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Date: April 15, 2022

Our Ref: 30062516.RPTI4  
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Subject: 2021 Annual Operation Maintenance and Monitoring Report  
Operable Unit 2, Northrop Grumman Systems Corporation and Naval Weapons  
Industrial Reserve Plant (NWIRP) Sites, Bethpage, New York.

Dear Jason,

On behalf of Northrop Grumman, Arcadis is providing the NYSDEC with one electronic PDF copy of the Operable Unit 2 (OU2) 2021 Annual Operation Maintenance and Monitoring Report (enclosed). As we have transitioned to electronic submittals (via PDF) in line with NYDEC's paper reduction program, hard copies of the report can be provided on request.

This report was prepared to document the operation, maintenance, and monitoring (OM&M) activities conducted for the on-site portion of the OU2 groundwater remedy and the results of ongoing volatile organic compound (VOC) and inorganic monitoring of groundwater to meet the applicable remedial objectives set forth in the March 2001 OU2 Record of Decision (ROD).

Please contact us if you have any questions or comments.

Sincerely,  
Arcadis of New York, Inc.



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Enclosures

**Northrop Grumman**

# **2021 ANNUAL OPERATION, MAINTENANCE AND MONITORING REPORT**

**Operable Unit 2 - Groundwater**

**Bethpage, New York**

**NYSDEC Sites # 1-30-003A and 1-30-003B**

April 15, 2022

# 2021 Annual Operation, Maintenance and Monitoring Report

April 15, 2022

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# 1 Introduction

Arcadis of New York, Inc. (Arcadis), on behalf of Northrop Grumman, has prepared this Operable Unit 2 (OU2) 2021 Annual Operation, Maintenance and Monitoring (OM&M) Report to document OM&M activities conducted for the on-site portion of the OU2 groundwater remedy (also referred to as the OU2 On-Site Containment [ONCT] system) for the former Northrop Grumman, Bethpage, New York facility (Site No. 1-30-003A) and the former Naval Weapons Industrial Reserve Plant (NWIRP), Bethpage, New York (Site No. 1-30-003B) (herein referred to as the “Site”). This report has been prepared in accordance with the OU2 Administrative Order on Consent (AOC) (NYSDEC, 2015a) Index # W1-118-14-12, the March 2001 OU2 Record of Decision (ROD) and, to the extent applicable to OU2, the associated December 2019 Amended ROD (AROD) issued for the Site by the New York State Department of Environmental Conservation (NYSDEC).

The above OM&M activities were conducted by Northrop Grumman to satisfy the remedial action objectives (RAOs) established in the March 2001 OU2 ROD (NYSDEC 2001) and December 2019 OU2/3 AROD (NYSDEC 2019), and in accordance with requirements of the OU2 ONCT System OM&M Manual (Arcadis, 2014) and the latest (June 2016) Updated Groundwater Monitoring Plan (GWMP) (Arcadis 2016). The above-referenced OM&M manual and monitoring plan were submitted to the NYSDEC pursuant to the OU2 AOC (NYSDEC, 2015a). Additionally, the NYSDEC conditionally approved an Updated GWMP Addendum in August 2015 (NYSDEC, 2015b), which was submitted prior to the complete Updated GWMP in 2016. The conditional approval required adding 1,4-dioxane to the analytical list, which was implemented and included in the 2016 Updated GWMP.

This report describes the performance and effectiveness monitoring completed for the ONCT system for the Fourth Quarter 2021 (current period) and the Year 2021 (reporting period), in terms of on-site containment of OU2 VOC-impacted groundwater and preventing, to the extent practicable, the off-site migration of impacted groundwater. As such, this report is effectively the Fourth Quarter Report for 2021 and also the 2021 Annual Report, and provides the basis for the annual engineering certification of the ONCT system, as required by the OU2 AOC, Section 1.B, and as warranted by evaluation of the data herein. In this report, the current period data was compared to data in the previous three 2021 quarterly reports issued by Arcadis (2021a; 2021b; 2021c) and to longer-term data trends (also referred to as the period of record), as applicable.

Monitoring of on and off-site groundwater impacted to some extent by site-related VOCs (referred to as the OU2 Plume, though there are multiple plumes within this single plume), is also required and detailed in this report to the extent undertaken by Northrop Grumman and is supplemented with groundwater analytical data reported by the Department of Navy (DON) from a total of 55 wells located north of Hempstead Turnpike. However, this report does not describe the activities conducted by DON at the former NWIRP property nor the Navy ROD-required off-site components of the groundwater remedial program, as these activities are separately managed, maintained, and reported by DON. DON activities include monitoring of the GM-38 Hotspot, OM&M of the GM-38 groundwater extraction and treatment system, monitoring and remediation of VOC-impacted groundwater identified in the vicinity of DON’s Vertical Profile Borings (VPB) VPB-139 and VPB-142 (also referred to as the RE108 hot spot), off-site groundwater investigation and remediation downgradient of the RE108 hot spot, and components of the public water supply contingency plan (i.e., additional outpost well installation and monitoring).

This report uses various lines of evidence to evaluate the effectiveness of the ONCT system, which is consistent with the USEPA (2008) “A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems” report. It consists of the sequential evaluation of hydraulic and water quality data to assess whether the lines of

evidence are supportive of the ONCT system design goals and establishment and maintenance of effective horizontal and vertical hydraulic capture of on-site OU2 VOC-impacted groundwater that prevents, to the extent practicable, its off-site migration. The ONCT system was designed to:

- Create a capture zone that encompasses the area of on-site OU2 VOC-impacted groundwater.
- Create an effective hydraulic barrier that prevents, to the extent practicable, off-site migration of OU2 VOC-impacted groundwater.
  - Evidence of an effective hydraulic barrier includes documentation of a “collective zone of capture” (area of lowered water levels generated by remedial well pumping) and downward vertical hydraulic gradients, particularly near the remedial wells.
- Development of the capture zone and hydraulic barrier would then create a clean water front (an area of less than 5 µg/L total VOCs in groundwater) downgradient of the ONCT system that would initially develop shallow and near the Site and would expand further downgradient and deeper over time, as on-site VOC-impacted groundwater continues to be removed from the aquifer via the remedial wells, and treated water continues to be discharged/recharged at the south recharge basins.
  - Evidence for the development of a clean water front includes separation (i.e., bifurcation) of the VOC-impacted groundwater plume and decreasing concentrations in monitoring wells.

Throughout this report, data is presented that confirms such expectations are being met and that the ONCT system is operating as designed.

## 2 Site Overview

This section provides a brief description of the Site, relevant history, main features/components of the ONCT system, associated remedial program and describes the RAOs specified in the OU2 ROD.

### 2.1 Description of Site

The Grumman Aerospace Corporation (now Northrop Grumman) (NYSDEC Site # 1-30-003A) formerly occupied approximately 638 acres in east-central Nassau County, in the Hamlet of Bethpage, Town of Oyster Bay, New York and, within this area, the NWIRP (NYSDEC Site # 1-30-003B) occupied approximately 105 acres. The Site was bounded by Stewart Avenue to the north, South Oyster Bay Road to the west, Route 107 to the southwest, Central Avenue to the south and various residential and commercial areas to the east. **Figure 1** depicts the former property boundaries of the Site.

The former NWIRP (NYSDEC Site # 1-30-003B) is located adjacent to the former Northrop Grumman facility. Also, the former Occidental Chemical Corporation (OXY)/Hooker Chemical Corporation/RUCO Polymer Corporation site (referred to throughout this report as the OXY Site) (NYSDEC Site # 1-30-0004) is located adjacent to the northwest portion of the Site and is generally hydraulically upgradient of the former Northrop Grumman site.

## 2.2 Nature and Extent of Impacted Groundwater

Groundwater sampling conducted as part of the Remedial Investigations (RIs) for the former Northrop Grumman, NWIRP, and OXY sites indicates that past chemical storage and/or waste disposal at each of these sites has resulted in impacts to groundwater (i.e., the upper glacial and Magothy aquifers).

Exhibit A, Table 1 of NYSDEC's AROD (provided as **Appendix A** of this Report) identifies the 21 VOC constituents of the OU2 Site plume (excluding total chromium and 1,4-dioxane). Of these 21 VOC constituents, the following make up the majority of the total VOC (TVOC) mass of the OU2 plume and, based on their concentrations and frequency of detection, have been identified as primary groundwater constituents of concern (COCs: trichloroethylene (TCE); tetrachloroethene (PCE); 1,1,1-trichloroethane (1,1,1-TCA); 1,2-dichloroethene (1,2-DCE); 1,1-dichloroethene (1,1-DCE); and 1,1-dichloroethane (1,1-DCA). As used in this report, TVOC concentrations are the sum of the 21 "site-related" VOCs identified in **Appendix A**. Groundwater associated with the former OXY site contains these primary COCs as well as vinyl chloride (VC). The 1994 RI Report (Geraghty and Miller 1994) described the overall extent (on-site and off-site) of groundwater impacts prior to initiation of remedial activities.

Additionally, chromium and cadmium/chromium are COCs in groundwater in the vicinity of the former Northrop Grumman Plants 1 and 2, respectively.

Please note that the plume depictions within this Report do not include acetone or 2-butanone (MEK), both of which are recognized lab contaminants, and are not included on the list of COCs in **Appendix A**. Furthermore, although 1,4-dioxane was identified as a COC in the OU2/3 AROD, it is not a constituent utilized in evaluating the ONCT system effectiveness because, although 1,4-dioxane is co-located with VOCs and would be captured by the ONCT system, the captured groundwater is not currently treated for 1,4-dioxane.

## 2.3 Remedial Action Objectives

The overall remedial goals for groundwater, as stated in the OU2 ROD, is to meet Standards, Criteria and Guidance values (SCGs) and be protective of human health and the environment.

Consistent with the overall remedial goals selected for the Site, the remedial action objectives (RAOs) identified in the OU2 ROD, either in whole or in part, are to:

- Eliminate, to the extent practicable, site-related constituents from the affected public water supplies and prevent, to the extent practicable, the future impacts to public water supplies.
- Eliminate, to the extent practicable, exposures to impacted groundwater.
- Eliminate, to the extent practicable, off-site migration of impacted groundwater and, where practicable, restore the groundwater to pre-disposal conditions.
- Eliminate, to the extent practicable, the off-site migration of soil impacts entering the groundwater.
- Eliminate, to the extent practicable, exceedances of applicable environmental quality standards related to releases of constituents to the waters of the state.
- Comply with applicable NYSDEC SCGs for ONCT system treated water and air. The discharge requirements for water and air are provided in the OM&M Manual (Arcadis, 2014).

The AROD contains the additional RAOs listed below:

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with contaminated groundwater.
- Hydraulically contain the OU2 plume, reduce its volume and contaminant concentrations and prevent its further expansion and migration.
- Prevent the discharge of contaminants to surface water.
- Prevent adverse impacts to the quantity or quality of the groundwater resources associated with the Nassau-Suffolk Sole Source Aquifer.

The AROD primarily focuses on COCs that exceed SCGs in off-site groundwater and, as such, the AROD RAOs do not specifically relate to the operation of the ONCT system.

## 2.4 Main Features/Components of the Remedy

Based on the OU2 ROD, and as shown on **Figures 2 and 3**, the following are the major elements of the remedial program and components of the OU2 On-Site Groundwater Remedy:

- Operation, maintenance and monitoring of the ONCT system, which consists of:
  - Five Remedial Wells (Remedial Wells 1, 3R, 17, 18, and 19) with design (current groundwater model-based) pumping rates of 800 gallons per minute (gpm), 700 gpm, 1,000 gpm, 800 gpm and 500 gpm, respectively. Current operational flow rates are discussed in **Section 3.2**.
  - Remedial Well 3R was brought online in 2013 to replace Remedial Well 3 due to its declining specific capacity which is a measure of the well's production efficiency.
  - Two treatment systems (Tower 96 and Tower 102), each consisting of a packed-tower air stripper to remove VOCs from extracted groundwater and regenerable vapor-phase granular activated carbon (RVPGAC) systems, with on-site steam regeneration via on-site boilers, to remove VOCs from the air strippers' off-gas emissions.
    - Prior to March 23, 2017, Tower 96 supplemental air treatment for VC (provided by OXY) consisted of VPGAC and potassium permanganate-impregnated zeolite (PPZ). NYSDEC concurrence to stop the supplemental air treatment was received on January 26, 2017, and this supplemental emission control unit was removed from service on January 26, 2017, and the PPZ was removed on March 23, 2017. Supplemental air treatment, now consisting of two vapor-phase granular activated carbon (VPGAC) polishing beds, is currently maintained by Northrop Grumman.
  - A pressurized discharge main to accept the treated water discharge, which is also available for limited non-potable reuse.
  - Two sets of recharge basins (the south recharge basins and the west recharge basins) accept the treated water from the clear wells, which drain by gravity to the basins. A minimum design groundwater model-based discharge rate of 2,231 gallons per minute (gpm) exists for the south recharge basins and any remaining volume is directed to the west recharge basins, as necessary.

- A groundwater monitoring program to assess the overall ONCT system's environmental effectiveness and a performance and compliance monitoring program at the treatment plants. The groundwater monitoring program also includes monitoring upgradient of public water supply wells. These wells were initially installed to serve as outpost wells (to warn of the advance of the OU2 plume) and were sampled in accordance with the Public Water Supply Contingency Plan (PWSCP) (Arcadis G&M, Inc., 2003). However, these wells have served the purpose outlined in the PWSCP and were repurposed as plume monitoring wells in 2015. The monitoring and former outpost wells included in Northrop Grumman's OU2 groundwater monitoring program, for which Northrop Grumman is responsible for reporting, and additional wells in the Site vicinity are shown on **Figure 1**. Monitoring and outpost wells for which DON has responsibility for reporting are not shown on **Figure 1**.

### 3 Operation and Maintenance

The following subsections summarize the performance of the ONCT system and routine/non-routine operation and maintenance activities completed during the 2021 reporting period.

#### 3.1 Summary of Completed O&M Activities

O&M of the ONCT system was conducted in accordance with the OM&M Manual (Arcadis, 2014), and consisted of the following:

- Daily site visits by Northrop Grumman personnel to visually check the system for proper operation, leaks or potential emergency situations. Additionally, the ONCT system was continuously monitored by the Supervisory Control and Data Acquisition (SCADA) system. Daily site visit logs (paper forms and electronically collected data) are included in **Appendix B**.
- Weekly site checks by Northrop Grumman personnel to monitor and record key process parameters to confirm proper system operation, to assess whether a process parameter is changing, and to provide information that may be helpful later in the event of an operational problem. A summary of the weekly monitoring data collected for Tower 96 and Tower 102 is provided in **Tables 1A and 1B**, respectively.
- Routine equipment maintenance was performed by Northrop Grumman in accordance with the manufacturers' specifications or otherwise, as needed, and per the routine maintenance schedule and checklist provided in the OM&M Manual (Arcadis, 2014). It should be noted that the OM&M Manual is continually updated, as needed, as various components get replaced/repaired over time to support effective and efficient operation of the ONCT system.
- Solvent recovered by the RVPGAC system is a characteristic hazardous waste and, as a part of routine system operation is drummed, temporarily staged in an on-site hazardous waste storage area, and properly transported and disposed off-site by a Northrop Grumman subcontractor in accordance with applicable regulations. Copies of the completed hazardous waste manifests are included in **Appendix C**.
- Non-routine equipment and system component maintenance is performed in response to alarm conditions, physical damage, or systems parameters operating outside of their normal operating ranges.

A detailed breakdown of the non-routine maintenance activities completed during the 2021 annual period is provided in **Table 2**, and a summary of the relatively larger-scale maintenance activities occurring in 2021 is provided below:

- A well pump motor and multiple VFD failures at Well 18 of the Tower 102 System and subsequent repair/replacement of these components resulted in Well 18 downtime between throughout portions of January and February 2021. Additionally, multiple Well 18 VFD-related failures and shutdowns occurred throughout portions of April and May 2021, and the VFD was repaired/replaced on two occasions during this time period.
- A well inspection effort was completed at Well 18 concurrently with the above repairs while the well pump was removed from the well. In addition, as reported herein, the drop pipe within Well 18 was extended by 20 feet to increase the depth of the pump within the well. It should also be noted that the overall Tower 102 system was not shut down for this effort, and Wells 17 and 19 continued to operate during this time period at higher than routine flow rates to ensure containment during Well 18 downtime.
- Multiple Tower 96 exterior blower bearing failures and associated replacement and shaft balancing events were completed throughout portions of March and extending through July 2021. In July 2021, the exterior blower was replaced with a temporary blower, installed at the stripper tower inlet, with Wells 1 and 3R running at a reduced combined total flow rate of approximately 900 gpm. In late August 2021, following multiple repairs and component replacements associated with the exterior blower, the temporary blower was removed, installation of a new exterior blower was completed, and the system was placed back into routine operating configuration at a total flow rate of approximately 1,600 gpm.
- VPGAC within the Tower 96 exterior VPGAC vessels was replaced in March and then again in November 2021.
- Multiple Well 18 VFD-related failures and shutdowns were observed throughout portions of April and May 2021 and the VFD was repaired/replaced on two occasions throughout this time period.

Despite the downtime events identified above, the ONCT system maintained capture of the on-site portions of the OU2 plume. Further analysis of ONCT capture through 2021 is provided in **Section 4.2.5**.

## 3.2 Performance Evaluation

This subsection provides an evaluation of ONCT system performance throughout 2021. An associated compliance evaluation is provided in **Section 4.2**.

Current model design flow rates summarized in **Table 3** and discussed in this report were updated from the initial model design flow rates (Arcadis G&M, Inc. 2002, modified April 2015) based on more recent modeling, as described in the 2020 OU2 Annual OM&M Report (Arcadis, 2021d). In summary, the changes from initial to current model design flow rates reflect shifting 200 gpm of pumpage from Well 19 to Well 18, effectively maintaining the overall ONCT system flow rate.

As described below and summarized in **Table 3**, current model design flow rates are as follows: Well 1 (800 gpm); Well 3R (700 gpm); Well 17 (1,000 gpm); Well 18 (800 gpm); and Well 19 (500 gpm). In addition, flow rates at Wells 1, 3R, and 18 were increased for extended periods of 2021 as a result of and in response to well and system downtime, as further detailed below.

An operational summary of uptime, remedial well discharges and treatment system efficiencies for 2021 are provided in **Table 3** and are summarized below:

- The remedial wells operated at the following “uptimes” throughout 2021, calculated as a percentage of the reporting period: Remedial Well 1 (88%); Remedial Well 3R (88%); Remedial Well 17 (99%), Remedial Well 18 (88%); and Remedial Well 19 (98%) (**Table 3**).
- Based on review of system operational logs/reports, the remedial wells extracted a total of 1,962 million gallons (MG) of groundwater in 2021 (**Table 3**).
- The individual remedial wells pumped at the following annual aggregate percentages of their current model design volume: Remedial Well 1 (92%); Remedial Well 3R (88%); Remedial Well 17 (100%); Remedial Well 18 (108%); and Remedial Well 19 (104%) (**Table 3**).
  - In general, remedial well pumping volume less than 100% of design flow volume in 2021 (i.e., Remedial Wells 1 and 3R) were the result of Tower 96 system shutdowns, as described above in **Section 3.1**.
  - The pumping volumes for Remedial Well 17, Remedial Well 18, and Remedial Well 19 were greater than 100% of their design volumes for 2021 to enhance VOC mass removal, as well as ensure containment during periods of well maintenance activities.
  - As previously reported, the flow rate for Remedial Well 18 was generally maintained at an average rate of 1,000 gpm throughout 2021, above its current model design flow rate of 800 gpm, as a means to enhance on-site capture of the OU2 plume, to compensate for well shutdowns as described above in **Section 3.1**, and to account for the reduced flow rate of Well 19.
  - As previously reported in the 2020 OU2 Annual OM&M Report, the flow rate for Remedial Well 19 was generally maintained at an average rate of 500 gpm through 2021, which is its current model design flow rate and below its initial design model flow rate of 700 gpm (Arcadis G&M, Inc. 2003c). Based current modeling, the pumping rate for Well 19 will be maintained at 500 gpm under routine ONCT operating conditions.
- The water treatment components of the ONCT system (air stripper/clear well) performed within acceptable operating ranges for this reporting period, as indicated by the following:
  - The air stripper VOC removal efficiencies were greater than 99.9% (**Table 3**).
  - The air stripper effluent water discharge complied with applicable SCGs (**Table 4**). Additional details regarding system water monitoring are discussed in **Section 4**.
- The air treatment components of the ONCT system (RVPGAC/solvent recovery) performed within acceptable operating ranges during this reporting period. The RVPGAC stack discharges complied with applicable SGCs/AGCs and discharge limits (**Tables 5A, 5B, 6A, and 6B**).
- Additional maintenance and assessment of the ONCT system’s critical alarms, SCADA system functionality, and set points were conducted during the reporting period and continued through March 2022. This effort was conducted to ensure that the alarms were functioning properly, would shut down the treatment systems and remedial wells in the event of an alarm condition, and that the set points were properly established in relation to the design criteria and current treatment system operating conditions.

## 4 Monitoring

This section provides a summary of the monitoring completed during the 2021 reporting period to meet the requirements outlined in the OM&M Manual (Arcadis, 2014), the associated Updated Groundwater Monitoring Plan (Arcadis 2016), and the PWSCP (Arcadis G&M, Inc., 2003). The following subsections provide summaries of 2021 monitoring data and comparisons of sample analytical results to applicable SCGs. Also included are data evaluations describing the 2021 performance, compliance and effectiveness of the ONCT system. Finally, key findings are presented that support overall conclusions and suggestions regarding the ONCT system and remedial program at the Site.

### 4.1 Summary of Monitoring Completed

A summary of the monitoring completed during 2021 in accordance with the above-referenced plans is provided below:

- Quarterly remedial system performance monitoring:
  - Remedial well water quality monitoring was completed to monitor the performance of the ONCT system and assess VOC mass removal. A summary of the VOC and 1,4-dioxane analytical results is provided in **Table 4**.
  - Water quality monitoring of treatment system effluent (Towers 96 and 102) was completed to monitor the performance of the groundwater treatment components of the ONCT system. A summary of the VOC and 1,4-dioxane analytical results is provided in **Table 4**.
  - Air quality monitoring of treatment system influent, mid-effluent and effluent (Towers 96 and 102), as appropriate, was completed to monitor the performance of the air treatment components of the ONCT system. A summary of the analytical results is provided in **Tables 5A and 5B** for the Tower 96 and 102 treatment systems, respectively.
- Remedial system compliance monitoring:
  - Water and air quality monitoring of treatment system influent, mid-train, and effluent, as appropriate, was completed to gauge quarterly TCE mass removal for the Tower 96 and 102 treatment systems, and a summary of the TCE mass removal results is provided in **Tables 5C and 5D**, respectively.
  - Quarterly air monitoring and modeling was completed to determine the compliance status of the vapor-phase effluent discharged from the Tower 96 and 102 treatment systems, and a summary of the results is provided in **Tables 6A and 6B**.
  - Monthly State Pollutant Discharge Elimination System (SPDES) monitoring was completed to verify that water discharged to the south recharge basins (i.e., Outfall 005) and west recharge basins (i.e., Outfall 006) met permit equivalency requirements. Monitoring was performed in accordance with the terms and conditions of Northrop Grumman's SPDES Permit No. NY0096792 and discharge limits, per the SPDES permit equivalency, dated October 12, 2017, amended on July 30, 2018, and issued by the NYSDEC to Northrop Grumman on August 9, 2018. A summary of the SPDES analytical results is provided in **Table 7**. SPDES discharge monitoring data are documented on a monthly basis by Northrop Grumman in Discharge Monitoring Reports (DMRs) that are transmitted to the NYSDEC

under separate cover. Copies of DMRs completed during this reporting period are provided in **Appendix D**.

- Effectiveness Monitoring:
  - Groundwater quality monitoring was completed at and downgradient of the Site to assess the effectiveness of the ONCT system with respect to containment and removal of OU2 VOC-impacted groundwater and preventing its off-site migration.
  - Groundwater quality monitoring was performed in accordance with the requirements of the GWMP (Arcadis, 2016). Groundwater quality results are provided in **Tables 8 through 12**. In addition, a review of percent change over time of TVOC concentrations in program monitoring and remedial wells is provided in **Table 13**.
  - Groundwater quality results associated with the First, Second, and Third Quarters of 2021 have been previously submitted to the NYSDEC in Quarterly Reports and are also included in this report for completeness. Copies of completed Groundwater Sampling Logs and Chain of Custody Records are provided in **Appendix E**.
  - Groundwater hydraulic (water-level) monitoring was completed to determine, monitor, and document local and regional groundwater flow patterns during operation of the ONCT system, including the vertical and horizontal extent of the cumulative capture zone created by operation of the ONCT system.
  - Routine hydraulic monitoring was performed from April 6 to April 8, 2021 (Second Quarter 2021) and October 4 to October 9, 2021 (Fourth Quarter 2021). **Tables 14 and 15** provide the water-level measurement data for the Second and Fourth Quarters of 2021, respectively. Data for select DON monitoring wells is included in these Tables as supplemental data, as suggested in the 2017 Annual OM&M Report (Arcadis, 2018) and in the 2018 Annual OM&M Report (Arcadis, 2019a).

## 4.2 Summary of Monitoring Results

Results of monitoring completed during the reporting period are discussed in the following subsections. The analytical data associated with the ONCT system monitoring were and continue to be submitted to the NYSDEC on a quarterly basis in electronic data deliverable (EDD) format, in compliance with requirements outlined in Section 1.15(a)2 (Electronic Submissions) of NYSDEC's May 2010 DER-10 guidance document.

### 4.2.1 Remedial System Performance Monitoring

The ONCT system remedial well influent concentrations, VOC mass recovered, VOC mass removal rates, and TVOC trends over time are provided in **Tables 3 and 4**, shown on **Figures 4, 5, 6, and 7**, and summarized below:

- Remedial well TVOC influent concentrations ranged from 54.5 micrograms per liter ( $\mu\text{g/L}$ ) (Remedial Well 18 in Q1 2021) to 870  $\mu\text{g/L}$  (Remedial Well 1 in Q3 2021) (**Table 4**). TCE and PCE were the VOCs detected at the highest concentrations in all remedial wells, except for Well 19, where TCE and cis-1,2-dichloroethene (cis-1,2-DCE) were detected at the highest concentrations.

- Although the remedial wells generally exhibit a slight to moderate increase in TVOC concentrations compared to 2020, TVOC concentrations in remedial wells (except Well 1) continue to exhibit an overall decreasing or stable trend since 2016 (**Figure 7**). TVOC concentrations in Well 1, located upgradient of Well 17, exhibit a generally increasing trend from approximately the middle of 2019.
- VC was only detected in Remedial Well 3R (**Table 4**), as its pumping rate was established to capture/contain VC entering the Site from the OXY site. OXY is conducting remediation of groundwater (i.e., biosparge system) to reduce VC upgradient (northwest) of Remedial Well 3R under USEPA oversight.
- A calculated 4,285 lbs of TVOCs were removed from the aquifer and treated by the ONCT system in 2021 (**Table 3** and **Figure 5**). The majority of VOC mass was recovered by Remedial Well 1 (54% of the total mass). The VOC mass removed in 2021 was slightly greater than the mass removed in 2020 (4,043 lbs).
- Since full-time startup of the ONCT system in November 1998, approximately 220,372 lbs of VOCs have been removed from the aquifer and treated by the ONCT system (**Table 3** and **Figure 6**).

## 4.2.2 Remedial System Compliance Monitoring

### 4.2.2.1 Water Discharge

The ONCT system's treated groundwater effluent met SPDES permit limits during the reporting period (**Table 7** and **Appendix D**). The measured concentrations of individual VOCs, nitrogen and pH levels in the treated effluent were below/within applicable discharge limits.

A SPDES discharge limit exceedance was observed for total iron at Outfall 006 during the September 2021 SPDES sampling event (**Table 7** and **Appendix D**). Following this exceedance, the October 2021 iron and manganese analyses were expedited and were reported to be below the detection limit, similar to historical data trends. As such, the September 2021 iron exceedance was determined to be anomalous and is likely a result of system effluent distribution line valving testing/adjustments completed a short time prior to collection of the September 2021 SPDES samples on September 14, 2021. Future, testing or modification of system effluent distribution line valving will be scheduled to occur following SPDES sample collection to limit the potential for future anomalous discharge limit exceedances.

### 4.2.2.2 Air Discharge

Tower 96 and Tower 102 emissions were evaluated for the reporting period to determine compliance with the DAR-1 Guidelines for The Evaluation and Control of Ambient Air Contaminants Under 6 CRR-NY 212 (Rule 212).

- As shown in **Table 5A** (Tower 96 vapor-phase analytical data), TCE (an A-rated compound) exhibited the highest concentrations of a single VOC compound in influent air by more than an order of magnitude at Tower 96. TCE was detected at concentrations of up to 18,100  $\mu\text{g}/\text{m}^3$  (a concentration equivalent to approximately 0.3 pounds per hour at a flow rate of 4,930 cubic feet per minute [cfm]) in Q3 2021. Given that Q3 2021 TCE aqueous-phase influent concentrations are generally comparable to typical concentration ranges observed over the last two years, it is unclear what caused this elevated vapor-phase concentration. Following this detection, Northrop Grumman inspected the regenerative GAC

system and determined that it was functional. In addition, concentrations of all compounds detected in Tower 96 influent air, with the exception of TCE, were less than 18,100 µg/m<sup>3</sup>. Based on the influent and effluent TCE concentrations, the treatment system achieved TCE removal rates of greater than 99.9% (**Table 3**).

- As shown in **Table 5B** (Tower 102 vapor-phase analytical data), TCE exhibited the highest concentration of a single VOC compound in influent air by close to an order of magnitude at Tower 102. TCE was detected at concentrations of up to 2,890 µg/m<sup>3</sup> (concentration equivalent to 0.1 pounds per hour at a flow rate of 7,785 cfm) in Q1 2021. In addition, concentrations of all compounds, with the exception of TCE, detected in Tower 102 influent air were less than 2,890 µg/m<sup>3</sup>. Based on the influent and effluent TCE concentrations, the treatment system achieved TCE removal rates greater than 99.9% (**Table 3**).
- As shown in **Tables 5C and 5D**, TCE mass emissions at Tower 96 and Tower 102 were well below the maximum allowable 12-month rolling average discharge limit for TCE of 500 pounds per year for 2021.

Pursuant to 6 CRR-NY 212-2.1, for an air contaminant listed in Section 212-2.2 Table 2 – High Toxicity Air Contaminant (HTAC) list, the facility owner or operator shall either limit the actual annual emissions from all process operations at the facility so as to not exceed the mass emission limit listed for the individual HTAC, or demonstrate compliance with the air cleaning requirements for the HTAC, as specified in Subdivision 212-2.3(b), Table 4 – Degree of Air Cleaning Required for Non-Criteria Air Contaminants of this Subpart for the environmental rating assigned to the contaminant by the NYSDEC. For each non-HTAC air contaminant, dispersion modeling will not be required if the actual annual emission rate is less than 100 pounds per year at each individual system (Tower 96 and Tower 102). Actual annual emission rates used for comparison can take control devices into account and must meet the provisions of 212-1.5(g). Emission rates were calculated using the highest ambient air concentrations of the compounds identified in **Tables 5A and 5B** and are summarized in **Tables 6A and 6B** for Towers 96 and 102, respectively.

For any constituents that exceeded the Rule 212 emission limit, United States Environmental Protection Agency (USEPA) air quality dispersion model AERMOD modeling was utilized to estimate the highest ambient air impact beyond the property line during the reporting period. AERMOD is the USEPA's recommended best state-of-the-art practice Gaussian plume dispersion model. Gaussian models are the most widely used techniques for estimating the impact of non-reactive pollutants, per Appendix W of Title 40 Code of Federal Regulations (CFR) 51 – Guideline of Air Quality Models. The maximum ambient air impacts were then compared to the respective annual and short-term guideline concentrations provided in NYSDEC DAR-1 guidance policy for compliance screening purposes.

The AERMOD air dispersion model program requires the input of certain site-specific data to produce results that are representative of the actual site conditions. In compliance with guidelines, the following parameters were used for the AERMOD model analysis:

- Stack height, stack diameter, exhaust gas temperature, and velocity for the Towers 96 and 102 stacks.
- Urban dispersion coefficients.
- AERMAP base and terrain elevations, processed using National Elevation Dataset (NED) digitized terrain data.
- Surface and upper air observations measured at the Nation Weather Service stations located at Farmingdale and Brookhaven airports for calendar years 2011 to 2015, in accordance with NYSDEC's DAR-10 Air Dispersion Modeling Guidance Document.

- Receptor grids, per the following methodology:
  - For Tower 96 and Tower 102, receptors were located along the property boundary at distances not exceeding 25 meters between receptors.
  - For Tower 96, 1.5 km x 1.5 km Cartesian grid receptors with distances of 50 meters between the receptors and 3.0 km x 3.0 km Cartesian grid receptors with distances of 100 meters between the receptors.
  - For Tower 102, discrete receptors were located off-site at distances not exceeding 50 meters, up to 500 meters from the plant boundary with additional off-site receptors placed at greater distances beyond 500 meters and discrete receptor spacing around the points of maximum predicted impacts did not exceed 50 meters.

The model was executed with a unit emission rate of 1.0 grams per second (normalized rate) for each source. The actual emission rate of each compound was multiplied by the predicted ambient impact at 1.0 grams per second to obtain the scaled impact for the compound. For the compound that triggered Rule 212 evaluation (TCE), **Tables 6A and 6B** provide the scaled hourly ambient air impact and the scaled annual ambient air impact for the annual reporting period for each system (Towers 96 and 102, respectively).

As shown on **Tables 6A and 6B**, TCE was the only constituent that triggered Rule 212 evaluation for Tower 96 and the scaled ambient air impacts are below the SGC and AGC for TCE. Based on the ambient modeling analysis, the effluent air discharge for the annual reporting period meets the requirements of Rule 212 for Tower 96 and 102. In addition, as noted above, Northrop Grumman replaced the VPGAC in the supplemental GAC beds at the T96 system in March 2021 and then again in November 2021 to further limit the potential for SGC or AGC exceedances in the future.

## 4.2.3 Groundwater Quality

This section describes and evaluates the analytical results of groundwater quality monitoring completed during 2021.

### 4.2.3.1 Volatile Organic Compounds

Analytical results of the routine annual, semi-annual and quarterly monitoring rounds (Second Quarter, Fourth Quarter, and First and Third Quarters of 2021, respectively) were used to evaluate VOC groundwater quality for this reporting period and are presented in **Tables 8 through 10** along with comparisons to applicable NYSDEC SCGs.

Additionally, time-concentration graphs depicting the long-term TVOC concentration trends in key wells with detectable concentrations of VOCs, grouped by proximity to the hydraulic barrier created by operation of the ONCT system, are shown on **Figures 8 through 13**. The key wells selected for graphing are generally representative of overall conditions within the OU2 plume (both on-site and immediately downgradient of the Site) over time, both horizontally and vertically and are considered surrogates for wells not graphed.

For clarity, the general areas relative to the ONCT system are described as follows:

- **Upgradient of the ONCT System:** Generally north of the ONCT system and within the capture zone created by the ONCT system.

- **Proximate of the ONCT System:** Generally in the vicinity of the ONCT remedial wells and south recharge basins, and the resulting capture zone and clean water front (an area of less than 5 µg/L total VOCs) created by the ONCT system, which are explained in further detail in **Section 4.2.5**.
- **Downgradient of the ONCT System:** South of the ONCT system and partially within the southernmost portion of the clean water front area. As discussed below, given that the majority of detections and higher concentrations of TVOCs are observed in the downgradient area, the downgradient subsection has been further organized into discrete downgradient sub-areas.

These areas are then further organized by depth intervals or zones within the aquifer where necessary (**Zone 1** [0 to 300 feet below land surface (ft bls)], **Zone 2** [300 to 500 ft bls], **Zone 3** [500 to 700 ft bls], and **Zone 4** [more than 700 ft bls]). This depth interval approach is a refinement of the previous hydrogeologic vertical zonation used in prior reports and has been adapted to be consistent with DON's depth interval structure. In general, as described below, the majority of the OU2 plume mass occurs in Zone 3.

Well locations are shown on **Figure 1**, with Northrop Grumman program wells depicted in black and supplemental Navy wells depicted in blue. Also included on **Figure 1** are brackets depicting the general locations of the upgradient, proximate, and downgradient areas, in relation to the Site.

