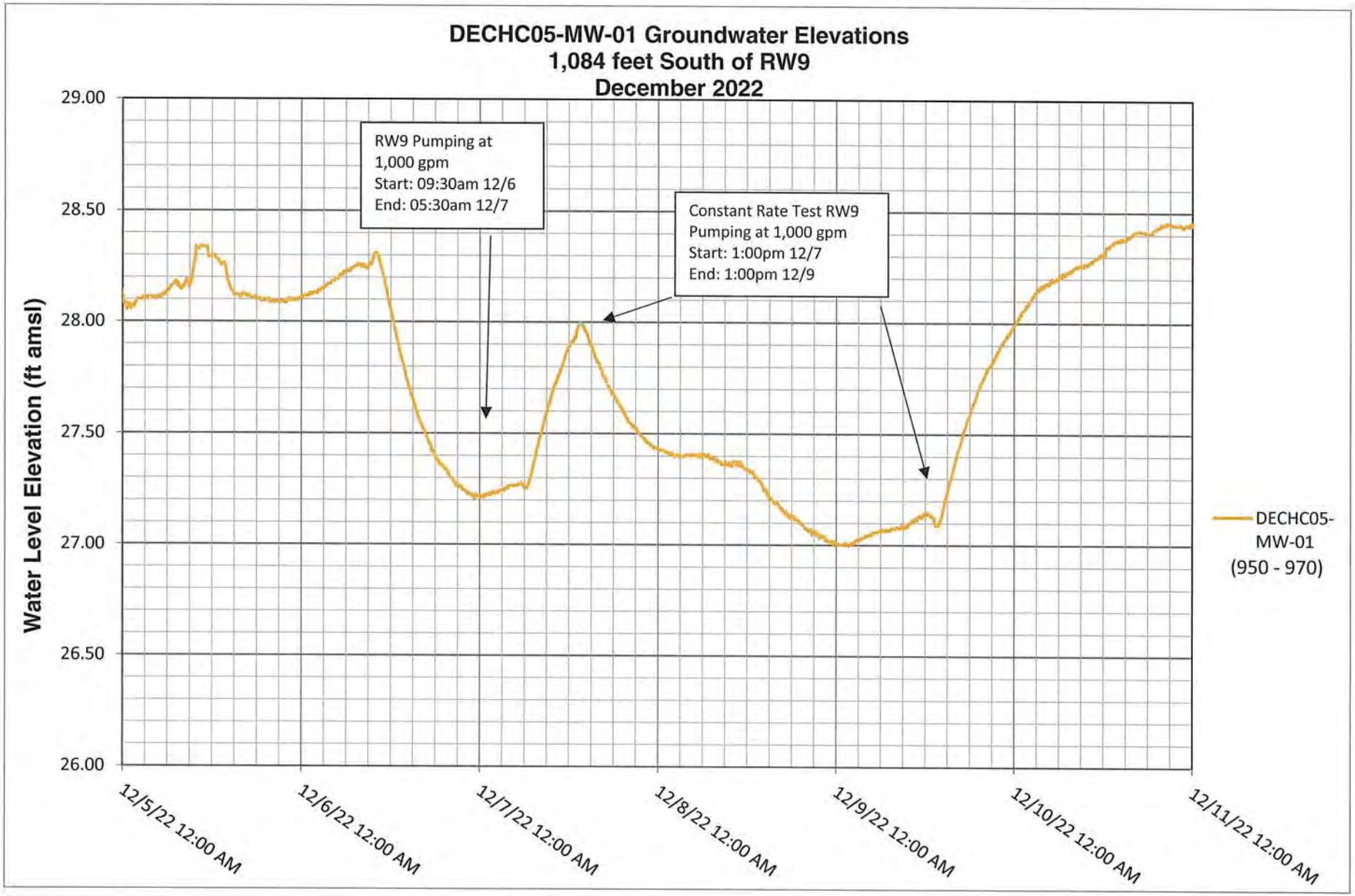

BPOW 6-3/6-4 Cluster Groundwater Elevations
1,591 to 1,606 feet Southeast of RW9
December 2022
Water Level Elevation (ft amsl)
30.00
29.00
28.00
27.00
26.00
25.00
24.00
23.00
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
BPOW 6-3
(750 -775)
BPOW 6-4
(545 - 570)

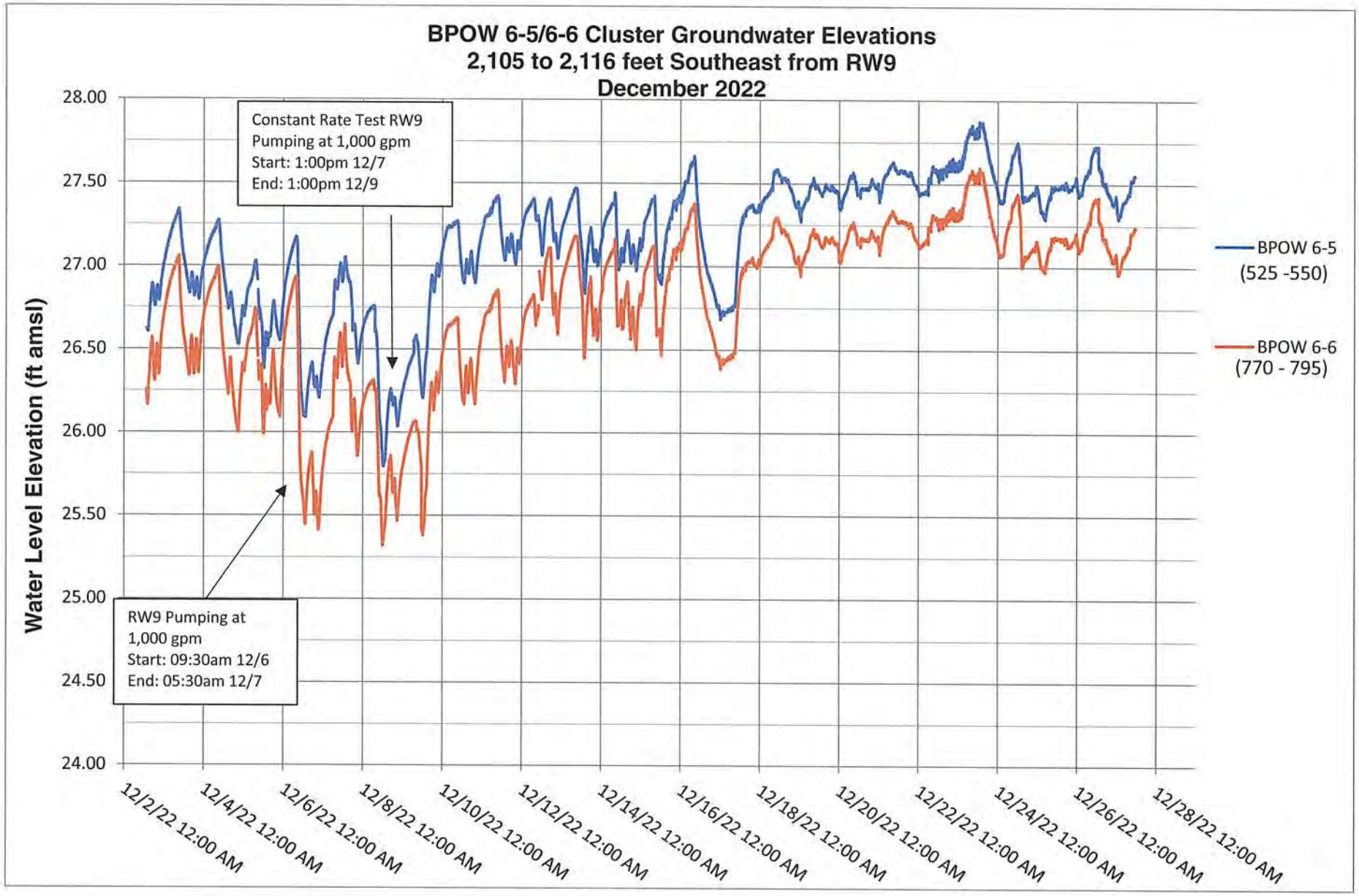

BPOW 6-3/6-4 Cluster Groundwater Elevations
1,591 to 1,606 feet Southeast of RW9
December 2022
Water Level Elevation (ft amsl)
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
BPOW 6-3
(750 - 775)
(545 - 570)
BPOW 6-4

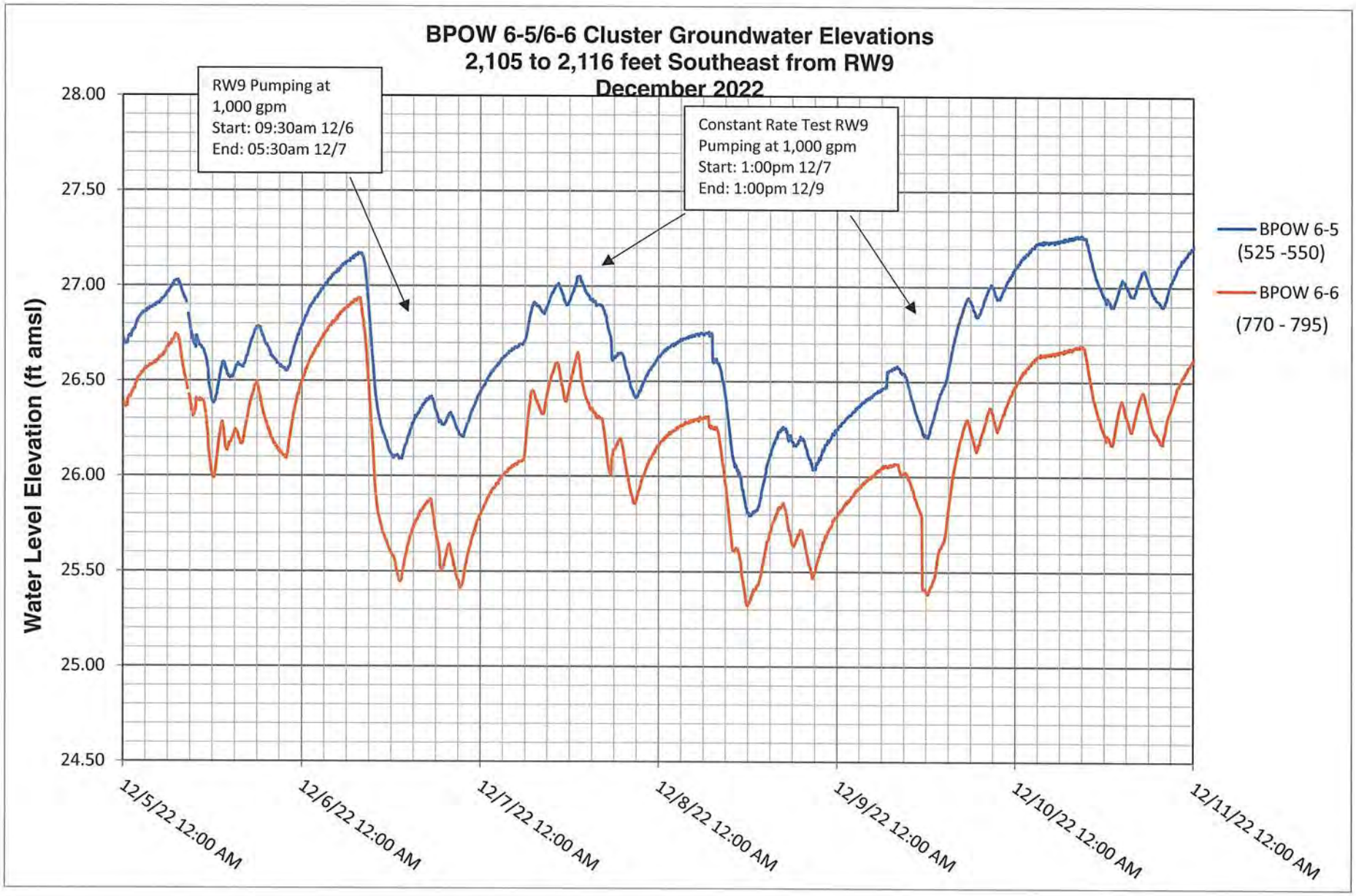

BPOW 6-1/6-2 Groundwater Elevations
1,977 to 2,005 feet South of RW9
December 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
23.50
23.00
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
BPOW 6-2
(755-780)
BPOW 6-1
(550-575)

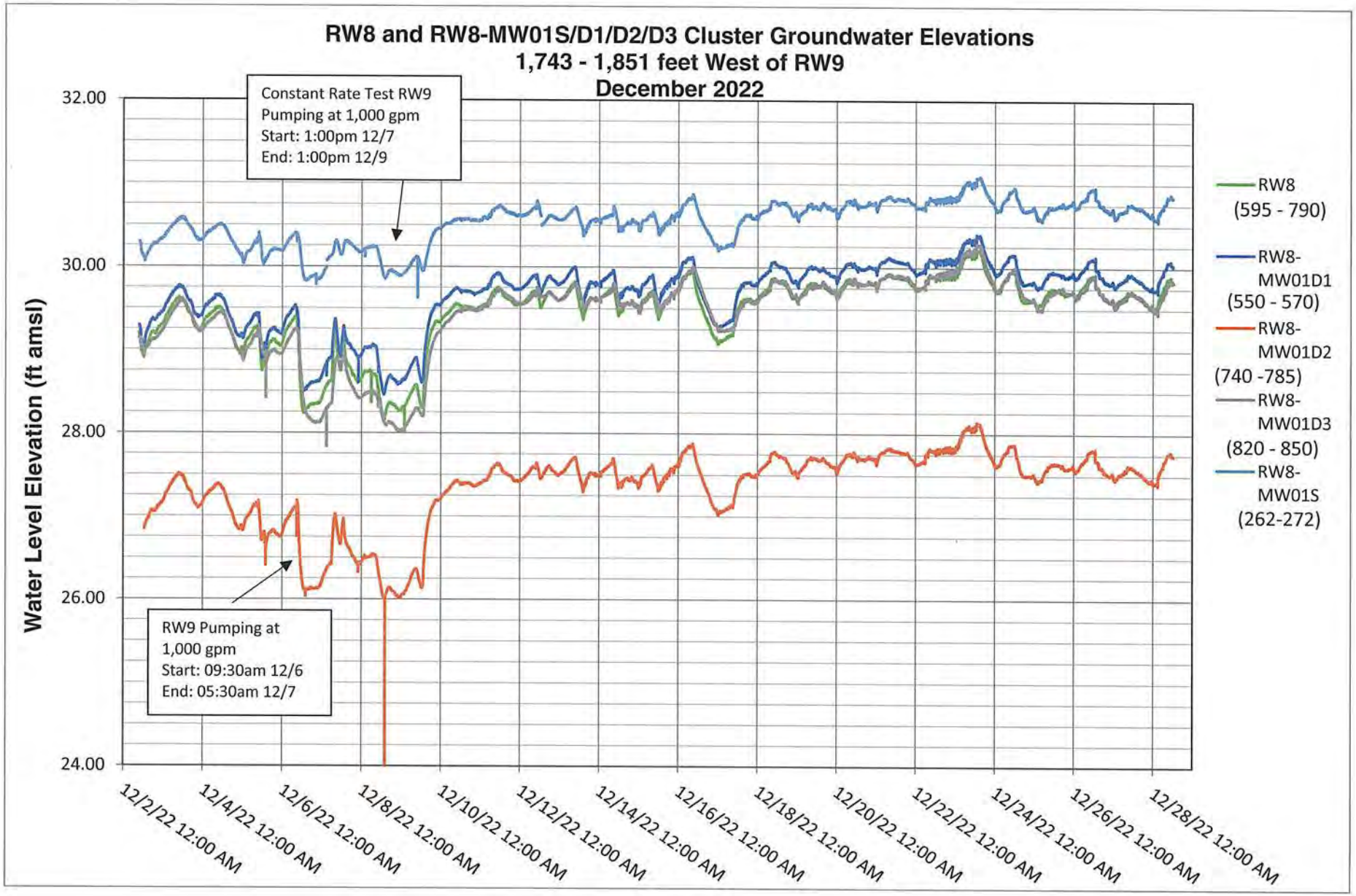

BPOW 6-1/6-2 Groundwater Elevations
1,977 to 2,005 feet South of RW9
December 2022
Water Level Elevation (ft amsl)
29.00
28.50
28.00
27.50
27.00
26.50
26.00
25.50
25.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
BPOW 6-2
(755 - 780)
BPOW 6-1
(550 - 575)
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM

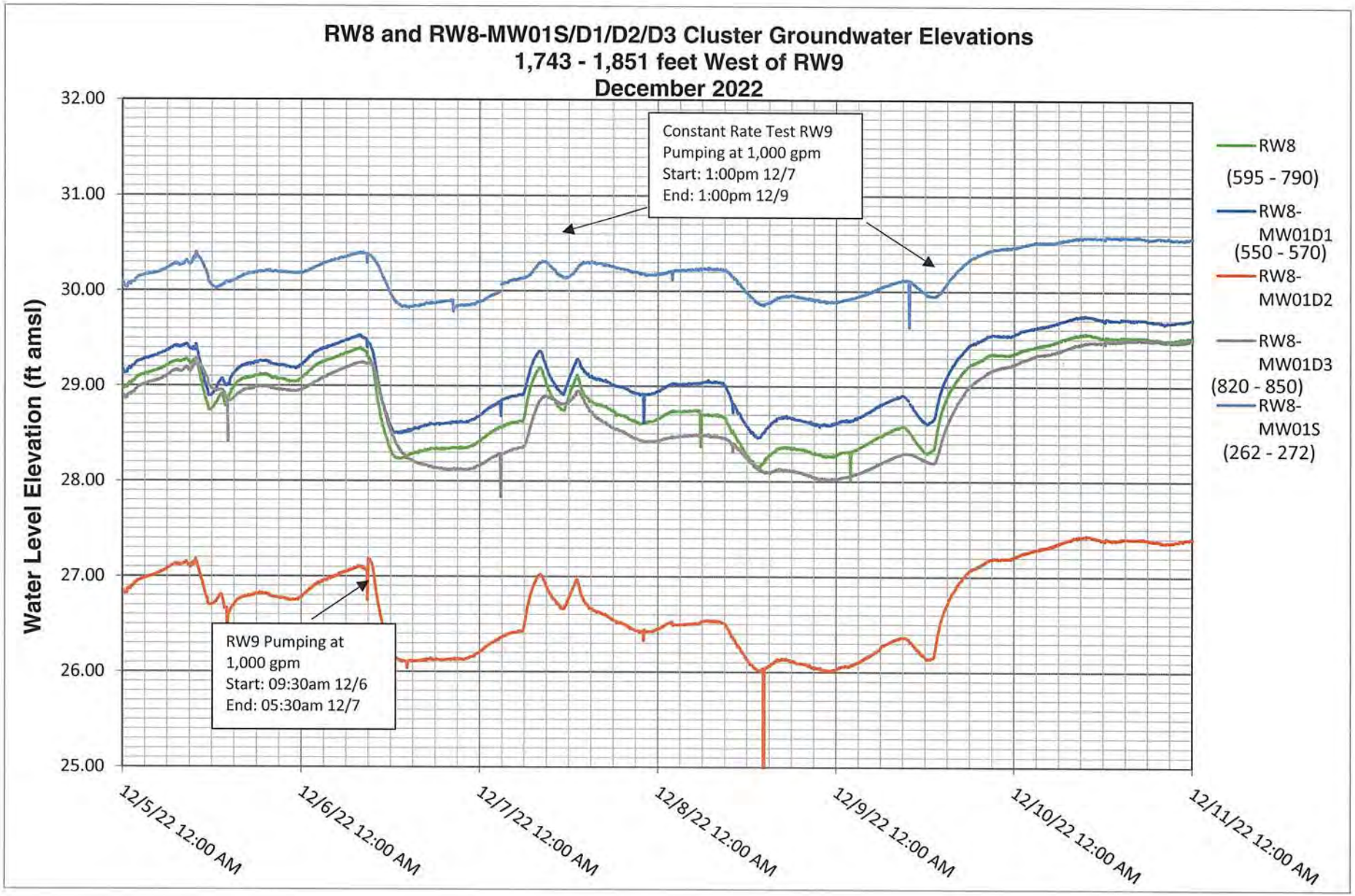

DECHC05-MW-01 Groundwater Elevations
1,084 feet South of RW9
December 2022
Water Level Elevation (ft amsl)
30.00
29.50
29.00
28.50
28.00
27.50
27.00
26.50
26.00
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
DECHC05-
MW-01
(950 - 970)


DECHC05-MW-01 Groundwater Elevations
1,084 feet South of RW9
December 2022
Water Level Elevation (ft amsl)
29.00
28.50
28.00
27.50
27.00
26.50
26.00
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
DECHC05-
MW-01
(950 - 970)


BPOW 6-5/6-6 Cluster Groundwater Elevations
2,105 to 2,116 feet Southeast from RW9
December 2022
Water Level Elevation (ft amsl)
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
24.00
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
BPOW 6-5
(525 -550)
BPOW 6-6
(770 - 795)


BPOW 6-5/6-6 Cluster Groundwater Elevations
2,105 to 2,116 feet Southeast from RW9
December 2022
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
Water Level Elevation (ft amsl)
28.00
27.50
27.00
26.50
26.00
25.50
25.00
24.50
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
BPOW 6-5
(525 -550)
BPOW 6-6
(770 - 795)


RW8 and RW8-MW01S/D1/D2/D3 Cluster Groundwater Elevations
1,743 - 1,851 feet West of RW9
December 2022
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
Water Level Elevation (ft amsl)
32.00
30.00
28.00
26.00
24.00
12/2/22 12:00 AM
12/4/22 12:00 AM
12/6/22 12:00 AM
12/8/22 12:00 AM
12/10/22 12:00 AM
12/12/22 12:00 AM
12/14/22 12:00 AM
12/16/22 12:00 AM
12/18/22 12:00 AM
12/20/22 12:00 AM
12/22/22 12:00 AM
12/24/22 12:00 AM
12/26/22 12:00 AM
12/28/22 12:00 AM
RW8
(595 - 790)
RW8-
MW01D1
(550 - 570)
RW8-
MW01D2
(740 -785)
RW8-
MW01D3
(820 - 850)
RW8-
MW01S
(262-272)


RW8 and RW8-MW01S/D1/D2/D3 Cluster Groundwater Elevations
1,743 - 1,851 feet West of RW9
December 2022
Water Level Elevation (ft amsl)
32.00
31.00
30.00
29.00
28.00
27.00
26.00
25.00
12/5/22 12:00 AM
12/6/22 12:00 AM
12/7/22 12:00 AM
12/8/22 12:00 AM
12/9/22 12:00 AM
12/10/22 12:00 AM
12/11/22 12:00 AM
Constant Rate Test RW9
Pumping at 1,000 gpm
Start: 1:00pm 12/7
End: 1:00pm 12/9
RW9 Pumping at
1,000 gpm
Start: 09:30am 12/6
End: 05:30am 12/7
RW8
(595 - 790)
RW8-MW01D1
(550 - 570)
RW8-MW01D2
RW8-MW01D3
(820 - 850)
RW8-MW01S
(262 - 272)

ATTACHMENT C

PRECIPITATION DATA

JFK Airport Precipitation ~15.5 Miles East of Bethpage

Date	Precipitation (inches)
10/7/2022	0
10/8/2022	0.04
10/9/2022	0
10/10/2022	0
10/11/2022	0
10/12/2022	0
10/13/2022	0
10/14/2022	1.22
10/15/2022	0
10/16/2022	0
10/17/2022	0.02
10/18/2022	0.06
10/19/2022	0
10/20/2022	0
10/21/2022	0
10/22/2022	0
10/23/2022	0
10/24/2022	0.06
10/25/2022	0.34
10/26/2022	0
10/27/2022	0
10/28/2022	0
10/29/2022	0
10/30/2022	0
10/31/2022	0
11/1/2022	0.29
11/2/2022	0
11/3/2022	0

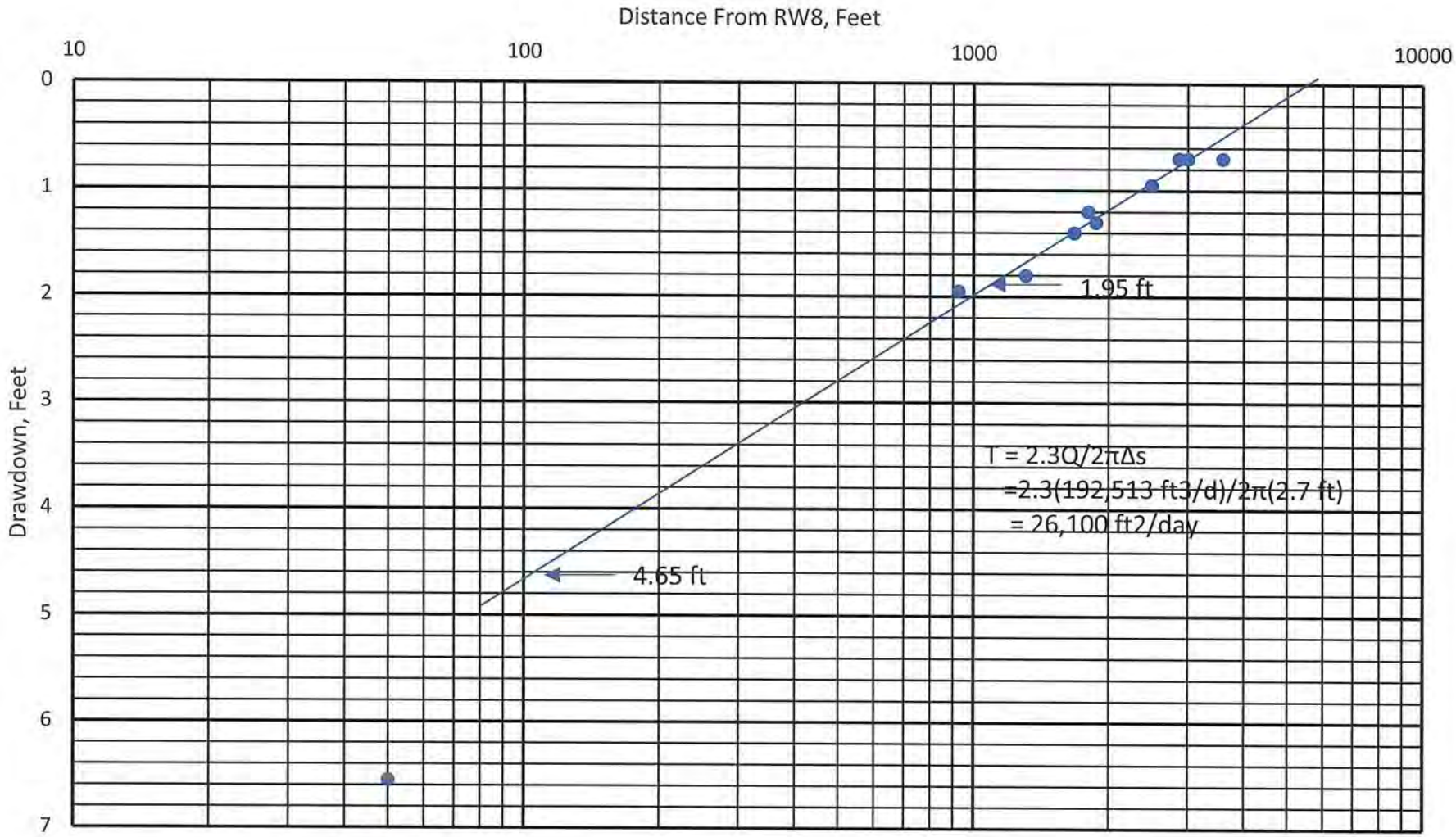
Date	Precipitation (inches)
11/4/2022	0
11/5/2022	0
11/6/2022	0
11/7/2022	0
11/8/2022	0
11/9/2022	0
11/10/2022	0
11/11/2022	0
11/12/2022	0.52
11/13/2022	0.12
11/14/2022	0.02
11/15/2022	0
11/16/2022	0.62
11/17/2022	0.01
11/18/2022	0
11/19/2022	0.01
11/20/2022	0
11/21/2022	0
11/22/2022	0
11/23/2022	0
11/24/2022	0
11/25/2022	0
11/26/2022	0.02
11/27/2022	0
11/28/2022	0.56
11/29/2022	0
11/30/2022	0
12/1/2022	0.34

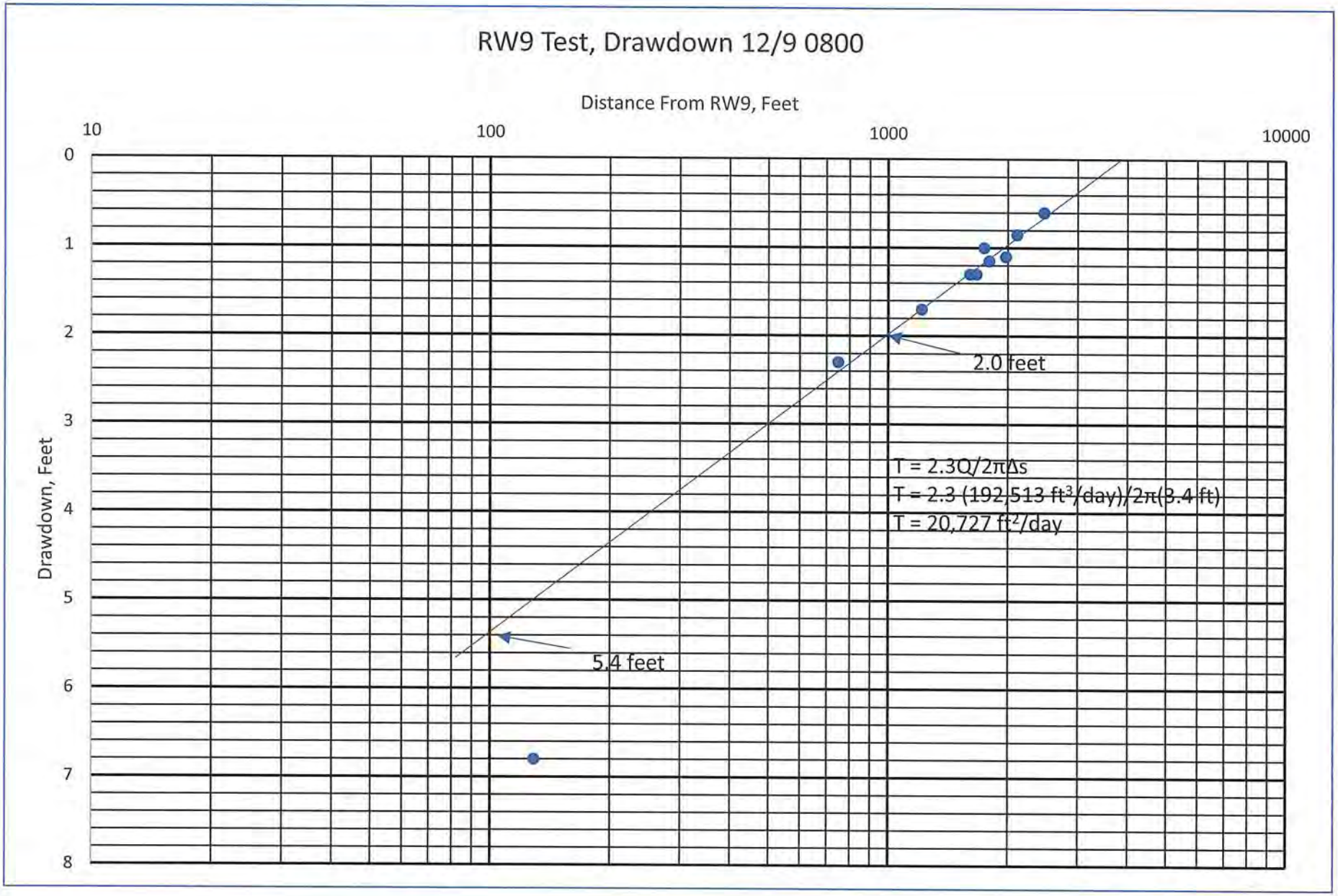
Date	Precipitation (inches)
12/2/2022	0
12/3/2022	0
12/4/2022	0.23
12/5/2022	0
12/6/2022	0
12/7/2022	0.72
12/8/2022	0.02
12/9/2022	0
12/10/2022	0
12/11/2022	0
12/12/2022	0.21
12/13/2022	0
12/14/2022	0
12/15/2022	0
12/16/2022	0.89
12/17/2022	0.39
12/18/2022	0
12/19/2022	0
12/20/2022	0
12/21/2022	0
12/22/2022	0
12/23/2022	0.39
12/24/2022	0.05
12/25/2022	0
12/26/2022	0
12/27/2022	0
12/28/2022	0
12/27/2022	0
12/28/2022	0

ATTACHMENT D

DISTANCE-DRAWDOWN GRAPHS

RW8 Test - Drawdown @ 2310 Minutes



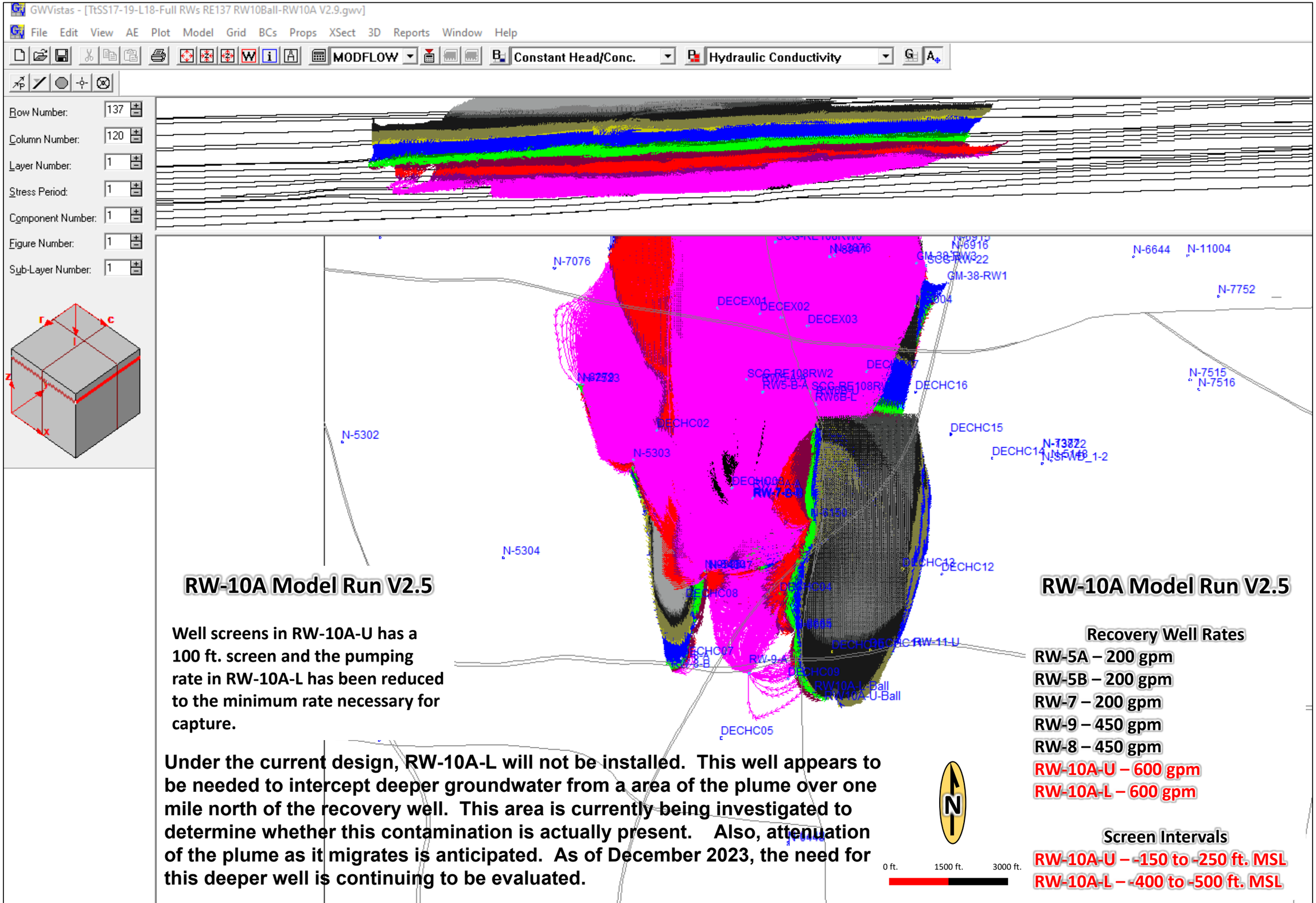

RW9 Test, Drawdown 12/9 0800
Distance From RW9, Feet
10
100
1000
10000
Drawdown, Feet
0
1
2
3
4
5
6
7
8
2.0 feet
5.4 feet
T = 2.3Q/2πΔs
T = 2.3 (192,513 ft³/day)/2π(3.4 ft)
T = 20,727 ft²/day

RW8 Pumping Test - Distance/Drawdown Data

Well ID	117D1	129D1	BPOW 6-6	118D1	BPOW 5-5	DEC1-D2	133D2	RW9MW01D2	TT102D2	RW8-MW01D2	BPOW 6-4
Radius, ft	1676	1308	3591	2878	2867	926	1801	1872	2491	50	3006
DD @ 2310 min	1.4	1.8	0.7	0.7	0.7	1.95	1.2	1.3	0.95	6.55	0.7

RW9 Pumping Test - Distance/Drawdown Data

Well ID	RW9MW01D2	TT102D2	RE133D2	BPOW 6-3	117D1	RW8	DEC1D2	BPOW 6-2	118D1	129D1
Radius, ft	129	749	1214	1606	1667	1743	1795	1977	2109	2468
DD @ 12/9 0800	6.8	2.3	1.7	1.3	1.3	1	1.15	1.1	0.85	0.6



RW-10A Model Run V2.5

Well screens in RW-10A-U has a 100 ft. screen and the pumping rate in RW-10A-L has been reduced to the minimum rate necessary for capture.

RW-10A Model Run V2.5

Recovery Well Rates

RW-5A – 200 gpm
RW-5B – 200 gpm
RW-7 – 200 gpm
RW-9 – 450 gpm
RW-8 – 450 gpm
RW-10A-U – 600 gpm
RW-10A-L – 600 gpm

Screen Intervals

RW-10A-U – -150 to -250 ft. MSL
RW-10A-L – -400 to -500 ft. MSL

Under the current design, RW-10A-L will not be installed. This well appears to be needed to intercept deeper groundwater from a area of the plume over one mile north of the recovery well. This area is currently being investigated to determine whether this contamination is actually present. Also, attenuation of the plume as it migrates is anticipated. As of December 2023, the need for this deeper well is continuing to be evaluated.

Infiltration Basin Evaluation, Nassau County Basins 162, 173, and 282 – Off Site Groundwater Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, New York

1.0 INTRODUCTION

This report evaluates the hydraulic capacities of three stormwater infiltration basins (Nassau County Basins 282, 162, and 173) located south of the Operable Unit 2 deep volatile organic compound (VOC) impacted groundwater, which extends approximately 3.1 miles south of the former Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage, Long Island, New York (Figure 1 and 2). The purpose of this evaluation is to assess the soil, geology, and the storm water infiltration rates of the basins to determine if, in combination, they would be adequate to receive treated groundwater flow from the Southern State Parkway Intercept System – West (Phase III System [W]). The Phase III System (W) is anticipated to have an approximate discharge rate of 2 to 3 million gallons per day (MGD).

1.1 Scope and Background

In the NWIRP Bethpage Area, storm water basins are used to manage precipitation runoff from roadways, parking lots, and roof drains. Stormwater basins are sized as a reservoir to accumulate storm surges and the basin design then assumes that the accumulated water would infiltrate into the aquifer before the next storm event. In New York, stormwater recharge basins are sized to hold a water quality volume which is equal to approximately 90% of all 24-hour from rain impervious cover within the contributing area (NYSDEC, 2015).

Storm water basins can also be used to infiltrate clean (non-contact) or treated water at production and remediation facilities. A similar approach will be used at the Phase III System (W), which will discharge approximately 2 to 3 million gallons per day (MGD) into the proposed recharge basins. For the Phase III System (W), three recharge basins, Nassau County Basins 282 (Basin 1), 162(Basin 2), and 173 (Basin 3 and 4), were selected because they are relatively close to the potential location of the Phase III System (W)and are far enough south (downgradient) that groundwater infiltration in these basins would not interfere with the extraction system capture zones (Figure 3).

The three selected recharge basins would continue to be used for storm water retention and infiltration. The current absence of standing water and presence of established vegetation throughout these three basins indicates that both basins effectively manage the current storm water loads.

1.1 Basin Descriptions

The three selected Nassau County (NC) recharge basins are located approximately 1,056 feet (0.2 mile) downgradient (south) of the anticipated Phase III System (W) (Figure 3). All three basins are in residential areas and are surrounded on most sides by single family homes. Basin 1 (NC 282) covers approximately 0.44 acres (19,202 square feet) and is approximately 10 feet deep (Figure 4). Basin 2 (NC 162) covers approximately 0.43 acres (18,775 square feet) and is approximately 7 feet deep (Figure 5). Basin 3 (NC 173) and Basin 4 (also known as Basin 3 Extension) have combined area of approximately 0.64 acres (27,863 square feet) and are both approximately 10 feet deep (Figure 6). These basins will continue to be used for storm water retention and infiltration. The absence of standing water and presence of established vegetation throughout these basins indicates that the basins can handle the current storm water loads. Infiltration test results from other basins in the area resulted in a range of rates from 1 MGD/acre, 1.4 MGD/acre, and greater than 2 MGD/acre.

Vertical profile boring (VPB) investigations have been conducted in the area of the basins as part of the NWIRP Bethpage Off-Site Groundwater Program to determine the lithology. Four VPBs, VPB-145, VPB-163, VPB-17, and VPB-RW8, have previously been installed in the southern portion of the plume and are in the vicinity of the potential Phase III System (W) storm water basins. Based on the information from the field logs presenting the lithology from the upper portion of the VPBs, the formation is classified as medium to coarse sand and gravel to depths of at least 60 feet below ground surface (bgs). A finer-grained unit was observed approximately 60 to 90 feet bgs at each of the VPBs. Groundwater approximately 10 to 15 feet below the bottom of the basins. This soil classification indicates that water should readily infiltrate into the aquifer formation.

1.2 Objectives

This evaluation aims to determine the current stormwater loads and infiltration rates of the Nassau County Basins 162, 173, and 282 to support consideration of their use for discharge from the Southern State Parkway Intercept System – W (Phase III System [W]). Double-ring soil infiltration testing and Long-term opportunistic recharge tests were conducted in order to:

- Calculate the direct infiltration rate for near surface soils in each basin in inches per hour (in/hr)
- Confirm the presence of standing water in the bottom of either basin after precipitation events
- Measure the standing water level (if any persists) in each basin over time and determine the infiltration rate of each basin in feet per day (ft/day)
- Determine capacity of discharge water that each basin can accept for infiltration in million gallons per day (MGD)

2.0 Double-Ring Infiltration Testing

Double-ring soil infiltration tests were conducted on May 23rd, May 24th, and May 25th, 2022. Testing locations were determined in the field to provide an estimated average infiltration rate across the entire basin as well as infiltration in areas that appeared to have been submerged by water as evidenced by vegetation and erosion patterns. Double-ring test locations and results for Basin 1 (NC 282), Basin 2 (NC 162), Basin 3 (NC 173), and Basin 4 (Basin 3 Extension) are shown on Figures 4, 5, and 6, respectively. All locations were located on a relatively flat, moderately wooded to overgrown area.

Test locations were dug with hand tools to minimally disturb soil being tested. Double-ring infiltrometers were used for testing and consisted of 10-inch and 6-inch diameter sections of steel casing. Once target depth was reached, the test surface was leveled, and any loose soil or vegetation was removed. The rings were driven a minimum of 2 inches into the undisturbed soil. Test locations were pre-soaked for 1 hour, and then tests were conducted with measurements at 10-minute and 30-minute intervals, based on the observed water level drops during the pre-soak period. Pre-soak and test information was recorded on infiltration test sheets (Attachment 1).

During the testing, the weather was sunny to cloudy, and ambient temperatures were seasonal. Temperatures were in the 80s (degrees Fahrenheit) on May 23rd, May 24th, and May 25th with no precipitation observed in the area at the time of testing. Additionally, no precipitation was observed within 24 hours prior to testing.

2.1 Double Ring Infiltration Testing Results

Table 1 summarizes the infiltration rates (inches per hour [in/hr]) calculated from the test data. Infiltration rates presented in Table 1 were calculated from the average water level drop of the last four readings measured in the inner ring.

Thirteen tests were conducted across the three selected recharge basins. Four tests were conducted at Basin 1, and all tests exhibited a fast infiltration rate requiring a 2-minute measurement cycle. The tests achieved stabilized rates within four measurements of starting the test period, except for IT-2 which required eight measurements. Four tests were also conducted at Basin 2. Tests IT-5 and IT-6 exhibited a fast infiltration rate requiring a 10-minute measurement cycle, and tests IT-7 and IT-8 exhibited a faster infiltration rate requiring a 2-minute measurement cycle. All tests achieved stabilized rates within four measurements. Two tests were conducted at Basin 4. IT-9 exhibited a fast infiltration rate requiring a 10-minute measurement cycle, and IT-10 exhibited a faster infiltration rate requiring a 2-minute cycle. IT-10 stabilized within four measurements, and IT-9 did not stabilize within the eight measurement readings allowed by the SOP. Three tests were conducted at Basin 3. All three tests

exhibited fast infiltration rates requiring a 2-minute cycle, and all tests stabilized within seven measurement readings.

Infiltration rates for Basin 1 ranged from 22.5 in/hr to 88.6 in/hr. Infiltration rates for Basin 2 ranged from 8.6 in/hr to 69.8 in/hr. For Basin 4, infiltration rates ranged from 1.4 in/hr (not stabilized) to 26.3 in/hr, and for Basin 3 infiltration rates ranged from 26.3 in/hr to 55.3 in/hr.

Table 1- Double-Ring Infiltration Test Results

Test Location (IT-)	Recharge Basin Name	Test Depth (inches)	Infiltration Test Result (inches/hour)
IT-1	Basin 1 (NC 282)	3	88.6
IT-2		2	64.2
IT-3		3	72.2
IT-4		2	22.5
IT-5	Basin 2 (NC 162)	3.5	13.9
IT-6		2.5	8.6
IT-7		2	69.8
IT-8		3	50.6
IT-9	Basin 4 (Basin 3 Extension)	3	1.4 (not stabilized)
IT-10		4	55.3
IT-11	Basin 3 (NC 173)	3	26.3
IT-12		4	26.3
IT-13		3.5	45.0

2.2 Double Ring Infiltration Testing Conclusion and Limitations

The double-ring infiltration tests were conducted using a limited volume of water and assuming uniform soil characteristics throughout the infiltration area. Results of this testing represent the infiltration rate for near surface soil but do not account for potential interference from reduced permeability zones which could be present in deeper soil in the basins. Further testing and evaluation are necessary to fully evaluate these recharge basins for accumulation of discharge water from the Phase III System (W).

3.0 Long-Term Opportunistic Recharge Tests

Long-term opportunistic recharge tests were conducted using storm water currently flowing into each basin. Local weather data for precipitation events and water level data recorded by eight transducers installed in staff gages (PZ-1 to PZ-8) in the selected basins were used to estimate the current storm water loads. The infiltration rate for

each basin can be calculated by observing water level data in the basins after precipitation events and determining the time it takes for the water to infiltrate the aquifer. Section 3.1 provides information on staff gage and transducer installation for each basin. Section 3.2 describes the evaluation of the data collected at pressure transducers as compared to precipitation data, as well as water level, infiltration, and basin capacity calculations. Results specific to Basin 1 (NC 282), Basin 2 (NC 162), Basin 3 (NC 173), and Basin 4 (Basin 3 Extension) are presented in sections 3.3, 3.4, 3.5, and 3.6 respectively. Raw transducer data for both basins and Weather Underground data is provided as Attachment 2. All calculations are presented in Attachment 3.

3.1 Long-Term Opportunistic Recharge Tests Transducer and Staff Gage Installation

The Solinst Levelogger Jr. Edge data logger pressure transducers were installed on August 17, 2022. The transducer in PZ-5 was recovered from the bottom of the well and re-installed August 19, 2022. The pressure transducers were installed at the low point of the basin and will be used to estimate the infiltration rate based on observed rainfall and ponding events. To secure the transducers, they were installed within a screened section of polyvinyl chloride (PVC) pipe which was driven approximately 1.5 feet into the subsurface.

Two pressure transducers were installed in each basin, for a total of eight pressure transducers. Locations of the staff gages in each basin which house the transducers are presented on Figures 4, 5, and 6. A drawing and measurements of the staff gages and pressure transducer set up is presented on Figure 7.

3.2 Long Term Opportunistic Recharge Tests Data Collection and Evaluation

The transducers installed for this study recorded pressure level data at fifteen-minute intervals between August 17 and November 22, 2022. Recorded data was compared to local weather precipitation data, starting August 1, 2022, to determine if the changes in pressure readings in each basin corresponded to storm events which occurred during the study period. Transducer pressure readings were then converted into water level measurements which are used to determine if there was ever any standing water in the basin and ultimately to calculate the average basin infiltration rate and available capacity for treated water discharged from the Phase III System (W).

3.2.1 Precipitation Data and Water Levels

Historical weather data from Weather Underground at the nearby John F. Kennedy Internal Airport weather station was downloaded to determine if there was a correlation between rain events and pressure increases at the transducers. Weather and transducer data collection continued until November 2022 and new data was also compared to Weather Underground data for consistency.

Transducer data was normalized to observe the relative changes in water level over the study period by subtracting the minimum recorded level at each transducer. These normalized values were compared to precipitation data obtained from Weather Underground. Evaluation of the Weather Underground precipitation data showed 6 precipitation events greater than 0.5 inches during transducer collection period. These events typically corresponded to the greatest change in water level at transducers in all three of the selected recharge basins.

The solinst levelogger transducers used do not automatically account for barometric pressure. Corresponding pressure data from Weather Underground for each precipitation event greater than 0.5 inches was subtracted from the recorded transducer levels to obtain the maximum water level at each transducer for each event. The water level above the bottom of the basin was then determined using the staff gage measurements presented on Figure 7. The resulting graph of precipitation vs transducer water level in each basin can be seen in Figure 8, 9, 10, and 11.

3.2.2 Infiltration Rate and Basin Capacity

Infiltration rates were calculated following precipitation events where the water level above the bottom of each basin exceeded 0.2 ft. Infiltration rate calculations are presented in Attachment 4. Transducer data was used to calculate the water level with respect to the bottom of the basin (as described in the previous section) at each fifteen-minute interval for the duration of each event at both staff gages (Attachment 4). Assuming the water level at the bottom of the basin to be 0 feet, the maximum water level represents the change in water level in the bottom of the basin at each transducer. The difference in time of the maximum and minimum water level values during each precipitation event at each transducer indicate the total time it takes for accumulated stormwater to completely infiltrate into the ground. The maximum water level and infiltration duration at each staff gage were each averaged together for each event to produce an approximate water level and infiltration duration throughout the entire basin for each event. The basin infiltration rate, in feet per day, was determined by dividing the water level (measured in feet above the bottom of the basin) by the total time it takes for all the water to infiltrate the basin. This infiltration rate was converted into million gallons per day and gallons per minute using the known area of each basin to determine the accumulated stormwater volume, divided by the infiltration duration in minutes.

The total volume capacity of each empty basin was determined using the known area and difference in average elevation between the top and bottom of each basin. Basins 1, 2, 3, and 4 are in residential areas surrounded by homes that likely include basements. In order to avoid potential flooding of these basements, a maximum capacity for accumulated water was calculated assuming water would not come within 8 feet of the surrounding home elevations. For example, the houses surrounding Basin 3

(NC 173) sit at approximately 43 feet above mean seal level (msl), therefore any standing water in the bottom of the basin should not exceed 35 feet msl. Since the bottom of the basin occurs at approximately 33 ft msl, the water should not rise more than 8 feet above the bottom of the basin. The same approach was used for the other NC recharge basins. This maximum water level is used in combination with the known basin area to determine the allowable capacity of water in gallons.

To be conservative, the greatest stormwater volume observed over the study period was subtracted from the allowable capacity in each basin, producing the volume available to accept discharge from the proposed treatment system. The maximum allowable flowrate from the treatment system into each basin is then calculated using the corresponding calculated infiltration rate and available volumes.

3.3 Basin 1 (NC 282) Recharge Basin Long Term Opportunistic Recharge Test Results and Evaluation

The water level in Basin 1 did not exceed 0.2 feet above the ground surface for all 6 precipitation events at PZ-1 and PZ-2 (Staff Gage 1 and 2, respectively). More data is required to evaluate the infiltration rate in million gallons per day at this basin.

3.4 Basin 2 (NC 162) Recharge Basin Long Term Opportunistic Recharge Test Results and Evaluation

The water level in Basin 2 exceeded 0.2 feet above ground surface during 1 precipitation event at both staff gages (PZ-3 and PZ-4). This event occurred on October 4, 2022, and corresponds with the event with the highest recorded water level in Basin 2.

Table 2 presents the event designation, dates, and maximum water levels (relative to the bottom of the basin) at each transducer. A graph showing the water level at each staff gage over time for the event at the Basin 2 are presented on Figure 10.

Table 2- Basin 2 Water Level and Infiltration Rate Results

Event	Dates	Recorded Precipitation (inches)	Calculated Average Basin Water Level (feet)	Water Level (feet) per 1 Inch Precipitation	Calculated Infiltration Rate (feet/day)	Calculated Infiltration Rate (gpm)
A	10/4/2022	1.9	0.46	0.24	12.48	1,217

The maximum average water level in the Boundary Avenue recharge basin occurred on October 4, 2022, at 0.46 feet. On average, 1 inch of precipitation corresponds to approximately 0.24 feet of water in the bottom of the basin. The infiltration rate for the Basin 2 is 12.48 feet/day (1,217 GPM).

Basin 2 can hold up to a calculated 1.4 million gallons of water. However, accumulated water should not rise more than 2.0 feet above the bottom of the basin to avoid potential

flooding of surrounding residential basements. Therefore, the maximum allowable volume of Basin 2 is 0.28 million gallons. The maximum calculated stormwater volume observed over the study period was approximately 1.12 million gallons, leaving the remaining 0.28 million gallons available. At the average calculated infiltration rate, Basin 2 could accept up to 1.35 million gallons/day (940 GPM continuously) from the Phase III System (West).

3.5 Basin 3 Long Term Opportunistic Recharge Test Results and Evaluation

The water level in Basin 3 and Extension exceeded 0.2 feet above ground surface during 1 precipitation event at two staff gages (PZ-7 and PZ-8). This event occurred on October 4, 2022 and corresponds with the event with the highest recorded water level in Basin 3. A graph showing the water level at each staff gage over time for this singular event at Basin 3 and Extension is presented on Figure 11.

Table 3- Basin 3 Water Level and Infiltration Rate Results

Event	Dates	Recorded Precipitation (inches)	Calculated Average Basin Water Level (feet)	Water Level (feet) per 1 Inch Precipitation	Calculated Infiltration Rate (feet/day)	Calculated Infiltration Rate (gpm)
A	10/4/2022	1.9	0.51	0.27	12.24	886

The maximum average water level in Basin 3 occurred on October 4, 2022, at 0.51 feet. Based on this data, 1 inch of precipitation corresponds to approximately 0.27 feet of water in the bottom of the basin. The calculated infiltration rate for the Basin 3 is 12.24 feet/day (886 GPM).

Basin 3 can hold up to a calculated 1.0 million gallons of water. However, accumulated water should not rise more than 2.0 feet above the bottom of the basin to avoid potential flooding of surrounding residential basements. Therefore, the maximum allowable volume of accumulated water in the Basin 3 recharge basin is 0.2 million gallons. The maximum calculated stormwater volume observed over the study period is approximately 0.8 million gallons, leaving the remaining 0.2 million gallons available. At the average calculated infiltration rate, Basin 3 could accept up to 0.95 million gallons/day (660 GPM continuously) from the Phase III System (W).

3.6 Basin 4 Long Term Opportunistic Recharge Test Results and Evaluation

The water level in Basin 4 (Basin 3 Extension) did not exceed 0.2 ft above the ground surface for all 6 precipitation events at PZ-5 and PZ-6 (Staff Gage 5 and 6, respectively). Basin 4 is in close proximity to Basin 3 and is of similar size and depth. The infiltration rate results of their area, 0.64 acres, is presented below.

Table 4- Basin 3 and Basin 4 Water Level and Infiltration Rate Results

Event	Dates	Recorded Precipitation (inches)	Calculated Average Basin Water Level (feet)	Water Level (feet) per 1 Inch Precipitation	Calculated Infiltration Rate (feet/day)	Calculated Infiltration Rate (gpm)
A	10/4/2022	1.9	0.51	0.27	12.24	1,772

Basin 3 and 4 can hold up to a calculated 2.1 million gallons of water. However, accumulated water should not rise more than 2.0 feet above the bottom of the basin to avoid potential flooding of surrounding residential basements. Therefore, the maximum allowable volume of accumulated water in basin is 0.42 million gallons. The maximum calculated stormwater volume observed over the study period was approximately 1.67 million, leaving the remaining 0.42 million gallons available. At the average calculated infiltration rate, Basin 3 and Basin 4 could accept up to 1.90 million gallons/day (1,320 GPM continuously) form the Phase III System (W).

4.0 CONCLUSIONS

Double ring soil infiltration and Long-Term Opportunistic Recharge tests were conducted between May and December 2022 to determine the current stormwater loads and infiltration rates of Basin 1 (NC 282), Basin 2 (NC 162), and Basin 3 (NC 173) and Extension recharge basins to support consideration of their use for discharge from the Phase III System (W). Results and evaluation of these tests are summarized for each basin as follows:

Basin 1:

- Requires more data to evaluate current stormwater loads and infiltration rates.

Basin 2:

- Results of double ring infiltration testing indicate a geometric mean infiltration rate of 25.50 in/hr for near surface soils.
- There was at least 0.2 feet of standing water in the bottom of the Basin 2 after 1 precipitation events and the maximum average water level occurred on October 4, 2022, at 0.46 feet.
- The maximum calculated stormwater volume observed over the study period was approximately 1.12 million gallons.
- The average basin infiltration rate was calculated to be 12.48 feet/day
- Basin 2 could accept up to 1.35 MGD continuously from the Phase III Treatment System.

Basin 3 and Basin 4 (Basin 3 Extension):

- Results of double ring infiltration testing indicate a geometric mean infiltration rate of 40.14 in/hr for near surface soils.

- There was at least 0.2 feet of standing water in the bottom of Basin 3 after one precipitation event which occurred on October 4, 2022, at 0.51 feet.
- The maximum calculated stormwater volume observed over the study period is approximately 1.67 million gallons.
- The average basin infiltration rate was calculated as 12.24 feet/day.
- Basin 3 could accept up to 1.90 MGD continuously from the Phase III Treatment System.

Based on the experience of the GM-38 groundwater treatment plant's use of recharge basins for discharge of treated water, the target infiltration rate for all selected recharge basins is 1 foot/day. Infiltration rates for all three basins exceed this goal.

Because these recharge basins serve as stormwater management devices and receive sediment-laden water, they are prone to reduction in infiltration rate over the lifetime of the proposed groundwater treatment system. To maximize the initial infiltration rate and provide a factor of safety, a 2-foot excavation depth is required during construction in addition to a minimum internal slope of 0.50% to ensure discharged groundwater distributes over the surface area of the basin.

An alarm gauge shall be installed to indicate when groundwater rises to a standing water elevation to trigger required maintenance. The design storage of the recharge basins must be available at all times to serve their associated watersheds, so the treated groundwater may not rise any higher than the existing bottom elevation of the recharge basins.