#### 4.2.3.1.1 Upgradient of the ONCT System

A total of seven wells, all screened within Zone 1, located upgradient of the ONCT system are routinely sampled. Groundwater quality results for wells upgradient of the ONCT system are summarized in **Table 8**. Only two of the seven wells (HN-24I and GM-13D) exhibited exceedances of SCGs for VOCs; however, these two wells continue to exhibit an overall decreasing TVOC concentration trend since startup of the OU2 system (**Figure 8**).

All seven wells in the upgradient area, are located within the capture zone of the ONCT system; therefore, groundwater in this area is hydraulically contained and, over time, will be extracted and treated via the continued operation of the ONCT system. Overall, upgradient monitoring wells currently exhibit a 99.8% decrease in TVOC concentrations from their highest historical values to current values (**Table 13**).

#### 4.2.3.1.2 Proximate to the ONCT System

A total of 31 monitoring wells, located proximate to the ONCT system and screened within Zones 1 through 3, are routinely sampled. Groundwater quality results for these wells are summarized in **Table 9** and a representative subset of these wells (except shallow wells) are shown on **Figure 9**. Due to its proximity to the ONCT system remedial wells, DON well cluster RE123 has been added to **Figure 9** to enhance the understanding of groundwater quality trends in this area.

##### Zone 1

A total of 17 Zone 1 wells are located proximate to the ONCT system. Except as stated below, VOCs were generally not detected or were detected at concentrations below SCGs in these wells. Monitoring well GM-79D exhibited an exceedance of the SCG for TCE (**Table 9**). Monitoring well GM-79D continues to exhibit an overall decreasing TVOC concentration trend since startup of the OU2 system (**Figure 9**), and has exhibited an overall reduction in TVOC concentrations of 85.8% from its highest historical value (**Figure 13**).

### Zone 2

A total of seven Zone 2 wells are located proximate to the ONCT system. Only three of these wells (GM-39DB, GM-73D, and MW-3-1) exhibited exceedances of the SCGs (**Table 9**). However, these wells exhibited overall reductions in TVOC concentrations of 86.8%, 95.0%, and 92.5%, respectively, from their highest historical values (**Table 13**).

### Zone 3

A total of seven Zone 3 wells are located proximate to the ONCT system. Five of these wells (GM-15D2, GM-21D2, GM-33D2, GM-73D2 and GM-74D2) exhibited exceedances of the SCGs (**Table 9**). However, these wells exhibited overall reductions in TVOCs concentrations of 73.7%, 98.6%, 99.9%, 94.9%, and 51.0%, respectively, from their highest historical values (**Table 13**). In addition, it is notable that well GM-21D2, located immediately south of the Site within the proximate area, continues to steadily show decreases in TVOC concentrations (**Figure 9**), with TCE concentrations below 5 ug/l for the first time (Fourth Quarter 2021), based on TVOC historical data. This is not unexpected, as the clean water front continues to extend within the GM-21 area to the south of the southern site boundary.

For comparison purposes, the RE123 well cluster is located immediately adjacent to monitoring well GM-73D2 (screened at 532 to 552 ft bls). During the reporting period, well RE123D1 (screened from 480 to 500 ft bls) exhibited the most elevated TVOC concentrations in the cluster of up to 14.6 µg/L. Well RE123D2 (screened from 635 to 655 ft bls), exhibited TVOC concentrations of up to 8.1 ug/L, and well RE123D3 (screened in Zone 4 from 815 to 835 ft bls), exhibited TVOC concentrations ranging from non-detect to a high of only 3.8 ug/L. The RE123 well cluster continues to exhibit an overall decreasing trend, as indicated in **Figure 9**.

As described above, representative wells located in proximity to the ONCT system continue to show an overall decreasing trend in TVOC concentrations since startup of the system (**Figure 9**), as these wells are located within the capture zone of the ONCT system. Additionally, the Northrop Grumman wells show a collective decrease in TVOC concentrations of 98.0% from their highest historical values in all monitored hydrogeologic zones (**Table 13**). Groundwater in this proximate area is hydraulically contained by the ONCT system, both horizontally and vertically, and over time, will be extracted and treated via the continued operation of the ONCT system. These decreasing concentration trends in groundwater is one fact that supports the conclusion that the ONCT system is operating as designed and per expectations (as summarized in **Section 1**).

#### 4.2.3.1.3 Downgradient of the ONCT System

A total of 13 monitoring wells and 15 former outpost wells (referred to as “BPOW” wells) located downgradient of the ONCT system are routinely sampled by Northrop Grumman.

Groundwater quality results for these wells are summarized in **Table 10**, as well as on **Figure 10A** (near central area downgradient/south of the Site) and **Figure 10B** (far central area further downgradient/south of the Site), and depict TVOC trends in representative wells located in the downgradient zone. To enhance the understanding of groundwater quality downgradient of the ONCT system, select representative downgradient DON wells are also depicted on **Figures 10A and 10B**, including well clusters RE108, RE109, RE122, and RE126.

These DON well clusters are located both within and beyond (generally south) of the clean water front and are screened at multiple depth horizons; therefore, these well clusters provide useful additional information (collected

by others) to delineate the plume and enhance the overall understanding of contaminant concentration trends downgradient of the Site. The majority of the DON wells located downgradient of the ONCT system exhibit similar overall decreasing trends in TVOC concentrations to the Northrop Grumman wells, which vary relative to their depth, location, and distance from the developing clean water front.

The below discussion summarizes the analytical results associated with the downgradient portion of Northrop Grumman's monitoring program for 2021, enhanced by discussion of pertinent analytical results associated with key representative downgradient DON wells in the Near Central and Far Central areas downgradient of the Site, followed by a discussion of analytical results associated with the Former Outpost Monitoring Wells and the GM-38 Area.

#### Near Central Downgradient Area

A total of four Northrop Grumman and six DON wells, including well clusters RE109 (D1 through D3) and RE126 (D1 through D3), are located in the near central area south of the Site, which extends from the "proximate" area to approximately 1,300 feet south of the Site. Analytical results associated with Northrop Grumman wells are provided on **Table 10**, while TVOC trends for the six DON wells, and key Northrop Grumman well GM-75D2 is provided on **Figure 10A**.

Two wells (GM-37D [Zone 1] and GM-75D2 [Zone 3]) in this area exhibited slight VOC exceedances of the SCGs (**Table 10**); however, these wells have also exhibited an overall reduction in TVOC concentrations of 81.2% and 99.1%, respectively, from their highest historical concentrations (**Table 13**). In addition, TVOC concentrations above SCGs were noted in the RE109 and RE126 well clusters, as discussed below. The majority and higher concentrations of TVOCs were identified within the DON wells in Zone 3 in this area.

The RE126 well cluster is located approximately 800 feet downgradient of the "proximate" GM-21 well cluster (maximum TVOC concentration of 5.81 µg/l at Well GM-21D2). Well RE126D2 (screened at 555 to 575 ft bgs) exhibited the highest TVOC concentration in this cluster, and in the near central downgradient area, at approximately 575 µg/L (**Figure 10A**). Well RE109D3 (screened at 580 to 600 ft bgs and) in the RE109 well cluster located to the east of the RE126 cluster, exhibited the highest TVOC concentration in this cluster of approximately 78 µg/L (**Figure 10A**). In contrast, GM-75D2 (screened at 505 to 525 ft bgs) and located west of the RE126 cluster exhibited a maximum TVOC concentration of approximately 14 µg/L (**Figure 10A**).

Although TVOC concentrations within Well RE126D2 are higher than those in adjacent wells GM-75D2 and RE109, Well RE126D2 has been exhibiting a generally stable trend over the period of record (**Figure 10A**). TVOC concentrations in Well GM-75D2 have decreased by over 99% from the highest historical values, and the RE109 cluster wells continue to exhibit a slow and gradual decline over their period of record since 2017.

For comparison purposes, "proximate" area Well GM-21D2 within the clean water front, located approximately 800 feet north or upgradient of the Well RE126 cluster and screened approximately 50 to 80 feet shallower than the RE126 wells (though still within Zone 3) exhibited a maximum TVOC concentration of only 5.81 µg/L, as indicated above. TVOC concentrations in Well GM-21D2 have exhibited an overall decrease of almost 99% from the highest historical values. Given that Well GM-21D2 is located upgradient of the Well RE109 and RE126

clusters, it is expected that similar decreases will be observed at these well clusters over time, as the clean water front continues to propagate through this vicinity and depth downgradient of the Site.

### Far Central Downgradient Area

A total of seven Northrop Grumman wells and five DON wells, including well clusters RE108 (D1 and D2) and RE122 (D1 through D3), are located in the far central area south of the Site, which extends from the southern portion of the near central area (approximately 1,300 feet south of the Site) southward to approximately Hempstead Turnpike. Analytical results associated with Northrop Grumman wells are provided on **Table 10**, while TVOC trends for the DON wells, and key Northrop Grumman wells (GM-34D2, GM-35D2, and GM-70D2) and Bethpage Water District Well BWD 6-2, are provided on **Figure 10B**.

Five wells (GM-34D [Zone 2], GM-34D2 [Zone 3], GM-35D2 [Zone 3], GM-70D2 [Zone 2], and GM-71D2 [Zone 2]) in this area exhibited VOC exceedances of the SCGs (**Table 10**); however, these wells have also exhibited an overall reduction in TVOC concentrations of 91.0%, 87.1%, 93.3%, 97.5%, and 56.8%, respectively, from their highest historical concentrations (**Table 13**). In addition, elevated TVOC concentrations were noted in the RE108 and RE122 well clusters, as discussed below. The majority and higher concentrations of TVOC were identified within the DON wells in Zone 3 in this area.

The RE122 well cluster is located downgradient of the clean water front, approximately 1,000 feet southeast (downgradient) of near central downgradient well GM-75D2. Well RE122D2 (screened at 590 to 610 ft bgs) exhibited the highest TVOC concentrations detected in the far central downgradient area of approximately 5,554 µg/L (**Figure 10B**). In addition, the Well RE108 cluster is located approximately 500 feet east of the RE122 cluster, and Well RE108D2 (screened at 630 to 650 ft bgs) exhibited the highest TVOC concentrations of 4,034 µg/L at this cluster location (**Figure 10B**). It should also be noted that Well RE122 D3, exhibiting a TVOC concentration of up to 6.2 µg/l, is screened within Zone 4 (from 715 to 735 feet below grade). As indicated above, the multiple depths of the "RE" well clusters provide a snapshot of the vertical extents of the plume. In this case, Well RE122 D3 delineates the lower vertical extent of the plume in this area.

Although elevated relative to GM-75D2, TVOC concentrations within Wells RE122D2 and RE108D2 have generally exhibited stable and decreasing long-term trends, respectively, over time (**Figure 10B**). For comparison, Well GM-75D2 (screened approximately 90 to 140 feet shallower than RE122D2 and RE108D2) exhibited TVOC concentrations of up to approximately 14 µg/L, and is currently exhibiting an overall decreasing trend in TVOC concentrations of over 99% from its highest historical value. Given that Well GM-75D2 is located upgradient of the Well RE108 and RE122 clusters, it is expected that similar decreases will be observed at these well clusters over time, as the clean water front continues to propagate through this vicinity and depth downgradient of the Site.

The variable pumping (well shutdown or operation at increased or decreased flow rates) of Bethpage Water District Well 6-2 (BWD 6-2) over time may also have an influence on water quality in this far central downgradient area, and consequently the continued downgradient development of the clean water front. The operation of BWD 6-2 locally affects the groundwater flow direction and based on the water quality data trends in BWD 6-2, may influence at least a portion of the OU2 plume to move east/southeast towards BWD 6-2, resulting in highly variable VOC concentrations in this well over time (**Figure 10B**). Given the locations of Wells RE108D2 and

RE122D2, approximately 2,000 feet northwest and generally upgradient of BWD 6-2, there is a potential that water quality at these wells is affected by the variable pumping of BWD 6-2, as illustrated by similar variable TVOC trends over time observed at BWD 6-2 (**Figure 10B**).

As identified above **Figures 10A and 10B** depict a generally downward trend in TVOC concentrations in representative downgradient Northrop Grumman and DON monitoring wells observed since startup of the ONCT system, with the exception of RE122D2 which has generally exhibited stable TVOC concentrations over time. The more pronounced decreasing trends are generally observed in closer proximity to the ONCT system and clean water front area in the near central downgradient area. Additionally, downgradient Northrop Grumman monitoring wells (near and far central) show a decrease in TVOC concentrations of over 98% and 90%, near and far respectively, from their highest historical values for all hydrogeologic zones (**Table 13**).

Based on the above near and far central downgradient area analyses, representative wells located downgradient of the ONCT system generally continue to show overall decreasing trends in TVOC concentrations, which vary in depth and location of wells relative to the developing clean water front immediately downgradient of the ONCT system (further defined in **Section 4.2.5**), as follows:

- Downgradient Northrop Grumman monitoring wells in the near and far central sub-areas show a decrease in TVOC concentrations of over 93% from their highest historical values for all hydrogeologic zones (**Table 13**).
- The supplemental downgradient DON monitoring wells, primarily screened within Zone 3 where the bulk of VOC impacts occur, generally exhibit a decrease in TVOC concentrations, with the following qualifiers and exceptions:
  - TVOC reductions are not occurring at the same rate as Northrop Grumman wells located in their vicinity due to differences in screened interval depths (i.e., DON Zone 3 wells typically monitor a deeper portion of Zone 3 relative to Northrop Grumman wells, where higher TVOC concentrations are observed). As further discussed in **Section 4.2.5**, as the clean water front takes time to propagate with depth, this difference in the rate of reduction is not unexpected.
  - In general, in the area further downgradient from the clean water front, TVOC reductions are not as evident in the trend graphs. As further discussed in **Section 4.2.5**, as the clean water front takes time to propagate downgradient of the ONCT system, this difference in the rate of reduction is not unexpected.
  - In the area further downgradient from the clean water front, pumping of BWD Well 6-2 appears to influence the concentration trends of Monitoring Wells RE108D2 and RE122D2. As such, the continued development of the clean water front will be complicated by the variable pumping of BWD 6-2, delaying its development.
- Operation of the ONCT system will continue to result in declining TVOC concentrations downgradient of the Site, as the clean water front continues to propagate and expand both further downgradient and at depth.

#### GM-38 Area

DON operates an off-site groundwater extraction and treatment system at the GM-38 hotspot area located downgradient and approximately 0.75 miles southeast of the Site. OM&M reports for the GM-38 Area Remedy are submitted to NYSDEC by DON under separate cover, and Arcadis reviews these reports to supplement

evaluation of off-site groundwater conditions. As such, a brief summary of the GM-38 Area Remedy is provided below.

In April 2021, pumping was initiated at recovery well RW-4, following its connection to the GM-38 Groundwater Treatment Plant (GWTP). At that time, pumping at RW-3 was to be suspended, and RW-1 and RW-4 were planned to be pumped at an average combined flow rate of up to 1,100 gpm with treated water discharged to the Arthur Avenue recharge basin. Based on the reporting available for review, the RW-4 pumping rate varied from less than 100 gpm to 200 gpm during the year and, as pumping increased, the rate of RW-1 was to be reduced by the amount of the RW-4 rate so that the total rate remained at 1,100 gpm (so as to not exceed the GWTP or Arthur Avenue recharged basin capacity). Treated effluent samples collected from RW-1 and RW-4 are routinely sampled for VOCs by DON.

As summarized in **Table 10**, wells GM-38D and GM-38D2 exhibited SCG groundwater exceedances of TCE, which were consistent with VOC data from previous quarters.

**Figure 11** depicts TVOC trends for Zone 1 and 2 wells in the off-site GM-38 Area. The TVOC concentrations in wells GM-38D and GM-38D2 have decreased since 2006 and 2002, respectively, except for a temporary increase in TVOCs observed in GM-38D2 beginning in late 2015. This increase occurred after DON shut-down the GM-38 Area recovery well RW-3 from July 2015 to June 2018 and increased well RW-1's pumping rate from 800 gpm to 1,000 gpm (H&S Environmental, 2018). In June 2018, well RW-3 was turned back on at 20% of total discharge capacity (approximately 250 gpm) and the pumping rate of well RW-1 was decreased to 80% of total discharge capacity (approximately 850 gpm) and the trend after this time was downward in Well GM-38D2.

#### Monitoring of Former Outpost Wells

Fifteen former outpost monitoring wells were repurposed at the end of 2015 as OU2 plume monitoring wells and continue to monitor the VOC plume upgradient of certain public supply wellfields. Due to their proximity to nearby drinking water supply wells, samples from the outpost monitoring wells continue to be analyzed using methods appropriate for water supply wells, by using USEPA Method 524.2 for VOCs and using USEPA Method 522 for 1,4-dioxane. Well Cluster BPOW 1 is utilized to monitor Wellfield 1 of the South Farmingdale Water District; Well Cluster BPOW 2 is utilized to monitor Wellfield 3 of the South Farmingdale Water District; Well Cluster BPOW 3 is utilized to monitor New York American Water's Seaman's Neck wellfield; and Well Cluster BPOW 4 is utilized to monitor Well N-5303 for the Town of Hempstead/Levittown Water District.

As summarized in **Table 10**, only three of the 15 former outpost wells (BPOW 3-4, BPOW 4-1R, and BPOW 4-2R) in Zones 3 and 4 exhibited VOC exceedances of the SCGs in 2021. These exceedances at BPOW 3-4 were primarily TCE, while the exceedances at BPOW 4-1R and BPOW 4-2R were primarily Freon-113.

**Figure 12** highlights the downward or stable trend in TVOC concentrations for the BPOW 1 cluster (wells BPOW 1-1 and BPOW 1-2, respectively). Wells BPOW 1-3 through BPOW 1-6 were non-detect for TVOCs and were, therefore, not graphed. In addition, **Figure 13** shows the increasing trends for outpost wells BPOW 3-4, BPOW 4-1R, and BPOW 4-2R and the stable trend for BPOW 3-3. It should be noted that Wells BPOW 3-1 and BPOW 3-2 were non-detect for TVOCs and were, therefore, not graphed. Well Cluster BPOW 2 has not exhibited exceedances of the SCGs since 2007 and is not graphed.

### 4.2.3.2 Cadmium and Chromium

Representative wells located in proximity to former Northrop Grumman Plants 1 and 2 are sampled for laboratory analysis of total and dissolved cadmium (Plant 2 only) and chromium (Plants 1 and 2). Analytical results for the Second and Fourth Quarters of 2021 are provided in **Table 11**. As a “worst-case” conservative approach, only total (unfiltered) metals concentrations are discussed below and depicted on the corresponding figures. Results are summarized below.

#### Former Northrop Grumman Plant 1

Exceedances of total chromium were detected in three of four wells (GM-15SR, PLT1 MW-05, and PLT1 MW-06) associated with Plant 1 during 2021 as indicated in the **Table 11**.

As depicted on **Figure 14**, total chromium in well PLT1 MW-05 has shown a generally decreasing trend over the period of record; however, significant variations in concentrations continue to occur year to year. The most recent result is approximately 60% less than the historical high. Well GM-15SR is exhibiting a downward trend in concentration since late 2010; however, 2021 increases limit this downtrend trend. Well PLT1 MW-06 shows a steady decline in concentrations for the period of record.

There have been no detections of total chromium in well PLT1 MW-04 since mid-2005, with the exception of one minor detection in 2014.

#### Former Northrop Grumman Plant 2

As shown in **Table 11**, total cadmium exceedances of the SCG were not detected in the five wells associated with Plant 2 during 2021. In addition, in July 2021, Well N-10631 was observed to be filled with approximately 22 feet of sediment. Following an unsuccessful redevelopment attempt, the well was determined to no longer be viable for sampling and Northrop Grumman is coordinating to replace this well in the near future. Based on historical data, this well has shown variations in cadmium concentrations over the period of record, with a long term declining trend (**Figure 15**). In addition, Wells GM-78I and GM-78S exhibited no exceedances of the SCGs for the period of record.

As shown in **Table 11**, total chromium exceedances of the SCG were detected in one of five wells associated with Plant 2 during 2021. Total chromium was detected at concentrations above the SCG in MW-02GF, located on the south side of former Northrop Grumman Plant 2. As depicted on **Figure 16**, monitoring well MW-02GF has shown widely varying concentrations for the period of record, including some results above the SCG prior to 2013, concentrations below the SCG from 2013 through 2017, and more recently increasing concentrations above the SCG from 2018 through 2021. As described above, Well N-10631, where total chromium was previously detected slightly above the SGC at one point in 2018, was observed to filled with sediment and was no longer able to be sampled. For the period of record wells samples from wells GM-78s, GM-78I, and MW-01GF have been below the SCG.

### 4.2.3.3 Tentatively Identified Compounds

Consistent with previous Annual Groundwater Monitoring Reports, this section summarizes Tentatively Identified Compounds (TICs). Methyl-tert-butylether was tentatively detected in wells BPOW 1-2 and BPOW 1-3 (in the Second Quarter of 2021). Silanol, trimethyl- was tentatively detected in the following wells in 2021: BPOW 1-6,

BPOW 2-1, BPOW 2-2, BPOW 2-3, BPOW 3-1, BPOW 3-2, BPOW 4-1R, GM-34D, Well 17, Well 18, and Well 19. Chlorodifluoromethane was tentatively detected in BPOW 4-1R (in the Fourth Quarter of 2021).

#### 4.2.3.4 1,4-Dioxane

Pursuant to NYSDEC's conditional approval of the June 2015 Groundwater Monitoring Plan Addendum (NYSDEC 2015b), 1,4-dioxane was added as an analyte for the remedial, monitoring, and former outpost wells sampled under the OU2 groundwater monitoring program. As described in **Section 4.1**, 1,4-dioxane was analyzed using USEPA Method 8270D SIM CLLE for monitoring wells and remedial wells, while samples collected from former outpost wells continue to be analyzed using USEPA Method 522. The results of 1,4-dioxane analysis of groundwater samples obtained from all four quarters of sampling in 2021 are provided in **Table 12**, organized by hydrogeologic zone.

Out of a total of 162 samples collected from former outpost wells, monitoring wells, and remedial wells in 2021, including replicates, 30 samples were non-detect for 1,4-dioxane. Detected concentrations ranged from 0.090 µg/L to 15 µg/L (MW-3-1). The highest 1,4-dioxane concentrations detected in the 2021 reporting period were generally observed in the vicinity of the ONCT system remedial wells.

#### 4.2.3.5 Vinyl Chloride

VC is routinely detected in Remedial Well 3R and adjacent monitoring well MW-3-1, which are both located in the northwestern portion of the Site. VC was detected in quarterly influent samples at Remedial Well 3R at concentrations ranging from 1.6 µg/L to 4.4 µg/L in 2021 (**Table 4**), while groundwater samples collected from monitoring well MW-3-1 exhibited VC concentrations ranging from 7.9 µg/L to 13.6 µg/L in 2021 (**Table 9**). Groundwater remediation (i.e., biosparge system) to address VC upgradient (northwest) of Remedial Well 3R and Monitoring Well MW-3-1 is ongoing by OXY under USEPA oversight. OXY has requested that USEPA allow them to submit a work plan for a trial/partial shutdown of the biosparge system and USEPA has agreed to their request. Northrop Grumman believes it is premature to allow OXY to conduct a trial/partial shutdown of their system.

#### 4.2.3.6 QA/QC Samples and Data Validation

Arcadis performed validation of treatment system vapor and water samples, and groundwater quality data in accordance with the updated GWMP (Arcadis 2016), by following the contract laboratory program and by applying relevant NYSDEC and USEPA protocols. The quality of the data is considered acceptable with the qualifiers indicated in **Tables 4, 5A/B/C/D and 7 through 12**. It should be noted that analytical data associated with QC samples (replicates) are only used for QC review purposes and are not summarized above.

### 4.2.4 Hydraulic Effectiveness Monitoring

As described above, the zones (Zone 1 [0 to 300 ft bls], Zone 2 [300 to 500 ft bls], Zone 3 [500 to 700 ft bls], and Zone 4 [more than 700 ft bls]) referenced herein have been reorganized to be consistent with the intervals reported separately by DON.

In general, "mounding" of the water table resulting from discharge of treated water to on-site recharge basins is expected to be most evident in Zone 1. Remedial well pumping generates "a cumulative cone of capture" (area of

lowered water levels), which is expected to be most clearly evident in Zone 3, where the remedial wells are screened. As such, groundwater flow in the vicinity of the ONCT system would be expected to have a vertical component downward from the shallower portions of the aquifer to the deeper portions of the aquifer. In general, these expectations are being realized, as documented in previous annual reports and throughout 2021, and as further discussed below.

Hydraulic monitoring was performed from April 6 to April 8, 2021 (Second Quarter 2021) and October 4 to October 9, 2021 (Fourth Quarter 2021). The ONCT system operated consistently throughout these time periods, at or above design pumping rates as follows:

- Well 1 of the Tower 96 system operated at an average flow rate of approximately 910 gpm during both time periods.
- Well 3R of the Tower 96 system operated at an average flow rate of approximately 710 gpm during both time periods.
- Both Wells 17 and 18 of the Tower 102 system operated at an average flow rate of approximately 1,010 gpm during both time periods.
- Wells 19 of the Tower 102 system operated at an average flow rate of approximately 509 gpm during both time periods.

**Tables 14 and 15**, respectively, provide the associated water-level measurement data. **Table 16** summarizes vertical hydraulic gradients for key monitoring well pairs in the vicinity of the ONCT system (which were calculated using the Fourth Quarter 2021 water-level measurements) and compares these gradients to groundwater model-predicted gradients (both direction and magnitude) for the ONCT system operating at current design flow rates to capture the VOC-impacted groundwater on-site. **Figures 17 and 18** depict groundwater elevations and flow directions in Zones 1 and 3, respectively, during operation of the ONCT system in October 2021.

**Figure 17** shows that mounding of the water table exists in Zone 1 beneath the west recharge basins and south recharge basins and extends across the Site southern boundary. Data summarized in **Table 16** indicate that vertical hydraulic gradients calculated from field measurements are generally downward and similar in magnitude to the model predicted gradients and therefore, are consistent with the expectation of vertical groundwater flow stated above. **Figure 18** shows that the ONCT system remedial wells have developed a cumulative zone of capture in Zone 3 that extends downgradient of the Site (see groundwater divide depicted on **Figure 18**, in the area just south of Central Avenue) and encompasses the on-site area of VOC-impacted groundwater.

#### 4.2.5 Remedial System Effectiveness

This section provides an assessment of additional lines of evidence related to the remedial system effectiveness, including an evaluation of the overall distribution of TVOCs, further analysis of the development of a “clean water” front, and further analysis of the ONCT system’s capture zone. These lines of evidence are provided in accordance with the applicable provisions of the USEPA’s A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems (USEPA 2008). This approach has been used to evaluate the ONCT system’s ability to provide effective horizontal and vertical hydraulic capture of on-site OU2 VOC-impacted groundwater, and to prevent its off-site migration.

### Overall TVOC Distribution Evaluation

This report provides an updated assessment of the three-dimensional distribution of TVOC concentrations in the upper glacial and Magothy aquifers developed based on a comparison of the previous 2020 TVOC distribution in the OU2 area to the most recently available data from monitoring wells, remedial wells, vertical profile borings, and public water supply wells collected in 2021. This evaluation primarily focuses on the distribution of TVOCs on-site and extending downgradient from the Site to north of Hempstead Turnpike.

**Figures 19 through 25** provide the 2021 updated three-dimensional interpretation of the plume based on analytical data included in this report collected from multiple OU2 on-site and off-site Northrop Grumman monitoring and remedial wells, supplemented with recently available 2021 analytical data from off-site DON monitoring wells, and Bethpage Water District public supply wells. Multiple plan and cross-sectional view figures (both perpendicular and parallel to groundwater flow direction) were updated in this manner and these provide a comprehensive three-dimensional interpretation of TVOC concentrations in Zones 1 through 4 at and downgradient of the Site, and extending to north of Hempstead Turnpike (the furthest south location where data interpretation was considered as part of determining ONCT system effectiveness). However, as discussed below in this report, this far downgradient southern area is well beyond the ONCT system capture zone and its resulting area of plume bifurcation and developing clean water front.

The locations of wells and VPBs used to define the plume contours and clean water front are shown on the maps as data points for context. Key wells within the plume and clean water front area are discussed herein and are labelled on the plan view and cross-section figures for convenience of review. As indicated previously, TVOC concentrations are the sum of 21 identified “site-related” VOCs. Based on this comparison, current plume conditions (north of Hempstead Turnpike) have not significantly changed as compared to 2020, with the few notable exceptions described below.

**Figure 19** depicts a 2021 plan view of the overall TVOC distribution (i.e., the maximum concentrations in all zones combined on one figure to show maximum OU2 plume extent) at and downgradient of the Site and the locations of two cross-sections: A to A', located west-east along the former Northrop Grumman site southern boundary, perpendicular to regional ambient groundwater flow; and B to B', located northwest-southeast from the southernmost portion of the Site to the Bethpage Water District Well Field 6, downgradient from the Site and approximately parallel to regional ambient groundwater flow. **Figures 20 and 21** respectively, provide A to A' and B to B' cross-sectional vertical interpretations of 2021 TVOC concentrations in groundwater from the water table to the top of the Raritan confining unit, which is the bottom of the Magothy aquifer. **Figures 22 through 25** provide plan-view interpretations of maximum 2021 TVOC concentrations in Zone 1, Zone 2, Zone 3 and Zone 4 respectively.

Key findings based on review of **Figures 19 through 25** are summarized below:

- Plan-view **Figures 19 and 22 through 25** show bifurcation of the plume (TVOC distribution) as evidenced by an area of less than 5 µg/L TVOCs on- and off-site near the southern Site boundary, induced by the continued pumping of the ONCT system remedial wells and recharge of clean water to the south recharge basins. As pumping continues, bifurcation of the plume and the associated clean water front will continue to develop downgradient of the ONCT system as on-site VOC-impacted groundwater continues to be removed from the aquifer by pumping the remedial wells and treated water continues to be

discharged/recharged at the south recharge basins. Further description and analysis of the clean water front is provided below. Importantly, the clean water front area has expanded to the south in response to “proximate” well GM-21D2 continuing its historical downward TVOC trend and falling below 5 ug/l for the first time during Fourth Quarter 2021.

- Based on the west-east A to A' cross-sectional interpretation shown on **Figure 20**, Remedial Wells 17 through 19 continue to intercept on-site contaminants at the southern boundary of the Site.
- The northwest-southeast B to B' cross-sectional interpretation shown on **Figure 21** depicts the bifurcation of the groundwater plume over an area containing TVOCs at concentrations of less than 5 µg/L. The northernmost area of the plume, where concentrations are greater than 5 µg/L, is intercepted on-site by Remedial Well 17, and the southernmost downgradient area of concentrations greater than 5 µg/L is separated by the clean water front (i.e., TVOC concentrations of less than 5 µg/L) from the northern area, of greater than 5 µg/L TVOCs, at the southern boundary of the Site.
- The deepest portion of the aquifer (basal Magothy) did not exhibit TVOC concentrations in excess of 5 µg/L, including beneath the ONCT system remedial wells.
- As indicated in **Appendix F**, which is a comparative analysis of chemical compositions in the northwest area (i.e., upgradient of DON well cluster RE106 and west of the Site) to the OU2 plume, VOC-impacted groundwater detected at RE106 appears to be from a source other than OU2 based on its location relative to the Site (sidegradient), its chemical composition, as well as recently completed VPBs and associated monitoring wells installed to the northwest and upgradient of RE106. Accordingly, data from DON well cluster RE106 data was not included in mapping the OU2 plume for this report. Consequently, as compared to the 2020 plume representation, the overall extent of the 5 to 50 ug/l off-site plume area has decreased in the area of RE106.

It is also recognized that there could be more than one VOC source impacting groundwater at the RE107 well cluster and, as such, results associated with the RE107 well cluster are not further discussed in this report. However, there is some uncertainty regarding this analysis therefore, RE107 is included in the plume update.

In addition, the overall extent of the greater than 1,000 ug/l portion of the off-site is narrower than in 2020, primarily due to lower downgradient contaminant concentrations in this area.

### Clean Water Front Analysis

As historically reported in previous OU2 ONCT System Annual Reports, bifurcation of the plume, as evidenced by an area of less than 5 µg/L TVOCs located on and off-site near the southern boundary of the Site, has been induced by the continued pumping of the ONCT system remedial wells and recharge of clean water to the south recharge basins. This bifurcation has resulted in the development of a prominent clean water front between on-site groundwater and the off-site or downgradient portions of the OU2 plume. Attributable directly to the successful performance and effectiveness of the ONCT, this clean water front has been developing at, and hydraulically downgradient of the southern Northrop Grumman property line since the ONCT system's inception in 1998.

Pumping of the five ONCT system remedial wells produces a barrier to movement of VOC-impacted groundwater off-site, thereby preventing the addition of VOCs from the Site to the groundwater downgradient of the Site. The treated water discharge, stormwater contributions and precipitation to the south recharge basins add clean water

to the aquifer, resulting in enhanced, targeted recharge along the southern Site boundary. As the majority of pumping and enhanced recharge occurs near the southern Northrop Grumman property, the resulting clean water front initially developed in Zone 1 in this area and continues to propagate deeper and downgradient away from the Site in response to the prevailing regional horizontal groundwater flow direction and vertical downward groundwater flow gradient. Therefore, over time, the clean water front will continue to propagate from Zone 1 to the more geologically complex deeper aquifer zones (Zones 2 through 4) and then further from the Site.

The development of the clean water front, both areally and at depth, is ultimately driven by groundwater flow velocity through the complex geology existing at and downgradient of the Site. In general, horizontal groundwater flow is approximately one foot per day in the sand and gravel portions of the aquifer, while vertical groundwater flow is slower due to the vertical heterogeneity in the permeabilities of the sediments (including localized lenses of silts and clays), which are approximately one-tenth (0.10) or less of the horizontal permeabilities. Given these factors, the vertical movement of groundwater is much slower than the horizontal movement of groundwater, which results in a much slower vertical development of the clean water front, as compared to its areal development.

Pumping of the ONCT system creates a groundwater divide in the vicinity of the southern Site boundary. At this groundwater divide, the direction of groundwater movement is reversed, resulting in some groundwater moving north toward the extraction wells and other groundwater continuing to flow generally to the south with the regional gradient. At the divide, where groundwater changes flow direction, a local stagnation zone (zone of slower groundwater movement) is created with reduced groundwater velocities, slowing the development of the clean water front in this localized area.

As the plume bifurcation process continues to expand the clean water front, clean water from upgradient areas begins to flush out the pore spaces within the aquifer. Pore spaces within the aquifer must generally be flushed multiple times (pore volume flushes) to result in contaminant concentration reductions less than applicable SCGs, in turn resulting in a commensurate slow but steady expansion of the clean water front. The ongoing adsorption and desorption of VOCs by clays and other fine-grained aquifer constituents, and the associated lower permeabilities of these fine-grained constituents, further complicates and slows the overall development of the clean water front.

Forward diffusion (defined as the contamination of an adjacent low permeability [K] zone [LPZ] by diffusive transport of contaminants from a high permeability zone [HPZ]) occurs when an HPZ is initially impacted by high concentrations of VOCs. These VOCs move through the HPZ and as the VOCs pass an adjacent LPZ a concentration gradient is established from the highly impacted HPZ to the unimpacted LPZ and contaminants move into the LPZ by diffusion. As the HPZ cleans up over time the VOC concentrations decrease and eventually the initial concentration gradient is reversed and back diffusion (defined as the contamination of an HPZ by diffusive transport of contaminants out of an adjacent LPZ) occurs and can significantly extend remediation time frames (Brooks, M.C., et.al., 2021), particularly in aquifers such as the Magothy, as described below. This concept of hydrogeologic controls on plume cleanup has been refined into a three-“compartment” aquifer model (Horst, et. al., 2017), based on order-of-magnitude contrasts in groundwater contaminant flow due to order of magnitude differences in aquifer permeability, as described immediately below:

- Compartment (C)1 – coarse-grained aquifer material/90% of flow/mass transport occurs here (advection [bulk movement of water] dominant) [HPZ-like],

- C2 - finer-grained aquifer material/9% of flow/mass transport occurs here (slow advection with diffusion [movement of contaminants from area of higher concentration to area of lower concentration due to random motion of molecules]),
- C3 – clay/1% of mass (diffusion and storage) [LPZ-like]).

Although the three compartments in the Magothy aquifer are conceptualized, each compartment is not confined to a particular aquifer area but instead all three compartments occur dispersed throughout the aquifer and in all four zones due to the aquifer heterogeneity (variation in properties with direction). In the Magothy aquifer onsite and downgradient contaminant mass occurs in all three compartments, with VOC mass moving through and cleaning up relatively quickly in C1 but more slowly in C2 and with back diffusion from C3 into C1 and C2 further slowing up cleanup time. Based on this concept, the Magothy aquifer can be expected to remain impacted with VOCs for longer than may be initially expected as a result of the permeability contrasts in the aquifer, resulting dominance of one transport mechanism (compartment) over another, and back diffusion. This “compartmental” effect is apparent on some TVOC monitoring trends where there is a longer history (e.g., Monitoring Well GM-13D on Figure 8) and C1 and C2 are evident. For wells with shorter monitoring histories, the compartmental effect may not be as evident. However, the TVOC versus time graph for such wells may be indicative of C2 and, therefore, can explain why such wells (e.g., Monitoring Well RE126D2 on Figure 10A) are not exhibiting a decline in TVOCs as quickly as might be anticipated or seen in other areas.

Therefore, the following should be considered when assessing relative rate of clean up time and the development of the clean water front:

- Documented heterogeneity and gradation of the Magothy aquifer from one compartment to another (e.g., gradation from coarse-grained to fine-grained deposits both horizontally and vertically).
- The hydrogeology of the Magothy aquifer, where fine-grained material make up 17% or more of the aquifer volume (Misut, P.E., 2014).
- Documented historical elevated VOC concentrations in the HPZs of the Magothy, which would have caused forward diffusion of VOCs into the LPZs.

However, despite these limitations, and as described above, the clean water front created and maintained by the ONCT system is evident based on review of the water level maps, vertical hydraulic gradients, plume maps, cross-sections, monitoring well analytical data and associated trend graphs included herein. The continued expansion of the clean water front and associated reductions in TVOC concentrations could not have been achieved without the ONCT system effectively capturing and preventing the off-site movement of VOC-impacted groundwater.

For example:

- **Figure 19** depicts the OU2 plume (all depths compiled onto one map, indicating maximum plume extents) for 2021 and shows bifurcation of the plume as an area of TVOCs of less than 5 µg/L immediately south of the Site. As identified above, the continued propagation of the clean water front can be observed over time, as “proximate” well GM-21D2 has continued its historical downward TVOC trend, falling below 5 ug/l for the first time during Fourth Quarter 2021.
- **Figure 20** is oriented west to east along the south recharge basins at the southern Site boundary and documents the large volume of clean groundwater between the water table and generally 290 feet below

North American Vertical Datum 1988 (NAVD), where TVOCs less than 5 µg/L occur due to operation of the ONCT system. Deeper groundwater 540 feet below NAVD is also less than 5 µg/L and documents that the ONCT system is preventing further vertical migration of VOC-impacted groundwater.

- **Figure 21** is oriented northwest to southeast from on-site Remedial Well 17 off-site to the BWD Well 6-2. This section shows TVOCs less than 5 µg/L throughout a vertical section downgradient of Well 17 and indicates plume bifurcation and a clean water front.
- **Figures 22 (Zone 1), 23 (Zone 2), 24 (Zone 3), and 25 (Zone 4)** depict the OU2 plume for specific depth horizons (0 to 300 ft bls, 300 to 500 ft bls, 500 to 700 ft bls, and greater than 700 ft bls, respectively) and shows bifurcation of the plume as an area of TVOCs of less than 5 µg/L immediately south of the Site.
- In addition, monitoring well GM-33D2, located a short distance off-site and west of Remedial Well 17, has exhibited a decline in TVOCs of over 99% since 1994, while monitoring well GM-75D2, located off-site approximately 1,300 feet downgradient of the ONCT system, has also exhibited a decline in TVOCs of over 99%. These TVOC reductions would not be possible if TVOCs were still migrating from the Site.

#### OU2 ONCT System Capture Analysis

This subsection describes capture analysis demonstrating that, in accordance with the applicable portions of USEPA's "A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems, January 2008", operation of the ONCT system continued to create an effective hydraulic barrier, meeting its objectives of on-site containment of OU2 VOC-impacted groundwater and prevention of its off-site migration.

To support the evaluation of the hydraulic effectiveness of the ONCT system, including during periods of 2021 when portions of the OU2 ONCT system were shut down for routine and non-routine maintenance (primarily Well 18 well pump motor and multiple VFD failures, and T96 system blower bearing issues), Arcadis reviewed current and historical ONCT system operational criteria (**Table 17**).

Despite the downtime experienced by the ONCT system during portions of 2021, the percent model design flow for the ONCT system in 2021 (**Table 17**) was greater than the percent model design flow for the ONCT system in 2019; therefore, as modeling completed for 2019 confirmed on-site plume capture, it is logical to conclude that on-site plume capture was maintained throughout 2021. This is supported by continuing declines in TVOC trends throughout the majority of the well network, the on-site and off-site areas of the overall 2021 plume reducing slightly, and the clean water front exhibiting an increase since 2020.

## 5 Conclusions

The following conclusions are provided regarding the performance and ability of the ONCT system to achieve the RAOs for the Site for the 2021 reporting period:

- The results of the groundwater quality trend analysis and hydraulic effectiveness monitoring described in **Section 4.2.3** and **Section 4.2.4**, respectively, along with additional lines of evidence presented in **Section 4.2.5**, demonstrate that the ONCT system maintained horizontal and vertical control of on-site OU2 VOC-impacted groundwater during 2021 via extraction of on-site VOC-impacted groundwater and discharge/recharge of treated water to the south recharge basins. The evaluations conducted to support this conclusion conform with the lines of evidence and evaluation process recommended in the

applicable sections of USEPA's A Systematic Approach for Evaluation of Capture Zones at Pump and Treat Systems (USEPA 2008) document.

- The capture zone created via operation of the ONCT system encompasses the area of on-site OU2 VOC-impacted groundwater and creates an effective hydraulic barrier; thereby meeting its objectives of on-site containment of OU2 VOC-impacted groundwater and preventing its off-site migration.
- The groundwater quality data from wells located immediately downgradient of the hydraulic barrier at the southern boundary of the Site have continued to exhibit downward TVOC concentration trends over time, as expected, due to the continued effectiveness, performance and compliance of the ONCT system.
- Groundwater quality data indicates that bifurcation of the VOC plume is continuing to propagate and expand south of the hydraulic barrier at the southern boundary of the Site. As identified above, the continued propagation of the clean water front can be observed over time, as "proximate" well GM-21D2 has continued its historical downward TVOC trend, falling below 5 ug/l for the first time during Fourth Quarter 2021.
- As operation of the ONCT system continues over time, bifurcation of TVOC-impacted groundwater, and an associated clean water front, will continue to develop and expand downgradient of the ONCT system and with depth as on-site VOC-impacted groundwater continues to be removed from the aquifer by pumping the remedial wells and treated water continues to be discharged/recharged at the south recharge basins.
- The ONCT system is operating as designed from a compliance and performance perspective:
  - The ONCT system complied with applicable NYSDEC SCGs for ONCT system emissions (i.e., treated water and air emissions).
  - A calculated 4,285 lbs of TVOCs were removed from the aquifer and treated by the ONCT system in 2021. Since full-time startup of the ONCT system in November 1998, approximately 220,372 lbs of VOCs have been removed from the aquifer and treated by the ONCT system.
- At former Plant 1, results for total chromium remain elevated above the SCG, except for Monitoring Well PLT1 MW-04. PLT1 MW-05 has shown a generally decreasing trend over the period of record; however, variations in concentrations continue to occur year to year. The most recent result is approximately 60% less than the historical high. Well GM-15SR appears to exhibit an overall decreasing trend since 2010 although yearly fluctuations make it difficult to be confident about this trend.
- At former Plant 2, total cadmium exceedances did not occur in 2021. Monitoring Well MW-02GF (the only Plant 2 well exhibiting chromium SCG exceedances) has shown widely varying concentrations for the period of record, including some results above the SCG prior to 2013, concentrations below the SCG from 2013 through 2017, and more recently increasing concentrations above the SCG from 2018 through 2021. In addition, Well N-10631 was observed to be filled with 22 feet of sediment and is no longer able to be sampled. Northrop Grumman is coordinating to replace this well in the near future.

## 6 Suggestions

Based on the findings and conclusions presented herein, the following suggestions are provided with respect to the continued operation and monitoring of the ONCT system for effectiveness:

- The ONCT system should continue to be operated as designed with updated model-based remedial well flow rates to meet remedial objectives and maintain/expand the clean water front created by the system.
- Groundwater monitoring should continue as previously specified with the following exception: Northrop Grumman has elected to sample Monitoring Well GM-21D2 on a quarterly sampling frequency, as proposed in the 2018 Annual Report. Other sampling frequency modifications suggested in the 2018 and 2019 Annual Reports are currently being revisited in coordination with DON from a more comprehensive perspective, and will be proposed to NYSDEC for approval separately in the future.
- Groundwater quality and hydraulic monitoring in the vicinity of the ONCT system should continue to be enhanced by incorporating data obtained from DON monitoring well clusters RE123, RE126 and RE109, and by supplementing with data obtained from DON monitoring well clusters RE107, RE108 and RE122. Given that these DON well clusters are generally located in critical areas nearby/downgradient of the clean water front and are screened at multiple depth horizons, they provide useful information to supplement Northrop Grumman well data to better monitor contaminant concentrations in these areas. These wells should continue to be evaluated as part of the routine annual system evaluation/certification process.
- Coordinate for the replacement of well N-10631 to continue monitoring the historically declining cadmium concentrations within this well.

## 7 Certification Statement

For each institutional or engineering control identified for the OU2 On-Site Groundwater Remedy, I certify that all of the following statements are true:

- a. The engineering control employed for the OU2 On-Site Groundwater Remedy is unchanged from the date the control was put in place, or last approved by New York State Department of Environmental Conservation Division of Environmental Remediation (DER).
- b. Nothing has occurred that would impair the ability of such control to protect public health and the environment.
- c. Nothing has occurred that would constitute a violation or failure to comply with any operation, maintenance, and monitoring plan for this control.
- d. Access to the OU2 On-Site Groundwater Remedy will continue to be provided to DER to evaluate the remedy, including access to evaluate the continued maintenance of this control.



*Christopher D. Engler*

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Christopher Engler, P.E.  
Engineer of Record  
New York License # 069748

## 8 References

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# Tables

**Table 1A**  
**Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Date	WELL 1					WELL 3R					Air Stripper			
	Extracted Groundwater			VFD		Extracted Groundwater			VFD		Influent Water Flow			Ambient Influent Air Temperature (°F)
	Flow Rate <sup>(5)</sup> (gpm)	Totalizer (x1000) (gal)	Pressure (psig)	Frequency (Hz)	Amperage (Amps)	Flow Rate (gpm)	Totalizer (x1000) (gal)	Pressure (psig)	Frequency (Hz)	Amperage (Amps)	Flow Recorder Rate (gpm)	Flow Meter Rate (gpm)	Totalizer (x100) (gal)	
1/5/2021	757	507,568	43	45.38	82.3	707	NA <sup>(3)</sup>	30	42.68	77.0	1,481	1,465	16,304,931	40
1/25/2021	850	560,186	45	48.76	90.2	710	1,463,610	30	42.85	77.4	1,576	1,552	17,269,046	58
3/23/2021	851	591,658	46	48.6	89.7	725	1,842,054	30	41.38	73.8	1,516	1,501	17,829,324	56
4/20/2021	850.4	625,815	46	48.58	89.9	726	2,133,951	30	41.36	73.5	1,510	1,492	18,433,090	54
5/18/2021	855	648,700	45	48.47	89.6	726	2,326,568	30	41.45	73.6	1,531	1,522	18,832,738	71
6/8/2021	850	674,200	45	48.45	89.0	725	2,544,493	30	41.34	73.1	1,521	1,502	19,284,346	67
7/6/2021	855	692,896	50	48	89.0	725	2,726,572	30	41	73.0	1,502	1,508	19,636,936	74
8/27/2021	921	721,447	57	52.91	102.0	728	2,987,700	31	42.82	77.0	1,681	1,674	20,159,254	75
9/14/2021	925	746,707	56	52.96	102.0	728	3,176,015	30	42.65	77.0	1,681	1,662	20,591,920	67
10/12/2021	925	786,077	57	52.87	101.6	727	3,468,345	30	42.57	76.6	1,682	1,671	21,262,660	59
11/16/2021	821	830,910	46	49.09	91.0	825	3,867,546	30	45.28	84.0	1,672	1,653	22,089,922	38
12/21/2021	818	873,183	52	49.11	91.3	827	4,285,148	30	45.54	84.2	1,684	1,671	22,913,908	30

Notes and Abbreviations on last page

Table 1A  
 Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>  
 Tower 96 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Date	HEAT EXCHANGER		PROCESS BLOWER				CONDENSER		
	Air Inlet Pressure (iwc)	Steam Inlet Pressure (psig)	Air Inlet Vacuum (iwc)	Air Effluent Temperature (°F)	Air Effluent Pressure (iwc)	Calculated Differential Blower Pressure (iwc)	Condenser Cooling Water		
							Influent Temperature (°F)	Effluent Temperature (°F)	Temperature Differential (°F)
1/5/2021	5.6	14	5.2	88	1.6	3.6	56	79	23
2/25/2021	5.8	14	5.3	87	2.4	2.9	56	78	22
3/23/2021	5.4	14	5.4	80	1.9	3.5	56	79	23
4/20/2021	5.8	14	5.5	89	1.9	3.6	56	79	23
5/18/2021	5.8	14	5.3	88	2.0	3.3	56	78	22
6/8/2021	6.0	14	7.0	84	2.2	4.8	56	79	23
7/6/2021	4.2	15	8.0	88	3.8	4.2	56	86	30
8/27/2021	6.0	14	5.2	85	1.6	3.6	56	79	23
9/14/2021	5.5	14	5.2	80	1.4	3.8	56	79	23
10/12/2021	5.8	14	5.4	80	1.6	3.8	56	83	27
11/16/2021	5.7	14	5.3	82	1.6	3.7	56	79	23
12/21/2021	5.9	14	5.3	80	1.6	3.7	56	79	23

Notes and Abbreviations on last page

Table 1A  
 Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>  
 Tower 96 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Date	SEPARATOR		AIR COMPRESSOR	SUPPLEMENTAL AIR TREATMENT SYSTEM		WEST RECHARGE BASINS			
	Condensed Steam Water			Influent Blower	Total System Effluent	North		South	
	Separator Temperature (°F)	Separator Vent Temperature (°F)	Delivery Pressure (psig)	Pressure (iwc)	Pressure (iwc)	Basin Water Height (ft)	Status <sup>(4)</sup> (On/Off)	Basin Water Height (ft)	Status <sup>(4)</sup> (On/Off)
1/5/2021	90	95	120	-2.5	5	0.5	On	6.4	On
2/25/2021	89	96	80	-2.5	5	2	On	3	On
3/23/2021	88	98	95	-2.5	5	2.5	On	3.5	On
4/20/2021	90	96	135	-2.5	5	2.3	On	3.5	On
5/18/2021	90	96	150	-2.5	5	2	On	8.2	On
6/8/2021	88	96	125	-2.5	5	0.8	Off	5	On
7/6/2021	92	98	120	-2.5	5	2.1	On	4	On
8/27/2021	90	96	135	-2.5	5	2.5	On	4	On
9/14/2021	88	96	110	-2.5	5	3	On	4	On
10/12/2021	90	98	98	-2.5	5	3.5	On	5.8	On
11/16/2021	90	98	95	-2.5	6	4	On	8	On
12/21/2021	88	96	97	-3	5	3.5	On	4.6	On

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Table 1A  
 Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>  
 Tower 96 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Date	REGENERATIVE VAPOR PHASE TREATMENT UNITS								
	Adsorb			Desorb					
	Flow (cfm )	Pressure (iwc)	Temperature (°F)	Flow (scfm)	Desorb Bed (A/B)	Time into cycle (min)	Influent Steam Pressure (psig)	Effluent Steam Temperature (°F)	Effluent Temperature (°F)
1/5/2021	4,940	0.4	86	4,800	B	41	14	225	89
2/25/2021	4,710	0.3	85	4,584	A	38	14	229	88
3/23/2021	4,820	0.2	84	4,698	A	34	14	218	83
4/20/2021	5,020	0.2	85	4,884	B	44	14	218	86
5/18/2021	4,760	0.2	84	4,640	B	50	14	224	89
6/8/2021	4,870	0.3	86	4,731	B	36	14	229	90
7/6/2021	4,609	0.3	87	4,469	B	38	15	204	90
8/27/2021	5,020	0.2	NA	NA	A	30	14	235	85
9/14/2021	4,930	0.3	84	4,806	B	45	14	NA	88
10/12/2021	4,930	0.3	85	4,798	B	58	14	221	86
11/16/2021	5,030	0.3	85	4,895	B	40	14	219	86
12/21/2021	4,990	0.3	84	4,865	B	36	14	196	85

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**Table 1A**  
**Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

<sup>(1)</sup> Operational data collected weekly by Northrop Grumman and supplemented by monthly Arcadis measurements, as needed. For clarity, data shown is considered to be representative of monthly conditions collected during a single weekly Northrop Grumman site visit or monthly Arcadis visit.

<sup>(2)</sup> Instantaneous values from field-mounted instruments, except otherwise noted.

<sup>(3)</sup> Well 3R totalizer data not available due to Well 3R flow meter malfunction.

<sup>(4)</sup> Status indicates if the basin was accepting water (on) or not accepting water (off).

<sup>(5)</sup> Well 1 flow rates increased by approximately 100 gpm from August to October 2021, flow rates returned to routine rate by November 2021.

°F	degrees Fahrenheit
Amps	amperes
cfm	cubic feet per minute
ft	feet
gal	gallons
gpm	gallons per minute
Hz	hertz
iwc	inches of water column
min	minutes
psig	pounds per square inch, gauge
scfm	standard cubic feet per minute
NA	Not Available
NC	Not Calculated
NR	Not Recorded
RVPGAC	Regenerative Vapor Phase Granular Activated Carbon
SCADA	Supervisory Control and Data Acquisition
SPDES	State Pollutant Discharge Elimination System
VFD	Variable Frequency Drive

**Table 1B**  
**Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Date	WELL 17			WELL 18			WELL 19			VFD		
	Extracted Groundwater			VFD	Extracted Groundwater			VFD	Extracted Groundwater			
	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Pressure (psig)	Frequency (Hz)	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Pressure (psig)	Frequency (Hz)	Flow Meter Rate (gpm)		Totalizer (x1000) (gal)	Pressure (psig)
1/5/2021	1,002	3,018,780	54	50.9	822	2,170,440	58	46.1	511	835,913	50	43.2
2/16/2021	1,002	3,081,759	58	51.0	1,009	2,201,091	64	52.5	513	877,307	52	43.0
3/23/2021	998	3,131,446	55	51.6	1,010	2,249,602	64	52.4	513	902,080	54	43.0
4/13/2021	1,001	3,158,874	58	51.0	1,010	2,276,545	62	52.0	508	916,525	54	42.0
5/14/2021	1,002	3,203,201	55	50.9	809	2,312,202	59	46.7	512	939,312	55	42.0
6/25/2021	999	3,263,617	54	51.6	1,008	2,367,252	63	52.4	510	970,097	54	42.8
7/27/2021	1,002	3,309,468	54	51.5	996	2,412,429	63	52.3	515	993,637	53	42.8
8/27/2021	998	3,354,085	55	51.6	981	2,455,007	62	52.3	512	1,016,486	52	42.8
9/14/2021	1,001	3,379,988	55	51.4	994	2,480,418	62	52.2	511	1,029,726	52	42.8
10/12/2021	1,000	3,420,368	54	51.5	991	2,519,983	62	52.2	512	1,050,353	53	42.8
11/9/2021	1,001	3,460,535	54	51.4	1,008	2,553,549	60	52.2	514	1,070,945	51	42.5
12/7/2021	1,003	3,501,066	55	51.4	1,009	2,585,093	61	52.3	512	1,091,555	41	39.2

Notes and Abbreviations on last page

**Table 1B**  
**Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Date	AIR STRIPPER					HEAT EXCHANGER			
	Influent Water Flow				Ambient Influent Air Temperature (°F)	Air Inlet Temperature (°F)	Steam Inlet Pressure (psig)	Air Outlet Temperature (°F)	Calculated Differential Between Inlet Air and Outlet Air Temperatures (°F)
	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Influent Water Temperature (°F)	Influent Water Pressure (psig)					
1/5/2021	2,373	79,854,376	59	29	58	60	30	80	20
2/16/2021	2,589	81,120,682	59	30	48	60	26	81	21
3/23/2021	2,592	82,363,956	59	30	58	60	30	80	20
4/13/2021	2,521	83,072,267	59	30	50	60	30	81	21
5/14/2021	2,393	84,115,592	59	30	50	60	30	80	20
6/25/2021	2,597	85,593,657	59	30	62	60	16	80	20
7/27/2021	2,588	86,748,079	59	30	68	60	30	80	20
8/27/2021	2,575	87,852,804	59	30	75	60	30	80	20
9/14/2021	2,578	88,503,180	59	30	60	60	30	80	20
10/12/2021	2,574	88,515,192	59	30	59	60	20	80	20
11/9/2021	2,589	90,466,058	59	30	45	60	22	80	20
12/7/2021	1,639	91,400,697	NA	30	59	60	32	80	20

Notes and Abbreviations on last page

Table 1B  
 Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>  
 Tower 102 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Date	PROCESS BLOWER TO RVPGAC TREATMENT UNITS				CONDENSER				AIR COMPRESSOR
	Blower Influent Pressure  (iwc)	VIV Position  (% open)	Blower Effluent Pressure  (iwc)	Calculated Blower Static Pressure  (iwc)	Cooling Water			Condensed Steam Water	Delivery Pressure  (psig)
					Influent Temperature <sup>(3)</sup>  (°F)	Effluent Temperature  (°F)	Calculated Temperature Increase  (°F)	Decanter Vent Temperature  (°F)	
1/5/2021	8	70	22	14	59	86	27	80	99
2/16/2021	8.2	60	20	12	59	72	13	79	110
3/23/2021	8	70	22	14	59	87	28	80	102
4/13/2021	6.8	60	22	15	59	78	19	76	115
5/14/2021	7	90	23	16	60	90	30	84	105
6/25/2021	8	95	22	14	59	82	23	81	95
7/27/2021	8	95	22	14	59	87	28	80	90
8/27/2021	8	95	22	14	59	82	23	92	98
9/14/2021	8	95	22	14	60	83	23	79	104
10/12/2021	8	90	22	14	60	87	27	91	104
11/9/2021	8	95	22	14	59	87	28	82	92
12/7/2021	8	95	22	14	59	87	28	82	101

Notes and Abbreviations on last page

Table 1B  
 Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>  
 Tower 102 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Date	T102 VAPOR DISCHARGE		T102 WEIR		FORCE MAIN	REGENERATIVE VAPOR PHASE TREATMENT UNITS					
	Effluent Treated Vapor		Effluent Treated Groundwater			Desorb					
	Flow (cfm)	Temperature (°F)	Flow Meter Rate (gpm)	Totalizer (x1000) (gal)	Distribution System Pressure (psig)	Desorb Bed (A/B)	Time Into Cycle (min)	Influent Steam Pressure (psig)	Influent Steam Temperature (°F)	Desorb Bed Temperature (°F)	Effluent Steam Temperature (°F)
1/5/2021	7,880	90	2,448	818,393	61.1	A	98	3.3	240	185	201
2/16/2021	7,585	87	2,577	951,858 <sup>(6)</sup>	59.2	A	64	3.6	241	171	198
3/23/2021	7,980	88	2,528	1,066,213 <sup>(6)</sup>	63	A	73	3.4	243	178	201
4/13/2021	8,110	89	2,526	1,135,218	62	B	81	3.1	244	174	201
5/14/2021	7,070	84	2,284	1,223,819	63.9	B	66	3.5	240	178	201
6/25/2021	8,190	81	2,415	1,345,545	61.1	A	78	3.5	249	172	201
7/27/2021	7,690	86	1,048	1,423,693	72.4	B	105	3.6	237	171	201
8/27/2021	7,580	83	2,431	1,476,048	60	A	48	3.5	249	172	200
9/14/2021	8,040	82	2,434	1,538,825	50.5	B	32	3.5	253	165	201
10/12/2021	7,790	83	2,712	1,634,234	71	B	52	3.5	247	170	201
11/9/2021	8,040	83	NA <sup>(4)</sup>	1,658,436 <sup>(5)</sup>	68.4	B	45	3.1	240	170	201
12/7/2021	7,890	83	NA <sup>(4)</sup>	1,658,436 <sup>(5)</sup>	69.9	A	148	3.5	248	192	201

Notes and Abbreviations on last page

**Table 1B**  
**Summary of Weekly Monitoring Data for 2021<sup>(1,2)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

<sup>(1)</sup> Operational data collected weekly by Northrop Grumman and supplemented by monthly Arcadis measurements, as needed. For clarity, data shown is considered to be representative of monthly conditions collected during a single weekly Northrop Grumman site visit or monthly Arcadis visit.

<sup>(2)</sup> Instantaneous values from field-mounted instruments, except otherwise noted.

<sup>(3)</sup> Measurement collected with infrared temperature gun.

<sup>(4)</sup> Data not available due to wier flow meter malfunction.

<sup>(5)</sup> Weir totalizer began malfunctioning the week of 11/2/2021. The reading remained at 658,436 kgal until the week of 12/14/2021.

<sup>(6)</sup> The totalizer's maximum display value of 1,000,000 kgal was exceeded in March 2021 causing the totalizer reading to reset. 1,000,000 kgal was therefore added to the totalizer values displayed after March 2021.

°F	degrees Fahrenheit
ft	feet
gal	gallons
gpm	gallons per minute
Hz	hertz
iwc	inches of water column
min	minutes
psig	pounds per square inch, gauge
scfm	standard cubic feet per minute
NA	Not Available
NC	Not Calculated
NR	Not Recorded
RVPGAC	Regenerative Vapor Phase Granular Activated Carbon
SCADA	Supervisory Control and Data Acquisition
SPDES	State Pollutant Discharge Elimination System
T102	Tower 102
VFD	Variable Frequency Drive
VIV	Variable Influent Vane

**Table 2**  
**Summary of Non-Routine Maintenance for 2021**  
**Tower 96 and Tower 102 Treatment Systems**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

Date Completed	Maintenance Item <sup>(1)</sup>	Description/Comments
1/2021 - 2/2021	Well 18 Inspection	A well inspection was completed concurrently with the replacement of the well pump motor, cable and VFD summarized below.
01/18/21	Well 18 VFD	VFD replaced with re-built unit.
01/26/21	Well 18 Submersible Pump Motor, Cable, and Piping	Pump motor replaced, new pump cable installed, and 20 feet of drop pipe added to lower the Well 18 submersible pump elevation within the well.
2/19/21 - 2/20/2021	Tower 102 Hydrovane and Alarm Notification System	Resolved issue with hydrovane and alarm notification system.
2/18/21 - 2/24/2021	Tower 96 Exterior Blower Bearing	Replaced exterior blower inner bearing.
03/03/21	Tower 96 Supplemental GAC	Change-out of GAC within supplemental GAC beds.
03/24/21	Tower 96 Blower Bearing	Installed smart sensors (temperature and vibration) on the blower bearings.
03/24/21	Tower 102 Blower Bearing	Installed Smart Sensors (temperature and vibration) on the blower bearings.
04/21/21	Tower 102 RVPGAC Influent Steam Valves	Replaced RVPGAC influent steam valves.
4/22/21 - 4/23/2021	Well 18 VFD	VFD repaired.
4/28/21 - 4/30/2021	Tower 96 Exterior Blower Bearing	Replaced exterior blower bearings with high RPM bearings.
05/05/21	Tower 96 Exterior Blower Drive Shaft	Installed new drive shaft.
05/05/21	Tower 96 Exterior Blower Compressor Wheel	Installed new compressor wheel.
05/05/21	Tower 96 Exterior Blower Bearing	Factory original OEM bearings installed.
05/27/21	Well 18 VFD	New VFD installed.
05/31/21	Tower 102 Air Compressor Airline	Airline broke off from the solenoid and was repaired.
06/04/21	Tower 96 Exterior Blower Electrical Conduit	Repaired damaged electrical conduit.
06/11/21	Tower 96 Exterior Blower Heaters	Replaced heaters on all 3 power legs.
06/11/21	Tower 96 Calpine Voltage	Requested Calpine adjust voltage to reduce blower starter panel tripping.
06/17/21	Tower 96 Exterior Blower Starter Coil	Replaced blower starter coil.
06/21/21	Tower 96 Exterior Blower Starter	Replaced blower starter.
06/21/21	Tower 96 Exterior Blower Starter Coil	Replaced starter coil in starter panel due to blower overheating.
06/26/21	Tower 102 Air Compressor Airline	Repaired broken airline.
06/28/21	Tower 96 System Air Pressure Switch	Replaced system air pressure switch with spare on-hand. Adjusted blower inner bearing vibration sensor.
06/28/21	Well 1 VFD	Repairs made to VFD.
7/12/21 - 7/21/2021	Tower 96 Exterior Blower Shaft	Exterior blower inner bearing failure and shaft damaged. New bearing installed.
07/29/21	Tower 96 Exterior Blower	Temporary blower set-up installed at the stripper tower using "original" configuration.
8/24/2021 - 8/25/21	Tower 96 Exterior Blower	Exterior blower repaired and temporary blower set-up removed. Blower shaft and bearing replaced. Blower wheel was also balanced.
08/25/21	Tower 96 Influent Air Flex Tubing	Replaced influent air sampling port line with flex tubing to facilitate sampling events.
08/25/21	Well 18 Stilling Tube	Removed obstruction in Well 18 stilling tube.
10/13/21	Tower 96 Supplemental GAC	Change-out of GAC within supplemental GAC beds.
10/20/21	Tower 102 Wet Well	Treatment building wet well maintenance.
10/30/21	Well 18 VFD	Replaced the wiring connecting the VFD to Well 18 wellhead.
12/17/21	Well 18 VFD	VFD and Phase Sensing Relays replaced.

Notes and Abbreviations on last page

**Table 2**  
**Summary of Non-Routine Maintenance for 2021**  
**Tower 96 and Tower 102 Treatment Systems**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

**Notes and Abbreviations:**

<sup>(1)</sup> Maintenance items were completed, as necessary, based on observations of the treatment system during the routine daily and weekly site visits and does not necessarily include all downtime associated with each maintenance item.

RVPGAC	Regenerative Vapor Phase Granular Activated Carbon
SCADA	Supervisory Control and Data Acquisition
T96	Tower 96 Treatment System
T102	Tower 102 Treatment System
VFD	Variable Frequency Drive
ONCT	On-Site Containment System
NG	Northrop Grumman Systems Corporation
RVPGAC	Regenerative Vapor Phase Granular Activated Carbon

Table 3  
Operational Summary for the Treatment System  
Fourth Quarter and Annual 2021<sup>(1)</sup> Reporting Period  
Operable Unit 2  
Northrop Grumman  
Bethpage, New York



	Fourth Quarter Flow Rates (gpm)		Quarterly Flow Volumes (MG)			Annual Flow Volumes (MG)			Fourth Quarter VOC Concentrations (µg/L)	
	Current Model Design <sup>(2)</sup>	Current Operational Flow <sup>(3,4)</sup>	Design <sup>(2)</sup>	Actual <sup>(3,4)</sup>	% of Design	Design <sup>(2)</sup>	Actual <sup>(3,4)</sup>	% of Design	TCE <sup>(5)</sup>	TVOC <sup>(5,6)</sup>
<b>Influent Groundwater<sup>(7)</sup></b>										
Well 1	800	832	106	110	104%	420.5	386.1	92%	603	633
Well 3R	700	787	93	104	112%	367.9	323.8	88%	174	245
Well 17	1,000	1,010	132	133	101%	525.6	525.8	100%	148	175
Well 18	800	1,010	106	112	106%	420.5	452.5	108%	35.6	63.5
Well 19	500	510	66	67	102%	262.8	273.6	104%	94.8	120.6
<b>Total <sup>(8)</sup></b>	<b>3,800</b>	<b>4,149</b>	<b>503</b>	<b>526</b>	<b>105%</b>	<b>1,997</b>	<b>1,962</b>	<b>98%</b>	<b>--</b>	<b>--</b>
<b>Effluent Groundwater <sup>(9)</sup></b>										
Calpine	100 - 400	137	--	18	--	--	149.3	--	--	--
OXY Biosparge <sup>(10)</sup>	2 - 42	0	--	0	--	--	0.0	--	--	--
West Recharge Basins	1,112 - 1,455	1,357	--	180	--	--	528.3	--	--	ND
South Recharge Basins <sup>(10)</sup>	2,231	2,477	296	328	111%	1,172.6	1,284.2	110%	--	0.98
<b>Total <sup>(11)</sup></b>	<b>--</b>	<b>3,971</b>	<b>--</b>	<b>526</b>	<b>--</b>	<b>--</b>	<b>1,962</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Additional Flow to South Recharge Basins</b>										
Storm Water Runoff Contributing to South Recharge Basins Flow Volume <sup>(11)</sup>	--	--	--	12	--	--	85.3	--	--	--
<b>Total Flow Volume to South Recharge Basins <sup>(10,11,12)</sup></b>	<b>--</b>	<b>--</b>	<b>296</b>	<b>340</b>	<b>115%</b>	<b>1,172.6</b>	<b>1,369.5</b>	<b>117%</b>	<b>--</b>	<b>--</b>
<b>Treatment Efficiencies <sup>(13)</sup></b>										
Tower 96 System:	>99.9%									
Tower 102 System:	>99.9%									

Notes and Abbreviations on last page

Table 3  
Operational Summary for the Treatment System  
Fourth Quarter and Annual 2021<sup>(1)</sup> Reporting Period  
Operable Unit 2  
Northrop Grumman  
Bethpage, New York

	VOC Mass Removed (lbs)				Fourth Quarter Remedial Well Uptime (%)	Annual Remedial Well Uptime (%)
	Fourth Quarter	Annual	Percent of Annual Mass Removal	Cumulative		
<b>Influent Groundwater<sup>(7)</sup></b>						
Well 1	582	2,307	54%	54,330	99.5%	88%
Well 3R	213	690	16%	93,752	99.5%	88%
Well 17	195	737	17%	55,505	99.7%	99%
Well 18	59	240	6%	7,278	83.7%	88%
Well 19	68	311	7%	9,507	99.7%	98%
<b>Total<sup>(8)</sup></b>	<b>1,117</b>	<b>4,285</b>	<b>100%</b>	<b>220,372</b>		
<b>Effluent Groundwater<sup>(9)</sup></b>						
Calpine	--	--		--	--	--
OXY Biosparge <sup>(10)</sup>	--	--		--	--	--
West Recharge Basins	--	--		--	--	--
South Recharge Basins <sup>(10)</sup>	--	--		--	--	--
<b>Total<sup>(11)</sup></b>						
<b>Additional Flow to South Recharge Basins</b>						
Storm Water Runoff Contributing to South Recharge Basins Flow Volume <sup>(11)</sup>	--	--		--	--	--
<b>Total Flow Volume to South Recharge Basins<sup>(10,11,12)</sup></b>						
<b>Treatment Efficiencies<sup>(13)</sup></b>						
Tower 96 System:						
Tower 102 System:						

Notes and Abbreviations on last page

Table 3  
 Operational Summary for the Treatment System  
 Fourth Quarter 2021<sup>(1)</sup> Reporting Period  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York

**Notes and Abbreviations:**

- <sup>(1)</sup> Quarterly reporting period: October 01, 2021 through December 31, 2021. Annual reporting period: January 1, 2021 through December 31, 2021.
- <sup>(2)</sup> "Current Model Design" flow rates were determined for the five remedial wells and for the South Recharge Basin based on computer modeling (ARCADIS G&M, Inc. 2002, updated in 2021). Flow rates for Calpine Power Plant (Calpine), Occidental Chemical (OXY) Biosparge, and West Recharge Basin flow rates are typical flow rates and are provided for reader information. "Design" flow volumes represent the volume of water that is expected to be pumped/discharged during the reporting period and is calculated by multiplying the design rate by the reporting period duration.
- <sup>(3)</sup> Actual flow rates for the remedial wells represent the average actual pumping rates when the pumps are operational and do not take into account the time that a well is not operational. Actual monthly flow volumes are calculated from instantaneous flow rates transmitted to SCADA from local flow meters. The actual monthly flow volumes for quarterly and annual reporting are subsequently taken from monthly SPDES reports.
- <sup>(4)</sup> "Actual" flow rates for the system discharges represent the average flow rate during the reporting period and are determined by dividing the total flow recorded during the reporting period by the reporting period duration.
- <sup>(5)</sup> The TCE and TVOC concentrations are from the quarterly sampling events performed during this reporting period on November 11, 2021.
- <sup>(6)</sup> The TVOC concentration for the two sets of recharge basins are their respective average monthly Outfall SPDES concentrations for the current quarter.
- <sup>(7)</sup> Well 18 of the Tower 102 System shut down multiple times this reporting period due to variable frequency drive (VFD) wiring and electrical feed issues and associated evaluations, coordination with PSEG, and repairs. As such, Well 18 was shut down as follows during this reporting period: approximately 5 days in October, approximately 7 days in November, and approximately 15 days in December.
- <sup>(8)</sup> Total pumpage/recharge rates are accurate to ±15% based on available information and expected or typical precision/accuracy factors for the gauges and meters.
- <sup>(9)</sup> There are four possible discharges for the effluent groundwater: South Recharge Basins, West Recharge Basins, Calpine, and the OXY Biosparge system. Treated water is continuously discharged to the south and west recharge basins during routine operation, and is available "on-demand" to both Calpine for use as make-up water, and the OXY Biosparge remediation system. For this quarter, the quarterly flow rates to the south and west recharge basins (SRB and WRB, respectively) were calculated using the remedial well flow rates and available additional information and assumptions provided by Northrop Grumman regarding flow distribution, as follows: the Tower 96 system (Remdial Wells 1 and 3R) discharges effluent water to the WRB, less Calpine usage and less 119 gpm of Tower 102 steam condenser usage (15.8 MG); the Tower 102 system (Remedial Wells 17 through 19), including the Tower 102 steam condenser usage (15.8 MG), discharges effluent water to the SRB.
- <sup>(10)</sup> Oxy has not reported any water usage for the OXY Biosparge system since May 2016.
- <sup>(11)</sup> Storm water runoff volume is calculated by multiplying the adjusted tributary area and NOAA precipitation data for the reporting periods. The tributary area is adjusted by the runoff coefficient to exclude the infiltration volume from the total rainfall volume. The tributary area, runoff coefficient, and adjusted tributary area are from Dvirka and Bartilucci Consulting Engineers' Storm Water Permit Evaluation Report (January, 28, 2010). The NOAA precipitation data are calculated as a sum of NOAA daily precipitation data for the reporting period. NOAA precipitation data are retrieved from Station GHCND:USW00054787 - FARMINGDALE REPUBLIC AIRPORT, NY US for October, November, and December 2021.
- <sup>(12)</sup> Total Flow Volume to South Recharge Basins is estimated as a sum of flow volumes contributed by the treated effluent discharge to South Recharge Basins and from storm water runoff to South Recharge Basins. Fourth Quarter 2021 calculated South Recharge Basin flow volumes is within historical operating volumes.
- <sup>(13)</sup> Treatment System Efficiencies are calculated by dividing the difference between the remedial well flow weighted influent and effluent TVOC concentrations by the remedial well flow weighted influent concentration.