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GENERAL LOCATION MAP
NWIRP BETHPAGE, NEW YORK

NAVFAC
Naval Facilities Engineering Systems Command

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MAS	02/12/21	112G08005-WE13
CHECKED BY	DATE	FIGURE NUMBER
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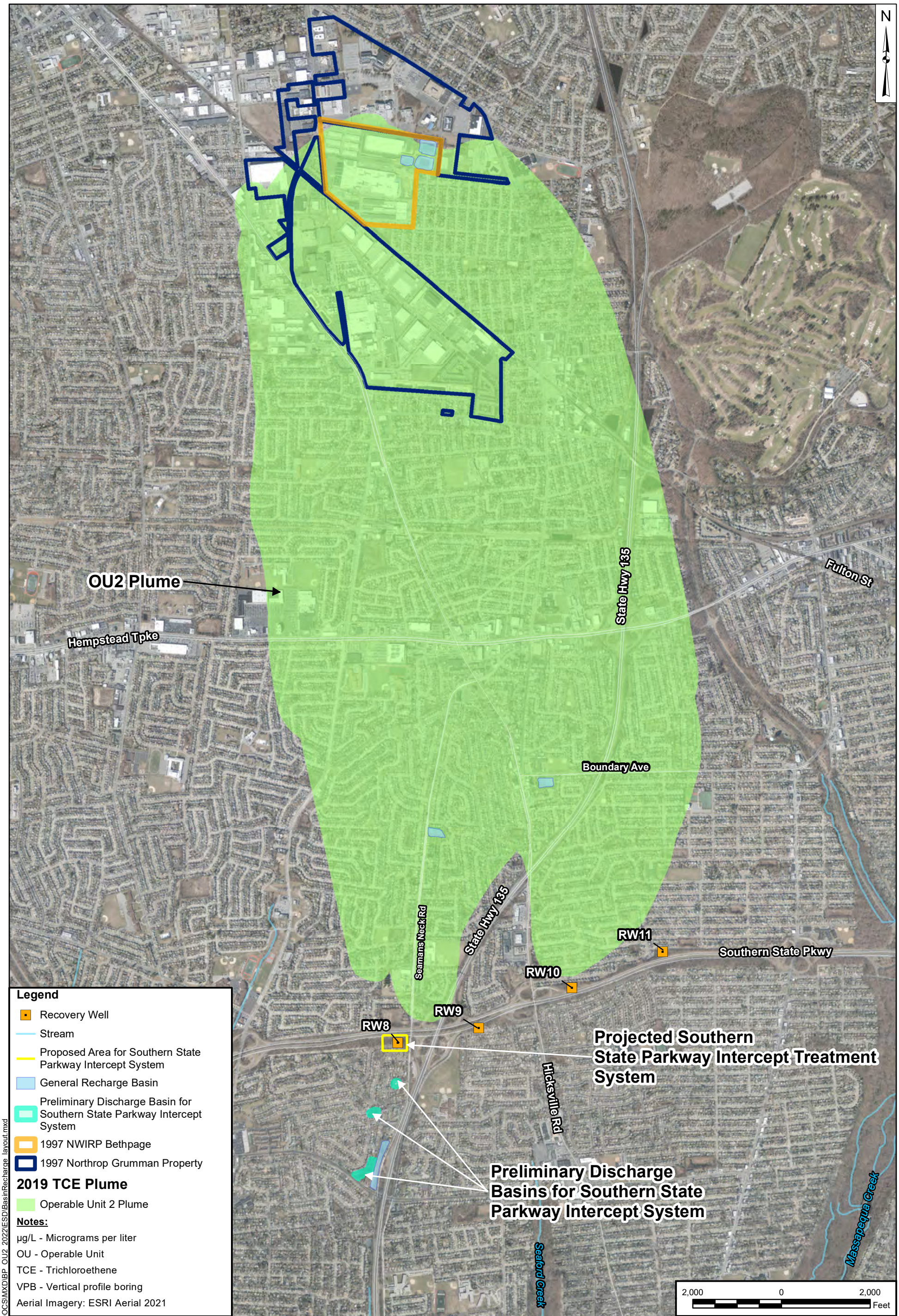

Legend

- Recovery Well
- Stream
- Proposed Area for Southern State Parkway Intercept System
- General Recharge Basin
- Preliminary Discharge Basin for Southern State Parkway Intercept System
- 1997 NWIRP Bethpage
- 1997 Northrop Grumman Property

2019 TCE Plume

- Operable Unit 2 Plume

Notes:

µg/L - Micrograms per liter
OU - Operable Unit
TCE - Trichloroethene
VPB - Vertical profile boring
Aerial Imagery: ESRI Aerial 2021

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GENERAL LOCATION MAP
SOUTHERN STATE PARKWAY INTERCEPT SYSTEM
NWIRP BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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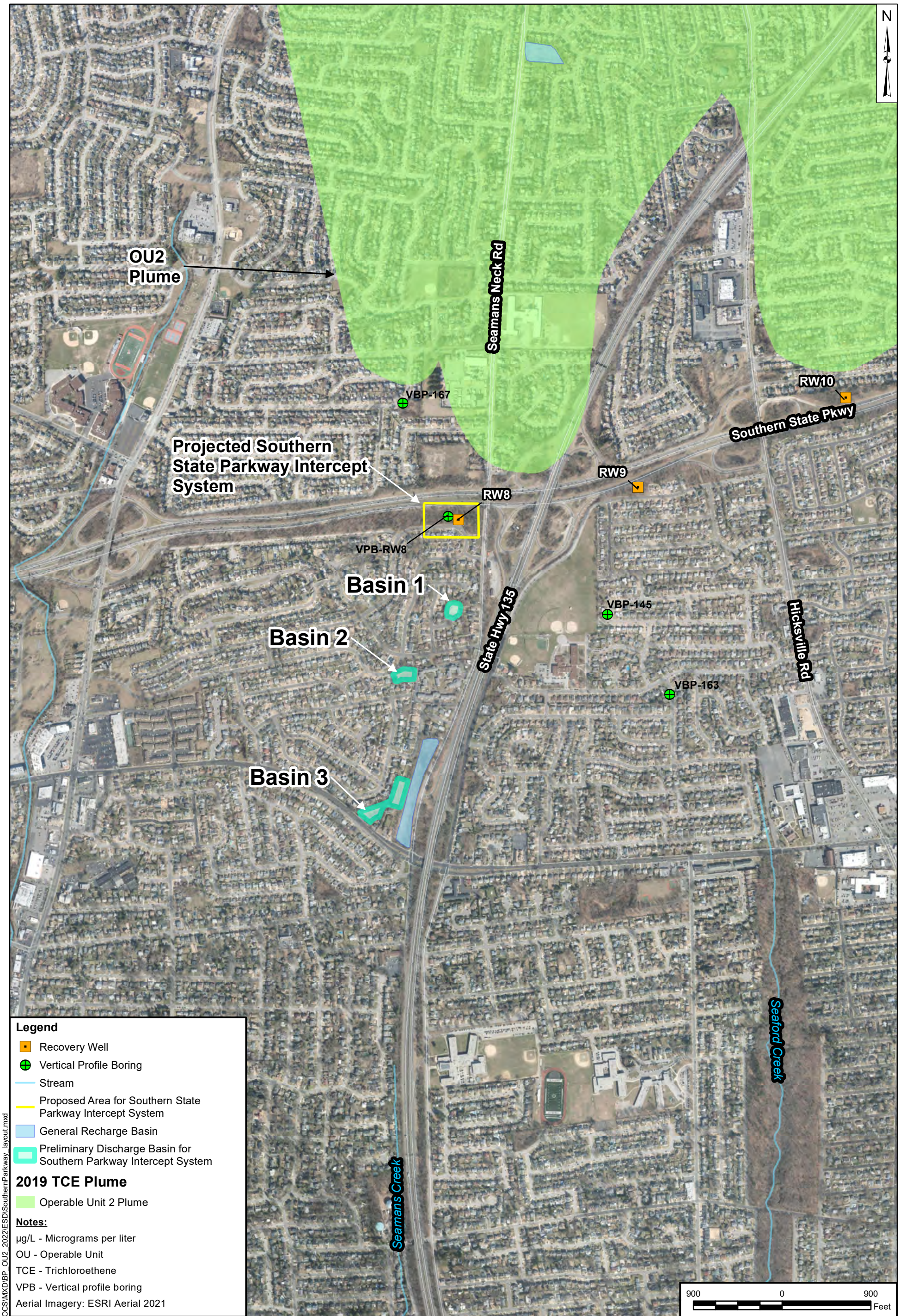

Legend

- Recovery Well
- Vertical Profile Boring
- Stream
- Proposed Area for Southern State Parkway Intercept System
- General Recharge Basin
- Preliminary Discharge Basin for Southern Parkway Intercept System

2019 TCE Plume

- Operable Unit 2 Plume

Notes:

µg/L - Micrograms per liter

OU - Operable Unit

TCE - Trichloroethene

VPB - Vertical profile boring

Aerial Imagery: ESRI Aerial 2021

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LAYOUT MAP

SOUTHERN STATE PARKWAY INTERCEPT SYSTEM AREA

NWIRP BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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MAS	02/11/22	112G08005-WE24
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DB	02/11/22	3

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BASIN 1 (NC 282)
RECHARGE BASIN LAYOUT
SOUTHERN STATE PARKWAY INTERCEPT SYSTEM AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

NAVFAC Naval Facilities Engineering Systems Command

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N. SPROUSE	08/04/22	1

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BASIN 2 (NC 162)
RECHARGE BASIN LAYOUT
SOUTHERN STATE PARKWAY INTERCEPT SYSTEM AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

NAVFAC
Naval Facilities Engineering Systems Command

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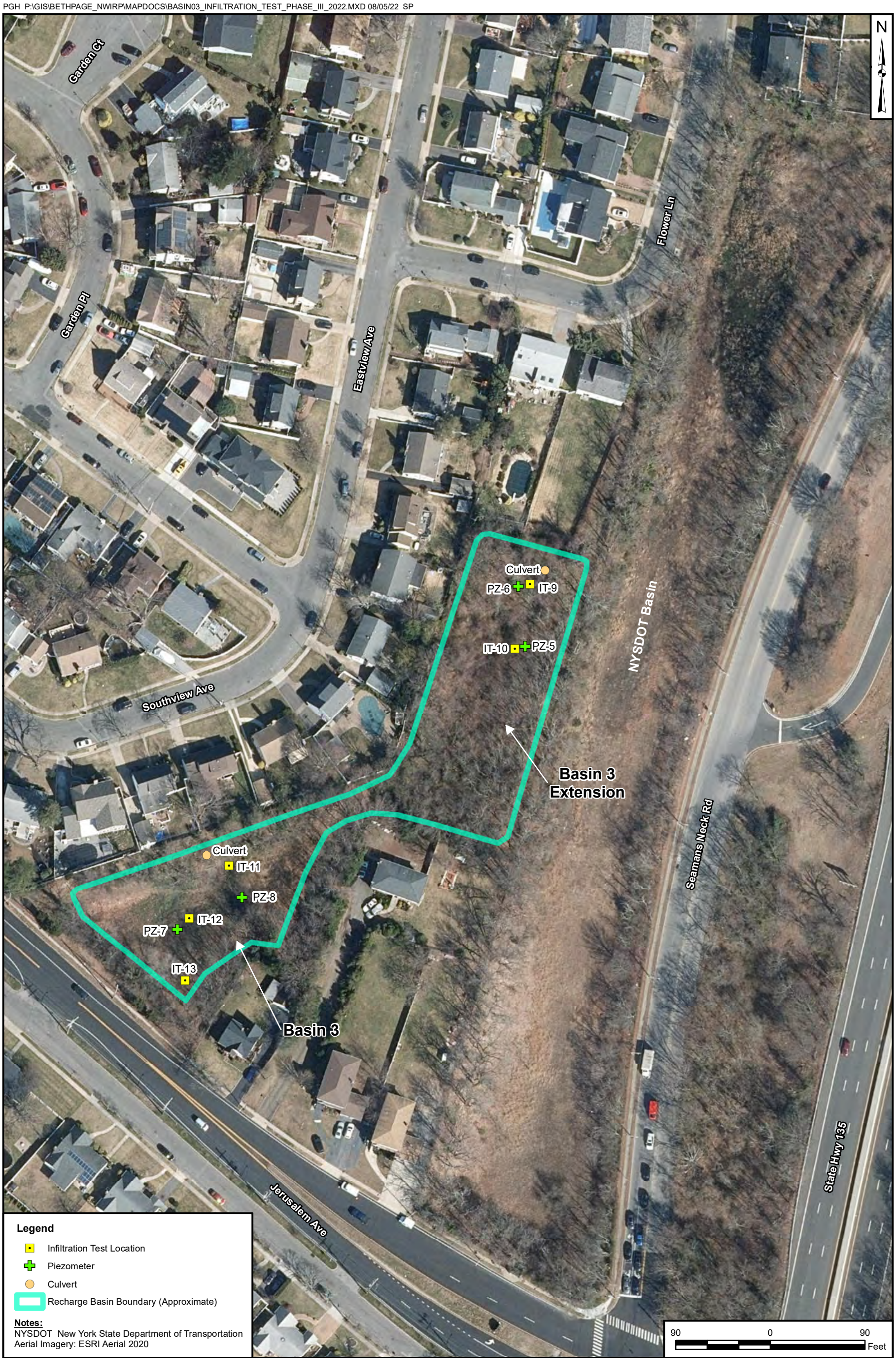

BASIN 3 (NC 173) AND EXTENSION
RECHARGE BASIN LAYOUT
SOUTHERN STATE PARKWAY INTERCEPT SYSTEM AREA
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE, NEW YORK

NAVFAC
Naval Facilities Engineering Systems Command

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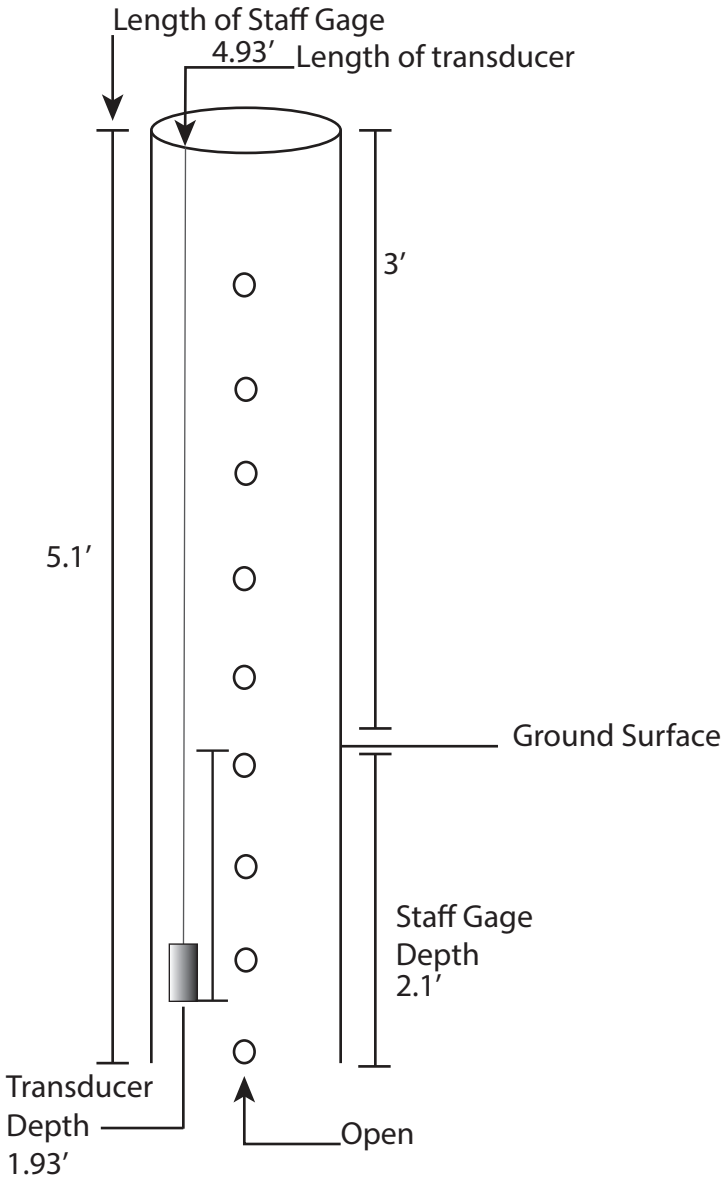
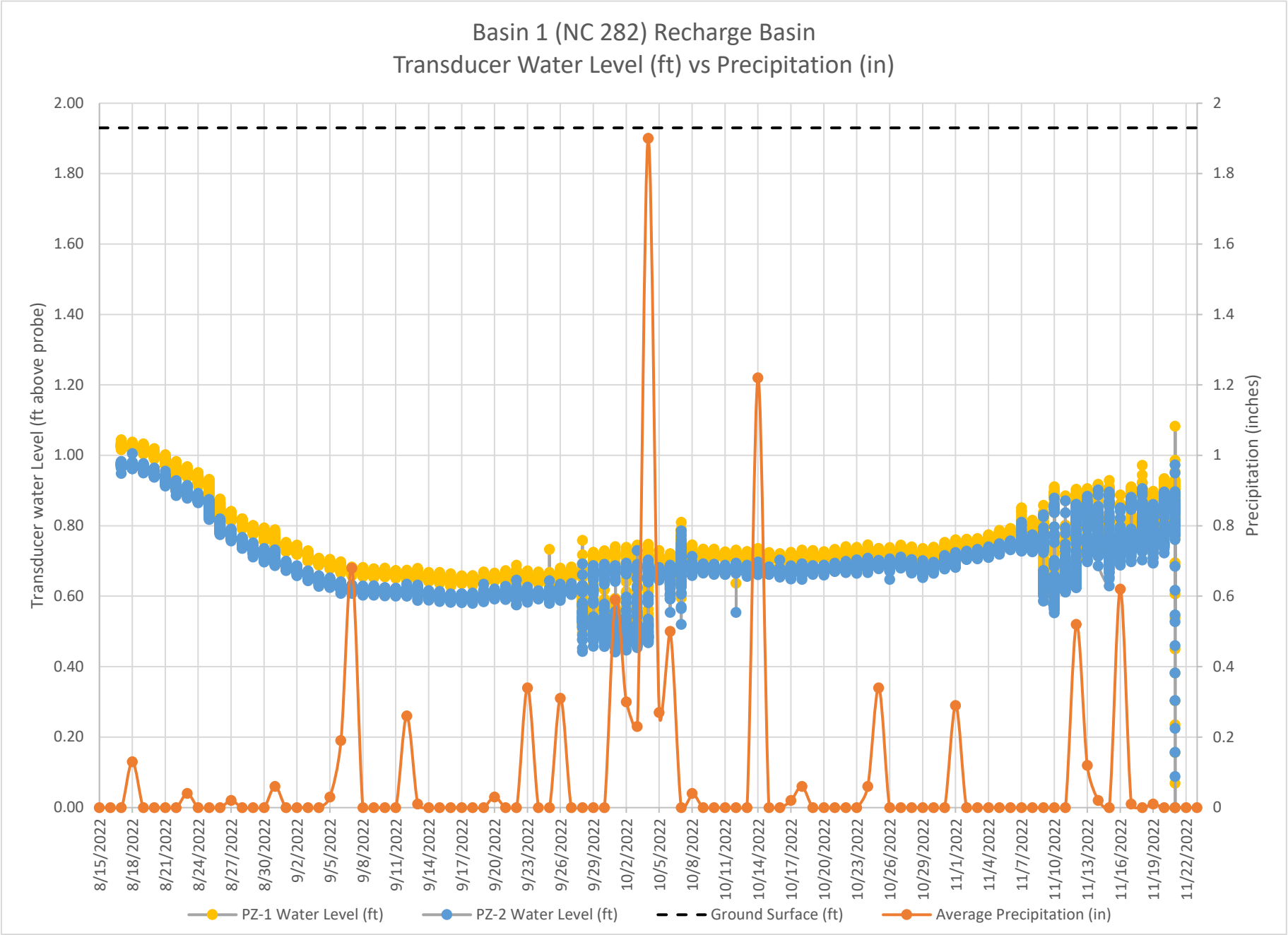
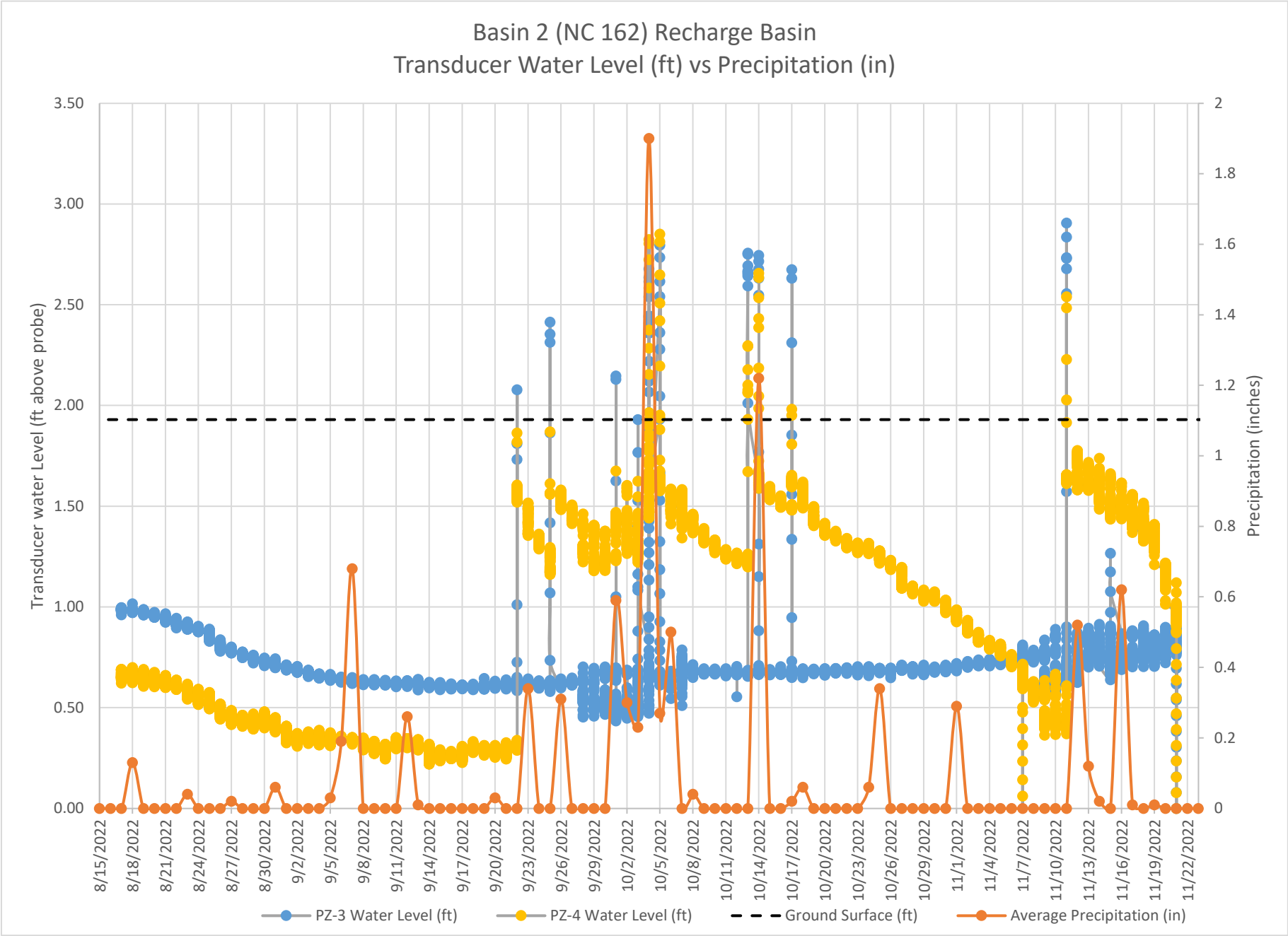


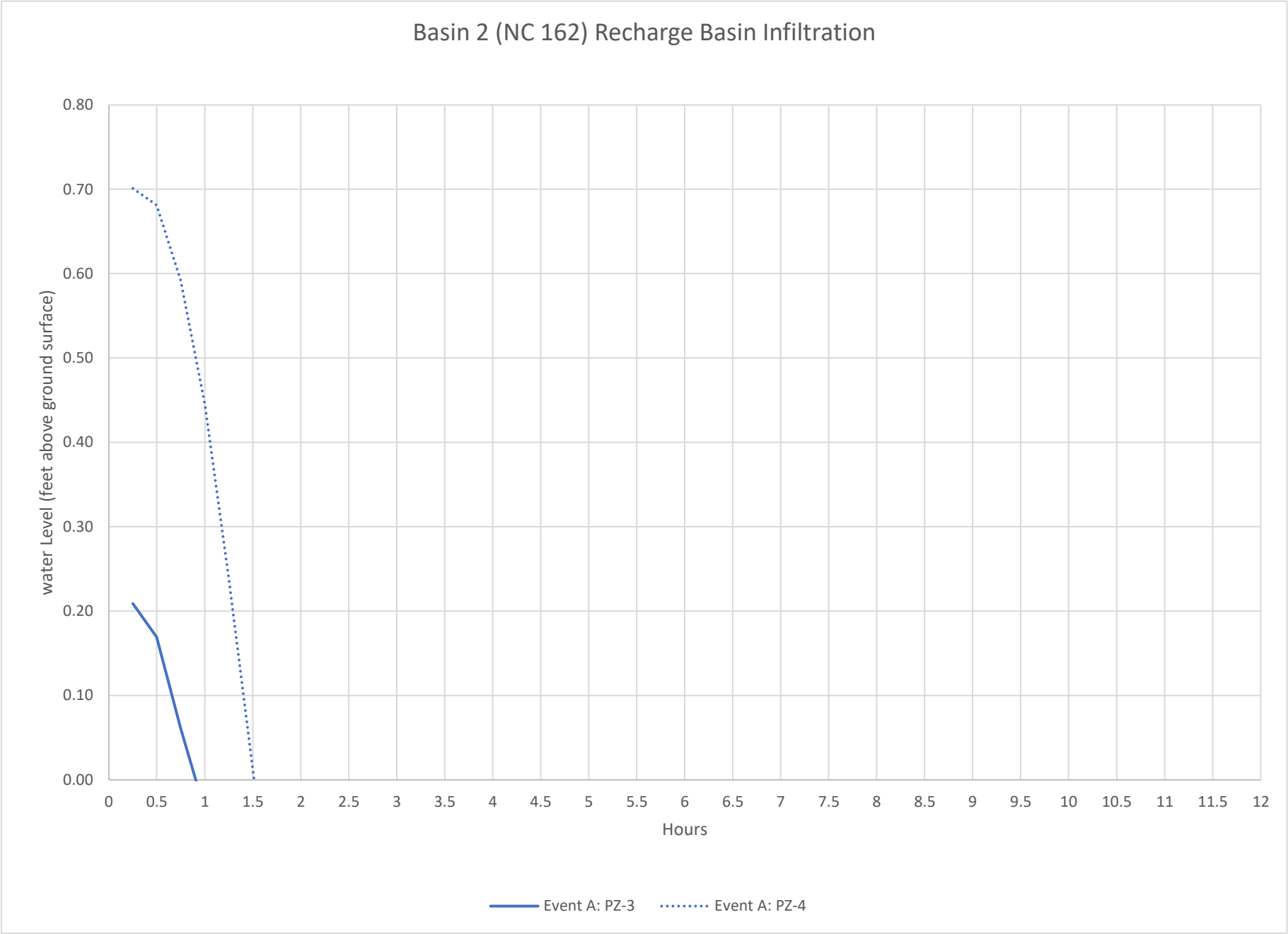
TETRA TECH

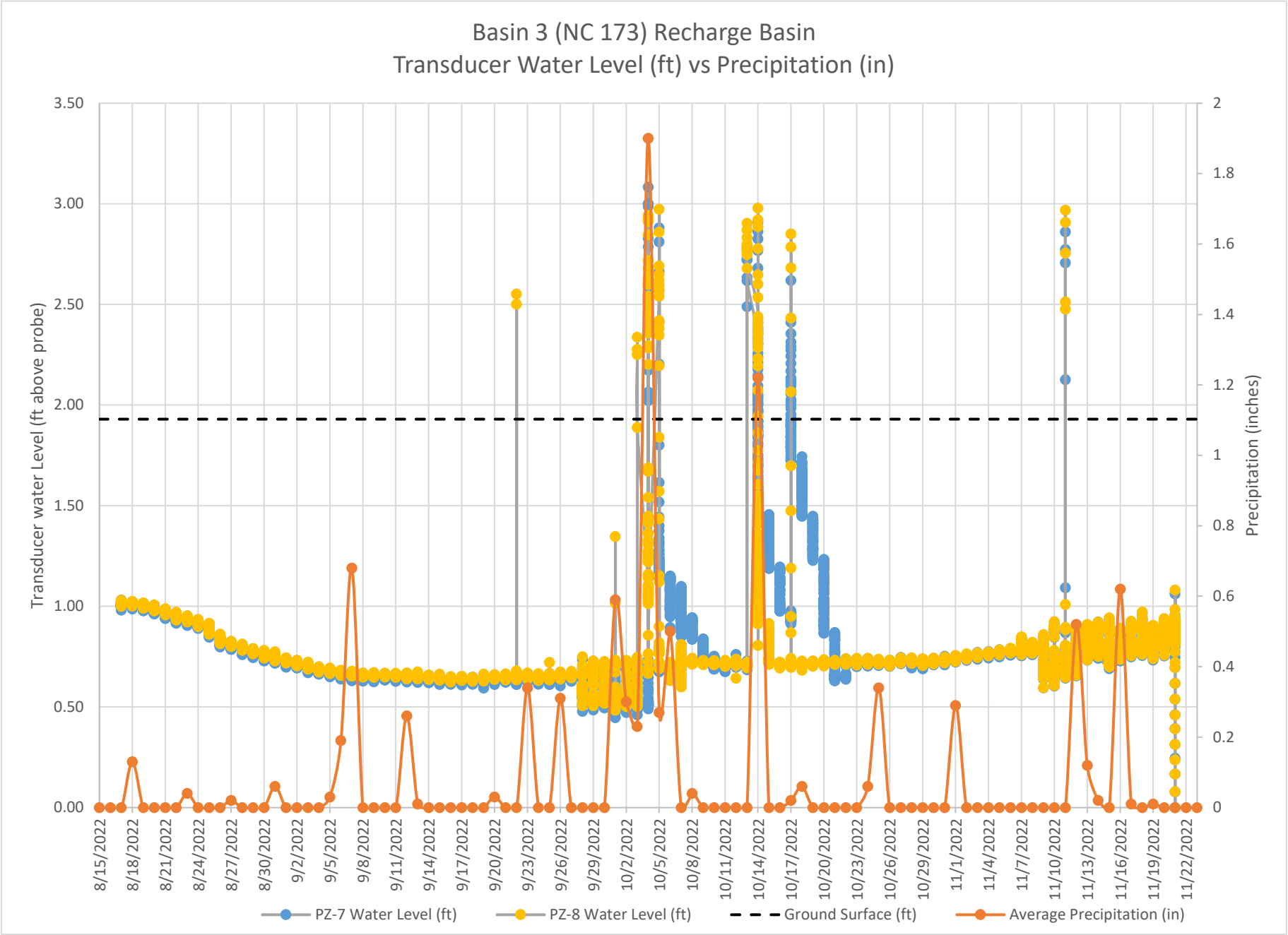
STAFF GAGE (PZ)
NWIRP BETHPAGE
BETHPAGE, NEW YORK

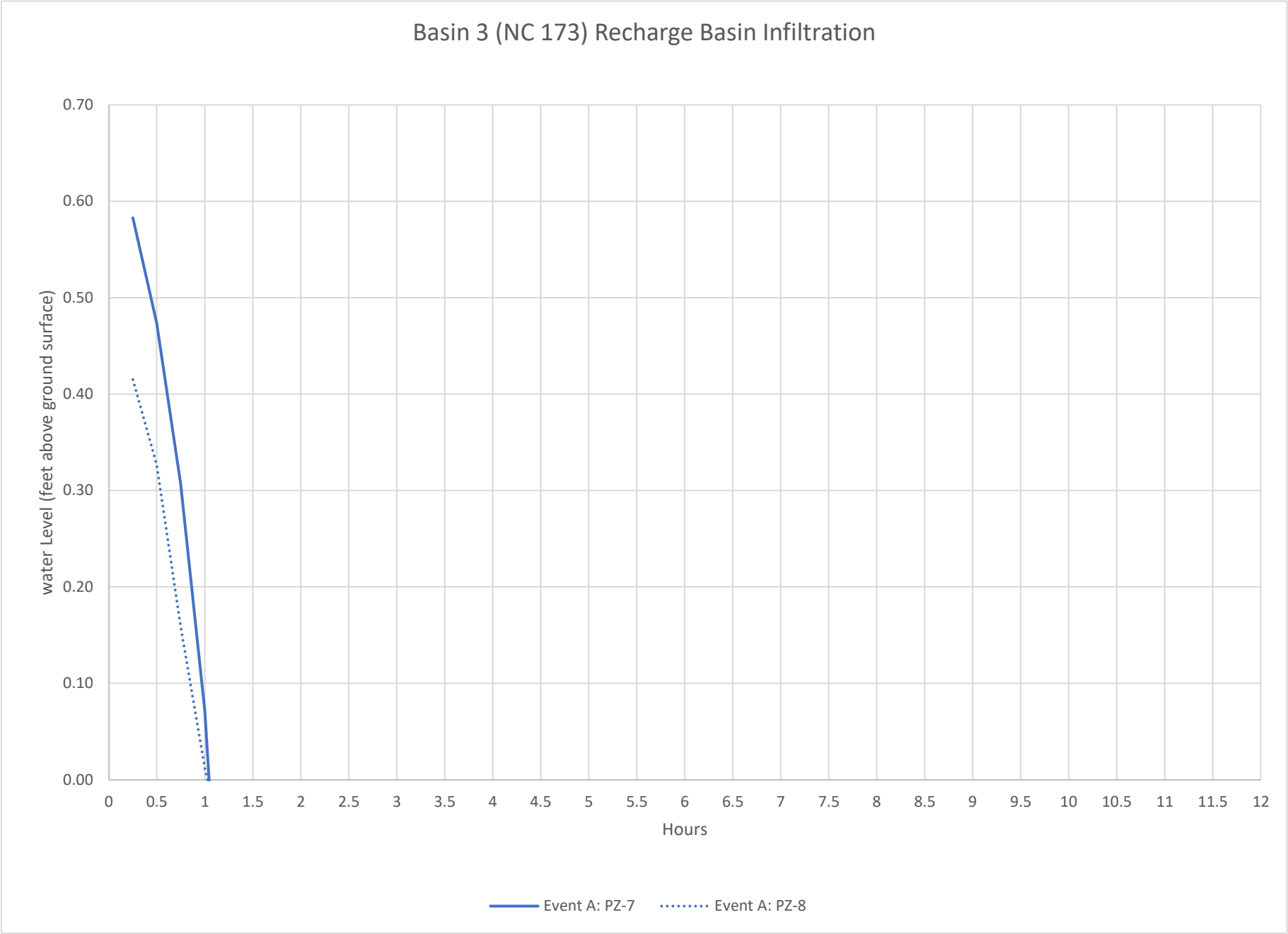
FILE	112G08005-WE24	SCALE	NOT TO SCALE
FIGURE NO.		REV	DATE 1/26/23

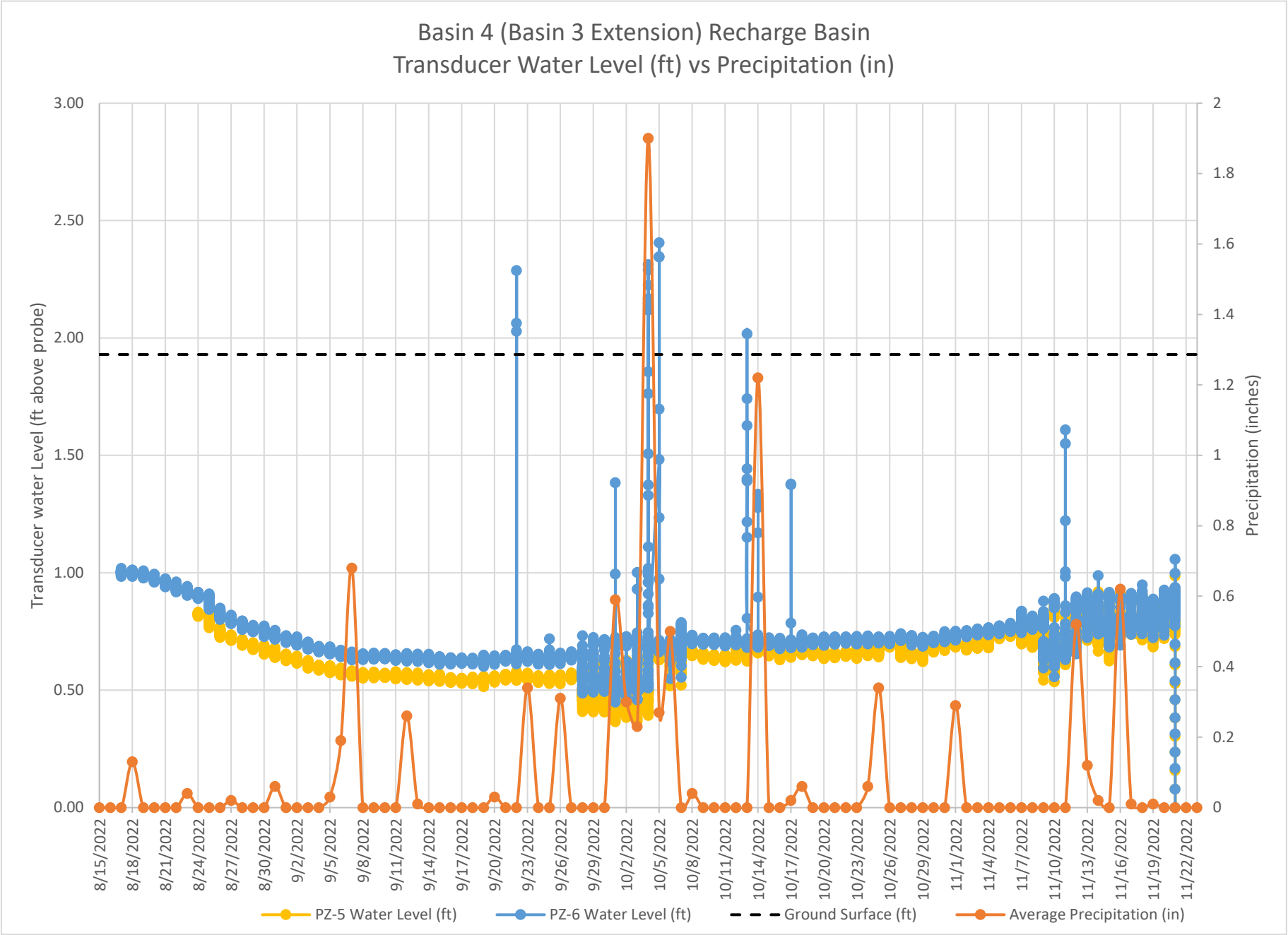

Basin 1 (NC 282) Recharge Basin
Transducer Water Level (ft) vs Precipitation (in)
Transducer water Level (ft above probe)
Precipitation (inches)
2.00
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/15/2022
8/18/2022
8/21/2022
8/24/2022
8/27/2022
8/30/2022
9/2/2022
9/5/2022
9/8/2022
9/11/2022
9/14/2022
9/17/2022
9/20/2022
9/23/2022
9/26/2022
9/29/2022
10/2/2022
10/5/2022
10/8/2022
10/11/2022
10/14/2022
10/17/2022
10/20/2022
10/23/2022
10/26/2022
10/29/2022
11/1/2022
11/4/2022
11/7/2022
11/10/2022
11/13/2022
11/16/2022
11/19/2022
11/22/2022
PZ-1 Water Level (ft)
PZ-2 Water Level (ft)
Ground Surface (ft)
Average Precipitation (in)


Basin 2 (NC 162) Recharge Basin
Transducer Water Level (ft) vs Precipitation (in)
Transducer water Level (ft above probe)
Precipitation (inches)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/15/2022
8/18/2022
8/21/2022
8/24/2022
8/27/2022
8/30/2022
9/2/2022
9/5/2022
9/8/2022
9/11/2022
9/14/2022
9/17/2022
9/20/2022
9/23/2022
9/26/2022
9/29/2022
10/2/2022
10/5/2022
10/8/2022
10/11/2022
10/14/2022
10/17/2022
10/20/2022
10/23/2022
10/26/2022
10/29/2022
11/1/2022
11/4/2022
11/7/2022
11/10/2022
11/13/2022
11/16/2022
11/19/2022
11/22/2022
PZ-3 Water Level (ft)
PZ-4 Water Level (ft)
Ground Surface (ft)
Average Precipitation (in)


Basin 2 (NC 162) Recharge Basin Infiltration
water Level (feet above ground surface)
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
Hours
Event A: PZ-3
Event A: PZ-4


Basin 3 (NC 173) Recharge Basin
Transducer Water Level (ft) vs Precipitation (in)
Transducer water Level (ft above probe)
Precipitation (inches)
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/15/2022
8/18/2022
8/21/2022
8/24/2022
8/27/2022
8/30/2022
9/2/2022
9/5/2022
9/8/2022
9/11/2022
9/14/2022
9/17/2022
9/20/2022
9/23/2022
9/26/2022
9/29/2022
10/2/2022
10/5/2022
10/8/2022
10/11/2022
10/14/2022
10/17/2022
10/20/2022
10/23/2022
10/26/2022
10/29/2022
11/1/2022
11/4/2022
11/7/2022
11/10/2022
11/13/2022
11/16/2022
11/19/2022
11/22/2022
PZ-7 Water Level (ft)
PZ-8 Water Level (ft)
Ground Surface (ft)
Average Precipitation (in)


Basin 3 (NC 173) Recharge Basin Infiltration
water Level (feet above ground surface)
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
7
7.5
8
8.5
9
9.5
10
10.5
11
11.5
12
Hours
Event A: PZ-7
Event A: PZ-8


Basin 4 (Basin 3 Extension) Recharge Basin
Transducer Water Level (ft) vs Precipitation (in)
Transducer water Level (ft above probe)
Precipitation (inches)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
8/15/2022
8/18/2022
8/21/2022
8/24/2022
8/27/2022
8/30/2022
9/2/2022
9/5/2022
9/8/2022
9/11/2022
9/14/2022
9/17/2022
9/20/2022
9/23/2022
9/26/2022
9/29/2022
10/2/2022
10/5/2022
10/8/2022
10/11/2022
10/14/2022
10/17/2022
10/20/2022
10/23/2022
10/26/2022
10/29/2022
11/1/2022
11/4/2022
11/7/2022
11/10/2022
11/13/2022
11/16/2022
11/19/2022
11/22/2022
PZ-5 Water Level (ft)
PZ-6 Water Level (ft)
Ground Surface (ft)
Average Precipitation (in)

ATTACHMENT 1
DOUBLE RING INFILTRATION TEST
DATA SHEETS

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-1 (Basin 1)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/23/2022
Personnel: N. Sprouse & J. Marlow	
Location / Description: Basin 1 Lattitude: 40.698197	Longitude: -73.49533
Weather: Sunny 80s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1336	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1406	**1**	30	42		
1436	**2**	60	36		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1436	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1438	**1**	2	3		
1440	**2**	4	2 15/16		
1442	**3**	6	3		
1444	**4**	8	2 7/8		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-2 (Basin 1)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: J. Marlow & L. Donston	
Location / Description: Basin 1 Lattitude: 40.698207	Longitude: -73.493719
Weather: Sunny 50s-60s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 3/4

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __2"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
923	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
953	**1**	30	45		
1023	**2**	60	39.5		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1023	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1025	**1**	2	3 3/8		
1027	**2**	4	2 1/2		**Measured at Outer Ring**
1029	**3**	6	3 3/8		
1031	**4**	8	2 15/16		
1033	**5**	10	2 1/4		
1035	**6**	12	2		
1037	**7**	14	2 3/16		
1039	**8**	16	2 1/8		**END TEST; STABLE**

Additional Comments: Estimated to be lowest accessible point in Basin 1

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-3 (Basin 1)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: N. Sprouse	
Location / Description: Basin 1 Lattitude: 40.698044	Longitude: -73.493764
Weather: Sunny 50s-60s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 3/4

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1021	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1051	**1**	30	30		
1121	**2**	60	28.75		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1121	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1123	**1**	2	2 1/2		
1125	**2**	4	2 3/8		
1127	**3**	6	2 3/8		
1129	**4**	8	2 3/8		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-4 (Basin 1)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: N. Sprouse & L. Donston	
Location / Description: Basin 1 Lattitude: 40.698055	Longitude: -73.493588
Weather: Sunny 50s-60s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 1/2

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __2"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1140	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1210	**1**	30	22 3/4		
1240	**2**	60	12 3/4		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1240	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1242	**1**	2	3/4		
1244	**2**	4	3/4		
1246	**3**	6	3/4		
1248	**4**	8	3/4		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

Basin 1 (NC 282)				
Test Interval (min)	2	2	2	2
Infiltration Test ID	IT-1	IT-2	IT-3	IT-4
Water Level Drop (in)	--	--	--	--
	3.00	3.38	2.50	0.75
	2.94	2.50	2.38	0.75
	3.00	3.38	2.38	0.75
	2.88	2.94	2.38	0.75
	--	2.25	--	--
	--	2.00	--	--
	--	2.19	--	--
	--	2.13	--	--
Average Water Level Drop (last four readings, in)	2.95	2.14	2.41	0.75
Infiltration Rate (in/hr)	88.59	64.22	72.19	22.50

Minimum Infiltration:	IT-4	22.50	in/hr
Maximum Infiltration:	IT-1	88.59	in/hr
Average Overall Basin Infiltration Rate:	61.88	in/hr	
Geometric Mean:	55.13	in/hr	

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-5 (Basin 2)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: L. Donston	
Location / Description: Basin 2 Lattitude: 40.696189	Longitude: -73.495821
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 1/8

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3.5"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1434	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1504	**1**	30	9 1/4		
1534	**2**	60	6 3/8		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1534	**0**	0	-----	Refill inner and outer ring after each measurement	**START 10 MINUTE TEST**
1544	**1**	10	2 1/8		
1554	**2**	20	2 3/8		
1604	**3**	30	2 1/4		
1614	**4**	40	2 1/2		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-6 (Basin 2)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: N. Sprouse	
Location / Description: Basin 2 Lattitude: 40.696250	Longitude: -73.495641
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 1/2

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __2.5"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1457	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1527	**1**	30	5		
1557	**2**	60	3 1/2		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1557	**0**	0	-----	Refill inner and outer ring after each measurement	**START 10 MINUTE TEST**
1607	**1**	10	1 1/2		
1617	**2**	20	1 3/8		
1627	**3**	30	1 1/2		
1637	**4**	40	1 3/8		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments: Estimated to be lowest accessible point in Basin 2

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-7 (Basin 2)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: J. Marlow	
Location / Description: Basin 2 Lattitude:	Longitude:
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 7/8

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __2"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1520	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1550	**1**	30	31		
1620	**2**	60	34 1/6		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1620	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1622	**1**	2	2 4/9		
1624	**2**	4	2 1/4		
1626	**3**	6	2 3/8		
1628	**4**	8	2 1/4		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-8 (Basin 2)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/24/2022
Personnel: L. Donston	
Location / Description: Basin 2 Lattitude:40.696328	Longitude: -73.495327
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1639	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1709	**1**	30	22 1/8		
1739	**2**	60	20		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1739	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1741	**1**	2	1 7/8		
1743	**2**	4	1 7/8		
1745	**3**	6	1 1/2		
1747	**4**	8	1 1/2		**END TEST**
	5				
	6				
	7				
	8				

Additional Comments:

Basin 2 (NC 162)				
Test Interval (min)	10	10	2	2
Infiltration Test ID	IT-5	IT-6	IT-7	IT-8
Water Level Drop (in)	--	--	--	--
	2.13	1.50	2.44	1.88
	2.38	1.38	2.25	1.88
	2.25	1.50	2.38	1.50
	2.50	1.38	2.25	1.50
Average Water Level Drop (in)	2.31	1.44	2.33	1.69
Infiltration Rate (in/hr)	13.88	8.63	69.84	50.63

Minimum Infiltration:	IT-6	8.63	in/hr
Maximum Infiltration:	IT-7	69.84	in/hr
Average Overall Basin Infiltration Rate:	35.74	in/hr	
Geometric Mean:	25.50	in/hr	

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-9 (Basin 3 Extension)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/25/2022
Personnel: N. Sprouse	
Location / Description: Basin 3 Ext. Lattitude:40.693267	Longitude: -73.495646
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 1/2

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
950	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1020	**1**	30	5 3/4		
1050	**2**	60	5 1/4		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1050	**0**	0	-----	Refill inner and outer ring after each measurement	**START 10 MINUTE TEST**
1100	**1**	10	7/8		
1110	**2**	20	7/8		
1120	**3**	30	1/2		
1130	**4**	40	1/2		
1140	**5**	50	7/8		
1150	**6**	60	1/2		
1200	**7**	70	3/4		
1210	**8**	80	5/8		**END TEST**

Additional Comments: Located near basin inlet; Estimated to be lowest accessible point in Basin 2

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-10 (Basin 3 Extension)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/25/2022
Personnel: J. Marlow	
Location / Description: Basin 3 Ext. Lattitude:	Longitude:
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 1/4

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __4"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1028	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1058	**1**	30	29 1/4		
1128	**2**	60	32 1/2		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1128	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1130	**1**	2	1 3/4		
1132	**2**	4	1 13/16		
1134	**3**	6	1 7/8		
1136	**4**	8	1 15/16		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments:

Basin 3 Extension		
Test Interval (min)	10	2
Infiltration Test ID	IT-9	IT-10
Water Level Drop (in)	--	--
	0.88	1.75
	0.88	1.81
	0.50	1.88
	0.50	1.94
	0.88	--
	0.50	--
	0.75	--
	0.63	--
Average Water Level Drop (last four readings, in)	0.69	1.84
Infiltration Rate (in/hr)	1.38	55.31

NOTE: IT-9 was not stabalized, infiltration rate calculated based on 30min test interval

Minimum Infiltration:	IT-9	1.38	in/hr
Maximum Infiltration:	IT-10	55.31	in/hr
Average Overall Basin Infiltration Rate:	28.34	in/hr	
Geometric Mean:	8.72	in/hr	

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-11 (Basin 3)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/25/2022
Personnel: N. Sprouse	
Location / Description: Basin 3 Lattitude: 40.692537	Longitude: -73.496685
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7 9/16

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1407	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1437	**1**	30	20 4/7		
1507	**2**	60	9 1/8		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1507	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1509	**1**	2	1 1/4		
1511	**2**	4	3/4		
1513	**3**	6	3/4		
1515	**4**	8	7/8		
1517	**5**	10	7/8		
1519	**6**	12	7/8		
1521	**7**	14	7/8		**END TEST; STABLE**
	8				

Additional Comments: Located near basin inlet

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-12 (Basin 3)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/26/2022
Personnel: J. Marlow & S. Rezaie	
Location / Description: Basin 3 Lattitude:	Longitude:
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 7

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __4"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1419	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1449	**1**	30	20 5/8		
1519	**2**	60	15 1/2		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1519	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1521	**1**	2	3/4		
1523	**2**	4	1		
1525	**3**	6	7/8		
1527	**4**	8	7/8		**END TEST; STABLE**
	5				
	6				
	7				
	8				

Additional Comments: Estimated to be lowest accessible point in Basin 3

INFILTRATION TEST DATA SHEET

TETRA TECH

Project Name: NWIRP Bethpage Offsite Infiltration Tests	**Test ID:** **IT-13 (Basin 3)**
Project Number: 112G08005-WE24 task ES.DB.03	**Date:** 5/26/2022
Personnel: N. Sprouse & S. Rezaie	
Location / Description: Basin 3 Lattitude: 40.692237	Longitude: -73.496837
Weather: Sunny 60s - 70s F	**Rainfall within past 24-hours:** 0.0"

Test Information

Test Method: Double Ring Infiltrometer __X__ Single Ring Infiltrometer _____ Percolation Test _____

Inner Ring Inside Diameter / Height: 6" / 10" Outer Ring Inside Diameter / Height: 10" / 10"

Percolation Hole Diameter: N/A (If performing an open hole perc test)

Distance from bottom of hole to measuring point (minimum water column of 6-8 inches): 8

Measuring Point: Ring Rim_X_ Indicator Mark _____ **Test Depth (BGS):** __3.5"

Field Measurements

Time	Reading	Elapsed time since start of test (minutes)	Water level drop, inner ring or perc hole (inches)		Remarks
PRESOAK DATA					
1539	**0**	0	-----	Refill inner and outer ring after each measurement	**START PRE-SOAK**
1609	**1**	30	22		
1639	**2**	60	20		**END PRE-SOAK**
	3				
	4				
	5				
	6				
TEST DATA					
1639	**0**	0	-----	Refill inner and outer ring after each measurement	**START 2 MINUTE TEST**
1641	**1**	2	1 7/8		
1643	**2**	4	1 3/4		
1645	**3**	6	1 1/2		
1647	**4**	8	1 1/2		
1649	**5**	10	1 1/2		
1651	**6**	12	1 1/2		**END TEST; STABLE**
	7				
	8				

Additional Comments:

Basin 3 (NC 173)			
Test Interval (min)	2	2	2
Infiltration Test ID	IT-11	IT-12	IT-13
Water Level Drop (in)	--	--	--
	1.25	0.75	1.88
	0.75	1.00	1.75
	0.75	0.88	1.50
	0.88	0.88	1.50
	0.88	--	1.50
	0.88	--	1.50
	0.88	--	--
Average Water Level Drop (in)	0.88	0.88	1.50
Infiltration Rate (in/hr)	26.25	26.25	45.00

Minimum Infiltration:	IT-11 & IT-12	26.25	in/hr
Maximum Infiltration:	IT-13	42.00	in/hr
Average Overall Basin Infiltration Rate:	32.50	in/hr	
Geometric Mean:	31.42	in/hr	

ATTACHMENT 2

LONG TERM OPPOTUNISTIC RECHARGE TEST

RAW DATA

(Transducer Data CD only)

Attachment 2
Weather Underground Data
August 1 through November 30, 2022

Day	Temperature (° F)			Dew Point (° F)			Humidity (%)			Wind Speed (mph)			Pressure (Hg)			Precipation (in)		
	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Total	Min
8/1/2022	75	71.5	69	69	67.6	65	93	87.3	78	13	7.7	0	30	29.9	29.9	-	0.25	-
8/2/2022	89	80.1	70	73	69	62	97	71.3	42	16	10.5	3	29.9	29.8	29.8	-	0	-
8/3/2022	88	80.3	74	74	65.5	61	91	62	40	20	10.8	3	30	30	29.9	-	0	-
8/4/2022	90	81.2	73	75	70.8	68	93	71.8	50	24	11.7	0	30.1	30	30	-	0	-
8/5/2022	88	81.1	77	72	70	67	84	69.4	57	15	10.6	8	30.2	30.1	30.1	-	0	-
8/6/2022	88	80.6	74	74	71.9	70	91	75.5	61	22	11.8	6	30.2	30.2	30.1	-	0	-
8/7/2022	88	81.5	78	74	73	71	87	75.4	61	22	14.5	7	30.2	30.1	30.1	-	0	-
8/8/2022	87	81	77	75	73	71	90	77	61	26	13.8	7	30.1	30	29.9	-	0.01	-
8/9/2022	93	84.7	75	76	73.2	71	94	69.6	52	18	11.5	5	29.9	29.9	29.9	-	0	-
8/10/2022	86	79.8	75	75	67.6	62	90	67.4	46	15	9.8	6	30.1	30	30	-	0	-
8/11/2022	84	77.1	73	74	69.4	62	100	79.4	47	14	7	0	29.9	29.9	29.8	-	0.19	-
8/12/2022	85	77.3	72	61	53.5	45	64	45.4	25	17	11.1	0	30	30	29.9	-	0.16	-
8/13/2022	80	72.9	66	59	49.5	46	68	44.9	30	15	11	5	30.1	30.1	30	-	0	-
8/14/2022	81	73.3	65	62	55.1	51	73	53.8	35	16	8.6	0	30.1	30.1	30	-	0	-
8/15/2022	81	73.7	67	60	57.1	52	76	57.5	36	15	7.3	0	30	30	30	-	0	-
8/16/2022	81	73	63	63	58.9	52	84	63	40	16	9	5	30	30	30	-	0	-
8/17/2022	80	72.6	66	63	57.8	54	87	61	40	13	7.2	0	30	30	29.9	-	0	-
8/18/2022	85	74.3	65	66	60.7	54	87	64.6	34	20	9.8	0	30	29.9	29.9	-	0.13	-
8/19/2022	88	78.1	71	69	60.8	54	82	57.1	31	21	11.3	5	30.1	30.1	30	-	0	-
8/20/2022	88	78.2	72	70	67.3	65	87	70.7	46	15	8.9	3	30.2	30.1	30.1	-	0	-
8/21/2022	81	75.2	71	73	69.9	65	100	84.2	60	14	7.5	0	30.1	30.1	30	-	0	-
8/22/2022	78	73.9	73	73	71	70	97	90.3	76	12	6.4	0	30	29.9	29.8	-	0	-
8/23/2022	84	76.8	72	73	69.8	62	100	80.4	54	18	8.4	0	29.9	29.8	29.8	-	0.04	-
8/24/2022	88	79.5	72	71	64.4	59	85	61.7	39	20	11.6	6	30	29.9	29.9	-	0	-
8/25/2022	91	80.7	70	69	61.5	56	76	53.6	34	18	9.6	0	30	30	30	-	0	-
8/26/2022	86	79.4	73	72	69.9	67	87	73.3	59	20	12.4	3	30	29.9	29.9	-	0	-
8/27/2022	90	79.5	74	72	67.5	59	93	68.8	35	15	8.2	0	30.1	30	29.9	-	0.02	-
8/28/2022	83	75.4	73	71	68.2	66	93	78.9	60	17	10.4	5	30.2	30.1	30.1	-	0	-
8/29/2022	84	77.5	74	73	71.9	70	97	83.5	65	18	10.1	3	30.1	30.1	30	-	0	-

8/30/2022	86	78.2	73	74	72.2	70	94	82.2	61	23	13.8	7	30	29.9	29.8	-	0	-
8/31/2022	88	79.3	72	71	58.6	45	91	53.3	28	17	11.4	3	29.9	29.8	29.7	-	0.06	-
9/1/2022	89	78.9	70	57	50.9	43	63	39.4	21	17	13	8	30.1	29.9	29.9	-	0	-
9/2/2022	77	70	62	61	53.9	47	81	57.6	45	13	7.6	0	30.3	30.2	30.1	-	0	-
9/3/2022	78	71	62	63	60.4	59	90	70.5	54	10	7.3	3	30.3	30.3	30.2	-	0	-
9/4/2022	85	77	72	71	68	64	84	74.1	57	15	9.5	0	30.2	30.1	30.1	-	0	-
9/5/2022	83	76.5	72	72	70.1	68	93	81.4	60	18	8.5	0	30.1	30.1	30	-	0.03	-
9/6/2022	75	70.9	67	73	68.6	64	97	92.4	84	17	9.5	5	30	30	30	-	0.19	-
9/7/2022	74	69.6	66	65	62.5	60	93	78.5	64	20	13.1	8	30	30	29.9	-	0.68	-
9/8/2022	79	71.1	65	61	58	55	81	64.3	45	16	7.6	0	29.9	29.9	29.9	-	0	-
9/9/2022	77	69.2	60	62	58.6	54	84	70.2	45	12	7.1	3	30.2	30.1	29.9	-	0	-
9/10/2022	82	73.1	65	66	59.1	47	84	64.3	30	12	7.3	3	30.3	30.2	30.2	-	0	-
9/11/2022	76	71.4	68	70	65.5	59	96	82.1	56	13	6.9	0	30.2	30.1	29.9	-	0	-
9/12/2022	78	73.1	68	72	69.5	68	100	89.1	71	13	8	3	29.9	29.8	29.8	-	0.26	-
9/13/2022	87	76.5	70	74	68.5	51	97	78.3	42	22	10.6	3	29.8	29.8	29.7	-	0.01	-
9/14/2022	83	73.8	65	61	55	52	66	52.5	38	17	12.4	8	30	29.9	29.8	-	0	-
9/15/2022	76	70.3	63	60	46.3	37	64	43.7	26	21	12.5	7	30.2	30.1	30	-	0	-
9/16/2022	78	66.6	56	58	46.2	35	75	50.8	21	10	5.9	3	30.2	30.2	30.1	-	0	-
9/17/2022	73	69.4	65	62	55.9	51	78	62.7	48	13	9	8	30.3	30.2	30.2	-	0	-
9/18/2022	84	74.3	67	67	62.8	60	87	68.3	47	20	14.3	9	30.2	30.1	30	-	0	-
9/19/2022	83	74.9	69	69	64.4	59	81	70.2	53	25	11.7	7	30	29.9	29.8	-	0	-
9/20/2022	83	74.4	69	66	59.3	55	87	61.3	39	18	12.4	7	29.9	29.9	29.8	-	0.03	-
9/21/2022	78	71	63	67	59.2	56	81	66.8	50	16	10.8	0	30	29.9	29.8	-	0	-
9/22/2022	78	69.2	59	68	59.3	44	87	72	44	26	15	7	29.8	29.6	29.6	-	0	-
9/23/2022	66	57.7	51	45	35.5	25	64	45.4	23	29	20.4	12	30	29.9	29.8	-	0.34	-
9/24/2022	71	60.4	49	48	40	35	64	48.3	31	15	10.9	5	30	30	29.9	-	0	-
9/25/2022	76	65.8	61	63	56	46	87	71.2	54	24	11.7	0	29.9	29.7	29.6	-	0	-
9/26/2022	74	66.3	59	63	56.5	50	90	72.3	45	22	14.2	9	29.8	29.7	29.6	-	0.31	-
9/27/2022	72	66	62	52	46.6	44	63	50.1	40	18	12.1	8	30	29.9	29.8	-	0	-
9/28/2022	72	63.7	54	50	46.8	46	75	55.4	40	15	10.9	6	30.2	30.1	30	-	0	-
9/29/2022	67	61.3	56	48	44.6	42	65	55	42	20	13.5	8	30.4	30.3	30.2	-	0	-

9/30/2022	64	58.8	54	49	46.8	45	75	64.8	54	14	11	8	30.3	30.3	30.1	-	0	-
10/1/2022	61	57.5	53	58	54.4	50	97	89.6	72	23	17.1	12	30.1	30	29.9	-	0.59	-
10/2/2022	60	56.3	50	54	46	36	89	69.3	51	29	20.9	14	30.2	30.1	29.9	-	0.3	-
10/3/2022	51	50.2	49	46	42.8	39	90	75.9	63	22	17.6	14	30.2	30.2	30.1	-	0.23	-
10/4/2022	56	51.3	47	55	50	45	100	95.3	90	25	18.8	12	30.1	30	29.9	-	1.9	-
10/5/2022	59	56.7	55	57	56	55	100	97.7	90	21	12.7	5	29.9	29.9	29.9	-	0.27	-
10/6/2022	76	62	53	59	51.1	43	100	72.4	31	10	7	3	30	29.9	29.9	-	0.5	-
10/7/2022	76	65.9	57	58	53.4	46	93	66.5	40	20	10.4	0	30.1	30	29.9	-	0	-
10/8/2022	60	54.6	48	44	37.8	33	80	54.1	41	20	11.3	3	30.2	30.1	30.1	-	0.04	-
10/9/2022	63	54.8	46	42	37.8	33	76	54.1	35	17	11.3	3	30.2	30.1	30.1	-	0	-
10/10/2022	67	58.5	49	47	42.2	38	77	56.5	34	17	9.5	5	30.3	30.2	30.2	-	0	-
10/11/2022	71	60.6	52	55	47.5	43	81	63.5	41	15	8.5	3	30.3	30.3	30.3	-	0	-
10/12/2022	68	60.8	53	58	51.4	45	90	72.3	50	20	9.6	3	30.3	30.2	30.1	-	0	-
10/13/2022	67	64.5	55	65	62.5	54	100	93.5	84	21	15.2	7	30.1	29.8	29.8	-	0	-
10/14/2022	69	58	53	54	48.5	37	97	74.5	31	23	11.1	0	30	29.9	29.8	-	1.22	-
10/15/2022	67	58.8	49	55	49.2	43	89	71.7	44	21	8.6	0	30.1	30	30	-	0	-
10/16/2022	66	59	53	52	47.6	39	93	67.8	37	10	6.7	3	30	29.9	29.9	-	0	-
10/17/2022	66	60.5	56	59	54.5	45	93	80.7	64	17	9.9	0	29.8	29.7	29.6	-	0.02	-
10/18/2022	57	53	48	51	32.5	27	84	46.5	38	17	12.3	8	29.8	29.7	29.6	-	0.06	-
10/19/2022	55	49.8	44	35	32.5	30	68	52.3	40	20	14.5	9	29.9	29.8	29.8	-	0	-
10/20/2022	60	52.9	45	38	34	28	68	50.6	30	23	17.3	12	30.1	30	29.9	-	0	-
10/21/2022	63	55.2	46	46	38.7	24	79	57.6	23	16	6.3	0	30.2	30.1	30	-	0	-
10/22/2022	64	54.9	44	48	44.5	40	93	70.3	43	9	4.4	0	30.3	30.3	30.2	-	0	-
10/23/2022	61	57.3	54	53	50.4	48	87	78.1	64	17	10.9	6	30.3	30.2	30.2	-	0	-
10/24/2022	63	59.1	55	61	56.9	52	96	92.4	87	13	9.3	6	30.2	30.1	30.1	-	0.06	-
10/25/2022	73	65.8	62	67	64.5	61	100	95.9	81	10	6.3	0	30.1	30.1	30	-	0.34	-
10/26/2022	72	65.4	62	65	62.9	55	100	92	72	15	6.3	0	30	29.8	29.7	-	0	-
10/27/2022	67	60.3	52	56	42.3	29	89	54.7	30	23	14.9	7	30.4	30.1	29.8	-	0	-
10/28/2022	58	51.1	46	38	36.1	34	68	57.1	46	18	10.5	5	30.5	30.5	30.4	-	0	-
10/29/2022	61	50.5	43	43	38.5	28	86	66.1	29	12	6.4	0	30.5	30.4	30.3	-	0	-
10/30/2022	62	51.1	40	51	41.4	37	97	72.6	39	7	2.8	0	30.3	30.2	30.1	-	0	-

Attachment 2
Weather Underground Data
August 1 through November 30, 2022

10/31/2022	64	58	50	58	52.7	48	96	83.4	63	12	6	0	30.1	30.1	30	-	0	-
11/1/2022	70	63	59	61	57.7	55	96	83.8	60	15	9.1	0	30.1	30	30	-	0.29	-
11/2/2022	71	61	52	55	48.8	42	87	66.6	35	14	6.2	0	30.3	30.3	30.1	-	0	-
11/3/2022	66	55.4	47	51	47.7	44	93	76.9	50	10	3.8	0	30.4	30.4	30.4	-	0	-
11/4/2022	67	57.1	48	60	54.7	47	100	91.9	76	12	3.9	0	30.4	30.4	30.3	-	0	-
11/5/2022	72	65.5	61	63	61.3	60	97	86.9	71	17	11.6	5	30.3	30.2	30.2	-	0	-
11/6/2022	70	66.1	64	63	62.2	61	93	87.3	78	18	14.5	10	30.2	30.2	30.2	-	0	-
11/7/2022	79	69.1	56	64	46.1	19	97	52.7	16	25	13.8	6	30.4	30.2	30.1	-	0	-
11/8/2022	59	52.2	47	32	24.9	16	52	36	21	22	15.4	8	30.6	30.5	30.4	-	0	-
11/9/2022	53	46.8	39	41	31.6	20	80	57.1	39	17	7.8	3	30.7	30.6	30.5	-	0	-
11/10/2022	63	55.3	44	57	48.8	39	93	79.9	58	12	5.8	0	30.5	30.4	30.2	-	0	-
11/11/2022	68	64.6	58	66	62.5	56	100	92.9	81	26	15.1	0	30.2	29.9	29.6	-	0	-
11/12/2022	71	66.1	60	66	58.3	50	100	77.7	51	24	15.3	3	29.7	29.6	29.4	-	0.52	-
11/13/2022	61	51.2	42	52	39.8	26	86	66.6	44	23	14.6	5	30.1	29.9	29.7	-	0.12	-
11/14/2022	47	41.7	35	26	24	22	61	49.9	42	22	13	6	30.4	30.3	30.1	-	0.02	-
11/15/2022	46	41.6	34	41	31.6	23	93	68.6	53	23	11.3	5	30.5	30.4	30.1	-	0	-
11/16/2022	52	46	41	47	37.7	27	96	74.8	50	21	17	12	30.1	29.9	29.8	-	0.62	-
11/17/2022	47	41.5	38	28	25.3	23	65	53.3	41	24	17.5	10	30.1	30	29.9	-	0.01	-
11/18/2022	45	39.1	35	31	24.2	17	82	57.4	34	33	19.1	9	30.2	30.1	30.1	-	0	-
11/19/2022	40	36.8	32	26	19	16	59	49.1	38	22	13.8	8	30.3	30.2	30	-	0.01	-
11/20/2022	43	35.5	30	29	11	4	60	37.4	27	23	18.3	10	30.4	30.1	30	-	0	-
11/21/2022	42	35.9	28	28	16.3	10	63	45.5	29	25	14.5	7	30.5	30.4	30.3	-	0	-
11/22/2022	50	43.3	37	34	27.3	23	70	54.2	37	16	10.3	5	30.4	30.3	30.2	-	0	-
11/23/2022	56	45.8	35	30	28	26	76	52.1	34	13	7.9	5	30.4	30.2	30.2	-	0	-
11/24/2022	52	44.6	35	42	35.6	28	82	71.2	57	14	6.5	0	30.4	30.3	30.2	-	0	-
11/25/2022	54	49.4	46	48	39.8	26	93	71.5	44	30	14.8	8	30.1	29.9	29.8	-	0	-
11/26/2022	57	48.7	43	36	28.8	26	65	47.1	32	23	13.9	7	30	30	29.9	-	0.02	-
11/27/2022	59	52.3	43	57	47.4	33	100	84.1	61	22	13.3	7	30	29.6	29.4	-	0	-
11/28/2022	56	49.9	41	47	37.8	29	90	64.1	50	23	16.8	8	30.1	29.7	29.4	-	0.56	-
11/29/2022	43	39.2	36	30	29	28	79	67.3	58	8	4.8	0	30.3	30.3	30.1	-	0	-
11/30/2022	58	51.1	36	56	44.5	24	100	79.8	46	35	20.6	3	30.3	29.9	29.7	-	0	-

Precipation > 0.5 inches

Weather Underground Data
JFK AIRPORT WEATHER STATION
Copied 01/18/2023
https://www.wunderground.com/history/monthly/us/ny/new-york-city/KJFK

ATTACHMENT 3

CALCULATIONS

Attachment 3
Water Level Calculations- Transducer 1
Basin 1 (NC 282) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 1 (NC 282) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:35 AM	9/7/22 4:05 PM	34.02	33.84	30.10	29.90	0.00	-0.05	-1.93	-1.98
10/1/22 12:05 AM	10/1/22 4:35 AM	34.03	33.98	30.10	29.90	0.01	0.09	-1.92	-1.84
10/3/22 9:35 AM	10/4/22 11:35 PM	34.14	33.74	30.20	29.90	0.02	-0.15	-1.91	-2.08
10/13/22 12:05 AM	10/14/22 12:05 AM	33.97	33.60	30.10	29.80	-0.05	-0.17	-1.98	-2.10
11/11/22 12:05 AM	11/12/22 6:20 AM	34.13	33.22	30.20	29.40	0.01	-0.10	-1.92	-2.03
11/15/22 11:05 AM	11/16/22 7:50 AM	34.42	33.64	30.50	29.80	-0.05	-0.13	-1.98	-2.06

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations

Notes:
Max/Min Dates chosen from rain events recorded by JFK Weather Underground greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Transducer 2
Basin 1 (NC 282) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 1 (NC 282) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:56 AM	9/7/22 11:56 PM	34.04	33.85	30.10	29.90	0.02	-0.04	-1.91	-1.97
10/1/22 2:11 AM	10/1/22 4:41 AM	34.06	34.01	30.10	29.90	0.04	0.12	-1.89	-1.81
10/3/22 9:41 AM	10/4/22 10:56 PM	34.17	33.78	30.20	29.90	0.05	-0.11	-1.88	-2.04
10/13/22 12:11 AM	10/14/22 6:11 AM	34.01	33.64	30.10	29.80	-0.01	-0.13	-1.94	-2.06
11/11/22 12:11 AM	11/12/22 6:26 AM	34.16	33.26	30.20	29.40	0.04	-0.06	-1.89	-1.99
11/15/22 11:11 AM	11/16/22 7:41 AM	34.46	33.67	30.50	29.80	-0.01	-0.10	-1.94	-2.03

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations

Notes:
Max/Min Dates chosen from rain events, recorded by JFK Weather Underground, greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Transducer 3
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 2 (NC 162) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:41 AM	9/7/22 4:26 PM	34.05	33.87	30.10	29.90	0.03	-0.02	-1.90	-1.95
10/1/22 7:11 AM	10/1/22 3:11 PM	35.57	33.85	30.10	29.90	1.56	-0.04	-0.37	-1.97
10/4/22 2:41 AM	10/4/22 10:56 PM	36.15	33.77	30.10	29.90	2.14	-0.12	0.21	-2.05
10/14/22 12:56 AM	10/14/22 6:11 AM	35.75	33.64	30.00	29.80	1.85	-0.13	-0.08	-2.06
11/11/22 6:56 PM	11/12/22 6:26 AM	35.94	33.26	30.20	29.40	1.81	-0.06	-0.12	-1.99
11/15/22 11:26 PM	11/16/22 7:41 AM	34.60	33.68	30.50	29.80	0.13	-0.09	-1.80	-2.02

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events recorded by JFK Weather Underground greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Transducer 4
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 2 (NC 162) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:58 AM	9/7/22 3:58 PM	34.10	33.92	30.10	29.90	0.08	0.03	-1.85	-1.90
10/1/22 7:13 AM	10/1/22 4:58 AM	35.43	35.03	30.10	29.90	1.42	1.14	-0.51	-0.79
10/4/22 2:43 AM	10/4/22 10:58 PM	36.64	35.07	30.10	29.90	2.63	1.18	0.70	-0.75
10/14/22 1:13 AM	10/14/22 5:13 PM	35.99	35.10	30.00	29.80	2.09	1.32	0.16	-0.61
11/11/22 6:58 PM	11/12/22 6:28 AM	35.92	34.56	30.20	29.40	1.79	1.24	-0.14	-0.69
11/15/22 6:58 AM	11/16/22 7:43 AM	35.58	34.78	30.50	29.80	1.12	1.01	-0.81	-0.92

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events, recorded by JFK Weather Underground, greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Event A
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-3 and PZ-4.		CHECKED BY:	

Known Values and Conversion Factors:

1 in Hg=	1.13 ft water column
PZ-3 Depth	1.93 ft below ground surface
PZ-4 Depth	1.93 ft below ground surface

PZ-3

	Transudcer Inputs				Water Level	
Date and Time	ms	Level	Temperature (°C)	Weather Underground Baro Pressure (in Hg)	Normalized Transducer Level (feet)	Feet Above Bottom of Basin
10/4/22 2:41 AM	0	36.15	50.54	30.1	2.14	0.21
10/4/22 2:56 AM	0	36.11	50.36	30.1	2.10	0.17
10/4/22 3:11 AM	0	36.00	50.36	30.1	1.99	0.06
10/4/22 3:26 AM	0	35.91	50.36	30.1	1.89	-0.04
10/4/22 3:41 AM	0	35.68	50.54	30.1	1.67	-0.26
10/4/22 3:56 AM	0	35.33	50.54	30.1	1.31	-0.62
10/4/22 4:11 AM	0	35.04	50.54	30.1	1.03	-0.90
10/4/22 4:26 AM	0	34.91	50.54	30.1	0.90	-1.03
10/4/22 4:41 AM	0	34.89	50.54	30.1	0.88	-1.05
10/4/22 4:56 AM	0	34.83	50.54	30.1	0.82	-1.11
10/4/22 5:11 AM	0	34.86	50.72	30.1	0.85	-1.08
10/4/22 5:26 AM	0	35.55	50.72	30.1	1.54	-0.39
10/4/22 5:41 AM	0	35.81	50.90	30.1	1.79	-0.14
10/4/22 5:56 AM	0	35.80	51.08	30.1	1.78	-0.15
10/4/22 6:11 AM	0	35.84	51.08	30.1	1.82	-0.11
10/4/22 6:26 AM	0	35.79	51.08	30.1	1.77	-0.16
10/4/22 6:41 AM	0	35.49	51.08	30.1	1.48	-0.45
10/4/22 6:56 AM	0	35.22	51.08	30.1	1.20	-0.73
10/4/22 7:11 AM	0	35.01	51.08	30.1	1.00	-0.93
10/4/22 7:26 AM	0	34.74	51.08	30.1	0.73	-1.20
10/4/22 7:41 AM	0	34.56	51.08	30.1	0.54	-1.39
10/4/22 7:56 AM	0	34.38	51.08	30.1	0.37	-1.56
10/4/22 8:11 AM	0	34.36	51.08	30.1	0.35	-1.58
10/4/22 8:26 AM	0	34.31	51.08	30.1	0.30	-1.63
10/4/22 8:41 AM	0	34.23	51.08	30.1	0.22	-1.71
10/4/22 8:56 AM	0	34.13	51.08	30.1	0.12	-1.81
10/4/22 9:11 AM	0	34.03	51.08	30.1	0.01	-1.92
10/4/22 9:26 AM	0	33.94	51.08	30.1	-0.08	-2.01
10/4/22 9:41 AM	0	33.89	51.08	30.1	-0.13	-2.06
10/4/22 9:56 AM	0	33.89	51.08	30.1	-0.13	-2.06
10/4/22 10:11 AM	0	33.89	51.08	30.1	-0.13	-2.06
10/4/22 10:26 AM	0	33.88	51.08	30.1	-0.13	-2.07
10/4/22 10:41 AM	0	33.89	51.08	30.1	-0.13	-2.06
10/4/22 10:56 AM	0	33.88	51.08	30.1	-0.13	-2.07
10/4/22 11:11 AM	0	33.88	51.08	30.1	-0.13	-2.07
10/4/22 11:26 AM	0	33.87	51.08	30.1	-0.14	-2.08

Attachment 3
Water Level Calculations- Event A
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS			***STANDARD CALCULATION SHEET***
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-3 and PZ-4.		CHECKED BY:	

10/4/22 11:41 AM	0	33.87	51.08	30.1	-0.14	-2.08
10/4/22 11:56 AM	0	33.87	51.26	30.1	-0.14	-2.08
10/4/22 12:11 PM	0	33.87	51.26	30.1	-0.14	-2.08
10/4/22 12:26 PM	0	33.86	51.26	30.1	-0.16	-2.09
10/4/22 12:41 PM	0	33.85	51.26	30.1	-0.16	-2.10
10/4/22 12:56 PM	0	33.85	51.26	30.1	-0.16	-2.10
10/4/22 1:11 PM	0	33.85	51.26	30.1	-0.16	-2.10
10/4/22 1:26 PM	0	33.84	51.26	30.1	-0.17	-2.10
10/4/22 1:41 PM	0	33.84	51.26	30.1	-0.17	-2.10
10/4/22 1:56 PM	0	33.83	51.26	30.1	-0.18	-2.11
10/4/22 2:11 PM	0	33.83	51.26	30.1	-0.18	-2.11
10/4/22 2:26 PM	0	33.83	51.26	30.1	-0.18	-2.11
10/4/22 2:41 PM	0	33.82	51.26	30.1	-0.19	-2.12
10/4/22 2:56 PM	0	33.82	51.26	30.1	-0.19	-2.12
10/4/22 3:11 PM	0	33.81	51.26	30.1	-0.20	-2.13
10/4/22 3:26 PM	0	33.81	51.26	30.1	-0.20	-2.13
10/4/22 3:41 PM	0	33.81	51.26	30.1	-0.20	-2.13
10/4/22 3:56 PM	0	33.81	51.26	30.1	-0.20	-2.13
10/4/22 4:11 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 4:26 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 4:41 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 4:56 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 5:11 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 5:26 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 5:41 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 5:56 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 6:11 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 6:26 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 6:41 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 6:56 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 7:11 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 7:26 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 7:41 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 7:56 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 8:11 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 8:26 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 8:41 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 8:56 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 9:11 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 9:26 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 9:41 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 9:56 PM	0	33.80	51.26	30.1	-0.21	-2.14
10/4/22 10:11 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 10:26 PM	0	33.79	51.26	30.1	-0.22	-2.15
10/4/22 10:41 PM	0	33.78	51.26	30.1	-0.23	-2.16
10/4/22 10:56 PM	0	33.77	51.26	30.1	-0.24	-2.17
PZ-4						

Attachment 3
Water Level Calculations- Event A
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-3 and PZ-4.		CHECKED BY:	

Date and Time	ms	Level	Temperature (°C)	Weather Underground Baro Pressure (in Hg)	Normalized Transducer Level (feet)	Feet Above Bottom of Basin
10/4/22 2:43 AM	0	36.644	50.72	30.1	2.63	0.70
10/4/22 2:58 AM	0	36.624	50.54	30.1	2.61	0.68
10/4/22 3:13 AM	0	36.535	50.36	30.1	2.52	0.59
10/4/22 3:28 AM	0	36.388	50.36	30.1	2.38	0.45
10/4/22 3:43 AM	0	36.181	50.36	30.1	2.17	0.24
10/4/22 3:58 AM	0	35.955	50.54	30.1	1.94	0.01
10/4/22 4:13 AM	0	35.728	50.54	30.1	1.72	-0.21
10/4/22 4:28 AM	0	35.571	50.72	30.1	1.56	-0.37
10/4/22 4:43 AM	0	35.502	50.72	30.1	1.49	-0.44
10/4/22 4:58 AM	0	35.482	50.9	30.1	1.47	-0.46
10/4/22 5:13 AM	0	35.512	50.9	30.1	1.50	-0.43
10/4/22 5:28 AM	0	35.571	51.08	30.1	1.56	-0.37
10/4/22 5:43 AM	0	35.61	51.08	30.1	1.60	-0.33
10/4/22 5:58 AM	0	35.63	51.08	30.1	1.62	-0.31
10/4/22 6:13 AM	0	35.699	51.08	30.1	1.69	-0.24
10/4/22 6:28 AM	0	35.738	51.08	30.1	1.73	-0.20
10/4/22 6:43 AM	0	35.669	51.08	30.1	1.66	-0.27
10/4/22 6:58 AM	0	35.541	51.26	30.1	1.53	-0.40
10/4/22 7:13 AM	0	35.404	51.26	30.1	1.39	-0.54
10/4/22 7:28 AM	0	35.236	51.26	30.1	1.22	-0.71
10/4/22 7:43 AM	0	35.236	51.26	30.1	1.22	-0.71
10/4/22 7:58 AM	0	35.236	51.26	30.1	1.22	-0.71
10/4/22 8:13 AM	0	35.354	51.26	30.1	1.34	-0.59
10/4/22 8:28 AM	0	35.236	51.44	30.1	1.22	-0.71
10/4/22 8:43 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 8:58 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 9:13 AM	0	35.236	51.44	30.1	1.22	-0.71
10/4/22 9:28 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 9:43 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 9:58 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 10:13 AM	0	35.217	51.44	30.1	1.20	-0.73
10/4/22 10:28 AM	0	35.226	51.44	30.1	1.21	-0.72
10/4/22 10:43 AM	0	35.217	51.44	30.1	1.20	-0.73
10/4/22 10:58 AM	0	35.207	51.44	30.1	1.19	-0.74
10/4/22 11:13 AM	0	35.207	51.44	30.1	1.19	-0.74
10/4/22 11:28 AM	0	35.197	51.44	30.1	1.18	-0.75
10/4/22 11:43 AM	0	35.197	51.44	30.1	1.18	-0.75
10/4/22 11:58 AM	0	35.187	51.44	30.1	1.17	-0.76
10/4/22 12:13 PM	0	35.187	51.44	30.1	1.17	-0.76
10/4/22 12:28 PM	0	35.177	51.44	30.1	1.16	-0.77
10/4/22 12:43 PM	0	35.177	51.44	30.1	1.16	-0.77
10/4/22 12:58 PM	0	35.167	51.44	30.1	1.15	-0.78
10/4/22 1:13 PM	0	35.158	51.44	30.1	1.15	-0.78

Attachment 3
Water Level Calculations- Event A
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-3 and PZ-4.		CHECKED BY:	

10/4/22 1:28 PM	0	35.158	51.44	30.1	1.15	-0.78
10/4/22 1:43 PM	0	35.158	51.44	30.1	1.15	-0.78
10/4/22 1:58 PM	0	35.148	51.26	30.1	1.14	-0.79
10/4/22 2:13 PM	0	35.148	51.44	30.1	1.14	-0.79
10/4/22 2:28 PM	0	35.148	51.44	30.1	1.14	-0.79
10/4/22 2:43 PM	0	35.138	51.44	30.1	1.13	-0.81
10/4/22 2:58 PM	0	35.128	51.26	30.1	1.12	-0.81
10/4/22 3:13 PM	0	35.128	51.44	30.1	1.12	-0.81
10/4/22 3:28 PM	0	35.128	51.44	30.1	1.12	-0.81
10/4/22 3:43 PM	0	35.128	51.44	30.1	1.12	-0.81
10/4/22 3:58 PM	0	35.128	51.44	30.1	1.12	-0.81
10/4/22 4:13 PM	0	35.118	51.44	30.1	1.11	-0.82
10/4/22 4:28 PM	0	35.118	51.44	30.1	1.11	-0.82
10/4/22 4:43 PM	0	35.108	51.44	30.1	1.10	-0.84
10/4/22 4:58 PM	0	35.108	51.44	30.1	1.10	-0.84
10/4/22 5:13 PM	0	35.108	51.44	30.1	1.10	-0.84
10/4/22 5:28 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 5:43 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 5:58 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 6:13 PM	0	35.108	51.44	30.1	1.10	-0.84
10/4/22 6:28 PM	0	35.108	51.44	30.1	1.10	-0.84
10/4/22 6:43 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 6:58 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 7:13 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 7:28 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 7:43 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 7:58 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 8:13 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 8:28 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 8:43 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 8:58 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 9:13 PM	0	35.098	51.44	30.1	1.09	-0.84
10/4/22 9:28 PM	0	35.089	51.44	30.1	1.08	-0.85
10/4/22 9:43 PM	0	35.089	51.44	30.1	1.08	-0.85
10/4/22 9:58 PM	0	35.098	51.62	30.1	1.09	-0.84
10/4/22 10:13 PM	0	35.089	51.62	30.1	1.08	-0.85
10/4/22 10:28 PM	0	35.089	51.62	30.1	1.08	-0.85
10/4/22 10:43 PM	0	35.079	51.62	30.1	1.07	-0.86
10/4/22 10:58 PM	0	35.069	51.62	30.1	1.06	-0.87

Attachment 3
Infiltration Rate and Capacity Calculations
Basin 2 (NC 162) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	PAGE: 1 of 1
SUBJECT: Basin 2 (NC 162) recharge basin infiltration rate and capacity calculations.		CHECKED BY:	DATE: 1/31/2023

Known Values and Conversion Factors				
1 ft^3=	7.48052	gal		
1 day=	1440.00	minutes		
Basin Area	18775	sq ft		
	0.43	acres		
Top Elevation	46	46	46	46
Bottom Elevation	36	36	36	36

Stormwater Infiltration Rate Calculations

Description: Infiltration rates are calculated in feet per day and gallons per minute for each even using the calculated water levels and recorded time at each staff gage for X precipitation events.