--	Not Applicable
µg/L	micrograms per liter
gpm	gallons per minute
lbs	pounds
MG	million gallons
NOAA	National Oceanic and Atmospheric Administration
SCADA	Supervisory Controls and Data Acquisition
SPDES	State Pollution Discharge Elimination System
TCE	trichloroethene
TVOC	total volatile organic compounds
VOC	volatile organic compounds

**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
**Treatment System Effluent**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 1	WELL 1	WELL 1	WELL 1
	Sample ID:	WELL 1	WELL 1	WELL 1	WELL 1
	Sample Date:	3/16/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	<b>0.24 J</b>	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	<b>0.76 J</b>	<b>0.82 J</b>	<b>1.1</b>	<b>0.91 J</b>
1,1-Dichloroethene	5	<b>1.5</b>	<b>2.2</b>	<b>2.3</b>	<b>2.6</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	<b>3.7</b>	<b>4.1</b>	<b>3.7</b>	<b>3.8</b>
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	<b>0.48 J</b>	<b>0.44 J</b>	<b>0.64</b>	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>5.9</b>	<b>5.8</b>	<b>7.1</b>	<b>6.4</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>17.5</b>	<b>15.5</b>	<b>18.2</b>	<b>14.7</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>578</b>	<b>698</b>	<b>833</b>	<b>603</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>3.4</b>	<b>2.8</b>	<b>3.8</b>	<b>2.0</b>
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>611</b>	<b>730</b>	<b>870</b>	<b>633</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>6.8</b>	<b>7.2</b>	<b>7.5</b>	<b>8.8</b>

Notes and Abbreviations on last page

**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
**Treatment System Effluent**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 3R	WELL 3R	WELL 3R	WELL 3R
	Sample ID:	WELL 3R	WELL 3R	WELL 3R	WELL 3R
	Sample Date:	3/16/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	<b>0.53</b>	<b>0.43 J</b>	<b>0.65</b>	<b>0.72</b>
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	<b>1.3</b>	<b>1.4</b>	<b>2.0</b>	<b>2.0</b>
1,1-Dichloroethene	5	<b>4.0</b>	<b>3.8</b>	<b>5.2</b>	<b>5.7</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	<b>0.32 J</b>	<b>0.44 J</b>	<b>0.57</b>
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>3.3</b>	<b>3.4</b>	<b>4.3</b>	<b>4.7</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>36.6</b>	<b>34.8</b>	<b>49.5</b>	<b>50.1</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>199</b>	<b>176</b>	<b>187</b>	<b>174</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>2.0</b>	<b>1.7</b>	<b>2.5</b>	<b>3.0</b>
Vinyl Chloride	2	<b>1.6</b>	<b>2.2</b>	<b>2.3</b>	<b>4.4</b>
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>248</b>	<b>224</b>	<b>254</b>	<b>245</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>11</b>	<b>8.9</b>	<b>12</b>	<b>7.2</b>

Notes and Abbreviations on last page

**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
**Treatment System Effluent**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	96 EFFLUENT	96 EFFLUENT	96 EFFLUENT	96 EFFLUENT
	Sample ID:	96 EFFLUENT	96 EFFLUENT	96 EFFLUENT	96 EFFLUENT
	Sample Date:	3/16/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	< 0.50	< 0.50	<b>0.63</b>	< 0.50
Trichlorotrifluoroethane (Freon 113)	5	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>ND</b>	<b>ND</b>	<b>0.63</b>	<b>ND</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	<b>NS</b>	<b>8.7</b>	<b>6.7</b>	<b>8</b>	<b>7.8</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
**Treatment System Effluent**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 17	WELL 17	WELL 17	WELL 17
	Sample ID:	WELL 17	WELL 17	WELL 17	WELL 17
	Sample Date:	2/24/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	<b>0.61 J</b>	<b>0.59 J</b>	<b>0.85 J</b>	<b>0.79 J</b>
1,1-Dichloroethene	5	<b>1.3</b>	<b>1.2</b>	<b>1.6</b>	<b>1.6</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	<b>0.69 J</b>	<b>0.90 J</b>	<b>1.1</b>	<b>1.0</b>
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>2.3</b>	<b>2.5</b>	<b>3.1</b>	<b>2.9</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>14.4</b>	<b>14.6</b>	<b>19.6</b>	<b>17.8</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>130</b>	<b>143</b>	<b>168</b>	<b>148</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>1.9</b>	<b>1.9</b>	<b>2.7</b>	<b>2.6</b>
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>151</b>	<b>165</b>	<b>197</b>	<b>175</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>6.9</b>	<b>4.2</b>	<b>8.4</b>	<b>10</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
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**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 18	WELL 18	WELL 18	WELL 18
	Sample ID:	WELL 18	WELL 18	WELL 18	WELL 18
	Sample Date:	2/24/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	<b>0.29 J</b>	<b>0.35 J</b>	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	<b>1.2</b>	<b>1.4</b>	<b>1.9</b>	<b>1.7</b>
1,1-Dichloroethene	5	<b>2.8</b>	<b>2.4</b>	<b>3.8</b>	<b>3.3</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>2.6</b>	<b>2.7</b>	<b>3.4</b>	<b>3.4</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>15.2</b>	<b>16.6</b>	<b>20.5</b>	<b>18.3</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>31.8</b>	<b>33.0</b>	<b>39.7</b>	<b>35.6</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>0.86</b>	<b>1.1</b>	<b>1.2</b>	<b>1.2</b>
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>54.5</b>	<b>57.5</b>	<b>70.9</b>	<b>63.5</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>4.8</b>	<b>4.8</b>	<b>4.8</b>	<b>4.5</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
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**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 19	WELL 19	WELL 19	WELL 19
	Sample ID:	WELL 19	WELL 19	WELL 19	WELL 19
	Sample Date:	2/24/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	<b>0.69 J</b>	<b>0.76 J</b>
1,1-Dichloroethene	5	<b>0.93</b>	<b>1.2</b>	<b>1.6</b>	<b>1.5</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	<b>0.38 J</b>	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>11.3</b>	<b>12.0</b>	<b>15.4</b>	<b>15.2</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>5.6</b>	<b>6.0</b>	<b>7.7</b>	<b>7.0</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>84.4</b>	<b>84.9</b>	<b>97.9</b>	<b>94.8</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>0.68</b>	<b>0.88</b>	<b>1.2</b>	<b>1.3</b>
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>102.9</b>	<b>105.0</b>	<b>124.9</b>	<b>120.6</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>4.2</b>	<b>3.7</b>	<b>3.8</b>	<b>3.8</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
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**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	WELL 19	WELL 19	WELL 19	WELL 19
	Sample ID:	REP-022421-JS-1	REP-051321-TG-1	REP-081821-TG-1	REP-111121-TG-1
	Sample Date:	2/24/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	<b>0.68 J</b>	<b>0.60 J</b>
1,1-Dichloroethene	5	<b>1.2</b>	<b>1.3</b>	<b>1.6</b>	<b>1.4</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	<b>0.35 J</b>	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	<b>11.7</b>	<b>11.7</b>	<b>14.8</b>	<b>13.0</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	<b>5.4</b>	<b>6.3</b>	<b>7.5</b>	<b>6.4</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	<b>84.6</b>	<b>86.3</b>	<b>96.5</b>	<b>82.7</b>
Trichlorotrifluoroethane (Freon 113)	5	<b>0.72</b>	<b>0.89</b>	<b>1.3</b>	<b>0.98</b>
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>103.6</b>	<b>106.5</b>	<b>122.7</b>	<b>105.1</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	NS	<b>4.4</b>	<b>4.0</b>	<b>3.1</b>	<b>3.0</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
**1,4-Dioxane in 2021 Remedial Well Influent and**  
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**Northrop Grumman**  
**Bethpage, New York**



Constituents <sup>(1)</sup> (units in µg/L)	Location ID:	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT
	Sample ID:	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT	102 EFFLUENT
	Sample Date:	2/24/2021	5/13/2021	8/18/2021	11/11/2021
<b><u>Volatile Organic Compounds (VOCs)<sup>(2)</sup></u></b>	NYSDEC SCGs <sup>(3)</sup>				
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
2-Hexanone (MBK)	50	< 5.0	< 5.0	< 5.0	< 5.0
4-methyl-2-pentanone (MIK)	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dibromochloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Methylene Chloride	5	< 0.50	< 0.50	< 0.50	< 0.50
Styrene	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethylene	5	< 0.50	< 0.50	< 0.50	< 0.50
Trichlorotrifluoroethane (Freon 113)	5	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl Chloride	2	< 0.50	< 0.50	< 0.50	< 0.50
Xylene-o	5	< 1.0	< 1.0	< 1.0	< 1.0
Xylene-m,p	5	< 1.0	< 1.0	< 1.0	< 1.0
<b>Total VOCs<sup>(4)</sup></b>		<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>
<b>1,4-Dioxane<sup>(2)</sup></b>	<b>NS</b>	<b>5.6</b>	<b>5.6</b>	<b>4.6</b>	<b>4.8</b>

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**Table 4**  
**Summary of Volatile Organic Compounds and**  
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**Notes and Abbreviations:**

- <sup>(1)</sup> Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016c).
- <sup>(2)</sup> VOC samples analyzed using USEPA Method 8260C. 1,4-Dioxane samples analyzed using USEPA Method 8270D-SIM-CLLE.
- <sup>(3)</sup> Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs (NYSDEC 1998); most stringent values are listed.
- <sup>(4)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least numerical precision (decimal place), including whole numbers with no decimal place.

<span style="border: 1px solid black; display: inline-block; width: 1em; height: 1em; vertical-align: middle;"></span>	Compound detected in exceedance of NYSDEC SCG Criteria
<b>1.5</b>	Bold value indicates a detection
< 0.50	Compound is not detected above its laboratory quantification limit
µg/L	micrograms per liter
CLLE	Continuous Liquid-Liquid Extraction
J	Constituent value is estimated
ND	Not detected
NS	None Specified
NYSDEC	New York State Department of Conservation
OU2	Operable Unit 2
REP	blind replicate sample
TOGs	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

**Table 5A**  
**Influent, Mid-Effluent, and Effluent Air Concentrations for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Location ID: Sample ID:	96 INFLUENT T96 INFLUENT (AA)			
Constituents (Units in µg/m <sup>3</sup> )	3/16/2021	5/13/2021	8/31/2021	11/11/2021
<b>Volatile Organic Compounds (VOCs)<sup>(1)</sup></b>				
1,1,1-Trichloroethane	10	3.6	< 22	9.3
1,1,2,2-Tetrachloroethane	< 0.55	< 0.69	< 27	< 0.55
1,1,2-Trichloroethane	1.8	0.60	< 22	1.4
1,1-Dichloroethane	26	10	40	30
1,1-Dichloroethene	74.1	27	122	79.3
1,2-Dichloroethane	1.7	0.69 J	< 32	1.2
1,2-Dichloropropane	61.9	21	67.5	< 0.74
Benzene	128	0.45 J	< 26	1.8
Bromodichloromethane	< 0.54	< 0.67	< 27	< 0.54
Bromoform	< 0.33	< 0.41	< 17	< 0.33
Bromomethane	< 0.62	< 0.78	< 31	< 0.62
Carbon Disulfide	< 0.50	< 0.62	< 25	< 0.50
Carbon Tetrachloride	2.5	1.3	< 10	1.9
Chlorobenzene	0.97	< 0.92	< 37	0.55 J
Chloroethane	2.1	0.82	< 21	2.6
Chloroform	11	4.5	< 39	10
Chloromethane	0.99	1.2	< 17	1.0
cis-1,2-Dichloroethene	115	41.6	180	123
cis-1,3-Dichloropropene	< 0.73	< 0.91	< 36	< 0.73
Dibromochloromethane	< 0.68	< 0.85	< 34	< 0.68
Ethylbenzene	0.48 J	< 0.87	< 35	< 0.69
Methylene Chloride	0.59	19	< 28	2.5
Styrene	0.43 J	< 0.85	< 34	< 0.68
Tetrachloroethene	705	656	1,240	692
Toluene	2.9	0.49 J	< 30	0.72
trans-1,2-Dichloroethene	1.4	0.52 J	< 32	1.5
trans-1,3-Dichloropropene	< 0.73	< 0.91	< 36	< 0.73
Trichloroethylene	13,500	11,600	18,100	10,000
Trichlorotrifluoroethane (Freon 113)	64	22	107	62
Vinyl Chloride	20	8.4	29.1	32.2
Xylene-o	< 0.69	< 0.87	< 35	< 0.69
Xylene-m,p	0.52 J	< 0.87	< 35	< 0.69
<b>Total VOCs <sup>(2)</sup></b>	<b>14,731</b>	<b>12,419</b>	<b>19,886</b>	<b>11,053</b>

Notes and Abbreviations on last page

**Table 5A**  
**Influent, Mid-Effluent, and Effluent Air Concentrations for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents (Units in $\mu\text{g}/\text{m}^3$ )	Location ID: Sample ID: 3/16/2021	96 MID-EFFLUENT T96 MIDTRAIN (AA) 5/13/2021	96 MID-EFFLUENT T96 MIDTRAIN (AA) 8/31/2021 <sup>(3)</sup>	96 MID-EFFLUENT T96 MIDTRAIN (AA) 11/11/2021
<b>Volatile Organic Compounds (VOCs)<sup>(1)</sup></b>				
1,1,1-Trichloroethane	5.2	1.2	< 22	8.2
1,1,2,2-Tetrachloroethane	< 0.55	< 0.69	< 27	< 0.55
1,1,2-Trichloroethane	< 0.44	< 0.55	< 22	1.4
1,1-Dichloroethane	16	3.6	37	29
1,1-Dichloroethene	50.0	9.5	111	76.1
1,2-Dichloroethane	0.85	< 0.81	< 32	1.3
1,2-Dichloropropane	20	6.0	57.3	< 0.74
Benzene	22	< 0.64	< 26	1.9
Bromodichloromethane	< 0.54	< 0.67	< 27	< 0.54
Bromoform	< 0.33	< 0.41	< 17	< 0.33
Bromomethane	< 0.62	< 0.78	< 31	< 0.62
Carbon Disulfide	< 0.50	< 0.62	< 25	< 0.50
Carbon Tetrachloride	1.3	0.75	< 10	1.7
Chlorobenzene	< 0.74	< 0.92	< 37	0.43 J
Chloroethane	1.6	< 0.53	< 21	2.6
Chloroform	6.3	1.5	< 39	9.8
Chloromethane	1.2	1.4	< 17	1.2
cis-1,2-Dichloroethene	69.4	14	173	114
cis-1,3-Dichloropropene	< 0.73	< 0.91	< 36	< 0.73
Dibromochloromethane	< 0.68	< 0.85	< 34	< 0.68
Ethylbenzene	< 0.69	< 0.87	< 35	< 0.69
Methylene Chloride	0.59	1.1	< 28	2.3
Styrene	< 0.68	< 0.85	< 34	< 0.68
Tetrachloroethene	203	68.5	895	536
Toluene	0.79	0.49 J	< 30	0.94
trans-1,2-Dichloroethene	0.87	< 0.79	< 32	1.6
trans-1,3-Dichloropropene	< 0.73	< 0.91	< 36	< 0.73
Trichloroethylene	5,320	1,430	14,800	8,650
Trichlorotrifluoroethane (Freon 113)	35	8.4	104	67
Vinyl Chloride	16	2.8	28.4	32.0
Xylene-o	< 0.69	< 0.87	< 35	< 0.69
Xylene-m,p	0.33 J	0.42 J	< 35	0.56 J
<b>Total VOCs<sup>(2)</sup></b>	<b>5,770</b>	<b>1,550</b>	<b>16,206</b>	<b>9,538</b>

Notes and Abbreviations on last page

**Table 5A**  
**Influent, Mid-Effluent, and Effluent Air Concentrations for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Location ID: Sample ID:	96 EFFLUENT T96 EFFLUENT (AA)			
Constituents (Units in $\mu\text{g}/\text{m}^3$ )	3/16/2021	5/13/2021	8/31/2021 <sup>(3)</sup>	11/11/2021
<b>Volatile Organic Compounds (VOCs)<sup>(1)</sup></b>				
1,1,1-Trichloroethane	< 0.44	4.1	< 6.5	< 0.44
1,1,2,2-Tetrachloroethane	< 0.55	< 0.69	< 8.2	< 0.55
1,1,2-Trichloroethane	< 0.44	< 0.55	< 6.5	< 0.44
1,1-Dichloroethane	< 0.65	45.7	12	0.53 J
1,1-Dichloroethene	0.34	99.1	95.9	8.3
1,2-Dichloroethane	< 0.65	1.3	< 9.7	< 0.65
1,2-Dichloropropane	< 0.74	0.97	23	< 0.74
Benzene	5.1	0.31 J	1.9 J	0.35 J
Bromodichloromethane	< 0.54	< 0.67	< 8.0	< 0.54
Bromoform	< 0.33	< 0.41	< 5.1	< 0.33
Bromomethane	< 0.62	< 0.78	< 9.3	< 0.62
Carbon Disulfide	0.24 J	< 0.62	< 7.5	< 0.50
Carbon Tetrachloride	< 0.20	0.82	< 3.1	< 0.20
Chlorobenzene	< 0.74	< 0.92	< 11	< 0.74
Chloroethane	1.4	2.0	2.5 J	4.2
Chloroform	< 0.78	16	3.0 J	< 0.78
Chloromethane	1.6	1.8	1.7 J	1.4
cis-1,2-Dichloroethene	3.3	148	36	0.99
cis-1,3-Dichloropropene	< 0.73	< 0.91	< 11	< 0.73
Dibromochloromethane	< 0.68	< 0.85	< 10	< 0.68
Ethylbenzene	1.3	< 0.87	< 10	< 0.69
Methylene Chloride	9.7	4.5	19	1.5
Styrene	< 0.68	< 0.85	< 10	< 0.68
Tetrachloroethene	8.1	2.5	3.1 J	2.0
Toluene	11	61.0	362	89.7
trans-1,2-Dichloroethene	< 0.63	2.0	< 9.5	< 0.63
trans-1,3-Dichloropropene	< 0.73	< 0.91	< 11	< 0.73
Trichloroethylene	34	514	5,250	80.6
Trichlorotrifluoroethane (Freon 113)	< 0.61	77.4	14	< 0.61
Vinyl Chloride	11	18	28.6	49.1
Xylene-o	0.83	< 0.87	< 10	< 0.69
Xylene-m,p	3.2	< 0.87	< 10	< 0.69
<b>Total VOCs<sup>(2)</sup></b>	<b>91</b>	<b>1,000</b>	<b>5,853</b>	<b>239</b>

Notes and Abbreviations on last page

**Table 5A**  
**Influent, Mid-Effluent, and Effluent Air Concentrations for 2021<sup>(1,2)</sup>**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

- <sup>(1)</sup> Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.
- <sup>(2)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least numerical precision (decimal place), including whole numbers with no decimal place.
- <sup>(3)</sup> The elevated T96 mid-train and effluent vapor-phase contaminant concentrations are potentially related to malfunctioning steam actuator valves operated during the regenerative vapor-phase granular activated carbon (RVPGAC) process. Impacted air stream may have commingled with treated vapor-phase effluent. It should be noted that there were no SGC or AGC air emission exceedances associated with these sample events, and the malfunctioning steam actuator valves were repaired. Subsequently the GAC was changed-out in the supplemental carbon beds in October 2021 and steam actuator valves were replaced with new model valves in January 2022.

<b>24</b>	Bold value indicates a detection
J	Compound detected below its reporting limit; value is estimated
µg/m <sup>3</sup>	Micrograms per cubic meter
ELAP	Environmental Laboratory Approval Program
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

**Table 5B**  
**Influent and Effluent Air Concentrations for 2021<sup>(1)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents (Units in $\mu\text{g}/\text{m}^3$ )	Location ID: Sample ID: 102 INFLUENT T102 INFLUENT (AA) 2/24/2021	102 INFLUENT T102 INFLUENT (AA) 5/13/2021	102 INFLUENT T102 INFLUENT (AA) 8/18/2021	102 INFLUENT T102 INFLUENT (AA) 11/11/2021
<b><u>Volatiles Organic Compounds (VOCs)<sup>(1)</sup></u></b>				
1,1,1-Trichloroethane	6.5 J	< 11	< 11	6.0
1,1,2,2-Tetrachloroethane	< 14	< 14	< 14	< 0.55
1,1,2-Trichloroethane	< 11	< 11	< 11	1.3
1,1-Dichloroethane	28	24	29	30
1,1-Dichloroethene	52.7	44.4	50.7	51.9
1,2-Dichloroethane	< 16	< 16	< 16	1.8
1,2-Dichloropropane	11 J	11 J	11 J	< 0.74
Benzene	< 13	< 13	< 13	0.61
Bromodichloromethane	< 13	< 13	< 13	< 0.54
Bromoform	< 8.3	< 8.3	< 8.3	< 0.33
Bromomethane	< 16	< 16	< 16	< 0.62
Carbon Disulfide	< 12	< 12	< 12	< 0.50
Carbon Tetrachloride	< 5.0	< 5.0	5.2	3.3
Chlorobenzene	< 18	< 18	< 18	< 0.74
Chloroethane	< 11	< 11	< 11	< 0.42
Chloroform	7.8 J	< 20	< 20	6.3
Chloromethane	< 8.3	< 8.3	< 8.3	0.95
cis-1,2 Dichloroethene	151	127	124	123
cis-1,3-Dichloropropene	< 18	< 18	< 18	< 0.73
Dibromochloromethane	< 17	< 17	< 17	< 0.68
Ethylbenzene	< 17	< 17	< 17	< 0.69
Methylene Chloride	< 14	< 14	< 14	1.1
Styrene	< 17	< 17	< 17	< 0.68
Tetrachloroethene	473	347	403	399
Toluene	21	< 15	< 15	0.60
trans-1,2-Dichloroethene	< 16	< 16	< 16	1.5
trans-1,3-Dichloropropene	< 18	< 18	< 18	< 0.73
Trichloroethylene	2,890	2,670	2,720	2,610
Trichlorotrifluoroethane (Freon 113)	39	35	43	41
Vinyl Chloride	< 2.0	< 2.0	< 2.0	0.25
Xylene-o	< 17	< 17	< 17	< 0.69
Xylene-m,p	23	< 17	< 17	< 0.69
<b>Total VOCs<sup>(2)</sup></b>	<b>3,703</b>	<b>3,258</b>	<b>3,386</b>	<b>3,279</b>

Notes and Abbreviations on last page

**Table 5B**  
**Influent and Effluent Air Concentrations for 2021<sup>(1)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents (Units in $\mu\text{g}/\text{m}^3$ )	Location ID: Sample ID: 102 EFFLUENT T102 EFFLUENT (AA) 2/24/2021	102 EFFLUENT T102 EFFLUENT (AA) 5/13/2021	102 EFFLUENT T102 EFFLUENT (AA) 8/18/2021	102 EFFLUENT T102 EFFLUENT (AA) 11/11/2021
<b>Volatile Organic Compounds (VOCs)<sup>(1)</sup></b>				
1,1,1-Trichloroethane	< 0.55	< 0.55	<b>4.6</b>	<b>0.52</b>
1,1,2,2-Tetrachloroethane	< 0.69	< 0.69	< 0.55	< 0.55
1,1,2-Trichloroethane	< 0.55	< 0.55	< 0.44	< 0.44
1,1-Dichloroethane	<b>13</b>	<b>12</b>	<b>30</b>	<b>33</b>
1,1-Dichloroethene	<b>31</b>	<b>36</b>	<b>57.1</b>	<b>52.7</b>
1,2-Dichloroethane	< 0.81	< 0.81	<b>2.1</b>	< 0.65
1,2-Dichloropropane	< 0.92	< 0.92	<b>1.2</b>	< 0.74
Benzene	<b>0.24 J</b>	< 0.64	< 0.51	< 0.51
Bromodichloromethane	< 0.67	< 0.67	< 0.54	< 0.54
Bromoform	< 0.41	< 0.41	< 0.33	< 0.33
Bromomethane	< 0.78	< 0.78	< 0.62	< 0.62
Carbon Disulfide	< 0.62	< 0.62	< 0.50	< 0.50
Carbon Tetrachloride	< 0.25	< 0.25	<b>2.6</b>	< 0.20
Chlorobenzene	< 0.92	< 0.92	< 0.74	< 0.74
Chloroethane	< 0.53	< 0.53	< 0.42	< 0.42
Chloroform	<b>2.0</b>	<b>1.7</b>	<b>8.3</b>	<b>3.0</b>
Chloromethane	<b>0.91</b>	<b>1.0</b>	<b>0.81</b>	<b>0.87</b>
cis-1,2 Dichloroethene	<b>17</b>	<b>15</b>	<b>125</b>	<b>38</b>
cis-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Dibromochloromethane	< 0.85	< 0.85	< 0.68	< 0.68
Ethylbenzene	< 0.87	< 0.87	< 0.69	< 0.69
Methylene Chloride	<b>4.5</b>	<b>1.8</b>	<b>1.4</b>	<b>1.6</b>
Styrene	< 0.85	< 0.85	< 0.68	< 0.68
Tetrachloroethene	<b>1.8</b>	<b>1.6</b>	<b>1.5</b>	<b>0.65</b>
Toluene	<b>1.2</b>	< 0.75	<b>0.49 J</b>	< 0.60
trans-1,2-Dichloroethene	<b>0.30 J</b>	< 0.79	<b>1.5</b>	<b>1.0</b>
trans-1,3-Dichloropropene	< 0.91	< 0.91	< 0.73	< 0.73
Trichloroethylene	<b>13</b>	<b>20</b>	<b>288</b>	<b>15</b>
Trichlorotrifluoroethane (Freon 113)	<b>19</b>	<b>18</b>	<b>44</b>	<b>32</b>
Vinyl Chloride	< 0.10	< 0.10	<b>0.26</b>	<b>0.23</b>
Xylene-o	< 0.87	< 0.87	< 0.69	< 0.69
Xylene-m,p	<b>0.87</b>	< 0.87	<b>0.52 J</b>	< 0.69
<b>Total VOCs <sup>(2)</sup></b>	<b>105</b>	<b>107</b>	<b>569</b>	<b>179</b>

Notes and Abbreviations on last page

**Table 5B**  
**Influent and Effluent Air Concentrations for 2021<sup>(1)</sup>**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

<sup>(1)</sup> Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP certified laboratory for VOC analyses per Modified USEPA Method TO-15.

<sup>(2)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least numerical precision (decimal place), including whole numbers with no decimal place.

<b>1.7</b>	Bold value indicates a detection
J	Compound detected below its reporting limit; value is estimated
µg/m <sup>3</sup>	Micrograms per cubic meter
ELAP	Environmental Laboratory Approval Program
NA	Not Applicable
NYSDOH	New York State Department of Health
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

**Table 5C**  
**Summary of TCE Mass Removal for 2021**  
**Tower 96 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Date	TCE Concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>(1)</sup>			TCE Mass Emission <sup>(2)</sup>	Percent of Allowable TCE Emissions <sup>(3)</sup>
	T96 INFLUENT <sup>(5,7)</sup>	T96 MIDTRAIN	T96 EFFLUENT <sup>(6)</sup>	(lbs)	12 Month Rolling Average
11/17/2020 <sup>(4)</sup>	19,300	2,190	5,040	196.4	72.9%
3/16/2021	13,500	5,320	34	1.8	70.8%
5/13/2021 <sup>(8)</sup>	11,600	1,430	514	12.6	55.2%
8/31/2021	18,100	14,800	5,250	256.0	88.1%
11/11/2021	10,000	8,650	81	2.6	57.2%

**Notes and Abbreviations:**

<sup>(1)</sup> Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP-certified laboratory for VOC analyses per Modified USEPA Method TO-15.

<sup>(2)</sup> TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding day of sampling. TCE (lb) = TCE Concentration [ $\mu\text{g}/\text{m}^3$ ] x Days x Flow Rate [ft<sup>3</sup>/min] x (1 m<sup>3</sup>/35 ft<sup>3</sup>) x (60 min/hr) x (24 hr/day) x (0.000001 g/1 ug) x (0.0022 lb/g)

<sup>(3)</sup> Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised February 5, 2019.

<sup>(4)</sup> Data and footnotes provided outside of the Fourth Quarter 2021 reporting period are included for 12 Month Rolling Average calculations.

<sup>(5)</sup> Given that Q3 2021 TCE aqueous-phase influent concentrations are comparable to typical concentration ranges observed over the last two years, it is unclear what caused this elevated vapor-phase concentration. Northrop Grumman inspected the GAC units and determined that they were functional.

<sup>(6)</sup> Based on vapor-phase effluent contaminant concentrations, GAC within the supplemental GAC beds was replaced on March 3, 2021 and again on October 13, 2021. On both occasions, Northrop Grumman inspected the RVPGAC components and identified no malfunctions/issues. Vapor-phase effluent contaminant concentrations will be monitored during upcoming sample rounds.

<sup>(7)</sup> Given that Q4 2020 TCE aqueous-phase influent concentrations are comparable to Q1 through Q3 2020 and prior quarters, it is unclear what caused this elevated vapor-phase concentration. Northrop Grumman inspected the GAC units and determined that they were functional.

<sup>(8)</sup> Revised from Q2 and Q3 2021 reported values.

- $\mu\text{g}/\text{m}^3$  micrograms per cubic meter
- lbs pounds
- CRR-NY Codes, Rules and Regulations of the State of New York
- ELAP Environmental Laboratory Approval Program
- NYSDOH New York State Department of Health
- TCE Trichloroethylene
- USEPA United States Environmental Protection Agency
- VOC Volatile Organic Compound
- VPGAC vapor phase granular activated carbon

**Table 5D**  
**Summary of TCE Mass Removal for 2021**  
**Tower 102 Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

Date	TCE Concentration ( $\mu\text{g}/\text{m}^3$ ) <sup>(1)</sup>		TCE Mass Emission <sup>(2)</sup>		Percentage of Allowable TCE Emissions <sup>(3)</sup>	
	T102 INFLUENT	T102 EFFLUENT	lbs	lbs/day	Period	12 Month Rolling Average
12/8/2020	2,130	1,990 <sup>(5)</sup>	147.8	1.42	103.7%	31.4%
2/24/2021	2,890	13	0.7	0.01	0.7%	31.4%
5/13/2021 <sup>(4)</sup>	2,670	20	1.1	0.01	1.0%	31.4%
8/18/2021	2,720	288	19.4	0.20	14.6%	33.9%
11/11/2021	2,610	15	0.9	0.01	0.7%	12.1%

**Notes and Abbreviations:**

<sup>(1)</sup> Vapor samples collected by Arcadis on the dates shown and submitted to a NYSDOH ELAP-certified laboratory for VOC analyses per Modified USEPA Method TO-15.

<sup>(2)</sup> TCE Mass Emission calculated based on the exhaust air flow rate on the day of sampling and the period of time since the preceding sampling day. TCE (lb) = TCE Concentration [ $\mu\text{g}/\text{m}^3$ ] x Days x Flow Rate [ $\text{ft}^3/\text{min}$ ] x (1  $\text{m}^3/35 \text{ ft}^3$ ) x (60  $\text{min}/\text{hr}$ ) x (24  $\text{hr}/\text{day}$ ) x (0.000001  $\text{g}/1 \text{ ug}$ ) x (0.0022  $\text{lb}/\text{g}$ )

<sup>(3)</sup> Percent of allowable TCE emissions to date is a time-weighted annual rolling average based on the 500 lb/year emission limit specified in the CRR-NY 212-2.2 Table 2. High Toxicity Air Contaminant List, revised February 5, 2019.

<sup>(4)</sup> Revised from Q2 2021 reported values.

<sup>(5)</sup> The elevated effluent vapor-phase contaminant concentrations, compared to prior quarterly sample events, are potentially related to a malfunctioning steam actuator valve noted at the regenerative vapor-phase granular activated carbon vessels (RVPGAC), which may have allowed regenerative steam and condensate to partially commingle with system vapor-phase effluent. It should be noted that no SGC or AGC air emission exceedance were noted associated with this sampling event, and the steam actuator valve has since been repaired. Arcadis will closely monitor contaminant concentrations during future sampling events.

- $\mu\text{g}/\text{m}^3$       Micrograms per cubic meter
- lbs            Pounds
- CRR-NY      Codes, Rules and Regulations of the State of New York
- ELAP         Environmental Laboratory Approval Program
- NYSDOH     New York State Department of Health
- TCE          Trichloroethene
- USEPA       United States Environmental Protection Agency
- VPGAC       Vapor phase granulated activated carbon

Table 6A  
 2021 Rule 212 Applicability and Evaluation  
 Tower 96 Treatment System  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



Project VOCs	CAS#	HTAC? <sup>1</sup>	2021 Tower 96 Treatment System Maximum Effluent Conc. (ug/m3) <sup>2</sup>	2021 Tower 96 Emissions (lb/yr) <sup>3</sup>	Rule 212 Limit (lb/yr) <sup>5</sup>	Rule 212 Applicability <sup>6</sup>	Further evaluation Required? <sup>6</sup>	2021 Tower 96 Emissions (g/s) <sup>7</sup>	Total Scaled Impact -Hourly (ug/m3) <sup>8</sup>	Total Scaled Impact -Annual (ug/m3) <sup>8</sup>	SGC3 (ug/m3) <sup>9</sup>	AGC3 (ug/m3) <sup>9</sup>
1,1,1-Trichloroethane	71-55-6	No	4.1	0.665	100	Less than limit, Rule 212 compliant	N	--	--	--	9,000	5,000
1,1-Dichloroethane	75-34-3	No	45.7	7.418	100	Less than limit, Rule 212 compliant	N	--	--	--	--	0.63
1,1-Dichloroethene	75-35-4	No	99.1	16.085	100	Less than limit, Rule 212 compliant	N	--	--	--	--	200
1,2-Dichloroethane	107-06-2	Yes	1.3	0.211	100	Less than limit, Rule 212 compliant	N	--	--	--	--	0.038
1,2-Dichloropropane	78-87-5	No	23	3.733	100	Less than limit, Rule 212 compliant	N	--	--	--	--	4
Benzene	71-43-2	Yes	5.1	0.828	100	Less than limit, Rule 212 compliant	N	--	--	--	27	0.13
Carbon Disulfide	75-15-0	No	0.24	0.039	100	Less than limit, Rule 212 compliant	N	--	--	--	6200	700
Carbon Tetrachloride	56-23-5	Yes	0.82	0.133	100	Less than limit, Rule 212 compliant	N	--	--	--	1,900	0.17
Chloroethane	75-00-3	No	4.2	0.682	100	Less than limit, Rule 212 compliant	N	--	--	--	--	10000
Chloroform	67-66-3	Yes	16	2.597	100	Less than limit, Rule 212 compliant	N	--	--	--	150	14.7
Chloromethane	74-87-3	No	1.8	0.292	100	Less than limit, Rule 212 compliant	N	--	--	--	22000	90
Ethylbenzene	100-41-4	No	1.3	0.211	100	Less than limit, Rule 212 compliant	N	--	--	--	--	1000
Methylene Chloride	75-09-2	No	19	3.084	100	Less than limit, Rule 212 compliant	N	--	--	--	14,000	46
Tetrachloroethene	127-18-4	Yes	8.1	1.315	1000	Less than limit, Rule 212 compliant	N	--	--	--	300	3.8
Toluene	108-88-3	No	362	58.756	100	Less than limit, Rule 212 compliant	N	--	--	--	37,000	5000
trans-1,2-Dichloroethene	156-60-5	No	2.0	0.325	100	Less than limit, Rule 212 compliant	N	--	--	--	--	63
Trichloroethylene	79-01-6	Yes	5,250	852.120	500	Subject to Rule 212 Requirement	Y	1.2E-02	1.81	0.053	20	0.2
Trichlorofluoroethane (Freon 113)	76-13-1	No	77.4	12.563	100	Less than limit, Rule 212 compliant	N	--	--	--	960,000	180,000
Vinyl Chloride	75-01-4	Yes	49.1	7.969	100	Less than limit, Rule 212 compliant	N	--	--	--	180,000	0.11
Xylenes (Total) <sup>(3)</sup>	1330-20-7	No	4.0	0.649	100	Less than limit, Rule 212 compliant	N	--	--	--	22,000	100

**Flowrates and Normalized Modeling Impacts**

Description	Flow (cfm)	AERMOD Normalized Ambient Impact at 1 g/s	
		Hourly ((ug/m <sup>3</sup> )/(g/s))	Annual ((ug/m <sup>3</sup> )/(g/s))
Tower 96	4,957	148.1	4.3

- Notes:**
- High toxicity air contaminant (HTAC) based on 6 CRR-NY Rule 212-2.2, Table 2 – High Toxicity Air Contaminant List.
  - Maximum effluent concentrations based on sampling performed in 2021. Compounds not detected above the laboratory reporting limit are excluded from the air quality impact analysis summary.
  - Total for xylenes m, o, and p
  - Emission rate calculated based on maximum effluent concentration and maximum air flow rates measured during the sampling events. Emission rate standardized at 70 °F and 1 atm.  

$$\text{Trichloroethylene (lb/yr)} = \text{Trichloroethylene } [\mu\text{g}/\text{m}^3] \times \text{Air Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min}/\text{hr}) \times (0.000001 \text{ g}/1 \mu\text{g}) \times (0.0022 \text{ lb}/\text{g}) \times 8,760 \text{ hrs}/\text{yr}$$
  - 100 lb/yr for non-HTACs, and mass emission limits based on Rule 212-2.2, Table 2 for HTACs.
  - For HTACs, no further demonstration is required if the actual emissions are less than mass emission limit. For non-HTACs, no further demonstration is required if the actual emissions are less than 100 lbs/yr.
  - $\text{g/s} = \text{Concentration } [\mu\text{g}/\text{m}^3] \times \text{Air Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min}/\text{hr}) \times (0.000001 \text{ g}/1 \mu\text{g}) \times (0.0022 \text{ lb}/\text{g}) \times \text{hr}/3,600 \text{ sec} \times 453.59 \text{ g}/\text{lb}$
  - Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015. The maximum impact from all the years was used for the calculations.  

$$\text{Scaled hourly impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted hourly ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/[\text{g}/\text{s}]) \times \text{Actual emission rate (g/s)}$$

$$\text{Scaled annual impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted annual ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/[\text{g}/\text{s}]) \times \text{Actual emission rate (g/s)}$$
  - Example for total scaled hourly for Trichloroethylene  

$$\text{Trichloroethylene scaled hourly impact } (\mu\text{g}/\text{m}^3) = (\text{T96 hourly ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/[\text{g}/\text{s}]) \times \text{Actual emission rate (g/s)})$$

$$\text{Trichloroethylene scaled hourly impact } (\mu\text{g}/\text{m}^3) = 148.1 (\mu\text{g}/\text{m}^3)/(\text{g/s}) \times 1.2\text{E-}02 (\text{g/s})$$
  - Short-term and annual guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised February 12, 2021.
  - The default AGC -0.1 ug/m3 to be used if the air contaminant does not have a published SGC/AGC. Medium toxicity was assumed.

Table 6B  
 2021 Rule 212 Applicability and Evaluation  
 Tower 102 Treatment System  
 Operable Unit 2  
 Northrop Grumman



Project VOCs	CAS#	HTAC? <sup>1</sup>	2021 Tower 102 Treatment System Maximum Effluent Conc. (ug/m3) <sup>2</sup>	2021 Tower 102 Emissions (lb/yr) <sup>4</sup>	Rule 212 Limit (lb/yr) <sup>5</sup>	Rule 212 Applicability <sup>6</sup>	Further evaluation Required? <sup>8</sup>	2021 Tower 102 Emissions (g/s) <sup>7</sup>	Total Scaled Impact -Hourly (ug/m3) <sup>9</sup>	Total Scaled Impact -Annual (ug/m3) <sup>9</sup>	SGC3 (ug/m3) <sup>9</sup>	AGC3 (ug/m3) <sup>9</sup>
1,1,1-Trichloroethane	71-55-6	No	4.6	1.147	100	Less than limit, Rule 212 compliant	N	--	--	--	9,000	5,000
1,1-Dichloroethane	75-34-3	No	33	8.229	100	Less than limit, Rule 212 compliant	N	--	--	--	--	0.63
1,1-Dichloroethene	75-35-4	No	57.1	14.239	100	Less than limit, Rule 212 compliant	N	--	--	--	--	200
1,2-Dichloroethane	107-06-2	Yes	2.1	0.524	100	Less than limit, Rule 212 compliant	N	--	--	--	--	0.038
1,2-Dichloropropane	78-87-5	No	1.2	0.299	100	Less than limit, Rule 212 compliant	N	--	--	--	--	4
Benzene	71-43-2	Yes	0.24	0.060	100	Less than limit, Rule 212 compliant	N	--	--	--	27	0.13
Carbon Tetrachloride	56-23-5	Yes	2.6	0.648	100	Less than limit, Rule 212 compliant	N	--	--	--	1,900	0.17
Chloroform	67-66-3	Yes	8.3	2.070	100	Less than limit, Rule 212 compliant	N	--	--	--	150	14.7
Chloromethane	74-87-3	No	1.0	0.249	100	Less than limit, Rule 212 compliant	N	--	--	--	22000	90
cis-1,2 Dichloroethene	156-59-2	No	125	31.172	100	Less than limit, Rule 212 compliant	N	--	--	--	--	63
Methylene Chloride	75-09-2	No	4.5	1.122	100	Less than limit, Rule 212 compliant	N	--	--	--	14,000	46
Tetrachloroethene	127-18-4	Yes	1.8	0.449	1000	Less than limit, Rule 212 compliant	N	--	--	--	300	3.8
Toluene	108-88-3	No	1.2	0.299	100	Less than limit, Rule 212 compliant	N	--	--	--	37,000	5000
trans-1,2-Dichloroethene	156-60-5	No	1.5	0.374	100	Less than limit, Rule 212 compliant	N	--	--	--	--	63
Trichloroethylene	79-01-6	Yes	288	71.819	500	Less than limit, Rule 212 compliant	N	--	--	--	20	0.2
Trichlorotrifluoroethane (Freon 113)	76-13-1	No	44	10.972	100	Less than limit, Rule 212 compliant	N	--	--	--	960,000	180,000
Vinyl Chloride	75-01-4	Yes	0.26	0.065	100	Less than limit, Rule 212 compliant	N	--	--	--	180,000	0.11
Xylenes (Total) <sup>(9)</sup>	1330-20-7	No	0.87	0.217	100	Less than limit, Rule 212 compliant	N	--	--	--	22,000	100

Flowrates and Normalized Modeling Impacts

Description	Flow (cfm)	AERMOD Normalized Ambient Impact at 1 g/s	
		Hourly ((ug/m <sup>3</sup> )/(g/s))	Annual ((ug/m <sup>3</sup> )/(g/s))
Tower 102	7,616	348.9	2.3

Notes:

- High toxicity air contaminant (HTAC) based on 6 CRR-NY Rule 212-2.2, Table 2 – High Toxicity Air Contaminant List.
- Maximum effluent concentrations based on sampling performed in 2021. Compounds not detected above the laboratory reporting limit are excluded from the air quality impact analysis summary.
- Total for xylenes m, o, and p
- Emission rate calculated based on maximum effluent concentration and maximum air flow rates measured during the sampling events. Emission rate standardized at 70 °F and 1 atm.  
 $\text{Trichloroethylene (lb/yr)} = \text{Trichloroethylene } [\mu\text{g}/\text{m}^3] \times \text{Air Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min/hr}) \times (0.000001 \text{ g}/1 \mu\text{g}) \times (0.0022 \text{ lb/g}) \times 8,760 \text{ hrs/yr}$
- 100 lb/yr for non-HTACs, and mass emission limits based on Rule 212-2.2, Table 2 for HTACs.
- For HTACs, no further demonstration is required if the actual emissions are less than mass emission limit. For non-HTACs, no further demonstration is required if the actual emissions are less than 100 lbs/yr.
- $\text{g/s} = \text{Concentration } [\mu\text{g}/\text{m}^3] \times \text{Air Flow Rate } [\text{ft}^3/\text{min}] \times (1 \text{ m}^3/35.3147 \text{ ft}^3) \times (60 \text{ min/hr}) \times (0.000001 \text{ g}/1 \mu\text{g}) \times (0.0022 \text{ lb/g}) \times \text{hr}/3,600 \text{ sec} \times 453.59 \text{ g/lb}$
- Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015. The maximum impact from all the years was used for the calculations.
- Ambient impact based on AERMOD modeling using normalized rate of 1 g/s is scaled to the actual emission rate of the pollutant. Modeling was performed using the representative meteorological data from the nearest station (Farmingdale, NY) for the years 2011 through 2015. The maximum impact from all the years was used for the calculations.  
 $\text{Scaled hourly impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted hourly ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/(\text{g/s})) \times \text{Actual emission rate (g/s)}$   
 $\text{Scaled annual impact } (\mu\text{g}/\text{m}^3) = \text{AERMOD predicted annual ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/(\text{g/s})) \times \text{Actual emission rate (g/s)}$
- Example for total scaled hourly for Trichloroethylene  
 $\text{Trichloroethylene scaled hourly impact } (\mu\text{g}/\text{m}^3) = (\text{T102 hourly ambient impact at 1 g/s } ((\mu\text{g}/\text{m}^3)/(\text{g/s})) \times \text{Actual emission rate (g/s)})$   
 $\text{Trichloroethylene scaled hourly impact } (\mu\text{g}/\text{m}^3) = (348.9 (\mu\text{g}/\text{m}^3)/(\text{g/s})) \times 1.0\text{E-}03 (\text{g/s})$
- Short-term and annual guideline concentrations specified in the NYSDEC DAR-1 AGC/SGC tables revised February 12, 2021.
- The default AGC -0.1 ug/m3 to be used if the air contaminant does not have a published SGC/AGC. Medium toxicity was assumed.

**Table 7**  
**Summary of SPDES Equivalency Effluent Water<sup>(1)</sup> Sample Analytical Results 2021**  
**ONCT Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

PARAMETER	Units	Discharge Limit <sup>(2)</sup>	Location ID: Sample ID: Sample Date:	Tower 102					
				Outfall 005 Outfall 005 1/14/2021	Outfall 005 Outfall 005 2/24/2021	Outfall 005 Outfall 005 3/16/2021	Outfall 005 Outfall 005 4/13/2021	Outfall 005 Outfall 005 5/13/2021	Outfall 005 Outfall 005 6/8/2021
<b>Volatile Organic Compounds (VOCs)<sup>(3)</sup></b>									
1,1,1-Trichloroethane (TCA)	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene (1,1-DCE)	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-dichloroethene	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	µg/L	5		< 0.50	< 0.50	< 0.50	< 0.50	<0.50	<0.50
Methylene Chloride	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-dichloroethene	µg/L	5		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene (TCE)	µg/L	5		<b>1.2</b>	<b>0.98</b>	<b>1.1</b>	<b>1.1</b>	<b>1.2</b>	<b>1.1</b>
Vinyl Chloride	µg/L	2		<0.50	< 0.50	<0.50	<0.50	<0.50	<0.50
<b>TVOCs<sup>(4)</sup></b>				<b>1.2</b>	<b>1.0</b>	<b>1.1</b>	<b>1.1</b>	<b>1.2</b>	<b>1.1</b>
<b>Semivolatile Organic Compounds (SVOCs)<sup>(6)</sup></b>									
<b>1,4-Dioxane</b>	µg/L	NA / Monitor		<b>5.6</b>	<b>5.1</b>	<b>5.8</b>	<b>6.8</b>	<b>3.6</b>	<b>4.3</b>
<b>Anions<sup>(5)</sup></b>									
Iron	µg/L	600		< 100	< 100	< 100	< 500	< 100	< 100
Manganese	µg/L	600		< 15	< 15	< 15	< 75	< 15	< 15
Nitrogen, (Nitrate+Nitrite)	mg/L	NA		<b>4.4</b>	<b>4.3</b>	<b>4.7</b>	<b>4.0</b>	<b>4.1</b>	<b>4.3</b>
Nitrogen, Total Kjeldahl	mg/L	NA		<0.12	<0.12	<0.12	<0.12	<0.12	<0.12
Total Nitrogen	mg/L	10		<b>4.4</b>	<b>4.3</b>	<b>4.7</b>	<b>4.0</b>	<b>4.1</b>	<b>4.3</b>
<b>pH - Intake (Tower 102)</b>	S.U.	NA		5.4	5.8	6.0	6.3	5.8	6.4
<b>pH - Effluent</b>	S.U.	5.0 - 8.5		6.2	6.3	7.0	6.3	6.9	6.9

Notes and Abbreviations on last page

**Table 7**  
**Summary of SPDES Equivalency Effluent Water<sup>(1)</sup> Sample Analytical Results 2021**  
**ONCT Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

PARAMETER	Units	Discharge Limit <sup>(2)</sup>	Location ID: Sample ID: Sample Date:	Tower 102					
				Outfall 005 Outfall 005 7/13/2021	Outfall 005 Outfall 005 8/18/2021	Outfall 005 Outfall 005 9/14/2021	Outfall 005 Outfall 005 10/12/2021	Outfall 005 Outfall 005 11/11/2021	Outfall 005 Outfall 005 12/20/2021
<b>Volatile Organic Compounds (VOCs)<sup>(3)</sup></b>									
1,1,1-Trichloroethane (TCA)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	< 0.50
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	< 0.50
1,1-Dichloroethene (1,1-DCE)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	< 0.50
cis-1,2-dichloroethene	µg/L	5		<b>0.38</b>	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-dichloroethene	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene (TCE)	µg/L	5		<b>0.94</b>	<b>1.0</b>	<b>0.83</b>	<b>1.1</b>	<b>0.85</b>	<b>1.0</b>
Vinyl Chloride	µg/L	2		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
<b>TVOCs<sup>(4)</sup></b>				<b>0.94</b>	<b>1.0</b>	<b>0.83</b>	<b>1.1</b>	<b>0.85</b>	<b>1.0</b>
<b>Semivolatile Organic Compounds (SVOCs)<sup>(6)</sup></b>									
<b>1,4-Dioxane</b>	µg/L	NA / Monitor		<b>4.9</b>	<b>5.7</b>	<b>6.1</b>	<b>4.7</b>	<b>5.8</b>	<b>3.2</b>
<b>Anions<sup>(5)</sup></b>									
Iron	µg/L	600		< 100	< 100	< 100	< 100	< 100	< 100
Manganese	µg/L	600		< 15	< 15	< 15	< 15	< 15	< 15
Nitrogen, (Nitrate+Nitrite)	mg/L	NA		<b>4.5</b>	<b>4.0</b>	<b>4.5</b>	<b>4.5</b>	<b>3.4</b>	<b>4.1</b>
Nitrogen, Total Kjeldahl	mg/L	NA		<0.14	<0.14	<0.14	<0.14	<b>0.19 J</b>	<0.14
Total Nitrogen	mg/L	10		<b>4.5</b>	<b>4.0</b>	<b>4.5</b>	<b>4.5</b>	<b>3.6</b>	<b>4.1</b>
<b>pH - Intake (Tower 102)</b>	S.U.	NA		4.9	4.3	4.5	5.6	4.4	.. <sup>(7)</sup>
<b>pH - Effluent</b>	S.U.	5.0 - 8.5		6.4	5.9	5.8	6.1	5.6	.. <sup>(7)</sup>

Notes and Abbreviations on last page

**Table 7**  
**Summary of SPDES Equivalency Effluent Water<sup>(1)</sup> Sample Analytical Results 2021**  
**ONCT Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

PARAMETER	Units	Discharge Limit <sup>(2)</sup>	Location ID: Sample ID: Sample Date:	Tower 96					
				Outfall 006					
				Outfall 006					
				1/14/2021	2/24/2021	3/16/2021	4/13/2021	5/13/2021	6/8/2021
<b>Volatile Organic Compounds (VOCs)<sup>(3)</sup></b>									
1,1,1-Trichloroethane (TCA)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene (1,1-DCE)	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-dichloroethene	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Chloroform	µg/L	5		< 0.50	< 0.50	< 0.50	< 0.50	<0.50	<0.50
Methylene Chloride	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Tetrachloroethene (PCE)	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-dichloroethene	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene (TCE)	µg/L	5		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Vinyl Chloride	µg/L	2		< 0.50	<0.50	<0.50	<0.50	<0.50	<0.50
<b>TVOCs<sup>(4)</sup></b>				ND	ND	ND	ND	ND	ND
<b>Semivolatile Organic Compounds (SVOCs)<sup>(6)</sup></b>									
1,4-Dioxane	µg/L	NA / Monitor		8.5	8.4	9.3	8.7	7.0	7.6
<b>Anions<sup>(5)</sup></b>									
Iron	µg/L	600		<100	< 100	< 100	< 100	<100	< 100
Manganese	µg/L	600		< 15	< 15	< 15	< 15	< 15	< 15
Nitrogen, (Nitrate+Nitrite)	mg/L	NA		5.0	4.8	4.8	4.6	4.6	5.0
Nitrogen, Total Kjeldahl	mg/L	NA		<0.12	<0.12	<0.12	<0.12	0.14 J	<0.12
Total Nitrogen	mg/L	10		5.0	4.8	4.8	4.6	4.7	5.0
<b>pH - Intake (Tower 96)</b>	S.U.	NA		5.2	5.9	6.1	5.8	5.7	6.2
<b>pH - Effluent</b>	S.U.	5.0 - 8.5		6.1	7.0	6.9	6.7	6.7	6.7

Notes and Abbreviations on last page

**Table 7**  
**Summary of SPDES Equivalency Effluent Water<sup>(1)</sup> Sample Analytical Results 2021**  
**ONCT Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

PARAMETER	Units	Discharge Limit <sup>(2)</sup>	Location ID: Sample ID: Sample Date:	Tower 96					
				Outfall 006	Outfall 006	Outfall 006	Outfall 006	Outfall 006	Outfall 006
				Outfall 006	Outfall 006	Outfall 006	Outfall 006	Outfall 006	Outfall 006
				7/30/2021	8/18/2021	9/14/2021 <sup>(8)</sup>	10/12/2021	11/11/2021	12/14/2021
<b>Volatile Organic Compounds (VOCs)<sup>(3)</sup></b>									
1,1,1-Trichloroethane (TCA)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1,2-Trichlorotrifluoroethane (Freon 113)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
1,1-Dichloroethene (1,1-DCE)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
cis-1,2-dichloroethene	µg/L	5		<0.50	<0.50	< 0.50	<0.50	<0.50	<0.50
Chloroform	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Methylene Chloride	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<b>0.37</b>
Tetrachloroethene (PCE)	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
trans-1,2-dichloroethene	µg/L	5		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Trichloroethene (TCE)	µg/L	5		<b>1.2</b>	<b>0.53</b>	< 0.50	<0.50	<0.50	<0.50
Vinyl Chloride	µg/L	2		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
<b>TVOCs<sup>(4)</sup></b>				<b>1.2</b>	<b>0.53</b>	ND	ND	ND	ND
<b>Semivolatile Organic Compounds (SVOCs)<sup>(6)</sup></b>									
<b>1,4-Dioxane</b>	µg/L	NA / Monitor		<b>6.3</b>	<b>6.9</b>	<b>8.6</b>	<b>7.7</b>	<b>9.4</b>	<b>8.1</b>
<b>Anions<sup>(5)</sup></b>									
Iron	µg/L	600		< 100	< 100	<b>1,750</b>	< 100	< 100	< 100
Manganese	µg/L	600		< 15	< 15	<b>52.7</b>	< 15	< 15	< 15
Nitrogen, Nitrate+Nitrite	mg/L	NA		<b>4.2</b>	<b>4.2</b>	<b>4.8</b>	<b>5.4</b>	<b>3.9</b>	<b>4.7</b>
Nitrogen, Total Kjeldahl	mg/L	NA		<0.14	<0.14	<0.14	<0.14	<b>0.2</b>	<0.14
Total Nitrogen	mg/L	10		<b>4.2</b>	<b>4.2</b>	<b>4.8</b>	<b>5.4</b>	<b>4.1</b>	<b>4.7</b>
<b>pH - Intake (Tower 96)</b>	S.U.	NA		4.3	5.0	5.1	6.0	4.6	.. <sup>(7)</sup>
<b>pH - Effluent</b>	S.U.	5.0 - 8.5		6.3	.. <sup>(7)</sup>	5.7	6.3	5.5	.. <sup>(7)</sup>

Notes and Abbreviations on last page

**Table 7**  
**Summary of SPDES Equivalency Effluent Water<sup>(1)</sup> Sample Analytical Results 2021**  
**ONCT Treatment System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

**Notes and Abbreviations:**

- <sup>(1)</sup> SPDES effluent water samples are collected at a point closest to the respective Outfalls to each of the recharge basins, not directly from the treatment system tower effluent ports unless otherwise noted.
- <sup>(2)</sup> Discharge limits are per the SPDES permit equivalency, dated October 12, 2017, amended on July 30, 2018 and transmitted by the NYSDEC to Northrop Grumman on August 9, 2018.
- <sup>(3)</sup> Samples were analyzed for permit specified VOCs using USEPA Method 624.
- <sup>(4)</sup> TVOC represents the sum of individual concentrations of VOCs detected. Results rounded to two significant figures.
- <sup>(5)</sup> Samples were analyzed for Nitrogen, (Nitrate+Nitrite) and Total Kjeldahl Nitrogen (TKN) by USEPA Methods 353.2 and 351.2, respectively. Total Nitrogen is calculated as the sum of Nitrogen, (Nitrate+Nitrite) and TKN concentrations and is rounded to two significant figures.
- <sup>(6)</sup> A SPDES equivalency letter was issued October 2017, at that time 1,4-Dioxane was added to the analyte list. Basin discharges are being reported under the current SPDES Permit Equivalency; however, discussion regarding pH and other analytes are ongoing with NYSDEC.
- <sup>(7)</sup> pH not recorded due to field recording errors.
- <sup>(8)</sup> The discharge limit exceedance for total iron at Outfall 006 is considered anomalous, and is likely a result of system effluent distribution line valving testing/adjustments completed a short time prior to collection of the SPDES samples on September 14, 2021. It should be noted, as will be reported in the following October 2021 SPDES Report, analysis of total iron and manganese associated with the October SPDES sample event (October 12, 2021) were expedited to verify this anomalous result, and both total iron and manganese were non-detect during the October SPDES sample event, consistent with historical data trends. Moving forward, any testing or modification of system effluent distribution line valving will be scheduled to occur following SPDES sample collection to limit the potential for future anomalous discharge limit exceedances.

--	Not Analyzed
<b>1.2</b>	Bolded value indicates a detection
< 0.50	Compound not detected above its laboratory quantification limit
µg/L	micrograms per liter
mg/L	milligrams per liter
J	Constituent value is estimated
DUP	Field Duplicate Sample
NA	Not Applicable
ND	Not Detected
ONCT	On-Site Containment System
SPDES	State Pollution Discharge Elimination System
S.U.	Standard Units
SVOCs	Semivolatile Organic Compounds
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

**Table 8**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Upgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone: Well ID: Sample ID: Date:	Zone 1							
		FW-03 FW-03 4/12/2021	HN-241 HN-241 5/5/2021	HN-40S HN-40S 5/4/2021	HN-401 HN-401 5/4/2021	HN-42S HN-42S 5/4/2021	HN-42I HN-42I 5/4/2021	GM-13D GM-13D 5/20/2021	GM-13D REP052021PQ 5/20/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>								
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	<b>2.4</b>	< 1.0	< 1.0	< 1.0	< 1.0	<b>1.2</b>	<b>1.1</b>
1,1-Dichloroethene	5	< 1.0	<b>0.94 J</b>	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.71 J</b>	<b>0.83 J</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	<b>0.66 J</b>	< 1.0	< 1.0	< 1.0	< 1.0	<b>4.0</b>	<b>4.1</b>
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	<b>3.6</b>	< 1.0	<b>4.3</b>	< 1.0	< 1.0	<b>14.3</b>	<b>14.3</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	< 1.0	<b>7.5</b>	< 1.0	<b>3.1</b>	< 1.0	< 1.0	<b>7.9</b>	<b>8.2</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>ND</b>	<b>15.1</b>	<b>ND</b>	<b>7.4</b>	<b>ND</b>	<b>ND</b>	<b>28.1</b>	<b>28.5</b>

Notes and Abbreviations on last page

**Table 8**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Upgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

**Notes and Abbreviations:**

<sup>(1)</sup> Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs (NYSDEC 1998); most stringent values are listed.

<sup>(2)</sup> Samples analyzed for the TCL VOCs using USEPA Method 8260C.

<sup>(3)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least precision (decimal places), including whole numbers with no decimal place.

Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).

**Bold** value indicates a detection.

< 5.0	Compound not detected above its method detection limit
ND	Non-Detect
µg/L	Micrograms per Liter
J	Value is estimated concentration
NYSDEC	New York State Department of Environmental Conservation
TCL	Target Compound List
TVOCs	Total Volatile Organic Compounds (known lab contaminants acetone, 2-butanone, and methylene chloride are not included in calculation of TVOCs)
TOGs	Technical and Operational Guidance Series
VOCs	Volatile Organic Compounds
<b> </b>	<b>Compound detected in exceedance of NYSDEC SCG Criteria</b>
USEPA	United States Environmental Protection Agency

**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 1								
	Well ID:	GM-15SR	GM-15SR	GM-15I	GM-15I	GM-17I	GM-17I	GM-18I	GM-18I	GM-20I
	Sample ID: Date:	GM-15SR 5/6/2021	GM-15SR 11/9/2021	GM-15I 5/6/2021	GM-15I 11/9/2021	GM-17I 4/13/2021	GM-17I 11/2/2021	GM-18I 5/12/2021	GM-18I 11/3/2021	GM-20I 5/11/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10 J	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0
Acetone	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10 J	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
Trichloroethene	5	<b>1.1</b>	<b>0.94 J</b>	<b>1.4</b>	<b>0.81 J</b>	<b>4.4</b>	< 1.0	< 1.0	< 1.0 J	<b>0.55 J</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>1.1</b>	<b>0.94</b>	<b>1.4</b>	<b>0.81</b>	<b>4.4</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>0.55</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 1								
	Well ID:	GM-21S	GM-211	GM-74I	GM-74I	GM-78S	GM-78I	GM-79I	GM-79I	GM-17D
	Sample ID: Date:	GM-21S 5/5/2021	GM-211 5/11/2021	GM-74I 4/14/2021	GM-74I 11/1/2021	GM-78S 4/15/2021	GM-78I 4/15/2021	GM-79I 5/12/2021	GM-79I 11/8/2021	GM-17D 4/13/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.81 J</b>	<b>0.62 J</b>	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10	< 10 J	< 10 J	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.76 J</b>	<b>0.60 J</b>	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	<b>0.53 J</b>	<b>0.76 J</b>	<b>1.1</b>	< 1.0	<b>3.1</b>	<b>2.9</b>	<b>1.2</b>	<b>1.7</b>	< 1.0
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>0.53</b>	<b>0.76</b>	<b>1.1</b>	<b>ND</b>	<b>4.7</b>	<b>4.1</b>	<b>1.2</b>	<b>1.7</b>	<b>ND</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 1								
	Well ID:	GM-17D	GM-18D	GM-18D	GM-20D	GM-21D	GM-39DA	GM-39DA	GM-79D	GM-79D
	Sample ID: Date:	GM-17D 11/2/2021	GM-18D 5/12/2021	GM-18D 11/3/2021	GM-20D 5/11/2021	GM-21D 5/11/2021	GM-39DA 5/12/2021	GM-39DA 11/9/2021	GM-79D 5/12/2021	GM-79D 11/8/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	5	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10 J	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10 J	< 10	< 10	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	<b>0.57 J</b>	<b>1.0</b>	<b>1.1</b>	<b>15.5</b>	<b>16.5</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>0.57</b>	<b>1.0</b>	<b>1.1</b>	<b>15.5</b>	<b>16.5</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 2								
	Well ID:	GM-15D	GM-15D	GM-39DB	GM-39DB	GM-73D	GM-73D	GM-74D	GM-74D	GM-78D
	Sample ID: Date:	GM-15D 5/6/2021	GM-15D 11/9/2021	GM-39DB 5/12/2021	GM-39DB 11/9/2021	GM-73D 4/14/2021	GM-73D 10/29/2021	GM-74D 4/14/2021	GM-74D 11/1/2021	GM-78D 4/15/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10 J
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	< 1.0	< 1.0	<b>11.1</b>	<b>14.7</b>	<b>11.3</b>	<b>39.1</b>	<b>1.9</b>	<b>1.9</b>	<b>0.64 J</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		ND	ND	<b>11.1</b>	<b>14.7</b>	<b>11.3</b>	<b>39.1</b>	<b>1.9</b>	<b>1.9</b>	<b>0.64</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 2						Zone 3		
	Well ID:	GM-78D	GM-78D2	GM-78D2	GM-78D2	MW-3-1	MW-3-1	GM-15D2	GM-15D2	GM-21D2
	Sample ID: Date:	GM-78D 11/17/2021	GM-78D2 4/15/2021	REP041521ARH 4/15/2021	GM-78D2 11/2/2021	REP041221ARH 4/12/2021	MW-3-1 10/29/2021	GM-15D2 5/6/2021	GM-15D2 11/9/2021	GM-21D2 3/8/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0	<b>2.1 J</b>	<b>1.7 J</b>	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>3.0</b>	<b>3.6</b>	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>2.6</b>	<b>2.2</b>	< 1.0	<b>0.61 J</b>	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10	< 10	< 10 J	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>11.4</b>	<b>6.5</b>	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	<b>33.4</b>	<b>24.5 J</b>	<b>2.2</b>	<b>2.4</b>	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0
Trichloroethene	5	<b>0.54 J</b>	<b>0.68 J</b>	<b>0.83 J</b>	<b>0.88 J</b>	<b>140</b>	<b>75.1</b>	<b>6.4</b>	<b>6.6</b>	<b>5.6</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	<b>13.6</b>	<b>7.9</b>	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>0.54</b>	<b>0.68</b>	<b>0.83</b>	<b>0.88</b>	<b>206</b>	<b>121.5</b>	<b>8.6</b>	<b>9.6</b>	<b>5.6</b>

Notes and Abbreviations on last page

**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone:	Zone 3								
	Well ID:	GM-21D2	GM-21D2	GM-21D2	GM-33D2	GM-33D2	GM-73D2	GM-73D2	GM-73D3	GM-73D3
	Sample ID: Date:	GM-21D2 5/5/2021	GM-21D2 9/10/2021	GM-21D2 11/3/2021	GM-33D2 5/20/2021	GM-33D2 11/3/2021	GM-73D2 4/14/2021	GM-73D2 10/29/2021	GM-73D3 4/14/2021	GM-73D3 10/29/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>									
1,1,1-Trichloroethane	5	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 0.50	< 5.0 J	<b>3.5 J</b>	<b>4.0 J</b>	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10 J	< 10	< 10 J	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10 J	< 10	< 10 J	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50 J	< 0.50	< 0.50 J	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0 J
cis-1,2-Dichloroethene	5	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 0.50	< 2.0 J	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	<b>0.91</b>	< 1.0 J	<b>1.6</b>	<b>1.6 J</b>	<b>1.0</b>	<b>1.2</b>	<b>1.5</b>	<b>1.4</b>
Toluene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	<b>5.6</b>	<b>4.9</b>	<b>3.9 J</b>	<b>11.9</b>	<b>12.8 J</b>	<b>41.9</b>	<b>60.1</b>	<b>2.3</b>	<b>2.2</b>
Vinyl chloride	2	< 1.0	< 0.50	< 1.0 J	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>5.6</b>	<b>5.8</b>	<b>3.9</b>	<b>17.0</b>	<b>18.4</b>	<b>42.9</b>	<b>61.3</b>	<b>3.8</b>	<b>3.6</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

Constituents units in (ug/L)	Zone:	Zone 3			
	Well ID:	GM-74D2	GM-74D2	GM-74D3	GM-74D3
	Sample ID: Date:	GM-74D2 4/14/2021	GM-74D2 11/1/2021	GM-74D3 4/14/2021	GM-74D3 11/1/2021
<b>Volatile Organic Compounds (VOCs) <sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>				
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	5	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	<b>0.65 J</b>	< 1.0	< 1.0
1,1-Dichloroethene	5	< 1.0	<b>1.1</b>	< 1.0	< 1.0
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0 J	< 1.0	< 1.0 J
cis-1,2-Dichloroethene	5	< 1.0	<b>0.79 J</b>	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	<b>2.0</b>	<b>2.3</b>	<b>3.0</b>
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	<b>3.3</b>	<b>7.9</b>	<b>3.6</b>	<b>3.9</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>3.3</b>	<b>12.4</b>	<b>5.9</b>	<b>6.9</b>

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**Table 9**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Proximate to the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

**Notes and Abbreviations:**

<sup>(1)</sup> Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs (NYSDEC 1998); most stringent values are listed.

<sup>(2)</sup> Samples analyzed for the TCL VOCs using USEPA Method 8260C.

<sup>(3)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least precision (decimal places), including whole numbers with no decimal place.

Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016.)