Event	**Start**	**End**	**Staff Gage**	**Infiltration Duration (Days)**	**Maximum Water level (ft)**	**Event Average Infiltration Duration (days)**	**Event Average Basin Water Level (ft)**
A	10/4/22 2:41 AM	10/4/22 10:58 PM	1	0.02083	0.21	0.04	0.46
			2	0.05208	0.70		
Average	--	--	--	--	--	0.04	0.46

Event	**Staff Gage**	**Infiltration Rate (ft/day)**	**Infiltration Duration (minutes)**	**Event Average Infiltration Duraiton (minutes)**	**Accumulated Stormwater Volume (ft^3)**	**Accumulated Stormwater volume (gal)**	**Infiltration Rate (gpm)**
A	1	12.48	30.00	52.5	8,543	63,903	1,217
	2		75				
Average	--	12.48	52	52	8,543	63,903	1,217

Basin Capacity Calculations

Description: Basin capacity is calculated using the know basin area and depths to determine allowable volume of water. Subtracting the maximum stormwater volume observed over the study period provides the volume available for traetment system discharge. A maximum influent flow rate from the treatment system to the recharge basin is calculated using the average basin infiltration rate.

Geomean Top Elevation	46	ft msl	Unallowable Volume	150200	ft^3
Geomean Bottom Elevation	36	ft msl		1.12	million gal
Basin Depth	10	ft	Maximum Allowable Water Level	2.00	feet
Caclulated Basin Volume (Empty)	187,750	ft^3	Maximum Allowable Volume	0.28	million gal
	1.4	million gal	Volume Available to Accept	0.22	million gal
Minimum Surrounding Home Elevation	46	ft msl	Time to Infiltrate if Basin Achieves Maximum Allowable Volume	0.16	days
Typical Basement Elevation	-8	ft bgs		4	hours
	38	ft msl	Basin Capacity for Discharge from Treatment System	1.35	million gal/day
				940	gpm

Attachment 3
Water Level Calculations- Transducer 7
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 3 (NC 173) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:47 AM	9/7/22 11:47 PM	34.03	33.84	30.10	29.90	0.01	-0.05	-1.92	-1.98
10/1/22 12:02 AM	10/1/22 3:17 PM	34.06	33.84	30.10	29.90	0.04	-0.05	-1.89	-1.98
10/4/22 3:02 AM	10/4/22 11:32 PM	36.53	33.76	30.10	29.90	2.51	-0.13	0.58	-2.06
10/14/22 1:02 AM	10/14/22 11:02 AM	35.88	34.95	30.00	29.80	1.98	1.18	0.05	-0.75
11/11/22 7:02 PM	11/12/22 6:32 AM	35.85	33.25	30.20	29.40	1.72	-0.07	-0.21	-2.00
11/15/22 7:02 AM	11/16/22 7:47 AM	34.46	33.67	30.50	29.80	-0.01	-0.10	-1.94	-2.03

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events recorded by JFK Weather Underground greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Transducer 8
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 3 (NC 173) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:49 AM	9/7/22 4:34 PM	34.05	33.86	30.10	29.90	0.03	-0.03	-1.90	-1.96
10/1/22 7:19 AM	10/1/22 3:04 PM	34.82	33.86	30.10	29.90	0.81	-0.03	-1.12	-1.96
10/4/22 2:34 AM	10/4/22 11:19 PM	36.38	34.10	30.10	29.90	2.37	0.22	0.44	-1.71
10/14/22 1:04 AM	10/14/22 3:19 PM	35.95	34.10	30.00	29.80	2.05	0.32	0.12	-1.61
11/11/22 6:49 PM	11/12/22 6:49 PM	35.97	33.61	30.20	29.40	1.84	0.29	-0.09	-1.64
11/15/22 7:04 AM	11/16/22 7:49 AM	34.46	33.68	30.50	29.80	-0.01	-0.09	-1.94	-2.02

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events, recorded by JFK Weather Underground, greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Event A
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-7 and PZ-8.		CHECKED BY:	

Known Values and Conversion Factors:

1 in Hg=	1.13 ft water column
PZ-7 Depth	1.93 ft below ground surface
PZ-8 Depth	1.93 ft below ground surface

PZ-7

	Transudcer Inputs				Water Level	
Date and Time	ms	Level	Temperature (°C)	Weather Underground Baro Pressure (in Hg)	Normalized Transducer Level (feet)	Feet Above Bottom of Basin
10/4/22 3:02 AM	0	36.53	50.54	30.1	2.51	0.58
10/4/22 3:17 AM	0	36.42	50.36	30.1	2.40	0.47
10/4/22 3:32 AM	0	36.25	50.36	30.1	2.24	0.31
10/4/22 3:47 AM	0	36.01	50.54	30.1	2.00	0.07
10/4/22 4:02 AM	0	35.61	50.54	30.1	1.60	-0.33
10/4/22 4:17 AM	0	35.59	50.54	30.1	1.58	-0.35
10/4/22 4:32 AM	0	35.58	50.54	30.1	1.57	-0.36
10/4/22 4:47 AM	0	35.47	50.54	30.1	1.46	-0.47
10/4/22 5:02 AM	0	35.44	50.54	30.1	1.43	-0.50
10/4/22 5:17 AM	0	35.42	50.54	30.1	1.41	-0.52
10/4/22 5:32 AM	0	35.84	50.54	30.1	1.82	-0.11
10/4/22 5:47 AM	0	35.93	51.44	30.1	1.91	-0.02
10/4/22 6:02 AM	0	35.92	51.44	30.1	1.90	-0.03
10/4/22 6:17 AM	0	35.95	51.44	30.1	1.93	0.00
10/4/22 6:32 AM	0	35.94	51.44	30.1	1.92	-0.01
10/4/22 6:47 AM	0	35.85	51.44	30.1	1.83	-0.10
10/4/22 7:02 AM	0	33.91	51.44	30.1	-0.10	-2.04
10/4/22 7:17 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 7:32 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 7:47 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 8:02 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 8:17 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 8:32 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 8:47 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 9:02 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 9:17 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 9:32 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 9:47 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 10:02 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 10:17 AM	0	33.90	51.44	30.1	-0.11	-2.04
10/4/22 10:32 AM	0	33.89	51.44	30.1	-0.13	-2.06
10/4/22 10:47 AM	0	33.89	51.44	30.1	-0.13	-2.06

Attachment 3
Water Level Calculations- Event A
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-7 and PZ-8.		CHECKED BY:	

10/4/22 11:02 AM	0	33.88	51.44	30.1	-0.13	-2.07
10/4/22 11:17 AM	0	33.87	51.44	30.1	-0.14	-2.08
10/4/22 11:32 AM	0	33.87	51.44	30.1	-0.14	-2.08
10/4/22 11:47 AM	0	33.86	51.44	30.1	-0.16	-2.09
10/4/22 12:02 PM	0	33.86	51.44	30.1	-0.16	-2.09
10/4/22 12:17 PM	0	33.86	51.44	30.1	-0.16	-2.09
10/4/22 12:32 PM	0	33.86	51.44	30.1	-0.16	-2.09
10/4/22 12:47 PM	0	33.85	51.44	30.1	-0.16	-2.10
10/4/22 1:02 PM	0	33.84	51.44	30.1	-0.17	-2.10
10/4/22 1:17 PM	0	33.84	51.44	30.1	-0.17	-2.10
10/4/22 1:32 PM	0	33.84	51.44	30.1	-0.17	-2.10
10/4/22 1:47 PM	0	33.84	51.44	30.1	-0.17	-2.10
10/4/22 2:02 PM	0	33.83	51.44	30.1	-0.18	-2.11
10/4/22 2:17 PM	0	33.82	51.44	30.1	-0.19	-2.12
10/4/22 2:32 PM	0	33.82	51.44	30.1	-0.19	-2.12
10/4/22 2:47 PM	0	33.81	51.44	30.1	-0.20	-2.13
10/4/22 3:02 PM	0	33.81	51.44	30.1	-0.20	-2.13
10/4/22 3:17 PM	0	33.81	51.44	30.1	-0.20	-2.13
10/4/22 3:32 PM	0	33.81	51.44	30.1	-0.20	-2.13
10/4/22 3:47 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 4:02 PM	0	33.81	51.44	30.1	-0.20	-2.13
10/4/22 4:17 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 4:32 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 4:47 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 5:02 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 5:17 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 5:32 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 5:47 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 6:02 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 6:17 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 6:32 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 6:47 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 7:02 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 7:17 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 7:32 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 7:47 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 8:02 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 8:17 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 8:32 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 8:47 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 9:02 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 9:17 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 9:32 PM	0	33.80	51.44	30.1	-0.21	-2.14

Tetra Tech NUS			***STANDARD CALCULATION SHEET***
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-7 and PZ-8.		CHECKED BY:	

10/4/22 9:47 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 10:02 PM	0	33.80	51.44	30.1	-0.21	-2.14
10/4/22 10:17 PM	0	33.79	51.44	30.1	-0.22	-2.15
10/4/22 10:32 PM	0	33.78	51.44	30.1	-0.23	-2.16
10/4/22 10:47 PM	0	33.78	51.44	30.1	-0.23	-2.16
10/4/22 11:02 PM	0	33.77	51.44	30.1	-0.24	-2.17
10/4/22 11:17 PM	0	33.77	51.44	30.1	-0.24	-2.17
10/4/22 11:32 PM	0	33.76	51.44	30.1	-0.25	-2.18

PZ-8

Date and Time	ms	Level	Temperature (°C)	Weather Underground Baro Pressure (in Hg)	Normalized Transducer Level (feet)	Feet Above Bottom of Basin
10/4/22 2:34 AM	0	36.38	52.34	30.1	2.37	0.44
10/4/22 2:49 AM	0	36.37	51.26	30.1	2.36	0.43
10/4/22 3:04 AM	0	36.36	50.9	30.1	2.35	0.41
10/4/22 3:19 AM	0	36.27	50.72	30.1	2.26	0.33
10/4/22 3:34 AM	0	36.10	50.72	30.1	2.09	0.16
10/4/22 3:49 AM	0	35.96	50.9	30.1	1.94	0.01
10/4/22 4:04 AM	0	35.85	50.9	30.1	1.83	-0.10
10/4/22 4:19 AM	0	35.85	51.08	30.1	1.83	-0.10
10/4/22 4:34 AM	0	35.92	51.26	30.1	1.90	-0.03
10/4/22 4:49 AM	0	35.92	51.44	30.1	1.90	-0.03
10/4/22 5:04 AM	0	35.91	51.62	30.1	1.89	-0.04
10/4/22 5:19 AM	0	35.94	51.62	30.1	1.92	-0.01
10/4/22 5:34 AM	0	35.99	51.62	30.1	1.98	0.05
10/4/22 5:49 AM	0	36.00	51.8	30.1	1.99	0.06
10/4/22 6:04 AM	0	35.99	51.62	30.1	1.98	0.05
10/4/22 6:19 AM	0	36.02	51.62	30.1	2.01	0.08
10/4/22 6:34 AM	0	35.99	51.62	30.1	1.98	0.05
10/4/22 6:49 AM	0	35.91	51.62	30.1	1.89	-0.04
10/4/22 7:04 AM	0	35.85	51.8	30.1	1.83	-0.10
10/4/22 7:19 AM	0	35.79	51.8	30.1	1.77	-0.16
10/4/22 7:34 AM	0	35.67	51.98	30.1	1.66	-0.27
10/4/22 7:49 AM	0	35.59	51.98	30.1	1.58	-0.35
10/4/22 8:04 AM	0	35.06	51.98	30.1	1.05	-0.88
10/4/22 8:19 AM	0	35.75	52.16	30.1	1.74	-0.20
10/4/22 8:34 AM	0	35.74	52.34	30.1	1.73	-0.20
10/4/22 8:49 AM	0	35.62	52.52	30.1	1.61	-0.32
10/4/22 9:04 AM	0	35.03	52.52	30.1	1.02	-0.91
10/4/22 9:19 AM	0	34.72	52.52	30.1	0.71	-1.22
10/4/22 9:34 AM	0	34.64	52.52	30.1	0.62	-1.31
10/4/22 9:49 AM	0	34.61	52.52	30.1	0.59	-1.34

Attachment 3
Water Level Calculations- Event A
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-7 and PZ-8.		CHECKED BY:	

10/4/22 10:04 AM	0	34.59	52.52	30.1	0.57	-1.36
10/4/22 10:19 AM	0	34.54	52.52	30.1	0.52	-1.41
10/4/22 10:34 AM	0	34.51	52.52	30.1	0.50	-1.44
10/4/22 10:49 AM	0	34.48	52.52	30.1	0.47	-1.47
10/4/22 11:04 AM	0	34.45	52.52	30.1	0.44	-1.49
10/4/22 11:19 AM	0	34.43	52.52	30.1	0.42	-1.51
10/4/22 11:34 AM	0	34.42	52.52	30.1	0.41	-1.52
10/4/22 11:49 AM	0	34.39	52.52	30.1	0.38	-1.55
10/4/22 12:04 PM	0	34.38	52.52	30.1	0.37	-1.56
10/4/22 12:19 PM	0	34.37	52.52	30.1	0.36	-1.57
10/4/22 12:34 PM	0	34.36	52.52	30.1	0.35	-1.58
10/4/22 12:49 PM	0	34.34	52.52	30.1	0.33	-1.60
10/4/22 1:04 PM	0	34.33	52.52	30.1	0.32	-1.61
10/4/22 1:19 PM	0	34.32	52.52	30.1	0.31	-1.62
10/4/22 1:34 PM	0	34.31	52.52	30.1	0.30	-1.63
10/4/22 1:49 PM	0	34.30	52.52	30.1	0.29	-1.64
10/4/22 2:04 PM	0	34.28	52.52	30.1	0.27	-1.66
10/4/22 2:19 PM	0	34.27	52.52	30.1	0.26	-1.67
10/4/22 2:34 PM	0	34.26	52.52	30.1	0.25	-1.68
10/4/22 2:49 PM	0	34.25	52.52	30.1	0.24	-1.69
10/4/22 3:04 PM	0	34.24	52.52	30.1	0.23	-1.70
10/4/22 3:19 PM	0	34.23	52.52	30.1	0.22	-1.71
10/4/22 3:34 PM	0	34.23	52.52	30.1	0.22	-1.71
10/4/22 3:49 PM	0	34.22	52.52	30.1	0.21	-1.72
10/4/22 4:04 PM	0	34.22	52.52	30.1	0.21	-1.72
10/4/22 4:19 PM	0	34.21	52.52	30.1	0.20	-1.73
10/4/22 4:34 PM	0	34.21	52.52	30.1	0.20	-1.73
10/4/22 4:49 PM	0	34.20	52.52	30.1	0.19	-1.74
10/4/22 5:04 PM	0	34.20	52.52	30.1	0.19	-1.74
10/4/22 5:19 PM	0	34.19	52.52	30.1	0.18	-1.75
10/4/22 5:34 PM	0	34.19	52.52	30.1	0.18	-1.75
10/4/22 5:49 PM	0	34.19	52.52	30.1	0.18	-1.75
10/4/22 6:04 PM	0	34.19	52.52	30.1	0.18	-1.75
10/4/22 6:19 PM	0	34.19	52.52	30.1	0.18	-1.75
10/4/22 6:34 PM	0	34.18	52.52	30.1	0.17	-1.76
10/4/22 6:49 PM	0	34.18	52.52	30.1	0.17	-1.76
10/4/22 7:04 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 7:19 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 7:34 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 7:49 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 8:04 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 8:19 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 8:34 PM	0	34.17	52.52	30.1	0.16	-1.77

Attachment 3
Water Level Calculations- Event A
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	DATE: 1/31/2023
SUBJECT: Precipitation Event A Water Level calculations for 15 minute intervals. PZ-7 and PZ-8.		CHECKED BY:	

10/4/22 8:49 PM	0	34.17	52.52	30.1	0.16	-1.77
10/4/22 9:04 PM	0	34.16	52.52	30.1	0.15	-1.78
10/4/22 9:19 PM	0	34.16	52.52	30.1	0.15	-1.78
10/4/22 9:34 PM	0	34.16	52.52	30.1	0.15	-1.78
10/4/22 9:49 PM	0	34.16	52.52	30.1	0.15	-1.78
10/4/22 10:04 PM	0	34.15	52.52	30.1	0.14	-1.79
10/4/22 10:19 PM	0	34.14	52.52	30.1	0.13	-1.80
10/4/22 10:34 PM	0	34.12	52.52	30.1	0.11	-1.82
10/4/22 10:49 PM	0	34.11	52.52	30.1	0.10	-1.83
10/4/22 11:04 PM	0	34.11	52.52	30.1	0.10	-1.83
10/4/22 11:19 PM	0	34.10	52.52	30.1	0.09	-1.84

Attachment 3
Infiltration Rate and Capacity Calculations
Basin 3 (NC 173) Recharge Basin

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	PAGE: 1 of 1
SUBJECT: Basin 3 (NC 173) recharge basin infiltration rate and capacity calculations.		CHECKED BY:	DATE: 1/31/2023

Known Values and Conversion Factors				
1 ft^3=	7.48052	gal		
1 day=	1440.00	minutes		
Basin Area	13932	sq ft		
	0.32	acres		
Top Elevation	43	43	43	43
Bottom Elevation	33	33	33	33

Stormwater Infiltration Rate Calculations

Description: Infiltration rates are calculated in feet per day and gallons per minute for each even using the calculated water levels and recorded time at each staff gage for X precipitation events.

Event	**Start**	**End**	**Staff Gage**	**Infiltration Duration (Days)**	**Maximum Water level (ft)**	**Event Average Infiltration Duration (days)**	**Event Average Basin Water Level (ft)**
A	10/4/22 2:34 AM	10/4/22 11:32 PM	1	0.03125	0.58	0.04	0.51
			2	0.05208	0.44		
Average	--	--	--	--	--	0.04	0.51

Event	**Staff Gage**	**Infiltration Rate (ft/day)**	**Infiltration Duration (minutes)**	**Event Average Infiltration Duraiton (minutes)**	**Accumulated Stormwater Volume (ft^3)**	**Accumulated Stormwater volume (gal)**	**Infiltration Rate (gpm)**
A	1	12.24	45.00	60	7,105	53,151	886
	2		75				
Average	--	12.24	60	60	7,105	53,151	886

Basin Capacity Calculations

Description: Basin capacity is calculated using the know basin area and depths to determine allowable volume of water. Subtracting the maximum stormwater volume observed over the study period provides the volume available for traetment system discharge. A maximum influent flow rate from the treatment system to the recharge basin is calculated using the average basin infiltration rate.

Geomean Top Elevation	43	ft msl	Unallowable Volume	111456	ft^3
Geomean Bottom Elevation	33	ft msl		0.83	million gal
Basin Depth	10	ft	Maximum Allowable Water Level	2.00	feet
Caclulated Basin Volume (Empty)	139,320	ft^3	Maximum Allowable Volume	0.21	million gal
	1.0	million gal	Volume Available to Accept	0.16	million gal
Minimum Surrounding Home Elevation	43	ft msl	Time to Infiltrate if Basin Achieves Maximum Allowable Volume	0.16	days
Typical Basement Elevation	-8	ft bgs		4	hours
	35	ft msl	Basin Capacity for Discharge from Treatment System	0.95	million gal/day
				660	gpm

Attachment 3
Water Level Calculations- Transducer 5
Basin 3 (NC 173) and Extension Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 3 (NC 173) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 9:15 AM	9/7/22 4:00 PM	34.05	33.86	30.10	29.90	0.03	-0.03	-1.90	-1.96
10/1/22 12:00 AM	10/1/22 3:15 PM	34.06	33.84	30.10	29.90	0.04	-0.05	-1.89	-1.98
10/4/22 12:00 AM	10/4/22 10:45 PM	34.00	33.83	30.10	29.90	-0.02	-0.06	-1.95	-1.99
10/13/22 12:00 AM	10/14/22 12:00 AM	34.02	33.70	30.10	29.80	0.00	-0.07	-1.93	-2.00
11/11/22 12:00 AM	11/12/22 6:30 PM	34.21	33.65	30.20	29.40	0.09	0.33	-1.84	-1.60
11/15/22 6:30 AM	11/16/22 7:45 AM	34.48	33.79	30.50	29.80	0.01	0.02	-1.92	-1.91

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events, recorded by JFK Weather Underground, greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Water Level Calculations- Transducer 6
Basin 3 (NC 173) and Extension Recharge Basin

Tetra Tech NUS	***STANDARD CALCULATION SHEET***		
CLIENT: USN CLEAN	BY:	CHECKED BY:	PAGE: 1 of 2
SUBJECT: Basin 3 (NC 173) recharge basin water level calculations		DATE: 1/31/2023	

Date and Time		**Barometric Pressure**				**Water Level (ft)**			
		Recorded (ft)		**Weather Underground (in Hg)**		**Above Probe (ft)**		**Above Ground Surface (ft)**	
Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
9/5/22 7:47 AM	9/7/22 4:32 PM	34.04	33.86	30.10	29.90	0.02	-0.03	-1.91	-1.96
10/1/22 7:02 AM	10/1/22 4:17 PM	34.72	33.85	30.10	29.90	0.71	-0.04	-1.22	-1.97
10/4/22 2:32 AM	10/4/22 11:02 PM	35.76	33.78	30.10	29.90	1.75	-0.11	-0.18	-2.04
10/13/22 10:02 PM	10/14/22 12:02 AM	35.00	33.64	30.10	29.80	0.99	-0.13	-0.94	-2.06
11/11/22 7:02 PM	11/12/22 6:32 AM	34.62	33.26	30.20	29.40	0.49	-0.06	-1.44	-1.99
11/15/22 11:17 AM	11/16/22 7:47 AM	34.47	33.68	30.50	29.80	0.00	-0.09	-1.93	-2.02

Water level above ground exceeds 2 feet
Water level above ground exceeds 1 foot
Event used for infiltration rate calculations (rain event greater than 0.2 feet)

Notes:
Max/Min Dates chosen from rain events, recorded by JFK Weather Underground, greater than 0.5 inches and correspond to Max/Min Level in transducer.

Attachment 3
Infiltration Rate and Capacity Calculations
Basin 3 (NC 173) and Basin 4

Tetra Tech NUS		***STANDARD CALCULATION SHEET***	
CLIENT: USN CLEAN	FILE No: WE28	BY:	PAGE: 1 of 1
SUBJECT: Basin 3 (NC 173) and Basin 4 (Basin 3 Extension) recharge basin infiltration rate and capacity calculations.		CHECKED BY:	DATE: 1/31/2023

Known Values and Conversion Factors				
1 ft^3=	7.48052	gal		
1 day=	1440.00	minutes		
Basin Area	27863	sq ft		
	0.64	acres		
Top Elevation	43	43	43	43
Bottom Elevation	33	33	33	33

Stormwater Infiltration Rate Calculations

Description: Infiltration rates are calculated in feet per day and gallons per minute for each even using the calculated water levels and recorded time at each staff gage for X precipitation events.

Event	Start	End	Staff Gage	Infiltration Duration (Days)	Maximum Water level (ft)	Event Average Infiltration Duration (days)	Event Average Basin Water Level (ft)
A	10/4/22 2:34 AM	10/4/22 11:32 PM	1	0.03125	0.58	0.04	0.51
			2	0.05208	0.44		
Average	--	--	--	--	--	0.04	0.51

Event	Staff Gage	Infiltration Rate (ft/day)	Infiltration Duration (minutes)	Event Average Infiltration Duraiton (minutes)	Accumulated Stormwater Volume (ft^3)	Accumulated Stormwater volume (gal)	Infiltration Rate (gpm)
A	1	12.24	45.00	60	14,210	106,299	1,772
	2		75				
Average	--	12.24	60	60	14,210	106,299	1,772

Basin Capacity Calculations

Description: Basin capacity is calculated using the know basin area and depths to determine allowable volume of water. Subtracting the maximum stormwater volume observed over the study period provides the volume available for traetment system discharge. A maximum influent flow rate from the treatment system to the recharge basin is calculated using the average basin infiltration rate.

Geomean Top Elevation	43	ft msl	Unallowable Volume	222904	ft^3
Geomean Bottom Elevation	33	ft msl		1.67	million gal
Basin Depth	10	ft	Maximum Allowable Water Level	2.00	feet
Caclulated Basin Volume (Empty)	278,630	ft^3	Maximum Allowable Volume	0.42	million gal
	2.1	million gal	Volume Available to Accept	0.31	million gal
Minimum Surrounding Home Elevation	43	ft msl	Time to Infiltrate if Basin Achieves Maximum Allowable Volume	0.16	days
Typical Basement Elevation	-8	ft bgs		4	hours
	35	ft msl	Basin Capacity for Discharge from Treatment System	1.90	million gal/day
				1,320	gpm

AOP Bench Scale Testing (Forthcoming)

To:	Harish Mital, PE
Cc:	Andrew Coats, PE
From:	Ralph Boedeker, PE (DE, PA, MD, VA, WV)
Date:	January 16, 2024
Subject:	Phase 3 Groundwater Treatment Plant Geotechnical Subsurface Investigation

This report presents results of a geotechnical subsurface investigation regarding a new groundwater treatment plant (GWTP), Bethpage, New York. Purposes of this study were to investigate subsurface conditions within the project site, formulate foundation design criteria for the proposed site development, and offer pertinent geotechnical site recommendations for construction.

This geotechnical study evaluated subsurface conditions within the project site, and the report offers recommendations based on an exploration of subsurface soil conditions by means of Standard Penetration Test (SPT) Borings (ASTM International [ASTM] D1586). The scope of this investigation included a test boring program, laboratory testing of representative soil samples, engineering analyses of the available data, and preparation of this engineering report.

PROPOSED DEVELOPMENT

A preliminary site plan and GWTP layout plan are in Attachment 1 for reference.

Proposed site development includes a new 12,300-square-foot (sf) GWTP. This brick and masonry clad building will be constructed of perimeter load bearing, reinforced concrete masonry unit (CMU) walls supporting open web steel roof joists and wide-flange beams spanning from exterior load-bearing CMU walls to a single line of steel columns/girders dividing the shorter span of the building in half, thus creating an open floor plan with minimal interior columns. The interior columns will be spaced at approximately 30 feet on-center. The GWTP will house many tanks and other ancillary equipment.

In addition to the water treatment facility will be a separate new office structure encompassing approximately 3,500 square feet (sq. ft). This brick and masonry clad building will be constructed of perimeter load bearing, reinforced CMU walls supporting cold formed steel roof joists spanning from exterior load-bearing CMU walls.

Supporting the proposed structure at the site will be a typical shallow foundation system comprised of reinforced concrete continuous footings and foundation walls around the building perimeter, as well as reinforced concrete spread footings at interior columns. The reinforced exterior load-bearing CMU walls will be supported directly on top of the reinforced concrete foundation walls that extend 8 inches above the finished floor for containment, and which will transfer all loads to the footings and native soil below.

Exterior to the GWTP will be an aboveground backwash tank with a preliminary diameter of 16.8 feet and height of 25.8 feet. The water tank will be placed over a mat foundation with an assumed width and length of approximately 19 feet.

Estimated structural loads conveyed by the project structural and process engineers are as follows:

- Building: Maximum column load of 80 kips
- Building: Maximum wall load of 5 kips per linear foot (klf)
- Exterior Backwash Tank: Based on an operating tank height of 25.8 feet, the water load on the underlying mat foundation will be less than 1,650 pounds per square foot psf). For purpose of analysis, we have assumed a soil bearing load of 2,000 psf (including weight of mat foundation) with an assumed width and length of 19 feet.
- GWTP Interior Tank/Equipment Pads: The interior EQ and BWS Tank loads will be 2,070 psf on their octagonal mat foundations. These tanks exert the largest loads within the GWTP on underlying foundations and soils. For purpose of analysis, we have assumed a length and width of 14 feet for the octagonal mat foundations.

If actual design values vary appreciably from the above values, the project geotechnical engineer should be notified to determine if additional analyses are warranted.

GEOTECHNICAL SUBSURFACE INVESTIGATION PROGRAM

From November 27 to 30, 2023, nine SPT borings were advanced to depths ranging from 20 to 40 feet below ground surface (bgs) at the site to collect representative soil samples and identify conditions of subsurface soil and groundwater. Approximate locations of the borings are conveyed in Attachment 1.

Advancements of borings proceeded by use of a truck-mounted drilling rig. SPT split-spoon samples (ASTM D1586) were collected from each boring at approximate 2-foot intervals to 10 feet bgs, and thereafter at 5-foot intervals. In the SPT procedure, a 2 inch-outside diameter (O.D.) split-barrel sampler is driven into the soil a distance of 18 or 24 inches by a 140-pound hammer falling 30 inches. The number of blows required to drive the sampler from the 6- to 18-inch interval is termed the Standard Penetration Resistance (SPR) N value. This value can be used as a qualitative indication of the in-place relative density of cohesionless (e.g., granular) soils. It is also a secondary indicator of consistency of cohesive soils. Gravel, cobbles, and boulders may induce high blow counts not representative of the soil's relative density/consistency. This indication is qualitative because many factors can significantly affect the SPR value (i.e., drilling crew procedures, drill rigs, and hammer-rod assemblies, etc.).

A Tetra Tech, Inc. (Tetra Tech) geologist reviewed performances of the test borings. Test boring logs (Attachment 2) include soil and groundwater data obtained from the explorations. After completion of the borings, they were backfilled with the auger soil cuttings. Test boring surface elevations were determined by land survey.

All soil samples collected during this investigation were inspected and described visually in Tetra Tech's geotechnical laboratory. Twelve Water Content Tests (ASTM: D2216) and Percent Finer than a No. 200 Sieve Tests (ASTM: D1140) were performed to assist in determining the general site stratigraphy, and to measure the amount of silt and clay particulate in the soil samples. Seventeen mechanical sieve tests (ASTM D6913) were conducted also to aid in classification of encountered soils. Results of the grain-size analysis were referenced to determine the Unified Soil Classification System (USCS) designation for the soils encountered, which provided information regarding soil engineering behavior. Laboratory testing results appear in Attachment 3.

SUBSURFACE CONDITIONS

Subsurface conditions encountered at boring locations are described in detail in the test boring logs (Attachment 2). Subsurface conditions between boring locations were interpolated and may not reflect actual conditions.

- *Surficial Gravel and Topsoil* – Surface of development areas consists of gravel or topsoil, at varying thicknesses (refer to boring logs).

- *Stratum A – Apparent Historical Fill – Coarse-Grained Soils:* Apparent historical fill materials (previously placed fill) were encountered at boring locations SB-01 and SB-02 (office building area), to a depth of 1.5 feet bgs. The fill material generally consisted of a dark brown fine to medium sand with a little silt and with a little fine gravel (USCS: SM). No organic soils, vegetative matter, or deleterious debris was observed within the fill. SPR values ranged from 8 to 22 blows, with an average SPR value of 15, indicating a medium dense relative density. Based on the medium dense relative density of the granular soils encountered within Stratum A, it appears that the fill material had been historically placed in a manner typical of engineered fill techniques—compacted in thin lifts by use of heavy compaction equipment. Laboratory and field SPR data indicate that the soils of Stratum A have relatively high shear strength and low compressibility characteristics.

- *Stratum B – Coarse-Grained Soils*: Predominant subsurface conditions within the investigation area generally can be described as variable brown, fine to coarse sand with a trace to some fine to coarse gravel (USCS: predominantly SP). All borings terminated within this stratum. SPR values ranged from 5 to 62 blows, with an average SPR value of 25, indicating a medium dense relative density. Laboratory and field SPR data indicated that the soils of Stratum B have relatively high shear strength and low compressibility characteristics.

Apparent groundwater was encountered within all borings at depths ranging from 12.7 to 15.7 feet bgs, corresponding to an elevation range of approximately 30.7 to 32.8, project datum. Groundwater elevations fluctuate throughout a given year, depending on field porosity and seasonal and annual variations of precipitation. Groundwater fluctuations of several feet should be anticipated.

GEOTECHNICAL EVALUATION AND DESIGN RECOMMENDATIONS

Tetra Tech evaluated subsurface conditions at the project site for suitability of the proposed development. Tetra Tech's opinion is that the natural site soils (Stratum B) are suitable for supporting the proposed structure on a shallow foundation system and floor slabs. Apparent previously placed soil fill (Stratum A) was observed within the area of the proposed office building (SB-01 and SB-02). Previously placed fill soils typically have more unknown subsurface conditions than do soils at natural undisturbed sites. Placement of foundations on fill soils usually is not recommended because of possible variability of the soil. However, uniformity of the fill material and its medium dense relative density at boring locations suggest application of typical engineered fill techniques for historical placement of the fill material, i.e., compacted in lifts by use of heavy compaction equipment. In addition, no organic soils, vegetative matter, debris, or any other indications of unsuitable bearing material were observed within the Stratum A fill soils. Therefore, Tetra Tech's opinion is that Stratum A is also suitable for supporting the proposed structures on a conventional shallow foundation system and floor slab, as long as careful monitoring during site preparation and foundation construction occur as discussed later herein.

Building Shallow Foundations

Based on results of field and laboratory testing of soils encountered during this evaluation, as well as foundation and foundation loading information provided by the structural engineer, an engineering analysis indicated that shallow spread and continuous wall footings may be designed for a net allowable soil bearing pressure of 4,000 psf.

Estimates of foundation settlement were developed to evaluate effects of building loads on subsurface conditions. Assuming a net allowable bearing capacity of 4,000 psf, we estimate that maximum total settlement of column spread foundations, and differential settlement between columns, will be less than 0.5 and 0.25 inch, respectively. Assuming a net allowable bearing capacity of 4,000 psf, we estimate that maximum total and differential settlement of continuous wall footings will be less than 0.5 and 0.25 inch, respectively, over a distance of 30 feet. Because of the encountered subsurface granular soils, settlement is expected to occur quickly (elastic settlement) and is expected to be "built out" primarily during construction and final loading of foundations. These magnitudes of total and differential settlement generally are considered to be within tolerable limits for the proposed structures and assume conformance to foundation subgrade preparation as discussed herein. The project's structural engineer should verify settlement tolerance of the proposed building.

Exterior footings exposed to freezing conditions should be placed at least 48 inches below finished exterior grade. Interior footings should be placed a minimum of 2 feet below finished floor elevations. Shallow-spread and continuous footings should have minimum widths of 3.0 and 2.0 feet, respectively, regardless of bearing pressure. Masonry walls should be provided with multiple control joints at architecturally convenient locations to provide preferred locations for differential settlements.

Building Ground-Supported Floor Slabs

All ground-supported floor slabs should be designed as free-floating and not connected to other structural elements. The slab may bear on footing projections, but isolation joints should be utilized to accommodate potential differential settlement between the floor slab and adjacent columns or walls. Control joints should also be provided in floor slabs, as required, to provide a preferred location for possible differential slab settlement. All floor slabs should be structurally reinforced to control cracking, more evenly distribute applied loads, and bridge localized zones of lower density material. Placement of a minimum 4 inches of poorly graded, free draining stone aggregate (e.g., American Association of State Highway and Transportation Officials [AASHTO] No. 57 Stone) under all floor slabs is also recommended to provide a uniform bearing surface with all-weather support, and to serve as a capillary break. To preclude floor dampness, placement of a minimum 0.01-inch (10-mil) polyethylene membrane or equivalent vapor barrier beneath the floor slab is recommended.

Actual stress distribution and settlement response under the floor slabs will be a function of structural rigidity of the slab and uniformity of applied loads. Individual equipment, machinery, and tanks typically should be supported on their own foundations and isolated from the floor slab to avoid localized cracking of the floor slab. However, if equipment foundations need to be part of the floor slab (e.g., because of environmental conditions, liquid containment requirements, etc.), the potential differential settlement response between the slab versus equipment pad should be considered during their design.

For floor slabs installed as recommended herein, a modulus of subgrade reaction (Ks) of 175 pounds per cubic inch (pci) is estimated for use in concrete slab-on-grade design.

Exterior Backwash Tank Mat Foundation

The exterior backwash water tank will be supported on an assumed 19- x 19-foot mat foundation with a maximum foundation load on underlying soils of less than 2,000 psf (including weight of concrete mat). This anticipated foundation load is much less than the allowable bearing capacity of the mat subgrade soils. Assuming an actual net soil bearing load of 2,000 psf, total and differential foundation settlement of the underlying soils is estimated to be less than 0.5 inch and 0.25 inch, respectively. An estimated 90% of the settlement is expected to occur quickly (elastic settlement) and to be "built out" during construction and initial placement of the water tank and its liquid service loading.

That tank mat foundation should be designed as a turn-down mat around its perimeter to protect against frost. The turn-down should extend a minimum 48 inches below exterior grades. To provide a uniform bearing surface with

all-weather support, placement of a minimum 6-inch compacted layer of AASHTO No. 57 Stone below the mat foundation is recommended. For a mat foundation installed as recommended herein, a modulus of subgrade reaction (Ks) of 175 pounds per cubic inch (pci) is estimated for use in concrete slab-on-grade design.

Interior Tanks on Octagonal Mat Foundation

The interior tanks will be supported on an assumed 14- x 14-foot octagonal mat foundation with a maximum foundation load on underlying soils of less than 2,100 psf. This anticipated foundation load is much less than the allowable bearing capacity of the mat subgrade soils. Assuming an actual net soil bearing load of 2,100 psf, total and differential foundation settlement of the underlying soils is estimated to be less than 0.33 inch and 0.25 inch, respectively. An estimated 90% of the settlement is expected to occur quickly (elastic settlement) and to be "built out" during construction and initial placement of the tank and its liquid service loading.

Retaining Walls

Determination of lateral earth pressures on retaining walls depends on (1) height and intended yield (i.e., deflection) of the wall, (2) physical properties (i.e., c, φ, and γ) and geometry of the soil fill/backfill behind and in front of the wall, and (3) drainage conditions. Retaining walls allowed to adequately deflect at the top (e.g., a cantilever retaining wall)—causing the soil behind the wall to adequately deflect with the wall—may be designed for the "active" condition of lateral earth pressure. "Passive" lateral earth pressures may be used in front of the wall where the wall adequately deflects and pushes into the soil on the toe side. Rigid retaining walls or walls designed not to deflect at the top during filling/backfilling should be designed for the "at-rest" condition of lateral earth pressure.

To facilitate construction, minimize lateral earth pressures, and preclude hydrostatic pressure buildup behind retaining walls, filling/backfilling behind and in front of retaining walls should proceed with use of a granular, free-draining material (with less than 25% passing a No. 200 sieve). Placement and compaction of fill/backfill material should accord with engineered fill recommendations offered in subsequent sections.

The following soil parameters for lateral earth loads are recommended:

Backfill Materials	**Imported Granular Fill (<25% passing No. 200 Sieve)**	**In-situ Condition On-site Granular Soils**
Moist Unit Weight (pounds per cubic foot [pcf])	130	130
At Rest Earth Pressure Coefficient (K_0)	0.44	0.44
Active Earth Pressure Coefficient (K_A)	0.28	0.28
Passive Earth Pressure Coefficient (K_p)	3.5	3.5
Coefficient of Sliding Friction (concrete to soil)	0.42	0.42

Soil parameters in the above listing are based on the subsurface profile observed in the test borings and are estimated from our experience with soils in the general area. Although general index testing was performed on representative samples, no laboratory testing occurred specifically to determine actual soil strength characteristics.

To minimize buildup of potential hydrostatic pressures, a 4-inch-diameter subdrain should be placed behind retaining walls, along and on top of the wall foundation. The subdrain should consist of a perforated drainage pipe surrounded by a minimum of 12 inches of graded aggregate free of fines, such as AASHTO No. 57 Stone, wrapped with a nonwoven geotextile fabric (Geotex 501 or equivalent). The subdrain should be sloped and should lead to a gravity outfall and/or an active dewatering sump

Seismic Design

Based on subsurface conditions encountered during the test boring program and review of regional geologic maps, Tetra Tech recommends utilization of a site Class D for seismic design purposes. The site class definition is in Section 1613 of the International Building Code.

GENERAL CONSTRUCTION RECOMMENDATIONS

Site Preparation

At start of construction, all topsoil, vegetation and roots should be stripped and entirely removed from all proposed building and mat foundation areas. Prior to placement of fill, the subgrade of building and pavement fill areas should be proof-rolled with a minimum 15-ton vibratory smooth-wheeled roller in the presence of a qualified soils technician. Proof-rolling will increase the density of exposed subgrade areas that will have been loosened or disturbed during stripping and clearing operations. Proof-rolling also will expose potential localized soft and yielding areas. The exposed surfaces should be compacted to a visually firm and stable condition. Subgrade compaction will facilitate placement and compacting of engineered fill at the required densities. Proof-rolling should also occur at final “cut” or “at grade” areas to ensure a firm and stable subgrade.

Any localized soft and unstable areas encountered during the proof-rolling program that cannot be adequately stabilized and compacted should be undercut and replaced with engineered fill. Localized soil conditioning and/or undercutting of soft subgrade soils should be anticipated during construction, especially during inclement weather seasons (winter and spring). If these soils are observed to be soft and unstable during proof-rolling, we recommend an attempt to initially condition the soils by allowing them to dry during favorable weather conditions (e.g., sun and wind). If conditioning of these soils (via aerating/drying) appears infeasible, they should be undercut to a firm and stable subgrade.

Because ponding water may destabilize soil during construction, soil subgrade disturbance should be minimized by providing positive surface drainage and limiting construction traffic on exposed subgrade soils.

Engineered Fill

The granular subsurface soils encountered at the site are considered suitable for use as engineered fill. Engineered fill required to bring areas to grade should be free of organic material, topsoil, debris, and gravel greater than 3 inches in their largest dimension. Any imported engineered fill should meet the USCS classifications of SW, SM, SC, or GW (or combination thereof), with no more than 25% passing a No. 200 sieve (ASTM D1140), and a plasticity index (ASTM D4318) not exceeding 6. Engineered fill material should be placed in horizontal thin lifts with compacted thickness no greater than 8 inches. Engineered fill lifts for hand tampers should not exceed 4 inches. Each thin lift of fill/backfill material placed below structural elements (i.e., foundations) and pavements should be compacted according to the following criteria:

- Within proposed structural building and mat foundation areas, compaction should be to at least 95% of maximum dry density, as determined by the Modified Proctor Test (ASTM D1557).
- Within proposed pavement areas, compaction should be to at least 90% of maximum dry density, as determined by the Modified Proctor Test (ASTM D1557).

Moisture content of placed engineered fill should facilitate compaction (typically at +/- 2 to 3% of optimum moisture, per ASTM D1557). A qualified geotechnical technician should monitor and test placement and compaction of engineered fill on a full-time basis.

AASHTO No. 57 Stone could also be used as engineered fill for foundation excavations or undercuts—placed in maximum 12-inch lifts and compacted by use of a hand-operated vibratory plate compactor. Proper strength flowable fill can also be utilized as engineered fill.

Foundation Construction

All foundations should be placed on dry, non-frozen, firm soil. When excessively soft, wet, or frozen soil is encountered at the foundation base, this material should be undercut to suitable bearing materials. The undercut zone may be replaced in accordance with engineered fill recommendations. AASHTO No. 57 Stone could also be used as backfill within foundation undercut zones—placed in maximum 12-inch lifts and compacted by use of a hand-operated vibratory plate compactor.

During excavation of foundations, disturbance of the subgrade soils may occur; therefore, compaction of the foundation subgrades should occur prior to placement of any reinforcing steel or concrete. All foundation excavations should be reviewed to verify the quality of the bearing material—by a qualified geotechnical technician working under the supervision of a geotechnical engineer familiar with the recommendations of this report.

All foundation excavations should be protected from ponding water and freezing conditions and backfilled as soon as practical after placement of the foundation concrete. Backfilling should accord with recommendations regarding engineered fill.

Excavated Slopes

Based on the test borings, subsurface soils in excavations will consist of sands. These soils typically are considered Type C Soil under Occupational Safety and Health Administration (OSHA) guidelines. OSHA guidelines indicate unsupported excavations in Type C soils should have a gradient of no steeper than 1.5H:1V. Slopes constructed in this manner may still exhibit surface sloughing. An OSHA-defined competent person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 *Code of Federal Regulations* (CFR), Part 1926, Subpart P, "Excavations and Trenches." The OSHA CFR states that excavation safety is the responsibility of the contractor.

Site Work Quality Control and Assurance

All site proof-rolling, fill placement, and foundation excavation/construction should be monitored by a qualified geotechnical technician working under the supervision of a geotechnical engineer. The technician should observe and document site preparation, foundation subgrades, engineered fill construction, and foundation construction—and should conduct appropriate field tests, as necessary, to verify that construction proceeds in accordance with applicable plans, specifications, and acceptable construction practice. Conclusions and recommendations in this memo are based on the premise of competent field engineering and monitoring during construction.

REPRESENTATIONS

Preparation of this memo accorded with generally accepted engineering principles and practices and was based on soil and groundwater conditions encountered during the field exploration. No warranty is expressed or implied. Although generalized subsurface conditions have been inferred through interpolation and/or extrapolation of acquired field and laboratory data, actual subsurface conditions between soil boring locations are unknown. As a result, recommendations in this memo may require modifications based on subsurface conditions actually encountered during construction. Tetra Tech should be notified if conditions encountered during construction differ from those indicated by test borings, thus possibly requiring re-evaluation of recommendations offered in this report. This report applies solely to size, type, and location of the structures described herein. If changes are proposed, this report will not be considered valid unless and until Tetra Tech has reviewed the changes and accordingly altered and re-approved recommendations of this report.

Construction bidders should thoroughly familiarize themselves with the on-site subsurface soil and groundwater conditions described herein. Recommendation is to provide bidding contractors with this report so they can develop their own interpretations of the available data. Tetra Tech or the Owner assumes no responsibility for interpretation

or deductions by the awarded contractor based on information in this report. Variations in subsurface conditions are expected.

ATTACHMENTS

Attachment 1: Test Boring Locations

Attachment 2: Test Boring Logs

Attachment 3: Laboratory Testing Summary

ATTACHMENT 1

Site Layout and Test Boring Locations

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

EXEMPTION 3. (5 USC 552(b)(3))

Information exempted by other statutes

10 USC Section 130(e) Treatment of Certain Critical Infrastructure Security Information

Pages 338-339

TO REQUEST A COPY OF THE DOCUMENT PLEASE CONTACT

Department of the Navy
Freedom of Information Act Office

http://www.secnav.navy.mil/foia/Pages/default.aspx

ATTACHMENT 2

Test Boring Logs

FIELD DESCRIPTION AND LOGGING SYSTEM FOR SOIL EXPLORATION

GRANULAR SOILS

(Sand, Gravel & Combinations)

Density	***N (blows)****
Very Loose	5 or less
Loose	6 to 10
Medium Dense	11 to 30
Dense	31to 50
Very Dense	51 or more

Relative Proportions

Description Term	*Percent*
Trace	1 - 10
Little	11 - 20
Some	21 - 35
And	36 - 50

Particle Size Identification

Boulders	8 in. diameter or more	
Cobbles	3 to 8 in. diameter	
Gravel	Coarse (C)	3 in. to ¾ in. sieve
	Fine (F)	¾ in. to No. 4 sieve
Sand	Coarse (C)	No. 4 to No. 10 sieve (4.75mm-2.00mm)
	Medium (M)	No. 10 to No. 40 sieve (2.00mm – 0.425mm)
	Fine (F)	No. 40 to No. 200 sieve (0.425 – 0.074mm)
Silt/Clay	Less Than a No. 200 sieve (<0.074mm)	

COHESIVE SOILS

(Silt, Clay & Combinations)

Consistency	***N (blows)****
Very Soft	3 or less
Soft	4 to 5
Medium Stiff	6 to 10
Stiff	11 to 15
Very Stiff	16 to 30
Hard	31 or more

Plasticity

Degree of Plasticity	*Plasticity Index*
None to Slight	0 - 4
Slight	5 - 7
Medium	8- 22
High to Very High	> 22

ROCK

(Rock Cores)

Rock Quality Designation (RQD), %	***Rock Quality Description***
0-25	Very Poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

RQD: Rock Quality Designation
TCR: Total Core Recovery
SCR: Solid Core Recovery

****N - Standard Penetration Resistance.*** Driving a 2.0" O.D., 1-3/8" I.D. sampler a distance of 18 inches into undisturbed soil with a 140 pound hammer free falling a distance of 30.0 inches. The number of hammer blows to drive the sampler through each 6 inch interval is recorded; the number of blows required to drive the sampler through the final 12 inch interval is termed the Standard Penetration Resistance (SPR) N-value. For example, blow counts of 6/8/9 (through three 6-inch intervals) results in an SPR N-value of 17 (8+9).

Groundwater observations were made at the times indicated. Groundwater elevations fluctuate throughout a given year, depending on actual field porosity and variations in seasonal and annual precipitation.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-01	Dates(s) Drilled: 11/27/23	Inspector: S. BERRY
Surface Elev:	45.2	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 14.5	Total Depth (ft): 20.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.2			TOPSOIL (2")					
1	0.0	2.0	0.2			A (SM)	DARK BROWN FINE TO MEDIUM SAND WITH A LITTLE FINE GRAVEL,	2	2	6	3	**8**
				1.5			WITH A LITTLE SILT. (FILL)					
2	2.0	4.0	1.5			B (SP)	ORANGE BROWN FINE TO MEDIUM SAND WITH A LITTLE FINE	3	7	9	15	**16**
							GRAVEL.					
3	4.0	6.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	10	14	19	20	**33**
4	6.0	8.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	10	16	16	15	**32**
5	8.0	10.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	8	9	9	10	**18**
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	6	8	7	7	**15**
7	18.0	20.0		20.0			BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	6	6	9	9	**15**
							WATER LEVEL THROUGH AUGERS AT 14.5'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-02	Dates(s) Drilled: 11/27/23	Inspector: S. BERRY
Surface Elev:	44.5	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 12.8	Total Depth (ft): 20.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			GRAVEL (4")					
1	0.0	2.0	0.3			SM	DARK BROWN FINE TO MEDIUM SAND WITH A LITTLE SILT,	20	12	10	15	**22**
				1.5			TRACE FINE GRAVEL. (FILL)					
2	2.0	4.0	1.5			SP	ORANGE BROWN FINE TO MEDIUM SAND WITH A LITTLE FINE	6	8	6	9	**14**
							GRAVEL.					
3	4.0	6.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	6	7	12	16	**19**
4	6.0	8.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	11	15	13	13	**28**
5	8.0	10.0					BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL.	8	6	8	13	**14**
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	12	12	11	11	**23**
7	18.0	20.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE TO COARSE	44	26	22	20	**48**
				20.0			GRAVEL.					
							WATER LEVEL THROUGH AUGERS AT 12.8'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-03	Dates(s) Drilled: 11/28/23	Inspector: S. BERRY
Surface Elev:	45.8	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 13.0	Total Depth (ft): 30.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (4")					
1	0.0	2.0	0.3			B (SP)	ORANGE BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE FINE GRAVEL.	2	2	3	3	**5**
2	2.0	4.0					ORANGE BROWN FINE TO COARSE SAND, WITH A LITTLE FINE GRAVEL.	2	5	11	14	**16**
3	4.0	6.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	6	13	26	30	**39**
4	6.0	8.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	13	16	27	31	**43**
5	8.0	10.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	18	14	17	24	**31**
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	5	5	12	20	**17**
7	18.0	20.0					BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL.	25	14	20	28	**34**
8	23.0	25.0					BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL.	14	12	12	16	**24**
9	28.0	30.0		30.0			BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL.	45	45	17	15	**62**
							WATER LEVEL THROUGH AUGERS AT 14.5'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-04	Dates(s) Drilled: 11/28/23	Inspector: S. BERRY
Surface Elev:	45.5	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 12.7	Total Depth (ft): 30.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.2			TOPSOIL (2")					
1	0.0	2.0	0.2			B (SP)	DARK BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL	4	2	4	8	**6**
2	2.0	4.0					YELLOW BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL.	5	4	7	11	**11**
3	4.0	6.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	3	10	14	18	**24**
4	6.0	8.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	4	10	15	20	**25**
5	8.0	10.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	5	10	15	19	**25**
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	4	9	12	13	**21**
7	18.0	20.0					GRAYIS BROWN FINE TO COARSE SAND WITH SOME FINE TO COARSE GRAVEL.	16	17	17	16	**34**
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	10	7	9	8	**16**
9	28.0	30.0		30.0			BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	12	11	11	14	**22**
							WATER LEVEL THROUGH AUGERS AT 12.7'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-05	Dates(s) Drilled: 11/28/23	Inspector: S. BERRY
Surface Elev:	45.7	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 13.4	Total Depth (ft): 30.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.2			TOPSOIL (2")					
1	0.0	2.0	0.2			B (SM)	DARK BROWN FINE TO MEDIUM SAND WITH A LITTLE SILT, TRACE	4	10	11	11	**21**
							FINE GRAVEL.					
2	2.0	4.0				B (SP)	YELLOW BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL	3	5	6	7	**11**
3	4.0	6.0				B (SP-SM)	REDDISH BROWN FINE TO MEDIUM SAND WITH A LITTLE FINE GRAVEL	10	11	15	30	**26**
							TRACE SILT.					
4	6.0	8.0				B (SP)	ORANGE BROWN FINE TO COARSE SAND WITH SOME FINE TO	19	16	28	35	**44**
							COARSE GRAVEL.					
5	8.0	10.0					YELLOW BROWN FINE TO COARSE SAND WITH SOME FINE TO	12	11	22	17	**33**
							COARSE GRAVEL.					
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	6	10	15	20	**25**
7	18.0	20.0					BROWN FINE TO COARSE SAND WITH SOME FINE TO COARSE	17	16	15	20	**31**
							GRAVEL.					
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH SOME FINE TO COARSE	28	16	16	15	**32**
							GRAVEL.					
9	28.0	30.0					BROWN FINE TO COARSE SAND WITH SOME FINE TO COARSE	42	13	12	12	**25**
				30.0			GRAVEL.					
							WATER LEVEL THROUGH AUGERS AT 13.4'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-06	Dates(s) Drilled: 11/29/23	Inspector: S. BERRY
Surface Elev:	47.2	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 14.6	Total Depth (ft): 30.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (4")					
1	0.0	2.0	0.3			B (SP-SM)	BROWN FINE TO COASE SAND WITH A LITTLE FINE GRAVEL, TRACE	2	4	3	7	**7**
							SILT					
2	2.0	4.0					ORANGE BROWN FINE TO MEDIUM SAND AND FINE GRAVEL, TRACE	4	10	12	18	**22**
							SILT.					
3	4.0	6.0					ORANGE BROWN FINE TO MEDIUM SAND AND FINE GRAVEL, TRACE	11	9	13	27	**22**
							SILT.					
4	6.0	8.0				B (SP)	ORANGE BROWN FINE TO MEDIUM SAND WITH SOME FINE GRAVEL.	15	18	21	36	**39**
5	8.0	10.0					ORANGE BROWN FINE TO MEDIUM SAND WITH SOME FINE GRAVEL.	14	15	18	27	**33**
6	13.0	15.0					ORANGE BROWN FINE TO MEDIUM SAND WITH SOME FINE GRAVEL.	11	16	22	25	**38**
7	18.0	20.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	3	4	6	12	**10**
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	15	12	12	16	**24**
9	28.0	30.0		30.0			BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	9	7	7	11	**14**
							WATER LEVEL THROUGH AUGERS AT 14.6'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

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Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-07	Dates(s) Drilled: 11/29/23	Inspector: S. BERRY
Surface Elev:	47.6	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 15.1	Total Depth (ft): 30.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (4")					
1	0.0	2.0	0.3			B (SM)	DARK BROWN FINE TO MEDIUM SAND WITH SOME SILT, WITH A	4	3	5	5	**8**
							LITTLE FINE GRAVEL.					
2	2.0	4.0				B (SP)	YELLOW BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL.	8	9	9	18	**18**
3	4.0	6.0					YELLOW BROWN FINE TO COARSE SAND WITH A LITTLE FINE	5	10	16	28	**26**
							GRAVEL.					
4	6.0	8.0					YELLOW BROWN FINE TO COARSE SAND WITH SOME FINE	7	11	15	15	**26**
							GRAVEL.					
5	8.0	10.0					YELLOW BROWN FINE TO COARSE SAND WITH SOME FINE	5	9	18	18	**27**
							GRAVEL.					
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	10	11	15	14	**26**
7	18.0	20.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	10	10	15	15	**25**
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	24	11	14	14	**25**
9	28.0	30.0		30.0			BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	15	9	10	18	**19**
							WATER LEVEL THROUGH AUGERS AT 15.1'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

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Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-08	Dates(s) Drilled: 11/30/23	Inspector: S. BERRY
Surface Elev:	47.8	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 15.7	Total Depth (ft): 40.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (3")					
1	0.0	2.0	0.3			B (SM)	DARK BROWN FINE TO MEDIUM SAND WITH SOME SILT, WITH A	6	4	4	6	**8**
							LITTLE FINE GRAVEL.					
2	2.0	4.0				B (SP)	ORANGE BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	5	9	17	20	**26**
3	4.0	6.0					ORANGE BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	20	16	22	25	**38**
4	6.0	8.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	6	13	17	20	**30**
5	8.0	10.0					ORANGE BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	6	13	16	16	**29**
6	13.0	15.0					ORANGE BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	5	10	10	12	**20**
7	18.0	20.0					BROWN FINE TO COARSE SAND WITH A LITTLE FINE GRAVEL.	14	6	11	16	**17**
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	17	11	13	11	**24**
9	28.0	30.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	5	4	7	9	**11**
10	33.0	35.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	11	9	6	8	**15**
11	38.0	40.0		40.0			BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	50	18	8	9	**26**
							WATER LEVEL THROUGH AUGERS AT 15.7'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

TETRA TECH
240 Continental Drive, Suite 200
Newark, Delaware 19713
302.738.7551
fax: 302.454.5988

TEST BORING LOG

Project Name:	NWIRP BETHPAGE PHASE 3 GROUNDWATER TREATMENT PLANT		Project No.: 112G08005-WE24
Project Location:	BETHPAGE, NEW YORK		Page 1 of 1
Boring No.:	SB-09	Dates(s) Drilled: 11/30/23	Inspector: S. BERRY
Surface Elev:	47.5	Drilling Method: SPT - ASTM D1586	Driller: J. GUECI
Drilling Contractor:	DELTA	Groundwater Depth (ft): 15.1	Total Depth (ft): 40.0

Sample No.	Sample Depth (ft) From	Sample Depth (ft) To	Strata Depth (ft) From	Strata Depth (ft) To	Recov. (in)	Strata (USCS)	Description of Materials	6" Increment Blows *				N
			0.0	0.3			TOPSOIL (4")					
1	0.0	2.0	0.3			B (SM)	DARK BROWN FINE TO MEDIUM SAND WITH SOME SILT, TRACE FINE GRAVEL.	5	3	4	5	**7**
2	2.0	4.0				B (SP)	ORANGE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL.	4	2	5	12	**7**
3	4.0	6.0					YELLOW BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL.	6	11	25	32	**36**
4	6.0	8.0				B (SP-SM)	BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL, TRACE SILT.	15	21	31	30	**52**
5	8.0	10.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL, TRACE SILT.	10	25	28	25	**53**
6	13.0	15.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL, TRACE SILT.	23	20	20	17	**40**
7	18.0	20.0				B (SP)	BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	15	14	17	20	**31**
8	23.0	25.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	17	12	11	12	**23**
9	28.0	30.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	12	10	7	12	**17**
10	33.0	35.0					BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	17	12	9	15	**21**
11	38.0	40.0		40.0			BROWN FINE TO COARSE SAND WITH SOME FINE GRAVEL.	60	30	13	10	**43**
							WATER LEVEL THROUGH AUGERS AT 15.1'					

Notes/Comments:

* Number of blows of 140 lb. Hammer dropped 30 in. required to drive 2 in. split-spoon sampler in 6 in. increments.
N: Number of blows to drive spoon from 6" to 18" interval.

ATTACHMENT 3

Laboratory Testing Summary

December 17, 2023

Project No. 2023-494-005

Mr. Ernie Wu
Tetra Tech, Inc.
Twin Oaks I, Suite 102
5700 Wright Lake Drive
Norfolk, VA 23502

Transmittal
Laboratory Test Results
Bethpage 112G08005-WE13

Please find attached the laboratory test results for the above referenced project. The tests were outlined on the Project Verification Form that was transmitted to your firm prior to the testing. The testing was performed in general accordance with the methods listed on the enclosed data sheets. The test results are believed to be representative of the samples that were submitted for testing and are indicative only of the specimens that were evaluated. We have no direct knowledge of the origin of the samples and imply no position with regard to the nature of the test results, i.e. pass/fail and no claims as to the suitability of the material for its intended use.

The test data and all associated project information provided shall be held in strict confidence and disclosed to other parties only with authorization by our Client. The test data submitted herein is considered integral with this report and is not to be reproduced except in whole and only with the authorization of the Client and Geotechnics. The remaining sample materials for this project will be retained for a minimum of 90 days as directed by the Geotechnics' Quality Program.

We are pleased to provide these testing services. Should you have any questions or if we may be of further assistance, please contact our office.

Respectfully submitted,
Geotechnics, Inc.

Nathan Melaro
Director of Operations

We understand that you have a choice in your laboratory services and we thank you for choosing Geotechnics.

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	001
Boring No.	SB-01A
Depth (ft)	4.0-6.0'
Sample No.	S-3
Tare Number	1620
Wt. of Tare & WS (gm)	428.01
Wt. of Tare & DS (gm)	417.62
Wt. of Tare (gm)	145
Wt. of Water (gm)	10.39
Wt. of DS (gm)	272.62
Water Content (%)	**3.8**
Wt. of Washed Soil & Tare	410.02
Percent Passing #200	**2.8**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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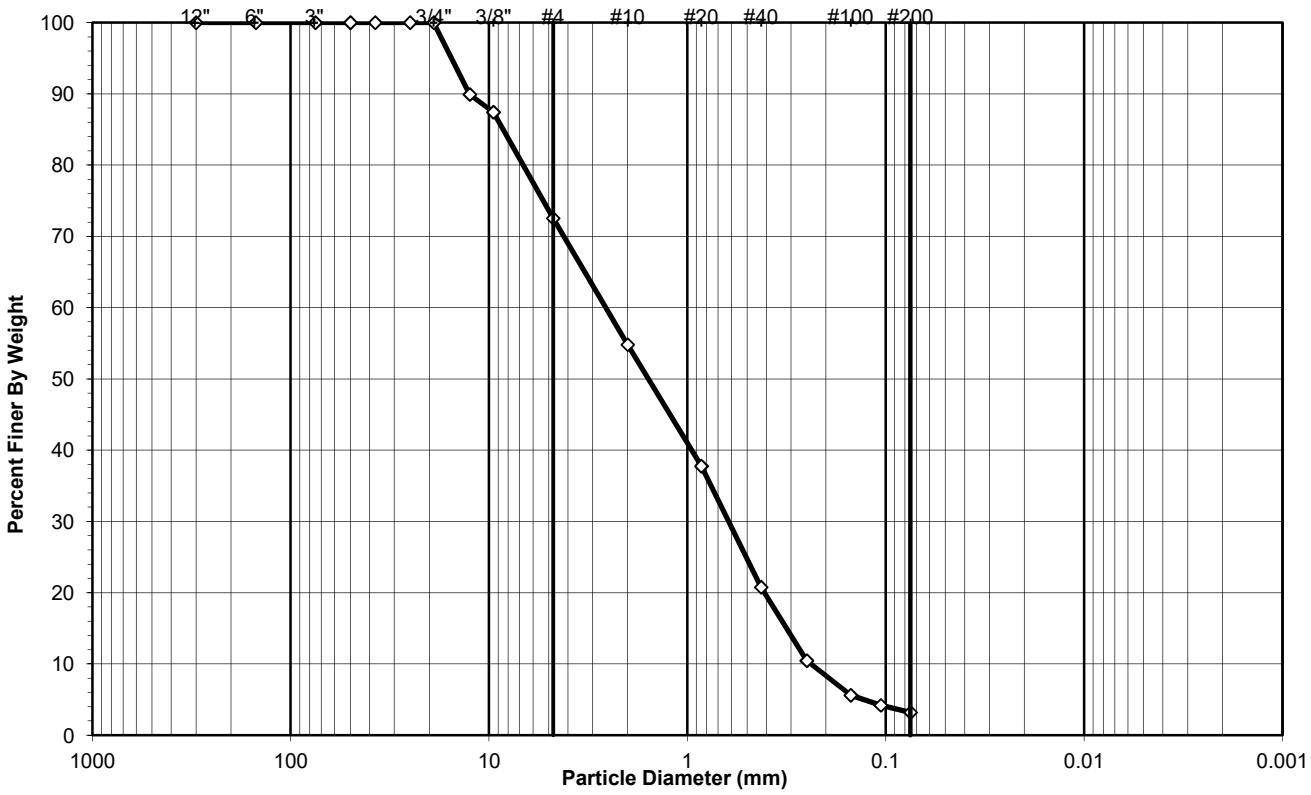
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-01A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-002	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**27.46**
#4 to #200	***Sand***	**69.34**
Finer than #200	***Silt & Clay***	**3.20**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 2.58 D50 = 1.57

D30 = 0.62 CU = 10.83

D10 = 0.238

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-01A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-002	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1434	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	357.27	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	351.86	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.02	Weight of Tare (g):	NA
Weight of Water (g):	5.41	Weight of Water (g):	NA
Weight of Dry Soil (g):	206.84	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.6**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	206.84
Tare No. (Sub-Specimen)	1434	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	357.27	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	145.02	Dry Weight of - 3/4" Sample (g):	206.84
Sub-Specimen Wet Weight (g):	212.25	Dry Weight -3/4" +3/8" Sample (g):	26.00
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	180.84
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	20.85	(**)	10.08	10.08	89.92	**90**
3/8"	9.5	5.15		2.49	12.57	87.43	**87**
#4	4.75	30.80		14.89	27.46	72.54	**73**
#10	2	36.68		17.73	45.19	54.81	**55**
#20	0.85	35.25	(**)	17.04	62.24	37.76	**38**
#40	0.425	35.13		16.98	79.22	20.78	**21**
#60	0.25	21.33		10.31	89.53	10.47	**10**
#100	0.15	10.04		4.85	94.39	5.61	**6**
#140	0.106	2.92		1.41	95.80	4.20	**4**
#200	0.075	2.07		1.00	96.80	3.20	**3**
Pan	-	6.62		3.20	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	003
Boring No.	SB-01A
Depth (ft)	13.0-15.0'
Sample No.	S-6
Tare Number	1425
Wt. of Tare & WS (gm)	527.53
Wt. of Tare & DS (gm)	490.41
Wt. of Tare (gm)	143.2
Wt. of Water (gm)	37.12
Wt. of DS (gm)	347.21
Water Content (%)	**10.7**
Wt. of Washed Soil & Tare	483.89
Percent Passing #200	**1.9**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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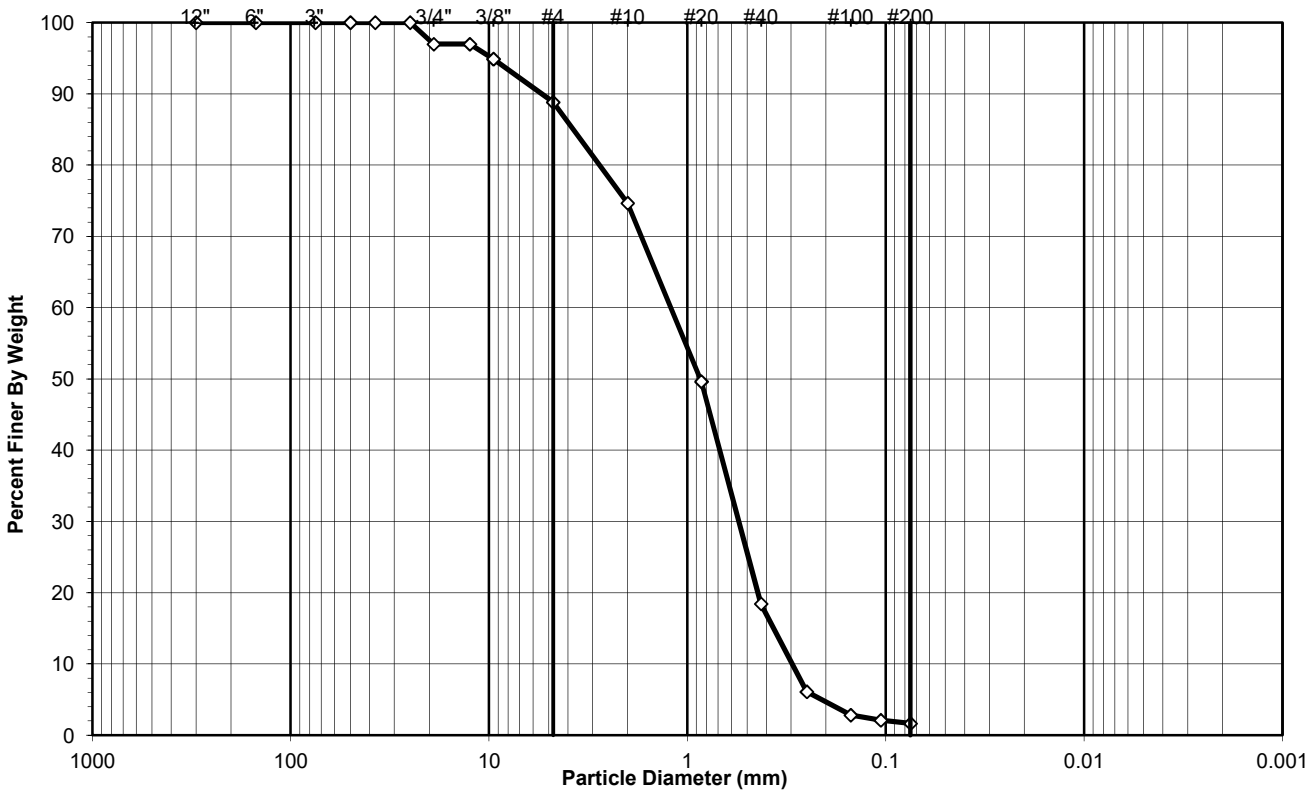
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-01A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-004	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**11.18**
#4 to #200	***Sand***	**87.17**
Finer than #200	***Silt & Clay***	**1.65**

USCS Symbol:
sp, ASSUMED

D60 = 1.21 D50 = 0.86

D30 = 0.55 CU = 4.10

USCS Classification:
POORLY GRADED SAND

D10 = 0.296

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Tetra Tech, Inc.	Boring No.:	SB-01A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-004	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1548	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	539.81	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	488.10	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.00	Weight of Tare (g):	NA
Weight of Water (g):	51.71	Weight of Water (g):	NA
Weight of Dry Soil (g):	343.10	Weight of Dry Soil (g):	NA
Moisture Content (%):	**15.1**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	343.10
Tare No. (Sub-Specimen)	1548	Wet Weight of +3/4" Sample (g):	11.94
Wt. of Tare & Wet Sub-Specimen (g):	539.81	Dry Weight of + 3/4" Sample (g):	10.38
Weight of Tare (g):	145.00	Dry Weight of - 3/4" Sample (g):	332.72
Sub-Specimen Wet Weight (g):	394.81	Dry Weight -3/4" +3/8" Sample (g):	7.17
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	325.55
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	10.38		3.03	3.03	96.97	**97**
1/2"	12.5	0.00	(**)	0.00	3.03	96.97	**97**
3/8"	9.5	7.17		2.09	5.12	94.88	**95**
#4	4.75	20.80		6.06	11.18	88.82	**89**
#10	2	48.58		14.16	25.34	74.66	**75**
#20	0.85	85.91	(**)	25.04	50.38	49.62	**50**
#40	0.425	107.04		31.20	81.57	18.43	**18**
#60	0.25	42.30		12.33	93.90	6.10	**6**
#100	0.15	11.27		3.28	97.19	2.81	**3**
#140	0.106	2.44		0.71	97.90	2.10	**2**
#200	0.075	1.54		0.45	98.35	1.65	**2**
Pan	-	5.67		1.65	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	005
Boring No.	SB-02
Depth (ft)	0.0-2.0'
Sample No.	S-1
Tare Number	1540
Wt. of Tare & WS (gm)	329.34
Wt. of Tare & DS (gm)	313.88
Wt. of Tare (gm)	146.95
Wt. of Water (gm)	15.46
Wt. of DS (gm)	166.93
Water Content (%)	**9.3**
Wt. of Washed Soil & Tare	280.79
Percent Passing #200	**19.8**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	006
Boring No.	SB-02
Depth (ft)	2.0-4.0'
Sample No.	S-2
Tare Number	1514
Wt. of Tare & WS (gm)	387.91
Wt. of Tare & DS (gm)	383.93
Wt. of Tare (gm)	146.26
Wt. of Water (gm)	3.98
Wt. of DS (gm)	237.67
Water Content (%)	**1.7**
Wt. of Washed Soil & Tare	378.34
Percent Passing #200	**2.4**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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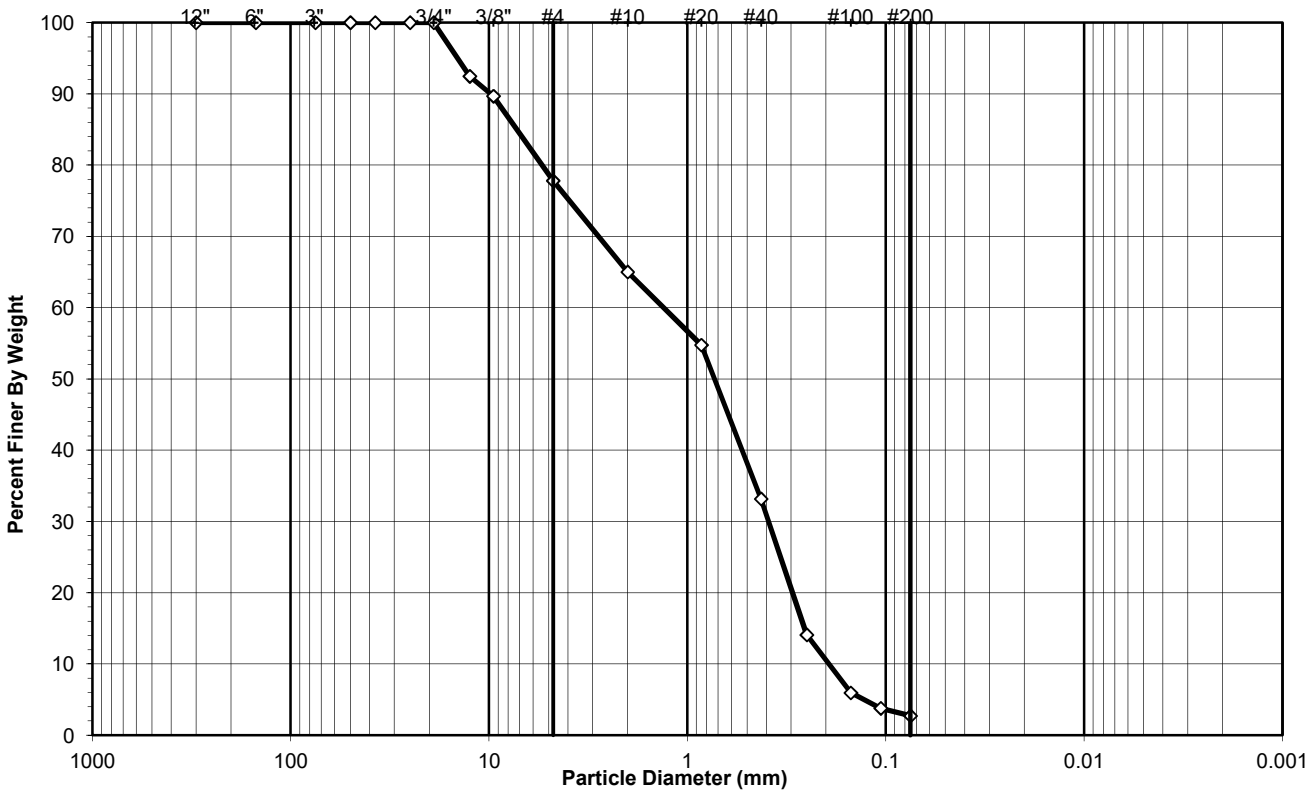
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-02
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-007	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**22.19**
#4 to #200	***Sand***	**75.09**
Finer than #200	***Silt & Clay***	**2.72**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 1.32 D50 = 0.73

D30 = 0.39 CU = 6.81

D10 = 0.193

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Tetra Tech, Inc.	Boring No.:	SB-02
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-007	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1505	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	352.57	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	346.47	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	140.23	Weight of Tare (g):	NA
Weight of Water (g):	6.10	Weight of Water (g):	NA
Weight of Dry Soil (g):	206.24	Weight of Dry Soil (g):	NA
Moisture Content (%):	**3.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	206.24
Tare No. (Sub-Specimen)	1505	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	352.57	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	140.23	Dry Weight of - 3/4" Sample (g):	206.24
Sub-Specimen Wet Weight (g):	212.34	Dry Weight -3/4" +3/8" Sample (g):	21.28
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	184.96
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	15.53	(**)	7.53	7.53	92.47	**92**
3/8"	9.5	5.75		2.79	10.32	89.68	**90**
#4	4.75	24.48		11.87	22.19	77.81	**78**
#10	2	26.40		12.80	34.99	65.01	**65**
#20	0.85	21.15	(**)	10.26	45.24	54.76	**55**
#40	0.425	44.52		21.59	66.83	33.17	**33**
#60	0.25	39.36		19.08	85.91	14.09	**14**
#100	0.15	16.78		8.14	94.05	5.95	**6**
#140	0.106	4.48		2.17	96.22	3.78	**4**
#200	0.075	2.17		1.05	97.28	2.72	**3**
Pan	-	5.62		2.72	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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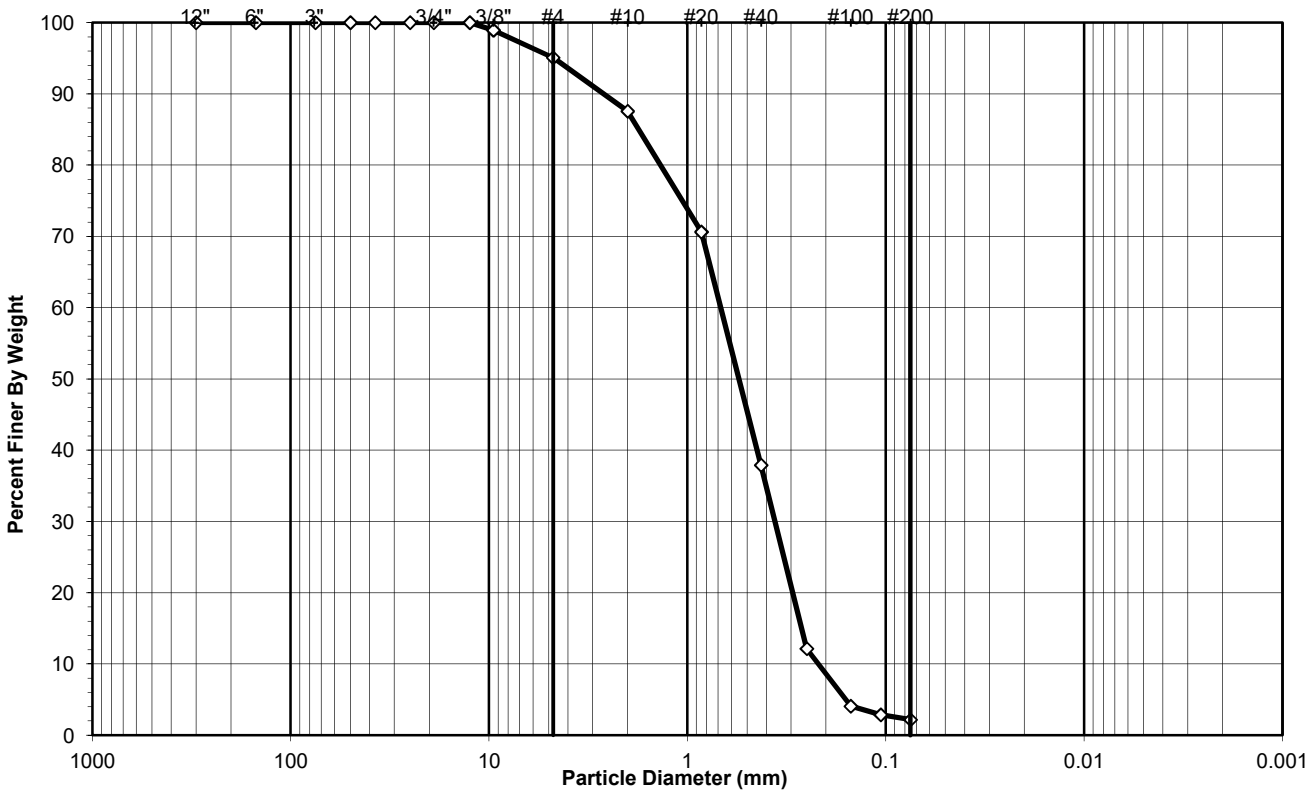
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-02
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-008	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**4.93**
#4 to #200	***Sand***	**92.89**
Finer than #200	***Silt & Clay***	**2.18**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND

D60 = 0.68 D50 = 0.55

D30 = 0.36 CU = 3.11

D10 = 0.218

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-02
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-008	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1477	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	366.16	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	361.36	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	144.11	Weight of Tare (g):	NA
Weight of Water (g):	4.80	Weight of Water (g):	NA
Weight of Dry Soil (g):	217.25	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	217.25
Tare No. (Sub-Specimen)	1477	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	366.16	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	144.11	Dry Weight of - 3/4" Sample (g):	217.25
Sub-Specimen Wet Weight (g):	222.05	Dry Weight -3/4" +3/8" Sample (g):	2.33
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	214.92
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	2.33		1.07	1.07	98.93	**99**
#4	4.75	8.38		3.86	4.93	95.07	**95**
#10	2	16.30		7.50	12.43	87.57	**88**
#20	0.85	36.80	(**)	16.94	29.37	70.63	**71**
#40	0.425	71.11		32.73	62.10	37.90	**38**
#60	0.25	55.95		25.75	87.86	12.14	**12**
#100	0.15	17.53		8.07	95.93	4.07	**4**
#140	0.106	2.62		1.21	97.13	2.87	**3**
#200	0.075	1.50		0.69	97.82	2.18	**2**
Pan	-	4.73		2.18	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	009
Boring No.	SB-03
Depth (ft)	2.0-4.0'
Sample No.	S-2
Tare Number	1529
Wt. of Tare & WS (gm)	404.12
Wt. of Tare & DS (gm)	396.91
Wt. of Tare (gm)	145.95
Wt. of Water (gm)	7.21
Wt. of DS (gm)	250.96
Water Content (%)	**2.9**
Wt. of Washed Soil & Tare	389.7
Percent Passing #200	**2.9**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-03
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-010	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay

Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**20.26**
#4 to #200	***Sand***	**76.71**
Finer than #200	***Silt & Clay***	**3.03**

USCS Symbol:
sp, ASSUMED

D60 = 1.78 D50 = 1.04

D30 = 0.49 CU = 7.01

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.254

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-03
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-010	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1437	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	432.24	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	424.83	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	143.97	Weight of Tare (g):	NA
Weight of Water (g):	7.41	Weight of Water (g):	NA
Weight of Dry Soil (g):	280.86	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.6**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	280.86
Tare No. (Sub-Specimen)	1437	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	432.24	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	143.97	Dry Weight of - 3/4" Sample (g):	280.86
Sub-Specimen Wet Weight (g):	288.27	Dry Weight -3/4" +3/8" Sample (g):	19.40
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	261.46
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	10.76	(**)	3.83	3.83	96.17	**96**
3/8"	9.5	8.64		3.08	6.91	93.09	**93**
#4	4.75	37.49		13.35	20.26	79.74	**80**
#10	2	49.46		17.61	37.87	62.13	**62**
#20	0.85	44.57	(**)	15.87	53.73	46.27	**46**
#40	0.425	58.22		20.73	74.46	25.54	**26**
#60	0.25	45.05		16.04	90.50	9.50	**9**
#100	0.15	12.10		4.31	94.81	5.19	**5**
#140	0.106	3.60		1.28	96.09	3.91	**4**
#200	0.075	2.46		0.88	96.97	3.03	**3**
Pan	-	8.51		3.03	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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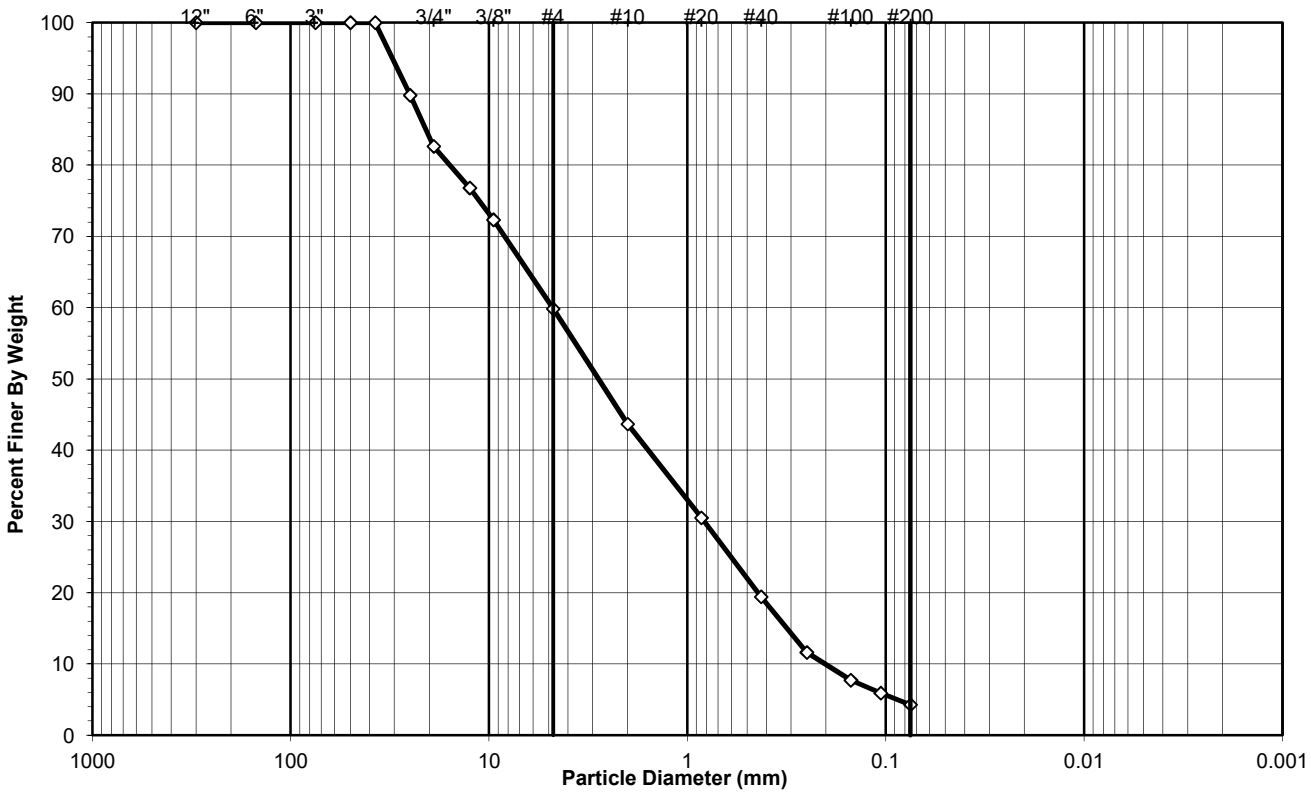
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-03
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-011	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**40.16**
#4 to #200	***Sand***	**55.56**
Finer than #200	***Silt & Clay***	**4.28**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 4.79 D50 = 2.81

D30 = 0.82 CU = 23.71

D10 = 0.202

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Tetra Tech, Inc.	Boring No.:	SB-03
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-011	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1426	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	465.60	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	441.17	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	144.05	Weight of Tare (g):	NA
Weight of Water (g):	24.43	Weight of Water (g):	NA
Weight of Dry Soil (g):	297.12	Weight of Dry Soil (g):	NA
Moisture Content (%):	**8.2**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	297.12
Tare No. (Sub-Specimen)	1426	Wet Weight of +3/4" Sample (g):	55.83
Wt. of Tare & Wet Sub-Specimen (g):	465.60	Dry Weight of + 3/4" Sample (g):	51.59
Weight of Tare (g):	144.05	Dry Weight of - 3/4" Sample (g):	245.53
Sub-Specimen Wet Weight (g):	321.55	Dry Weight -3/4" +3/8" Sample (g):	30.63
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	214.90
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	30.30		10.20	10.20	89.80	**90**
3/4"	19	21.29		7.17	17.36	82.64	**83**
1/2"	12.5	17.34	(**)	5.84	23.20	76.80	**77**
3/8"	9.5	13.29		4.47	27.67	72.33	**72**
#4	4.75	37.10		12.49	40.16	59.84	**60**
#10	2	48.04		16.17	56.33	43.67	**44**
#20	0.85	39.09	(**)	13.16	69.48	30.52	**31**
#40	0.425	32.95		11.09	80.57	19.43	**19**
#60	0.25	23.18		7.80	88.38	11.62	**12**
#100	0.15	11.60		3.90	92.28	7.72	**8**
#140	0.106	5.37		1.81	94.09	5.91	**6**
#200	0.075	4.85		1.63	95.72	4.28	**4**
Pan	-	12.72		4.28	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	012
Boring No.	SB-04A
Depth (ft)	4.0-6.0'
Sample No.	S-3
Tare Number	1531
Wt. of Tare & WS (gm)	376.26
Wt. of Tare & DS (gm)	370.26
Wt. of Tare (gm)	145.73
Wt. of Water (gm)	6
Wt. of DS (gm)	224.53
Water Content (%)	**2.7**
Wt. of Washed Soil & Tare	364.67
Percent Passing #200	**2.5**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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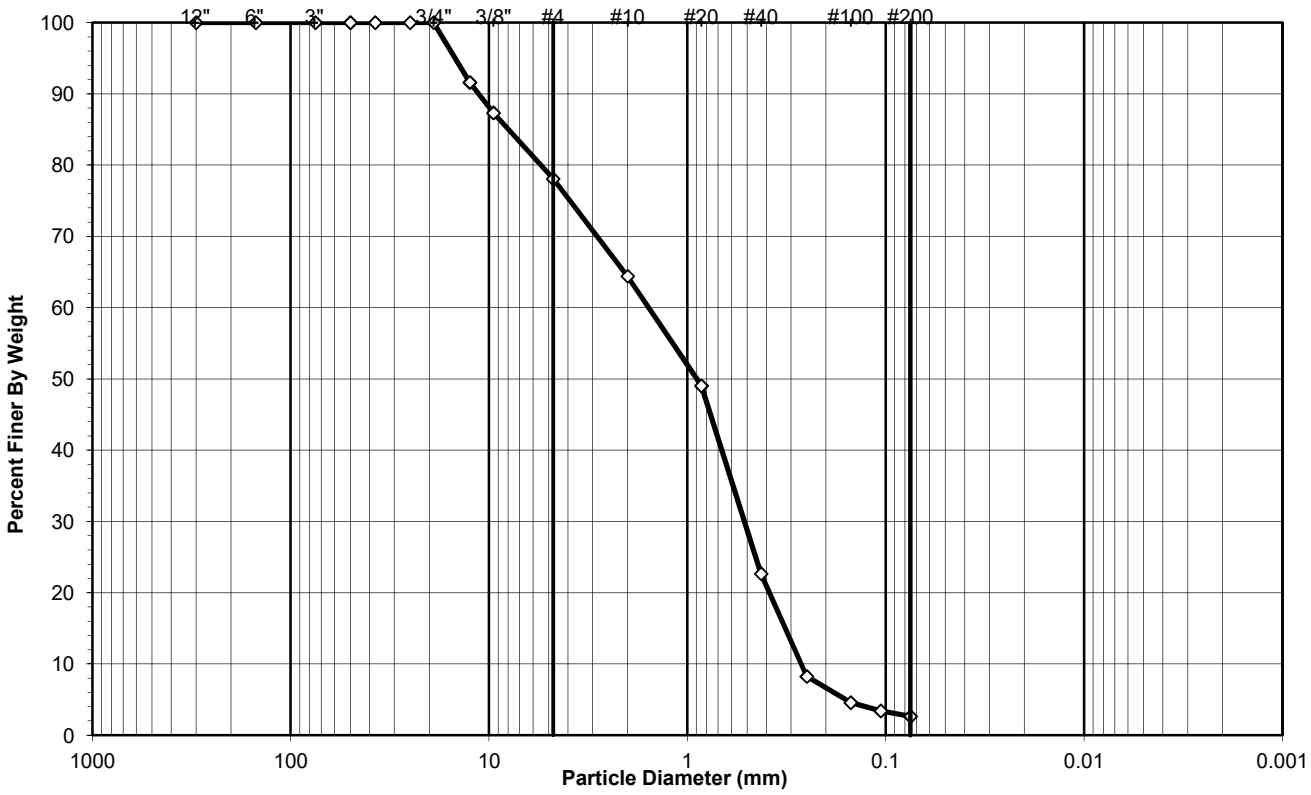
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-04A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-013	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**21.92**
#4 to #200	***Sand***	**75.44**
Finer than #200	***Silt & Clay***	**2.65**

USCS Symbol:
sp, ASSUMED

D60 = 1.56 D50 = 0.90

D30 = 0.52 CU = 5.87

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.267

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-04A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-013	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	2025	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	455.57	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	444.84	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.47	Weight of Tare (g):	NA
Weight of Water (g):	10.73	Weight of Water (g):	NA
Weight of Dry Soil (g):	299.37	Weight of Dry Soil (g):	NA
Moisture Content (%):	**3.6**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	299.37
Tare No. (Sub-Specimen)	2025	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	455.57	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	145.47	Dry Weight of - 3/4" Sample (g):	299.37
Sub-Specimen Wet Weight (g):	310.10	Dry Weight -3/4" +3/8" Sample (g):	37.93
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	261.44
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	25.12	(**)	8.39	8.39	91.61	**92**
3/8"	9.5	12.81		4.28	12.67	87.33	**87**
#4	4.75	27.69		9.25	21.92	78.08	**78**
#10	2	40.93		13.67	35.59	64.41	**64**
#20	0.85	46.03	(**)	15.38	50.97	49.03	**49**
#40	0.425	78.94		26.37	77.34	22.66	**23**
#60	0.25	43.14		14.41	91.75	8.25	**8**
#100	0.15	11.00		3.67	95.42	4.58	**5**
#140	0.106	3.50		1.17	96.59	3.41	**3**
#200	0.075	2.29		0.76	97.35	2.65	**3**
Pan	-	7.92		2.65	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	014
Boring No.	SB-04A
Depth (ft)	23.0-25.0'
Sample No.	S-8
Tare Number	2024
Wt. of Tare & WS (gm)	453.28
Wt. of Tare & DS (gm)	420
Wt. of Tare (gm)	145.28
Wt. of Water (gm)	33.28
Wt. of DS (gm)	274.72
Water Content (%)	**12.1**
Wt. of Washed Soil & Tare	411.98
Percent Passing #200	**2.9**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	015
Boring No.	SB-05
Depth (ft)	0.0-2.0'
Sample No.	S-1
Tare Number	1547
Wt. of Tare & WS (gm)	352.34
Wt. of Tare & DS (gm)	335.4
Wt. of Tare (gm)	145.74
Wt. of Water (gm)	16.94
Wt. of DS (gm)	189.66
Water Content (%)	**8.9**
Wt. of Washed Soil & Tare	304.43
Percent Passing #200	**16.3**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	016
Boring No.	SB-05
Depth (ft)	4.0-6.0'
Sample No.	S-3
Tare Number	1431
Wt. of Tare & WS (gm)	300.18
Wt. of Tare & DS (gm)	294.67
Wt. of Tare (gm)	144.22
Wt. of Water (gm)	5.51
Wt. of DS (gm)	150.45
Water Content (%)	**3.7**
Wt. of Washed Soil & Tare	285.09
Percent Passing #200	**6.4**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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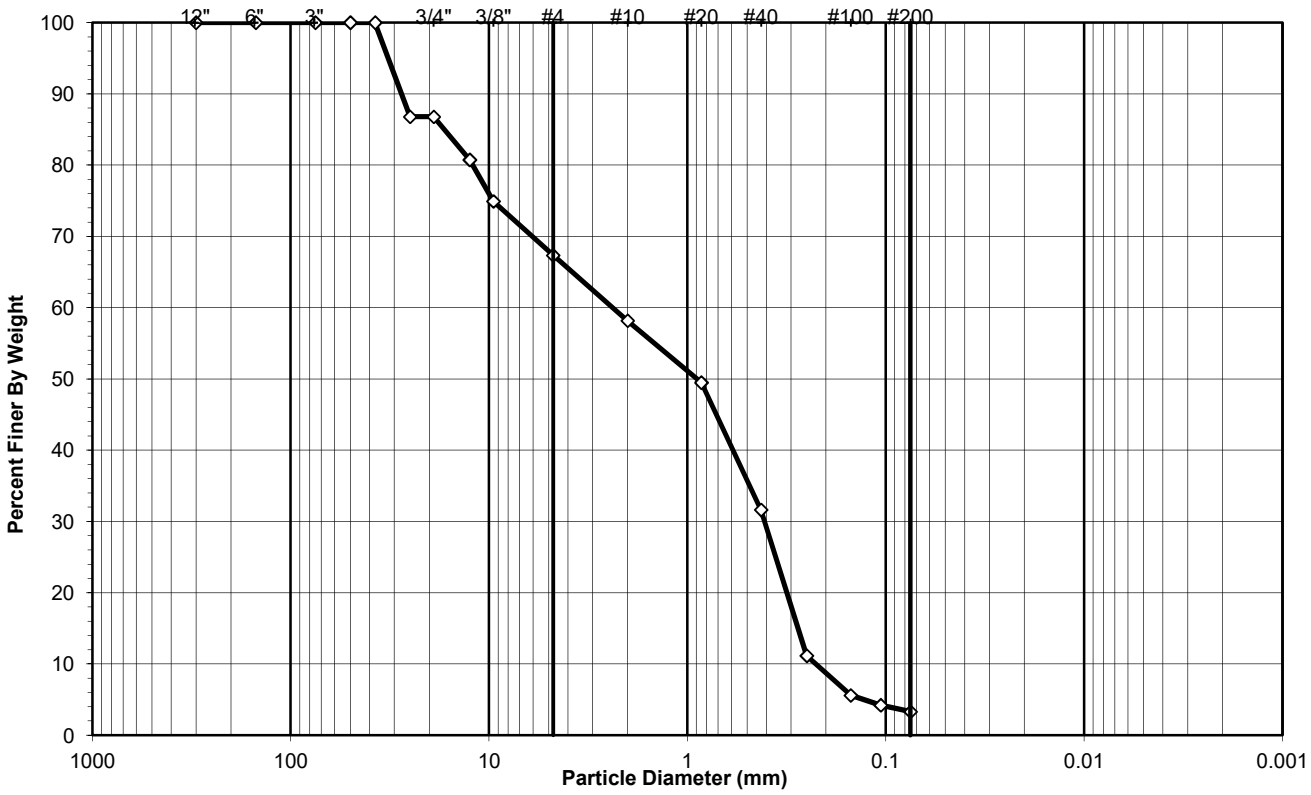
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-05
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-017	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**32.66**
#4 to #200	***Sand***	**64.04**
Finer than #200	***Silt & Clay***	**3.30**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 2.38 D50 = 0.89

D30 = 0.41 CU = 10.56

D10 = 0.225

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-05
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-017	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	2031	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	413.73	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	403.69	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	146.80	Weight of Tare (g):	NA
Weight of Water (g):	10.04	Weight of Water (g):	NA
Weight of Dry Soil (g):	256.89	Weight of Dry Soil (g):	NA
Moisture Content (%):	**3.9**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	256.89
Tare No. (Sub-Specimen)	2031	Wet Weight of +3/4" Sample (g):	35.29
Wt. of Tare & Wet Sub-Specimen (g):	413.73	Dry Weight of + 3/4" Sample (g):	33.96
Weight of Tare (g):	146.80	Dry Weight of - 3/4" Sample (g):	222.93
Sub-Specimen Wet Weight (g):	266.93	Dry Weight -3/4" +3/8" Sample (g):	30.47
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	192.46
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	33.96		13.22	13.22	86.78	**87**
3/4"	19	0.00		0.00	13.22	86.78	**87**
1/2"	12.5	15.52	(**)	6.04	19.26	80.74	**81**
3/8"	9.5	14.95		5.82	25.08	74.92	**75**
#4	4.75	19.47		7.58	32.66	67.34	**67**
#10	2	23.55		9.17	41.83	58.17	**58**
#20	0.85	22.32	(**)	8.69	50.52	49.48	**49**
#40	0.425	45.89		17.86	68.38	31.62	**32**
#60	0.25	52.59		20.47	88.85	11.15	**11**
#100	0.15	14.28		5.56	94.41	5.59	**6**
#140	0.106	3.54		1.38	95.79	4.21	**4**
#200	0.075	2.34		0.91	96.70	3.30	**3**
Pan	-	8.48		3.30	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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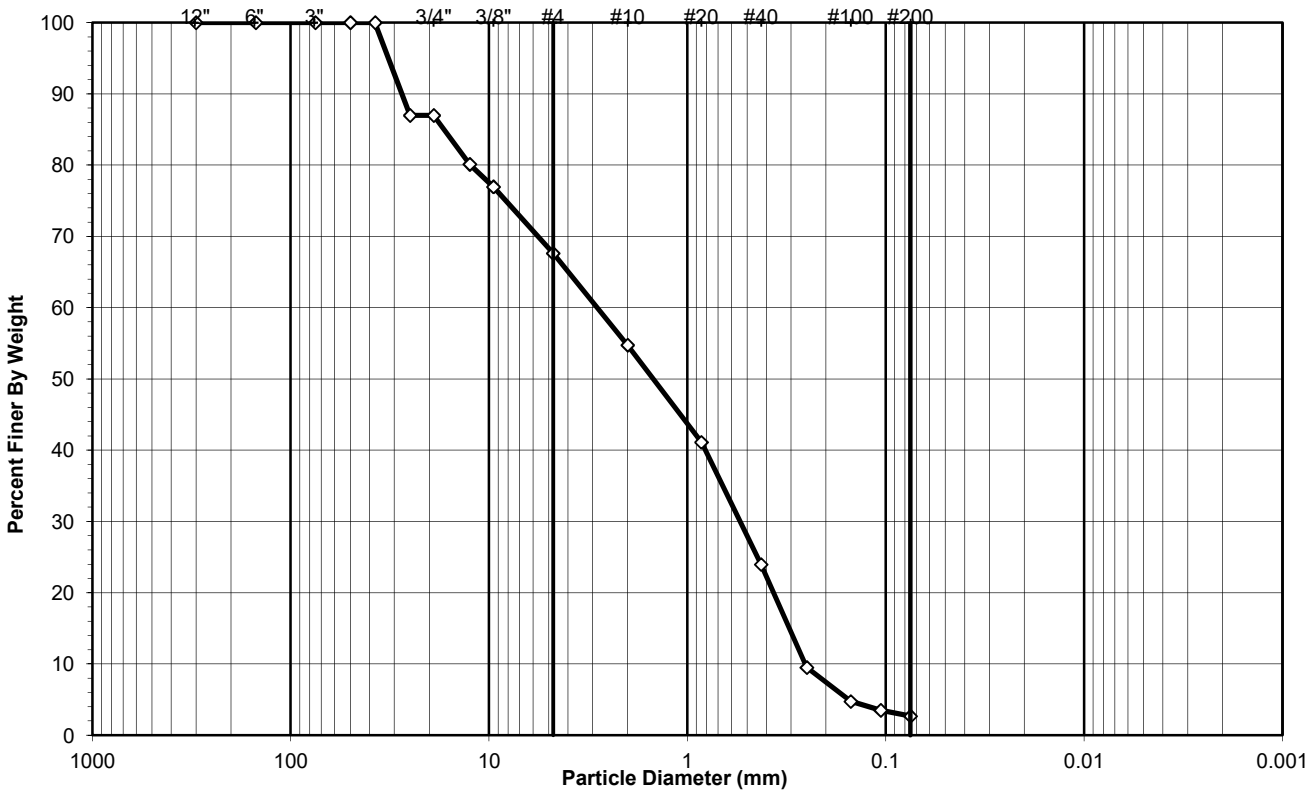
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-05
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	23.0-25.0'
Project No.:	2023-494-005	Sample No.:	S-8
Lab ID:	2023-494-005-018	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**32.38**
#4 to #200	***Sand***	**64.94**
Finer than #200	***Silt & Clay***	**2.69**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 2.85 D50 = 1.48

D30 = 0.54 CU = 11.18

D10 = 0.255

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

Client:	Tetra Tech, Inc.	Boring No.:	SB-05
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	23.0-25.0'
Project No.:	2023-494-005	Sample No.:	S-8
Lab ID:	2023-494-005-018	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1466	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	394.60	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	369.53	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	141.30	Weight of Tare (g):	NA
Weight of Water (g):	25.07	Weight of Water (g):	NA
Weight of Dry Soil (g):	228.23	Weight of Dry Soil (g):	NA
Moisture Content (%):	**11.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	228.23
Tare No. (Sub-Specimen)	1466	Wet Weight of +3/4" Sample (g):	32.98
Wt. of Tare & Wet Sub-Specimen (g):	394.60	Dry Weight of + 3/4" Sample (g):	29.72
Weight of Tare (g):	141.30	Dry Weight of - 3/4" Sample (g):	198.51
Sub-Specimen Wet Weight (g):	253.30	Dry Weight -3/4" +3/8" Sample (g):	22.87
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	175.64
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	29.72		13.02	13.02	86.98	**87**
3/4"	19	0.00		0.00	13.02	86.98	**87**
1/2"	12.5	15.65	(**)	6.86	19.88	80.12	**80**
3/8"	9.5	7.22		3.16	23.04	76.96	**77**
#4	4.75	21.30		9.33	32.38	67.62	**68**
#10	2	29.40		12.88	45.26	54.74	**55**
#20	0.85	31.11	(**)	13.63	58.89	41.11	**41**
#40	0.425	39.15		17.15	76.04	23.96	**24**
#60	0.25	32.99		14.45	90.50	9.50	**10**
#100	0.15	10.88		4.77	95.26	4.74	**5**
#140	0.106	2.82		1.24	96.50	3.50	**4**
#200	0.075	1.86		0.81	97.31	2.69	**3**
Pan	-	6.13		2.69	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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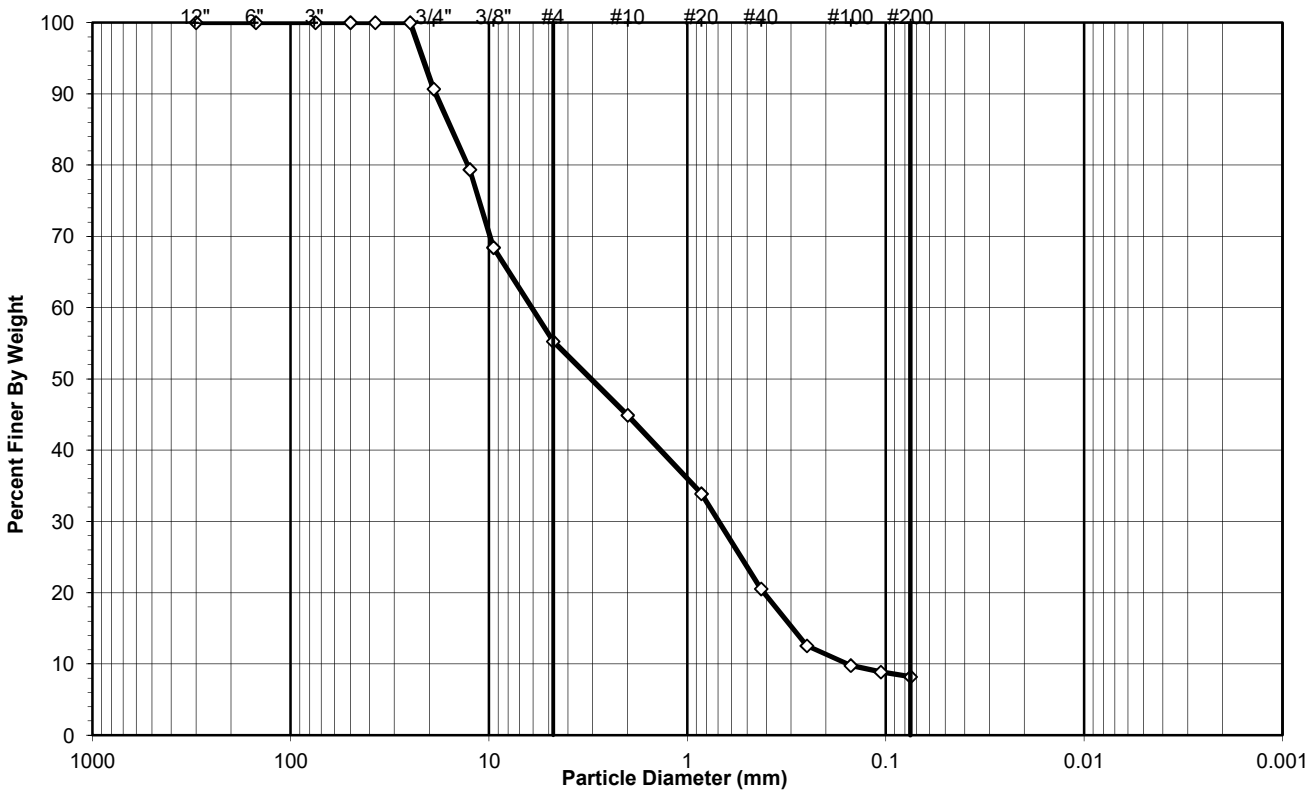
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-06A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	2.0-4.0'
Project No.:	2023-494-005	Sample No.:	S-2
Lab ID:	2023-494-005-019	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**44.73**
#4 to #200	***Sand***	**47.06**
Finer than #200	***Silt & Clay***	**8.21**

USCS Symbol:
sp-sm, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH SILT AND GRAVEL

D60 = 6.09 D50 = 3.06

D30 = 0.69 CU = 39.00

D10 = 0.156

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-06A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	2.0-4.0'
Project No.:	2023-494-005	Sample No.:	S-2
Lab ID:	2023-494-005-019	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1427	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	399.04	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	389.25	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.35	Weight of Tare (g):	NA
Weight of Water (g):	9.79	Weight of Water (g):	NA
Weight of Dry Soil (g):	243.90	Weight of Dry Soil (g):	NA
Moisture Content (%):	**4.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	243.90
Tare No. (Sub-Specimen)	1427	Wet Weight of +3/4" Sample (g):	23.65
Wt. of Tare & Wet Sub-Specimen (g):	399.04	Dry Weight of + 3/4" Sample (g):	22.74
Weight of Tare (g):	145.35	Dry Weight of - 3/4" Sample (g):	221.16
Sub-Specimen Wet Weight (g):	253.69	Dry Weight -3/4" +3/8" Sample (g):	54.25
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	166.91
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	22.74		9.32	9.32	90.68	**91**
1/2"	12.5	27.55	(**)	11.30	20.62	79.38	**79**
3/8"	9.5	26.70		10.95	31.57	68.43	**68**
#4	4.75	32.11		13.17	44.73	55.27	**55**
#10	2	25.28		10.36	55.10	44.90	**45**
#20	0.85	26.86	(**)	11.01	66.11	33.89	**34**
#40	0.425	32.58		13.36	79.47	20.53	**21**
#60	0.25	19.46		7.98	87.45	12.55	**13**
#100	0.15	6.77		2.78	90.22	9.78	**10**
#140	0.106	2.22		0.91	91.13	8.87	**9**
#200	0.075	1.61		0.66	91.79	8.21	**8**
Pan	-	20.02		8.21	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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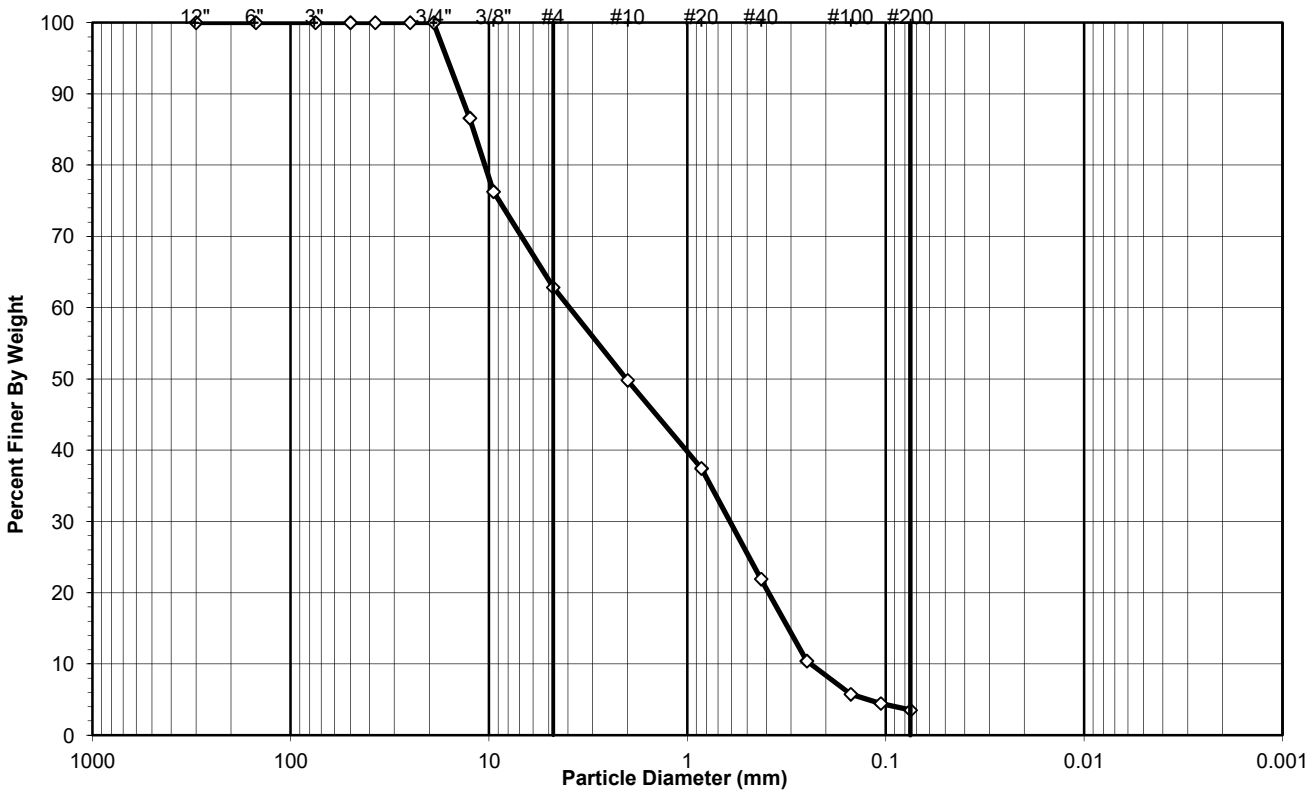
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-06A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-020	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**37.15**
#4 to #200	***Sand***	**59.32**
Finer than #200	***Silt & Clay***	**3.53**

USCS Symbol:
sp, ASSUMED

D60 = 3.93 D50 = 2.03

D30 = 0.61 CU = 16.46

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.239

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-06A
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-020	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1456	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	348.04	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	343.70	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	130.16	Weight of Tare (g):	NA
Weight of Water (g):	4.34	Weight of Water (g):	NA
Weight of Dry Soil (g):	213.54	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.0**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	213.54
Tare No. (Sub-Specimen)	1456	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	348.04	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	130.16	Dry Weight of - 3/4" Sample (g):	213.54
Sub-Specimen Wet Weight (g):	217.88	Dry Weight -3/4" +3/8" Sample (g):	50.66
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	162.88
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	28.60	(**)	13.39	13.39	86.61	**87**
3/8"	9.5	22.06		10.33	23.72	76.28	**76**
#4	4.75	28.68		13.43	37.15	62.85	**63**
#10	2	27.84		13.04	50.19	49.81	**50**
#20	0.85	26.39	(**)	12.36	62.55	37.45	**37**
#40	0.425	33.16		15.53	78.08	21.92	**22**
#60	0.25	24.58		11.51	89.59	10.41	**10**
#100	0.15	9.94		4.65	94.24	5.76	**6**
#140	0.106	2.76		1.29	95.54	4.46	**4**
#200	0.075	2.00		0.94	96.47	3.53	**4**
Pan	-	7.53		3.53	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	021
Boring No.	SB-06A
Depth (ft)	13.0-15.0'
Sample No.	S-6
Tare Number	1528
Wt. of Tare & WS (gm)	174.21
Wt. of Tare & DS (gm)	173.25
Wt. of Tare (gm)	145.49
Wt. of Water (gm)	0.96
Wt. of DS (gm)	27.76
Water Content (%)	**3.5**
Wt. of Washed Soil & Tare	171.96
Percent Passing #200	**4.6**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	022
Boring No.	SB-07
Depth (ft)	0.0-2.0'
Sample No.	S-1
Tare Number	1613
Wt. of Tare & WS (gm)	282.32
Wt. of Tare & DS (gm)	270.87
Wt. of Tare (gm)	148.42
Wt. of Water (gm)	11.45
Wt. of DS (gm)	122.45
Water Content (%)	**9.4**
Wt. of Washed Soil & Tare	244.2
Percent Passing #200	**21.8**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-07
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-023	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay

Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**30.26**
#4 to #200	***Sand***	**67.05**
Finer than #200	***Silt & Clay***	**2.69**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D60 = 2.89 D50 = 1.70

D30 = 0.59 CU = 11.37

D10 = 0.254

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-07
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	6.0-8.0'
Project No.:	2023-494-005	Sample No.:	S-4
Lab ID:	2023-494-005-023	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1533	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	429.41	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	423.44	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	142.70	Weight of Tare (g):	NA
Weight of Water (g):	5.97	Weight of Water (g):	NA
Weight of Dry Soil (g):	280.74	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.1**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	280.74
Tare No. (Sub-Specimen)	1533	Wet Weight of +3/4" Sample (g):	13.68
Wt. of Tare & Wet Sub-Specimen (g):	429.41	Dry Weight of + 3/4" Sample (g):	13.40
Weight of Tare (g):	142.70	Dry Weight of - 3/4" Sample (g):	267.34
Sub-Specimen Wet Weight (g):	286.71	Dry Weight -3/4" +3/8" Sample (g):	32.33
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	235.01
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	13.40		4.77	4.77	95.23	**95**
1/2"	12.5	24.55	(**)	8.74	13.52	86.48	**86**
3/8"	9.5	7.78		2.77	16.29	83.71	**84**
#4	4.75	39.23		13.97	30.26	69.74	**70**
#10	2	47.55		16.94	47.20	52.80	**53**
#20	0.85	41.84	(**)	14.90	62.10	37.90	**38**
#40	0.425	41.60		14.82	76.92	23.08	**23**
#60	0.25	37.87		13.49	90.41	9.59	**10**
#100	0.15	13.63		4.86	95.27	4.73	**5**
#140	0.106	3.40		1.21	96.48	3.52	**4**
#200	0.075	2.35		0.84	97.31	2.69	**3**
Pan	-	7.54		2.69	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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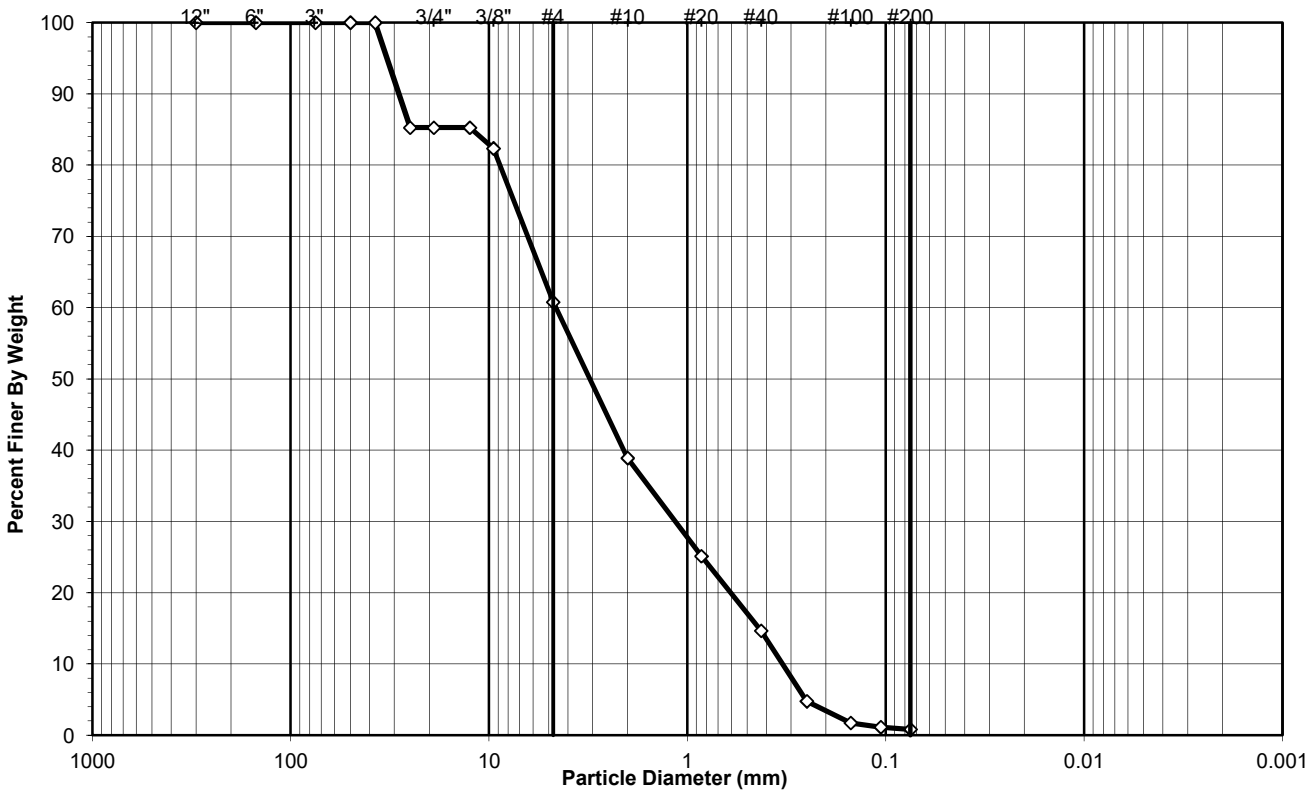
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-07
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-024	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**39.21**
#4 to #200	***Sand***	**59.97**
Finer than #200	***Silt & Clay***	**0.81**

USCS Symbol:
sp, ASSUMED

D60 = 4.60 D50 = 3.10

D30 = 1.15 CU = 13.91

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.331

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-07
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	18.0-20.0'
Project No.:	2023-494-005	Sample No.:	S-7
Lab ID:	2023-494-005-024	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1495	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	333.02	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	317.19	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	146.45	Weight of Tare (g):	NA
Weight of Water (g):	15.83	Weight of Water (g):	NA
Weight of Dry Soil (g):	170.74	Weight of Dry Soil (g):	NA
Moisture Content (%):	**9.3**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	170.74
Tare No. (Sub-Specimen)	1495	Wet Weight of +3/4" Sample (g):	27.51
Wt. of Tare & Wet Sub-Specimen (g):	333.02	Dry Weight of + 3/4" Sample (g):	25.18
Weight of Tare (g):	146.45	Dry Weight of - 3/4" Sample (g):	145.56
Sub-Specimen Wet Weight (g):	186.57	Dry Weight -3/4" +3/8" Sample (g):	4.97
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	140.59
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	25.18		14.75	14.75	85.25	**85**
3/4"	19	0.00		0.00	14.75	85.25	**85**
1/2"	12.5	0.00	(**)	0.00	14.75	85.25	**85**
3/8"	9.5	4.97		2.91	17.66	82.34	**82**
#4	4.75	36.80		21.55	39.21	60.79	**61**
#10	2	37.39		21.90	61.11	38.89	**39**
#20	0.85	23.50	(**)	13.76	74.87	25.13	**25**
#40	0.425	17.86		10.46	85.33	14.67	**15**
#60	0.25	16.90		9.90	95.23	4.77	**5**
#100	0.15	5.20		3.05	98.28	1.72	**2**
#140	0.106	1.00		0.59	98.86	1.14	**1**
#200	0.075	0.55		0.32	99.19	0.81	**1**
Pan	-	1.39		0.81	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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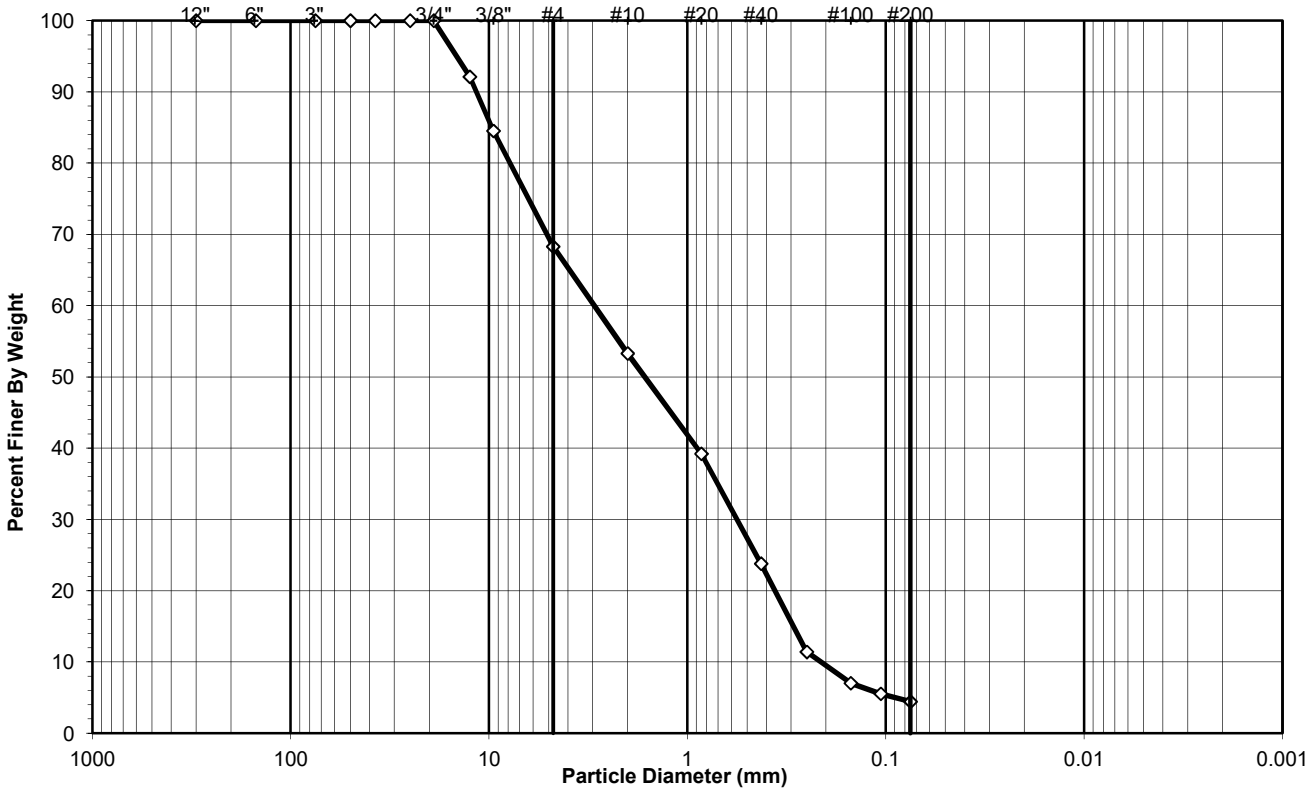
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-08
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-025	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**31.71**
#4 to #200	***Sand***	**63.85**
Finer than #200	***Silt & Clay***	**4.44**