**Bold** value indicates a detection.

< 5.0	Compound not detected above its laboratory quantification limit.
ND	Non-Detect
µg/L	micrograms per Liter
J	Value is estimated concentration
NYSDEC	New York State Department of Environmental Conservation
TCL	Target Compound List
TOGs	Technical and Operational Guidance Series
TVOCs	Total Volatile Organic Compounds (known lab contaminants acetone, 2-butanone, and methylene chloride are not included in calculation of TVOCs).
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds
<b> </b>	<b>Compound detected in exceedance of NYSDEC SCG Criteria</b>
USEPA	United States Environmental Protection Agency

**Table 10**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Downgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone: Well ID: Sample ID: Date:	Near Central					Far Central									
		Zone 1	Zone 2	Zone 3	Zone 3	Zone 1	Zone 2	Zone 2	Zone 3	Zone 3	Zone 3	Zone 3	Zone 1	Zone 3	Zone 2	Zone 2
		GM-37D	GM-37D2	GM-75D2	GM-75D2	N-10624	GM-34D	GM-34D	GM-34D2	GM-34D2	GM-35D2	GM-35D2	GM-36D	GM-36D2	GM-70D2	GM-71D2
<b>Volatile Organic Compounds (VOCs)<sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>															
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.74 J</b>
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-trichloro-1,2,2-trifluoroethane	5	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	<b>0.59 J</b>	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1-Dichloroethane	5	< 1.0	<b>0.72 J</b>	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<b>0.64 J</b>	< 1.0	<b>1.6</b>
1,1-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<b>1.0</b>
1,2-Dichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10 J	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Acetone	50	< 10	< 10	< 10	< 10 J	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10 J	< 10 J	< 10	< 10
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Bromomethane	5	< 2.0 J	< 2.0 J	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0 J	< 2.0 J	< 2.0	< 2.0
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Chloromethane	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0 J	< 1.0	< 1.0
cis-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	<b>3.0</b>	<b>2.3</b>	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0 J	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0 J	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Tetrachloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	<b>5.4</b>	<b>5.9</b>	<b>8.1</b>	<b>5.9</b>	<b>3.7</b>	<b>4.0</b>	< 1.0	< 1.0	<b>2.0</b>	< 1.0
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Trichloroethene	5	<b>7.7</b>	<b>1.7</b>	<b>13.9</b>	<b>13.8 J</b>	< 1.0	<b>108</b>	<b>97.0</b>	<b>53.1</b>	<b>47.5</b>	<b>25.0</b>	<b>26.6</b>	< 1.0	<b>3.4</b>	<b>5.9</b>	<b>8.1</b>
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0 J	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
<b>TVOCs<sup>(3)</sup></b>		<b>7.7</b>	<b>2.4</b>	<b>13.9</b>	<b>13.8</b>	ND	<b>116</b>	<b>105.8</b>	<b>61.2</b>	<b>53.4</b>	<b>28.7</b>	<b>30.6</b>	ND	<b>4.0</b>	<b>7.9</b>	<b>11.4</b>

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**Table 10**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Downgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone: Well ID: Sample ID: Date:	GM-38 Area					Former Outpost Wells									
		Zone 2	Zone 1	Zone 1	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 3	Zone 3				
		GM-38D	GM-38D	GM-38D	GM-38D2	GM-38D2	BPOW 1-1	BPOW 1-1	BPOW 1-2	BPOW 1-2	BPOW 1-3	BPOW 1-3	BPOW 1-4	BPOW 1-4	BPOW 1-5	BPOW 1-5
<b>Volatile Organic Compounds (VOCs)<sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>															
1,1,1-Trichloroethane	5	< 1.0	< 1.0	< 1.0	<b>0.84 J</b>	<b>0.61 J</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-trichloro-1,2,2-trifluoroethane	5	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethane	5	< 1.0	<b>0.76 J</b>	<b>0.79 J</b>	<b>3.8</b>	<b>3.5</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethene	5	< 1.0	<b>0.90 J</b>	<b>0.97 J</b>	<b>1.3</b>	<b>1.5</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	5	<b>1.3</b>	<b>1.1 J</b>	<b>1.2</b>	< 1.0	< 1.0 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloropropane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Butanone (MEK)	50	< 10	< 10	< 10	< 10	< 10	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Methyl-2-Pentanone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Acetone	50	< 10 J	< 10	< 10	< 10 J	< 10	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromoform	50	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromomethane	5	< 2.0 J	< 2.0	< 2.0	< 2.0 J	< 2.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Carbon Disulfide	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Carbon Tetrachloride	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chlorobenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chlorodibromomethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloroform	7	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 1.0 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50				
cis-1,2-Dichloroethene	5	<b>0.82 J</b>	<b>1.0</b>	<b>1.0</b>	<b>0.90 J</b>	<b>1.5</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dichloromethane	5	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Ethylbenzene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
m&p-Xylenes	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Methyl N-Butyl Ketone (2-Hexanone)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
o-Xylene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Styrene (Monomer)	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tetrachloroethene	5	<b>2.0</b>	<b>2.7</b>	<b>2.8</b>	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,2-Dichloroethene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Trichloroethene	5	<b>110</b>	<b>117</b>	<b>125</b>	<b>27.5</b>	<b>29.8</b>	< 0.50	<b>0.98</b>	<b>0.68</b>	<b>0.78</b>	<b>0.96</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl chloride	2	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
<b>TVOCs<sup>(3)</sup></b>		<b>114</b>	<b>123</b>	<b>132</b>	<b>34.3</b>	<b>36.9</b>	ND	<b>0.98</b>	<b>0.68</b>	<b>0.78</b>	<b>0.96</b>	ND	ND	ND	ND	ND

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**Table 10**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Downgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone: Well ID: Sample ID: Date:	Former Outpost Wells														
		Zone 4	Zone 4	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 2	Zone 3	Zone 3	Zone 3	Zone 3
		BPOW 1-6	BPOW 1-6	BPOW 2-1	BPOW 2-1	BPOW 2-1	BPOW 2-1	BPOW 2-1	BPOW 2-2	BPOW 2-2	BPOW 2-2	BPOW 2-2	BPOW 2-2	BPOW 2-3	BPOW 2-3	BPOW 2-3
		4/19/2021	10/25/2021	3/8/2021	4/20/2021	9/9/2021	10/27/2021	3/8/2021	4/20/2021	9/9/2021	10/27/2021	3/8/2021	4/20/2021	9/9/2021	9/9/2021	10/27/2021
Volatile Organic Compounds (VOCs) <sup>(2)</sup>	NYSDEC SCGs (ug/L) <sup>(1)</sup>															
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2,2-Tetrachloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1,2-trichloro-1,2,2-trifluoroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
1,1,2-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,1-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
1,2-Dichloropropane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50 J	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
2-Butanone (MEK)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
4-Methyl-2-Pentanone	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
Acetone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromodichloromethane	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromoform	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Bromomethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Carbon Disulfide	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Carbon Tetrachloride	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chlorobenzene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chlorodibromomethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Chloromethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
cis-1,3-Dichloropropene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Dichloromethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Ethylbenzene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
m&p-Xylenes	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Methyl N-Butyl Ketone (2-Hexanone)	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
o-Xylene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Styrene (Monomer)	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Tetrachloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Toluene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
trans-1,3-Dichloropropene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Trichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Vinyl chloride	2	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
<b>TVOCs<sup>(3)</sup></b>		<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>

Notes and Abbreviations on last page

**Table 10**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Downgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituents units in (ug/L)	Zone: Well ID: Sample ID: Date:	Former Outpost Wells													
		Zone 2	Zone 2	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 3	Zone 4	Zone 4
		BPOW 3-1	BPOW 3-1	BPOW 3-2	BPOW 3-2	BPOW 3-3	BPOW 3-3	BPOW 3-4	BPOW 3-4	BPOW 3-4	BPOW 3-4	BPOW 4-1R	BPOW 4-1R	BPOW 4-2R	BPOW 4-2R
		5/14/2021	10/27/2021	5/17/2021	11/10/2021	5/17/2021	10/28/2021	5/17/2021	10/28/2021	10/28/2021	4/20/2021	10/28/2021	4/20/2021	10/28/2021	
<b>Volatile Organic Compounds (VOCs)<sup>(2)</sup></b>	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>														
1,1,1-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.42 J</b>	<b>0.66</b>	<b>0.62</b>	< 0.50	<b>0.26 J</b>	< 0.50	< 0.50	
1,1,2,2-Tetrachloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
1,1,2-trichloro-1,2,2-trifluoroethane	5	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	<b>1.0</b>	<b>4.6</b>	<b>6.8</b>	<b>6.2</b>	<b>60.1</b>	<b>59.1</b>	<b>36.3</b>	<b>36.7</b>	
1,1,2-Trichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>1.3</b>	<b>1.7</b>	<b>1.6</b>	< 0.50	< 0.50	< 0.50	< 0.50	
1,1-Dichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.63</b>	<b>1.0</b>	<b>0.94</b>	< 0.50	< 0.50	< 0.50	< 0.50	
1,1-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>5.3</b>	<b>8.7</b>	<b>7.8</b>	<b>1.2</b>	<b>1.5</b>	<b>0.81</b>	<b>0.95</b>	
1,2-Dichloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.22 J</b>	< 0.50	<b>0.20 J</b>	<b>0.23 J</b>	< 0.50	< 0.50	
1,2-Dichloropropane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.21 J</b>	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
2-Butanone (MEK)	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	
4-Methyl-2-Pentanone	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	
Acetone	50	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	< 5.0	
Benzene	1	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Bromodichloromethane	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Bromoform	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Bromomethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Carbon Disulfide	50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Carbon Tetrachloride	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>1.8</b>	<b>2.8</b>	<b>2.6</b>	<b>0.45 J</b>	<b>0.54</b>	<b>0.33 J</b>	<b>0.37 J</b>	
Chlorobenzene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Chlorodibromomethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Chloroethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Chloroform	7	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 1.5 B	<b>1.9</b>	<b>1.8</b>	<b>0.30 J</b>	<b>0.35 J</b>	< 0.50	< 0.50	
Chloromethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
cis-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>2.1</b>	<b>2.9</b>	<b>2.6</b>	<b>0.35 J</b>	<b>0.56</b>	<b>0.21 J</b>	<b>0.30 J</b>	
cis-1,3-Dichloropropene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Dichloromethane	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Ethylbenzene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
m&p-Xylenes	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Methyl N-Butyl Ketone (2-Hexanone)	50	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0	
o-Xylene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Styrene (Monomer)	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Tetrachloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>0.61</b>	<b>1.1</b>	
Toluene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
trans-1,2-Dichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
trans-1,3-Dichloropropene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
Trichloroethene	5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	<b>172 D</b>	<b>240 D</b>	<b>283 D</b>	<b>1.8</b>	<b>2.5</b>	<b>3.0</b>	<b>4.1</b>	
Vinyl chloride	2	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	
<b>TVOCs<sup>(3)</sup></b>		<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>ND</b>	<b>1.0</b>	<b>188</b>	<b>267</b>	<b>307</b>	<b>64.4</b>	<b>65.0</b>	<b>41.3</b>	<b>43.5</b>	

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**Table 10**  
**Summary of Volatile Organic Compound Concentrations in Groundwater for 2021**  
**Downgradient of the ONCT System**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

<sup>(1)</sup> Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs. (NYSDEC 1998); most stringent values are listed.

<sup>(2)</sup> Samples were analyzed using USEPA Method 8260C.

<sup>(3)</sup> TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least precision (decimal places), including whole numbers with no decimal place.

Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).

**Bold** value indicates a detection.

< 5.0	Compound not detected above its laboratory quantification limit.
ND	Non-Detect
µg/L	micrograms per liter
D	Concentration is based on a diluted sample analysis
J	Value is estimated concentration.
NYSDEC	New York State Department of Environmental Conservation
OU2	Operable Unit 2
REP	Blind duplicate sample
TOGs	Technical and Operational Guidance Series
TVOCs	Total Volatile Organic Compounds (known lab contaminants acetone, 2-butanone, and methylene chloride are not included in calculation of TVOCs)
VOCs	Volatile Organic Compounds
<b>[Redacted]</b>	Compound detected in exceedance of NYSDEC SCG Criteria
USEPA	United States Environmental Protection Agency

**Table 11**  
**Summary of Metals Concentrations in Groundwater for 2021**  
**Proximate to Former Northrop Grumman Plants 1 and 2**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Constituent (units in ug/L)	Location Well ID: Sample ID: Sample Date:	Plant 1									
		GM-15SR GM-15SR 5/6/2021	GM-15SR GM-15SR 11/9/2021	PLT1 MW-04 PLT1 MW-04 5/6/2021	PLT1 MW-04 PLT1 MW-04 11/4/2021	PLT1 MW-04 REP110421BW1 11/4/2021	PLT1 MW-05 PLT1 MW-05 5/6/2021	PLT1 MW-05 PLT1 MW-05 11/4/2021	PLT1 MW-06 PLT1 MW-06 5/6/2021	PLT1 MW-06 REP050621BA 5/6/2021	PLT1 MW-06 PLT1 MW-06 11/4/2021
	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>										
Cadmium (Total)	5	--	--	--	--	--	--	--	--	--	--
Cadmium (Dissolved)	5	--	--	--	--	--	--	--	--	--	--
Chromium (Total)	50	<b>462</b>	<b>763</b>	< 10	< 10	< 10	<b>429</b>	<b>485</b>	<b>154</b>	<b>149</b>	<b>162</b>
Chromium (Dissolved)	50	<b>437</b>	<b>799</b>	< 10	< 10	< 10	<b>424</b>	<b>493</b>	<b>156</b>	<b>149</b>	<b>163</b>

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**Table 11**  
**Summary of Metals Concentrations in Groundwater for 2021**  
**Proximate to Former Northrop Grumman Plants 1 and 2**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

Constituent (units in ug/L)	Location Well ID: Sample ID: Sample Date:	Plant 2						
		GM-78I	GM-78S	MW-01GF	MW-01GF	MW-02GF	MW-02GF	N-10631
		GM-78I	GM-78S	MW-01GF	MW-01GF	MW-02GF	MW-02GF	(2)
		4/15/2021	4/15/2021	4/15/2021	11/4/2021	4/15/2021	11/4/2021	(2)
	<b>NYSDEC SCGs (ug/L)<sup>(1)</sup></b>							
Cadmium (Total)	5	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	--
Cadmium (Dissolved)	5	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	< 3.0	--
Chromium (Total)	50	< 10	< 10	< 10	< 10	<b>238</b>	<b>257</b>	--
Chromium (Dissolved)	50	< 10	< 10	< 10	< 10	<b>234</b>	<b>255</b>	--

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**Table 11**  
**Summary of Metals Concentrations in Groundwater for 2021**  
**Proximate to Former Northrop Grumman Plants 1 and 2**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**

**Notes and Abbreviations:**

<sup>(1)</sup> Standards, Criteria, and Guidance (SCG) values based on documents referenced in the Groundwater Feasibility Study Report (ARCADIS Geraghty & Miller, Inc. 2000) that are based on the NYSDEC TOGs (NYSDEC 1998); most stringent values listed.

<sup>(2)</sup> Well N-10631 was observed to be filled with approximately 22 feet of sediment in July 2021 and therefore was not sampled in 2021.

Samples analyzed for total unfiltered and filtered Cadmium and Chromium using USEPA Method 6010C; Total indicates unfiltered sample and Dissolved indicates filtered sample.

Results for the program are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).

**Bold value indicates a detection**

--	Not analyzed
< 3.0	Compound not detected above its laboratory quantification limit
µg/L	Micrograms per liter
NYSDEC	New York State Department of Environmental Conservation
OU2	Operable Unit 2
REP	Blind Duplicate Sample
TOGs	Technical Operational and Guidance Series
USEPA	United States Environmental Protection Agency
<b> </b>	<b>Compound detected in exceedance of NYSDEC SCG Criteria</b>

**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Sample ID	Sample Date	1,4-Dioxane (µg/L)
<b>Zone 1</b>			
BPOW 1-1 <sup>(3)</sup>	BPOW 1-1	4/19/2021	< 0.200 J
BPOW 1-1 <sup>(3)</sup>	BPOW 1-1	10/25/2021	< 0.200
FW-03 <sup>(2)</sup>	FW-03	4/12/2021	< 0.24
GM-13D <sup>(2)</sup>	GM-13D	5/20/2021	<b>0.38 J</b>
GM-13D <sup>(2)</sup>	GM-13D	5/20/2021	<b>4.8 J</b>
GM-15I <sup>(2)</sup>	GM-15I	5/6/2021	< 0.23
GM-15I <sup>(2)</sup>	GM-15I	11/9/2021	<b>0.090 J</b>
GM-15SR <sup>(2)</sup>	GM-15SR	5/6/2021	< 0.24 B
GM-15SR <sup>(2)</sup>	GM-15SR	11/9/2021	<b>0.20 J</b>
GM-17D <sup>(2)</sup>	GM-17D	4/13/2021	<b>10</b>
GM-17D <sup>(2)</sup>	GM-17D	11/2/2021	< 7.2 B
GM-17I <sup>(2)</sup>	GM-17I	4/13/2021	<b>7.0</b>
GM-17I <sup>(2)</sup>	GM-17I	11/2/2021	< 7.8 B
GM-18D <sup>(2)</sup>	GM-18D	5/12/2021	<b>8.0</b>
GM-18D <sup>(2)</sup>	GM-18D	11/3/2021	<b>8.7 J</b>
GM-18I <sup>(2)</sup>	GM-18I	5/12/2021	<b>6.0</b>
GM-18I <sup>(2)</sup>	GM-18I	11/3/2021	<b>9.8 J</b>
GM-20D <sup>(2)</sup>	GM-20D	5/11/2021	<b>5.4</b>
GM-20I <sup>(2)</sup>	GM-20I	5/11/2021	<b>4.8</b>
GM-21D <sup>(2)</sup>	GM-21D	5/11/2021	<b>4.4</b>
GM-21I <sup>(2)</sup>	GM-21I	5/11/2021	<b>6.2</b>
GM-21S <sup>(2)</sup>	GM-21S	5/5/2021	<b>5.0</b>
GM-36D <sup>(2)</sup>	GM-36D	5/13/2021	<b>1.4</b>
GM-37D <sup>(2)</sup>	GM-37D	5/19/2021	<b>0.39</b>
GM-39DA <sup>(2)</sup>	GM-39DA	5/12/2021	<b>4.7</b>
GM-39DA <sup>(2)</sup>	GM-39DA	11/9/2021	<b>3.5</b>
GM-74I <sup>(2)</sup>	GM-74I	4/14/2021	<b>5.8</b>
GM-74I <sup>(2)</sup>	GM-74I	11/1/2021	<b>4.4</b>
GM-78I <sup>(2)</sup>	GM-78I	4/15/2021	<b>5.2 J</b>
GM-78S <sup>(2)</sup>	GM-78S	4/15/2021	<b>3.6 J</b>
GM-79D <sup>(2)</sup>	GM-79D	5/12/2021	<b>4.6</b>
GM-79D <sup>(2)</sup>	GM-79D	11/8/2021	<b>4.4</b>
GM-79I <sup>(2)</sup>	GM-79I	5/12/2021	<b>4.3</b>
GM-79I <sup>(2)</sup>	GM-79I	11/8/2021	<b>3.4</b>
HN-24I <sup>(2)</sup>	HN-24I	5/5/2021	<b>1.0</b>

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**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Sample ID	Sample Date	1,4-Dioxane (µg/L)
<b>Zone 1 (continued)</b>			
HN-40I <sup>(2)</sup>	HN-40I	5/4/2021	<b>0.20 J</b>
HN-40S <sup>(2)</sup>	HN-40S	5/4/2021	< 0.24
HN-42I <sup>(2)</sup>	HN-42I	5/4/2021	<b>0.31</b>
HN-42S <sup>(2)</sup>	HN-42S	5/4/2021	< 0.23
MW-01GF <sup>(2)</sup>	MW-01GF	4/15/2021	<b>7.8 J</b>
MW-01GF <sup>(2)</sup>	MW-01GF	11/4/2021	<b>6.4 J</b>
MW-02GF <sup>(2)</sup>	MW-02GF	4/15/2021	<b>6.2 J</b>
MW-02GF <sup>(2)</sup>	MW-02GF	11/4/2021	<b>6.4 J</b>
N-10624 <sup>(2)</sup>	N-10624	5/18/2021	<b>2.6</b>
N-10627 <sup>(2)</sup>	N-10627	5/19/2020	<b>4.1</b>
N-10631 <sup>(2)</sup>	N-10631	5/19/2020	<b>2.4</b>
PLT1 MW-04 <sup>(2)</sup>	PLT1 MW-04	5/6/2021	< 2.2 B
PLT1 MW-04 <sup>(2)</sup>	PLT1 MW-04	11/4/2021	< 0.24 BJ
PLT1 MW-04 <sup>(2)</sup>	PLT1 MW-04	11/4/2021	<b>1.3 J</b>
PLT1 MW-05 <sup>(2)</sup>	PLT1 MW-05	5/6/2021	< 0.24 B
PLT1 MW-05 <sup>(2)</sup>	PLT1 MW-05	11/4/2021	< 0.24 J
PLT1 MW-06 <sup>(2)</sup>	PLT1 MW-06	5/6/2021	< 0.24 J
PLT1 MW-06 <sup>(2)</sup>	PLT1 MW-06	5/6/2021	< 0.24 BJ
PLT1 MW-06 <sup>(2)</sup>	PLT1 MW-06	11/4/2021	< 0.24 BJ
<b>Zone 2</b>			
BPOW 1-2 <sup>(3)</sup>	BPOW 1-2	4/19/2021	< 0.200
BPOW 1-2 <sup>(3)</sup>	BPOW 1-2	10/25/2021	< 0.200
BPOW 1-3 <sup>(3)</sup>	BPOW 1-3	4/20/2021	<b>0.177 J</b>
BPOW 1-3 <sup>(3)</sup>	BPOW 1-3	10/25/2021	< 0.200
BPOW 1-4 <sup>(3)</sup>	BPOW 1-4	4/19/2021	<b>0.201</b>
BPOW 1-4 <sup>(3)</sup>	BPOW 1-4	10/25/2021	< 0.200
BPOW 2-1 <sup>(3)</sup>	BPOW 2-1	3/8/2021	<b>0.705 J</b>
BPOW 2-1 <sup>(3)</sup>	BPOW 2-1	4/20/2021	<b>0.871</b>
BPOW 2-1 <sup>(3)</sup>	BPOW 2-1	9/9/2021	<b>1.09</b>
BPOW 2-1 <sup>(3)</sup>	BPOW 2-1	10/27/2021	<b>1.35</b>
BPOW 2-2 <sup>(3)</sup>	BPOW 2-2	3/8/2021	<b>0.716</b>
BPOW 2-2 <sup>(3)</sup>	BPOW 2-2	4/20/2021	<b>0.772</b>
BPOW 2-2 <sup>(3)</sup>	BPOW 2-2	9/9/2021	<b>0.738</b>
BPOW 2-2 <sup>(3)</sup>	BPOW 2-2	10/27/2021	<b>0.572</b>
BPOW 3-1 <sup>(3)</sup>	BPOW 3-1	5/14/2021	<b>0.767</b>

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**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Sample ID	Sample Date	1,4-Dioxane (µg/L)
<b>Zone 2 (continued)</b>			
BPOW 3-1 <sup>(3)</sup>	BPOW 3-1	10/27/2021	<b>0.548</b>
GM-15D <sup>(2)</sup>	GM-15D	5/6/2021	< 0.24 B
GM-15D <sup>(2)</sup>	GM-15D	11/9/2021	<b>0.14 J</b>
GM-34D <sup>(2)</sup>	GM-34D	5/25/2021	<b>6.6</b>
GM-34D <sup>(2)</sup>	GM-34D	11/8/2021	<b>6.3</b>
GM-37D2 <sup>(2)</sup>	GM-37D2	5/19/2021	<b>0.44</b>
GM-38D <sup>(2)</sup>	GM-38D	5/13/2021	<b>3.1 J</b>
GM-38D <sup>(2)</sup>	GM-38D	11/2/2021	< 4.4 B
GM-38D <sup>(2)</sup>	GM-38D	11/2/2021	< 0.25
GM-38D2 <sup>(2)</sup>	GM-38D2	5/13/2021	<b>0.59</b>
GM-38D2 <sup>(2)</sup>	GM-38D2	11/2/2021	< 3.2 B
GM-39DB <sup>(2)</sup>	GM-39DB	5/12/2021	<b>4.3</b>
GM-39DB <sup>(2)</sup>	GM-39DB	11/9/2021	<b>2.8</b>
GM-70D2 <sup>(2)</sup>	GM-70D2	5/18/2021	<b>3.9</b>
GM-71D2 <sup>(2)</sup>	GM-71D2	5/18/2021	<b>3.8</b>
GM-73D <sup>(2)</sup>	GM-73D	4/14/2021	<b>1.8</b>
GM-73D <sup>(2)</sup>	GM-73D	10/29/2021	<b>2.5</b>
GM-74D <sup>(2)</sup>	GM-74D	4/14/2021	<b>5.4</b>
GM-74D <sup>(2)</sup>	GM-74D	11/1/2021	<b>3.8 J</b>
GM-78D <sup>(2)</sup>	GM-78D	4/15/2021	<b>10 J</b>
GM-78D <sup>(2)</sup>	GM-78D	11/17/2021	<b>7.6</b>
GM-78D <sup>(2)</sup>	GM-78D	11/17/2021	<b>8.7</b>
GM-78D2 <sup>(2)</sup>	GM-78D2	4/15/2021	<b>13 J</b>
GM-78D2 <sup>(2)</sup>	GM-78D2	4/15/2021	<b>14 J</b>
GM-78D2 <sup>(2)</sup>	GM-78D2	11/2/2021	< 14 B
MW-3-1 <sup>(2)</sup>	MW-3-1	4/12/2021	<b>15</b>
MW-3-1 <sup>(2)</sup>	MW-3-1	4/12/2021	<b>13</b>
MW-3-1 <sup>(2)</sup>	MW-3-1	10/29/2021	<b>8.3</b>
WELL 3R <sup>(2)</sup>	WELL 3R	3/16/2021	<b>11</b>
WELL 3R <sup>(2)</sup>	WELL 3R	5/13/2021	<b>8.9</b>
WELL 3R <sup>(2)</sup>	WELL 3R	8/18/2021	<b>12</b>
WELL 3R <sup>(2)</sup>	WELL 3R	11/11/2021	<b>8.6</b>
<b>Zone 3</b>			
BPOW 1-5 <sup>(3)</sup>	BPOW 1-5	4/19/2021	< 0.200
BPOW 1-5 <sup>(3)</sup>	BPOW 1-5	4/19/2021	< 0.200
BPOW 2-3 <sup>(3)</sup>	BPOW 2-3	3/8/2021	<b>2.89</b>

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**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Sample ID	Sample Date	1,4-Dioxane (µg/L)
<b>Zone 3 (continued)</b>			
BPOW 2-3 <sup>(3)</sup>	BPOW 2-3	4/20/2021	<b>2.77</b>
BPOW 2-3 <sup>(3)</sup>	BPOW 2-3	9/9/2021	<b>4.14</b>
BPOW 2-3 <sup>(3)</sup>	BPOW 2-3	9/9/2021	<b>4.07</b>
BPOW 2-3 <sup>(3)</sup>	BPOW 2-3	10/27/2021	<b>3.20</b>
BPOW 3-2 <sup>(3)</sup>	BPOW 3-2	5/17/2021	<b>3.98</b>
BPOW 3-2 <sup>(3)</sup>	BPOW 3-2	11/10/2021	<b>3.20</b>
BPOW 3-3 <sup>(3)</sup>	BPOW 3-3	5/17/2021	<b>7.01 J</b>
BPOW 3-3 <sup>(3)</sup>	BPOW 3-3	10/28/2021	<b>7.31</b>
BPOW 3-4 <sup>(3)</sup>	BPOW 3-4	5/17/2021	<b>7.74</b>
BPOW 3-4 <sup>(3)</sup>	BPOW 3-4	10/28/2021	<b>8.24</b>
BPOW 3-4 <sup>(3)</sup>	BPOW 3-4	10/28/2021	<b>8.92</b>
BPOW 4-1R <sup>(1)(3)</sup>	BPOW 4-1R	4/20/2021	<b>3.69</b>
BPOW 4-1R <sup>(1)(3)</sup>	BPOW 4-1R	10/28/2021	<b>4.31 J</b>
GM-15D2 <sup>(2)</sup>	GM-15D2	5/6/2021	< 3.7 B
GM-15D2 <sup>(2)</sup>	GM-15D2	11/9/2021	<b>2.5</b>
GM-21D2 <sup>(2)</sup>	GM-21D2	3/8/2021	<b>4.5</b>
GM-21D2 <sup>(2)</sup>	GM-21D2	5/5/2021	<b>4.3</b>
GM-21D2 <sup>(2)</sup>	GM-21D2	9/10/2021	<b>6.7</b>
GM-21D2 <sup>(2)</sup>	GM-21D2	11/3/2021	<b>5.8 J</b>
GM-33D2 <sup>(2)</sup>	GM-33D2	5/20/2021	<b>9.9</b>
GM-33D2 <sup>(2)</sup>	GM-33D2	11/3/2021	<b>10 J</b>
GM-34D2 <sup>(2)</sup>	GM-34D2	5/25/2021	<b>4.3</b>
GM-34D2 <sup>(2)</sup>	GM-34D2	11/8/2021	<b>6.7</b>
GM-35D2 <sup>(2)</sup>	GM-35D2	5/19/2021	<b>5.8</b>
GM-35D2 <sup>(2)</sup>	GM-35D2	11/10/2021	<b>8.7</b>
GM-73D2 <sup>(2)</sup>	GM-73D2	4/14/2021	<b>2.7</b>
GM-73D2 <sup>(2)</sup>	GM-73D2	10/29/2021	<b>1.6</b>
GM-73D3 <sup>(2)</sup>	GM-73D3	4/14/2021	<b>1.5 J</b>
GM-73D3 <sup>(2)</sup>	GM-73D3	10/29/2021	<b>1.2</b>
GM-74D2 <sup>(2)</sup>	GM-74D2	4/14/2021	<b>3.0</b>
GM-74D2 <sup>(2)</sup>	GM-74D2	11/1/2021	<b>2.4</b>
GM-74D3 <sup>(2)</sup>	GM-74D3	4/14/2021	<b>1.6</b>
GM-74D3 <sup>(2)</sup>	GM-74D3	11/1/2021	<b>1.4</b>
GM-75D2 <sup>(2)</sup>	GM-75D2	5/18/2021	<b>4.9</b>
GM-75D2 <sup>(2)</sup>	GM-75D2	11/3/2021	<b>8.1 J</b>

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**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Sample ID	Sample Date	1,4-Dioxane (µg/L)
<b>Zone 3 (continued)</b>			
WELL 1 <sup>(2)</sup>	WELL 1	3/16/2021	<b>6.8</b>
WELL 1 <sup>(2)</sup>	WELL 1	5/13/2021	<b>7.2</b>
WELL 1 <sup>(2)</sup>	WELL 1	8/18/2021	<b>7.5</b>
WELL 1 <sup>(2)</sup>	WELL 1	11/11/2021	<b>8.8</b>
WELL 17 <sup>(2)</sup>	WELL 17	2/24/2021	<b>6.9</b>
WELL 17 <sup>(2)</sup>	WELL 17	5/13/2021	<b>4.2</b>
WELL 17 <sup>(2)</sup>	WELL 17	8/18/2021	<b>8.4</b>
WELL 17 <sup>(2)</sup>	WELL 17	11/11/2021	<b>10</b>
WELL 18 <sup>(2)</sup>	WELL 18	2/24/2021	<b>4.8</b>
WELL 18 <sup>(2)</sup>	WELL 18	5/13/2021	<b>4.8</b>
WELL 18 <sup>(2)</sup>	WELL 18	8/18/2021	<b>4.8</b>
WELL 18 <sup>(2)</sup>	WELL 18	11/11/2021	<b>4.5</b>
WELL 19 <sup>(2)</sup>	WELL 19	2/24/2021	<b>4.4</b>
WELL 19 <sup>(2)</sup>	WELL 19	2/24/2021	<b>4.2</b>
WELL 19 <sup>(2)</sup>	WELL 19	5/13/2021	<b>4.0</b>
WELL 19 <sup>(2)</sup>	WELL 19	5/13/2021	<b>3.7</b>
WELL 19 <sup>(2)</sup>	WELL 19	8/18/2021	<b>3.1</b>
WELL 19 <sup>(2)</sup>	WELL 19	8/18/2021	<b>3.8</b>
WELL 19 <sup>(2)</sup>	WELL 19	11/11/2021	<b>4.6</b>
<b>Zone 4</b>			
BPOW 1-6 <sup>(3)</sup>	BPOW 1-6	4/19/2021	< 0.200
BPOW 1-6 <sup>(3)</sup>	BPOW 1-6	10/25/2021	< 0.200
BPOW 4-2R <sup>(1)(3)</sup>	BPOW 4-2R	4/20/2021	<b>2.12</b>
BPOW 4-2R <sup>(1)(3)</sup>	BPOW 4-2R	10/28/2021	<b>1.89</b>

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**Table 12**  
**1,4-Dioxane Concentrations in Groundwater for 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

(1) The NAVY abandoned original Wells BPOW4-1 and BPOW4-2 and installed replacement Wells BPOW4-1R and BPOW4-2R between August, 2014 and October, 2014.

(2) Samples analyzed using USEPA Method 8270D SIM

(3) Samples analyzed using USEPA Method 522

Results are validated at 20% frequency, per protocols specified in OU2 Groundwater Monitoring Plan (Arcadis 2016).

Samples were analyzed for 1,4-Dioxane using USEPA Method 8270D SIM, except for outpost wells (BPOW designation in Well ID) which were analyzed using USEPA Method 522.