USCS Symbol:
sp, ASSUMED

D60 = 2.94 D50 = 1.64

D30 = 0.56 CU = 13.88

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.212

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

 DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-08
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-025	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1465	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	497.10	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	487.20	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	145.61	Weight of Tare (g):	NA
Weight of Water (g):	9.90	Weight of Water (g):	NA
Weight of Dry Soil (g):	341.59	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.9**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	341.59
Tare No. (Sub-Specimen)	1465	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	497.10	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	145.61	Dry Weight of - 3/4" Sample (g):	341.59
Sub-Specimen Wet Weight (g):	351.49	Dry Weight -3/4" +3/8" Sample (g):	52.85
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	288.74
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	26.90	(**)	7.87	7.87	92.13	**92**
3/8"	9.5	25.95		7.60	15.47	84.53	**85**
#4	4.75	55.46		16.24	31.71	68.29	**68**
#10	2	51.22		14.99	46.70	53.30	**53**
#20	0.85	48.08	(**)	14.08	60.78	39.22	**39**
#40	0.425	52.68		15.42	76.20	23.80	**24**
#60	0.25	42.32		12.39	88.59	11.41	**11**
#100	0.15	15.00		4.39	92.98	7.02	**7**
#140	0.106	5.05		1.48	94.46	5.54	**6**
#200	0.075	3.76		1.10	95.56	4.44	**4**
Pan	-	15.17		4.44	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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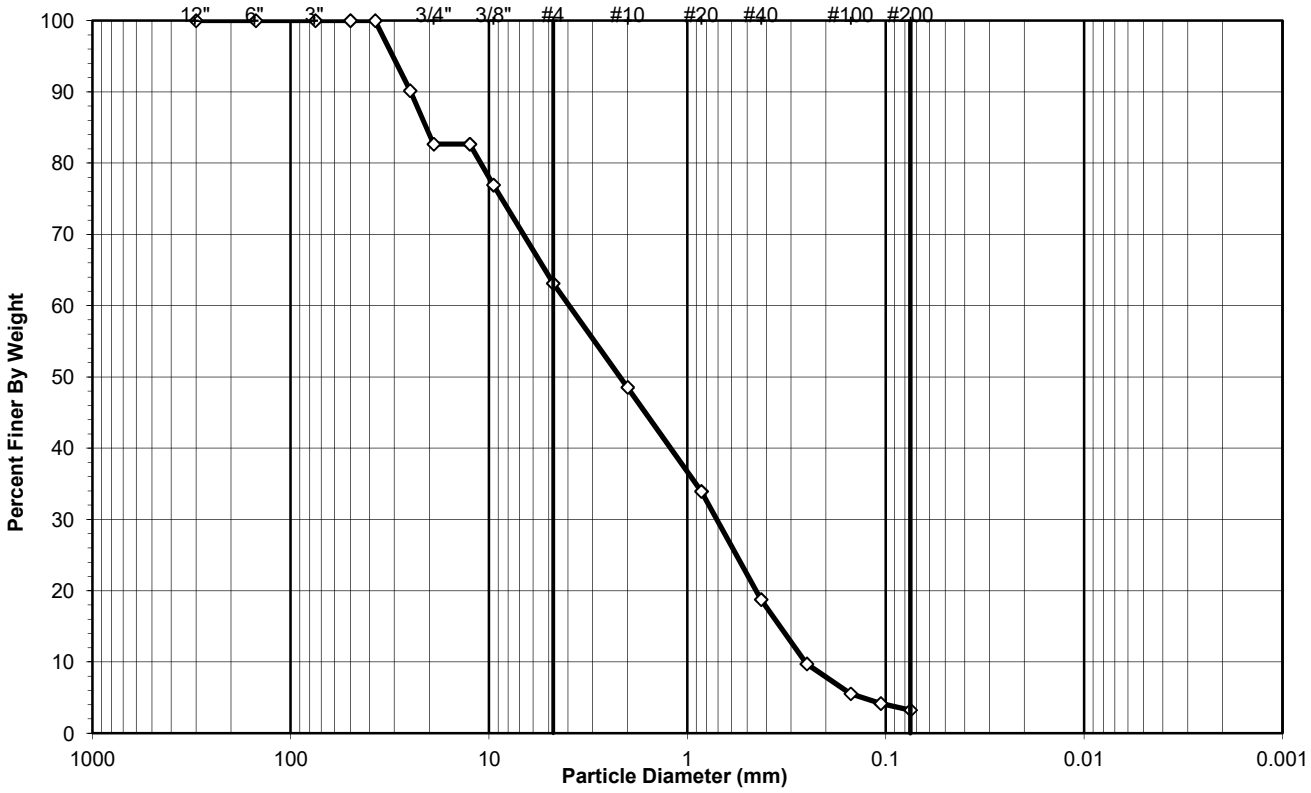
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-08
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	13.0-15.0'
Project No.:	2023-494-005	Sample No.:	S-6
Lab ID:	2023-494-005-026	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**36.87**
#4 to #200	***Sand***	**59.88**
Finer than #200	***Silt & Clay***	**3.25**

USCS Symbol:
sp, ASSUMED

D60 = 3.95 D50 = 2.18

D30 = 0.71 CU = 15.54

USCS Classification:
POORLY GRADED SAND WITH GRAVEL

D10 = 0.254

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-08
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	13.0-15.0'
Project No.:	2023-494-005	Sample No.:	S-6
Lab ID:	2023-494-005-026	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1543	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	468.53	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	460.60	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	143.02	Weight of Tare (g):	NA
Weight of Water (g):	7.93	Weight of Water (g):	NA
Weight of Dry Soil (g):	317.58	Weight of Dry Soil (g):	NA
Moisture Content (%):	**2.5**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	317.58
Tare No. (Sub-Specimen)	1543	Wet Weight of +3/4" Sample (g):	56.42
Wt. of Tare & Wet Sub-Specimen (g):	468.53	Dry Weight of + 3/4" Sample (g):	55.05
Weight of Tare (g):	143.02	Dry Weight of - 3/4" Sample (g):	262.53
Sub-Specimen Wet Weight (g):	325.51	Dry Weight -3/4" +3/8" Sample (g):	18.21
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	244.32
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	31.22		9.83	9.83	90.17	**90**
3/4"	19	23.83		7.50	17.33	82.67	**83**
1/2"	12.5	0.00	(**)	0.00	17.33	82.67	**83**
3/8"	9.5	18.21		5.73	23.07	76.93	**77**
#4	4.75	43.83		13.80	36.87	63.13	**63**
#10	2	46.34		14.59	51.46	48.54	**49**
#20	0.85	46.36	(**)	14.60	66.06	33.94	**34**
#40	0.425	48.20		15.18	81.24	18.76	**19**
#60	0.25	28.68		9.03	90.27	9.73	**10**
#100	0.15	13.31		4.19	94.46	5.54	**6**
#140	0.106	4.34		1.37	95.82	4.18	**4**
#200	0.075	2.94		0.93	96.75	3.25	**3**
Pan	-	10.32		3.25	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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PERCENT PASSING # 200 SIEVE

ASTM D 1140-17

Client	Tetra Tech, Inc.
Client Reference	Bethpage 112G08005-WE13
Project No.	2023-494-005

Lab Id.	027
Boring No.	SB-08
Depth (ft)	28.0-30.0'
Sample No.	S-9
Tare Number	2030
Wt. of Tare & WS (gm)	230.27
Wt. of Tare & DS (gm)	219.5
Wt. of Tare (gm)	145.89
Wt. of Water (gm)	10.77
Wt. of DS (gm)	73.61
Water Content (%)	**14.6**
Wt. of Washed Soil & Tare	218.23
Percent Passing #200	**1.7**

Tested By *TO* *Date* *12/14/23* *Checked By* *BRB* *Date* 12/15/23

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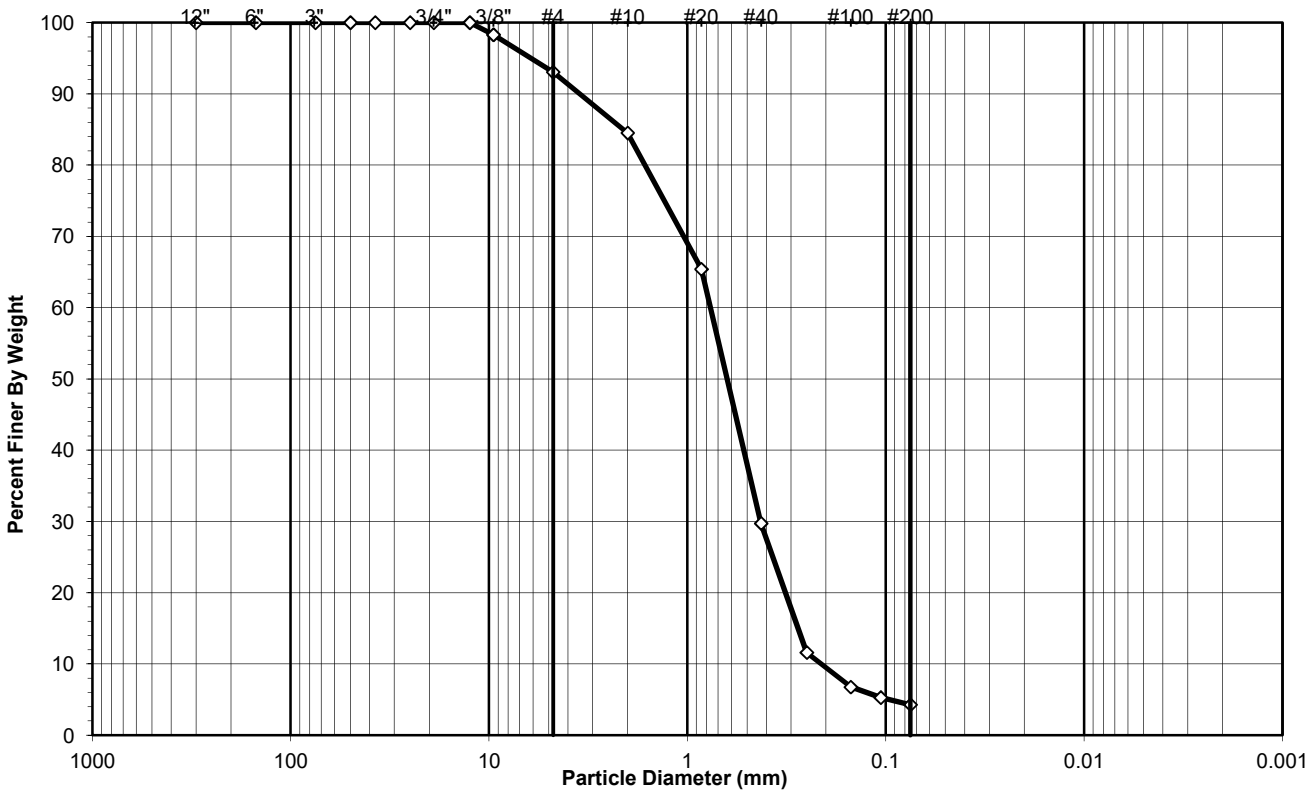
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-09
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-028	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**6.94**
#4 to #200	***Sand***	**88.77**
Finer than #200	***Silt & Clay***	**4.29**

USCS Symbol:
sp, ASSUMED

USCS Classification:
POORLY GRADED SAND

D60 = 0.77 D50 = 0.63

D30 = 0.43 CU = 3.63

D10 = 0.211

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-09
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	4.0-6.0'
Project No.:	2023-494-005	Sample No.:	S-3
Lab ID:	2023-494-005-028	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	1448	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	380.94	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	376.37	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	136.75	Weight of Tare (g):	NA
Weight of Water (g):	4.57	Weight of Water (g):	NA
Weight of Dry Soil (g):	239.62	Weight of Dry Soil (g):	NA
Moisture Content (%):	**1.9**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	239.62
Tare No. (Sub-Specimen)	1448	Wet Weight of +3/4" Sample (g):	0.00
Wt. of Tare & Wet Sub-Specimen (g):	380.94	Dry Weight of + 3/4" Sample (g):	0.00
Weight of Tare (g):	136.75	Dry Weight of - 3/4" Sample (g):	239.62
Sub-Specimen Wet Weight (g):	244.19	Dry Weight -3/4" +3/8" Sample (g):	4.08
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	235.54
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	0.00		0.00	0.00	100.00	**100**
3/4"	19	0.00		0.00	0.00	100.00	**100**
1/2"	12.5	0.00	(**)	0.00	0.00	100.00	**100**
3/8"	9.5	4.08		1.70	1.70	98.30	**98**
#4	4.75	12.56		5.24	6.94	93.06	**93**
#10	2	20.46		8.54	15.48	84.52	**85**
#20	0.85	45.80	(**)	19.11	34.60	65.40	**65**
#40	0.425	85.48		35.67	70.27	29.73	**30**
#60	0.25	43.43		18.12	88.39	11.61	**12**
#100	0.15	11.61		4.85	93.24	6.76	**7**
#140	0.106	3.53		1.47	94.71	5.29	**5**
#200	0.075	2.40		1.00	95.71	4.29	**4**
Pan	-	10.27		4.29	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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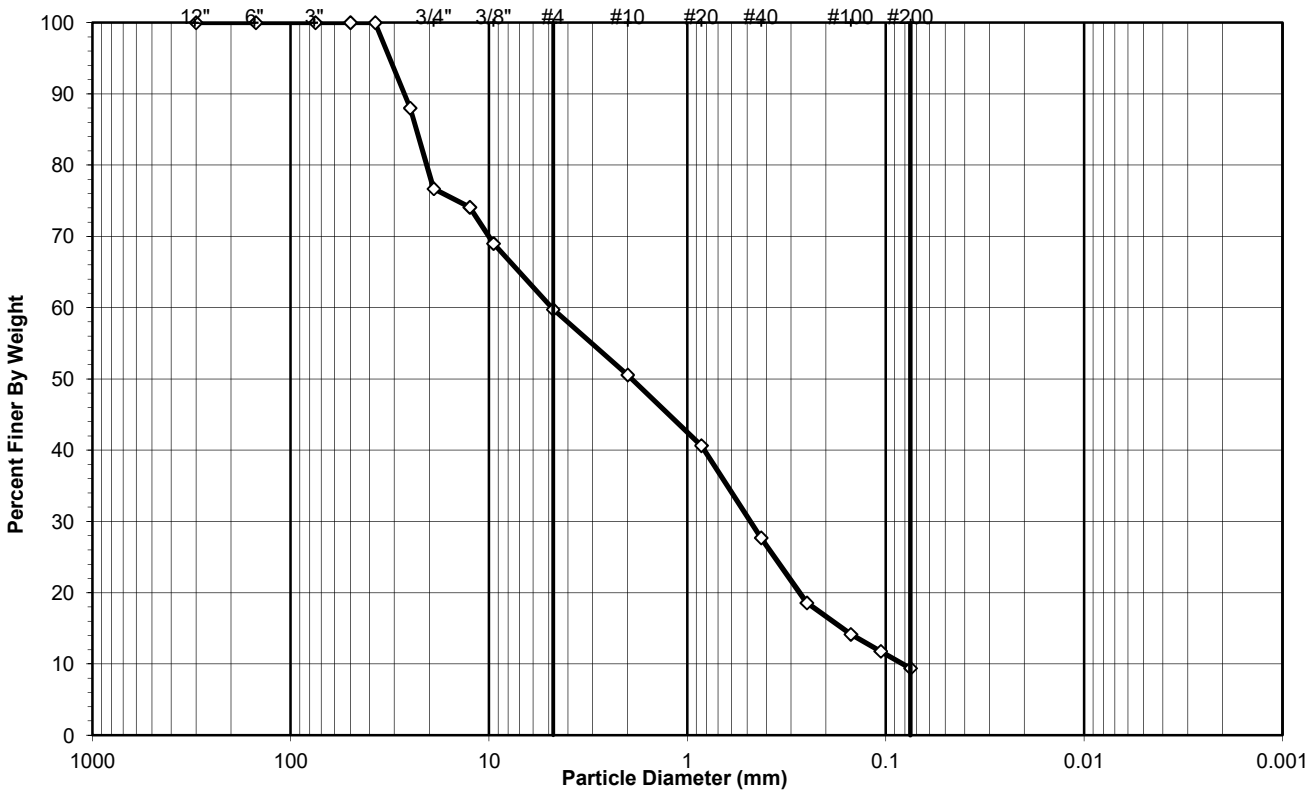
SIEVE AND HYDROMETER ANALYSIS

ASTM D6913 / D7928

Client:	Tetra Tech, Inc.	Boring No.:	SB-09
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-029	Soil Color:	Brown

USCS	SIEVE ANALYSIS		HYDROMETER
	gravel	sand	silt and clay



Sieve Size		Percentage (%)
Greater than #4	***Gravel***	**40.25**
#4 to #200	***Sand***	**50.35**
Finer than #200	***Silt & Clay***	**9.41**

USCS Symbol:
sp-sm, ASSUMED

USCS Classification:
POORLY GRADED SAND WITH SILT AND GRAVEL

D60 = 4.84 D50 = 1.90

D30 = 0.48 CU = 59.16

D10 = 0.082

Tested By DF Date 12/15/23 Checked By JLK Date 12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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WASH SIEVE ANALYSIS

ASTM D6913-17

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Client:	Tetra Tech, Inc.	Boring No.:	SB-09
Client Reference:	Bethpage 112G08005-WE13	Depth (ft):	8.0-10.0'
Project No.:	2023-494-005	Sample No.:	S-5
Lab ID:	2023-494-005-029	Soil Color:	Brown

Moisture Content of Passing 3/4" Material		Moisture Content of Retained 3/4" Material	
Tare No.:	2019	Tare No.:	NA
Wt. of Tare & Wet Sample (g):	408.99	Weight of Tare & Wet Sample (g):	NA
Wt. of Tare & Dry Sample (g):	405.53	Weight of Tare & Dry Sample (g):	NA
Weight of Tare (g):	149.41	Weight of Tare (g):	NA
Weight of Water (g):	3.46	Weight of Water (g):	NA
Weight of Dry Soil (g):	256.12	Weight of Dry Soil (g):	NA
Moisture Content (%):	**1.4**	**Moisture Content (%):**	**0.0**

Dry Weight of Sample (g):	NA	Total Dry Weight of Sample (g):	256.12
Tare No. (Sub-Specimen)	2019	Wet Weight of +3/4" Sample (g):	60.52
Wt. of Tare & Wet Sub-Specimen (g):	408.99	Dry Weight of + 3/4" Sample (g):	59.71
Weight of Tare (g):	149.41	Dry Weight of - 3/4" Sample (g):	196.41
Sub-Specimen Wet Weight (g):	259.58	Dry Weight -3/4" +3/8" Sample (g):	19.68
Tare No. (-3/8" Sub-Specimen):	NA	Dry Weight of -3/8" Sample (g):	176.73
Wt. of Tare & Wet -3/8" Sub-Specimen (g):	NA	J - Factor (% Finer than 3/4"):	NA
Weight of Tare (g):	NA	J - Factor (% Finer than 3/8"):	NA
Sub-Specimen -3/8" Wet Weight (g):	NA		

Sieve Size	Sieve Opening (mm)	Weight of Soil Retained (g)		Percent Retained (%)	Accumulated Percent Retained (%)	Percent Finer (%)	**Accumulated Percent Finer (%)**
12"	300	0.00		0.00	0.00	100.00	**100**
6"	150	0.00		0.00	0.00	100.00	**100**
3"	75	0.00		0.00	0.00	100.00	**100**
2"	50	0.00	(*)	0.00	0.00	100.00	**100**
1 1/2"	37.5	0.00		0.00	0.00	100.00	**100**
1"	25	30.71		11.99	11.99	88.01	**88**
3/4"	19	29.00		11.32	23.31	76.69	**77**
1/2"	12.5	6.65	(**)	2.60	25.91	74.09	**74**
3/8"	9.5	13.03		5.09	31.00	69.00	**69**
#4	4.75	23.69		9.25	40.25	59.75	**60**
#10	2	23.53		9.19	49.43	50.57	**51**
#20	0.85	25.40	(**)	9.92	59.35	40.65	**41**
#40	0.425	33.15		12.94	72.29	27.71	**28**
#60	0.25	23.39		9.13	81.43	18.57	**19**
#100	0.15	11.31		4.42	85.84	14.16	**14**
#140	0.106	6.09		2.38	88.22	11.78	**12**
#200	0.075	6.08		2.37	90.59	9.41	**9**
Pan	-	24.09		9.41	100.00	-	**-**

Notes : *(*) The + 3/4" sieve analysis is based on the Total Dry Weight of the Sample*
*(**) The - 3/4" and - 3/8" sieve analysis is based on the Weight of the Dry Specimen*

Tested By	DF	Date	12/15/23	Checked By	JLK	Date	12/15/23

DCN: CT-S73T, DATE 2/25/22, REV. 1

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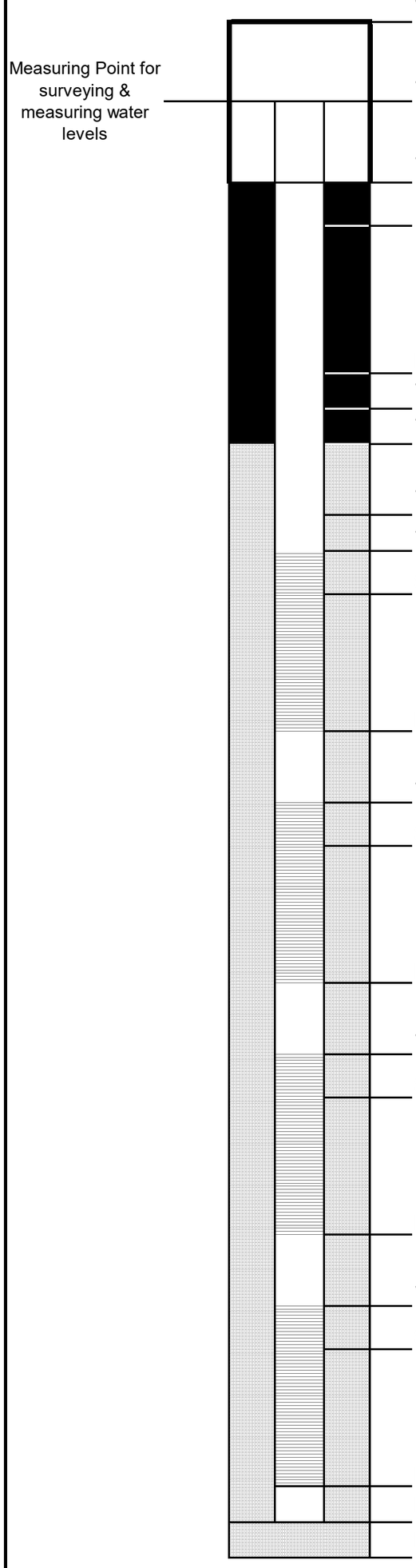
TETRA TECH	*Client:* NAVFAC *Project Number: 112G08005-WE13*	***WELL ID: RW8***
	Site Location: NWIRP BETHPAGE, NY	
	Well Location: Twin Lane N., Seaford, NY	*Date Installed: 4/26/2022*
	Method: Reverse Rotary	*Inspector: Vince Shickora*
	Coordinates: Northing: 194913.7 Easting: 1124679.5	*Contractor: Delta Drilling Co.*

MONITORING WELL CONSTRUCTION DETAIL



		Depth from G.S. (feet)	Elevation (feet)
Top of Flush Mount Well Cap		0	45.43
Top of Riser Pipe		0.9	44.58
Top of Grout Seal		12	33.43
Riser Pipe:			
Length	595		
Inside Diameter (ID)	12.75"		
Type of Material	Black Steel ASTM A53B		
Bottom of 24 inch diameter Steel Surface Casing		80	-34.57
Top of Bentonie Seal		540	-494.57
Top of Transition Sand Pack		550	-504.57
Top of Sand Pack	#1 Sand	568	-522.57
Top of Screen		595	-549.57
Screen:			
Slot Size	0.03		
Inside Diameter (ID)	12"		
Type of Material	304 Stainless Steel		
Bottom of Screen		644	-598.57
Top of Screen		698	-652.57
Screen:			
Slot Size	0.03		
Inside Diameter (ID)	12"		
Type of Material	304 Stainless Steel		
Bottom of Screen		718	-672.57
Top of Screen		737	-692
Screen:			
Slot Size	0.03		
Inside Diameter (ID)	12"		
Type of Material	304 Stainless Steel		
Bottom of Screen		755	-710
Top of Screen		780	-735
Screen:			
Slot Size	0.03		
Inside Diameter (ID)	12"		
Type of Material	304 Stainless Steel		
Bottom of Screen		790	-745
Bottom of Sump		795	-750
Bottom of Borehole		824	-779

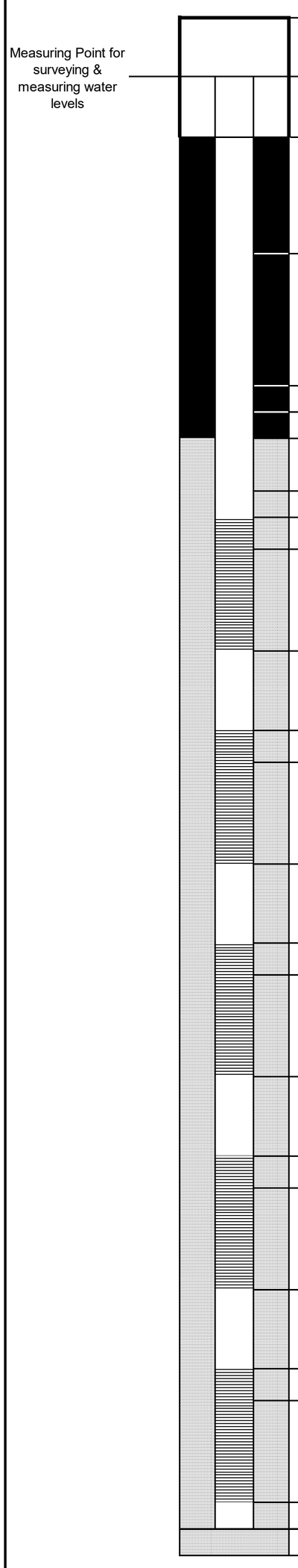
Borehole Diameter: 24" (0-70' bgs), 18" (70-573' bgs), 22" (573-824' bgs)

Vince Shickora — Signature

6/6/2022 — Date

TETRA TECH	*Client:* NAVFAC *Project Number: 112G08005-WE13*	***WELL ID: RW9***
	Site Location: NWIRP BETHPAGE, NY	
	Well Location: Seamans Neck Rd.	*Date Installed: 7/20/2022*
	Method: Reverse Rotary	*Inspector: Beau Benfield*
	Coordinates: Northing: 195193.1 Easting: 1126400.1	*Contractor: Delta Drilling Co.*

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation (feet)
Top of Flush Mount Well Cap	0	53.03
Top of Riser Pipe	1.1	51.98
Top of Grout Seal	8	45
Riser Pipe: Length 650; Inside Diameter (ID) 12"; Type of Material Black Steel ASTM A53B		
Bottom of 20 inch diameter Steel Surface Casing	60	-6.97
Top of Bentonie Seal	594	-540.97
Top of Transition Sand Pack	605	-551.97
Top of Sand Pack #1 Sand	615	-561.97
Top of Screen	650	-596.97
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	670	-616.97
Top of Screen	715	-662
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	725	-672
Top of Screen	740	-687
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	750	-697
Top of Screen	755	-702
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	778	-725
Top of Screen	855	-802
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	865	-812
Bottom of Sump	870	-817
Bottom of Borehole	895	-842

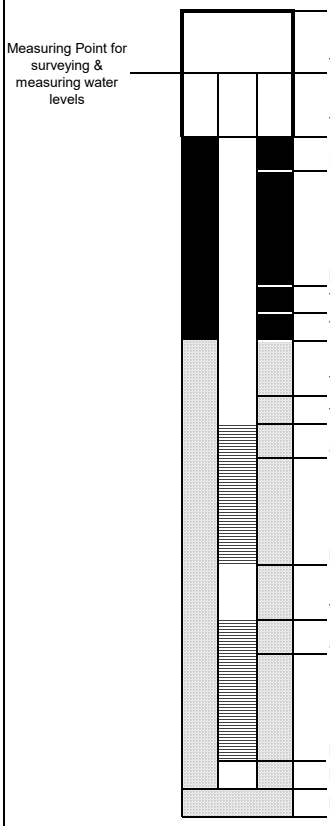
Borehole Diameter: 24" (0-60' bgs), 18" (60-625' bgs), 22" (625-895' bgs)

Signature

7/20/2022
Date

TETRA TECH	*Client:* NAVFAC *Project Number: 112G08005-WE13*	***WELL ID: RW10A***
	Site Location: NWIRP BETHPAGE, NY	
	Well Location: N Pine St. Park, Massapequa, NY	*Date Installed: 12/3/2024*
	Method: Reverse Rotary	*Inspector: Nick Crescenzo*
	Coordinates: Northing: 194977.4 feet Easting: 1128689.1 feet	*Contractor: Delta Drilling Co.*

MONITORING WELL CONSTRUCTION DETAIL



	Depth from G.S. (feet)	Elevation (feet)
Top of Flush Mount Well Cap	0	51.1
Top of Riser Pipe	1	50
Top of Grout Seal	8	43.1
Riser Pipe: Length 217'; Inside Diameter (ID) 12"; Type of Material Black Steel ASTM A53B		
Bottom of 24 inch diameter Steel Surface Casing	60	-8.9
Top of Bentonite Seal	168	-116.9
Top of Transition Sand Pack (#00)	173	-121.9
Top of Sand Pack #1 Sand	184	-132.9
Top of Screen	217	-166
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	239	-188
Top of Screen	262	-211
Screen: Slot Size 0.03; Inside Diameter (ID) 12"; Type of Material 304 Stainless Steel		
Bottom of Screen	310	-259
Bottom of Sump	315	-264
Bottom of Borehole	322	-271

Borehole Diameter: 24" (0-60' bgs), 22" (60-322' bgs)

Nicholas Crescenzo — Signature

12/4/2024 — Date

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

FOIA Exemption 4 (5 USC 552(b)(4))

Trade secrets and commercial or financial information received from a person which is privileged or confidential

Pages *403-423*

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Department of the Navy
Freedom of Information Act Office

http://www.secnav.navy.mil/foia/Pages/default.aspx

CHART 1: Target Compound Trends By Treatment Time

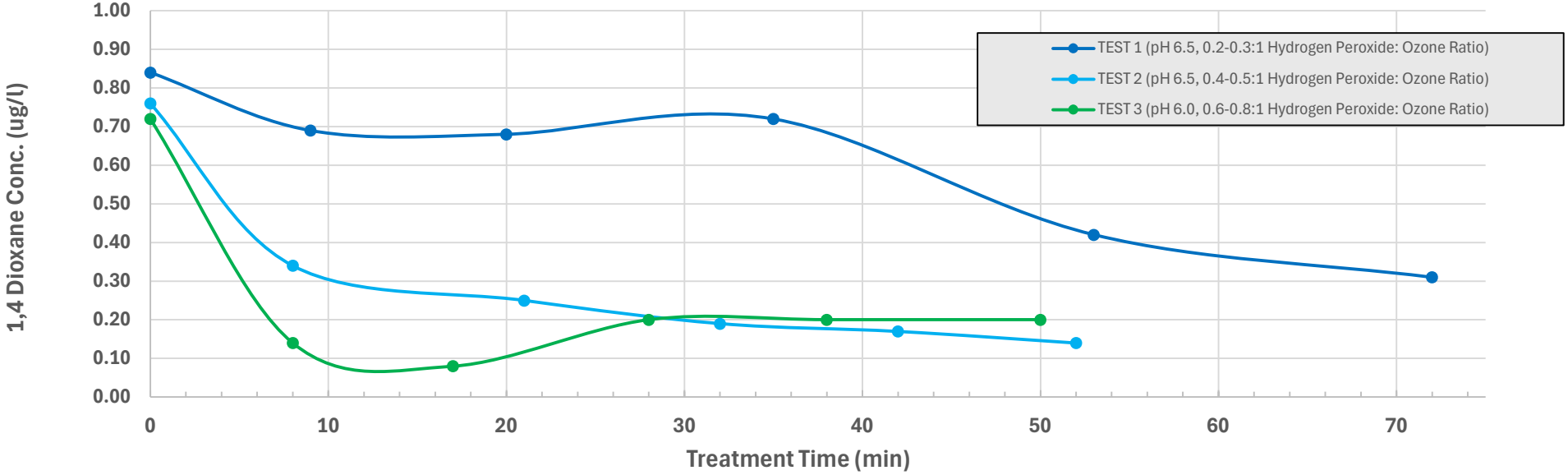
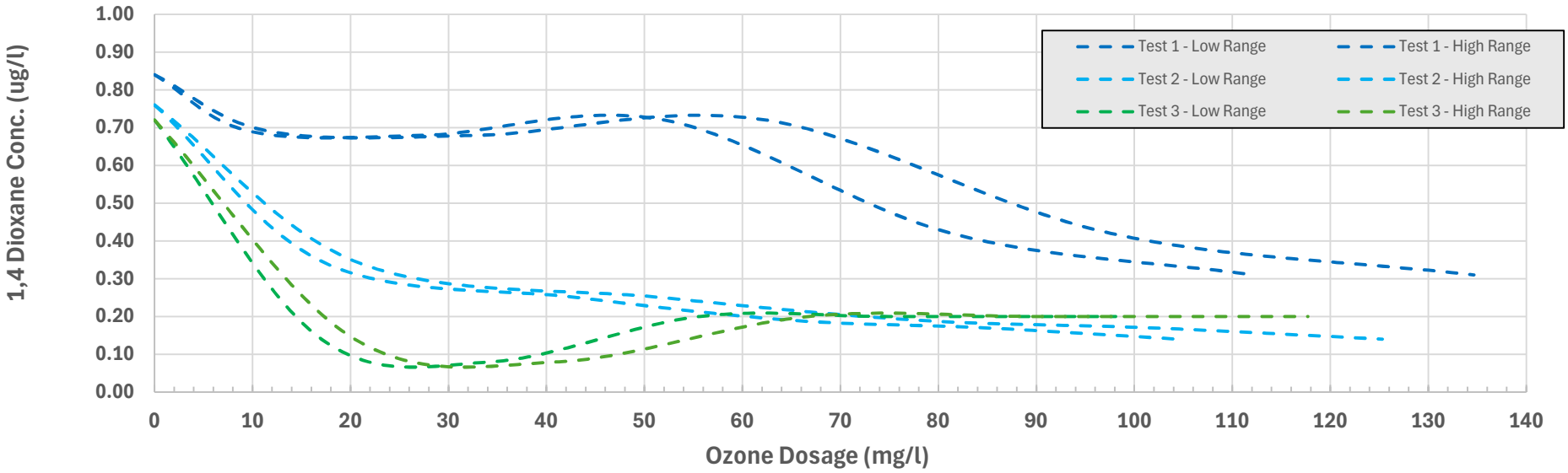


CHART 2: Target Compound Trends by Ozone Dosage



APPENDIX A

Laboratory Analytical Report

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

ANALYTICAL RESULTS SUMMARY

GENERAL CHEMISTRY
SEMI-VOLATILE ORGANICS

PROJECT NAME : CTO WE13

TETRA TECH NUS, INC.

661 Andersen Drive

Suite 200

Pittsburgh, PA - 15220-2745

Phone No: 412-921-7090

ORDER ID : P2315

ATTENTION : Ernie Wu

Laboratory Certification ID # 20012

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7.2) ROC 72

7.3) Lab Certificate 73

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Cover Page

Order ID : P2315

Project ID : CTO WE13

Client : Tetra Tech NUS, Inc.

Lab Sample Number	Client Sample Number
P2315-01	TEST-1-T0
P2315-02	TEST-1-T9
P2315-03	TEST-1-T20
P2315-04	TEST-1-T35

I certify that the data package is in compliance with the terms and conditions of the contract,both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the laboratory manager or his designee, as verified by the following signature.

Signature : N. N. Pandya

APPROVED

By Nimisha Pandya QA/QC Supervisor at 12:11 pm, May 14, 2024

NYDOH CERTIFICATION NO - 11376

NJDEP CERTIFICATION NO - 20012

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LAB CHRONICLE

OrderID:	P2315	**OrderDate:**	4/30/2024 9:58:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2315-01	**TEST-1-T0**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2315-02	**TEST-1-T9**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2315-03	**TEST-1-T20**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2315-04	**TEST-1-T35**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	

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Hit Summary Sheet
SW-846

SDG No.: P2315

Client: Tetra Tech NUS, Inc.

Sample ID	Client ID		Parameter	Concentration	C	MDL	LOD	RDL	Units
Client ID : TEST-1-T0									
P2315-01	TEST-1-T0	WATER	1,4-Dioxane	0.840		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.84**				
			Total Concentration:		**0.84**				
Client ID : TEST-1-T9									
P2315-02	TEST-1-T9	WATER	1,4-Dioxane	0.690		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.69**				
			Total Concentration:		**0.69**				
Client ID : TEST-1-T20									
P2315-03	TEST-1-T20	WATER	1,4-Dioxane	0.680		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.68**				
			Total Concentration:		**0.68**				
Client ID : TEST-1-T35									
P2315-04	TEST-1-T35	WATER	1,4-Dioxane	0.720		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.72**				
			Total Concentration:		**0.72**				

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SAMPLE DATA

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T0	SDG No.:	P2315
Lab Sample ID:	P2315-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031462.D	1	05/01/24 08:20	05/10/24 14:25	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.84		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.27		30 - 150		68%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.31		30 - 150		78%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.29		55 - 111		72%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.29		53 - 106		72%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.31		58 - 132		78%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	13300	7.711				
1146-65-2	Naphthalene-d8	44400	10.496				
15067-26-2	Acenaphthene-d10	26300	14.338				
1517-22-2	Phenanthrene-d10	61000	17.091				
1719-03-5	Chrysene-d12	53600	21.274				
1520-96-3	Perylene-d12	57700	23.522				

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T9	SDG No.:	P2315
Lab Sample ID:	P2315-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031463.D	1	05/01/24 08:20	05/10/24 15:01	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.69		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.27		30 - 150		67%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		80%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.28		55 - 111		70%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.28		53 - 106		71%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.37		58 - 132		91%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	16100	7.711				
1146-65-2	Naphthalene-d8	52900	10.496				
15067-26-2	Acenaphthene-d10	31300	14.338				
1517-22-2	Phenanthrene-d10	71500	17.091				
1719-03-5	Chrysene-d12	61300	21.274				
1520-96-3	Perylene-d12	60200	23.516				

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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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
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() = Laboratory InHouse Limit
A = Aldol-Condensation Reaction Products

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T20	SDG No.:	P2315
Lab Sample ID:	P2315-03	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031465.D	1	05/01/24 08:20	05/10/24 16:14	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.68		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.28		30 - 150		69%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.34		30 - 150		84%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.28		55 - 111		71%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.29		53 - 106		72%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.35		58 - 132		86%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12300	7.711				
1146-65-2	Naphthalene-d8	40000	10.496				
15067-26-2	Acenaphthene-d10	23900	14.349				
1517-22-2	Phenanthrene-d10	54700	17.091				
1719-03-5	Chrysene-d12	50100	21.274				
1520-96-3	Perylene-d12	50000	23.513				

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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T35	SDG No.:	P2315
Lab Sample ID:	P2315-04	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031466.D	1	05/01/24 08:20	05/10/24 16:51	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.72		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.27		30 - 150		68%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		81%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.28		55 - 111		71%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.29		53 - 106		72%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.34		58 - 132		85%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	13400	7.711				
1146-65-2	Naphthalene-d8	43200	10.496				
15067-26-2	Acenaphthene-d10	25700	14.349				
1517-22-2	Phenanthrene-d10	58800	17.091				
1719-03-5	Chrysene-d12	51500	21.274				
1520-96-3	Perylene-d12	50800	23.513				

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J = Estimated Value
B = Analyte Found in Associated Method Blank
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SAMPLE DATA

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 18:24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T0	SDG No.:	P2315
Lab Sample ID:	P2315-01	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:02	SM 5220 D-11
TOC	1.30		1	0.19	0.50	1.00	mg/L		05/01/24 12:03	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 18:38
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T9	SDG No.:	P2315
Lab Sample ID:	P2315-02	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:04	SM 5220 D-11
TOC	0.91	J	1	0.19	0.50	1.00	mg/L		05/01/24 13:18	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
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OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 18:50
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T20	SDG No.:	P2315
Lab Sample ID:	P2315-03	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:04	SM 5220 D-11
TOC	0.95	J	1	0.19	0.50	1.00	mg/L		05/01/24 13:41	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
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J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 19:03
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T35	SDG No.:	P2315
Lab Sample ID:	P2315-04	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:05	SM 5220 D-11
TOC	1.30		1	0.19	0.50	1.00	mg/L		05/01/24 15:22	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Fax : 908 789 8922

Hit Summary Sheet
SW-846

SDG No.: P2316

Client: Tetra Tech NUS, Inc.

Sample ID	Client ID		Parameter	Concentration	C	MDL	LOD	RDL	Units
Client ID :	**TEST-3-T0**								
P2316-01	TEST-3-T0	WATER	1,4-Dioxane	0.720		0.07	0.2	0.2	ug/L
			Total Svoc :	**0.72**					
			Total Concentration:	**0.72**					
Client ID :	**TEST-3-T0RE**								
P2316-01RE	TEST-3-T0RE	WATER	1,4-Dioxane	0.730		0.07	0.2	0.2	ug/L
			Total Svoc :	**0.73**					
			Total Concentration:	**0.73**					
Client ID :	**TEST-3-T8**								
P2316-02	TEST-3-T8	WATER	1,4-Dioxane	0.140	J	0.07	0.2	0.2	ug/L
			Total Svoc :	**0.14**					
			Total Concentration:	**0.14**					
Client ID :	**TEST-3-T17**								
P2316-03	TEST-3-T17	WATER	1,4-Dioxane	0.080	J	0.07	0.2	0.2	ug/L
			Total Svoc :	**0.08**					
			Total Concentration:	**0.08**					

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SAMPLE DATA

CHEMTECH
AN ALLIANCE TECHNICAL GROUP COMPANY
284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T0	SDG No.:	P2316
Lab Sample ID:	P2316-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031467.D	1	05/01/24 08:20	05/10/24 17:27	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.72		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.0040	*	30 - 150		1%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.15		30 - 150		36%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.28		55 - 111		69%	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		93%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	11900	7.711				
1146-65-2	Naphthalene-d8	38800	10.496				
15067-26-2	Acenaphthene-d10	23000	14.338				
1517-22-2	Phenanthrene-d10	53800	17.091				
1719-03-5	Chrysene-d12	45900	21.274				
1520-96-3	Perylene-d12	46100	23.513				

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

CHEMTECH
AN ALLIANCE TECHNICAL GROUP COMPANY
284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T0RE	SDG No.:	P2316
Lab Sample ID:	P2316-01RE	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031502.D	1	05/01/24 08:20	05/13/24 15:16	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.73		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.0040	*	30 - 150		1%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.14		30 - 150		36%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		67%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.31		53 - 106		77%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.37		58 - 132		91%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	11700	7.704				
1146-65-2	Naphthalene-d8	36800	10.485				
15067-26-2	Acenaphthene-d10	19100	14.338				
1517-22-2	Phenanthrene-d10	45300	17.078				
1719-03-5	Chrysene-d12	36900	21.265				
1520-96-3	Perylene-d12	32100	23.499				

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T8	SDG No.:	P2316
Lab Sample ID:	P2316-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031468.D	1	05/01/24 08:20	05/10/24 18:04	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.14	J	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		63%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.27		30 - 150		68%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		68%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.27		58 - 132		67%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12800	7.711				
1146-65-2	Naphthalene-d8	40300	10.496				
15067-26-2	Acenaphthene-d10	23800	14.338				
1517-22-2	Phenanthrene-d10	54000	17.091				
1719-03-5	Chrysene-d12	45700	21.274				
1520-96-3	Perylene-d12	45300	23.513				

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LOD = Limit of Detection
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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T17	SDG No.:	P2316
Lab Sample ID:	P2316-03	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031473.D	1	05/01/24 08:20	05/10/24 22:25	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.080	J	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		62%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		76%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		68%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.31		58 - 132		79%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	13600	7.711				
1146-65-2	Naphthalene-d8	42900	10.496				
15067-26-2	Acenaphthene-d10	24600	14.338				
1517-22-2	Phenanthrene-d10	56900	17.091				
1719-03-5	Chrysene-d12	46100	21.274				
1520-96-3	Perylene-d12	40500	23.51				

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LOD = Limit of Detection
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T28	SDG No.:	P2316
Lab Sample ID:	P2316-04	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031474.D	1	05/01/24 08:20	05/10/24 23:01	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.23		30 - 150		57%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.28		30 - 150		69%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.25		55 - 111		63%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.25		53 - 106		63%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.29		58 - 132		74%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	15200	7.711				
1146-65-2	Naphthalene-d8	47600	10.496				
15067-26-2	Acenaphthene-d10	27000	14.338				
1517-22-2	Phenanthrene-d10	61000	17.078				
1719-03-5	Chrysene-d12	48700	21.265				
1520-96-3	Perylene-d12	41400	23.507				

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LOD = Limit of Detection
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B = Analyte Found in Associated Method Blank
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A = Aldol-Condensation Reaction Products

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LAB CHRONICLE

OrderID:	P2316	**OrderDate:**	4/30/2024 9:58:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2316-01	**TEST-3-T0**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2316-01RE	**TEST-3-T0RE**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/13/24	
P2316-02	**TEST-3-T8**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2316-03	**TEST-3-T17**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2316-04	**TEST-3-T28**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	

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SAMPLE DATA

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 00:15
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T0	SDG No.:	P2316
Lab Sample ID:	P2316-01	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:05	SM 5220 D-11
TOC	0.99	J	1	0.19	0.50	1.00	mg/L		05/01/24 15:46	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 00:30
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T8	SDG No.:	P2316
Lab Sample ID:	P2316-02	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:07	SM 5220 D-11
TOC	0.76	J	1	0.19	0.50	1.00	mg/L		05/01/24 17:23	SM 5310 B-14

Comments:

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LOQ = Limit of Quantitation
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LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

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OR = Over Range
N =Spiked sample recovery not within control limits

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 00:39
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T17	SDG No.:	P2316
Lab Sample ID:	P2316-03	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:07	SM 5220 D-11
TOC	0.79	J	1	0.19	0.50	1.00	mg/L		05/01/24 17:46	SM 5310 B-14

Comments:

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LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

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B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
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N =Spiked sample recovery not within control limits

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 00:50
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T28	SDG No.:	P2316
Lab Sample ID:	P2316-04	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:08	SM 5220 D-11
TOC	0.77	J	1	0.19	0.50	1.00	mg/L		05/01/24 18:09	SM 5310 B-14

Comments:

U = Not Detected
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LOD = Limit of Detection
D = Dilution
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H = Sample Analysis Out Of Hold Time

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B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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LAB CHRONICLE

OrderID:	P2316	**OrderDate:**	4/30/2024 9:58:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2316-01	**TEST-3-T0**	**Water**			**04/26/24 00:15**			**04/30/24**
			COD	SM5220 D			05/01/24 15:05	
			TOC	SM5310B			05/01/24 15:46	
P2316-02	**TEST-3-T8**	**Water**			**04/26/24 00:30**			**04/30/24**
			COD	SM5220 D			05/01/24 15:07	
			TOC	SM5310B			05/01/24 17:23	
P2316-03	**TEST-3-T17**	**Water**			**04/26/24 00:39**			**04/30/24**
			COD	SM5220 D			05/01/24 15:07	
			TOC	SM5310B			05/01/24 17:46	
P2316-04	**TEST-3-T28**	**Water**			**04/26/24 00:50**			**04/30/24**
			COD	SM5220 D			05/01/24 15:08	
			TOC	SM5310B			05/01/24 18:09	

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SHIPPING DOCUMENTS

CHEMTECH

Cooler 2

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO. P2316
QUOTE NO.
COC Number 2044457

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: TETRA TECH
ADDRESS: Twin Oaks 1, STE 102 5700 Lake Wright Dr
CITY Norfolk STATE: VA ZIP: 23502
ATTENTION: Vin Varricchio
PHONE: 757-466-3283 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWILG/CTO WE13
PROJECT NO.: LOCATION:
PROJECT MANAGER: Vin Varricchio
e-mail: Vin.Varricchio@tetratech.com
PHONE: Same FAX:

CLIENT BILLING INFORMATION

BILL TO: Same PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) _____ DAYS*
HARDCOPY (DATA PACKAGE): _____ DAYS*
EDD: _____ DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ☐ Level 1 (Results Only)
- ☐ Level 2 (Results + QC)
- ☐ Level 3 (Results + QC + Raw Data)
- ☐ Level 4 (QC + Full Raw Data)
- ☐ NJ Reduced
- ☐ US EPA CLP
- ☐ NYS ASP A
- ☐ NYS ASP B
- ☐ Other _____
- ☐ EDD FORMAT _____

ANALYSIS

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 SVOC Sinbox 1 #	2 COD	3 TOC	4	5	6	7	8	9	COMMENTS
PRESERVATIVES								N/A	C	C							← Specify Preservatives A-HCl D-NaOH B-HNO3 E-ICE C-H2SO4 F-OTHER
1.	TEST 3 - T6	W		X	4/26/24	00:15	5	X	X	X							
2.	TEST 3 - T8	W		X		00:30	5	X	X	X							
3.	TEST 3 - T17	W		X		00:39	5	X	X	X							
4.	TEST 3 - T18	W		X		00:50	5	X	X	X							
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Scott Lato (IBM)	4/26/24	1. FEDEX
2.	4/30/24 7:30	2.
3.		3.

Conditions of bottles or coolers at receipt: ☐ COMPLIANT ☐ NON COMPLIANT ☐ COOLER TEMP _____ °C
Comments: * 1,4 Dioxane 23.2°C
JR-C

Page ___ of ___
CLIENT: ☐ Hand Delivered ☐ Other _____
CHEMTECH: ☐ Picked Up ☐ Field Sampling

Shipment Complete ☐ YES ☐ NO

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4ACF19B8-807C-4A48-BC1A-077683E78A7A.jpeg
H&K GRAPHICS (941) 756-2200
4/26/24, 2:28 PM
https://mail.google.com/mail/u/0/#inbox/FMfcgzGxStspsqmXNlsdJnfMjGfzSgjt?projector=1

From: Scott Lato, P.E. <scott.lato@prmfiltration.com>
Sent: Tuesday, April 30, 2024 2:45 PM
To: Yazmeen@chemtech.net
Cc: Varricchio, Vin; Wu, Ernie
Subject: Re: Sample ID

Samples were collected 4/25-4/26.

Scott Lato, P.E.

SpartOx Division Manager
Product Recovery Management, Inc.

mobile: (850) 933-7569
direct: (984) 243-2266
main: (888) 873-2848
support: Click here for immediate support
address: 2591 Centerville Road, Unit 102 Tallahassee, FL 32308
eComm: shop.prmfiltration.com
website: www.prmfiltration.com
email: scott.lato@prmfiltration.com

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Product Recovery Management, Incorporated is a North Carolina Corporation. Your acceptance and responding communications acknowledge that you are doing business with a North Carolina Corporation. PRM may operate under the Trade Names of Product Recovery Management, Inc., PRM, PRM Filtration, Falmouth Products, Falco, BagFilters.com, or PD-Blowers.com
Please consider the environment before printing this email.

On Tue, Apr 30, 2024 at 2:16 PM Yazmeen Gomez <Yazmeen@chemtech.net> wrote:

> Can you confirm the attached sampling date is 4/20/24 – if so, please note these samples are out of hold.
>
> ***My previous email was – yazmeen@chemtech.net;**
>
> **going forward I will be using this email address(Yazmeen.Gomez@AllianceTG.com)***

Best Regards,

Yazmeen Gomez

Yazmeen Gomez
Sr. Project Manager, CHEMTECH Laboratory
An Alliance Technical Group Company
Main: 908-789-8900

Direct: 908-728-3147
Address: 284 Sheffield St, Ste 1, Mountainside, NJ 07092

www.alliancetg.com

From: Scott Lato, P.E. <scott.lato@prmfiltration.com>
Sent: Tuesday, April 30, 2024 11:51 AM
To: Wu, Ernie <Ernie.Wu@tetratech.com>
Cc: Yazmeen@chemtech.net; Varricchio, Vin <Vin.Varricchio@tetratech.com>
Subject: Re: Sample ID

Yazmeen,

I just verified with my testing notes and the sample shown in the photo should have the sample ID "Test 2 - T21" on the label which is consistent with the COC. ":Test 2 - **T25**" is a typo.

Let me know if you have any further questions.

Thank You,

Scott.

On Tue, Apr 30, 2024 at 11:37 AM Scott Lato, P.E. <scott.lato@prmfiltration.com> wrote:

> I just got off a conf. call and will look through my notes now to clarify that sample label discrepancy.

Thank You,

Scott.

On Tue, Apr 30, 2024 at 11:15 AM Wu, Ernie <Ernie.Wu@tetratech.com> wrote:

Hi Yazmeen,

I've added Scott Lato to this e-mail. Scott conducted the test and collected the samples. He should be able to provide clarification. Also, on the CoC, the analysis should report only 1,-4 Dioxane (8270 SIM).

Were there other coolers/samples received? There should be more samples.

Thanks,

Ernie

Ernie Wu|Project Manager|Environmental Scientist

Main: 757.461.3768 |Direct: 757.466.4901| Fax: 757.461.4148

ernie.wu@tetratech.com

Tetra Tech, Inc| Hampton Roads Office

4433 Corporation Lane, Suite 300 | Virginia Beach, VA 23462 | www.tetratech.com

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From: Yazmeen Gomez <Yazmeen@chemtech.net>
Sent: Tuesday, April 30, 2024 10:31 AM
To: Varricchio, Vin <Vin.Varricchio@tetratech.com>; Wu, Ernie <Ernie.Wu@tetratech.com>
Subject: Sample ID

Good morning,

Please see attached – received bottleware with the sample ID – TEST-2-T25 which isn't listed on any COC, however did not receive sample 01 on the attached COC. Should the sample ID be corrected?

***My previous email was – yazmeen@chemtech.net;**

going forward I will be using this email address(Yazmeen.Gomez@AllianceTG.com)*

Best Regards,

Yazmeen Gomez

Yazmeen Gomez
Sr. Project Manager, CHEMTECH Laboratory
An Alliance Technical Group Company
Main: 908-789-8900

Direct: 908-728-3147
Address: 284 Sheffield St, Ste 1, Mountainside, NJ 07092

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--

Scott Lato, P.E.

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email: scott.lato@prmfiltration.com

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Scott Lato, P.E.

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Please consider the environment before printing this email.

To: Wu, Ernie

Subject: TEMP - P2315, P2316, P2317 , P2318, P2319

Good afternoon Ernie,

Just wanted to let you know these samples were received out of Temp.

***My previous email was – yazmeen@chemtech.net;**
going forward I will be using this email address(Yazmeen.Gomez@AllianceTG.com)*

Best Regards,

Yazmeen Gomez

Yazmeen Gomez
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284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Hit Summary Sheet
SW-846

SDG No.: P2317

Client: Tetra Tech NUS, Inc.

Sample ID	Client ID		Parameter	Concentration	C	MDL	LOD	RDL	Units
Client ID : TEST-1-T53									
P2317-01	TEST-1-T53	WATER	1,4-Dioxane	0.420		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.42**				
			Total Concentration:		**0.42**				
Client ID : TEST-1-T72									
P2317-02	TEST-1-T72	WATER	1,4-Dioxane	0.310		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.31**				
			Total Concentration:		**0.31**				

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SAMPLE DATA

CHEMTECH
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284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T53	SDG No.:	P2317
Lab Sample ID:	P2317-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031475.D	1	05/01/24 08:20	05/10/24 23:37	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.42		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		63%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.33		30 - 150		82%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		67%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.29		58 - 132		72%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	11400	7.711				
1146-65-2	Naphthalene-d8	36500	10.496				
15067-26-2	Acenaphthene-d10	20800	14.338				
1517-22-2	Phenanthrene-d10	47800	17.091				
1719-03-5	Chrysene-d12	42400	21.265				
1520-96-3	Perylene-d12	42700	23.507				

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

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T72	SDG No.:	P2317
Lab Sample ID:	P2317-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031476.D	1	05/01/24 08:20	05/11/24 00:13	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.31		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.24		30 - 150		60%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		81%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.26		55 - 111		65%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.26		53 - 106		64%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.30		58 - 132		74%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12600	7.711				
1146-65-2	Naphthalene-d8	40400	10.496				
15067-26-2	Acenaphthene-d10	23200	14.338				
1517-22-2	Phenanthrene-d10	52200	17.09				
1719-03-5	Chrysene-d12	45900	21.265				
1520-96-3	Perylene-d12	44500	23.507				

U = Not Detected
LOQ = Limit of Quantitation
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LOD = Limit of Detection
E = Value Exceeds Calibration Range
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M = MS/MSD acceptance criteria did not meet requirements

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A = Aldol-Condensation Reaction Products

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LAB CHRONICLE

OrderID:	P2317	**OrderDate:**	4/30/2024 10:00:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2317-01	**TEST-1-T53**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/10/24	
P2317-02	**TEST-1-T72**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	

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SAMPLE DATA

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284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 19:21
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T53	SDG No.:	P2317
Lab Sample ID:	P2317-01	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:08	SM 5220 D-11
TOC	1.30		1	0.19	0.50	1.00	mg/L		05/02/24 13:09	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 19:40
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-1-T72	SDG No.:	P2317
Lab Sample ID:	P2317-02	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:09	SM 5220 D-11
TOC	1.50		1	0.19	0.50	1.00	mg/L		05/01/24 18:59	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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LAB CHRONICLE

OrderID:	P2317	**OrderDate:**	4/30/2024 10:00:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2317-01	**TEST-1-T53**	**Water**			**04/25/24 19:21**			**04/30/24**
			COD	SM5220 D			05/01/24 15:08	
			TOC	SM5310B			05/02/24 13:09	
P2317-02	**TEST-1-T72**	**Water**			**04/25/24 19:40**			**04/30/24**
			COD	SM5220 D			05/01/24 15:09	
			TOC	SM5310B			05/01/24 18:59	

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SHIPPING DOCUMENTS

CHEMTECH

Cooler #6

CHAIN OF CUSTODY RECORD

284 Sheffield Street, Mountainside, NJ 07092
(908) 789-8900 • Fax (908) 789-8922
www.chemtech.net

CHEMTECH PROJECT NO. / QUOTE NO. P2317
COC Number 2044451

CLIENT INFORMATION (REPORT TO BE SENT TO:)

COMPANY: Tetra Tech
ADDRESS: Town Oaks I, Ste 102 5700 Lake Wright Dr
CITY Norfolk STATE: VA ZIP: 23502
ATTENTION: Via Varricchio
PHONE: 757-466-3283 FAX:

CLIENT PROJECT INFORMATION

PROJECT NAME: NWIRG/CTU WEB
PROJECT NO.: LOCATION:
PROJECT MANAGER: Same
e-mail: Via.Varricchio@tetratech.com
PHONE: Same FAX:

CLIENT BILLING INFORMATION

BILL TO: Same PO#:
ADDRESS:
CITY STATE: ZIP:
ATTENTION: PHONE:

DATA TURNAROUND INFORMATION

FAX (RUSH) _____ DAYS*
HARDCOPY (DATA PACKAGE): _____ DAYS*
EDD: _____ DAYS*
*TO BE APPROVED BY CHEMTECH
STANDARD HARDCOPY TURNAROUND TIME IS 10 BUSINESS DAYS

DATA DELIVERABLE INFORMATION

- ☐ Level 1 (Results Only)
- ☐ Level 2 (Results + QC)
- ☐ Level 3 (Results + QC + Raw Data)
- ☐ EDD FORMAT _____
- ☐ Level 4 (QC + Full Raw Data)
- ☐ NJ Reduced ☐ US EPA CLP
- ☐ NYS ASP A ☐ NYS ASP B
- ☐ Other _____

ANALYSIS

1 CyDC SimBioNit 2 COD 3 TOC 4 5 6 7 8 9

PRESERVATIVES

CHEMTECH SAMPLE ID	PROJECT SAMPLE IDENTIFICATION	SAMPLE MATRIX	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	SAMPLE COLLECTION DATE	SAMPLE COLLECTION TIME	# OF BOTTLES	1 N/A	2 C	3 C	4	5	6	7	8	9	COMMENTS
1.	Test1 - T53	W		X	4/25/24	19:21	5	X	X	X							
2.	Test1 - T72	W		X	↓	19:40	5	X	X	X							
3.																	
4.																	
5.																	
6.																	
7.																	
8.																	
9.																	
10.																	

← Specify Preservatives
A-HCl D-NaOH
B-HNO3 E-ICE
C-H2SO4 F-OTHER

SAMPLE CUSTODY MUST BE DOCUMENTED BELOW EACH TIME SAMPLES CHANGE POSSESSION INCLUDING COURIER DELIVERY

RELINQUISHED BY SAMPLER:	DATE/TIME:	RECEIVED BY:
1. Scott Lake (Pam)	4/26/24	1. FED EX
RELINQUISHED BY SAMPLER: 2.	DATE/TIME: 3:30 4/30/24	RECEIVED BY: 2.
RELINQUISHED BY SAMPLER: 3.	DATE/TIME:	RECEIVED BY: 3.

Conditions of bottles or coolers at receipt: ☐ COMPLIANT ☐ NON COMPLIANT ☐ COOLER TEMP _____ °C
Comments: * 1,4 Dioxane 19.5 °C
TR Cooler #1

Page ____ of ____

CLIENT: ☐ Hand Delivered ☐ Other _____
CHEMTECH: ☐ Picked Up ☐ Field Sampling

Shipment Complete ☐ YES ☐ NO

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4/26/24, 2:27 PM
https://mail.google.com/mail/u/0/#inbox/FMfcgzGxStspsqmXNlsdJnfMjGfzSgjt?projector=1

To: Wu, Ernie

Subject: TEMP - P2315, P2316, P2317 , P2318, P2319

Good afternoon Ernie,

Just wanted to let you know these samples were received out of Temperature.

***My previous email was – yazmeen@chemtech.net;**
going forward I will be using this email address(Yazmeen.Gomez@AllianceTG.com)*

Best Regards,

Yazmeen Gomez

Yazmeen Gomez
Sr. Project Manager, CHEMTECH Laboratory
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www.alliancetg.com

CHEMTECH
AN ALLIANCE TECHNICAL GROUP COMPANY
284 Sheffield Street, Mountainside NJ 07092 (908)-789-8900 Fax : 908 789 8922

Laboratory Certification

Certified By	License No.
CAS EPA CLP Contract	68HERH20D0011
Connecticut	PH-0649
DOD ELAP (L-A-B)	L2219
Maine	2022022
Maryland	296
New Hampshire	255423
New Jersey	20012
New York	11376
Pennsylvania	68-00548
Soil Permit	P330-21-00137
Texas	T104704488-23-16

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

ANALYTICAL RESULTS SUMMARY

GENERAL CHEMISTRY
SEMI-VOLATILE ORGANICS

PROJECT NAME : CTO WE13

TETRA TECH NUS, INC.

661 Andersen Drive

Suite 200

Pittsburgh, PA - 15220-2745

Phone No: 412-921-7090

ORDER ID : P2318

ATTENTION : Ernie Wu

Laboratory Certification ID # 20012

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5) SVOC-SIMGroup1 Data 10

6) Genchem Data 17

7) Shipping Document 23

7.1) CHAIN OF CUSTODY 24

7.2) ROC 25

7.3) Lab Certificate 26

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Cover Page

Order ID : P2318

Project ID : CTO WE13

Client : Tetra Tech NUS, Inc.

Lab Sample Number	Client Sample Number
P2318-01	TEST-3-T38
P2318-02	TEST-3-T50
P2318-03	TEST-2-T0
P2318-04	TEST-2-T8

I certify that the data package is in compliance with the terms and conditions of the contract,both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the laboratory manager or his designee, as verified by the following signature.

Signature : N. N. Pandya

APPROVED
By Nimisha Pandya QA/QC Supervisor at 11:07 am, May 14, 2024
Date: 5/14/2024

NYDOH CERTIFICATION NO - 11376

NJDEP CERTIFICATION NO - 20012

CHEMTECH
AN ALLIANCE TECHNICAL GROUP COMPANY

284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Hit Summary Sheet
SW-846

SDG No.: P2318

Client: Tetra Tech NUS, Inc.

Sample ID	Client ID		Parameter	Concentration	C	MDL	LOD	RDL	Units
Client ID : TEST-2-T0									
P2318-03	TEST-2-T0	WATER	1,4-Dioxane	0.760		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.76**				
			Total Concentration:		**0.76**				
Client ID : TEST-2-T8									
P2318-04	TEST-2-T8	WATER	1,4-Dioxane	0.340		0.07	0.2	0.2	ug/L
			Total Svoc :		**0.34**				
			Total Concentration:		**0.34**				

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SAMPLE DATA

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284 Sheffield Street, Mountainside, New Jersey 07092, Phone : 908 789 8900,
Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T38	SDG No.:	P2318
Lab Sample ID:	P2318-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031477.D	1	05/01/24 08:20	05/11/24 00:50	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		63%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.27		30 - 150		68%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.28		55 - 111		69%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.26		53 - 106		66%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.26		58 - 132		65%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12800	7.711				
1146-65-2	Naphthalene-d8	40000	10.496				
15067-26-2	Acenaphthene-d10	23400	14.338				
1517-22-2	Phenanthrene-d10	53500	17.091				
1719-03-5	Chrysene-d12	44500	21.265				
1520-96-3	Perylene-d12	40900	23.507				

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

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T50	SDG No.:	P2318
Lab Sample ID:	P2318-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031478.D	1	05/01/24 08:20	05/11/24 01:26	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.20	U	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.26		30 - 150		66%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		75%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.30		55 - 111		74%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.28		53 - 106		70%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.29		58 - 132		73%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	13300	7.711				
1146-65-2	Naphthalene-d8	41500	10.496				
15067-26-2	Acenaphthene-d10	24000	14.338				
1517-22-2	Phenanthrene-d10	55300	17.091				
1719-03-5	Chrysene-d12	45800	21.265				
1520-96-3	Perylene-d12	39600	23.507				

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A = Aldol-Condensation Reaction Products

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T0	SDG No.:	P2318
Lab Sample ID:	P2318-03	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031479.D	1	05/01/24 08:20	05/11/24 02:02	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.76		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.22		30 - 150		55%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.29		30 - 150		73%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.25		55 - 111		62%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.24		53 - 106		59%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.29		58 - 132		72%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12100	7.711				
1146-65-2	Naphthalene-d8	38100	10.496				
15067-26-2	Acenaphthene-d10	22000	14.338				
1517-22-2	Phenanthrene-d10	53000	17.078				
1719-03-5	Chrysene-d12	43500	21.265				
1520-96-3	Perylene-d12	37200	23.507				

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LOD = Limit of Detection
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B = Analyte Found in Associated Method Blank
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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T8	SDG No.:	P2318
Lab Sample ID:	P2318-04	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031480.D	1	05/01/24 08:20	05/11/24 02:39	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.34		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.23		30 - 150		57%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.26		30 - 150		65%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		67%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.24		53 - 106		61%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.25		58 - 132		62%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12700	7.711				
1146-65-2	Naphthalene-d8	40100	10.495				
15067-26-2	Acenaphthene-d10	23200	14.338				
1517-22-2	Phenanthrene-d10	54100	17.078				
1719-03-5	Chrysene-d12	45000	21.264				
1520-96-3	Perylene-d12	37700	23.504				

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LAB CHRONICLE

OrderID:	P2318	**OrderDate:**	4/30/2024 10:01:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2318-01	**TEST-3-T38**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2318-02	**TEST-3-T50**	**Water**			**04/26/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2318-03	**TEST-2-T0**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2318-04	**TEST-2-T8**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 00:58
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T38	SDG No.:	P2318
Lab Sample ID:	P2318-01	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:09	SM 5220 D-11
TOC	0.67	J	1	0.19	0.50	1.00	mg/L		05/01/24 19:22	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/26/24 01:10
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-3-T50	SDG No.:	P2318
Lab Sample ID:	P2318-02	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:10	SM 5220 D-11
TOC	0.97	J	1	0.19	0.50	1.00	mg/L		05/01/24 21:26	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 22:21
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T0	SDG No.:	P2318
Lab Sample ID:	P2318-03	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:10	SM 5220 D-11
TOC	1.00		1	0.19	0.50	1.00	mg/L		05/01/24 21:49	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 22:32
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T8	SDG No.:	P2318
Lab Sample ID:	P2318-04	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:11	SM 5220 D-11
TOC	1.30		1	0.19	0.50	1.00	mg/L		05/02/24 18:51	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
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LOD = Limit of Detection
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H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
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E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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LAB CHRONICLE

OrderID:	P2318	**OrderDate:**	4/30/2024 10:01:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2318-01	**TEST-3-T38**	**Water**			**04/26/24 00:58**			**04/30/24**
			COD	SM5220 D			05/01/24 15:09	
			TOC	SM5310B			05/01/24 19:22	
P2318-02	**TEST-3-T50**	**Water**			**04/26/24 01:10**			**04/30/24**
			COD	SM5220 D			05/01/24 15:10	
			TOC	SM5310B			05/01/24 21:26	
P2318-03	**TEST-2-T0**	**Water**			**04/25/24 22:21**			**04/30/24**
			COD	SM5220 D			05/01/24 15:10	
			TOC	SM5310B			05/01/24 21:49	
P2318-04	**TEST-2-T8**	**Water**			**04/25/24 22:32**			**04/30/24**
			COD	SM5220 D			05/01/24 15:11	
			TOC	SM5310B			05/02/24 18:51	

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Hit Summary Sheet
SW-846

SDG No.: P2319

Client: Tetra Tech NUS, Inc.

Sample ID	Client ID		Parameter	Concentration	C	MDL	LOD	RDL	Units
Client ID : TEST-2-T21									
P2319-01	TEST-2-T21	WATER	1,4-Dioxane	0.250		0.07	0.2	0.2	ug/L
			Total Svoc :	**0.25**					
			Total Concentration:	**0.25**					
Client ID : TEST-2-T32									
P2319-02	TEST-2-T32	WATER	1,4-Dioxane	0.190	J	0.07	0.2	0.2	ug/L
			Total Svoc :	**0.19**					
			Total Concentration:	**0.19**					
Client ID : TEST-2-T42									
P2319-03	TEST-2-T42	WATER	1,4-Dioxane	0.170	J	0.07	0.2	0.2	ug/L
			Total Svoc :	**0.17**					
			Total Concentration:	**0.17**					
Client ID : TEST-2-T52									
P2319-04	TEST-2-T52	WATER	1,4-Dioxane	0.140	J	0.07	0.2	0.2	ug/L
			Total Svoc :	**0.14**					
			Total Concentration:	**0.14**					

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T21	SDG No.:	P2319
Lab Sample ID:	P2319-01	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	980 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031481.D	1	05/01/24 08:20	05/11/24 03:15	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.25		0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		63%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.29		30 - 150		72%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.29		55 - 111		72%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		67%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.27		58 - 132		68%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12300	7.711				
1146-65-2	Naphthalene-d8	38700	10.496				
15067-26-2	Acenaphthene-d10	22500	14.338				
1517-22-2	Phenanthrene-d10	52500	17.078				
1719-03-5	Chrysene-d12	44700	21.265				
1520-96-3	Perylene-d12	41000	23.504				

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T32	SDG No.:	P2319
Lab Sample ID:	P2319-02	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031482.D	1	05/01/24 08:20	05/11/24 03:51	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.19	J	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.23		30 - 150		56%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.30		30 - 150		76%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.24		55 - 111		60%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.24		53 - 106		60%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.29		58 - 132		72%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	11800	7.711				
1146-65-2	Naphthalene-d8	37100	10.495				
15067-26-2	Acenaphthene-d10	21500	14.338				
1517-22-2	Phenanthrene-d10	50200	17.078				
1719-03-5	Chrysene-d12	42800	21.264				
1520-96-3	Perylene-d12	38000	23.507				

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

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Fax : 908 789 8922

Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T42	SDG No.:	P2319
Lab Sample ID:	P2319-03	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031483.D	1	05/01/24 08:20	05/11/24 04:28	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.17	J	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		63%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.32		30 - 150		79%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		68%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.28		53 - 106		70%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.32		58 - 132		79%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12300	7.711				
1146-65-2	Naphthalene-d8	39100	10.496				
15067-26-2	Acenaphthene-d10	22400	14.338				
1517-22-2	Phenanthrene-d10	51600	17.078				
1719-03-5	Chrysene-d12	43900	21.265				
1520-96-3	Perylene-d12	39000	23.505				

U = Not Detected
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MDL = Method Detection Limit
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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

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T52	SDG No.:	P2319
Lab Sample ID:	P2319-04	Matrix:	Water
Analytical Method:	SW8270SIM	% Solid:	0
Sample Wt/Vol:	990 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 :
Prep Method :	SW3510C		

File ID/Qc Batch:	Dilution:	Prep Date	Date Analyzed	Prep Batch ID
BN031484.D	1	05/01/24 08:20	05/11/24 05:04	PB160640

CAS Number	Parameter	Conc.	Qualifier	MDL	LOD	LOQ / CRQL	Units
TARGETS							
123-91-1	1,4-Dioxane	0.14	J	0.070	0.20	0.20	ug/L
SURROGATES							
7297-45-2	2-Methylnaphthalene-d10	0.25		30 - 150		62%	SPK: 0.4
93951-69-0	Fluoranthene-d10	0.27		30 - 150		68%	SPK: 0.4
4165-60-0	Nitrobenzene-d5	0.27		55 - 111		68%	SPK: 0.4
321-60-8	2-Fluorobiphenyl	0.27		53 - 106		68%	SPK: 0.4
1718-51-0	Terphenyl-d14	0.27		58 - 132		68%	SPK: 0.4
INTERNAL STANDARDS							
3855-82-1	1,4-Dichlorobenzene-d4	12100	7.711				
1146-65-2	Naphthalene-d8	38100	10.496				
15067-26-2	Acenaphthene-d10	22000	14.338				
1517-22-2	Phenanthrene-d10	51300	17.078				
1719-03-5	Chrysene-d12	42200	21.265				
1520-96-3	Perylene-d12	36800	23.505				

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

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LAB CHRONICLE

OrderID:	P2319	**OrderDate:**	4/30/2024 10:01:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2319-01	**TEST-2-T21**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2319-02	**TEST-2-T32**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2319-03	**TEST-2-T42**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	
P2319-04	**TEST-2-T52**	**Water**			**04/25/24**			**04/30/24**
			SVOC-SIMGroup1	8270-Modified		05/01/24	05/11/24	

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SAMPLE DATA

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 22:45
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T21	SDG No.:	P2319
Lab Sample ID:	P2319-01	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:11	SM 5220 D-11
TOC	1.40		1	0.19	0.50	1.00	mg/L		05/02/24 13:57	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 22:56
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T32	SDG No.:	P2319
Lab Sample ID:	P2319-02	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:13	SM 5220 D-11
TOC	1.70		1	0.19	0.50	1.00	mg/L		05/02/24 19:15	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 23:06
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T42	SDG No.:	P2319
Lab Sample ID:	P2319-03	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:13	SM 5220 D-11
TOC	1.30		1	0.19	0.50	1.00	mg/L		05/02/24 16:03	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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Report of Analysis

Client:	Tetra Tech NUS, Inc.	Date Collected:	04/25/24 23:16
Project:	CTO WE13	Date Received:	04/30/24
Client Sample ID:	TEST-2-T52	SDG No.:	P2319
Lab Sample ID:	P2319-04	Matrix:	Water
		% Solid:	0

Parameter	Conc.	Qua.	DF	MDL	LOD	LOQ / CRQL	Units	Prep Date	Date Ana.	Ana Met.
COD	5.00	U	1	2.35	5.00	10.0	mg/L		05/01/24 15:14	SM 5220 D-11
TOC	1.50		1	0.19	0.50	1.00	mg/L		05/02/24 18:04	SM 5310 B-14

Comments:

U = Not Detected
LOQ = Limit of Quantitation
MDL = Method Detection Limit
LOD = Limit of Detection
D = Dilution
Q = indicates LCS control criteria did not meet requirements
H = Sample Analysis Out Of Hold Time

J = Estimated Value
B = Analyte Found in Associated Method Blank
* = indicates the duplicate analysis is not within control limits.
E = Indicates the reported value is estimated because of the presence of interference.
OR = Over Range
N =Spiked sample recovery not within control limits

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LAB CHRONICLE

OrderID:	P2319	**OrderDate:**	4/30/2024 10:01:00 AM
Client:	Tetra Tech NUS, Inc.	**Project:**	CTO WE13
Contact:	Ernie Wu	**Location:**	I31

LabID	ClientID	Matrix	Test	Method	Sample Date	Prep Date	Anal Date	Received
P2319-01	**TEST-2-T21**	**Water**			**04/25/24 22:45**			**04/30/24**
			COD	SM5220 D			05/01/24 15:11	
			TOC	SM5310B			05/02/24 13:57	
P2319-02	**TEST-2-T32**	**Water**			**04/25/24 22:56**			**04/30/24**
			COD	SM5220 D			05/01/24 15:13	
			TOC	SM5310B			05/02/24 19:15	
P2319-03	**TEST-2-T42**	**Water**			**04/25/24 23:06**			**04/30/24**
			COD	SM5220 D			05/01/24 15:13	
			TOC	SM5310B			05/02/24 16:03	
P2319-04	**TEST-2-T52**	**Water**			**04/25/24 23:16**			**04/30/24**
			COD	SM5220 D			05/01/24 15:14	
			TOC	SM5310B			05/02/24 18:04	

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ANALYTICAL REPORT

PREPARED FOR

Attn: Ernie Wu
Tetra Tech Inc
Twin Oaks I, Suite 102
5700 Lake Wright Drive
Norfolk, Virginia 23502

Generated 5/7/2024 5:18:39 PM

JOB DESCRIPTION

NWIRP \ CTO WE 13 Bromate

JOB NUMBER

410-169642-1

Eurofins Lancaster Laboratories Environment Testing, LLC
2425 New Holland Pike
Lancaster PA 17601

See page two for job notes and contact information.

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Detection Summary

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 1 - T0 — Lab Sample ID: 410-169642-1

No Detections.

Client Sample ID: Test 1 - T9 — Lab Sample ID: 410-169642-2

No Detections.

Client Sample ID: Test 1 - T20 — Lab Sample ID: 410-169642-3

No Detections.

Client Sample ID: Test 1 - T35 — Lab Sample ID: 410-169642-4

No Detections.

Client Sample ID: Test 1 - T53 — Lab Sample ID: 410-169642-5

No Detections.

Client Sample ID: Test 1 - T72 — Lab Sample ID: 410-169642-6

No Detections.

Client Sample ID: Test 2 - T0 — Lab Sample ID: 410-169642-7

No Detections.

Client Sample ID: Test 2 - T8 — Lab Sample ID: 410-169642-8

No Detections.

Client Sample ID: Test 2 - T21 — Lab Sample ID: 410-169642-9

No Detections.

Client Sample ID: Test 2 - T32 — Lab Sample ID: 410-169642-10

No Detections.

Client Sample ID: Test 2 - T42 — Lab Sample ID: 410-169642-11

No Detections.

Client Sample ID: Test 2 - T52 — Lab Sample ID: 410-169642-12

No Detections.

Client Sample ID: Test 3 - T0 — Lab Sample ID: 410-169642-13

No Detections.

Client Sample ID: Test 3 - T8 — Lab Sample ID: 410-169642-14

No Detections.

Client Sample ID: Test 3 - T17 — Lab Sample ID: 410-169642-15

No Detections.

Client Sample ID: Test 3 - T28 — Lab Sample ID: 410-169642-16

No Detections.

This Detection Summary does not include radiochemical test results.

Detection Summary

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 3 - T38 — Lab Sample ID: 410-169642-17

No Detections.

Client Sample ID: Test 3 - T50 — Lab Sample ID: 410-169642-18

No Detections.

This Detection Summary does not include radiochemical test results.

Client Sample Results

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 1 - T0

Lab Sample ID: 410-169642-1
Date Collected: 04/25/24 18:24
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 16:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*112*		*90 - 115*		*05/01/24 16:16*	*1*

Client Sample ID: Test 1 - T9

Lab Sample ID: 410-169642-2
Date Collected: 04/25/24 18:38
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 16:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*107*		*90 - 115*		*05/01/24 16:39*	*1*

Client Sample ID: Test 1 - T20

Lab Sample ID: 410-169642-3
Date Collected: 04/25/24 18:50
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 17:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*105*		*90 - 115*		*05/01/24 17:02*	*1*

Client Sample ID: Test 1 - T35

Lab Sample ID: 410-169642-4
Date Collected: 04/25/24 19:03
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 17:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*105*		*90 - 115*		*05/01/24 17:25*	*1*

Client Sample ID: Test 1 - T53

Lab Sample ID: 410-169642-5
Date Collected: 04/25/24 19:21
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/03/24 18:18	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*124*	*S1+ cn*	*90 - 115*		*05/03/24 18:18*	*1*

Client Sample Results

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 1 - T72

Lab Sample ID: 410-169642-6
Date Collected: 04/25/24 19:40
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 17:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*05/01/24 17:48*	*1*

Client Sample ID: Test 2 - T0

Lab Sample ID: 410-169642-7
Date Collected: 04/25/24 22:21
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 18:57	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*108*		*90 - 115*		*05/01/24 18:57*	*1*

Client Sample ID: Test 2 - T8

Lab Sample ID: 410-169642-8
Date Collected: 04/25/24 22:32
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 20:07	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*05/01/24 20:07*	*1*

Client Sample ID: Test 2 - T21

Lab Sample ID: 410-169642-9
Date Collected: 04/25/24 22:45
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 20:30	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*110*		*90 - 115*		*05/01/24 20:30*	*1*

Client Sample ID: Test 2 - T32

Lab Sample ID: 410-169642-10
Date Collected: 04/25/24 22:56
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 20:53	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*05/01/24 20:53*	*1*

Client Sample Results

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 2 - T42

Lab Sample ID: 410-169642-11
Date Collected: 04/25/24 23:06
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 21:16	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*108*		*90 - 115*		*05/01/24 21:16*	*1*

Client Sample ID: Test 2 - T52

Lab Sample ID: 410-169642-12
Date Collected: 04/25/24 23:16
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 21:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*106*		*90 - 115*		*05/01/24 21:39*	*1*

Client Sample ID: Test 3 - T0

Lab Sample ID: 410-169642-13
Date Collected: 04/26/24 00:15
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 22:02	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*113*		*90 - 115*		*05/01/24 22:02*	*1*

Client Sample ID: Test 3 - T8

Lab Sample ID: 410-169642-14
Date Collected: 04/26/24 00:30
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 22:25	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*05/01/24 22:25*	*1*

Client Sample ID: Test 3 - T17

Lab Sample ID: 410-169642-15
Date Collected: 04/26/24 00:39
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 22:48	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*05/01/24 22:48*	*1*

Client Sample Results

Client: Tetra Tech Inc
Project/Site: NWIRP \ CTO WE 13 Bromate

Job ID: 410-169642-1

Client Sample ID: Test 3 - T28

Lab Sample ID: 410-169642-16
Date Collected: 04/26/24 00:50
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/01/24 23:11	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*05/01/24 23:11*	*1*

Client Sample ID: Test 3 - T38

Lab Sample ID: 410-169642-17
Date Collected: 04/26/24 00:58
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/02/24 01:29	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*104*		*90 - 115*		*05/02/24 01:29*	*1*

Client Sample ID: Test 3 - T50

Lab Sample ID: 410-169642-18
Date Collected: 04/26/24 01:10
Matrix: Water
Date Received: 04/27/24 10:00

Method: EPA 300.1 - Disinfection By-Products, (IC)
Lab: Eurofins Orlando

Analyte	Result	Qualifier	LOQ	LOD		Unit	D	Analyzed	Dil Fac
Bromate	<5.0		5.0		5.0	ug/L		05/02/24 02:39	1

Surrogate	*%Recovery*	*Qualifier*	*Limits*	*Prepared*	*Analyzed*	*Dil Fac*
Dichloroacetic acid(Surr)	*109*		*90 - 115*		*05/02/24 02:39*	*1*

APPENDIX B

Photo Log

NOTIFICATION: THIS PAGE CONTAINS SENSITIVE BUT UNCLASSIFIED INFORMATION WHICH IS PROTECTED BY THE FREEDOM OF INFORMATION ACT

EXEMPTION 3. (5 USC 552(b)(3))

Information exempted by other statutes

10 USC Section 130(e) Treatment of Certain Critical Infrastructure Security Information

Pages 513-514

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Appendix B
Phase III GWTS Design Calculations

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Pipe Sizing Calculations								
SITE INFORMATION								
	SITE	Phase III GWTP				SPEC NO.		
	PROJECT	Bethpage, NY				REV		
	PROJECT NO.	112G08005-WE24				DATE		03/11/24
GW Extraction Pipe Description	**Pipe Material**		**Operational Flow (ft3/s)**	**Maximum Operational Flow (gpm)**	**Carrier Pipe Size (inch)**	**Size (feet)**	**Area (ft2)**	**Velocity (ft/s)**
RW-8	Single Wall HDPE		1.33	600	8	0.67	0.35	3.82
RW-9	Single Wall HDPE		1.33	600	8	0.67	0.35	3.82
RW-10A	Single Wall HDPE		1.55	700	8	0.67	0.35	4.45
Total maximum design flow			4.218	1900				
Interior Pipe Description	**Pipe Material**	**Maximum Operational Flow (gpm)**	**Operational Flow (ft3/s)**	**Nomimal Pipe size (Inch)/OD**	**Actual ID (inch)**	**Size (feet)**	**Area (ft2)**	**Velocity (ft/s)**
Influent RW-8	Sch 80	600	1.33	8/8.62	7.56	0.63	0.31	4.28
Influent RW-9	Sch 80	600	1.33	8/8.62	7.56	0.63	0.31	4.28
Influent RW-10A	Sch 80	700	1.55	8/8.62	7.56	0.63	0.31	4.99
Influent Header to EQ tank	Sch 80	1800	4.00	12/12.75	11.29	0.94	0.69	5.75
EQ Tank to MMF header	Sch 80	1800	4.00	12/12.75	11.29	0.94	0.69	5.75
MMF piping connection to nozzle	Sch 80	600	1.33	10/10.75	9.49	0.79	0.49	2.71
MMF Outlet to Bag Filters	Sch 80	1800	4.00	12/12.75	11.29	0.94	0.69	5.75
Bag filter piping connection	Sch 80	1800	4.00	12/12.75	11.29	0.94	0.69	5.75
Bag Filters to AOP Inlet	Sch 80	1800	3.996	12/12.75	11.29	0.94	0.69	5.75
AOP inlet/outlet to each reactor	Sch 80	900	1.998	8/8.62	7.56	0.63	0.31	6.41
AOP outlet to LGAC Pumping Tank	Sch 80	1800	3.996	12/12.75	11.29	0.94	0.69	5.75
LGAC feed pump to LGAC Header	Sch 80	1800	3.996	12/12.76	11.29	0.94	0.69	5.75
LGAC piping connection to nozzle	Sch 80	600	1.332	10/10.75	9.49	0.79	0.49	2.71
AOP Outlet to EQ Tank (Startup Recycle)	Sch 80	1800	3.996	12/12.75	11.29	0.94	0.69	5.75
Plant Effluent to fill Backwash Supply Tank	Sch 80	600	1.332	8/8.62	7.56	0.63	0.31	4.28
LGAC/MMF Backwash Supply line	Sch 80	950	2.109	8/8.62	7.56	0.63	0.31	6.77
LGAC/MMF Backwash Waste line	Sch 80	950	2.109	8/8.62	7.56	0.63	0.31	6.77
Backwash to EQ tank	Sch 80	100	0.222	3/3.5	2.86	0.24	0.04	4.98
Building sump to EQ tank	Sch 80	100	0.222	3/3.6	2.86	0.24	0.04	4.98
Final Treated Effluent Discharge Pipe Description		**Maximum Operational Flow (gpm)**	**Operational Flow (ft3/s)**	**Nomimal Pipe size (Inch)/OD**	**Actual ID (inch)**	**Size (feet)**	**Area (ft2)**	**Velocity (ft/s)**
LGAC to discharge manhole	PE 4710 Single wall HDPE	1800	4.00	12/13.20	11.127	0.93	0.67	5.92
To SB-1	PE 4710 Single wall HDPE	600	1.33	8/8.62	7.56	0.63	0.31	4.28
Dishcharge manhole to SB-2 and SB-3 Splitter Box	PE 4710 Single wall HDPE	1800	4.00	12/13.20	11.127	0.93	0.67	5.92
To SB-2	PE 4710 Single wall HDPE	900	2.00	10/10.75	9.49	0.79	0.49	4.07
To SB-3	PE 4710 Single wall HDPE	900	2.00	10/10.75	9.49	0.79	0.49	4.07
Dishcharge manhole to SB-4 and SB-5 Connected	PE 4710 Single wall HDPE	1800	4.00	12/13.20	11.127	0.93	0.67	5.92

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Phase III GWTP**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**June 27, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	MMF Feed Pumps - Horizontal split case centrifugal pump
Design Flowrate (gpm)	1500
Pump Flowrate (gpm)	1500
Pump Location	Pump pad of MMF Feed pumps
Pipeline Description	Water is pumped from EQ tank through MMFs, Bag filters, AOP and into Pumping tank

HEAD LOSSES

Static Discharge Head

Pumping Tank bottom Elevation	0.5	$h_s = \Delta z$
MMF inlet top Elevation	12.00	$h_s = \Delta z$
Static Head Loss (ft)	11.50	Vacuum break (at outlet)
Static Head Loss (ft)	11.50	

Pipe Friction Head Loss

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100D^{4.8655}}$$

Line No.	Description	Pipe Mat'l	Hazen Williams	ID	Length	Flow	Velocity	Head Loss
			Coeff.	(in)	(ft)	(gpm)	ft/s	(ft)
a	Pump Suction from EQ tank	PVC	150	12	5	1500	4.255	0.02
b	Pump Discharge to MMFs	PVC	150	10	30	1500	6.128	0.30
c	MMF to 10" Flange TEE to bag filtration units	PVC	150	12	30	1500	4.255	0.12
d	Cartridge filtration units from 10"Flange TEE to AOP contact tank	PVC	150	10	20	1500	6.128	0.20
n	From AOP contact tank to pumping tank	PVC	150	12	30	1500	4.255	0.12
						Subtotal Straight Pipe Friction Head Loss (ft)		0.77

Miscellaneous Losses - estimate

Fittings:

$$h_m = \sum \frac{Kv^2}{2g}$$

Line No.	Type	LD	Flow	Qty	Diameter	K		Head Loss
			(gpm)					(ft)
EQ tank to Suction of Pump P-100A/P-100B	12 inch 90° bend	30	1500	2	12	0.51		0.29
	8" TEE		1500	1	8	1.00		1.42
	8 inch 90 bend		1500	2	8	0.51		1.45
	8" Butterfly valve	8	1500	2	8	0.77		2.19
	8 x 12 reducer		1500	1	12	0.50		0.14
	Entry loss		1500	1	12	1.00		0.28
Discharge of Pump P-100A/P-100B to MMFs units	6 x 12 Expander		1600	1	12	0.50		0.16
	12" butterfly valve	8	1500	1	12	0.77		0.22
	12" check valve	100/50	1500	1	12	1.50		0.42
	12" flange TEE up	20/60	600	3	10	1.00		0.28
	10x12 flanged reducer		600	1	10	0.50		0.05
	12 inch 90 bend	30	1500	3	12	0.51		0.43
	Exit loss		1500	1	10	1.00		0.58
To cartridge filtration units (CF-240/CF-250)	12x10 flanged reducer		1500	1	10	0.50		0.29
	12" flange TEE		1500	2	10	1.00		1.17
	12" gate valve	8	1500	1	12	0.77		0.22
	10 x 12 reducer		1500	1	10	0.50		0.29
	10" gate valve	8	1500	2	12	0.77		0.43
Cartridge filter to AOP contact tank and to Pumping tank	90o bend		1500	5	12	0.51		0.72
	12" butterfly valve	8	1500	2	12	0.77		0.43
						Subtotal of minor losses(ft)		11.47

Equipment losses

		psi	Flow	Qty	Dia(inch)	Velocity		
	MMF filter loss	12	500	1				27.6
	Cartridge filter(CF-240/CF-250)loss	1	1500	1				2.3
	AOP reactor contact tank	12	1500	1				27.60
						Total equipment headlosses		57.5

Add 20% contingency for older pipe conditions **14.70**

TOTAL DYNAMIC HEAD **83.70** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP	**39.14**	
Selected Motor HP	**50.00**	HP

HP = q(gpm)xH(ft)/(3960*0.81)
Pump Model = TBD

Prepared By NRS Checked By:

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Phase III GWTP**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**June 27, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	MMF Feed Pumps - Horizontal split case centrifugal pump
Design Flowrate (gpm)	1800
Pump Flowrate (gpm)	1800
Pump Location	Pump pad of MMF Feed pumps
Pipeline Description	Water is pumped from EQ tank through MMFs, Bag filters, AOP and into Pumping tank

HEAD LOSSES

Static Discharge Head

Pumping Tank bottom Elevation	0.5	$h_s = \Delta z$
MMF inlet top Elevation	12.00	$h_s = \Delta z$
Static Head Loss (ft)	11.50	Vacuum break (at outlet)
Static Head Loss (ft)	11.50	

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams	ID	Length	Flow	Velocity	Head Loss
			Coeff.	(in)	(ft)	(gpm)	ft/s	(ft)
a	Pump Suction from EQ tank	PVC	150	12	5	1800	5.106	0.03
b	Pump Discharge to MMFs	PVC	150	10	30	1800	7.353	0.42
c	MMF to 10" Flange TEE to bag filtration units	PVC	150	12	30	1800	5.106	0.17
d	Cartridge filtration units from 10"Flange TEE to AOP contact tank	PVC	150	10	20	1800	7.353	0.28
n	From AOP contact tank to pumping tank	PVC	150	12	30	1800	5.106	0.17
						Subtotal Straight Pipe Friction Head Loss (ft)		1.08

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow	Qty	Diameter	K		Head Loss
			(gpm)					(ft)
EQ tank to Suction of Pump P-100A/P-100B	12 inch 90° bend	30	1800	2	12	0.51		0.41
	8" TEE		1800	1	8	1.00		2.05
	8 inch 90 bend		1800	2	8	0.51		2.09
	8" Butterfly valve	8	1800	2	8	0.77		3.16
	8 x 12 reducer		1800	1	12	0.50		0.20
	Entry loss		1800	1	12	1.00		0.41
Discharge of Pump P-100A/P-100B to MMFs units	6 x 12 Expander		1600	1	12	0.50		0.16
	12" butterfly valve	8	1800	1	12	0.77		0.31
	12" check valve	100/50	1800	1	12	1.50		0.61
	12" flange TEE up	20/60	600	3	10	1.00		0.28
	10x12 flanged reducer		600	1	10	0.50		0.05
	12 inch 90 bend	30	1800	3	12	0.51		0.62
	Exit loss		1800	1	10	1.00		0.84
To cartridge filtration units (CF-240/CF-250)	12x10 flanged reducer		1800	1	10	0.50		0.42
	12" flange TEE		1800	2	10	1.00		1.68
	12" gate valve	8	1800	1	12	0.77		0.31
	10 x 12 reducer		1800	1	10	0.50		0.42
	10" gate valve	8	1800	2	12	0.77		0.62
Cartridge filter to AOP contact tank and to Pumping tank	90o bend		1800	5	12	0.51		1.03
	12" butterfly valve	8	1800	2	12	0.77		0.62

$$h_m = \sum \frac{Kv^2}{2g}$$

						Subtotal of minor losses(ft)		16.31

Equipment losses

		psi	Flow	Qty	Dia(inch)	Velocity		
	MMF filter loss	12	600	1				27.6
	Cartridge filter(CF-240/CF-250)loss	1	1800	1				2.3
	AOP reactor contact tank	12	1800	1				27.60
						Total equipment headlosses		57.5

Add 20% contingency for older pipe conditions **20.87**

TOTAL DYNAMIC HEAD **89.87** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP	**50.43**	
Selected Motor HP	**50.00**	HP

HP = q(gpm)xH(ft)/(3960*0.81)
Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Phase III GWTP**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**March 11, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	LGAC Feed Pumps - Horizontal split case centrifugal pump
Design Flowrate (gpm)	1500
Pump Flowrate (gpm)	1500
Pump Location	Pump pad of LGAC Feed pumps
Pipeline Description	Water is pumped from Pumping tank to LGAC and Stormbasins

HEAD LOSSES

Static Discharge Head

Pumping Tank bottom Elevation	0.5	
LGAC inlet top Elevation	22.00	
Static Head Loss (ft)	21.50	ok

$$h_s = \Delta z$$

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams Coeff.	ID (in)	Length (ft)	Flow (gpm)	Velocity ft/s	Head Loss (ft)
a	Pump Suction - Pumping tank to LGACs	PVC	150	12	10	1500	4.255	0.04
b	Pump Discharge to LGACs and out to Stormbasins	PVC	150	12	300	1500	4.255	1.24

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Subtotal Straight Pipe Friction Head Loss (ft) 1.29

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow (gpm)	Qty	Diameter	K		Head Loss (ft)
Pump Suction - Pumping tank to pump P-400A/B	Butterfly Valve	8	1500	2	12	0.77		0.43
	12"x 10" Reducer		1500	1	10	0.50		0.29
	90 degree bends	30	1500	3	12	0.51		0.43
	Tee		1500	1	12	1.00		0.28
	Entry loss		1500	1	12	1.00		0.28
Pump Discharge - pump P-400A/B to LGACs and SBs	8"x12" Expander		1500	1	12	0.50		0.14
	Butterfly Valve	8	1500	1	12	0.77		0.22
	Check Valve	50/100	1500	1	12	1.50		0.42
	90 degree bends		1500	3	12	0.51		0.43
	12" flanged Tee UP	20	500	3	10	1.00		0.19
	12"x 10" Reducer		500	1	10	0.50		0.03
	Header inlet in LGAC		1600	1	12	1.00		11.50
	Exit loss		1500	1	12	1.00		0.28
							Subtotal of minor losses(ft)	14.94

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				
Pump Discharge - pump to SBs	Magnetic Flowmeter	1	1500	1	12			2.30

Total piping headlosses 18.52

Add 20% contingency for older pipe conditions **22.23**

TOTAL DYNAMIC HEAD **44** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **20.97**

Selected Motor HP **30.00** HP

HP = q(gpm)xH(ft)/(3960*0.79)

Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Phase III GWTP**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**March 13, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	LGAC Feed Pumps - Horizontal split case centrifugal pump
Design Flowrate (gpm)	1800
Pump Flowrate (gpm)	1800
Pump Location	Pump pad of LGAC Feed pumps
Pipeline Description	Water is pumped from Pumping tank to LGAC and Stormbasins

HEAD LOSSES

Static Discharge Head

Pumping Tank bottom Elevation	0.5
LGAC inlet top Elevation	22.00
Static Head Loss (ft)	21.50

$$h_s = \Delta z$$

ok

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams	ID	Length	Flow	Velocity	Head Loss
			Coeff.	(in)	(ft)	(gpm)	ft/s	(ft)
a	Pump Suction - Pumping tank to LGACs	PVC	150	12	10	1800	5.106	0.06
b	Pump Discharge to LGACs and out to Stormbasins	PVC	150	12	300	1800	5.106	1.74

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Subtotal Straight Pipe Friction Head Loss (ft) 1.80

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow	Qty	Diameter	K		Head Loss
			(gpm)					(ft)
Pump Suction - Pumping tank to pump P-400A/B	Butterfly Valve	8	1800	2	12	0.77		0.62
	12"x 10" Reducer		1800	1	10	0.50		0.42
	90 degree bends	30	1800	3	12	0.51		0.62
	Tee		1800	1	12	1.00		0.41
	Entry loss		1800	1	12	1.00		0.41
Pump Discharge - pump P-400A/B to LGACs and SBs	8"x12" Expander		1800	1	12	0.50		0.20
	Butterfly Valve	8	1800	1	12	0.77		0.31
	Check Valve	50/100	1800	1	12	1.50		0.61
	90 degree bends		1800	3	12	0.51		0.62
	12" flanged Tee UP	20	500	3	10	1.00		0.19
	12"x 10" Reducer		500	1	10	0.50		0.03
	Header inlet in LGAC		1800	1	12	1.00		11.50
	Exit loss		1800	1	12	1.00		0.41
							Subtotal of minor losses(ft)	16.35

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				
Pump Discharge - pump to SBs	Magnetic Flowmeter	1	1800	1	12			2.30

Total piping headlosses 20.45

Add 20% contingency for older pipe conditions **24.54**

TOTAL DYNAMIC HEAD **46** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **26.49**

Selected Motor HP **30.00** HP

HP = q(gpm)xH(ft)/(3960*0.79)

Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Phase III GWTP**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**December 3, 2023**

PUMP AND PIPELINE DESCRIPTION

Type	Backwash supply pumps - Horizontal split case centrifugal pump
Design Flowrate (gpm)	950
Pump Flowrate (gpm)	950
Pump Location	Pump pad of BWS pump
Pipeline Description	Water is pumped from Clean Water Tank (BWS) to LGACs/MMF and then to BWW inlet

HEAD LOSSES

Static Discharge Head

BWS Tank suction	2
BWW Tank inlet nozzles (ft MSL)	20.00
Static Head Loss (ft)	18.00

$$h_s = \Delta z$$

ok

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams Coeff.	ID (in)	Length (ft)	Flow (gpm)	Velocity ft/s	Head Loss (ft)
a	Pump Suction - Clean water tank (BWS) to pump P-700A/B	HDPE	150	8	10	950	6.064	0.13
b	Pump Discharge to LGACs and BWW tank	PVC	150	8	100	950	6.064	1.28

Subtotal Straight Pipe Friction Head Loss (ft) 1.41

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow (gpm)	Qty	Diameter	K		Head Loss (ft)
Pump Suction - BWS tank to pump P-700A/B	Butterfly Valve	8	950	2	8	0.77		0.88
	8"x 6" Reducer		950	1	8	0.50		0.29
	90 degree bends	30	950	4	8	0.51		1.17
	Entry loss		950	1	8	1.00		0.57
	Tee loss		950	1	8	1.00		0.57
Pump Discharge - to LGAC	4"x8" Expander		950	1	8	0.50		0.29
	Butterfly Valve	8	950	2	8	0.77		0.88
	Check Valve	50/100	950	1	8	1.50		0.86
	90 degree bends		950	4	8	0.51		1.17
	8" X 10" expander		950	1	10	0.50		0.12
	Tee loss	20	950	2	10	1.00		0.47
	Header Nozzle inlet LGAC		950	1	10	1.00		0.23
	Exit loss		950	1	12	1.00		0.11
						Subtotal of minor losses(ft)		7.60

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				
LGAC	LGAC loss (operating pressure)	12	950	1	12			27.60

Total piping headlosses 36.61

Add 20% contingency for older pipe conditions and clean water **43.93**

TOTAL DYNAMIC HEAD **62** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **18.57**

Selected Motor HP **20.00** HP

HP = q(gpm)xH(ft)/(3960*0.80)

Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	Phase III GWTP	SPEC NO.	
PROJECT	Phase III GWTP	REV	
PROJECT NO.	112G08005-WE24	DATE	December 3, 2023

PUMP AND PIPELINE DESCRIPTION

Type	Submersible Pump- Water is pumped from Building sump to EQ tank
Design Flowrate (gpm)	150
Pump Flowrate (gpm)	150
Pump Location	Pump pad
Pipeline Description	Water is pumped from BWW tank to EQ tank

HEAD LOSSES

Static Discharge Head

Building sump pad	-10
EQ tank 3" inlet pipe (ft MSL)	20.00
Static Head Loss (ft)	30.00

ok

$$h_s = \Delta z$$

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams Coeff.	ID (in)	Length (ft)	Flow (gpm)	Velocity ft/s	Head Loss (ft)
a	Pump Discharge P-800A/B- Building sump to EQ tank	PVC	150	3	50	150	6.808	2.49

Subtotal Straight Pipe Friction Head Loss (ft) 2.49

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow (gpm)	Qty	Diameter	K		Head Loss (ft)
Pump Discharge - pump P-800A/B to EQ tank	Ball Valve	8	150	2	3	0.77		1.11
	Check Valve	50/100	150	1	3	1.50		1.08
	90 degree bends		150	4	3	0.51		1.47
	Exit loss		150	1	3	1.00		0.72
	Entry loss		150	1	3	1.00		0.72
							Subtotal of minor losses(ft)	5.10

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				

Total piping headlosses 7.59

Add 20% contingency for older pipe conditions **9.11**

TOTAL DYNAMIC HEAD **39** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **3.02**

Selected Motor HP **5.00** HP

HP = q(gpm)xH(ft)/(3960*0.49)

Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Bethpage, NY**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**March 13, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	RW-8 pumps P-8
Max Pump Flowrate from each well (gpm)	600
Pump Location (in well)	Pump rests 150 ft from top of casing
Pipeline Description	Water is pumped from bottom of pump to top of EQ tank

HEAD LOSSES

Static Discharge Head

Well Grade elevation	46
EQ tank Inlet Elevation (ft MSL)	70
Static Water level (50 ft below well Grade elevation)	-25
Drawdown in well	-50
Lowest Groundwater Elevation (ft MSL)	-75
Total Static Headloss (ft)	99.00

$$h_s = \Delta z$$

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams	ID	Length	Flow	Velocity	Head Loss
			Coeff.	(in)	(ft)	(gpm)	ft/s	(ft)
a	GW Pump Discharge - RW8 line to EQ tank	HDPE	150	6	100	600	6.808	2.220

Subtotal Straight Pipe Friction Head Loss (ft) 2.22

HAZEN WILLIAMS EQUATION

OK

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow	Qty	Diameter	K		Head Loss
			(gpm)					(ft)
	8 inch 90° elbow		600	6	6	0.51		2.20
	8 inch 45° elbow		600	2	6	0.51		0.73
	8 inch Butterfly valve		600	2	6	0.77		1.11
	8 inch check valve		600	1	6	1.50		1.08
	8 inch Butterfly valve		600	2	6	0.77		1.11
	Exit Loss		600	1	6	1.00		0.72
							Subtotal of minor losses(ft)	6.96

OK

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				
	Flowmeter - 6"	1		1	6			2.30

Total piping headlosses 11.48

Add 30% contingency for older pipe conditions **13.78**

TOTAL DYNAMIC HEAD **112.8** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **21.4**

Selected Motor HP **30.00** HP

HP = q(gpm)xH(ft)/(3960*0.80)

Pump Model = TBD

Prepared By NRS

Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Bethpage, NY**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**March 13, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	RW-9 pumps P-9
Max Pump Flowrate from each well (gpm)	600
Pump Location (in well)	Pump rests 150 ft from top of casing
Pipeline Description	Water is pumped from bottom of pump to top of EQ tank

HEAD LOSSES

Static Discharge Head

Well Grade elevation	54
EQ tank Inlet Elevation (ft MSL)	70
Static Water level (50 ft below well Grade elevation)	-32
Drawdown in well	-50
Lowest Groundwater Elevation (ft MSL)	-82
Total Static Headloss (ft)	98.00

$$h_s = \Delta z$$

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams Coeff.	ID (in)	Length (ft)	Flow (gpm)	Velocity ft/s	Head Loss (ft)	
a	GW Pump Discharge - RW9 line to EQ tank	HDPE	150	8	3150	600	3.830	17.251	OK
						Subtotal Straight Pipe Friction Head Loss (ft)		17.25	

HAZEN WILLIAMS EQUATION

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow (gpm)	Qty	Diameter	K		Head Loss (ft)	
	8 inch 90° elbow		600	12	8	0.51		1.40	OK
	8 inch 45° elbow		600	6	8	0.51		0.70	
	8 inch Butterfly valve		600	2	8	0.77		0.35	
	8 inch check valve		600	1	8	1.50		0.34	
	8 inch Butterfly valve		600	2	8	0.77		0.35	
	Exit Loss		600	1	8	1.00		0.23	
							Subtotal of minor losses(ft)	3.37	

$$h_m = \sum \frac{Kv^2}{2g}$$

Equipment losses

		psi		Qty				
	Flowmeter - 6"	1		1	6			2.30
							Total piping headlosses	22.92
							Add 20% contingency for older pipe conditions	**27.50**

TOTAL DYNAMIC HEAD	**125.5**	**FT**
Computed HP	**23.77**	
Selected Motor HP	**30.00**	HP

$$TDH = h_z + h_f + h_m$$

HP =

Pump Model = TBD

Prepared By NRS Checked By: _____

TOTAL DYNAMIC HEAD and HP CALCULATION

SITE INFORMATION

SITE	**Phase III GWTP**	SPEC NO.	
PROJECT	**Bethpage, NY**	REV	
PROJECT NO.	**112G08005-WE24**	DATE	**March 13, 2024**

PUMP AND PIPELINE DESCRIPTION

Type	RW-10A pumps P-10
Max Pump Flowrate from each well (gpm)	700
Pump Location (in well)	Pump rests 150 ft from top of casing
Pipeline Description	Water is pumped from bottom of pump to top of EQ tank

HEAD LOSSES

Static Discharge Head

Well Grade elevation	54
EQ tank Inlet Elevation (ft MSL)	70
Static Water level (50 ft below well Grade elevation)	-32
Drawdown in well	-50
Lowest Groundwater Elevation (ft MSL)	-82
Total Static Headloss (ft)	98.00

$$h_s = \Delta z$$

Pipe Friction Head Loss

Line No.	Description	Pipe Mat'l	Hazen Williams Coeff.	ID (in)	Length (ft)	Flow (gpm)	Velocity ft/s	Head Loss (ft)
a	GW Pump Discharge - RW10A line to EQ tank	HDPE	150	8	4000	700	4.468	29.136

Subtotal Straight Pipe Friction Head Loss (ft) 29.14

HAZEN WILLIAMS EQUATION

OK

$$h_f = \frac{0.2083\left(\frac{100}{C}\right)^{1.85} Q^{1.85} L}{100 D^{4.8655}}$$

Miscellaneous Losses - estimate

Fittings:

Line No.	Type	LD	Flow (gpm)	Qty	Diameter	K		Head Loss (ft)
	8 inch 90° elbow		700	14	8	0.51		2.22
	8 inch 45° elbow		700	6	8	0.51		0.95
	8 inch Butterfly valve		700	2	8	0.77		0.48
	8 inch check valve		700	1	8	1.50		0.47
	8 inch Butterfly valve		700	2	8	0.77		0.48
	Exit Loss		700	1	8	1.00		0.31
							Subtotal of minor losses(ft)	4.90

Equipment losses

		psi		Qty				
	Flowmeter - 6"	1		1	6			2.30

Total piping headlosses 36.33

Add 20% contingency for older pipe conditions **43.60**

OK

$$h_m = \sum \frac{Kv^2}{2g}$$

TOTAL DYNAMIC HEAD **141.6** **FT**

$$TDH = h_z + h_f + h_m$$

Computed HP **31.29**

Selected Motor HP **40.00** HP

HP = q(gpm)xH(ft)/(3960*0.80)

Pump Model = TBD

Prepared By NRS Checked By: _____

SITE INFORMATION			
SITE	**Bethpage, NY**	SPEC NO.	
PROJECT	**Phase III**	REV	**1**
PROJECT NO.		DATE	**03/11/24**

Storage Tank calculations

EQ tank (T-100)	12'D x 18' H	Unit	
SF area	113	sqft	
Working height	15	ft	
EQ Working volume	1695	ft3	
EQ Working volume	12679	gallons	
EQ Nominal volume	**15000**	**gallons**	
Design flowrate	1500	gpm	
Detention time	8.5	min	

LGAC pumping tank (T-410)	12'D x 18' H	Unit	
Diameter	12	ft	
Height	18	ft	
SF area	113	sqft	
Working height	15	ft	
LGAC Tank Working volume	1696	ft3	
LGAC Tank Working volume	12683	gallons	
LGAC Tank Nominal volume	**15000**	**gallons**	
Design flowrate	1500	gpm	
Detention time	8.5	min	

Backwash Supply tank (T-500)	12' D X 16' H	Unit	
MMF			
MMF SF area	78.5	ft2/filter	10' d x 11.5' high
MMF BWS volume	8242.5	gallons	78.5 sqft x 10 min x 5gpm/sf (low rate) + 78.5sqft x 2 min air purge x 5 gpm/sf (low rate) + 78.5 sqft x 3 min re-stratification water only x 15 gpm/sft (high rate) =
LGAC			
LGAC SF area	78.5	ft2/vessel	10' d x 22' high
LGAC BW rate	12	gpm/ft2	
LGAC BW flow rate/vessel	942	gpm	
BW duration	**10**	**min**	
BWS tank diameter	12	ft	
BWS tank height	16	ft	
Working volume	9420	gallons	
Nominal volume	**13529**	**gallons**	

Backwash waste tank (T-550)	15' D X 22' H	Unit	
MMF/LGAC BW volume x 3 filters or vessels	24728	gallons	
BWW Working volume	**24728**	gallons	
BWW Diameter	15	ft	
BWW Height	22	ft	
BWW Nominal volume	3885.75	ft3	
BWW Nominal volume	**29065**	**gallons**	
BWW Nominal volume with 12" freeboard	**30387**	**gallons**	

SITE INFORMATION			
SITE	**Bethpage, NY**	SPEC NO.	
PROJECT	**Phase III**	REV	**1**
PROJECT NO.		DATE	**03/11/24**

Hydrogen Peroxide Dosing and Tank Calculations

Treatment Plant Flow =	1500	gpm
Hydrogen peroxide dose	6	ppm
Lbs of hydrogen peroxide required on an hourly basis	4.5	lbs/hr
% of Hydrogen Peroxide be used at the site	27.0%	%
Density of 27% H2O2	9.22	lbs/gal
Peroxide in 27% solution	2.489	lbs/gal
Quantity of H2O2 Required	1.81	gal/hour
Quantity required per day	43	gpd
Volume for four weeks	1,216	gal/month

Hydrogen Peroxide Tank - Double Wall (Based on Trojan USP tank)

Outer Tank diameter, inches	102
Outer Tank diameter, feet	8.5
Inner Tank diameter, inches	95
Inner Tank diameter, feet	8
Tank Height, inches	107.5
Tank Height, feet	9.0
Operating Height, inches	90
Operating Height, feet	7.5
Total Volume of tank, ft3	441
Total Volume of tank, gallon	3297
Operating Volume of tank, ft3	369
Operating Volume of tank, gallon	2760
Quantity of hydrogen peroxide (70% working volume), gallons	1932
Feet of chemical in tank	5.25
Usage at 1,600 gpm flow; gal/day	43
Days of storage @ 1,500 gpm plant flow + 6 ppm dose	44.5

SITE INFORMATION			
SITE	**Bethpage, NY**	SPEC NO.	
PROJECT	**Phase III**	REV	**1**
PROJECT NO.		DATE	**03/11/24**

Oxygen and Ozone demand

Treatment Plant Flow	1500	gpm
Treatment Plant Flow	2.16	MGD
Ozone concentration needed	3	ppm
Ozone concentration design	6	ppm
Lbs of Ozone loading per day	108	lbs/day
Lbs of Oxygen demand per day	1081	lbs/day
Oxygen demand per day	13054	scf
Oxygen demand per hour	543.9	scfh

SITE INFORMATION			
SITE	**Bethpage, NY**	SPEC NO.	
PROJECT	**Phase III**	REV	**1**
PROJECT NO.		DATE	**03/11/24**

Sodium Hydroxide Dosing and Tank Calculations

Treatment Plant Flow	1500	gpm
Sodium Hydroxide dose	20	ppm
Lbs of sodium hydroxide required on an hourly basis	15.0	lbs/hr
25% Sodium Hydroxide used at the site	25.0%	%
Density of 25% NaOH	10.63	lbs/gal
NaOH in 25% solution	2.658	lbs/gal
Quantity of NaOH Required	5.65	gal/hour
Quantity required per day	136	gpd
Volume for 4 weeks	3,796	gal/4 weeks
Nominal tank volume	4,400	gallons
Working tank volume	4,000	gallons

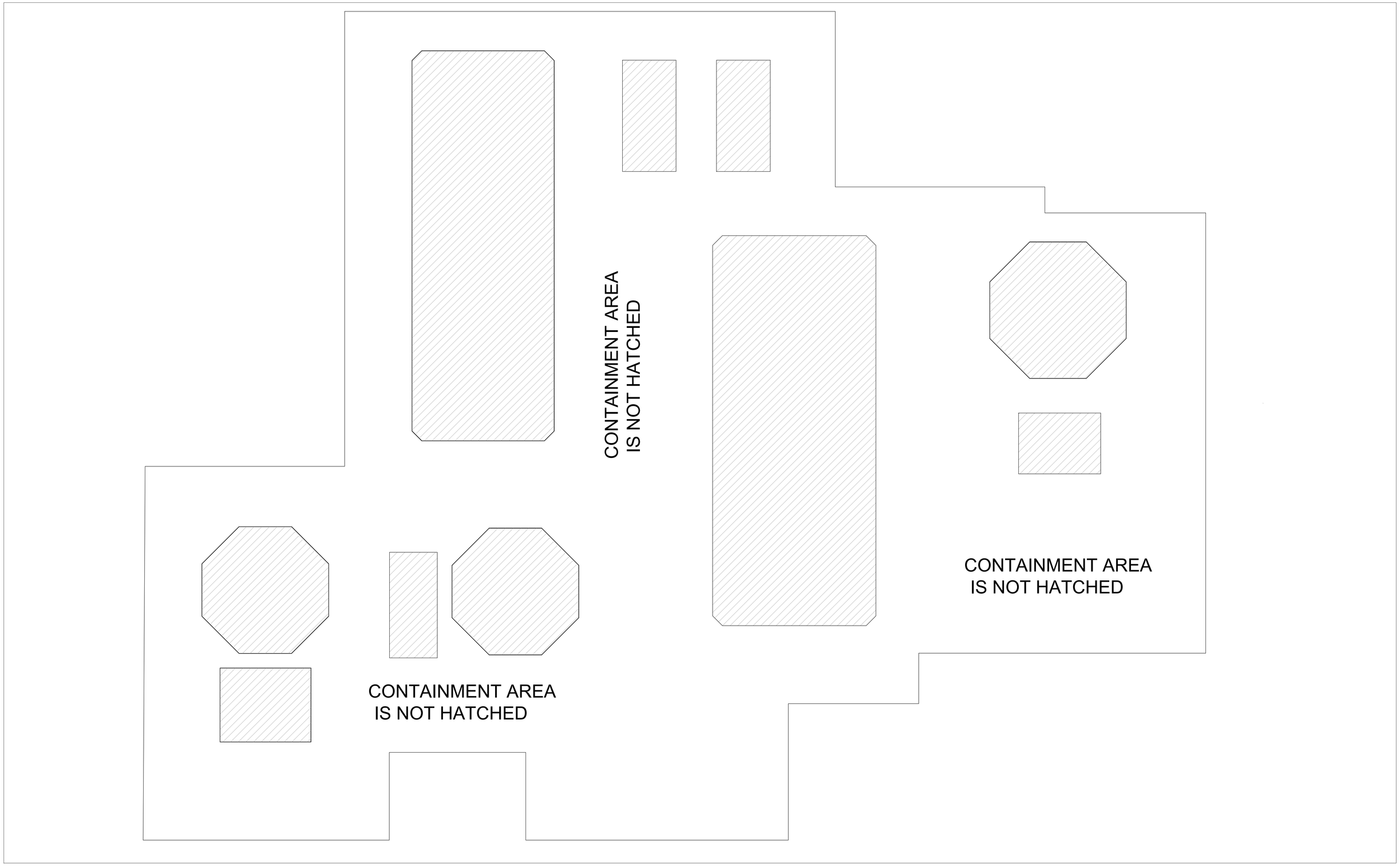
SITE INFORMATION			
SITE	**Bethpage, NY**	SPEC NO.	
PROJECT	**Phase III**	REV	**1**
PROJECT NO.		DATE	**03/11/24**

Sodium Hypochlorite Dosing and Tank Calculations

NaOCl alone: mg/L NaOCl = 0.7 x 2.5 mg/L Fe + 1.4 x 0 mg/L Mn = 1.75 mg/L of NaOCL (say ~ 2 mg/L)		
Treatment Plant Flow	1500	gpm
Sodium Hypochlorite dose	2	ppm
Lbs of sodium hypochlorite required on an hourly basis	1.5	lbs/hr
12% Sodium Hypochlorite used at the site	12.0%	%
Density of 12% NaOCL	10.18	lbs/gal
NaOCL in 12% solution	1.222	lbs/gal
Quantity of NaOCL Required	1.23	gal/hour
Quantity required per day	29	gpd
Volume for four weeks	885	gal/month
Nominal tank volume	1,000	gallons

Building containment calculations to determine Total volume to be contained and design of containment curb inside building

SITE INFORMATION				
SITE	**Bethpage, NY**	**SPEC NO.**		
PROJECT	**Phase III GWTP**	**REV**		
PROJECT NO.		**DATE**	**9/9/2024**	
Building Containment Volume Calculations				
Building dimensions	144' x 85'			
Building area (ft2)	12240			
Effective Building area (excludes all rooms) (ft2)	6698			
Area taken by equipment pad (ft2)	**1919**	**Total**	**1919**	ft2
Effective Building area to contain volume (ft2)	4779	MMFs	600	ft2
Effective Building area to contain volume (gallon/in)	2979	LGACs	700	ft2
Curb height of building (inches)	6	Cartridge Filters	145	ft2
Total building containment volume (gallons)	17873	EQ tank	86	ft2
Building sump 12'x 8' x 8' volume (gallons)	5745	BWS tank	86	ft2
Total containment volume (gallons) = Building containment + Building sump	**23618**	LGAC Feed tank	86	ft2
Biggest BWS tank volume (gallons)	17000	EQ tank Pumps	72	ft2
110% BWS tank volume (gallons)	18700	LGAC Feed Pumps	72	ft2
Total volume to be contained (gallons)	**18700**	BWS Pumps	72	ft2
Total building containment + Building sump >Total volume to be contained (gallons)	**23618 > 18700**	**OK**		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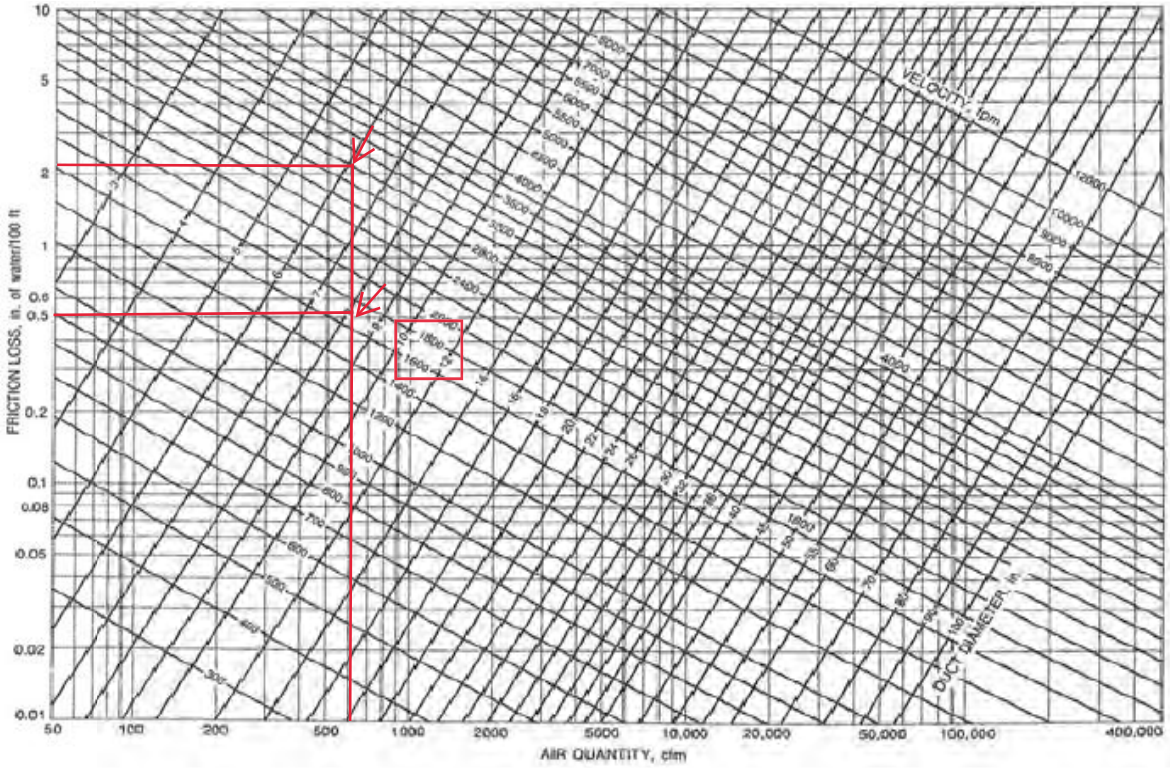
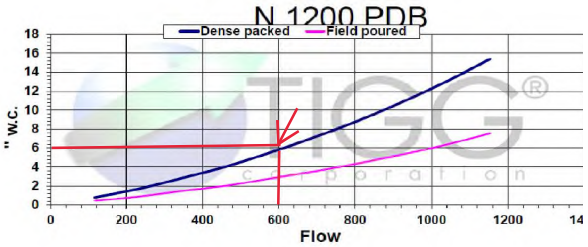
SITE INFORMATION			
SITE	**Bethpage, NY**	**SPEC NO.**	
PROJECT	**Phase III GWTP**	**REV**	
PROJECT NO.		**DATE**	**3/1/2024**

Blower Headloss Calculation

GAC vessel pressure drop at 600 scfm through 4mm pellet, inch of water	6	inch
Max Friction Loss at 600 scfm flow rate in 6" (inch of water / 100 feet)	2.2	inch
Max Friction Loss at 600 scfm flow rate in 8" (inch of water /100 feet)	0.5	inch
Max Fittings Loss at 600 scfm flow rate in 6" and 8" fittings (inch of water /100 feet)	2.2	inch
Loss due to vacuum, inch of water	2	inch
Total Pressure drop, inch	13	inch
Total Design Pressure drop, inch	**18**	**inch**

Air velocity in 8" at 600 cfm duct (FPM)	1700	FPM





STRUCTURAL CALCULATIONS

FOR

Bethpage NY Phase III

Code Search

Code: International Building Code 2018

Occupancy:

Occupancy Group = U Utility & Miscellaneous

Risk Category & Importance Factors:

Risk Category =	III
Wind factor =	1.00
Snow factor =	1.10
Seismic factor =	1.25

Type of Construction:

Fire Rating:

Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	4.00 / 12	18.4 deg
Building length	120.0 ft	
Least width	80.0 ft	
Mean Roof Ht (h)	30.0 ft	
Parapet ht above grd	0.0 ft	
Minimum parapet ht	0.0 ft	

Live Loads:

Roof

0 to 200 sf:	20 psf
200 to 600 sf:	24 - 0.02Area, but not less than 12 psf
over 600 sf:	12 psf

Floor:

Typical Floor	50 psf
Partitions	15 psf
Corridors above first floor	80 psf
Lobbies & first floor corridors	100 psf
Stairs and exit ways	100 psf

Tetra Tech
2000 Warington Way
Louisville, KY
(502) 584-5555

JOB TITLE Bethpage NY Phase III
JOB NO. 112G09005-WE24 **SHEET NO.**
CALCULATED BY J. Thomas **DATE** 12/1/23
CHECKED BY **DATE**

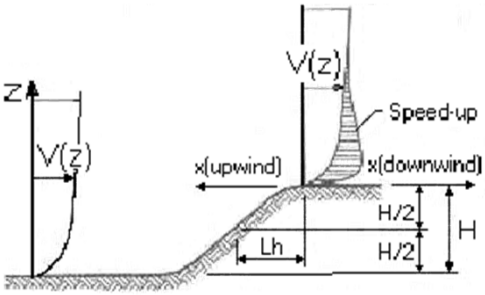
Wind Loads : ASCE 7- 16

Ultimate Wind Speed	136 mph
Nominal Wind Speed	105.3 mph
Risk Category	III
Exposure Category	B
Enclosure Classif.	Enclosed Building
Internal pressure	+/-0.18
Directionality (Kd)	0.85
Kh case 1	0.701
Kh case 2	0.701
Type of roof	Gable

Topographic Factor (Kzt)

Topography		Flat
Hill Height	(H)	80.0 ft
Half Hill Length (Lh)		100.0 ft
Actual H/Lh	=	0.80
Use H/Lh	=	0.50
Modified Lh	=	160.0 ft
From top of crest: x =		50.0 ft
Bldg up/down wind?		downwind

H/Lh= 0.50 K_1 = 0.000
x/Lh = 0.31 K_2 = 0.792
z/Lh = 0.19 K_3 = 1.000
At Mean Roof Ht:
Kzt = $(1+K_1K_2K_3)$^2 = 1.00



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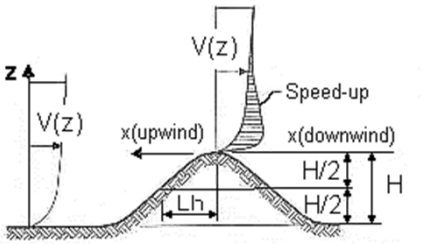

2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h =	30.0 ft
B =	80.0 ft
/z (0.6h) =	30.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).
If building h/B>4 then may be flexible and should be investigated.
h/B = 0.38 Rigid structure (low rise bldg)

G = 0.85 Using rigid structure formula

Rigid Structure

$\bar{e}$ =	0.33
ℓ =	320 ft
z_{min} =	30 ft
c =	0.30
g_Q, g_v =	3.4
L_z =	310.0 ft
Q =	0.87
I_z =	0.30
G =	**0.85**

Flexible or Dynamically Sensitive Structure

Natural Frequency (η_1) =	0.0 Hz				
Damping ratio (β) =	0				
/b =	0.45				
/α =	0.25				
Vz =	87.6				
N_1 =	0.00				
R_n =	0.000				
R_h =	28.282	η =	0.000	h =	30.0 ft
R_B =	28.282	η =	0.000		
R_L =	28.282	η =	0.000		
g_R =	0.000				
R =	0.000				
Gf =	0.000				

Enclosure Classification

Test for Enclosed Building: Ao < 0.01Ag or 4 sf, whichever is smaller

Test for Open Building: All walls are at least 80% open.
Ao ≥ 0.8Ag

Test for Partially Enclosed Building: Predominately open on one side only

	Input			Test	
Ao	500.0	sf	Ao ≥ 1.1Aoi	NO	
Ag	600.0	sf	Ao > 4' or 0.01Ag	YES	
Aoi	1000.0	sf	Aoi / Agi ≤ 0.20	YES	Building is NOT Partially Enclosed
Agi	10000.0	sf			

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:
Ao ≥ 1.1Aoi
Ao > smaller of 4' or 0.01 Ag
Aoi / Agi ≤ 0.20
Where:
Ao = the total area of openings in a wall that receives positive external pressure.
Ag = the gross area of that wall in which Ao is identified.
Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Test for Partially Open Building: A building that does not qualify as open, enclosed or partially enclosed.
(This type building will have same wind pressures as an enclosed building.

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): 0 sf
Unpartitioned internal volume (Vi) : 0 cf
Ri = 1.00

Ground Elevation Factor (Ke)

Grd level above sea level = 0.0 ft Ke = 1.0000
Constant = 0.00256 Adj Constant = 0.00256

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CHECKED BY		**DATE**	

Wind Loads - MWFRS all h (Except for Open Buildings)

Kh (case 2) =	0.70			GCpi =	+/-0.18
Base pressure (q_h) =	**28.2 psf**	Bldg dim parallel to ridge =	120.0 ft	G =	0.85
Roof Angle (θ) =	18.4 deg	Bldg dim normal to ridge =	80.0 ft	qi = qh	
Roof tributary area:		h =	30.0 ft		
Wind normal to ridge =(h/2)*L:	1800 sf	ridge ht =	36.7 ft		
Wind parallel to ridge =(h/2)*L:	1200 sf				

Ultimate Wind Surface Pressures (psf)

Surface	Wind Normal to Ridge L/B = 0.67		h/L = 0.38		Wind Parallel to Ridge L/B = 1.50		h/L = 0.25	
	Cp	q_hGC_p	w/+q_iGC_{pi}	w/-q_hGC_{pi}	Dist.*	Cp	q_hGC_p	w/ +q_iGC_{pi}	w/ -q_hGC_{pi}
Windward Wall (WW)	0.80	19.1	see table below			0.80	19.1	see table below	
Leeward Wall (LW)	-0.50	-11.9	-17.0	-6.9		-0.40	-9.6	-14.6	-4.5
Side Wall (SW)	-0.70	-16.7	-21.8	-11.6		-0.70	-16.7	-21.8	-11.6
Leeward Roof (LR)	-0.57	-13.6	-18.7	-8.5		Included in windward roof			
Neg Windward Roof pressure	-0.43	-10.2	-15.3	-5.2	0 to h/2*	-0.90	-21.5	-26.6	-16.4
Pos/min Windward Roof press.	0.04	1.0	-4.1	6.0	h/2 to h*	-0.90	-21.5	-26.6	-16.4
					h to 2h*	-0.50	-11.9	-17.0	-6.9
					> 2h*	-0.30	-7.2	-12.2	-2.1
					Min press.	-0.18	-4.3	-9.4	0.8

*Horizontal distance from windward edge

Parapet

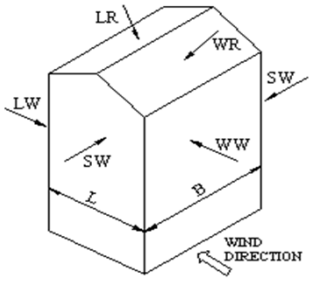
z	Kz	Kzt	qp (psf)
0.0 ft	0.57	1.00	0.0

Windward parapet: 0.0 psf (GCpn = +1.5)
Leeward parapet: 0.0 psf (GCpn = -1.0)

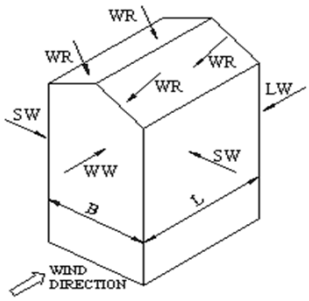
Windward roof overhangs : 19.1 psf (upward - add to windward roof pressure)

Windward Wall Pressures at "z" (psf)

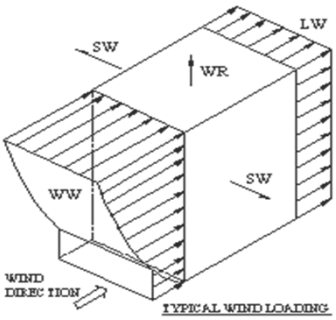
	z	Kz	Kzt	q_zGC_p	Windward Wall w/+q_iGC_{pi}	w/-q_hGC_{pi}	Combined WW + LW Wind Normal to Ridge	Wind Parallel to Ridge
	0 to 15'	0.57	1.00	15.7	10.6	20.7	27.6	25.2
	20.0 ft	0.62	1.00	17.0	11.9	22.1	29.0	26.6
	25.0 ft	0.67	1.00	18.1	13.1	23.2	30.1	27.7
h=	30.0 ft	0.70	1.00	19.1	14.0	24.2	31.0	28.7
ridge =	36.7 ft	0.74	1.00	20.2	15.2	25.3	32.2	29.8



WIND NORMAL TO RIDGE

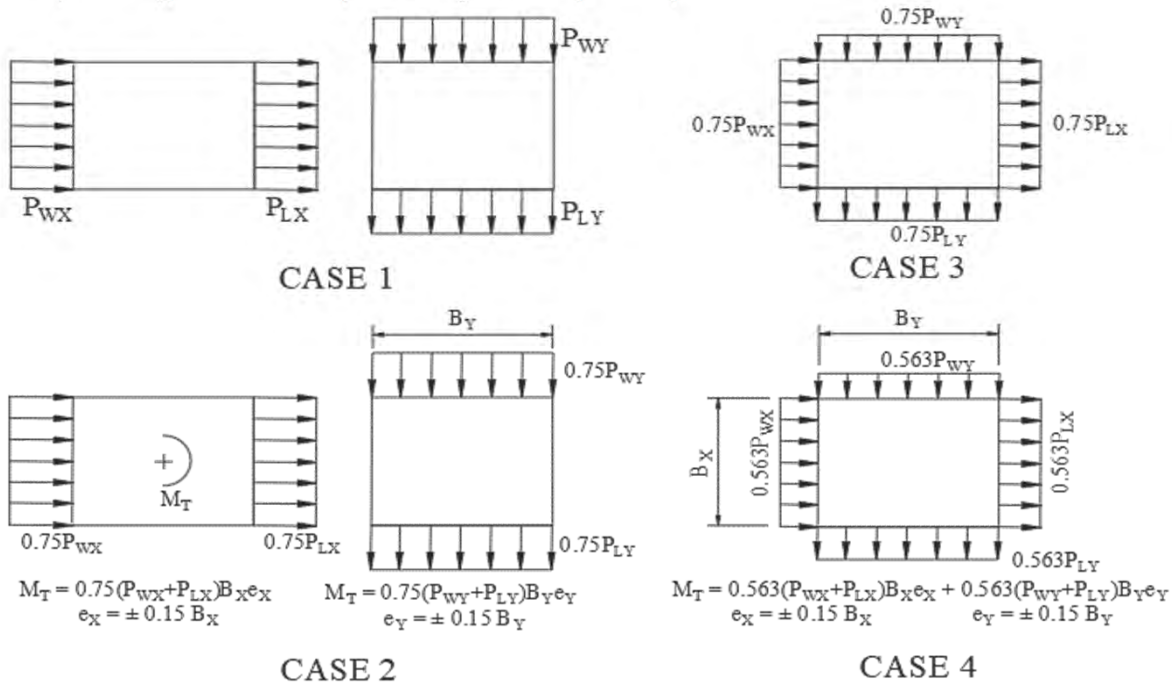


WIND PARALLEL TO RIDGE



TYPICAL WIND LOADING

NOTE: ASCE 7 requires the application of full and partial loading of the wind pressures per the 4 cases below.