**Bold value indicates constituent detected.**

< 0.20	Compound not detected above its laboratory quantification limit
µg/L	micrograms per liter
B	Contamination found in associated blank
J	Value is estimated concentration
OU2	Operable Unit 2
SIM	Selective Ion Monitoring
USEPA	United States Environmental Protection Agency

**Table 13**  
**Percent Change in Total Volatile Organic Compounds Over Time**  
**in Monitoring and Remedial Wells**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Highest Historical or Earliest Concentration <sup>(1)</sup>		Current TVOC Concentration		Percent Change From Highest Historical or Earliest Concentration
	Date	µg/L	Date	µg/L	
<b>Upgradient From OU2 ONCT System (Zone 1)</b>					
FW-03	1/3/2002	64.9	4/12/2021	ND	100.0%
<b>GM-13D</b>	<b>3/23/2000</b>	<b>2,401</b>	5/20/2021	<b>28.1</b>	<b>-98.8%</b>
<b>HN-24I</b>	<b>12/1/1991</b>	<b>58,034</b>	5/5/2021	<b>15.1</b>	<b>-100%</b>
HN-40I	12/22/2003	53.3	5/4/2021	7.4	-86.1%
HN-40S	3/17/2006	8.0	5/4/2021	ND	100.0%
HN-42I	7/8/2009	27.4	5/4/2021	ND	100.0%
HN-42S	3/18/2003	5.0	5/4/2021	ND	100.0%
<b>Average Upgradient:</b>	--	<b>8,656</b>	--	16.9	<b>-99.8%</b>
<b>Proximate to OU2 ONCT System (Zone 1)</b>					
GM-15SR	6/28/2017	11.1	11/9/2021	0.94	-91.5%
GM-15I	2/24/2010	38.2	11/9/2021	0.8	-97.9%
GM-17D	12/27/2001	3.0	11/2/2021	ND	100.0%
GM-17I	3/28/2003	2.5	11/2/2021	ND	100.0%
GM-18D	4/11/2006	12.9	11/3/2021	ND	100.0%
GM-18I	10/29/1991	14.0	11/3/2021	ND	100.0%
GM-20D	6/28/2018	50.2	5/11/2021	ND	100.0%
GM-20I	6/5/2001	899	5/11/2021	0.55	-99.9%
GM-21D	9/10/2019	8.0	5/11/2021	0.57	-92.9%
GM-21I	10/23/1991	17.0	5/11/2021	0.76	-95.5%
GM-21S	10/22/1991	7.0	5/5/2021	0.53	-92.4%
GM-39DA	3/23/2004	42.0	11/9/2021	1.1	-97.4%
<b>GM-74I</b>	<b>12/9/2013</b>	<b>1.4</b>	11/1/2021	<b>ND</b>	<b>100.0%</b>
GM-78I	1/9/2002	7.0	4/15/2021	4.1	-41.1%
GM-78S	6/18/2002	8.8	4/15/2021	4.7	-46.9%
<b>GM-79D</b>	<b>4/7/2003</b>	<b>116</b>	<b>11/8/2021</b>	<b>16.5</b>	<b>-85.8%</b>
GM-79I	2/14/2012	31.4	11/8/2021	1.7	-94.6%
<b>Proximate to OU2 ONCT System (Zone 2)</b>					
GM-15D	10/8/2001	39.9	11/9/2021	ND	100.0%
GM-39DB	1/7/2003	111	11/9/2021	14.7	-86.8%
GM-73D	10/18/2002	780	10/29/2021	39.1	-95.0%
<b>GM-74D</b>	<b>2/5/2001</b>	<b>87.0</b>	<b>11/1/2021</b>	<b>1.9</b>	<b>-97.8%</b>
GM-78D	4/26/2013	4.8	11/17/2021	0.54	-88.7%
GM-78D2	5/4/2017	1.6	11/2/2021	0.88	-45.0%
MW-3-1	3/28/2012	1,620	10/29/2021	122	-92.5%
<b>Proximate to OU2 ONCT System (Zone 3)</b>					
GM-15D2	3/21/2003	36.5	11/9/2021	9.6	-73.7%
<b>GM-21D2</b>	<b>2/11/2016</b>	<b>278</b>	<b>11/3/2021</b>	<b>3.9</b>	<b>-98.6%</b>
<b>GM-33D2</b>	<b>11/2/1994</b>	<b>16,000</b>	<b>11/3/2021</b>	<b>18.4</b>	<b>-99.9%</b>
<b>GM-73D2</b>	<b>11/22/2002</b>	<b>1,204</b>	<b>10/29/2021</b>	<b>61.3</b>	<b>-94.9%</b>
GM-73D3	10/8/2019	3.3	10/29/2021	3.6	9.1%
<b>GM-74D2</b>	<b>3/20/2006</b>	<b>25.4</b>	<b>11/1/2021</b>	<b>12.4</b>	<b>-51.0%</b>
<b>GM-74D3</b>	<b>6/13/2015</b>	<b>11.5</b>	<b>11/1/2021</b>	<b>6.9</b>	<b>-39.9%</b>
<b>Average Proximate:</b>	--	<b>693</b>	--	<b>13.6</b>	<b>-98.0%</b>

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**Table 13**  
**Percent Change in Total Volatile Organic Compounds Over Time**  
**in Monitoring and Remedial Wells**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well ID	Highest Historical TVOC Concentration		Current Concentration		Percent Change From Highest Historical Concentration
	Date	µg/L	Date	µg/L	
<b>Near Central Downgradient of OU2 ONCT System <sup>(2)</sup></b>					
GM-37D / 1	9/7/1999	41.0	5/19/2021	7.7	-81.2%
GM-37D2 / 2	7/13/2000	29.0	5/19/2021	2.42	-91.7%
GM-75D2 / 3	10/3/2002	1,566	11/3/2021	13.8	-99.1%
N-10624 / 1	3/31/2004	3.0	5/18/2021	ND	100.0%
<b>Average Near:</b>	--	<b>410</b>	--	<b>8.0</b>	<b>-98.1%</b>
<b>Far Central Downgradient of OU2 ONCT System <sup>(2)</sup></b>					
GM-34D / 2	11/30/2006	1,172	11/8/2021	105.79	-91.0%
GM-34D2 / 3	6/9/2005	415	11/8/2021	53.4	-87.1%
GM-35D2 / 3	10/3/2002	455	11/10/2021	30.6	-93.3%
GM-36D / 1	8/23/1993	255	5/13/2021	ND	100.0%
GM-36D2 / 2	6/26/2018	5.3	5/13/2021	4.0	-23.6%
GM-70D2 / 2	12/16/1996	314	5/18/2021	7.9	-97.5%
GM-71D2 / 2	4/12/2016	26.5	5/18/2021	11.4	-56.8%
<b>Average Far:</b>	--	<b>377</b>	--	<b>35.5</b>	<b>-90.6%</b>
<b>Average Near and Far:</b>	--	<b>389</b>	--	<b>26</b>	<b>-93.2%</b>
<b>GM-38 Area Downgradient of OU2 ONCT System <sup>(2)</sup></b>					
GM-38D / 2	12/11/1996	1,622	11/2/2021	132	-91.9%
GM-38D2 / 2	7/1/2002	2,012	11/2/2021	36.9	-98.2%
<b>Average GM-38 Area:</b>	--	<b>1,817</b>	--	<b>84.3</b>	<b>-95.4%</b>
<b>Former Outpost Wells Downgradient of OU2 ONCT System <sup>(2)</sup></b>					
BPOW 1-1 / 1	4/30/2004	30.2	10/25/2021	0.98	-96.8%
BPOW 1-2 / 2	6/7/2016	1.6	10/25/2021	0.78	-52.6%
BPOW 1-3 / 2	6/18/2007	16.0	10/25/2021	ND	NA
BPOW 1-4 / 2	11/8/2017	0.2	10/25/2021	ND	NA
BPOW 1-6 / 4	11/29/2016	0.1	10/25/2021	ND	NA
BPOW 2-1 / 2	6/19/2007	230	10/27/2021	ND	NA
BPOW 2-2 / 2	1/17/2006	2.6	10/27/2021	ND	NA
BPOW 2-3 / 3	12/22/2011	0.6	10/27/2021	ND	NA
BPOW 3-1 / 2	6/4/2019	0.2	10/27/2021	ND	NA
BPOW 3-2 / 3	10/21/2003	0.3	11/10/2021	ND	NA
BPOW 3-3 / 3	8/11/2011	0.0	10/28/2021	1.0	100.0%
BPOW 3-4 / 3	8/11/2011	43.5	10/28/2021	307	606%
BPOW 4-1R / 3	12/30/2014	8.8	10/28/2021	65.0	636%
BPOW 4-2R / 4	12/30/2014	11.7	10/28/2021	43.5	271%
<b>Average BPOW Wells:</b>	--	<b>24.7</b>	--	<b>69.7</b>	<b>182.5%</b>
<b>ONCT Remedial Wells (Zone 3)</b>					
Well 1	3/17/1989	14,362	11/11/2021	633	-95.6%
Well 17	3/5/1998	7,200	11/11/2021	175	-97.6%
Well 18	10/16/2000	221	11/11/2021	63.5	-71.3%
Well 19	2/27/2012	237	11/11/2021	121	-49.2%
Well 3R	12/13/2017	647	11/11/2021	245	-62.1%
<b>Average ONCT Wells:</b>	--	<b>4,533</b>	--	<b>247</b>	<b>-94.5%</b>

Notes and Abbreviations on last page

**Table 13**  
**Percent Change in Total Volatile Organic Compounds Over Time**  
**in Monitoring and Remedial Wells**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



**Notes and Abbreviations:**

<sup>(1)</sup> Yellow color indicates % increase from initial concentration

Green color indicates % decrease from historical high concentration

<sup>(2)</sup> Well Zone is Specified in Well ID Column with Well ID and ( / [Zone #]).

ND Non-Detect

NA Not Applicable

**Bold wells are shown in trend graph figures.**

Well BPOW1-5 has no historical VOC detections and is not shown on table.

TVOC concentrations are rounded to the number of decimal places of the individual VOC with the least precision (decimal places), including whole numbers with no decimal place.

**Table 14**  
**Water-Level Measurement Results, Second Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well Identification <sup>(1)</sup>	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water <sup>(8)</sup> (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 1 Wells</b>				
FW-03	49-64	124.30	53.28	71.02
MW-3R	45-55	101.45	34.28	67.17
N-9921 <sup>(2)</sup>	58-62	94.23	NM	NM
N-10597	63-67	109.85	39.07	70.78
N-10600	57-61	102.41	36.13	66.28
N-10631	63-67	103.47	37.73	NM
N-10633	63-67	103.80	36.23	67.57
N-10634	63-67	101.20	38.46	62.74
N-10821 <sup>(2)</sup>	63-67	91.58	NM	NM
GM-15SR	70-80	109.35	42.82	66.53
GM-15I	95-105	109.29	42.45	66.84
GM-16SR	60-70	115.86	45.66	70.20
GM-16I	135-145	115.81	45.63	70.18
GM-17I	100-120	115.83	43.25	72.58
GM-17SR	60-70	115.79	42.60	73.19
GM-18S	63-67	107.60	40.03	67.57
GM-18I	95-105	109.03	40.95	68.08
GM-19S	48-53	109.86	39.99	69.87
GM-19I	130-140	109.86	41.21	68.65
GM-20I	95-105	103.88	36.61	67.27
GM-21S	63-67	105.81	33.36	72.45
GM-21I	130-140	105.72	36.50	69.22
GM-74I	94-114	107.42	36.76	70.66
GM-78S	60-70	104.94	37.89	67.05
GM-78I	90-110	105.06	37.94	67.12
GM-79S (N-10628)	63-67	100.88	37.25	63.63
HN-24S	49-59	122.73	49.27	73.46
HN-29I	120-130	116.42	43.92	72.50
HN-40S	49-59	116.35	47.31	69.04
HN-40I	108-118	115.91	47.08	68.83
HN-42S	50-60	120.32	45.91	74.41
HN-42I	100-110	119.61	45.67	73.94
PZ-ONCT-1	48-58	103.97	37.92	66.05
PZ-ONCT-2	48-58	105.42	36.2	69.22
PZ-ONCT-4	48-58	105.90	36.89	69.01
PZ-ONCT-5	53-63	106.71	34.32	72.39
PZ-ONCT-6	48-58	106.43	33.16	73.27
PZ-ONCT-7	48-58	105.67	31.29	74.38
PZ-ONCT-8	48-58	106.76	40.7	66.06
PZ-ONCT-9	48-58	104.63	37.68	66.95
PZ-PLT5-1	57-67	118.29	46.89	71.40
PZ-PLT5-2	52-62	117.29	47.23	70.06
PZ-PLT5-3	50-60	115.96	48.96	67.00
PZ-PLT5-4	50-60	115.11	43.96	71.15
PZ-PLT5-5	53-63	113.22	43.56	69.66
PZ-PLT5-6	51-61	114.81	44.95	69.86

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Table 14  
 Water-Level Measurement Results, Second Quarter 2021  
 Operable Unit 2  
 Northrop Grumman  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 1 Wells Continued</b>				
N-10624	190-194	93.61	30.66	62.95
GM-13D	200-210	113.97	44.17	69.80
HN-24I	148-158	125.80	49.76	76.04
HN-29D	210-220	115.11	44.42	70.69
GM-79I	170-180	101.09	37.91	63.18
N-10627	290-295	93.70	31.15	62.55
GM-17D	278-298	115.68	47.54	68.14
GM-18D	290-300	108.88	43.54	65.34
GM-20D	216-226	103.92	37.65	66.27
GM-21D	278-288	105.66	41.51	64.15
GM-36D	204-214	91.63	32.89	58.74
GM-37D	242-262	97.26	37.73	59.53
GM-39D <sub>A</sub> <sup>(3)</sup>	262-282	102.23	37.25	64.98
GM-74D	295-305	107.43	43.47	63.96
BPOW 1-1	196-241	73.65	27.64	46.01
GM-79D	280-290	101.25	39.68	61.57
MW203D <sup>(7)</sup>	275-290	127.15	54.90	72.25
MW178S <sup>(7)</sup>	190-210	114.48	45.60	68.88
MW179D <sup>(7)</sup>	212-232	118.48	47.68	70.80
MW178I <sup>(7)</sup>	290-310	114.75	46.07	68.68
<b>Zone 2 Wells</b>				
GM-15D	332-342	109.84	47.27	62.57
GM-34D	309-319	71.19	13.14	58.05
GM-37D2	370-390	97.17	36.98	60.19
GM-38D	320-340	91.75	36.85	54.90
GM-39D <sub>B</sub> <sup>(3)</sup>	410-420	102.08	39.91	62.17
GM-70D2	310-330	99.58	39.83	59.75
GM-73D	401-411	104.87	42.46	62.41
GM-78D	354-364	103.81	41.86	61.95
BPOW 1-2	310-335	73.54	30.84	42.70
BPOW 1-3	374-419	71.92	31.29	40.63
BPOW 1-4	340-400	56.68	11.60	45.08
BPOW 2-1	360-400	58.64	17.02	41.62
GM-38D2	475-495	91.56	37.03	54.53
GM-71D2	444-464	98.45	39.58	58.87
GM-78D2	459-479	103.82	43.92	59.90
BPOW 2-2	455-495	58.50	18.17	40.33
BPOW 3-1	446-516	61.43	23.43	38.00
RE106D1	440-460	101.19	40.02	61.17
RE106D2	480-490	101.37	40.45	60.92
MW201D <sup>(7)</sup>	335-350	120.92	50.35	70.57
MW201D1 <sup>(7)</sup>	480-500	120.80	50.64	70.16
MW202D <sup>(7)</sup>	335-350	125.95	54.10	71.85
MW202D1 <sup>(7)</sup>	425-440	125.98	54.30	71.68
MW203D1 <sup>(7)</sup>	335-350	127.07	54.90	72.17
MW203D2 <sup>(7)</sup>	435-450	127.02	55.10	71.92
MW178I1 <sup>(7)</sup>	420-440	113.88	46.45	67.43

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**Table 14**  
**Water-Level Measurement Results, Second Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 2 Wells Continued</b>				
MW179D1 <sup>(7)</sup>	305-325	119.31	48.90	70.41
MW179D2 <sup>(7)</sup>	400-420	119.00	49.50	69.50
Well 3R	421-531	119.80	80.30	39.50
RE123D1 <sup>(7)</sup>	480-500	105.49	45.24	60.25
<b>Zone 3 Wells</b>				
GM-15D2	536-556	109.78	45.47	64.31
GM-21D2	516-526	104.62	47.15	57.47
GM-33D2	500-520	106.85	47.34	59.51
GM-34D2	510-520	71.19	14.74	56.45
GM-35D2	510-530	96.28	39.72	56.56
GM-36D2	520-540	91.60	28.29	63.31
GM-73D2	532-552	104.62	44.26	60.36
GM-73D3	635-650	103.88	44.36	59.52
GM-74D2	542-562	107.36	50.86	56.50
GM-74D3	625-645	106.56	47.76	58.80
GM-75D2	505-525	93.63	33.92	59.71
MW 3-1	556-566	115.28	56.61	58.67
Well 1 <sup>(4)(5)</sup>	519-570	116.78	85.20	31.58
Well 17 <sup>(4)(5)</sup>	480-563	104.10	62.10	42.00
Well 18 <sup>(4)(5)</sup>	466-570	110.00	72.10	37.90
Well 19 <sup>(4)(5)</sup>	465-617	108.70	58.60	50.10
BPOW 1-5	600-650	56.75	12.72	44.03
BPOW 2-3	564-594	57.98	17.24	40.74
BPOW 3-2	612-647	61.82	24.96	36.86
BPOW 3-3	580-620	60.64	20.67	39.97
BPOW 3-4	640-690	62.44	23.07	39.37
BPOW 4-1R <sup>(6)</sup>	652-692	67.34	21.51	45.83
RE106D3	510-530	101.34	40.53	60.81
RE107D1	505-525	98.92	40.29	58.63
RE107D2	560-580	98.99	39.94	59.05
RE107D3	645-665	99.96	41.44	58.52
RE109D1	515-535	100.03	42.44	57.59
RE109D2	550-570	100.15	42.67	57.48
RE109D3	580-600	100.40	42.71	57.69
RE123D2 <sup>(7)</sup>	635-655	106.11	46.45	59.66
RE126D1 <sup>(7)</sup>	500-520	101.03	43.80	57.23
RE126D2 <sup>(7)</sup>	555-575	101.39	44.45	56.94
RE126D3 <sup>(7)</sup>	640-660	101.10	44.05	57.05

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**Table 14**  
**Water-Level Measurement Results, Second Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 4 Wells</b>				
BPOW 1-6	700-750	57.06	12.95	44.11
BPOW 4-2R <sup>(6)</sup>	725-765	67.18	22.93	44.25
RE123D3 <sup>(7)</sup>	815-835	105.92	46.59	59.33

**Notes and Abbreviations:**

- <sup>(1)</sup> Well identification (e.g., GM-70D2) does not necessarily designate or correlate with the aquifer zone.
- <sup>(2)</sup> Well N-9921 was not accessible due to past soil re-grading activities on the road median that covered the well. Well N-10821 no longer exists. New well located in same place (well construction details unknown).
- <sup>(3)</sup> Monitoring wells were voluntarily monitored to enhance coverage in Zone 2 and Zone 3.
- <sup>(4)</sup> Surveyed elevation not available, elevation is estimated from topographic map of the area.
- <sup>(5)</sup> Pumping rates for the Wells collected during Water Level Measurement are as follows: Well 1 is 910 gpm, Well 3R is 710 gpm, Well 17 is 1,010 gpm, Well 18 is 1,010 gpm and Well 19 is 509 gpm as recorded in April 2021.
- <sup>(6)</sup> The NAVY abandoned original Wells BPOW4-1R and BPOW4-2R between August, 2014 and October, 2014 August 8, 2017.
- <sup>(7)</sup> Water level data for this well was collected by Navy and was provided to Arcadis.
- <sup>(8)</sup> Hydraulic monitoring was performed from April 6 to April 8, 2021.
  - ft bmp                feet below measuring point
  - ft msl                feet relative to mean sea level
  - gpm                    gallons per minute

**Table 15**  
**Water-Level Measurement Results, Fourth Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water <sup>(8)</sup> (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 1 Wells</b>				
FW-03	49-64	124.30	53.01	71.29
MW-3R	45-55	101.45	34.64	66.81
N-9921 <sup>(2)</sup>	58-62	94.23	NM	NM
N-10597	63-67	109.85	40.58	69.27
N-10600	57-61	102.41	36.70	65.71
N-10631 <sup>(9)</sup>	63-67	103.47	NM	NM
N-10633	63-67	103.80	36.29	67.51
N-10634	63-67	101.20	37.85	63.35
N-10821 <sup>(2)</sup>	63-67	91.58	NM	NM
GM-15SR	70-80	109.35	42.00	67.35
GM-15I	95-105	109.29	41.70	67.59
GM-16SR	60-70	115.86	44.95	70.91
GM-16I	135-145	115.81	45.05	70.76
GM-17I	100-120	115.83	43.10	72.73
GM-17SR	60-70	115.79	42.50	73.29
GM-18S	63-67	107.60	39.65	67.95
GM-18I	95-105	109.03	40.45	68.58
GM-19S	48-53	109.86	38.90	70.96
GM-19I	130-140	109.86	40.35	69.51
GM-20I	95-105	103.88	30.35	73.53
GM-21S	63-67	105.81	33.15	72.66
GM-21I	130-140	105.72	35.77	69.95
GM-74I	94-114	107.42	35.69	71.73
GM-78S	60-70	104.94	39.34	65.60
GM-78I	90-110	105.06	39.60	65.46
GM-79S (N-10628)	63-67	100.88	43.53	57.35
HN-24S	49-59	122.73	49.03	73.70
HN-29I	120-130	116.42	44.10	72.32
HN-40S	49-59	116.35	46.25	70.10
HN-40I	108-118	115.91	46.11	69.80
HN-42S	50-60	120.32	48.56	71.76
HN-42I	100-110	119.61	48.88	70.73
PZ-ONCT-1	48-58	103.97	36.44	67.53
PZ-ONCT-2	48-58	105.42	38.07	67.35
PZ-ONCT-4	48-58	105.9	36.57	69.33
PZ-ONCT-5	53-63	106.71	34.20	72.51
PZ-ONCT-6	48-58	106.43	32.41	74.02
PZ-ONCT-7	48-58	105.67	30.80	74.87
PZ-ONCT-8	48-58	106.76	38.52	68.24
PZ-ONCT-9	48-58	104.63	36.51	68.12
PZ-PLT5-1	57-67	118.29	48.00	70.29
PZ-PLT5-2	52-62	117.29	46.70	70.59
PZ-PLT5-3	50-60	115.96	43.54	72.42
PZ-PLT5-4	50-60	115.11	43.94	71.17
PZ-PLT5-5	53-63	113.22	43.30	69.92
PZ-PLT5-6	51-61	114.81	44.81	70.00

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**Table 15**  
**Water-Level Measurement Results, Fourth Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 1 Wells Continued</b>				
N-10624	190-194	93.61	30.20	63.41
GM-13D	200-210	113.97	43.45	70.52
HN-24I	148-158	125.80	49.82	75.98
HN-29D	210-220	115.11	44.42	70.69
GM-79I	170-180	101.09	36.97	64.12
N-10627	290-295	93.70	30.65	63.05
GM-17D	278-298	115.68	47.14	68.54
GM-18D	290-300	108.88	43.12	65.76
GM-20D	216-226	103.92	37.45	66.47
GM-21D	278-288	105.66	40.09	65.57
GM-36D	204-214	91.63	32.40	59.23
GM-37D	242-262	97.26	36.50	60.76
GM-39D <sub>A</sub> <sup>(3)</sup>	262-282	102.23	37.14	65.09
GM-74D	295-305	107.43	43.00	64.43
BPOW 1-1	196-241	73.65	27.50	46.15
GM-79D	280-290	101.25	39.25	62.00
MW203D <sup>(7)</sup>	275-290	127.15	54.32	72.83
MW178S <sup>(7)</sup>	190-210	114.48	44.66	69.82
MW179D <sup>(7)</sup>	212-232	118.48	47.88	70.60
MW178I <sup>(7)</sup>	290-310	114.75	45.21	69.54
<b>Zone 2 Wells</b>				
GM-15D	332-342	109.84	44.63	65.21
GM-34D	309-319	71.19	12.69	58.50
GM-37D2	370-390	97.17	36.33	60.84
GM-38D	320-340	91.75	36.65	55.10
GM-39D <sub>B</sub> <sup>(3)</sup>	410-420	102.08	39.69	62.39
GM-70D2	310-330	99.58	38.94	60.64
GM-73D	401-411	104.87	42.24	62.63
GM-78D	354-364	103.81	41.85	61.96
BPOW 1-2	310-335	73.54	29.20	44.34
BPOW 1-3	374-419	71.92	29.65	42.27
BPOW 1-4	340-400	56.68	11.40	45.28
BPOW 2-1	360-400	58.64	17.95	40.69
GM-38D2	475-495	91.56	38.25	53.31
GM-71D2	444-464	98.45	39.82	58.63
GM-78D2	459-479	103.82	43.86	59.96
BPOW 2-2	455-495	58.50	18.35	40.15
BPOW 3-1	446-516	61.43	23.84	37.59
RE106D1	440-460	101.19	39.66	61.53
RE106D2	480-490	101.37	40.15	61.22
MW201D <sup>(7)</sup>	335-350	120.92	49.97	70.95
MW201D1 <sup>(7)</sup>	480-500	120.80	50.39	70.41
MW202D <sup>(7)</sup>	335-350	125.95	53.66	72.29
MW202D1 <sup>(7)</sup>	425-440	125.98	53.92	72.06
MW203D1 <sup>(7)</sup>	335-350	127.07	54.34	72.73
MW203D2 <sup>(7)</sup>	435-450	127.02	54.49	72.53
MW178I1 <sup>(7)</sup>	420-440	113.88	45.88	68.00

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**Table 15**  
**Water-Level Measurement Results, Fourth Quarter 2021**  
**Operable Unit 2**  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 2 Wells Continued</b>				
MW179D1 <sup>(7)</sup>	305-325	119.31	48.17	71.14
MW179D2 <sup>(7)</sup>	400-420	119.00	48.33	70.67
Well 3R	421-531	119.80	82.1	37.70
RE123D1 <sup>(7)</sup>	480-500	105.49	44.57	60.92
<b>Zone 3 Wells</b>				
GM-15D2	536-556	109.78	47.15	62.63
GM-21D2	516-526	104.62	47.25	57.37
GM-33D2	500-520	106.85	47.18	59.67
GM-34D2	510-520	71.19	15.20	55.99
GM-35D2	510-530	96.28	39.12	57.16
GM-36D2	520-540	91.60	35.99	55.61
GM-73D2	532-552	104.62	44.14	60.48
GM-73D3	635-650	103.88	44.36	59.52
GM-74D2	542-562	107.36	50.88	56.48
GM-74D3	625-645	106.56	47.9	58.66
GM-75D2	505-525	93.63	33.80	59.83
MW 3-1	556-566	115.28	56.75	58.53
Well 1 <sup>(4)(5)</sup>	519-570	116.78	90.70	26.08
Well 17 <sup>(4)(5)</sup>	480-563	104.10	62.10	42.00
Well 18 <sup>(4)(5)</sup>	466-570	110.00	74.90	35.10
Well 19 <sup>(4)(5)</sup>	465-617	108.70	58.5	50.20
BPOW 1-5	600-650	56.75	12.10	44.65
BPOW 2-3	564-594	57.98	17.55	40.43
BPOW 3-2	612-647	61.82	25.45	36.37
BPOW 3-3	580-620	60.64	21.00	39.64
BPOW 3-4	640-690	62.44	22.90	39.54
BPOW 4-1R <sup>(6)</sup>	652-692	67.34	21.65	45.69
RE106D3	510-530	101.34	40.09	61.25
RE107D1	505-525	98.92	39.80	59.12
RE107D2	560-580	98.99	40.20	58.79
RE107D3	645-665	99.96	41.43	58.53
RE109D1	515-535	100.03	43.09	56.94
RE109D2	550-570	100.15	43.44	56.71
RE109D3	580-600	100.40	43.41	56.99
RE123D2 <sup>(7)</sup>	635-655	106.11	45.90	60.21
RE126D1 <sup>(7)</sup>	500-520	101.03	42.54	58.49
RE126D2 <sup>(7)</sup>	555-575	101.39	43.20	58.19
RE126D3 <sup>(7)</sup>	640-660	101.10	42.95	58.15

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**Table 15**  
**Water-Level Measurement Results, Fourth Quarter 2021**  
**Operable Unit 2**  
**Northrop Grumman**  
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Well Identification	Screen Interval (ft bls)	Measuring Point Elevation (ft msl)	Depth to Water (ft bmp)	Water-Level Elevation (ft msl)
<b>Zone 4 Wells</b>				
BPOW 1-6	700-750	57.06	13.33	43.73
BPOW 4-2R <sup>(6)</sup>	725-765	67.18	23.40	43.78
RE123D3 <sup>(7)</sup>	815-835	105.92	45.75	60.17

**Notes and Abbreviations:**

- <sup>(1)</sup> Well identification (e.g., GM-70D2) does not necessarily designate or correlate with the aquifer zone.
  - <sup>(2)</sup> Well N-9921 was not accessible due to past soil re-grading activities on the road median that covered the well. Well N-10821 no longer exists. New well located in same place (well construction details unknown).
  - <sup>(3)</sup> Monitoring wells were voluntarily monitored to enhance coverage in Zone 2 and 3.
  - <sup>(4)</sup> Surveyed elevation not available, elevation is estimated from topographic map of the area.
  - <sup>(5)</sup> Pumping rates for the Wells collected during Water Level Measurement are as follows: Well 1 is 910 gpm, Well 3R is 710 gpm, Well 17 is 1,010 gpm, Well 18 is 1,010 gpm and Well 19 is 509 gpm as recorded in October 2021.
  - <sup>(6)</sup> The NAVY abandoned original Wells BPOW4-1R and BPOW4-2R between August, 2014 and October, 2014 and installed replacements.
  - <sup>(7)</sup> Water level data for this well was collected by Navy and was provided to Arcadis
  - <sup>(8)</sup> Hydraulic monitoring was performed from October 4 to October 9, 2021.
  - <sup>(9)</sup> Well N-10631 was observed to be filled with approximately 22 feet of sediment in July 2021.
- ft bmp            feet below measuring point  
ft msl            feet relative to mean sea level  
gpm                gallons per minute  
NM                not measured  
OU2               Operable Unit 2

**Table 16**  
**Comparison of Fourth Quarter 2021**  
**Field Measured Vertical Hydraulic Gradients to**  
**Model-Predicted Gradients**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well Pair ID	Measuring Point Elevation (ft msl)	Well Screen Midpoint Elevation (ft msl)	Water-Level Elevation (ft msl)	Field-Measured Vertical Gradient <sup>(1)</sup> (ft/ft) x 10 <sup>-3</sup>	Model-Predicted, Steady-State Vertical Gradient <sup>(2)</sup> (ft/ft) x 10 <sup>-3</sup>	Difference Between Field Measured and Model Predicted Gradient <sup>(3)</sup>
<b>In Zone 1</b>						
GM-17SR	115.79	50.79	73.29			
GM-17I	115.83	5.83	72.73	12.46	2.67	9.79
GM-78S	104.94	39.94	65.60			
GM-78I	105.06	5.56	65.46	4.07	1.75	2.32
GM-19S	109.86	59.36	70.96			
GM-19I	109.86	-25.14	69.51	17.16	0.47	16.69
GM-21S	105.81	40.81	72.66			
GM-21I	105.72	-29.28	69.95	38.66	5.99	32.67
GM-17I	115.83	5.83	72.73			
GM-17D	115.68	-172.32	68.54	23.52	20.43	3.09
GM-18I	109.03	9.03	68.58			
GM-18D	108.88	-186.12	65.76	14.45	19.16	-4.71
GM-20I	103.88	3.88	73.53			
GM-20D	103.92	-117.08	66.47	58.37	26.70	31.67
GM-21I	105.72	-29.28	73.53			
GM-21D	105.66	-177.34	65.57	53.76	42.55	11.21
<b>Between Zones 1 &amp; 2</b>						
GM-74I	107.42	8.42	71.73			
GM-74D	107.43	-192.57	64.43	36.32	35.13	1.19
GM-39D <sub>A</sub>	102.23	-169.77	65.09			
GM-39D <sub>B</sub>	102.08	-312.92	62.39	18.86	25.92	-7.06
<b>Between Zones 2 &amp; 3</b>						
GM-15D	109.66	-227.34	65.21			
GM-15D2	109.59	-436.20	62.63	12.35	-16.32	-28.67
GM-73D	104.87	-301.13	62.63			
GM-73D2	104.62	-437.38	60.48	15.78	23.85	-8.07
RE123D1	105.49	-384.51	60.92			
RE123D2	106.11	-538.89	60.21	4.60	5.94	-1.34
<b>Between Zones 1 &amp; 3</b>						
GM-18D	108.88	-186.12	65.76			
GM-33D2	106.85	-403.15	59.67	28.06	49.49	-21.43
GM-21D	105.66	-177.34	65.57			
GM-21D2	104.62	-416.60	57.37	34.27	21.27	13.00

Notes and Abbreviations on last page

**Table 16**  
**Comparison of Fourth Quarter 2021**  
**Field Measured Vertical Hydraulic Gradients to**  
**Model-Predicted Gradients**  
**Operable Unit 2**  
**Northrop Grumman**  
**Bethpage, New York**



Well Pair ID	Measuring Point Elevation (ft msl)	Well Screen Midpoint Elevation (ft msl)	Water-Level Elevation (ft msl)	Field-Measured Vertical Gradient <sup>(1)</sup> (ft/ft) x 10 <sup>-3</sup>	Model-Predicted, Steady-State Vertical Gradient <sup>(2)</sup> (ft/ft) x 10 <sup>-3</sup>	Difference Between Field Measured and Model Predicted Gradient <sup>(3)</sup>
<b>In Zone 3</b>						
GM-74D2	107.63	-444.64	56.48			
GM-74D3	107.58	-527.42	58.66	-26.33	-37.49	-11.16
GM-73D	104.87	-301.13	62.63			
GM-73D3	104.64	-537.86	59.52	13.14	10.12	3.02
RE109D1	100.03	-424.97	56.94			
RE109D2	100.15	-459.85	56.71	6.59	-1.79	-8.38
RE126D1	101.03	-408.97	58.49			
RE126D2	101.39	-463.61	58.19	5.49	-0.64	-6.13

**Notes and Abbreviations:**

- (1) Vertical hydraulic gradients are calculated as follows:  

$$\frac{(\text{Water-Level Elevation}_1 - \text{Water-Level Elevation}_2)}{(\text{Screen Midpoint Elevation}_1 - \text{Screen Midpoint Elevation}_2)}$$
<sub>1</sub> - Shallower well of pairing  
<sub>2</sub> - Deeper well of pairing  
 Positive gradient value indicates a downward hydraulic gradient.  
 Negative gradient value indicates an upward hydraulic gradient.
- (2) The 2019 model was used to calculate the Steady State Vertical Gradient.
- (3) Positive value indicates an increase compared to model predicted gradient.  
 Negative value indicates a decrease compared to model predicted gradient.

ft msl feet relative to mean sea level

Table 17  
 Summary of 2021 and Historical Uptime and Remedial Well Flow Volumes  
 Operable Unit 2  
 Northrop Grumman  
 Bethpage, New York



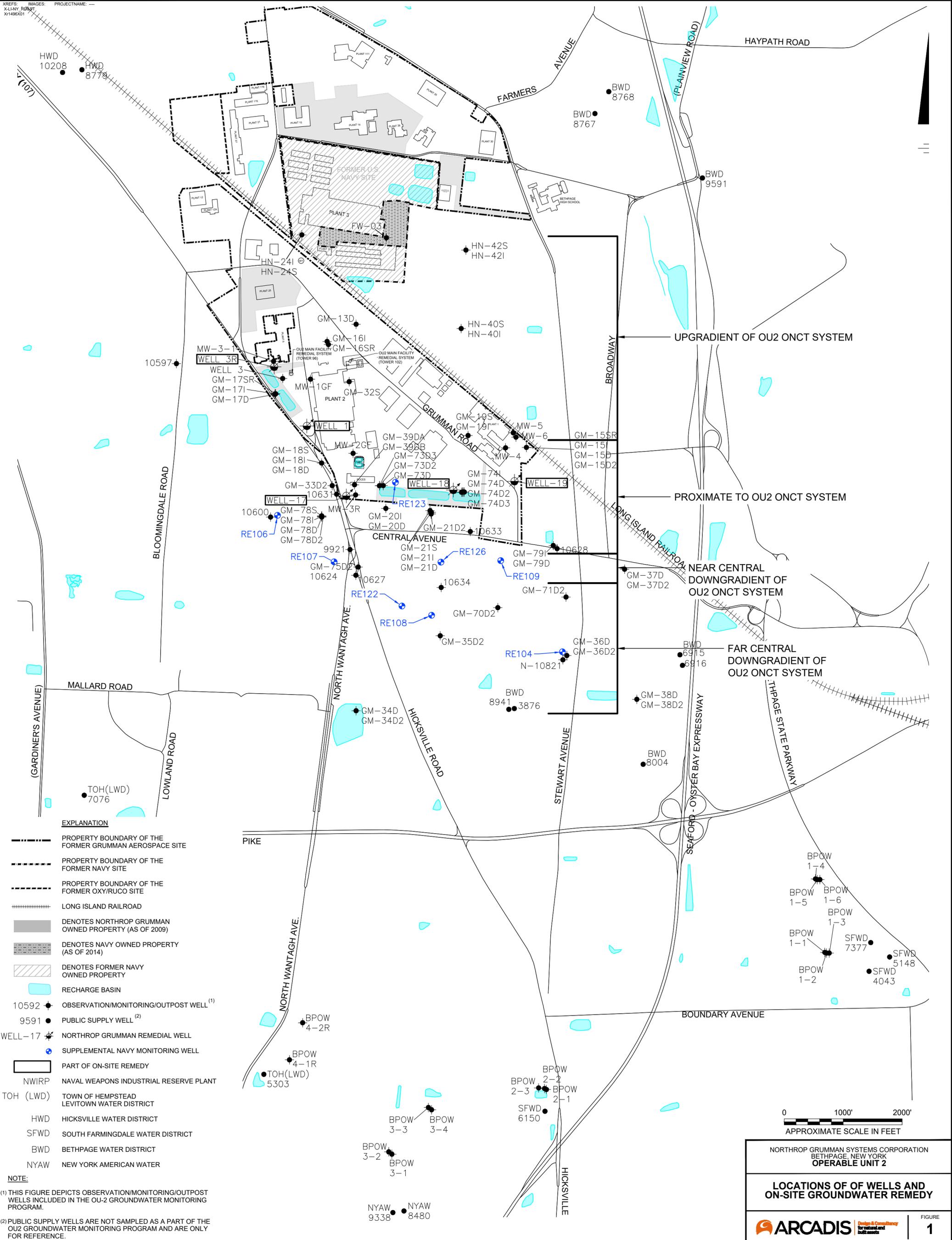
OU2 Historical System Uptime															
	2021					2020					2019				
Quarter	Q4	Q3	Q2	Q1	% Uptime	Q4	Q3	Q2	Q1	% Uptime	Q4	Q3	Q2	Q1	% Uptime
Days Per Period	92	92	91	90	365	92	92	91	90	365	92	92	91	90	365
Well 1	99.5	81.0	77.3	92.3	87.5	95.4	99.5	70.6	95.9	90.4	99.7	84.6	98.9	100.0	95.8
Well 3R	99.5	82.4	77.5	90.8	87.6	95.5	99.5	70.5	78.5	86.1	30.4	80.2	99.8	100.0	77.4
Well 17	99.7	99.9	97.7	98.0	98.8	93.7	97.3	97.7	99.2	97.0	82.0	88.7	95.9	96.0	90.6
Well 18	83.7	98.9	96.2	72.4	87.9	93.7	97.0	97.3	99.2	96.8	82.0	98.4	95.9	99.7	94.0
Well 19	99.7	99.9	97.7	96.3	98.4	93.7	97.9	97.8	99.2	97.1	79.7	98.4	96.5	99.7	93.5
T96 System Uptime	99.5	83.1	77.5	92.4	93.2	95.5	99.5	70.6	99.2	91.2	98.9	83.9	99.9	100.0	95.6
T102 System Uptime	99.7	99.9	97.7	98.1	93.8	93.7	98.1	97.9	99.9	97.4	82.1	98.5	96.5	100.0	94.2

All values provided in % of uptime.