Wind Forces at Floors

		Building dimension (parallel with ridge) =	120.0 ft	e =	18.00 ft
Total Floors =	1	Building dimension (normal to ridge) =	80.0 ft	e =	12.00 ft
T/Fdn (dist below grade) =	2.0 ft	L is the building dimension parallel to the wind direction			

	Elevation	Height of	Wind Normal to Ridge						Wind Parallel to Ridge			
Level	Above Grade (ft)	Centroid to Fdn (ft)	L	B	Area (sf)	Applied Force (k)	Story Shear (k)	Overturning Moment ('k)	Area	Applied Force (k)	Story Shear (k)	Overturning Moment ('k)
Equip,etc		0.00	wind on equip, screenwalls, etc =					0.0				
Parapet	0.00	0.00				0.0		0.0		0.0		
T/Ridge		0.00			0.0	0.0		0.0	0.0	0.0		0.0
Roof	15.00	17.00	80.0	120.0	900.0	24.9	24.9	0.0	600.0	15.1	15.1	0.0
1	0.00	2.00	80.0	120.0	900.0	24.9	49.7	372.8	600.0	15.1	30.3	227.0
FDN		0.00						472.2				287.6

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Ultimate Wind Pressures

Wind Loads - Components & Cladding : h ≤ 60'

Kh (case 2) =	0.70	h =	30.0 ft
Base pressure (qh) =	**28.2 psf**	a =	8.0 ft
Minimum parapet ht =	0.0 ft	GCpi =	+/-0.18
Roof Angle (θ) =	18.4 deg	qi = qh =	28.2 psf
Type of roof =	Gable		

Roof

	Surface Pressure (psf)								User input	
Area	2 sf	10 sf	20 sf	50 sf	75 sf	100 sf	200 sf	250 sf	10 sf	150 sf
Negative Zone 1 & 2e	-61.5	-61.5	-61.5	-37.4	-26.7	-19.2	-19.2	-19.2	-61.5	-19.2
Negative Zone 2n, 2r &3e	-89.7	-89.7	-77.5	-61.5	-54.4	-49.3	-37.2	-33.3	-89.7	-42.2
Negative Zone 3r	-106.6	-106.6	-91.3	-71.1	-62.2	-55.8	-55.8	-55.8	-106.6	-55.8
Positive All Zones	24.8	20.2	18.2	16	16.0	16.0	16.0	16.0	20.2	16.0
Overhang Zone 1 & 2e	-70.5	-70.5	-70.5	-54.4	-47.3	-42.3	-42.3	-42.3	-70.5	-42.3
Overhang Zone 2n & 2r	-98.7	-98.7	-89.6	-77.5	-72.2	-68.4	-59.3	-56.4	-98.7	-63.1
Overhang Zone 3e	-115.6	-115.6	-99.8	-79	-69.7	-63.2	-47.4	-42.3	-115.6	-53.9
Overhang Zone 3r	-132.5	-132.5	-112.2	-85.2	-73.3	-64.9	-64.9	-64.9	-132.5	-64.9

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 5.1 psf)

Parapet

qp = 0.0 psf

		Surface Pressure (psf)						User input
Solid Parapet Pressure		10 sf	20 sf	50 sf	100 sf	250 sf	500 sf	20 sf
CASE A:	Zone 2e :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 2n, 2r & 3e :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 3r :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CASE B:	Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Walls

	GCp +/- GCpi				Surface Pressure at h				User input	
Area	10 sf	100 sf	200 sf	500 sf	10 sf	100 sf	200 sf	500 sf	20 sf	55 sf
Negative Zone 4	-1.28	-1.10	-1.05	-0.98	-36.1	-31.1	-29.6	-27.6	-34.6	-32.4
Negative Zone 5	-1.58	-1.23	-1.12	-0.98	-44.6	-34.6	-31.6	-27.6	-41.6	-37.2
Positive Zone 4 & 5	1.18	1.00	0.95	0.88	33.3	28.3	26.8	24.8	31.8	29.6

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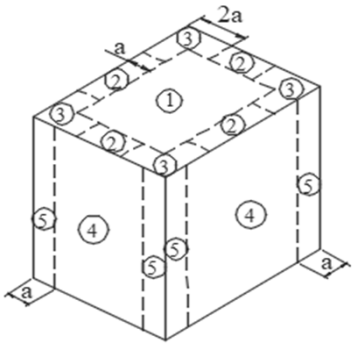
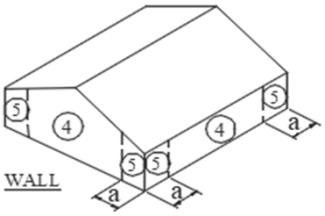
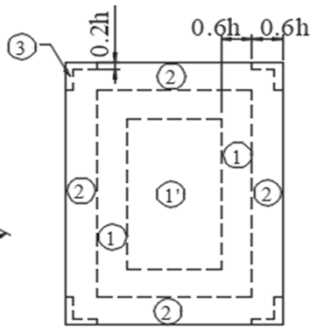
Location of C&C Wind Pressure Zones - ASCE 7-16



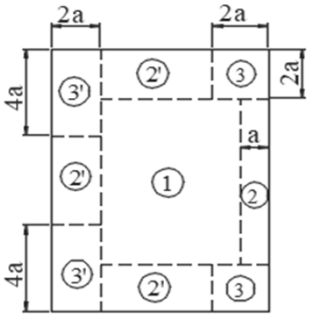
Roofs w/ θ ≤ 10°
and all walls
h > 60'



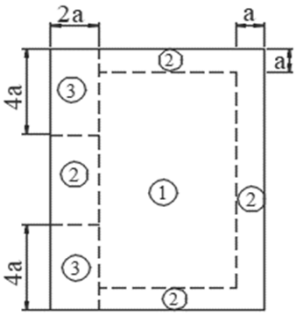
Walls h ≤ 60'
& alt design h<90'



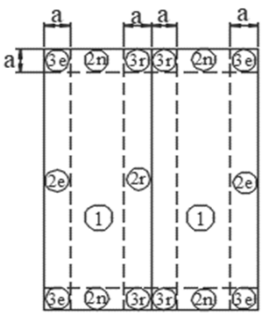
Gable, Sawtooth and
Multispan Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'



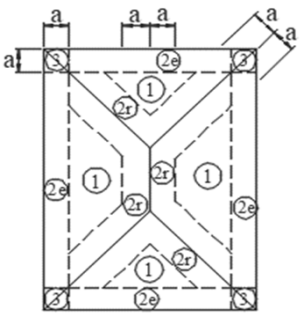
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



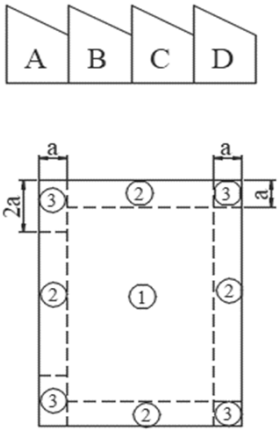
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'



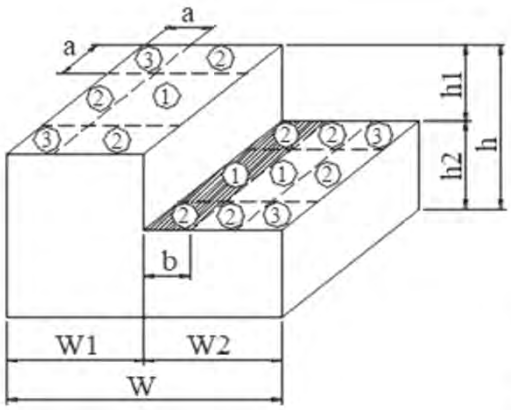
Multispan Gable &
Gable 7° < θ ≤ 45°

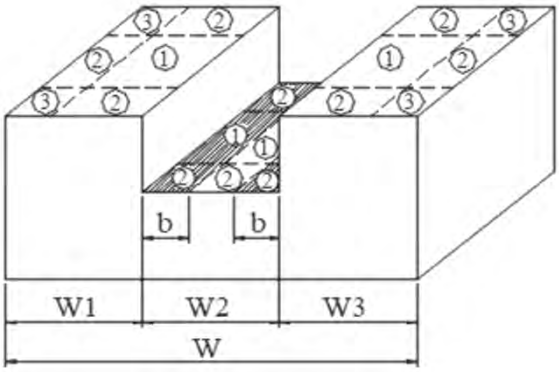


Hip 7° < θ ≤ 27°



Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'





Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

Note: The stepped roof zones above are as shown in ASCE 7-16 (except the upper roof zones 1 and 2 are shown at the inside edge per the notes). Prior editions didn't show zones, but the notes sent you to the low slope gable figure. The note in ASCE 7-16 still sends you to the low slope gable figure, but for some reasons the zones shown are per editions prior to ASCE 7-16. Therefore, the above zones may be a code mistake and the correct zone locations may be per the low slope gable roof shown at the top of this page.

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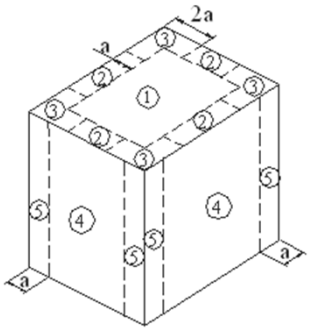
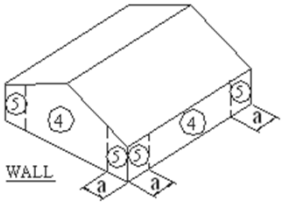
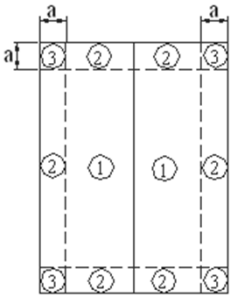
Location of C&C Wind Pressure Zones - ASCE 7-10 & earlier



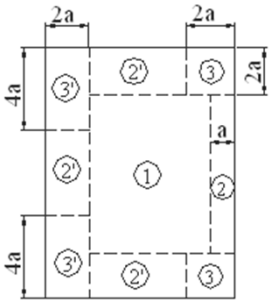
Roofs w/ θ ≤ 10°
and all walls
h > 60'



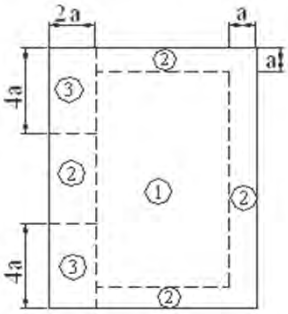
Walls h ≤ 60'
& alt design h<90'



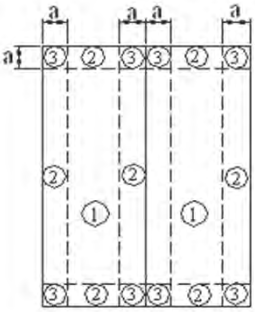
Gable, Sawtooth and
Multispan Gable θ ≤ 7 degrees &
Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'



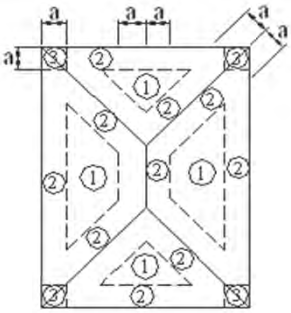
Monoslope roofs
3° < θ ≤ 10°
h ≤ 60' & alt design h<90'



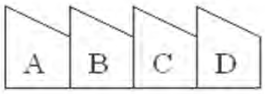
Monoslope roofs
10° < θ ≤ 30°
h ≤ 60' & alt design h<90'

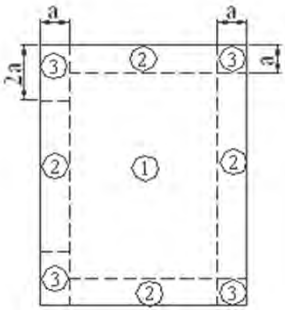


Multispan Gable &
Gable 7° < θ ≤ 45°

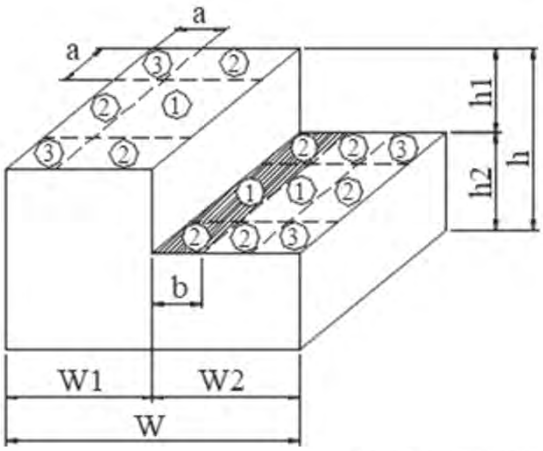


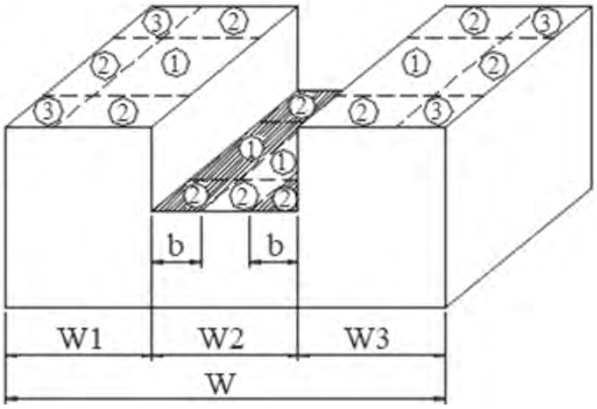
Hip 7° < θ ≤ 27°





Sawtooth 10° < θ ≤ 45°
h ≤ 60' & alt design h<90'





Stepped roofs θ ≤ 3°
h ≤ 60' & alt design h<90'

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Snow Loads : ASCE 7- 16

Nominal Snow Forces

Roof slope		=	18.4 deg
Horiz. eave to ridge dist (W)		=	40.0 ft
Roof length parallel to ridge (L)		=	120.0 ft
Type of Roof			Hip and gable w/ rafters
Ground Snow Load	Pg	=	30.0 psf
Risk Category		=	III
Importance Factor	I	=	1.1
Thermal Factor	Ct	=	1.00
Exposure Factor	Ce	=	1.0
Pf = 0.7*Ce*Ct*I*Pg		=	23.1 psf
Unobstructed Slippery Surface			yes
Sloped-roof Factor	Cs	=	0.79
Balanced Snow Load		**=**	**18.3 psf**
Rain on Snow Surcharge Angle			0.80 deg
Code Maximum Rain Surcharge			5.0 psf
Rain on Snow Surcharge		=	0.0 psf
Ps plus rain surcharge		=	18.3 psf
Minimum Snow Load	Pm	=	0.0 psf
Uniform Roof Design Snow Load		=	**18.3 psf**

Near ground level surface balanced snow load = **33.0 psf**

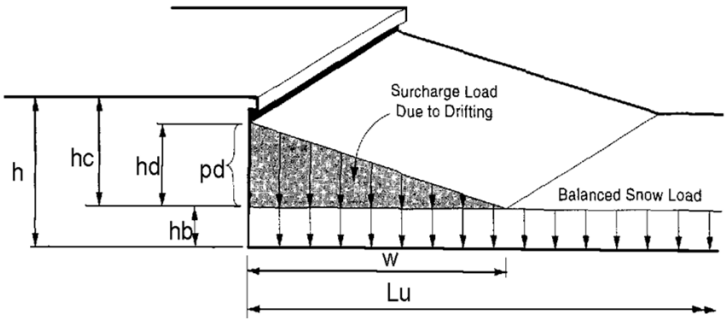
NOTE: Alternate spans of continuous beams shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code for loading diagrams and exceptions for gable roofs..

Unbalanced Snow Loads - for Hip & Gable roofs only

Required if slope is between 7 on 12 =	30.26 deg	
and 2.38 deg =	2.38 deg	**Unbalanced snow loads must be applied**
Windward snow load =	5.5 psf	= 0.3Ps
Leeward snow load from ridge to 10.15' =	41.0 psf	= hdγ / √S + Ps
Leeward snow load from 10.15' to the eave =	18.3 psf	= Ps

Windward Snow Drifts 1 - Against walls, parapets, etc

Up or downwind fetch	lu	=	220.0 ft
Projection height	h	=	5.2 ft
Projection width/length	lp	=	10.0 ft
Snow density	g	=	17.9 pcf
Balanced snow height	hb	=	1.02 ft
	hd	=	3.96 ft
	hc	=	4.18 ft
hc/hb >0.2 = 4.1	**lp <15', drift not req'd**		
Drift height (hd)		=	3.96 ft
Drift width	w	=	15.82 ft
Surcharge load:	pd = γ*hd	=	**70.8 psf**
Balanced Snow load:		=	18.3 psf
			89.1 psf



Note: If bottom of projection is at least 2 feet above hb then snow drift is not required.

Windward Snow Drifts 2 - Against walls, parapets, etc

Up or downwind fetch	lu	=	160.0 ft
Projection height	h	=	4.0 ft
Projection width/length	lp	=	20.0 ft
Snow density	g	=	17.9 pcf
Balanced snow height	hb	=	1.02 ft
	hd	=	3.44 ft
	hc	=	2.98 ft
hc/hb >0.2 = 2.9	**Therefore, design for drift**		
Drift height (hc)		=	2.98 ft
Drift width	w	=	15.89 ft
Surcharge load:	pd = γ*hd	=	**53.3 psf**
Balanced Snow load:		=	18.3 psf
			71.6 psf

Tetra Tech
2000 Warington Way
Louisville, KY
(502) 584-5555

JOB TITLE	Bethpage NY Phase III		
JOB NO.	112G09005-WE24	**SHEET NO.**	
CALCULATED BY	J. Thomas	**DATE**	
CHECKED BY		**DATE**	

Seismic Loads: IBC 2018

Strength Level Forces

Risk Category : III
Importance Factor (Ie) : 1.25
Site Class : D

Ss (0.2 sec) = 23.30 %g
S1 (1.0 sec) = 6.60 %g

Site specific ground motion analysis performed:

Fa =	1.600	Sms =	0.373	S_{DS} =	0.249	Design Category =	B
Fv =	2.400	Sm1 =	0.158	S_{D1} =	0.106	Design Category =	B

Seismic Design Category = **B**
Redundancy Coefficient ρ = 1.30
Number of Stories: 1
Structure Type: Steel eccentrically braced frames
Horizontal Struct Irregularities: No plan Irregularity
Vertical Structural Irregularities: No vertical Irregularity
Flexible Diaphragms: No
Building System: **Building Frame Systems**
Seismic resisting system: **Steel eccentrically braced frames**
System Structural Height Limit: **Height not limited**
Actual Structural Height (hn) = 30.0 ft

DESIGN COEFFICIENTS AND FACTORS

Response Modification Coefficient (R) = 8
Over-Strength Factor (Ωo) = 2
Deflection Amplification Factor (Cd) = 4
S_{DS} = 0.249
S_{D1} = 0.106

Seismic Load Effect (E) = Eh +/-Ev = ρ Q_E +/- 0.2S_{DS} D = 1.3Qe +/ 0.000D Q_E = horizontal seismic force
Special Seismic Load Effect (Em) = Emh +/- Ev = Ωo Q_E +/- 0.2S_{DS} D = 2Qe +/- 0.050D D = dead load

PERMITTED ANALYTICAL PROCEDURES

Simplified Analysis - Use Equivalent Lateral Force Analysis

Equivalent Lateral-Force Analysis - Permitted
Building period coef. (C_T) = 0.030 Cu = 1.69
Approx fundamental period (Ta) = $C_T h_n^x$ = 0.385 sec x= 0.75 Tmax = CuTa = 0.649 sec
User calculated fundamental period = T = 0.385 sec
Long Period Transition Period (TL) = ASCE7 map = error
Seismic response coef. (Cs) = SdsI/R = 0.039
need not exceed Cs = Sd1 I TL/RT^2 = 0.000
but not less than Cs = 0.044SdsI = 0.014
USE Cs = 0.014

Design Base Shear V = error, you need to enter TL (see link above right)

Model & Seismic Response Analysis - Permitted (see code for procedure)

ALLOWABLE STORY DRIFT

Structure Type: All other structures

Allowable story drift Δa = 0.015hsx where hsx is the story height below level :

Total Stories =	1	Floor Dead Load =	80.0 psf	Roof Dead Load =	20.0 psf
Building length L =	120.0 ft	Floor LL to include =	0.0 psf	Roof Snow Load =	0.0 psf
Building width W =	80.0 ft	Floor Equip wt =	0.0 kips	Roof Equip wt =	0.0 kips
hn =	30.0 ft	Partition weight =	10.0 psf	Parapet weight =	0.0 psf
k =	1.000	Ext Wall Weight =	0.0 psf	Parapet height =	0.0 ft

V = error, you need to enter TL (see link above right)

Bottom Floor is a slab on grade

Diaphragm shall be designed for level force Fx, but not less than Fpx = (Σ Fi / Σ wi) wpx, but :
Fpx min = $0.2S_{DS}$ Ie wpx = 0.062 wpx
Fpx max = $0.4S_{DS}$ Ie wpx = 0.124 wpx

Seismic Forces Normal to Building Length

V = #VALUE!

Level (x)	EL above Seismic Base hx (ft)	Level Weight Wx (kips)	Wx hx^k (ft-kips)	Cvx = Wx hx^k / Σ Wi hi^k	Base Shear Distribution Fx=CvxV	Σ Fx (k)	Story M	Diaphragm Force Fpx Σ Wi (k)	Fpx	Design Fpx
Roof	35.00	192	6,720	1.000	#VALUE!	#VALUE!	0	192	#VALUE!	#VALUE!
1	0.00	0	0	0.000	#VALUE!	0.0	0	0	0.0	0.0
Base		192		1.000		#VALUE!	#VALUE!			
							#VALUE! = Base M			

Seismic Forces Parallel to Building Length

V = #VALUE!

Level (x)	hx (ft)	Wx (kips)	Wx hx^k	Cvx =	Base Shear Distribution Fx=CvxV	Σ Fx (k)	Story M	Diaphragm Force Fpx Σ Wi (k)	Fpx	Design Fpx
Roof	35.00	192	6,720	1.000	#VALUE!	#VALUE!	0	192	#VALUE!	#VALUE!
1	0.00	0	0	0.000	#VALUE!	0.0	0	0	0.0	0.0
Base	0.00	192		1.000		#VALUE!	#VALUE!			
							#VALUE! = Base M			

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FIXTURE WATER LOAD VALUES (GWTP and Office Bldg.)						
FIXTURE	**OCCUPANCY**	**TYPE OF SUPPLY**	**Quantity**	**Cold**	**Hot**	**Total**
Drinking fountain	Offices, Etc.	3/8" valve	0	0	0	0
Sorting Station Sink	Public or private	Faucet	1	3	3	4
Lavatory	Public	Faucet	2	3	3	4
Service sink	Offices, Etc.	Faucet	1	2.25	2.25	3
Water closet	Public	Flush valve	2	20	0	20
Urinal	Public	3'4" Flush valve	0	0	0	0
Shower head	Public	Mixing valve	0	0	0	0
Emergency Eyewash	Offices, Etc.	Faucet	0	0	0	0
Emergency Shower/Eyewash	Offices, Etc.	Faucet	3	75	55	75
Hose Bibb	Public or private	Faucet	4	9	0	9
Washing machine box	Offices, Etc.	Faucet	0	0	0	0
Ice Maker	Offices, Etc.	3/8" valve	0	0	0	0
		TOTAL		112.25	63.25	115

115 Fixture Units = 73 gpm (2" Line)
Calculation based on International Plumbing Code Table and Figures E103.3(2) thru E103.3(7)

HOT WATER DEMAND PER FIXUTRE (GWTP)					
FIXTURE	**OCCUPANCY**	**TYPE OF SUPPLY**	**Quantity**	**GPH***	**Total**
Sorting Station Sink	Public or private	Faucet	1	20	20
Lavatory	Public	Faucet	1	2	2
Service sink	Offices, Etc.	Faucet	0	20	0
Washing Machine	Offices, Etc.	Faucet	0	20	0
Shower	Public or private	Mixing Valve	0	30	0
		TOTAL		92	22

22 Total Demand * 1.00 Demand Factor = 22 gph required
* 2011 ASHRAE Handbook Ch. 50 Table 10 (Values predate Low-Flow Fixtures and Appliances)
Emergency shower/eyewashs will require 172.5 gph of 120 Degree F water for mixing to 80 Degree F
Total demand with diversity of the Emergency fixtures as one of each operating at any one point
22 + 172.5 = 194.5 gph required.

DRAINAGE FIXTURE LOAD VALUES (GWTP)			
FIXTURE	**Fixture Unit**	**Quantity**	**Total**
Drinking fountain	0.5	0	0
Lavatory	1	1	1
Sorting Station Sink	2	1	2
Service sink	2	0	0
Shower	2	0	0
Laundry tub	2	0	0
Water closet	4	2	8
Urinal	4	0	0
Dishwashing Machine	2	0	0
Washing Machine	3	0	0
Floor Drain	2	4	8
Trench Drain	4	0	0
	TOTAL		19

19 Sanitary Fixture Units = 4" Main with 1/8" Slope
Calculation based on International Plumbing Code Section 709

Hydraulic Calculation Summary Sheet

vCalc Version:1.0.2826.0

Project information

Project name: Phase III GWTP
Location: Wantagh, NY
Date: 1/27/2024
Drawing No.: FX104

Design information

Remote area name: Equipment Area
Remote area location: Equipment Area
Occupancy classification: Ordinary
Density: 0.2 gpm/ft²
Area of application: 3250 ft²
Coverage per sprinkler: 120 ft²
Type of sprinklers calculated: Upright ELO
No. of sprinklers calculated: 28
In rack demand: N/A
Hose streams: 250 gpm
Type of system: Wet Pipe
Total System Volume: 1,770.38 gallons
Volume of dry or preaction system: 0.00 gallons
Supply 35.33 psi
Supply w/ Hose 29.57 psi
Total water required (including hose streams) 1203.05 gpm @ 9.53 psi
Safety margin 25.8 psi Safety margin /w hose 20.05 psi
Calculation Type: Demand
Calculation Method: Hazen Williams
Exclude Fixed Flow: No
Exclude Pump: No
Exclude Check Valve: No
Check Valve Loss Method: Remove Pipe Section
Iterations: 500

Water supply information

Date: 01/24/2024
Location: Twin Ln N, Wantagh, NY
Source: Municipal Water Supply

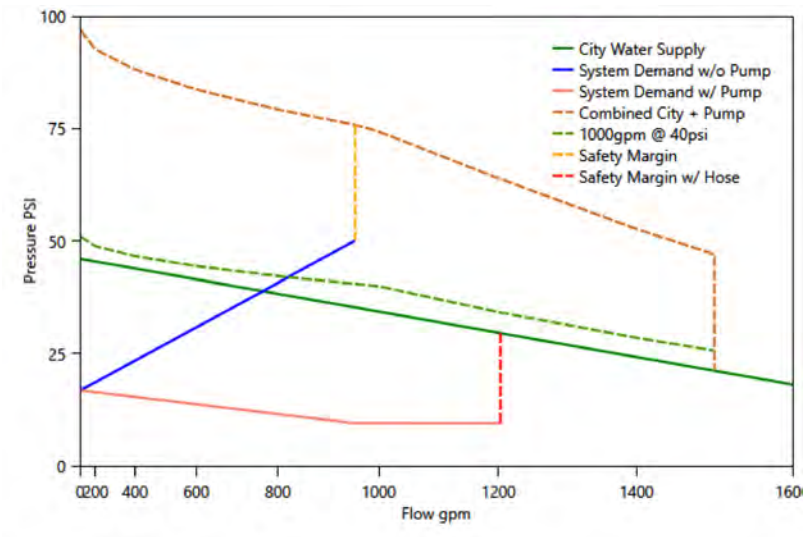
Contact information

Contractor: Tetra Tech
Address: 101 Federal St, Ste 600, Boston, MA
Phone: 617-748-7800
Name of designer: N. Martin, PE
Authority having jurisdiction: NAVFAC

Notes

Notes (include peaking inform or gridded systems here.):

low Test S mm y Sheet N 1.85



Notes

Notes (chart notes):

upply An lys

upply:	3
Static Pressure	46.00 psi
Residual Pressure	36.00 psi
Residual Flow	920.00 gpm
Sprinkler Demand	953.05 gpm
Fixe Flows	0 gpm
System Demand	953.05 gpm
System Pressure	9.53 psi
Supply Pressure Available	35.33 psi
Safety Margin	25.80 psi
Hose Allowance	250 gpm
System Demand w/ Hose	1203.05 gpm
System Pressure w/ Hose	9.53 psi
Supply Pressure Available w/ Hose	29.57 psi
Safety Margin w/ Hose	20.05 psi

Design Area Analys s

Results for design area Equipment Area

Node	Elevation	K-Factor	Hose Allowance[gpm]	PRV[psi]	Pressure[psi]	Real Flow [gpm]
S18	25.39	11.20	0.00	0.00	13.30	40.85
S27	28.23	11.20	0.00	0.00	11.90	38.64
S29	25.39	11.20	0.00	0.00	11.53	38.04
S35	31.08	11.20	0.00	0.00	10.77	36.75
S37	25.39	11.20	0.00	0.00	11.18	37.44
S38	28.23	11.20	0.00	0.00	9.74	34.95
S43	33.93	11.20	0.00	0.00	9.74	34.96
S44	25.39	11.20	0.00	0.00	11.57	38.09
S45	28.23	11.20	0.00	0.00	9.49	34.51
S46	31.08	11.20	0.00	0.00	8.31	32.29
S51	28.23	11.20	0.00	0.00	9.80	35.06
S52	31.08	11.20	0.00	0.00	8.15	31.97
S53	33.93	11.20	0.00	0.00	7.13	29.90
S58	31.08	11.20	0.00	0.00	8.40	32.45
S59	33.93	11.20	0.00	0.00	7.01	29.66
S66	33.93	11.20	0.00	0.00	7.23	30.11
S74	33.91	11.20	0.00	0.00	7.09	29.82
S83	33.91	11.20	0.00	0.00	7.00	29.63
S84	31.06	11.20	0.00	0.00	8.12	31.91
S91	33.91	11.20	0.00	0.00	7.20	30.05
S92	31.06	11.20	0.00	0.00	8.04	31.76
S93	28.21	11.20	0.00	0.00	9.25	34.06
S99	31.06	11.20	0.00	0.00	8.23	32.13
S100	28.21	11.20	0.00	0.00	9.22	34.01
S101	25.37	11.20	0.00	0.00	10.60	36.47
S104	28.21	11.20	0.00	0.00	9.37	34.28
S105	25.37	11.20	0.00	0.00	10.65	36.54
S108	25.37	11.20	0.00	0.00	10.75	36.72
N1	-5.00	0.00	0.00	0.00	6.63	
N12	19.37	0.00	0.00	0.00	22.89	
N13	19.37	0.00	0.00	0.00	22.93	
N15	19.37	0.00	0.00	0.00	22.87	
N17	19.37	0.00	0.00	0.00	22.46	
N19	19.37	0.00	0.00	0.00	22.86	
N22	19.37	0.00	0.00	0.00	22.32	
N26	19.37	0.00	0.00	0.00	22.85	
N30	19.37	0.00	0.00	0.00	22.24	
N34	19.37	0.00	0.00	0.00	22.85	
N49	24.19	0.00	0.00	0.00	16.76	
N50	19.37	0.00	0.00	0.00	22.19	
N60	27.03	0.00	0.00	0.00	15.07	
N64	24.31	0.00	0.00	0.00	14.53	
N72	29.88	0.00	0.00	0.00	13.70	
N74	24.31	0.00	0.00	0.00	14.10	
N75	27.16	0.00	0.00	0.00	12.36	
N83	32.72	0.00	0.00	0.00	12.47	
N84	24.20	0.00	0.00	0.00	14.66	

ode	Elevation	K-Factor	Hose Allowance[gpm]	PRV[psi]	Pressure[psi]	Real Flow [gpm]
N85	27.16	0.00	0.00	0.00	12.07	
N86	30.01	0.00	0.00	0.00	10.64	
N95	27.05	0.00	0.00	0.00	12.52	
N96	30.01	0.00	0.00	0.00	10.44	
N97	32.85	0.00	0.00	0.00	9.22	
N106	29.89	0.00	0.00	0.00	10.82	
N107	32.85	0.00	0.00	0.00	9.07	
N117	32.74	0.00	0.00	0.00	9.41	
N130	32.82	0.00	0.00	0.00	9.18	
N140	32.82	0.00	0.00	0.00	9.07	
N141	29.97	0.00	0.00	0.00	10.42	
N150	32.70	0.00	0.00	0.00	9.39	
N151	29.97	0.00	0.00	0.00	10.33	
N152	27.12	0.00	0.00	0.00	11.78	
N154	19.50	0.00	0.00	0.00	19.81	
N159	19.50	0.00	0.00	0.00	19.57	
N161	29.86	0.00	0.00	0.00	10.63	
N162	27.12	0.00	0.00	0.00	11.75	
N163	24.28	0.00	0.00	0.00	13.42	
N165	19.50	0.00	0.00	0.00	19.95	
N169	19.50	0.00	0.00	0.00	19.23	
N171	27.01	0.00	0.00	0.00	12.01	
N172	24.28	0.00	0.00	0.00	13.47	
N174	19.50	0.00	0.00	0.00	20.04	
N177	19.50	0.00	0.00	0.00	18.78	
N178	24.17	0.00	0.00	0.00	13.68	
N181	19.50	0.00	0.00	0.00	20.08	
N183	19.50	0.00	0.00	0.00	18.44	
N186	19.50	0.00	0.00	0.00	20.09	
N187	19.50	0.00	0.00	0.00	18.25	
N190	19.50	0.00	0.00	0.00	18.20	
N376	1.50	0.00	0.00	0.00	-4.80	
N503	19.37	0.00	0.00	0.00	23.06	
N552	19.37	0.00	0.00	0.00	22.20	
SRC3	-5.00	0.00	0.00	0.00	9.53	

Pipe Information

Results for design area Equipment Area

Path 0

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S83	33.91	11.20	29.63	1	1(T)	1.15	120.00	7.00	
						6.22		0.47	
N140	32.82		29.63	1.097		7.37	0.217	1.60	
N140	32.82		-12.14	2		9.00	120.00	9.07	
						0.00		1.23	
N151	29.97		17.49	2.157		9.00	0.003	0.03	
N151	29.97		31.76	2		9.00	120.00	10.33	
						0.00		1.23	
N162	27.12		49.25	2.157		9.00	0.021	0.19	
N162	27.12		34.01	2		9.00	120.00	11.75	
						0.00		1.23	
N172	24.28		83.26	2.157		9.00	0.054	0.49	
N172	24.28		36.54	2	1(T)	13.09	120.00	13.47	
						12.31		2.07	
N187	19.50		119.80	2.157		25.40	0.107	2.71	
N187	19.50		114.83	4		14.00	120.00	18.25	
						0.00		0.00	
N183	19.50		234.63	4.260		14.00	0.013	0.19	
N183	19.50		111.51	4		12.50	120.00	18.44	
						0.00		0.00	
N177	19.50		346.15	4.260		12.50	0.028	0.35	
N177	19.50		30.15	4		14.00	120.00	18.78	
						0.00		0.00	
N169	19.50		376.30	4.260		14.00	0.032	0.45	
N169	19.50		-54.03	4		14.00	120.00	19.23	
						0.00		0.00	
N159	19.50		322.27	4.260		14.00	0.024	0.34	
N159	19.50		-55.13	4		14.00	120.00	19.57	
						0.00		0.00	
N154	19.50		267.14	4.260		14.00	0.017	0.24	
N154	19.50		-55.56	4		12.50	120.00	19.81	
						0.00		0.00	
N165	19.50		211.58	4.260		12.50	0.011	0.14	
N165	19.50		-53.97	4		14.00	120.00	19.95	
						0.00		0.00	
N174	19.50		157.61	4.260		14.00	0.006	0.09	
N174	19.50		-52.91	4		14.00	120.00	20.04	
						0.00		0.00	
N181	19.50		104.70	4.260		14.00	0.003	0.04	
N181	19.50		-52.29	2	1(T)	88.00	120.00	20.08	
					2(E)	29.54		0.06	
N26	19.37		52.41	2.157	2(45)	117.54	0.023	2.72	
N26	19.37		52.29	6		14.00	120.00	22.85	
						0.00		0.00	
N19	19.37		104.70	6.357		14.00	0.000	0.01	
N19	19.37		52.91	6		14.00	120.00	22.86	
						0.00		0.00	
N15	19.37		157.61	6.357		14.00	0.001	0.01	
N15	19.37		53.97	6		12.50	120.00	22.87	
						0.00		0.00	
N12	19.37		211.58	6.357		12.50	0.002	0.02	
N12	19.37		55.56	6		14.00	120.00	22.89	
						0.00		0.00	
N13	19.37		267.14	6.357		14.00	0.002	0.03	
N13	19.37		55.13	6	1(T)	1.52	120.00	22.93	
						37.72		0.00	
N503	19.37		322.27	6.357		39.24	0.003	0.14	
N503	19.37		630.78	6	1(Model D-1/G-1 Swing Check)	38.47	120.00	23.06	
					1(1000gpm @ 40psi)				
					1(Model E/F Easy Riser)	153.40		7.74	Pump Effect: 40.52 psi
N376	1.50		953.05	6.357	1(T)	191.87	-0.186	-35.61	
					1(BV)				
					3(E)				
N376	1.50		0.00	8	3(E)	21.63	120.00	-4.80	
					1(DCVA 8psi UFC)	64.50		2.82	Curve Effect: 8.00 psi
N1	-5.00		953.05	8.249	1(Gate Valve)	86.13	0.100	8.62	
N1	-5.00		0.00	8	1(45)	299.34	100.00	6.63	
						42.53		0.00	
SRC3	-5.00		953.05	8.550	2(E)	341.87	0.008	2.90	

Path 1

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S59	33.93	11.20	29.66	1		1.13	120.00	7.01	
					1(T)	6.22		0.47	
N107	32.85		29.66	1.097		7.35	0.217	1.59	
N107	32.85		12.14	2		9.00	120.00	9.07	
						0.00		1.23	
N96	30.01		41.80	2.157		9.00	0.015	0.14	
N96	30.01		31.97	2		9.00	120.00	10.44	
						0.00		1.23	
N85	27.16		73.77	2.157		9.00	0.043	0.39	
N85	27.16		34.51	2		9.00	120.00	12.07	
						0.00		1.23	
N74	24.31		108.28	2.157		9.00	0.088	0.80	
N74	24.31		37.44	2	1(T)	14.30	120.00	14.10	
						24.61		2.14	
N552	19.37		145.72	2.157	2(E)	38.91	0.153	5.96	
N552	19.37		154.07	6		13.33	120.00	22.20	
						0.00		0.00	
N30	19.37		299.79	6.357		13.33	0.003	0.04	
N30	19.37		155.93	6		12.50	120.00	22.24	
						0.00		0.00	
N22	19.37		455.72	6.357		12.50	0.007	0.08	
N22	19.37		121.03	6		14.00	120.00	22.32	
						0.00		0.00	
N17	19.37		576.75	6.357		14.00	0.010	0.14	
N17	19.37		54.03	6		12.48	120.00	22.46	
					1(T)	37.72		0.00	
N503	19.37		630.78	6.357		50.20	0.012	0.60	

Path 2

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S74	33.91	11.20	29.82	1		1.15	120.00	7.09	
					1(T)	6.22		0.47	
N130	32.82		29.82	1.097		7.37	0.219	1.61	
N130	32.82		-9.07	2		7.56	120.00	9.18	
					2(45)	4.92		-0.01	
N97	32.85		20.75	2.157		12.48	0.004	0.05	
N97	32.85		29.90	2		9.00	120.00	9.22	
						0.00		1.23	
N86	30.01		50.65	2.157		9.00	0.022	0.20	
N86	30.01		32.29	2		9.00	120.00	10.64	
						0.00		1.23	
N75	27.16		82.94	2.157		9.00	0.054	0.49	
N75	27.16		34.95	2		9.00	120.00	12.36	
						0.00		1.23	
N64	24.31		117.89	2.157		9.00	0.104	0.93	
N64	24.31		38.04	2	1(T)	13.63	120.00	14.53	
						18.46		2.14	
N30	19.37		155.93	2.157	1(E)	32.09	0.174	5.57	

Path 3

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S53	33.93	11.20	29.90	1		1.13	120.00	7.13	
					1(T)	6.22		0.47	
N97	32.85		29.90	1.097		7.35	0.220	1.62	

Path 4

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S91	33.91	11.20	30.05	1		1.27	120.00	7.20	
					1(T)	6.22		0.52	
N150	32.70		30.05	1.097		7.49	0.222	1.66	
N150	32.70		-11.70	2		7.48	120.00	9.39	
					2(45)	4.92		-0.02	
N117	32.74		18.35	2.157		12.40	0.003	0.04	
N117	32.74		30.11	2		9.00	120.00	9.41	
						0.00		1.23	
N106	29.89		48.46	2.157		9.00	0.020	0.18	

106	29.89		2.4	2		9.00	120.00	10.82	
						0.00		1.23	
N95	27.05		80.91	2.1 7		9.00	0.052	0.46	
N95	27.05		35.06	2		9.00	120.00	12.52	
						0.00		1.23	
N84	24.20		115.98	2.157		9.00	0.100	0.90	
N84	24.20		38.09	2	1(T)	13.55	120.00	14.66	
						18.46		2.09	
N50	19.37		154.07	2.157	1(E)	32.01	0.170	5.44	
N50	19.37		0.00	6		14.66	120.00	22.19	
						0.00		0.00	
N552	19.37		154.07	6.357		14.66	0.001	0.01	

Path 5

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	otes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S66	33.93	11.20	30.11	1		1.25	120.00	7.23	
					1(T)	6.22		0.52	
N117	32.74		30.11	1.097		7.47	0.223	1.67	

Path 6

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S92	31.06	11.20	31.76	1		1.15	120.00	8.04	
					1(T)	6.22		0.47	
N151	29.97		31.76	1.097		7.37	0.246	1.81	

Path 7

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S84	31.06	11.20	31.91	1		1.15	120.00	8.12	
					1(T)	6.22		0.47	
N141	29.97		31.91	1.097		7.37	0.248	1.83	
N141	29.97		9.07	2		9.00	120.00	10.42	
						0.00		1.23	
N152	27.12		40.98	2.157		9.00	0.015	0.13	
N152	27.12		34.06	2		9.00	120.00	11.78	
						0.00		1.23	
N163	24.28		75.04	2.157		9.00	0.045	0.40	
N163	24.28		36.47	2	1(E)	13.09	120.00	13.42	
						18.46		2.07	
N183	19.50		111.51	2.157	1(T)	31.55	0.093	2.95	

Path 8

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S52	31.08	11.20	31.97	1		1.13	120.00	8.15	
					1(T)	6.22		0.46	
N96	30.01		31.97	1.097		7.35	0.249	1.83	

Path 9

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S99	31.06	11.20	32.13	1		1.27	120.00	8.23	
					1(T)	6.22		0.52	
N161	29.86		32.13	1.097		7.49	0.251	1.88	
N161	29.86		11.70	2		9.00	120.00	10.63	
						0.00		1.23	
N171	27.01		43.83	2.157		9.00	0.017	0.15	
N171	27.01		34.28	2		9.00	120.00	12.01	
						0.00		1.23	
N178	24.17		78.11	2.157		9.00	0.048	0.44	
N178	24.17		36.72	2		13.01	120.00	13.68	
					1(T)	12.31		2.02	
N190	19.50		114.83	2.157		25.32	0.099	2.50	
N190	19.50		0.00	4		14.00	120.00	18.20	

N187	19.50		114.8	4.260		.00 14.0	.004	.00 0.05	

Path 10

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S46	31.08	11.20	32.29	1	1(T)	1.13	120.00	8.31	
N86	30.01		32.29	1.097		6.22 7.35	0.254	0.46 1.87	

Path 11

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S58	31.08	11.20	32.45	1	1(T)	1.25	120.00	8.40	
N106	29.89		32.45	1.097		6.22 7.47	0.256	0.52 1.91	

Path 12

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S100	28.21	11.20	34.01	1	1(T)	1.15	120.00	9.22	
N162	27.12		34.01	1.097		6.22 7.37	0.279	0.47 2.06	

Path 13

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S93	28.21	11.20	34.06	1	1(T)	1.15	120.00	9.25	
N152	27.12		34.06	1.097		6.22 7.37	0.280	0.47 2.06	

Path 14

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S104	28.21	11.20	34.28	1	1(T)	1.27	120.00	9.37	
N171	27.01		34.28	1.097		6.22 7.49	0.284	0.52 2.12	

Path 15

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S45	28.23	11.20	34.51	1	1(T)	1.13	120.00	9.49	
N85	27.16		34.51	1.097		6.22 7.35	0.287	0.46 2.11	

Path 16

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S38	28.23	11.20	34.95	1	1(T)	1.13	120.00	9.74	
N75	27.16		34.95	1.097		6.22 7.35	0.294	0.46 2.16	

Path 17

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft F ft	C Factor	total (P_t) elev (P_e)	Notes
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S43	33.93	11.20	34.96	1	1(T)	1.27	120.00	9.74	
N83	32.72		34.96	1.097		6.22 7.49	0.294	0.52 2.20	

N83	32.72		-4.80	2	2(45)	47.46	120.00	12.47	
					1(E)	23.38		5.73	
N177	19.50		30.15	2.157	1(T)	70.84	0.008	0.59	

Path 18

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S51	28.23	11.20	35.06	1		1.25	120.00	9.80	
					1(T)	6.22		0.51	
N95	27.05		35.06	1.097		7.47	0.296	2.21	

Path 19

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S101	25.37	11.20	36.47	1		1.15	120.00	10.60	
					1(T)	6.22		0.47	
N163	24.28		36.47	1.097		7.37	0.318	2.34	

Path 20

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S105	25.37	11.20	36.54	1		1.15	120.00	10.65	
					1(T)	6.22		0.47	
N172	24.28		36.54	1.097		7.37	0.319	2.35	

Path 21

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S108	25.37	11.20	36.72	1		1.27	120.00	10.75	
					1(T)	6.22		0.52	
N178	24.17		36.72	1.097		7.49	0.322	2.41	

Path 22

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S35	31.08	11.20	36.75	1		1.27	120.00	10.77	
					1(T)	6.22		0.52	
N72	29.88		36.75	1.097		7.49	0.322	2.41	
N72	29.88		4.80	2		9.00	120.00	13.70	
						0.00		1.23	
N60	27.03		41.55	2.157		9.00	0.015	0.14	
N60	27.03		38.64	2		9.00	120.00	15.07	
						0.00		1.23	
N49	24.19		80.19	2.157		9.00	0.051	0.46	
N49	24.19		40.85	2		13.54	120.00	16.76	
					1(T)	18.46		2.09	
N22	19.37		121.03	2.157	1(E)	32.00	0.109	3.48	

Path 23

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S37	25.39	11.20	37.44	1		1.13	120.00	11.18	
					1(T)	6.22		0.47	
N74	24.31		37.44	1.097		7.35	0.334	2.45	

Path 24

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S29	25.39	11.20	38.04	1	1(T)	1.13	120.00	11.53	
						6.22		0.47	
N64	24.31		38.04	1.097			0.344		

						.35		2.53	

Path 25

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fitting quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S44	25.39	11.20	38.09	1	1(T)	1.25	120.00	11.57	
						6.22		0.52	
N84	24.20		38.09	1.097		7.47	0.345	2.57	

Path 26

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S27	28.23	11.20	38.64	1	1(T)	1.27	120.00	11.90	
						6.22		0.52	
N60	27.03		38.64	1.097		7.49	0.354	2.65	

Path 27

Start Node	Elevation	K-Factor	Flow added this step (Q)	Nominal ID	Fittings quantity and length	L ft	C Factor	total (P_t)	Notes
						F ft		elev (P_e)	
End Node			Total Flow	Actual ID		T ft	P_f per foot	frict (P_f)	
S18	25.39	11.20	40.85	1	1(T)	1.27	120.00	13.30	
						6.22		0.52	
N49	24.19		40.85	1.097		7.49	0.392	2.94	

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tart	End	Pipe Schedule	Diameter [in]	Pipe Length [ft]	EQ [ft]	ength [ft]	Components	tart Elevation[ft]	End Elevation [ft]	Flow[gpm]	Pf [psi]	Pe [psi]	tart Pressure [psi]	End Pressure [psi]	Velocity [fps]	Pump Effect [psi]	Curve Effect [psi]	Reynolds	dw_f
RC3	N1	UN DI 350	8	299.340	42.53	341.87	1(45) 2(E)	-5.00	-5.00	953.05	2.90	0.00	9.53	6.63	5.32	0.00	0.00	0.00	0.00
N1	N376	Sch 10	8	21.630	64.50	86.13	3(E) 1(DCVA 8psi UFC) 1(Gate Valve)	-5.00	1.50	953.05	8.62	2.82	6.63	-4.80	5.71	0.00	8.00	0.00	0.00
N376	N503	Sch 10	6	38.470	153.40	191.87	1(Model D-1/G-1 Swing Check) 1(1000gpm @ 40psi) 1(Model E/F Easy Riser) 1(T) 1(BV) 3(E)	1.50	19.37	953.05	-35.61	7.74	-4.80	23.06	9.62	40.52	0.00	0.00	0.00
N503	N13	Sch 10	6	1.520	37.72	39.24	1(T)	19.37	19.37	322.27	0.14	0.00	23.06	22.93	3.25	0.00	0.00	0.00	0.00
N503	N17	Sch 10	6	12.480	37.72	50.20	1(T)	19.37	19.37	630.78	0.60	0.00	23.06	22.46	6.37	0.00	0.00	0.00	0.00
N13	N159	Sch 10	2	88.170	41.84	130.01	2(T) 2(E) 2(45)	19.37	19.50	55.13	3.30	0.06	22.93	19.57	4.83	0.00	0.00	0.00	0.00
N13	N12	Sch 10	6	14.000	0.00	14.00		19.37	19.37	267.14	0.03	0.00	22.93	22.89	2.70	0.00	0.00	0.00	0.00
N17	N22	Sch 10	6	14.000	0.00	14.00		19.37	19.37	576.75	0.14	0.00	22.46	22.32	5.82	0.00	0.00	0.00	0.00
N17	N169	Sch 10	2	88.000	41.84	129.84	2(T) 2(E) 2(45)	19.37	19.50	54.03	3.17	0.06	22.46	19.23	4.74	0.00	0.00	0.00	0.00
N12	N154	Sch 10	2	88.000	29.54	117.54	1(T) 2(E) 2(45)	19.37	19.50	55.56	3.03	0.06	22.89	19.81	4.87	0.00	0.00	0.00	0.00
N12	N15	Sch 10	6	12.500	0.00	12.50		19.37	19.37	211.58	0.02	0.00	22.89	22.87	2.14	0.00	0.00	0.00	0.00
N22	N30	Sch 10	6	12.500	0.00	12.50		19.37	19.37	455.72	0.08	0.00	22.32	22.24	4.60	0.00	0.00	0.00	0.00
N22	N49	Sch 10	2	13.540	18.46	32.00	1(T) 1(E)	19.37	24.19	121.03	3.48	2.09	22.32	16.76	10.61	0.00	0.00	0.00	0.00
N15	N165	Sch 10	2	88.000	29.54	117.54	1(T) 2(E) 2(45)	19.37	19.50	53.97	2.87	0.06	22.87	19.95	4.73	0.00	0.00	0.00	0.00
N15	N19	Sch 10	6	14.000	0.00	14.00		19.37	19.37	157.61	0.01	0.00	22.87	22.86	1.59	0.00	0.00	0.00	0.00
N30	N64	Sch 10	2	13.630	18.46	32.09	1(T) 1(E)	19.37	24.31	155.93	5.57	2.14	22.24	14.53	13.67	0.00	0.00	0.00	0.00
N30	N552	Sch 10	6	13.330	0.00	13.33		19.37	19.37	299.79	0.04	0.00	22.24	22.20	3.03	0.00	0.00	0.00	0.00
N19	N26	Sch 10	6	14.000	0.00	14.00		19.37	19.37	104.70	0.01	0.00	22.86	22.85	1.06	0.00	0.00	0.00	0.00
N19	N174	Sch 10	2	88.000	29.54	117.54	1(T) 2(E) 2(45)	19.37	19.50	52.91	2.76	0.06	22.86	20.04	4.64	0.00	0.00	0.00	0.00
N552	N50	Sch 10	6	14.660	0.00	14.66		19.37	19.37	154.07	0.01	0.00	22.20	22.19	1.56	0.00	0.00	0.00	0.00
N552	N74	Sch 10	2	14.300	24.61	38.91	1(T) 2(E)	19.37	24.31	145.72	5.96	2.14	22.20	14.10	12.78	0.00	0.00	0.00	0.00
N26	N34	Sch 10	6	12.000	0.00	12.00		19.37	19.37	52.29	0.00	0.00	22.85	22.85	0.53	0.00	0.00	0.00	0.00
N26	N181	Sch 10	2	88.000	29.54	117.54	1(T) 2(E) 2(45)	19.37	19.50	52.41	2.72	0.06	22.85	20.08	4.60	0.00	0.00	0.00	0.00
N49	N60	Sch 10	2	9.000	0.00	9.00		24.19	27.03	80.19	0.46	1.23	16.76	15.07	7.03	0.00	0.00	0.00	0.00
N49	S18	Sch 10	1	1.270	6.22	7.49	1(T)	24.19	25.39	40.85	2.94	0.52	16.76	13.30	13.85	0.00	0.00	0.00	0.00
N34	N186	Sch 10	2	88.000	29.54	117.54	1(T) 2(E) 2(45)	19.37	19.50	52.29	2.70	0.06	22.85	20.09	4.59	0.00	0.00	0.00	0.00
N64	S29	Sch 10	1	1.130	6.22	7.35	1(T)	24.31	25.39	38.04	2.53	0.47	14.53	11.53	12.90	0.00	0.00	0.00	0.00
N64	N75	Sch 10	2	9.000	0.00	9.00		24.31	27.16	117.89	0.93	1.23	14.53	12.36	10.34	0.00	0.00	0.00	0.00
N50	N84	Sch 10	2	13.550	18.46	32.01	1(T) 1(E)	19.37	24.20	154.07	5.44	2.09	22.19	14.66	13.51	0.00	0.00	0.00	0.00
N60	S27	Sch 10	1	1.270	6.22	7.49	1(T)	27.03	28.23	38.64	2.65	0.52	15.07	11.90	13.10	0.00	0.00	0.00	0.00
N60	N72	Sch 10	2	9.000	0.00	9.00		27.03	29.88	41.55	0.14	1.23	15.07	13.70	3.64	0.00	0.00	0.00	0.00
N75	S38	Sch 10	1	1.130	6.22	7.35	1(T)	27.16	28.23	34.95	2.16	0.46	12.36	9.74	11.85	0.00	0.00	0.00	0.00
N75	N86	Sch 10	2	9.000	0.00	9.00		27.16	30.01	82.94	0.49	1.23	12.36	10.64	7.27	0.00	0.00	0.00	0.00
N72	S35	Sch 10	1	1.270	6.22	7.49	1(T)	29.88	31.08	36.75	2.41	0.52	13.70	10.77	12.46	0.00	0.00	0.00	0.00
N72	N83	Sch 10	2	9.000	0.00	9.00		29.88	32.72	4.80	0.00	1.23	13.70	12.47	0.42	0.00	0.00	0.00	0.00
N86	S46	Sch 10	1	1.130	6.22	7.35	1(T)	30.01	31.08	32.29	1.87	0.46	10.64	8.31	10.95	0.00	0.00	0.00	0.00
N86	N97	Sch 10	2	9.000	0.00	9.00		30.01	32.85	50.65	0.20	1.23	10.64	9.22	4.44	0.00	0.00	0.00	0.00
N74	N85	Sch 10	2	9.000	0.00	9.00		24.31	27.16	108.28	0.80	1.23	14.10	12.07	9.50	0.00	0.00	0.00	0.00
N74	S37	Sch 10	1	1.130	6.22	7.35	1(T)	24.31	25.39	37.44	2.45	0.47	14.10	11.18	12.69	0.00	0.00	0.00	0.00
N83	S43	Sch 10	1	1.270	6.22	7.49	1(T)	32.72	33.93	34.96	2.20	0.52	12.47	9.74	11.85	0.00	0.00	0.00	0.00
N83	N177	Sch 10	2	47.460	23.38	70.84	2(45) 1(E) 1(T)	32.72	19.50	-30.15	-0.59	-5.73	12.47	18.78	-2.64	0.00	0.00	0.00	0.00
N97	N130	Sch 10	2	7.560	4.92	12.48	2(45)	32.85	32.82	20.75	0.05	-0.01	9.22	9.18	1.82	0.00	0.00	0.00	0.00
N97	S53	Sch 10	1	1.130	6.22	7.35	1(T)	32.85	33.93	29.90	1.62	0.47	9.22	7.13	10.14	0.00	0.00	0.00	0.00
N84	S44	Sch 10	1	1.250	6.22	7.47	1(T)	24.20	25.39	38.09	2.57	0.52	14.66	11.57	12.92	0.00	0.00	0.00	0.00
N84	N95	Sch 10	2	9.000	0.00	9.00		24.20	27.05	115.98	0.90	1.23	14.66	12.52	10.17	0.00	0.00	0.00	0.00
N85	S45	Sch 10	1	1.130	6.22	7.35	1(T)	27.16	28.23	34.51	2.11	0.46	12.07	9.49	11.70	0.00	0.00	0.00	0.00
N85	N96	Sch 10	2	9.000	0.00	9.00		27.16	30.01	73.77	0.39	1.23	12.07	10.44	6.47	0.00	0.00	0.00	0.00
N95	S51	Sch 10	1	1.250	6.22	7.47	1(T)	27.05	28.23	35.06	2.21	0.51	12.52	9.80	11.89	0.00	0.00	0.00	0.00
N95	N106	Sch 10	2	9.000	0.00	9.00		27.05	29.89	80.91	0.46	1.23	12.52	10.82	7.10	0.00	0.00	0.00	0.00
N96	N107	Sch 10	2	9.000	0.00	9.00		30.01	32.85	41.80	0.14	1.23	10.44	9.07	3.67	0.00	0.00	0.00	0.00
N96	S52	Sch 10	1	1.130	6.22	7.35	1(T)	30.01	31.08	31.97	1.83	0.46	10.44	8.15	10.84	0.00	0.00	0.00	0.00
N106	S58	Sch 10	1	1.250	6.22	7.47	1(T)	29.89	31.08	32.45	1.91	0.52	10.82	8.40	11.00	0.00	0.00	0.00	0.00
N106	N117	Sch 10	2	9.000	0.00	9.00		29.89	32.74	48.46	0.18	1.23	10.82	9.41	4.25	0.00	0.00	0.00	0.00
N107	N140	Sch 10	2	7.560	4.92	12.48	2(45)	32.85	32.82	12.14	0.02	-0.01	9.07	9.07	1.06	0.00	0.00	0.00	0.00
N107	S59	Sch 10	1	1.130	6.22	7.35	1(T)	32.85	33.93	29.66	1.59	0.47	9.07	7.01	10.06	0.00	0.00	0.00	0.00
N130	N141	Sch 10	2	9.000	0.00	9.00		32.82	29.97	-9.07	-0.01	-1.23	9.18	10.42	-0.80	0.00	0.00	0.00	0.00
N130	S74	Sch 10	1	1.150	6.22	7.37	1(T)	32.82	33.91	29.82	1.61	0.47	9.18	7.09	10.11	0.00	0.00	0.00	0.00
N117	S66	Sch 10	1	1.250	6.22	7.47	1(T)	32.74	33.93	30.11	1.67	0.52	9.41	7.23	10.21	0.00	0.00	0.00	0.00
N117	N150	Sch 10	2	7.480	4.92	12.40	2(45)	32.74	32.70	18.35	0.04	-0.02	9.41	9.39	1.61	0.00	0.00	0.00	0.00
N141	N152	Sch 10	2	9.000	0.00	9.00		29.97	27.12	-40.98	-0.13	-1.23	10.42	11.78	-3.59	0.00	0.00	0.00	0.00
N141	S84	Sch 10	1	1.150	6.22	7.37	1(T)	29.97	31.06	31.91	1.83	0.47	10.42	8.12	10.82	0.00	0.00	0.00	0.00

Start	End	Pipe Schedule	Diameter [in]	Pipe Length [ft]	EQL [ft]	Length [ft]	Components	Start Elevation[ft]	End Elevation [ft]	Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	Pump Effect [psi]	Curve Effect [psi]	Reynolds	dw_f
N152	S93	Sch 10	1	1.150	6.22	7.37	1(T)	27.12	28.21	34.06	2.06	0.47	11.78	9.25	11.55	0.00	0.00	0.00	0.00
N152	N163	Sch 10	2	9.000	0.00	9.00		27.12	24.28	-75.04	-0.40	-1.23	11.78	13.42	-6.58	0.00	0.00	0.00	0.00
N140	S83	Sch 10	1	1.150	6.22	7.37	1(T)	32.82	33.91	29.63	1.60	0.47	9.07	7.00	10.05	0.00	0.00	0.00	0.00
N140	N151	Sch 10	2	9.000	0.00	9.00		32.82	29.97	-17.49	-0.03	-1.23	9.07	10.33	-1.53	0.00	0.00	0.00	0.00
N163	S101	Sch 10	1	1.150	6.22	7.37	1(T)	24.28	25.37	36.47	2.34	0.47	13.42	10.60	12.37	0.00	0.00	0.00	0.00
N163	N183	Sch 10	2	13.090	18.46	31.55	1(E) 1(T)	24.28	19.50	-111.51	-2.95	-2.07	13.42	18.44	-9.78	0.00	0.00	0.00	0.00
N150	N161	Sch 10	2	9.000	0.00	9.00		32.70	29.86	-11.70	-0.01	-1.23	9.39	10.63	-1.03	0.00	0.00	0.00	0.00
N150	S91	Sch 10	1	1.270	6.22	7.49	1(T)	32.70	33.91	30.05	1.66	0.52	9.39	7.20	10.19	0.00	0.00	0.00	0.00
N151	N162	Sch 10	2	9.000	0.00	9.00		29.97	27.12	-49.25	-0.19	-1.23	10.33	11.75	-4.32	0.00	0.00	0.00	0.00
N151	S92	Sch 10	1	1.150	6.22	7.37	1(T)	29.97	31.06	31.76	1.81	0.47	10.33	8.04	10.77	0.00	0.00	0.00	0.00
N159	N154	Sch 10	4	14.000	0.00	14.00		19.50	19.50	-267.14	-0.24	0.00	19.57	19.81	-6.01	0.00	0.00	0.00	0.00
N159	N169	Sch 10	4	14.000	0.00	14.00		19.50	19.50	322.27	0.34	0.00	19.57	19.23	7.25	0.00	0.00	0.00	0.00
N161	N171	Sch 10	2	9.000	0.00	9.00		29.86	27.01	-43.83	-0.15	-1.23	10.63	12.01	-3.84	0.00	0.00	0.00	0.00
N161	S99	Sch 10	1	1.270	6.22	7.49	1(T)	29.86	31.06	32.13	1.88	0.52	10.63	8.23	10.89	0.00	0.00	0.00	0.00
N162	S100	Sch 10	1	1.150	6.22	7.37	1(T)	27.12	28.21	34.01	2.06	0.47	11.75	9.22	11.53	0.00	0.00	0.00	0.00
N162	N172	Sch 10	2	9.000	0.00	9.00		27.12	24.28	-83.26	-0.49	-1.23	11.75	13.47	-7.30	0.00	0.00	0.00	0.00
N169	N177	Sch 10	4	14.000	0.00	14.00		19.50	19.50	376.30	0.45	0.00	19.23	18.78	8.46	0.00	0.00	0.00	0.00
N154	N165	Sch 10	4	12.500	0.00	12.50		19.50	19.50	-211.58	-0.14	0.00	19.81	19.95	-4.76	0.00	0.00	0.00	0.00
N171	N178	Sch 10	2	9.000	0.00	9.00		27.01	24.17	-78.11	-0.44	-1.23	12.01	13.68	-6.85	0.00	0.00	0.00	0.00
N171	S104	Sch 10	1	1.270	6.22	7.49	1(T)	27.01	28.21	34.28	2.12	0.52	12.01	9.37	11.62	0.00	0.00	0.00	0.00
N172	N187	Sch 10	2	13.090	12.31	25.40	1(T)	24.28	19.50	-119.80	-2.71	-2.07	13.47	18.25	-10.51	0.00	0.00	0.00	0.00
N172	S105	Sch 10	1	1.150	6.22	7.37	1(T)	24.28	25.37	36.54	2.35	0.47	13.47	10.65	12.39	0.00	0.00	0.00	0.00
N177	N183	Sch 10	4	12.500	0.00	12.50		19.50	19.50	346.15	0.35	0.00	18.78	18.44	7.78	0.00	0.00	0.00	0.00
N165	N174	Sch 10	4	14.000	0.00	14.00		19.50	19.50	-157.61	-0.09	0.00	19.95	20.04	-3.54	0.00	0.00	0.00	0.00
N183	N187	Sch 10	4	14.000	0.00	14.00		19.50	19.50	234.63	0.19	0.00	18.44	18.25	5.28	0.00	0.00	0.00	0.00
N178	N190	Sch 10	2	13.010	12.31	25.32	1(T)	24.17	19.50	-114.83	-2.50	-2.02	13.68	18.20	-10.07	0.00	0.00	0.00	0.00
N178	S108	Sch 10	1	1.270	6.22	7.49	1(T)	24.17	25.37	36.72	2.41	0.52	13.68	10.75	12.45	0.00	0.00	0.00	0.00
N174	N181	Sch 10	4	14.000	0.00	14.00		19.50	19.50	-104.70	-0.04	0.00	20.04	20.08	-2.35	0.00	0.00	0.00	0.00
N187	N190	Sch 10	4	14.000	0.00	14.00		19.50	19.50	114.83	0.05	0.00	18.25	18.20	2.58	0.00	0.00	0.00	0.00
N181	N186	Sch 10	4	12.000	0.00	12.00		19.50	19.50	-52.29	-0.01	0.00	20.08	20.09	-1.18	0.00	0.00	0.00	0.00

Full Pipe Table

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	Reynolds
SRC3	N192	UNL DI 350	84.000	8	8.550	100.0000	0.0150	-5.00	-5.00		0.00	84.00	1	953.05	0.71	0.00	9.53	8.81	5.32	0.00
N192	N193	UNL DI 350	100.000	8	8.550	100.0000	0.0150	-5.00	-5.00	1(45)	8.51	108.51	1	953.05	0.92	0.00	8.81	7.90	5.32	0.00
N193	N194	UNL DI 350	106.170	8	8.550	100.0000	0.0150	-5.00	-5.00	1(E)	17.01	123.18	1	953.05	1.04	0.00	7.90	6.85	5.32	0.00
N194	N1	UNL DI 350	9.170	8	8.550	100.0000	0.0150	-5.00	-5.00	1(E)	17.01	26.18	1	953.05	0.22	0.00	6.85	6.63	5.32	0.00
N1	N2	Sch 10	6.500	8	8.249	120.0000	0.0040	-5.00	1.50	1(E)	20.02	26.52	1	953.05	0.19	2.82	6.63	3.62	5.71	0.00
N2	N3	Sch 10	2.580	8	8.249	120.0000	0.0040	1.50	1.50	1(E) 1(DCVA 8psi UFC)	20.02	22.60	1	953.05	8.16	0.00	3.62	-4.54	5.71	0.00
N3	N375	Sch 10	4.060	8	8.249	120.0000	0.0040	1.50	1.50		0.00	4.06	1	953.05	0.03	0.00	-4.54	-4.57	5.71	0.00
N375	N419	Sch 10	1.500	8	8.249	120.0000	0.0040	1.50	1.50	1(E)	20.02	21.52	1	953.05	0.15	0.00	-4.57	-4.72	5.71	0.00
N419	N420	Sch 10	0.950	8	8.249	120.0000	0.0040	1.50	1.50		0.00	0.95	1	953.05	0.01	0.00	-4.72	-4.73	5.71	0.00
N419	N421	Sch 10	1.090	6	6.357	120.0000	0.0040	1.50	2.59	1(T)	37.72	38.81	1	0.00	0.00	0.47	-4.72	-5.19	0.00	0.00
N420	N422	Sch 40	1.400	1	1.049	120.0000	0.0040	1.50	1.50	1(T)	5.00	6.40	1	0.00	0.00	0.00	-4.73	-4.73	0.00	0.00
N420	N423	Sch 10	0.790	8	8.249	120.0000	0.0040	1.50	1.50		0.00	0.79	1	953.05	0.01	0.00	-4.73	-4.73	5.71	0.00
N421	N424	Sch 10	0.750	6	6.357	120.0000	0.0040	2.59	3.33	1(BV)	12.57	13.32	1	0.00	0.00	0.32	-5.19	-5.51	0.00	0.00
N422	N425	Sch 40	0.690	1	1.049	120.0000	0.0040	1.50	0.81	1(E)	2.00	2.69	1	0.00	0.00	-0.30	-4.73	-4.43	0.00	0.00
N423	N376	Sch 10	5.250	8	8.249	120.0000	0.0040	1.50	1.50	1(Gate Valve)	4.45	9.70	1	953.05	0.07	0.00	-4.73	-4.80	5.71	0.00
N424	N426	Sch 10	2.670	6	6.357	120.0000	0.0040	3.33	6.00	1(Model D-1/G-1 Swing Check)	25.15	27.82	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
N425	N549	Sch 40	1.900	1	1.049	120.0000	0.0040	0.81	0.81	1(E)	2.00	3.90	1	0.00	0.00	0.00	-4.43	-4.43	0.00	0.00
N376	N413	Sch 10	1.700	6	6.357	120.0000	0.0040	1.50	1.50	1(1000gpm @ 40psi)	0.00	1.70	1	953.05	-40.47	0.00	-4.80	35.67	9.62	0.00
N426	N428	Sch 10	0.880	6	6.357	120.0000	0.0040	6.00	6.00	1(T)	37.72	38.60	1	0.00	0.00	0.00	33.05	33.05	0.00	0.00
N426	N429	Sch 10	1.500	6	6.357	120.0000	0.0040	6.00	7.50		0.00	1.50	1	0.00	0.00	0.65	33.05	32.40	0.00	0.00
N413	N431	Sch 10	0.900	6	6.357	120.0000	0.0040	1.50	1.50	1(Model D-1/G-1 Swing Check)	25.15	26.05	1	953.05	0.67	0.00	35.67	35.00	9.62	0.00
N428	N432	Sch 10	0.660	6	6.357	120.0000	0.0040	6.00	6.00	1(BV)	12.57	13.23	1	0.00	0.00	0.00	33.05	33.05	0.00	0.00
N429	N550	Sch 10	9.580	6	6.357	120.0000	0.0040	7.50	7.50	1(E)	17.60	27.18	1	0.00	0.00	0.00	32.40	32.40	0.00	0.00
N431	N435	Sch 10	1.200	6	6.357	120.0000	0.0040	1.50	1.50		0.00	1.20	1	953.05	0.03	0.00	35.00	34.97	9.62	0.00
N431	N436	Sch 10	1.090	6	6.357	120.0000	0.0040	1.50	2.59	1(T)	37.72	38.81	1	0.00	0.00	0.47	35.00	34.53	0.00	0.00
N432	N437	Sch 10	1.820	6	6.357	120.0000	0.0040	6.00	6.00	1(SC)	40.23	42.05	1	0.00	0.00	0.00	33.05	33.05	0.00	0.00
N550	N436	Sch 10	4.910	6	6.357	120.0000	0.0040	7.50	2.59	1(E)	17.60	22.51	1	0.00	0.00	-2.13	32.40	34.53	0.00	0.00
N435	N439	Sch 40	1.400	1	1.049	120.0000	0.0040	1.50	1.50	1(T)	5.00	6.40	1	0.00	0.00	0.00	34.97	34.97	0.00	0.00
N435	N440	Sch 10	0.980	6	6.357	120.0000	0.0040	1.50	1.50		0.00	0.98	1	953.05	0.03	0.00	34.97	34.95	9.62	0.00
N437	N441	Sch 10	0.960	6	6.357	120.0000	0.0040	6.00	5.04	1(E)	17.60	18.56	1	0.00	0.00	-0.42	33.05	33.47	0.00	0.00
N439	N443	Sch 40	0.690	1	1.049	120.0000	0.0040	1.50	0.81	1(E)	2.00	2.69	1	0.00	0.00	-0.30	34.97	35.27	0.00	0.00
N440	N444	Sch 10	1.090	6	6.357	120.0000	0.0040	1.50	2.59	1(T)	37.72	38.81	1	953.05	0.99	0.47	34.95	33.48	9.62	0.00
N440	N445	Sch 10	0.480	6	6.357	120.0000	0.0040	1.50	1.50		0.00	0.48	1	0.00	0.00	0.00	34.95	34.95	0.00	0.00
N443	N551	Sch 40	5.390	1	1.049	120.0000	0.0040	0.81	0.81	1(E)	2.00	7.39	1	0.00	0.00	0.00	35.27	35.27	0.00	0.00
N444	N448	Sch 10	0.970	6	6.357	120.0000	0.0040	2.59	3.56	1(BV)	12.57	13.54	1	953.05	0.35	0.42	33.48	32.71	9.62	0.00
N448	N500	Sch 10	6.190	6	6.357	120.0000	0.0040	3.56	9.75	1(Model E/F Easy Riser)	25.15	31.34	1	953.05	0.80	2.68	32.71	29.23	9.62	0.00
N500	N501	Sch 10	1.210	6	6.357	120.0000	0.0040	9.75	9.75	1(E)	17.60	18.81	1	953.05	0.48	0.00	29.23	28.75	9.62	0.00
N501	N451	Sch 10	13.420	6	6.357	120.0000	0.0040	9.75	9.75	1(E)	17.60	31.02	1	953.05	0.79	0.00	28.75	27.96	9.62	0.00
N451	N502	Sch 10	1.190	6	6.357	120.0000	0.0040	9.75	9.75		0.00	1.19	1	953.05	0.03	0.00	27.96	27.92	9.62	0.00
N451	N453	Sch 10	4.680	4	4.260	120.0000	0.0040	9.75	9.75	1(T)	26.33	31.01	1	0.00	0.00	0.00	27.96	27.96	0.00	0.00
N502	N503	Sch 10	9.620	6	6.357	120.0000	0.0040	9.75	19.37	1(E)	17.60	27.22	1	953.05	0.70	4.17	27.92	23.06	9.62	0.00
N453	N455	Sch 10	0.610	1 ½	1.682	120.0000	0.0040	9.75	10.36	1(T)	9.90	10.51	1	0.00	0.00	0.26	27.96	27.69	0.00	0.00
N453	N454	Sch 10	10.500	4	4.260	120.0000	0.0040	9.75	9.75		0.00	10.50	1	0.00	0.00	0.00	27.96	27.96	0.00	0.00
N503	N13	Sch 10	1.520	6	6.357	120.0000	0.0040	19.37	19.37	1(T)	37.72	39.24	1	322.27	0.14	0.00	23.06	22.93	3.25	0.00
N503	N17	Sch 10	12.480	6	6.357	120.0000	0.0040	19.37	19.37	1(T)	37.72	50.20	1	630.78	0.60	0.00	23.06	22.46	6.37	0.00
N455	S233	Sch 10	1.660	1 ½	1.682	120.0000	0.0040	10.36	10.36	1(E)	4.95	6.61	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N454	N457	Sch 10	0.610	1 ½	1.682	120.0000	0.0040	9.75	10.36	1(T)	9.90	10.51	1	0.00	0.00	0.26	27.96	27.69	0.00	0.00
N454	N456	Sch 10	8.330	4	4.260	120.0000	0.0040	9.75	9.75		0.00	8.33	1	0.00	0.00	0.00	27.96	27.96	0.00	0.00
N13	N16	Sch 10	0.870	2	2.157	120.0000	0.0040	19.37	20.24	1(T)	12.31	13.18	1	55.13	0.33	0.38	22.93	22.22	4.83	0.00
N13	N12	Sch 10	14.000	6	6.357	120.0000	0.0040	19.37	19.37		0.00	14.00	1	267.14	0.03	0.00	22.93	22.89	2.70	0.00
N17	N22	Sch 10	14.000	6	6.357	120.0000	0.0040	19.37	19.37		0.00	14.00	1	576.75	0.14	0.00	22.46	22.32	5.82	0.00
N17	N23	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	54.03	0.32	0.34	22.46	21.80	4.74	0.00
S233	N460	Sch 10	9.000	1 ½	1.682	120.0000	0.0040	10.36	10.36		0.00	9.00	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N457	S234	Sch 10	1.660	1 ½	1.682	120.0000	0.0040	10.36	10.36	1(E)	4.95	6.61	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N456	N458	Sch 10	10.000	4	4.260	120.0000	0.0040	9.75	9.75		0.00	10.00	1	0.00	0.00	0.00	27.96	27.96	0.00	0.00
N456	N459	Sch 10	0.610	1 ½	1.682	120.0000	0.0040	9.75	10.36	1(T)	9.90	10.51	1	0.00	0.00	0.26	27.96	27.69	0.00	0.00
N16	N21	Sch 10	3.730	2	2.157	120.0000	0.0040	20.24	21.42	1(E)	6.15	9.88	1	55.13	0.25	0.51	22.22	21.45	4.83	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N12	N14	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	55.56	0.34	0.34	22.89	22.22	4.87	0.00
N12	N15	Sch 10	12.500	6	6.357	120.0000	0.0040	19.37	19.37		0.00	12.50	1	211.58	0.02	0.00	22.89	22.87	2.14	0.00
N22	N30	Sch 10	12.500	6	6.357	120.0000	0.0040	19.37	19.37		0.00	12.50	1	455.72	0.08	0.00	22.32	22.24	4.60	0.00
N22	N29	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	121.03	1.42	0.34	22.32	20.56	10.61	0.00
N23	N31	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	54.03	0.24	0.52	21.80	21.05	4.74	0.00
N460	S236	Sch 10	0.200	¾	0.884	120.0000	0.0040	10.36	10.56	1(E)	2.82	3.02	1	0.00	0.00	0.09	27.69	27.60	0.00	0.00
S234	N463	Sch 10	9.000	1 ½	1.682	120.0000	0.0040	10.36	10.36		0.00	9.00	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N458	N461	Sch 10	0.610	1 ½	1.682	120.0000	0.0040	9.75	10.36	1(T)	9.90	10.51	1	0.00	0.00	0.26	27.96	27.69	0.00	0.00
N458	N462	Sch 10	4.130	4	4.260	120.0000	0.0040	9.75	9.75		0.00	4.13	1	0.00	0.00	0.00	27.96	27.96	0.00	0.00
N459	S235	Sch 10	1.660	1 ½	1.682	120.0000	0.0040	10.36	10.36	1(E)	4.95	6.61	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N21	N28	Sch 10	9.000	2	2.157	120.0000	0.0040	21.42	24.26		0.00	9.00	1	55.13	0.23	1.23	21.45	19.99	4.83	0.00
N21	S2	Sch 10	1.190	1	1.097	120.0000	0.0040	21.42	22.54	1(T)	6.22	7.41	1	0.00	0.00	0.49	21.45	20.97	0.00	0.00
N14	N18	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	55.56	0.26	0.52	22.22	21.45	4.87	0.00
N15	N20	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	53.97	0.32	0.34	22.87	22.22	4.73	0.00
N15	N19	Sch 10	14.000	6	6.357	120.0000	0.0040	19.37	19.37		0.00	14.00	1	157.61	0.01	0.00	22.87	22.86	1.59	0.00
N30	N40	Sch 10	0.920	2	2.157	120.0000	0.0040	19.37	20.29	1(T)	12.31	13.23	1	155.93	2.30	0.40	22.24	19.54	13.67	0.00
N30	N552	Sch 10	13.330	6	6.357	120.0000	0.0040	19.37	19.37		0.00	13.33	1	299.79	0.04	0.00	22.24	22.20	3.03	0.00
N29	N38	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	121.03	1.08	0.52	20.56	18.97	10.61	0.00
N31	S6	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.05	20.53	0.00	0.00
N31	N41	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	54.03	0.22	1.23	21.05	19.59	4.74	0.00
N463	S238	Sch 10	0.200	¾	0.884	120.0000	0.0040	10.36	10.56	1(E)	2.82	3.02	1	0.00	0.00	0.09	27.69	27.60	0.00	0.00
N461	S237	Sch 10	1.660	1 ½	1.682	120.0000	0.0040	10.36	10.36	1(E)	4.95	6.61	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N462	N464	Sch 10	3.670	4	4.260	120.0000	0.0040	9.75	13.42	1(E)	13.17	16.84	1	0.00	0.00	1.59	27.96	26.37	0.00	0.00
S235	N465	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.36	10.36		0.00	12.00	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N28	N37	Sch 10	9.000	2	2.157	120.0000	0.0040	24.26	27.11		0.00	9.00	1	55.13	0.23	1.23	19.99	18.53	4.83	0.00
N28	S5	Sch 10	1.190	1	1.097	120.0000	0.0040	24.26	25.39	1(T)	6.22	7.41	1	0.00	0.00	0.49	19.99	19.51	0.00	0.00
N18	N24	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	55.56	0.23	1.23	21.45	19.98	4.87	0.00
N18	S1	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.45	20.93	0.00	0.00
N20	N27	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	53.97	0.24	0.52	22.22	21.46	4.73	0.00
N19	N26	Sch 10	14.000	6	6.357	120.0000	0.0040	19.37	19.37		0.00	14.00	1	104.70	0.01	0.00	22.86	22.85	1.06	0.00
N19	N25	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	52.91	0.31	0.34	22.86	22.21	4.64	0.00
N40	N52	Sch 10	3.710	2	2.157	120.0000	0.0040	20.29	21.47	1(E)	6.15	9.86	1	155.93	1.71	0.51	19.54	17.32	13.67	0.00
N552	N553	Sch 10	0.830	6	6.357	120.0000	0.0040	19.37	19.37		0.00	0.83	1	154.07	0.00	0.00	22.20	22.20	1.56	0.00
N552	N554	Sch 10	0.920	2	2.157	120.0000	0.0040	19.37	20.29	1(T)	12.31	13.23	1	145.72	2.03	0.40	22.20	19.77	12.78	0.00
N38	S11	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.97	18.45	0.00	0.00
N38	N49	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	121.03	0.98	1.23	18.97	16.76	10.61	0.00
N41	S12	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	19.59	19.07	0.00	0.00
N41	N53	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	54.03	0.22	1.23	19.59	18.14	4.74	0.00
S237	N466	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.36	10.36		0.00	12.00	1	0.00	0.00	0.00	27.69	27.69	0.00	0.00
N464	N467	Sch 10	5.200	4	4.260	120.0000	0.0040	13.42	13.42	1(E)	13.17	18.37	1	0.00	0.00	0.00	26.37	26.37	0.00	0.00
N465	S239	Sch 10	0.200	¾	0.884	120.0000	0.0040	10.36	10.56	1(E)	2.82	3.02	1	0.00	0.00	0.09	27.69	27.60	0.00	0.00
N37	N48	Sch 10	9.000	2	2.157	120.0000	0.0040	27.11	29.95		0.00	9.00	1	55.13	0.23	1.23	18.53	17.07	4.83	0.00
N37	S10	Sch 10	1.190	1	1.097	120.0000	0.0040	27.11	28.23	1(T)	6.22	7.41	1	0.00	0.00	0.49	18.53	18.05	0.00	0.00
N24	N32	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	55.56	0.23	1.23	19.98	18.52	4.87	0.00
N24	S3	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	19.98	19.46	0.00	0.00
N27	N36	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	53.97	0.22	1.23	21.46	20.00	4.73	0.00
N27	S4	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.46	20.94	0.00	0.00
N26	N34	Sch 10	12.000	6	6.357	120.0000	0.0040	19.37	19.37		0.00	12.00	1	52.29	0.00	0.00	22.85	22.85	0.53	0.00
N26	N35	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	52.41	0.30	0.34	22.85	22.21	4.60	0.00
N25	N33	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	52.91	0.23	0.52	22.21	21.47	4.64	0.00
N52	S19	Sch 10	1.130	1	1.097	120.0000	0.0040	21.47	22.54	1(T)	6.22	7.35	1	0.00	0.00	0.46	17.32	16.86	0.00	0.00
N52	N64	Sch 10	9.000	2	2.157	120.0000	0.0040	21.47	24.31		0.00	9.00	1	155.93	1.56	1.23	17.32	14.53	13.67	0.00
N553	N555	Sch 10	3.050	4	4.260	120.0000	0.0040	19.37	16.33	1(T)	26.33	29.38	1	0.00	0.00	-1.32	22.20	23.52	0.00	0.00
N553	N50	Sch 10	13.830	6	6.357	120.0000	0.0040	19.37	19.37		0.00	13.83	1	154.07	0.01	0.00	22.20	22.19	1.56	0.00
N554	N556	Sch 10	0.670	2	2.157	120.0000	0.0040	20.29	20.29	1(E)	6.15	6.82	1	145.72	1.05	0.00	19.77	18.73	12.78	0.00
N49	N60	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	80.19	0.46	1.23	16.76	15.07	7.03	0.00
N49	S18	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	40.85	2.94	0.52	16.76	13.30	13.85	0.00
N53	S20	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.14	17.62	0.00	0.00
N53	N65	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	54.03	0.22	1.23	18.14	16.69	4.74	0.00
N466	S240	Sch 10	0.200	¾	0.884	120.0000	0.0040	10.36	10.56	1(E)	2.82	3.02	1	0.00	0.00	0.09	27.69	27.60	0.00	0.00
N467	N469	Sch 10	0.580	1 ½	1.682	120.0000	0.0040	13.42	14.00	1(T)	9.90	10.48	1	0.00	0.00	0.25	26.37	26.11	0.00	0.00
N467	N468	Sch 10	12.000	4	4.260	120.0000	0.0040	13.42	13.42		0.00	12.00	1	0.00	0.00	0.00	26.37	26.37	0.00	0.00
N48	S17	Sch 10	1.190	1	1.097	120.0000	0.0040	29.95	31.08	1(T)	6.22	7.41	1	0.00	0.00	0.49	17.07	16.58	0.00	0.00
N48	N59	Sch 10	9.000	2	2.157	120.0000	0.0040	29.95	32.80		0.00	9.00	1	55.13	0.23	1.23	17.07	15.61	4.83	0.00
N32	N42	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	55.56	0.23	1.23	18.52	17.05	4.87	0.00
N32	S7	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.52	18.00	0.00	0.00
N36	S9	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	20.00	19.48	0.00	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N36	N47	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	53.97	0.22	1.23	20.00	18.55	4.73	0.00
N34	N44	Sch 10	0.780	2	2.157	120.0000	0.0040	19.37	20.15	1(T)	12.31	13.09	1	52.29	0.30	0.34	22.85	22.21	4.59	0.00
N34	N45	Sch 10	0.590	6	6.357	120.0000	0.0040	19.37	19.37		0.00	0.59	1	0.00	0.00	0.00	22.85	22.85	0.00	0.00
N35	N46	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	52.41	0.23	0.52	22.21	21.47	4.60	0.00
N33	N43	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	52.91	0.21	1.23	21.47	20.02	4.64	0.00
N33	S8	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.47	20.95	0.00	0.00
N64	S29	Sch 10	1.130	1	1.097	120.0000	0.0040	24.31	25.39	1(T)	6.22	7.35	1	38.04	2.53	0.47	14.53	11.53	12.90	0.00
N64	N75	Sch 10	9.000	2	2.157	120.0000	0.0040	24.31	27.16		0.00	9.00	1	117.89	0.93	1.23	14.53	12.36	10.34	0.00
N555	N557	Sch 10	1.850	4	4.260	120.0000	0.0040	16.33	16.33	1(E)	13.17	15.02	1	0.00	0.00	0.00	23.52	23.52	0.00	0.00
N50	N558	Sch 10	0.900	6	6.357	120.0000	0.0040	19.37	19.37		0.00	0.90	1	0.00	0.00	0.00	22.19	22.19	0.00	0.00
N50	N62	Sch 10	0.800	2	2.157	120.0000	0.0040	19.37	20.17	1(T)	12.31	13.11	1	154.07	2.23	0.35	22.19	19.61	13.51	0.00
N556	N63	Sch 10	3.710	2	2.157	120.0000	0.0040	20.29	21.47	1(E)	6.15	9.86	1	145.72	1.51	0.51	18.73	16.71	12.78	0.00
N60	S27	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	38.64	2.65	0.52	15.07	11.90	13.10	0.00
N60	N72	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	41.55	0.14	1.23	15.07	13.70	3.64	0.00
N65	S30	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	16.69	16.17	0.00	0.00
N65	N76	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	54.03	0.22	1.23	16.69	15.24	4.74	0.00
N469	N472	Sch 10	0.990	1 ½	1.682	120.0000	0.0040	14.00	14.00	1(E)	4.95	5.94	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N468	N471	Sch 10	0.580	1 ½	1.682	120.0000	0.0040	13.42	14.00	1(T)	9.90	10.48	1	0.00	0.00	0.25	26.37	26.11	0.00	0.00
N468	N470	Sch 10	12.000	4	4.260	120.0000	0.0040	13.42	13.42		0.00	12.00	1	0.00	0.00	0.00	26.37	26.37	0.00	0.00
N59	S26	Sch 10	1.190	1	1.097	120.0000	0.0040	32.80	33.93	1(T)	6.22	7.41	1	0.00	0.00	0.49	15.61	15.12	0.00	0.00
N59	N71	Sch 10	1.420	2	2.157	120.0000	0.0040	32.80	33.25		0.00	1.42	1	55.13	0.04	0.19	15.61	15.38	4.83	0.00
N42	N54	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	55.56	0.23	1.23	17.05	15.59	4.87	0.00
N42	S13	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	17.05	16.53	0.00	0.00
N47	S16	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.55	18.04	0.00	0.00
N47	N58	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	53.97	0.22	1.23	18.55	17.10	4.73	0.00
N44	N56	Sch 10	3.760	2	2.157	120.0000	0.0040	20.15	21.34	1(E)	6.15	9.91	1	52.29	0.23	0.52	22.21	21.47	4.59	0.00
N46	S15	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.47	20.95	0.00	0.00
N46	N57	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	52.41	0.21	1.23	21.47	20.03	4.60	0.00
N43	N55	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	52.91	0.21	1.23	20.02	18.58	4.64	0.00
N43	S14	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	20.02	19.50	0.00	0.00
N75	S38	Sch 10	1.130	1	1.097	120.0000	0.0040	27.16	28.23	1(T)	6.22	7.35	1	34.95	2.16	0.46	12.36	9.74	11.85	0.00
N75	N86	Sch 10	9.000	2	2.157	120.0000	0.0040	27.16	30.01		0.00	9.00	1	82.94	0.49	1.23	12.36	10.64	7.27	0.00
N557	N559	Sch 10	0.590	1 ½	1.682	120.0000	0.0040	16.33	16.92	1(T)	9.90	10.49	1	0.00	0.00	0.26	23.52	23.26	0.00	0.00
N557	N560	Sch 10	10.000	4	4.260	120.0000	0.0040	16.33	16.33		0.00	10.00	1	0.00	0.00	0.00	23.52	23.52	0.00	0.00
N62	N73	Sch 10	3.750	2	2.157	120.0000	0.0040	20.17	21.36	1(E)	6.15	9.90	1	154.07	1.68	0.52	19.61	17.42	13.51	0.00
N63	S28	Sch 10	1.130	1	1.097	120.0000	0.0040	21.47	22.54	1(T)	6.22	7.35	1	0.00	0.00	0.46	16.71	16.24	0.00	0.00
N63	N74	Sch 10	9.000	2	2.157	120.0000	0.0040	21.47	24.31		0.00	9.00	1	145.72	1.38	1.23	16.71	14.10	12.78	0.00
N72	S35	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	36.75	2.41	0.52	13.70	10.77	12.46	0.00
N72	N83	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	4.80	0.00	1.23	13.70	12.47	0.42	0.00
N76	S39	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.24	14.71	0.00	0.00
N76	N87	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	54.03	0.03	0.19	15.24	15.01	4.74	0.00
N472	N476	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N472	S241	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N471	N475	Sch 10	0.990	1 ½	1.682	120.0000	0.0040	14.00	14.00	1(E)	4.95	5.94	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N470	N474	Sch 10	0.560	4	4.260	120.0000	0.0040	13.42	13.42		0.00	0.56	1	0.00	0.00	0.00	26.37	26.37	0.00	0.00
N470	N473	Sch 10	0.580	2 ½	2.635	120.0000	0.0040	13.42	14.00	1(T)	16.47	17.05	1	0.00	0.00	0.25	26.37	26.11	0.00	0.00
N71	N82	Sch 10	4.550	2	2.157	120.0000	0.0040	33.25	33.25	1(45)	2.46	7.01	1	55.13	0.18	0.00	15.38	15.20	4.83	0.00
N54	S21	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.59	15.07	0.00	0.00
N54	N66	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	55.56	0.04	0.19	15.59	15.36	4.87	0.00
N58	N70	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	53.97	0.22	1.23	17.10	15.65	4.73	0.00
N58	S25	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	17.10	16.58	0.00	0.00
N56	S23	Sch 10	1.270	1	1.097	120.0000	0.0040	21.34	22.54	1(T)	6.22	7.49	1	0.00	0.00	0.52	21.47	20.95	0.00	0.00
N56	N68	Sch 10	9.000	2	2.157	120.0000	0.0040	21.34	24.19		0.00	9.00	1	52.29	0.21	1.23	21.47	20.03	4.59	0.00
N57	N69	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	52.41	0.21	1.23	20.03	18.59	4.60	0.00
N57	S24	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	20.03	19.51	0.00	0.00
N55	N67	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	52.91	0.21	1.23	18.58	17.13	4.64	0.00
N55	S22	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.58	18.06	0.00	0.00
N86	S46	Sch 10	1.130	1	1.097	120.0000	0.0040	30.01	31.08	1(T)	6.22	7.35	1	32.29	1.87	0.46	10.64	8.31	10.95	0.00
N86	N97	Sch 10	9.000	2	2.157	120.0000	0.0040	30.01	32.85		0.00	9.00	1	50.65	0.20	1.23	10.64	9.22	4.44	0.00
N559	N561	Sch 10	3.330	1 ½	1.682	120.0000	0.0040	16.92	16.92	1(E)	4.95	8.28	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N560	N562	Sch 10	0.590	1 ½	1.682	120.0000	0.0040	16.33	16.92	1(T)	9.90	10.49	1	0.00	0.00	0.26	23.52	23.26	0.00	0.00
N560	N563	Sch 10	6.670	4	4.260	120.0000	0.0040	16.33	16.33		0.00	6.67	1	0.00	0.00	0.00	23.52	23.52	0.00	0.00
N73	N84	Sch 10	9.000	2	2.157	120.0000	0.0040	21.36	24.20		0.00	9.00	1	154.07	1.53	1.23	17.42	14.66	13.51	0.00
N73	S36	Sch 10	1.250	1	1.097	120.0000	0.0040	21.36	22.54	1(T)	6.22	7.47	1	0.00	0.00	0.51	17.42	16.91	0.00	0.00
N74	N85	Sch 10	9.000	2	2.157	120.0000	0.0040	24.31	27.16		0.00	9.00	1	108.28	0.80	1.23	14.10	12.07	9.50	0.00
N74	S37	Sch 10	1.130	1	1.097	120.0000	0.0040	24.31	25.39	1(T)	6.22	7.35	1	37.44	2.45	0.47	14.10	11.18	12.69	0.00
N83	S43	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	34.96	2.20	0.52	12.47	9.74	11.85	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N83	N94	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	-1	-30.15	-0.01	0.19	12.47	12.28	-2.64	0.00
N87	N98	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	54.03	0.17	0.00	15.01	14.84	4.74	0.00
N476	S243	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N476	N479	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N475	N478	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N475	S242	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N473	N477	Sch 10	0.990	2 ½	2.635	120.0000	0.0040	14.00	14.00	1(E)	8.24	9.23	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N82	N93	Sch 10	1.550	2	2.157	120.0000	0.0040	33.25	32.76	1(45)	2.46	4.01	1	55.13	0.10	-0.21	15.20	15.31	4.83	0.00
N66	N77	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	55.56	0.18	0.00	15.36	15.18	4.87	0.00
N70	S34	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.65	15.13	0.00	0.00
N70	N81	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	53.97	0.03	0.19	15.65	15.42	4.73	0.00
N68	S32	Sch 10	1.270	1	1.097	120.0000	0.0040	24.19	25.39	1(T)	6.22	7.49	1	0.00	0.00	0.52	20.03	19.51	0.00	0.00
N68	N79	Sch 10	9.000	2	2.157	120.0000	0.0040	24.19	27.03		0.00	9.00	1	52.29	0.21	1.23	20.03	18.59	4.59	0.00
N69	N80	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	52.41	0.21	1.23	18.59	17.15	4.60	0.00
N69	S33	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.59	18.07	0.00	0.00
N67	N78	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	52.91	0.21	1.23	17.13	15.69	4.64	0.00
N67	S31	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	17.13	16.61	0.00	0.00
N97	N108	Sch 10	1.460	2	2.157	120.0000	0.0040	32.85	33.31		0.00	1.46	1	20.75	0.01	0.20	9.22	9.01	1.82	0.00
N97	S53	Sch 10	1.130	1	1.097	120.0000	0.0040	32.85	33.93	1(T)	6.22	7.35	1	29.90	1.62	0.47	9.22	7.13	10.14	0.00
N561	S222	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(T)	6.22	6.54	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N561	N564	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	16.92	16.92		0.00	12.00	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N562	N565	Sch 10	3.330	1 ½	1.682	120.0000	0.0040	16.92	16.92	1(E)	4.95	8.28	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N563	N566	Sch 10	10.000	4	4.260	120.0000	0.0040	16.33	16.33		0.00	10.00	1	0.00	0.00	0.00	23.52	23.52	0.00	0.00
N563	N567	Sch 10	0.590	1 ½	1.682	120.0000	0.0040	16.33	16.92	1(T)	9.90	10.49	1	0.00	0.00	0.26	23.52	23.26	0.00	0.00
N84	S44	Sch 10	1.250	1	1.097	120.0000	0.0040	24.20	25.39	1(T)	6.22	7.47	1	38.09	2.57	0.52	14.66	11.57	12.92	0.00
N84	N95	Sch 10	9.000	2	2.157	120.0000	0.0040	24.20	27.05		0.00	9.00	1	115.98	0.90	1.23	14.66	12.52	10.17	0.00
N85	S45	Sch 10	1.130	1	1.097	120.0000	0.0040	27.16	28.23	1(T)	6.22	7.35	1	34.51	2.11	0.46	12.07	9.49	11.70	0.00
N85	N96	Sch 10	9.000	2	2.157	120.0000	0.0040	27.16	30.01		0.00	9.00	1	73.77	0.39	1.23	12.07	10.44	6.47	0.00
N94	N105	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	-1	-30.15	-0.06	0.00	12.28	12.34	-2.64	0.00
N98	N109	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	54.03	0.10	-0.21	14.84	14.95	4.74	0.00
N479	S246	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N479	N482	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N478	S245	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N478	N481	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N477	N480	Sch 10	10.000	2 ½	2.635	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N477	S244	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N93	N104	Sch 10	9.000	2	2.157	120.0000	0.0040	32.76	29.91		0.00	9.00	1	55.13	0.23	-1.23	15.31	16.32	4.83	0.00
N93	S50	Sch 10	1.210	1	1.097	120.0000	0.0040	32.76	33.91	1(T)	6.22	7.43	1	0.00	0.00	0.50	15.31	14.81	0.00	0.00
N77	N88	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	55.56	0.10	-0.21	15.18	15.29	4.87	0.00
N81	N92	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	53.97	0.17	0.00	15.42	15.25	4.73	0.00
N79	N90	Sch 10	9.000	2	2.157	120.0000	0.0040	27.03	29.88		0.00	9.00	1	52.29	0.21	1.23	18.59	17.15	4.59	0.00
N79	S41	Sch 10	1.270	1	1.097	120.0000	0.0040	27.03	28.23	1(T)	6.22	7.49	1	0.00	0.00	0.52	18.59	18.07	0.00	0.00
N80	S42	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	17.15	16.63	0.00	0.00
N80	N91	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	52.41	0.21	1.23	17.15	15.71	4.60	0.00
N78	N89	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	52.91	0.03	0.19	15.69	15.46	4.64	0.00
N78	S40	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.69	15.17	0.00	0.00
N108	N119	Sch 10	4.530	2	2.157	120.0000	0.0040	33.31	33.31	1(45)	2.46	6.99	1	20.75	0.03	0.00	9.01	8.98	1.82	0.00
N564	S221	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(E)	2.49	2.81	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N565	S226	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(T)	6.22	6.54	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N565	N568	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	16.92	16.92		0.00	12.00	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N566	N569	Sch 10	2.490	4	4.260	120.0000	0.0040	16.33	16.33		0.00	2.49	1	0.00	0.00	0.00	23.52	23.52	0.00	0.00
N566	N570	Sch 10	0.590	1 ½	1.682	120.0000	0.0040	16.33	16.92	1(T)	9.90	10.49	1	0.00	0.00	0.26	23.52	23.26	0.00	0.00
N567	N571	Sch 10	3.330	1 ½	1.682	120.0000	0.0040	16.92	16.92	1(E)	4.95	8.28	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N95	S51	Sch 10	1.250	1	1.097	120.0000	0.0040	27.05	28.23	1(T)	6.22	7.47	1	35.06	2.21	0.51	12.52	9.80	11.89	0.00
N95	N106	Sch 10	9.000	2	2.157	120.0000	0.0040	27.05	29.89		0.00	9.00	1	80.91	0.46	1.23	12.52	10.82	7.10	0.00
N96	N107	Sch 10	9.000	2	2.157	120.0000	0.0040	30.01	32.85		0.00	9.00	1	41.80	0.14	1.23	10.44	9.07	3.67	0.00
N96	S52	Sch 10	1.130	1	1.097	120.0000	0.0040	30.01	31.08	1(T)	6.22	7.35	1	31.97	1.83	0.46	10.44	8.15	10.84	0.00
N105	N116	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	-1	-30.15	-0.03	-0.21	12.34	12.59	-2.64	0.00
N109	S60	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	14.95	14.42	0.00	0.00
N109	N120	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	54.03	0.22	-1.23	14.95	15.96	4.74	0.00
N482	S249	Sch 10	0.560	¾	0.884	120.0000	0.0040	14.00	14.56	1(E)	2.82	3.38	1	0.00	0.00	0.24	26.11	25.87	0.00	0.00
N481	N484	Sch 10	10.000	1 ½	1.682	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N481	S248	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N480	S247	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N480	N483	Sch 10	10.000	2 ½	2.635	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N104	N115	Sch 10	9.000	2	2.157	120.0000	0.0040	29.91	27.07		0.00	9.00	1	55.13	0.23	-1.23	16.32	17.32	4.83	0.00
N104	S57	Sch 10	1.210	1	1.097	120.0000	0.0040	29.91	31.06	1(T)	6.22	7.43	1	0.00	0.00	0.50	16.32	15.82	0.00	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N88	S47	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.29	14.76	0.00	0.00
N88	N99	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	55.56	0.23	-1.23	15.29	16.29	4.87	0.00
N92	N103	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	53.97	0.10	-0.21	15.25	15.37	4.73	0.00
N90	N101	Sch 10	9.000	2	2.157	120.0000	0.0040	29.88	32.72		0.00	9.00	1	52.29	0.21	1.23	17.15	15.71	4.59	0.00
N90	S48	Sch 10	1.270	1	1.097	120.0000	0.0040	29.88	31.08	1(T)	6.22	7.49	1	0.00	0.00	0.52	17.15	16.63	0.00	0.00
N91	N102	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	52.41	0.03	0.19	15.71	15.48	4.60	0.00
N91	S49	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.71	15.18	0.00	0.00
N89	N100	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	52.91	0.16	0.00	15.46	15.30	4.64	0.00
N119	N130	Sch 10	1.570	2	2.157	120.0000	0.0040	33.31	32.82	1(45)	2.46	4.03	1	20.75	0.02	-0.21	8.98	9.18	1.82	0.00
N568	S223	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(E)	2.49	2.81	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N569	N572	Sch 10	4.330	4	4.260	120.0000	0.0040	16.33	12.00	1(E)	13.17	17.50	1	0.00	0.00	-1.88	23.52	25.39	0.00	0.00
N570	N573	Sch 10	3.330	1 ½	1.682	120.0000	0.0040	16.92	16.92	1(E)	4.95	8.28	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N571	S228	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(T)	6.22	6.54	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N571	N574	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	16.92	16.92		0.00	12.00	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N106	S58	Sch 10	1.250	1	1.097	120.0000	0.0040	29.89	31.08	1(T)	6.22	7.47	1	32.45	1.91	0.52	10.82	8.40	11.00	0.00
N106	N117	Sch 10	9.000	2	2.157	120.0000	0.0040	29.89	32.74		0.00	9.00	1	48.46	0.18	1.23	10.82	9.41	4.25	0.00
N107	N118	Sch 10	1.460	2	2.157	120.0000	0.0040	32.85	33.31		0.00	1.46	1	12.14	0.00	0.20	9.07	8.87	1.06	0.00
N107	S59	Sch 10	1.130	1	1.097	120.0000	0.0040	32.85	33.93	1(T)	6.22	7.35	1	29.66	1.59	0.47	9.07	7.01	10.06	0.00
N116	N127	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	-1	-30.15	-0.07	-1.23	12.59	13.89	-2.64	0.00
N116	S65	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	12.59	12.05	0.00	0.00
N120	S67	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.96	15.43	0.00	0.00
N120	N131	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	54.03	0.22	-1.23	15.96	16.98	4.74	0.00
N484	S251	Sch 10	0.560	¾	0.884	120.0000	0.0040	14.00	14.56	1(E)	2.82	3.38	1	0.00	0.00	0.24	26.11	25.87	0.00	0.00
N483	N485	Sch 10	10.000	2 ½	2.635	120.0000	0.0040	14.00	14.00		0.00	10.00	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N483	S250	Sch 10	0.490	1	1.097	120.0000	0.0040	14.00	14.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	26.11	25.90	0.00	0.00
N115	S64	Sch 10	1.210	1	1.097	120.0000	0.0040	27.07	28.21	1(T)	6.22	7.43	1	0.00	0.00	0.49	17.32	16.83	0.00	0.00
N115	N126	Sch 10	9.000	2	2.157	120.0000	0.0040	27.07	24.22		0.00	9.00	1	55.13	0.23	-1.23	17.32	18.33	4.83	0.00
N99	N110	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	55.56	0.23	-1.23	16.29	17.29	4.87	0.00
N99	S54	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.29	15.76	0.00	0.00
N103	S56	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.37	14.83	0.00	0.00
N103	N114	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	53.97	0.22	-1.23	15.37	16.38	4.73	0.00
N101	N112	Sch 10	1.400	2	2.157	120.0000	0.0040	32.72	33.17		0.00	1.40	1	52.29	0.03	0.19	15.71	15.49	4.59	0.00
N101	S55	Sch 10	1.270	1	1.097	120.0000	0.0040	32.72	33.93	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.71	15.19	0.00	0.00
N102	N113	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	52.41	0.16	0.00	15.48	15.32	4.60	0.00
N100	N111	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	52.91	0.09	-0.21	15.30	15.42	4.64	0.00
N130	N141	Sch 10	9.000	2	2.157	120.0000	0.0040	32.82	29.97		0.00	9.00	-1	-9.07	-0.01	-1.23	9.18	10.42	-0.80	0.00
N130	S74	Sch 10	1.150	1	1.097	120.0000	0.0040	32.82	33.91	1(T)	6.22	7.37	1	29.82	1.61	0.47	9.18	7.09	10.11	0.00
N572	N575	Sch 10	3.510	4	4.260	120.0000	0.0040	12.00	12.00	1(E)	13.17	16.68	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N573	S227	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(T)	6.22	6.54	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N573	N576	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	16.92	16.92		0.00	12.00	1	0.00	0.00	0.00	23.26	23.26	0.00	0.00
N574	S225	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(E)	2.49	2.81	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N117	S66	Sch 10	1.250	1	1.097	120.0000	0.0040	32.74	33.93	1(T)	6.22	7.47	1	30.11	1.67	0.52	9.41	7.23	10.21	0.00
N117	N128	Sch 10	1.420	2	2.157	120.0000	0.0040	32.74	33.19		0.00	1.42	1	18.35	0.00	0.19	9.41	9.21	1.61	0.00
N118	N129	Sch 10	4.530	2	2.157	120.0000	0.0040	33.31	33.31	1(45)	2.46	6.99	1	12.14	0.01	0.00	8.87	8.86	1.06	0.00
N127	S73	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	13.89	13.36	0.00	0.00
N127	N138	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	-1	-30.15	-0.07	-1.23	13.89	15.20	-2.64	0.00
N131	S75	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.98	16.45	0.00	0.00
N131	N142	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	54.03	0.22	-1.23	16.98	17.99	4.74	0.00
N485	S252	Sch 10	0.560	¾	0.884	120.0000	0.0040	14.00	14.56	1(T)	5.63	6.19	1	0.00	0.00	0.24	26.11	25.87	0.00	0.00
N485	N486	Sch 10	3.060	2 ½	2.635	120.0000	0.0040	14.00	14.00		0.00	3.06	1	0.00	0.00	0.00	26.11	26.11	0.00	0.00
N126	S72	Sch 10	1.210	1	1.097	120.0000	0.0040	24.22	25.37	1(T)	6.22	7.43	1	0.00	0.00	0.50	18.33	17.83	0.00	0.00
N126	N137	Sch 10	9.000	2	2.157	120.0000	0.0040	24.22	21.38		0.00	9.00	1	55.13	0.23	-1.23	18.33	19.33	4.83	0.00
N110	N121	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	55.56	0.23	-1.23	17.29	18.29	4.87	0.00
N110	S61	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.29	16.76	0.00	0.00
N114	S63	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.38	15.85	0.00	0.00
N114	N125	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	53.97	0.22	-1.23	16.38	17.39	4.73	0.00
N112	N123	Sch 10	4.550	2	2.157	120.0000	0.0040	33.17	33.17	1(45)	2.46	7.01	1	52.29	0.16	0.00	15.49	15.32	4.59	0.00
N113	N124	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	52.41	0.09	-0.21	15.32	15.44	4.60	0.00
N111	N122	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	52.91	0.21	-1.23	15.42	16.43	4.64	0.00
N111	S62	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.42	14.88	0.00	0.00
N141	N152	Sch 10	9.000	2	2.157	120.0000	0.0040	29.97	27.12		0.00	9.00	-1	-40.98	-0.13	-1.23	10.42	11.78	-3.59	0.00
N141	S84	Sch 10	1.150	1	1.097	120.0000	0.0040	29.97	31.06	1(T)	6.22	7.37	1	31.91	1.83	0.47	10.42	8.12	10.82	0.00
N575	N577	Sch 10	2.330	1 ½	1.682	120.0000	0.0040	12.00	12.00	1(T)	9.90	12.23	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N575	N578	Sch 10	8.000	4	4.260	120.0000	0.0040	12.00	12.00		0.00	8.00	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N576	S224	Sch 10	0.320	1	1.097	120.0000	0.0040	16.92	17.24	1(E)	2.49	2.81	1	0.00	0.00	0.14	23.26	23.12	0.00	0.00
N128	N139	Sch 10	4.530	2	2.157	120.0000	0.0040	33.19	33.19	1(45)	2.46	6.99	1	18.35	0.02	0.00	9.21	9.19	1.61	0.00
N129	N140	Sch 10	1.570	2	2.157	120.0000	0.0040	33.31	32.82	1(45)	2.46	4.03	1	12.14	0.01	-0.21	8.86	9.07	1.06	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N138	N149	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	-1	-30.15	-0.07	-1.23	15.20	16.51	-2.64	0.00
N138	S82	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.20	14.67	0.00	0.00
N142	S85	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.99	17.46	0.00	0.00
N142	N153	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	54.03	0.22	-1.23	17.99	19.00	4.74	0.00
N486	N487	Sch 10	3.830	2 ½	2.635	120.0000	0.0040	14.00	10.17	1(E)	8.24	12.07	1	0.00	0.00	-1.66	26.11	27.77	0.00	0.00
N137	S81	Sch 10	1.210	1	1.097	120.0000	0.0040	21.38	22.52	1(T)	6.22	7.43	1	0.00	0.00	0.49	19.33	18.83	0.00	0.00
N137	N148	Sch 10	3.180	2	2.157	120.0000	0.0040	21.38	20.37		0.00	3.18	1	55.13	0.08	-0.44	19.33	19.68	4.83	0.00
N121	S68	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	18.29	17.76	0.00	0.00
N121	N132	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	55.56	0.23	-1.23	18.29	19.29	4.87	0.00
N125	N136	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	53.97	0.22	-1.23	17.39	18.40	4.73	0.00
N125	S71	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.39	16.86	0.00	0.00
N123	N134	Sch 10	1.520	2	2.157	120.0000	0.0040	33.17	32.68	1(45)	2.46	3.98	1	52.29	0.09	-0.21	15.32	15.45	4.59	0.00
N124	S70	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.44	14.91	0.00	0.00
N124	N135	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	52.41	0.21	-1.23	15.44	16.46	4.60	0.00
N122	N133	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	52.91	0.21	-1.23	16.43	17.46	4.64	0.00
N122	S69	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.43	15.91	0.00	0.00
N152	S93	Sch 10	1.150	1	1.097	120.0000	0.0040	27.12	28.21	1(T)	6.22	7.37	1	34.06	2.06	0.47	11.78	9.25	11.55	0.00
N152	N163	Sch 10	9.000	2	2.157	120.0000	0.0040	27.12	24.28		0.00	9.00	-1	-75.04	-0.40	-1.23	11.78	13.42	-6.58	0.00
N577	N579	Sch 10	13.000	1 ½	1.682	120.0000	0.0040	12.00	12.00		0.00	13.00	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N577	S232	Sch 10	0.490	1	1.097	120.0000	0.0040	12.00	12.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	25.39	25.18	0.00	0.00
N578	N580	Sch 10	1.710	4	4.260	120.0000	0.0040	12.00	12.00		0.00	1.71	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N578	N581	Sch 10	2.330	1 ½	1.682	120.0000	0.0040	12.00	12.00	1(T)	9.90	12.23	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N139	N150	Sch 10	1.530	2	2.157	120.0000	0.0040	33.19	32.70	1(45)	2.46	3.99	1	18.35	0.01	-0.21	9.19	9.39	1.61	0.00
N140	S83	Sch 10	1.150	1	1.097	120.0000	0.0040	32.82	33.91	1(T)	6.22	7.37	1	29.63	1.60	0.47	9.07	7.00	10.05	0.00
N140	N151	Sch 10	9.000	2	2.157	120.0000	0.0040	32.82	29.97		0.00	9.00	-1	-17.49	-0.03	-1.23	9.07	10.33	-1.53	0.00
N149	S90	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.51	15.98	0.00	0.00
N149	N160	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	-1	-30.15	-0.07	-1.23	16.51	17.82	-2.64	0.00
N153	N164	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	54.03	0.08	-0.44	19.00	19.36	4.74	0.00
N153	S94	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.00	18.47	0.00	0.00
N487	N488	Sch 10	1.420	2 ½	2.635	120.0000	0.0040	10.17	10.17	1(E)	8.24	9.66	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N148	N159	Sch 10	0.870	2	2.157	120.0000	0.0040	20.37	19.50	1(E) 1(T)	18.46	19.33	1	55.13	0.49	-0.38	19.68	19.57	4.83	0.00
N132	N143	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	55.56	0.08	-0.44	19.29	19.65	4.87	0.00
N132	S76	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.29	18.76	0.00	0.00
N136	N147	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	53.97	0.22	-1.23	18.40	19.42	4.73	0.00
N136	S80	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	18.40	17.87	0.00	0.00
N134	N145	Sch 10	9.000	2	2.157	120.0000	0.0040	32.68	29.84		0.00	9.00	1	52.29	0.21	-1.23	15.45	16.47	4.59	0.00
N134	S78	Sch 10	1.290	1	1.097	120.0000	0.0040	32.68	33.91	1(T)	6.22	7.51	1	0.00	0.00	0.53	15.45	14.91	0.00	0.00
N135	N146	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	52.41	0.21	-1.23	16.46	17.49	4.60	0.00
N135	S79	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.46	15.93	0.00	0.00
N133	N144	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	52.91	0.21	-1.23	17.46	18.48	4.64	0.00
N133	S77	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.46	16.93	0.00	0.00
N163	S101	Sch 10	1.150	1	1.097	120.0000	0.0040	24.28	25.37	1(T)	6.22	7.37	1	36.47	2.34	0.47	13.42	10.60	12.37	0.00
N163	N173	Sch 10	9.000	2	2.157	120.0000	0.0040	24.28	21.43		0.00	9.00	-1	-111.51	-0.84	-1.23	13.42	15.49	-9.78	0.00
N579	S230	Sch 10	0.490	1	1.097	120.0000	0.0040	12.00	12.49	1(E)	2.49	2.98	1	0.00	0.00	0.21	25.39	25.18	0.00	0.00
N580	N582	Sch 10	17.170	4	4.260	120.0000	0.0040	12.00	12.00	1(E)	13.17	30.34	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N581	N583	Sch 10	13.000	1 ½	1.682	120.0000	0.0040	12.00	12.00		0.00	13.00	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N581	S231	Sch 10	0.490	1	1.097	120.0000	0.0040	12.00	12.49	1(T)	6.22	6.71	1	0.00	0.00	0.21	25.39	25.18	0.00	0.00
N150	N161	Sch 10	9.000	2	2.157	120.0000	0.0040	32.70	29.86		0.00	9.00	-1	-11.70	-0.01	-1.23	9.39	10.63	-1.03	0.00
N150	S91	Sch 10	1.270	1	1.097	120.0000	0.0040	32.70	33.91	1(T)	6.22	7.49	1	30.05	1.66	0.52	9.39	7.20	10.19	0.00
N151	N162	Sch 10	9.000	2	2.157	120.0000	0.0040	29.97	27.12		0.00	9.00	-1	-49.25	-0.19	-1.23	10.33	11.75	-4.32	0.00
N151	S92	Sch 10	1.150	1	1.097	120.0000	0.0040	29.97	31.06	1(T)	6.22	7.37	1	31.76	1.81	0.47	10.33	8.04	10.77	0.00
N160	S98	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.82	17.29	0.00	0.00
N160	N170	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	-1	-30.15	-0.03	-0.44	17.82	18.28	-2.64	0.00
N164	N169	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E) 1(T)	18.46	19.24	1	54.03	0.47	-0.34	19.36	19.23	4.74	0.00
N488	N489	Sch 10	3.200	2 ½	2.635	120.0000	0.0040	10.17	10.17	1(E)	8.24	11.44	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N159	N154	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	-1	-267.14	-0.24	0.00	19.57	19.81	-6.01	0.00
N159	N504	Sch 10	5.960	4	4.260	120.0000	0.0040	19.50	19.50		0.00	5.96	1	322.27	0.14	0.00	19.57	19.43	7.25	0.00
N143	N154	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E)	6.15	6.93	1	55.56	0.18	-0.34	19.65	19.81	4.87	0.00
N147	N158	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	53.97	0.08	-0.44	19.42	19.78	4.73	0.00
N147	S89	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.42	18.89	0.00	0.00
N145	N156	Sch 10	9.000	2	2.157	120.0000	0.0040	29.84	26.99		0.00	9.00	1	52.29	0.21	-1.23	16.47	17.50	4.59	0.00
N145	S87	Sch 10	1.290	1	1.097	120.0000	0.0040	29.84	31.06	1(T)	6.22	7.51	1	0.00	0.00	0.53	16.47	15.94	0.00	0.00
N146	N157	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	52.41	0.21	-1.23	17.49	18.51	4.60	0.00
N146	S88	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.49	16.96	0.00	0.00
N144	N155	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	52.91	0.21	-1.23	18.48	19.50	4.64	0.00
N144	S86	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	18.48	17.95	0.00	0.00
N173	N180	Sch 10	3.160	2	2.157	120.0000	0.0040	21.43	20.43		0.00	3.16	-1	-111.51	-0.30	-0.43	15.49	16.22	-9.78	0.00

Start	End	Pipe Schedule	Pipe Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	Start Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	Reynolds
N173	S106	Sch 10	1.150	1	1.097	120.0000	0.0040	21.43	22.52	1(T)	6.22	7.37	1	0.00	0.00	0.47	15.49	15.02	0.00	0.00
N582	N584	Sch 10	1.660	4	4.260	120.0000	0.0040	12.00	12.00	1(Model D-1/G-1 Swing Check)	17.12	18.78	1	0.00	0.00	0.00	25.39	25.39	0.00	0.00
N583	S229	Sch 10	0.490	1	1.097	120.0000	0.0040	12.00	12.49	1(E)	2.49	2.98	1	0.00	0.00	0.21	25.39	25.18	0.00	0.00
N161	N171	Sch 10	9.000	2	2.157	120.0000	0.0040	29.86	27.01		0.00	9.00	-1	-43.83	-0.15	-1.23	10.63	12.01	-3.84	0.00
N161	S99	Sch 10	1.270	1	1.097	120.0000	0.0040	29.86	31.06	1(T)	6.22	7.49	1	32.13	1.88	0.52	10.63	8.23	10.89	0.00
N162	S100	Sch 10	1.150	1	1.097	120.0000	0.0040	27.12	28.21	1(T)	6.22	7.37	1	34.01	2.06	0.47	11.75	9.22	11.53	0.00
N162	N172	Sch 10	9.000	2	2.157	120.0000	0.0040	27.12	24.28		0.00	9.00	-1	-83.26	-0.49	-1.23	11.75	13.47	-7.30	0.00
N170	N177	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E) 1(T)	18.46	19.24	-1	-30.15	-0.16	-0.34	18.28	18.78	-2.64	0.00
N169	N504	Sch 10	8.040	4	4.260	120.0000	0.0040	19.50	19.50		0.00	8.04	-1	-322.27	-0.19	0.00	19.23	19.43	-7.25	0.00
N169	N177	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	1	376.30	0.45	0.00	19.23	18.78	8.46	0.00
N489	N490	Sch 10	2.530	2 ½	2.635	120.0000	0.0040	10.17	10.17	1(E)	8.24	10.77	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N154	N165	Sch 10	12.500	4	4.260	120.0000	0.0040	19.50	19.50		0.00	12.50	-1	-211.58	-0.14	0.00	19.81	19.95	-4.76	0.00
N504	N505	Sch 10	9.230	2 ½	2.635	120.0000	0.0040	19.50	10.27	1(T)	16.47	25.70	1	0.00	0.00	-4.00	19.43	23.42	0.00	0.00
N158	N165	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E)	6.15	6.93	1	53.97	0.17	-0.34	19.78	19.95	4.73	0.00
N156	N167	Sch 10	9.000	2	2.157	120.0000	0.0040	26.99	24.15		0.00	9.00	1	52.29	0.21	-1.23	17.50	18.52	4.59	0.00
N156	S96	Sch 10	1.290	1	1.097	120.0000	0.0040	26.99	28.21	1(T)	6.22	7.51	1	0.00	0.00	0.53	17.50	16.97	0.00	0.00
N157	S97	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	18.51	17.98	0.00	0.00
N157	N168	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	52.41	0.21	-1.23	18.51	19.54	4.60	0.00
N155	N166	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	52.91	0.08	-0.44	19.50	19.86	4.64	0.00
N155	S95	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.50	18.97	0.00	0.00
N180	N183	Sch 10	0.930	2	2.157	120.0000	0.0040	20.43	19.50	1(E) 1(T)	18.46	19.39	-1	-111.51	-1.81	-0.40	16.22	18.44	-9.78	0.00
N584	N411	Sch 10	9.000	4	4.260	120.0000	0.0040	12.00	3.00	1(E)	13.17	22.17	1	0.00	0.00	-3.90	25.39	29.29	0.00	0.00
N171	N178	Sch 10	9.000	2	2.157	120.0000	0.0040	27.01	24.17		0.00	9.00	-1	-78.11	-0.44	-1.23	12.01	13.68	-6.85	0.00
N171	S104	Sch 10	1.270	1	1.097	120.0000	0.0040	27.01	28.21	1(T)	6.22	7.49	1	34.28	2.12	0.52	12.01	9.37	11.62	0.00
N172	N179	Sch 10	9.000	2	2.157	120.0000	0.0040	24.28	21.43		0.00	9.00	-1	-119.80	-0.96	-1.23	13.47	15.66	-10.51	0.00
N172	S105	Sch 10	1.150	1	1.097	120.0000	0.0040	24.28	25.37	1(T)	6.22	7.37	1	36.54	2.35	0.47	13.47	10.65	12.39	0.00
N177	N183	Sch 10	12.500	4	4.260	120.0000	0.0040	19.50	19.50		0.00	12.50	1	346.15	0.35	0.00	18.78	18.44	7.78	0.00
N490	N491	Sch 10	10.330	2 ½	2.635	120.0000	0.0040	10.17	10.17		0.00	10.33	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N490	N492	Sch 10	3.200	1 ½	1.682	120.0000	0.0040	10.17	10.17	1(T)	9.90	13.10	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N165	N174	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	-1	-157.61	-0.09	0.00	19.95	20.04	-3.54	0.00
N505	N506	Sch 10	5.000	2 ½	2.635	120.0000	0.0040	10.27	10.27	1(E)	8.24	13.24	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N167	N175	Sch 10	9.000	2	2.157	120.0000	0.0040	24.15	21.30		0.00	9.00	1	52.29	0.21	-1.23	18.52	19.55	4.59	0.00
N167	S102	Sch 10	1.290	1	1.097	120.0000	0.0040	24.15	25.37	1(T)	6.22	7.51	1	0.00	0.00	0.53	18.52	17.99	0.00	0.00
N168	N176	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	52.41	0.07	-0.44	19.54	19.90	4.60	0.00
N168	S103	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.54	19.01	0.00	0.00
N166	N174	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E)	6.15	6.93	1	52.91	0.16	-0.34	19.86	20.04	4.64	0.00
N183	N187	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	1	234.63	0.19	0.00	18.44	18.25	5.28	0.00
N411	N412	Sch 10	2.170	4	4.260	120.0000	0.0040	3.00	3.00	1(E)	13.17	15.34	1	0.00	0.00	0.00	29.29	29.29	0.00	0.00
N178	N184	Sch 10	9.000	2	2.157	120.0000	0.0040	24.17	21.32		0.00	9.00	-1	-114.83	-0.89	-1.23	13.68	15.80	-10.07	0.00
N178	S108	Sch 10	1.270	1	1.097	120.0000	0.0040	24.17	25.37	1(T)	6.22	7.49	1	36.72	2.41	0.52	13.68	10.75	12.45	0.00
N179	S109	Sch 10	1.150	1	1.097	120.0000	0.0040	21.43	22.52	1(T)	6.22	7.37	1	0.00	0.00	0.47	15.66	15.19	0.00	0.00
N179	N185	Sch 10	3.160	2	2.157	120.0000	0.0040	21.43	20.43		0.00	3.16	-1	-119.80	-0.34	-0.43	15.66	16.43	-10.51	0.00
N491	N493	Sch 10	3.200	1 ½	1.682	120.0000	0.0040	10.17	10.17	1(T)	9.90	13.10	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N491	N494	Sch 10	7.620	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	7.62	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N492	N495	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	12.00	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N492	S253	Sch 10	0.320	1	1.097	120.0000	0.0040	10.17	10.49	1(T)	6.22	6.54	1	0.00	0.00	0.14	27.77	27.63	0.00	0.00
N174	N181	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	-1	-104.70	-0.04	0.00	20.04	20.08	-2.35	0.00
N506	N507	Sch 10	4.630	2 ½	2.635	120.0000	0.0040	10.27	10.27	1(E)	8.24	12.87	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N175	S107	Sch 10	1.290	1	1.097	120.0000	0.0040	21.30	22.52	1(T)	6.22	7.51	1	0.00	0.00	0.53	19.55	19.02	0.00	0.00
N175	N182	Sch 10	3.210	2	2.157	120.0000	0.0040	21.30	20.28		0.00	3.21	1	52.29	0.07	-0.44	19.55	19.91	4.59	0.00
N176	N181	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E)	6.15	6.93	1	52.41	0.16	-0.34	19.90	20.08	4.60	0.00
N187	N190	Sch 10	14.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	14.00	1	114.83	0.05	0.00	18.25	18.20	2.58	0.00
N187	N185	Sch 10	0.930	2	2.157	120.0000	0.0040	19.50	20.43	1(T)	12.31	13.24	1	119.80	1.41	0.40	18.25	16.43	10.51	0.00
N184	S110	Sch 10	1.270	1	1.097	120.0000	0.0040	21.32	22.52	1(T)	6.22	7.49	1	0.00	0.00	0.52	15.80	15.28	0.00	0.00
N184	N188	Sch 10	3.200	2	2.157	120.0000	0.0040	21.32	20.31		0.00	3.20	-1	-114.83	-0.32	-0.44	15.80	16.55	-10.07	0.00
N493	N496	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	12.00	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N493	S254	Sch 10	0.320	1	1.097	120.0000	0.0040	10.17	10.49	1(T)	6.22	6.54	1	0.00	0.00	0.14	27.77	27.63	0.00	0.00
N494	N497	Sch 10	9.760	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	9.76	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N494	S255	Sch 10	0.320	1	1.097	120.0000	0.0040	10.17	10.49	1(T)	6.22	6.54	1	0.00	0.00	0.14	27.77	27.63	0.00	0.00
N495	N498	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	12.00	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N495	S256	Sch 10	0.320	1	1.097	120.0000	0.0040	10.17	10.49	1(T)	6.22	6.54	1	0.00	0.00	0.14	27.77	27.63	0.00	0.00
N181	N186	Sch 10	12.000	4	4.260	120.0000	0.0040	19.50	19.50		0.00	12.00	-1	-52.29	-0.01	0.00	20.08	20.09	-1.18	0.00
N507	N509	Sch 10	0.780	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	0.78	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N507	N508	Sch 10	4.970	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	11.19	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N182	N186	Sch 10	0.780	2	2.157	120.0000	0.0040	20.28	19.50	1(E)	6.15	6.93	1	52.29	0.16	-0.34	19.91	20.09	4.59	0.00
N190	N188	Sch 10	0.810	2	2.157	120.0000	0.0040	19.50	20.31	1(T)	12.31	13.12	1	114.83	1.29	0.35	18.20	16.55	10.07	0.00

tart	End	Pip Sch dule	Pip Length [ft]	Diameter [in]	Diameter id	C Factor	Roughness	tart Elevation[ft]	End Elevation [ft]	Components	EQL [ft]	Length [ft]	Flow Direction	Real Flow[gpm]	Pf [psi]	Pe [psi]	Start Pressure [psi]	End Pressure [psi]	Velocity [fps]	R nolds
N190	N191	Sch 10	0.940	4	4.260	120.0000	0.0040	19.50	19.50		0.00	0.94	1	0.00	0.00	0.00	18.20	18.20	0.00	0.00
N496	S257	Sch 10	0.320	1	1.097	120.0000	0.0040	10.17	10.49	1(T)	6.22	6.54	1	0.00	0.00	0.14	27.77	27.63	0.00	0.00
N496	N499	Sch 10	12.000	1 ½	1.682	120.0000	0.0040	10.17	10.17		0.00	12.00	1	0.00	0.00	0.00	27.77	27.77	0.00	0.00
N497	S258	Sch 10	0.390	¾	0.884	120.0000	0.0040	10.17	10.56	1(E)	2.82	3.21	1	0.00	0.00	0.17	27.77	27.60	0.00	0.00
N498	S259	Sch 10	0.390	¾	0.884	120.0000	0.0040	10.17	10.56	1(E)	2.82	3.21	1	0.00	0.00	0.17	27.77	27.60	0.00	0.00
N186	N512	Sch 10	1.010	4	4.260	120.0000	0.0040	19.50	19.50		0.00	1.01	1	0.00	0.00	0.00	20.09	20.09	0.00	0.00
N509	N511	Sch 10	13.220	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	13.22	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N509	N510	Sch 10	5.030	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	11.25	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N508	S261	Sch 10	0.370	1	1.097	120.0000	0.0040	10.27	9.90	1(E)	2.49	2.86	1	0.00	0.00	-0.16	23.42	23.58	0.00	0.00
N499	S260	Sch 10	0.390	¾	0.884	120.0000	0.0040	10.17	10.56	1(E)	2.82	3.21	1	0.00	0.00	0.17	27.77	27.60	0.00	0.00
N512	N516	Sch 10	8.540	2 ½	2.635	120.0000	0.0040	19.50	10.96	1(T)	16.47	25.01	1	0.00	0.00	-3.70	20.09	23.79	0.00	0.00
N512	N517	Sch 10	0.730	4	4.260	120.0000	0.0040	19.50	19.50		0.00	0.73	1	0.00	0.00	0.00	20.09	20.09	0.00	0.00
N511	N515	Sch 10	4.970	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	11.19	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N511	N514	Sch 10	0.790	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	0.79	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N510	N513	Sch 10	0.780	1	1.097	120.0000	0.0040	10.27	10.27	1(E)	2.49	3.27	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N516	N520	Sch 10	2.820	2 ½	2.635	120.0000	0.0040	10.96	10.96	1(E)	8.24	11.06	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N515	S263	Sch 10	0.370	1	1.097	120.0000	0.0040	10.27	9.90	1(E)	2.49	2.86	1	0.00	0.00	-0.16	23.42	23.58	0.00	0.00
N514	N518	Sch 10	10.960	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	10.96	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N514	N519	Sch 10	5.030	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	11.25	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N513	S262	Sch 10	0.340	1	1.097	120.0000	0.0040	10.27	9.93	1(E)	2.49	2.83	1	0.00	0.00	-0.15	23.42	23.57	0.00	0.00
N520	N524	Sch 10	8.430	2 ½	2.635	120.0000	0.0040	10.96	10.96		0.00	8.43	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N520	N525	Sch 10	0.880	1 ½	1.682	120.0000	0.0040	10.96	10.96	1(T)	9.90	10.78	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N518	N521	Sch 10	0.920	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	0.92	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N518	N522	Sch 10	3.720	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	9.94	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N519	N523	Sch 10	0.790	1	1.097	120.0000	0.0040	10.27	10.27	1(E)	2.49	3.28	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N524	N530	Sch 10	6.730	2 ½	2.635	120.0000	0.0040	10.96	10.96		0.00	6.73	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N524	N529	Sch 10	0.880	1 ½	1.682	120.0000	0.0040	10.96	10.96	1(T)	9.90	10.78	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N525	N531	Sch 10	6.260	1 ½	1.682	120.0000	0.0040	10.96	10.96		0.00	6.26	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N525	N532	Sch 10	1.550	1	1.097	120.0000	0.0040	10.96	10.96	1(T)	6.22	7.77	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N521	N527	Sch 10	13.580	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	13.58	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N521	N526	Sch 10	3.620	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	9.84	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N522	N528	Sch 10	0.920	1	1.097	120.0000	0.0040	10.27	10.27	1(E)	2.49	3.41	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N523	S264	Sch 10	0.340	1	1.097	120.0000	0.0040	10.27	9.93	1(E)	2.49	2.83	1	0.00	0.00	-0.15	23.42	23.57	0.00	0.00
N530	N537	Sch 10	1.380	1 ½	1.682	120.0000	0.0040	10.96	10.96	1(T)	9.90	11.28	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N530	N538	Sch 10	0.410	2 ½	2.635	120.0000	0.0040	10.96	10.96		0.00	0.41	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N529	N536	Sch 10	0.750	1	1.097	120.0000	0.0040	10.96	10.96	1(T)	6.22	6.97	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N529	N535	Sch 10	7.830	1 ½	1.682	120.0000	0.0040	10.96	10.96		0.00	7.83	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N531	N539	Sch 10	0.590	1	1.097	120.0000	0.0040	10.96	10.96	1(E)	2.49	3.08	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N532	S267	Sch 10	0.700	1	1.097	120.0000	0.0040	10.96	10.26	1(E)	2.49	3.19	1	0.00	0.00	-0.30	23.79	24.09	0.00	0.00
N527	N534	Sch 10	0.920	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	0.92	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N527	N533	Sch 10	3.720	1	1.097	120.0000	0.0040	10.27	10.27	1(T)	6.22	9.94	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N526	S265	Sch 10	0.540	¾	0.884	120.0000	0.0040	10.27	10.81	1(E)	2.82	3.36	1	0.00	0.00	0.23	23.42	23.19	0.00	0.00
N528	S266	Sch 10	0.470	1	1.097	120.0000	0.0040	10.27	10.74	1(E)	2.49	2.96	1	0.00	0.00	0.20	23.42	23.22	0.00	0.00
N537	N544	Sch 10	1.240	1	1.097	120.0000	0.0040	10.96	10.96	1(T)	6.22	7.46	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N537	N545	Sch 10	1.870	1 ½	1.682	120.0000	0.0040	10.96	10.96		0.00	1.87	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N536	S268	Sch 10	0.700	1	1.097	120.0000	0.0040	10.96	10.26	1(E)	2.49	3.19	1	0.00	0.00	-0.30	23.79	24.09	0.00	0.00
N535	N543	Sch 10	0.750	1	1.097	120.0000	0.0040	10.96	10.96	1(E)	2.49	3.24	1	0.00	0.00	0.00	23.79	23.79	0.00	0.00
N539	S269	Sch 10	0.700	1	1.097	120.0000	0.0040	10.96	10.26	1(E)	2.49	3.19	1	0.00	0.00	-0.30	23.79	24.09	0.00	0.00
N534	N542	Sch 10	3.620	1 ½	1.682	120.0000	0.0040	10.27	10.27	1(T)	9.90	13.52	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N534	N541	Sch 10	0.410	2 ½	2.635	120.0000	0.0040	10.27	10.27		0.00	0.41	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N533	N540	Sch 10	0.920	1	1.097	120.0000	0.0040	10.27	10.27	1(E)	2.49	3.41	1	0.00	0.00	0.00	23.42	23.42	0.00	0.00
N544	S273	Sch 10	0.700	1	1.097	120.0000	0.0040	10.96	10.26	1(E)	2.49	3.19	1	0.00	0.00	-0.30	23.79	24.09	0.00	0.00
N545	N546	Sch 10	0.580	1 ½	1.682	120.0000	0.0040	10.96	10.38	1(E)	4.95	5.53	1	0.00	0.00	-0.25	23.79	24.04	0.00	0.00
N543	S272	Sch 10	0.700	1	1.097	120.0000	0.0040	10.96	10.26	1(E)	2.49	3.19	1	0.00	0.00	-0.30	23.79	24.09	0.00	0.00
N542	S271	Sch 10	0.540	¾	0.884	120.0000	0.0040	10.27	10.81	1(E)	2.82	3.36	1	0.00	0.00	0.23	23.42	23.19	0.00	0.00
N540	S270	Sch 10	0.470	1	1.097	120.0000	0.0040	10.27	10.74	1(E)	2.49	2.96	1	0.00	0.00	0.20	23.42	23.22	0.00	0.00
N546	N547	Sch 10	6.320	1 ½	1.682	120.0000	0.0040	10.38	10.38	1(E)	4.95	11.27	1	0.00	0.00	0.00	24.04	24.04	0.00	0.00
N547	N548	Sch 10	0.480	1	1.097	120.0000	0.0040	10.38	10.38	1(E)	2.49	2.97	1	0.00	0.00	0.00	24.04	24.04	0.00	0.00
N548	S274	Sch 10	0.430	¾	0.884	120.0000	0.0040	10.38	10.81	1(E)	2.82	3.25	1	0.00	0.00	0.19	24.04	23.86	0.00	0.00

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Appendix C
Key Equipment Cutsheets

Technical Specifications

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Appendix D
Technical Specifications

Any use of trade, firm, or product literature is for descriptive purposes only, and does not imply endorsement or selection by the US Navy.

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Appendix E
Design Drawings

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