OU2 Historical System % of Model Design Flow Rate															
	2021					2020					2019				
Quarter	Q4	Q3	Q2	Q1	% Model Design Flow	Q4	Q3	Q2	Q1	% Model Design Flow	Q4	Q3	Q2	Q1	% Model Design Flow
Well 1	104.0	78.0	84.0	102.0	92.0	97.0	102.0	71.0	101.0	92.8	118.0	84.0	98.0	102.0	100.5
Well 3R	112.0	71.0	77.0	91.0	87.8	102.0	115.0	81.0	85.0	95.8	30.0	78.0	101.0	101.0	77.5
Well 17	101.0	101.0	97.0	101.0	100.0	98.0	107.0	108.0	109.0	105.5	89.0	90.0	96.0	96.0	92.8
Well 18	106.0	125.0	111.0	89.0	107.8	103.0	123.0	123.0	124.0	118.3	103.0	105.0	97.0	100.0	101.3
Well 19	102.0	102.0	98.0	115.0	104.3	95.0	100.0	100.0	100.0	98.8	85.0	110.0	98.0	101.0	98.5
Total % Model Design Flow	105.0	96.0	94.0	99.0	98.5	99.0	110.0	97.0	105.0	102.8	87.0	92.0	98.0	100.0	94.3

1. For the purposes of maintaining accuracy of historical % model design flows for Wells 18 and 19, the model design flow rates were increased from 600 to 800 gpm for Well 18 and decreased from 700 to 500 gpm for Well 19 beginning in the 2018 annual period.

# Figures



**EXPLANATION**

- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER NAVY SITE
- PROPERTY BOUNDARY OF THE FORMER OXY/RUCO SITE
- +++++ LONG ISLAND RAILROAD
- DENOTES NORTHROP GRUMMAN OWNED PROPERTY (AS OF 2009)
- DENOTES NAVY OWNED PROPERTY (AS OF 2014)
- DENOTES FORMER NAVY OWNED PROPERTY
- RECHARGE BASIN
- 10592 ● OBSERVATION/MONITORING/OUTPOST WELL (1)
- 9591 ● PUBLIC SUPPLY WELL (2)
- WELL-17 ● NORTHROP GRUMMAN REMEDIAL WELL
- SUPPLEMENTAL NAVY MONITORING WELL
- PART OF ON-SITE REMEDY
- NWIRP NAVAL WEAPONS INDUSTRIAL RESERVE PLANT
- TOH (LWD) TOWN OF HEMPSTEAD LEVITOWN WATER DISTRICT
- HWD HICKSVILLE WATER DISTRICT
- SFWD SOUTH FARMINGDALE WATER DISTRICT
- BWD BETHPAGE WATER DISTRICT
- NYAW NEW YORK AMERICAN WATER

**NOTE:**  
 (1) THIS FIGURE DEPICTS OBSERVATION/MONITORING/OUTPOST WELLS INCLUDED IN THE OU-2 GROUNDWATER MONITORING PROGRAM.  
 (2) PUBLIC SUPPLY WELLS ARE NOT SAMPLED AS A PART OF THE OU2 GROUNDWATER MONITORING PROGRAM AND ARE ONLY FOR REFERENCE.



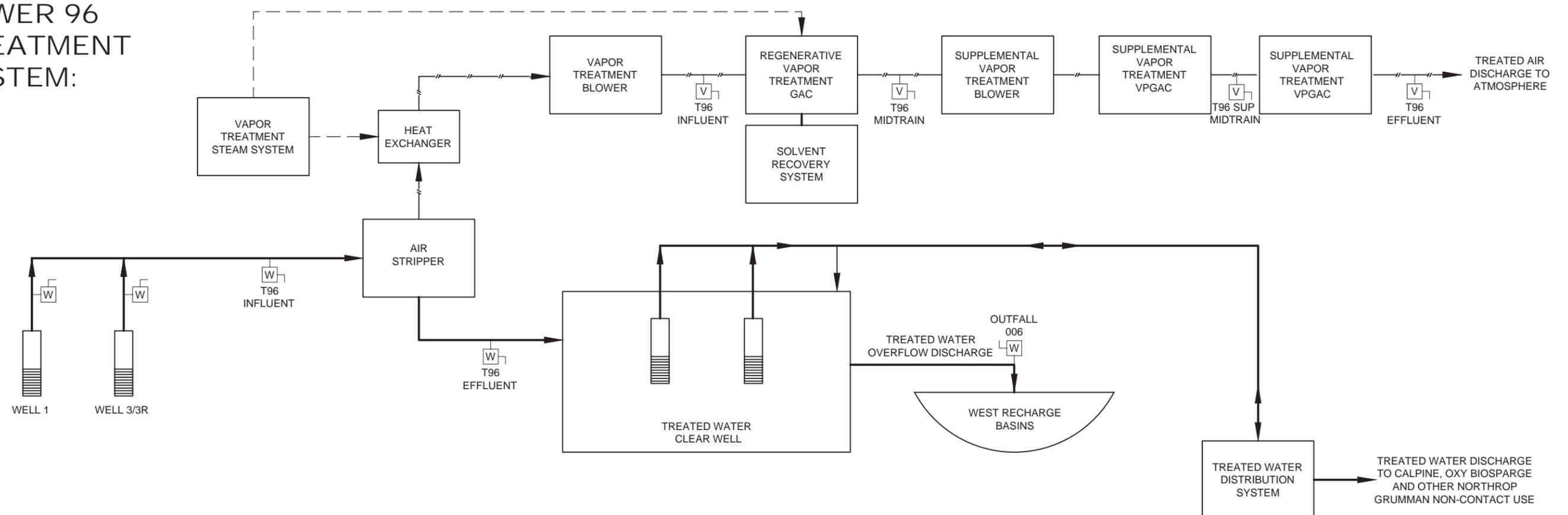
NORTHROP GRUMMAN SYSTEMS CORPORATION  
 BETHPAGE, NEW YORK  
**OPERABLE UNIT 2**

**LOCATIONS OF OF WELLS AND  
 ON-SITE GROUNDWATER REMEDY**

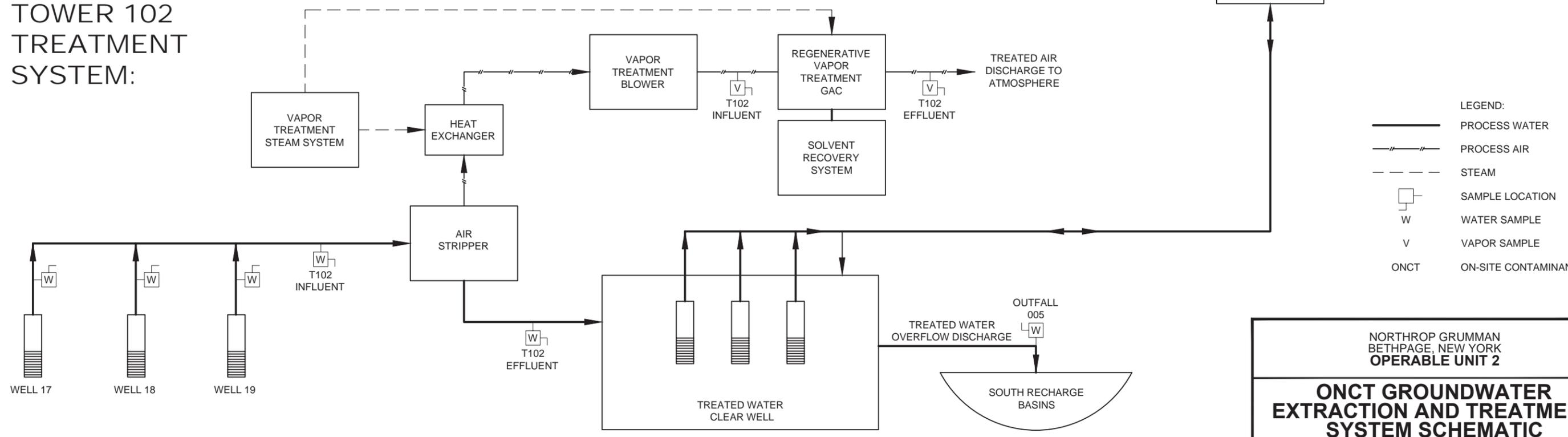
FIGURE  
**1**



# TOWER 96 TREATMENT SYSTEM:



# TOWER 102 TREATMENT SYSTEM:



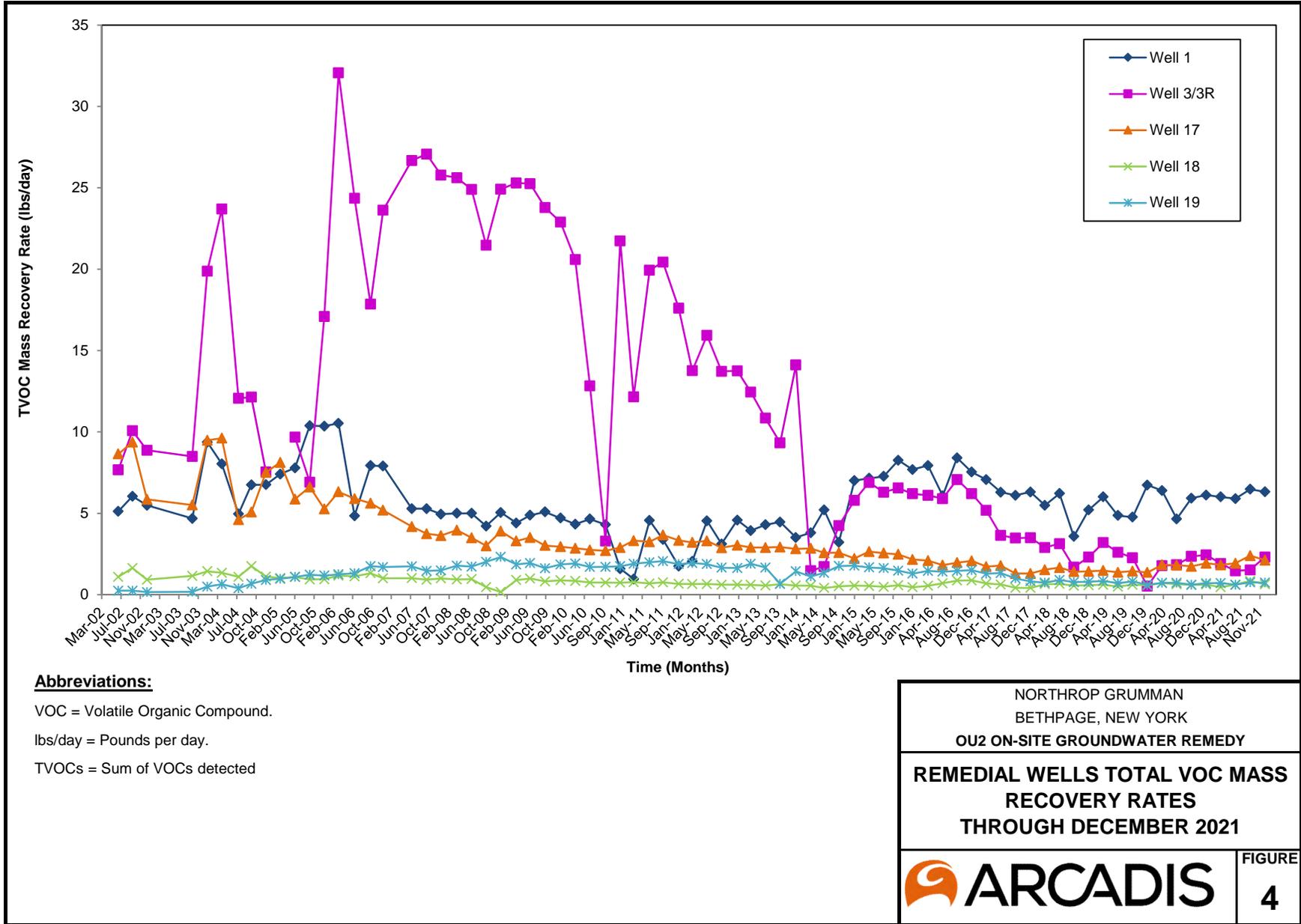
- LEGEND:
- PROCESS WATER
  - - - PROCESS AIR
  - - - - STEAM
  - W SAMPLE LOCATION
  - W WATER SAMPLE
  - V VAPOR SAMPLE
  - ONCT ON-SITE CONTAMINANT

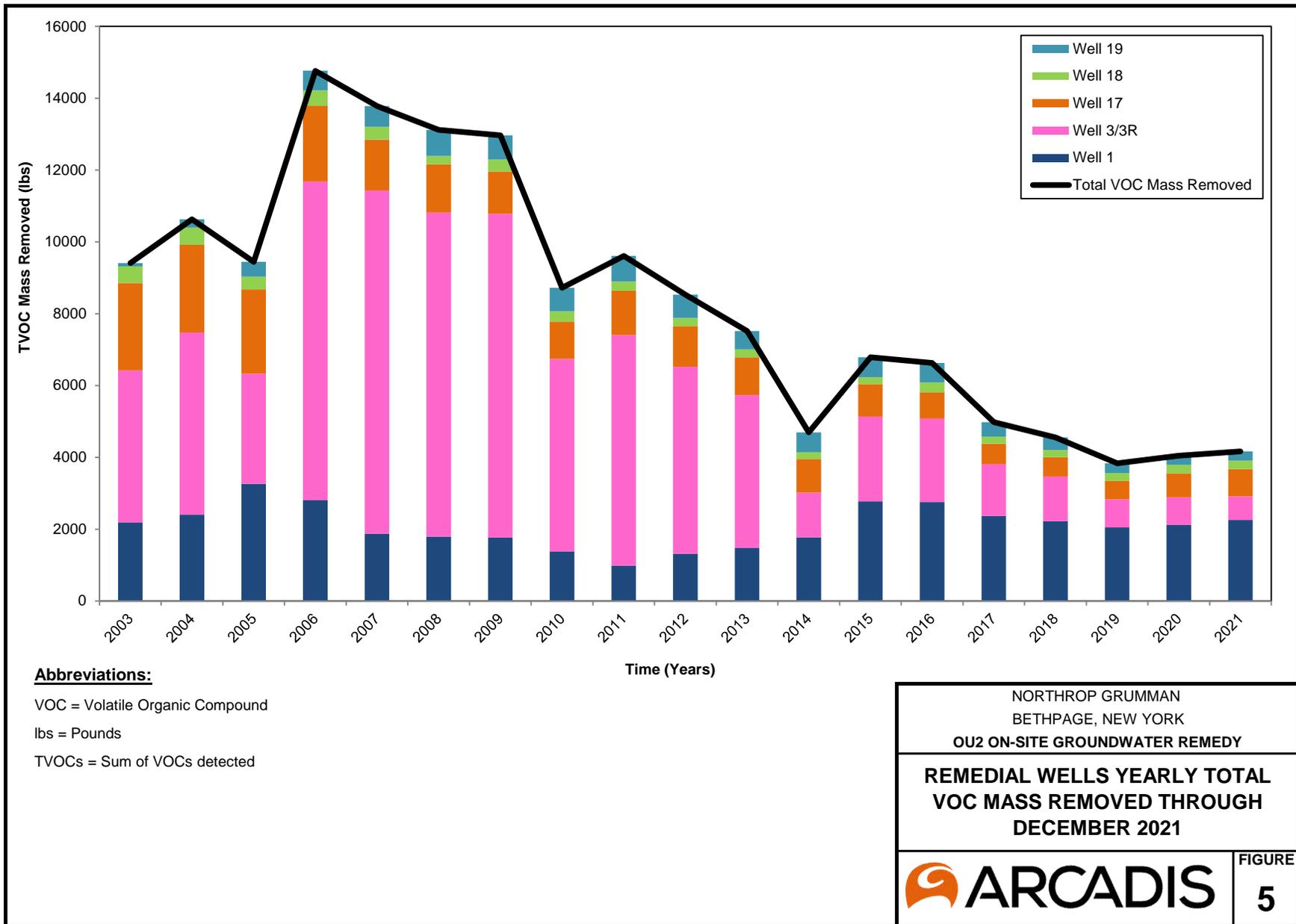
NORTHROP GRUMMAN  
BETHPAGE, NEW YORK  
**OPERABLE UNIT 2**

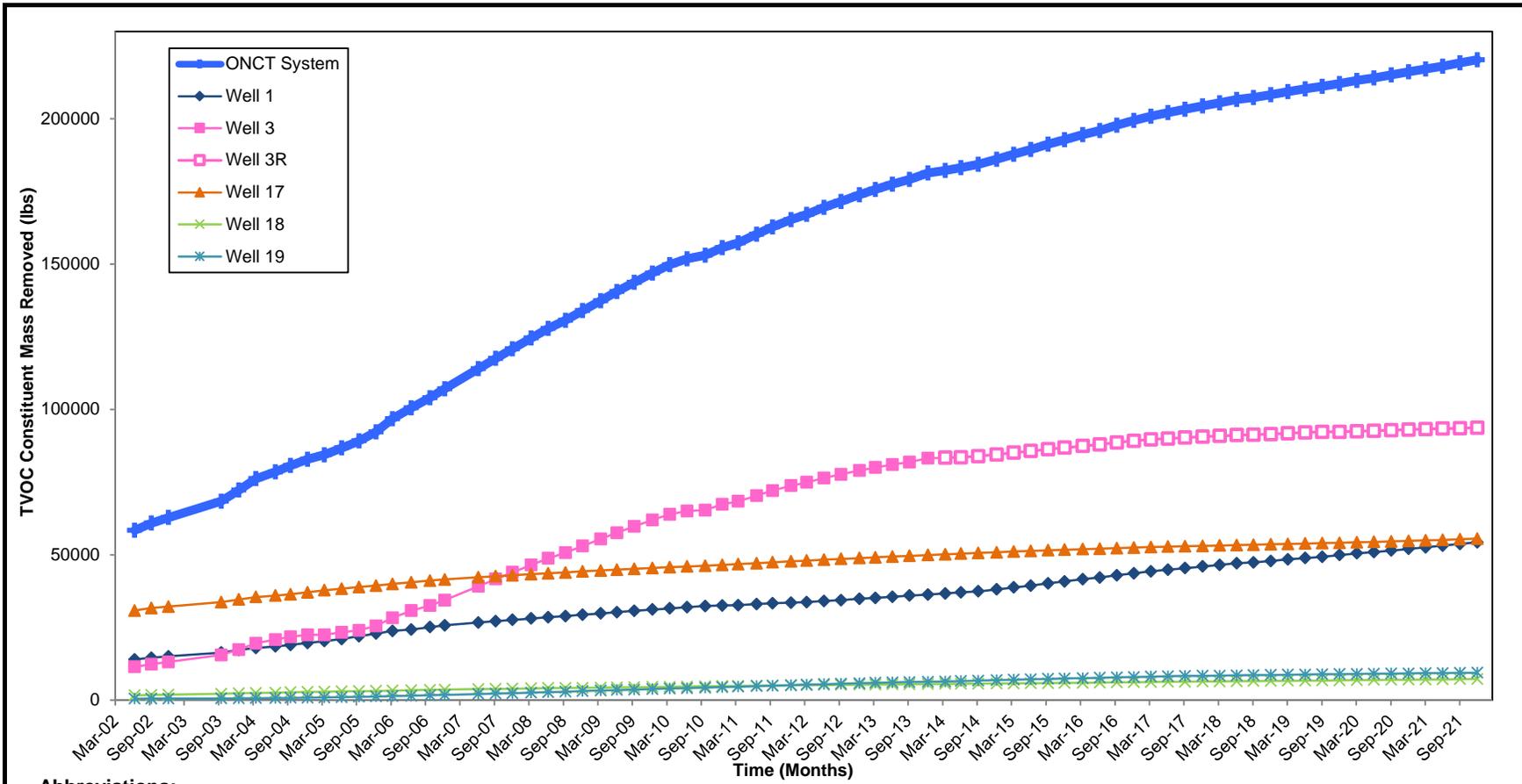
**ONCT GROUNDWATER  
EXTRACTION AND TREATMENT  
SYSTEM SCHEMATIC**

**ARCADIS**

CITY: SYRACUSE, NY DIV: GROUP ENV DB: A. SANCHEZ LD: ALS PIC: (Regd) TM: (Opt) LYR: (Opt) ON: -OFF-REF\* (PATRICIA RICHE PDF CHANGES SUP BED TEXT and extra VSP-10.26.17)  
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 XREFS: IMAGES: PROJECTNAME:







**Abbreviations:**

VOC = Volatile Organic Compound

lbs = Pounds

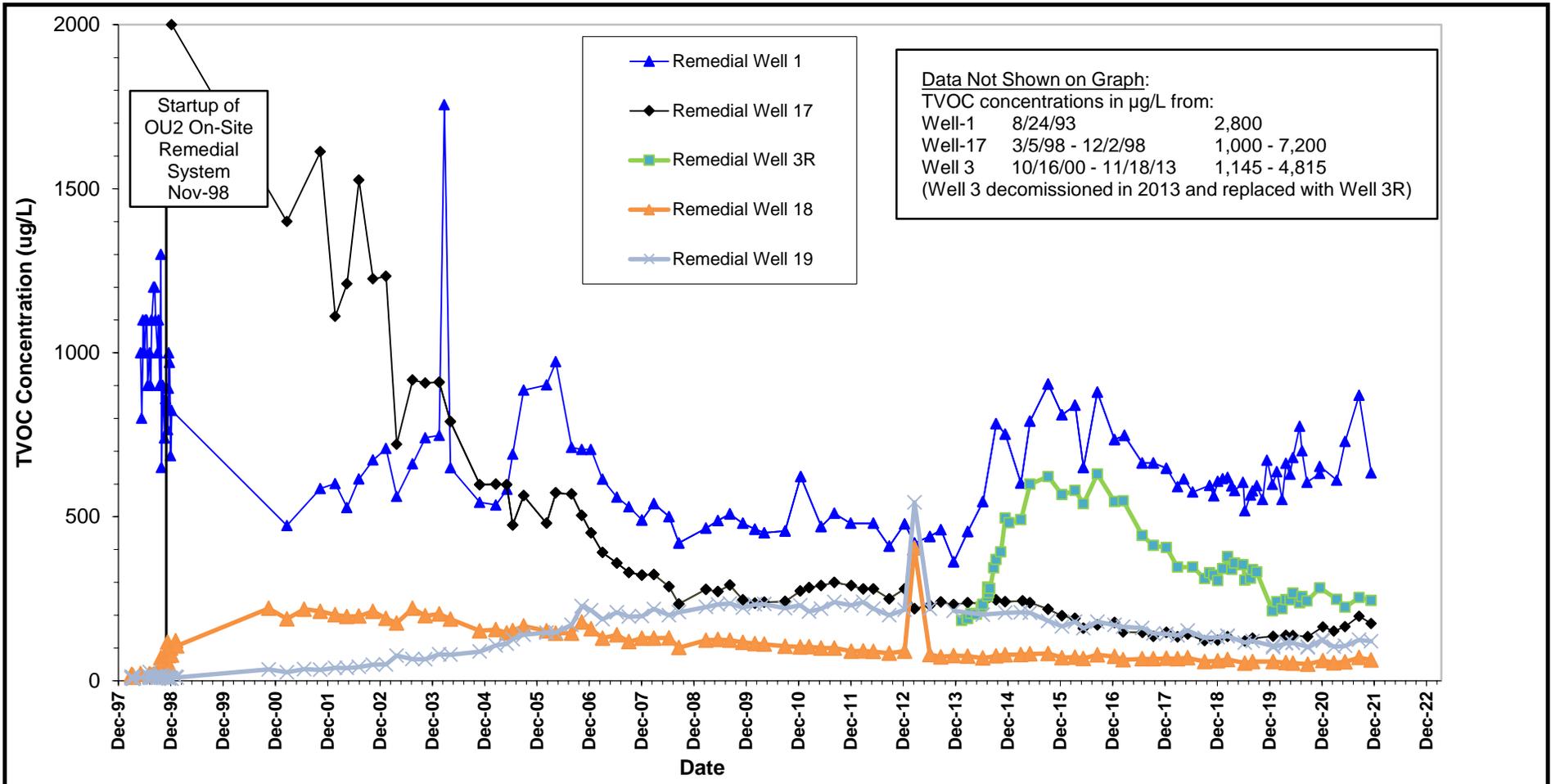
TVOCs = Sum of VOCs detected

ONCT = On-Site Containment

**Notes:**

1. Cumulative Total VOC Mass Removed includes mass removed since startup of the ONCT system in September 1998.

NORTHROP GRUMMAN BETHPAGE, NEW YORK <b>OU2 ON-SITE GROUNDWATER REMEDY</b>	
<b>REMEDIAL WELLS CUMULATIVE          TOTAL VOC MASS REMOVED          THROUGH DECEMBER 2021</b>	
	<b>FIGURE 6</b>



**Notes and Abbreviations:**

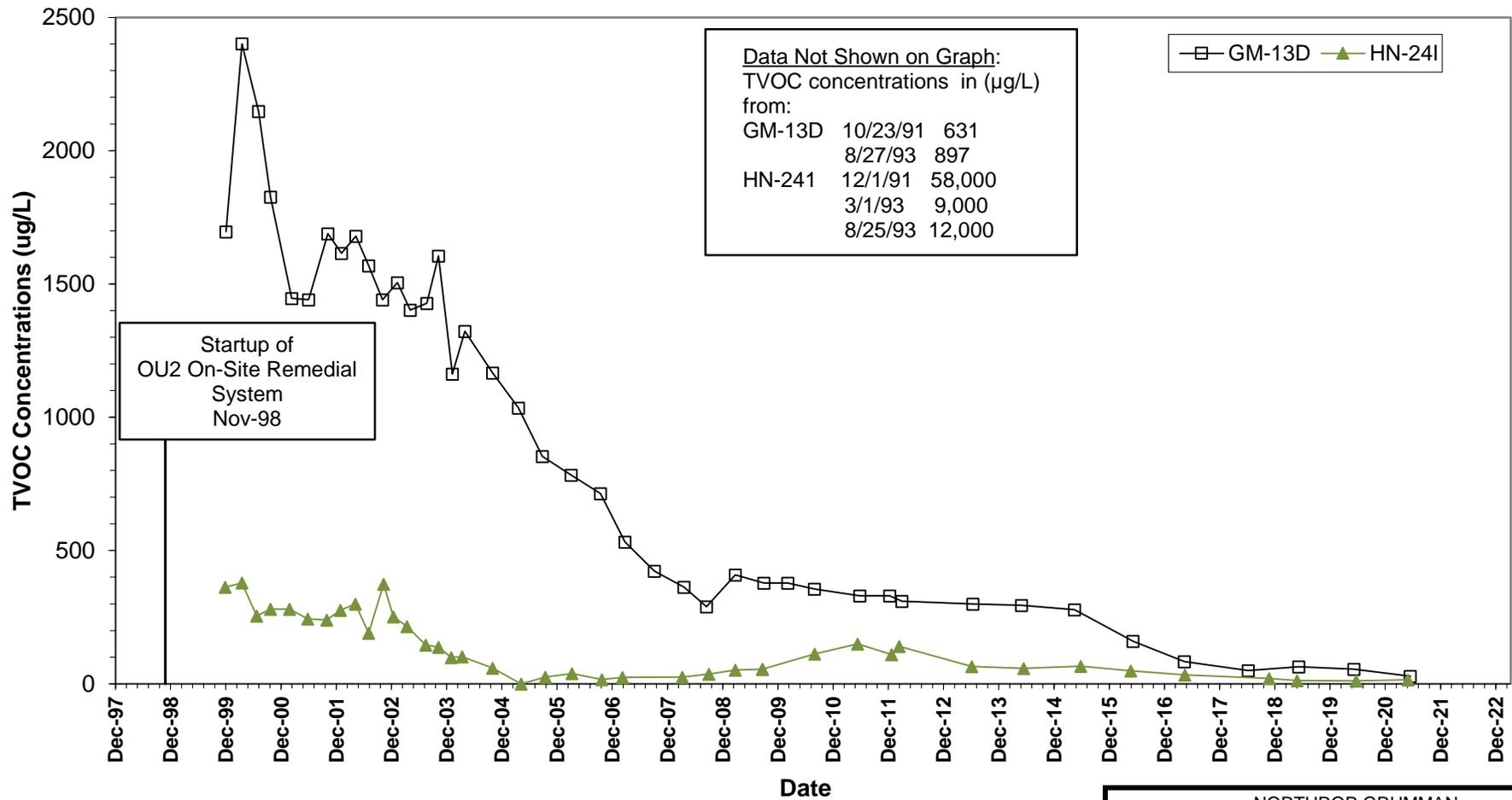
TVOC: Total volatile organic compound  
 Total VOCs: Sum of VOCs detected  
 µg/L: micrograms per liter

NORTHROP GRUMMAN  
 BETHPAGE, NEW YORK  
 OPERABLE UNIT 2

**Total Volatile Organic Compound  
 Concentrations in On-Site Zone 3 OU2 Remedial  
 Wells**

 **ARCADIS**

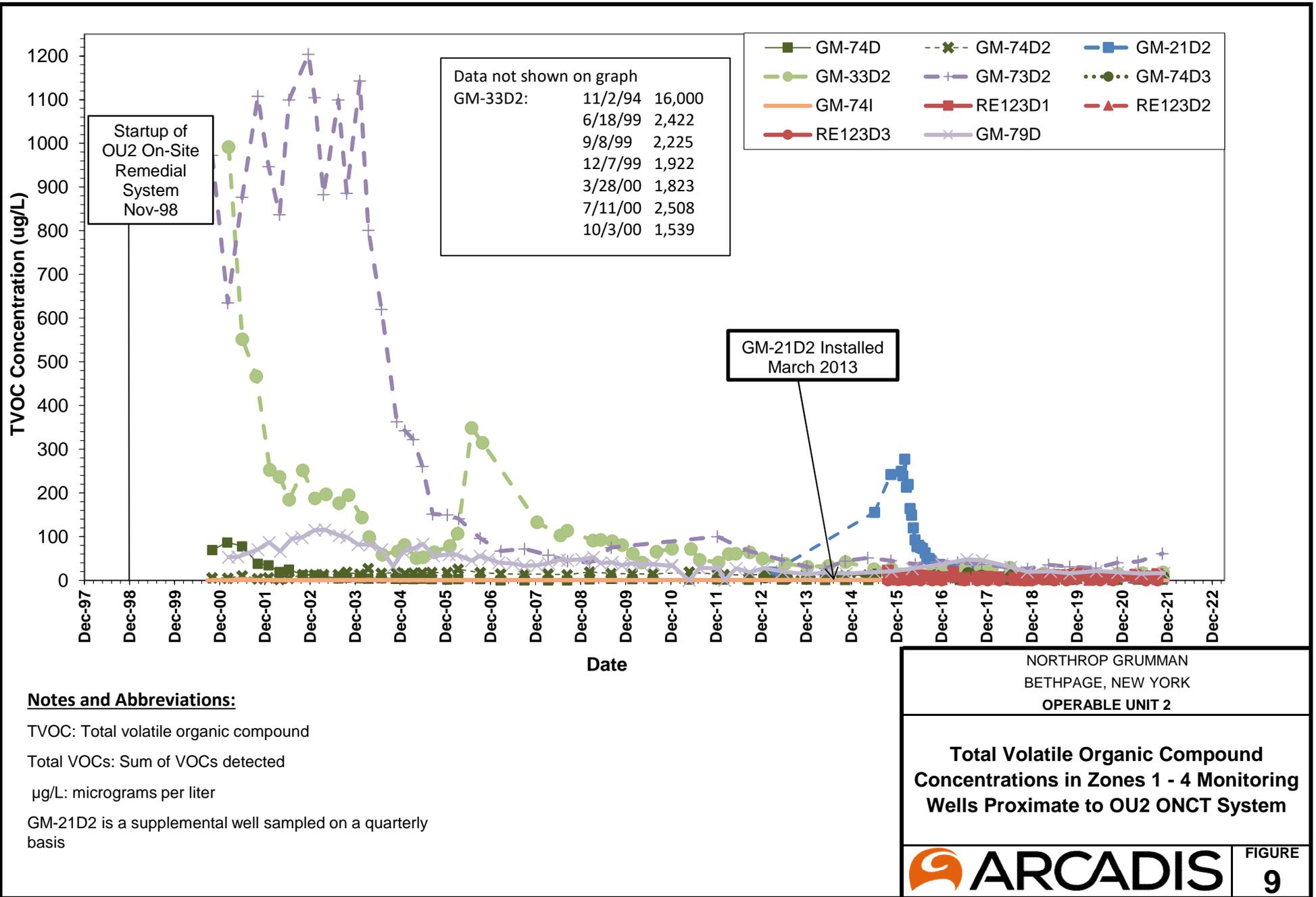
FIGURE  
**7**

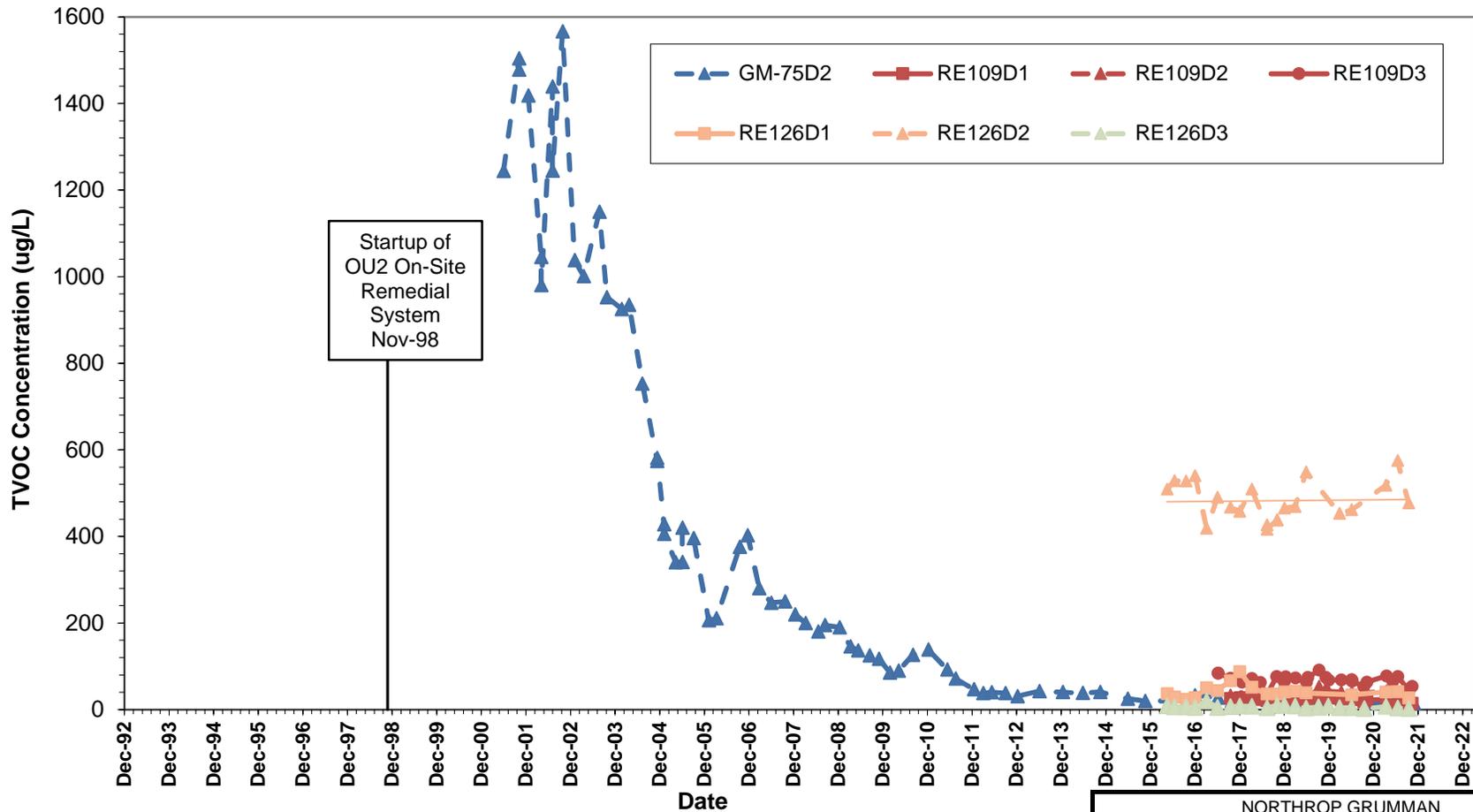


**Notes and Abbreviations:**

TVOC: Total volatile organic compound  
 Total VOCs: Sum of VOCs detected  
 µg/L: micrograms per liter

NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Volatile Organic Compound          Concentrations in Upgradient Zone 1          Monitoring Wells</b>	
	<b>FIGURE 8</b>

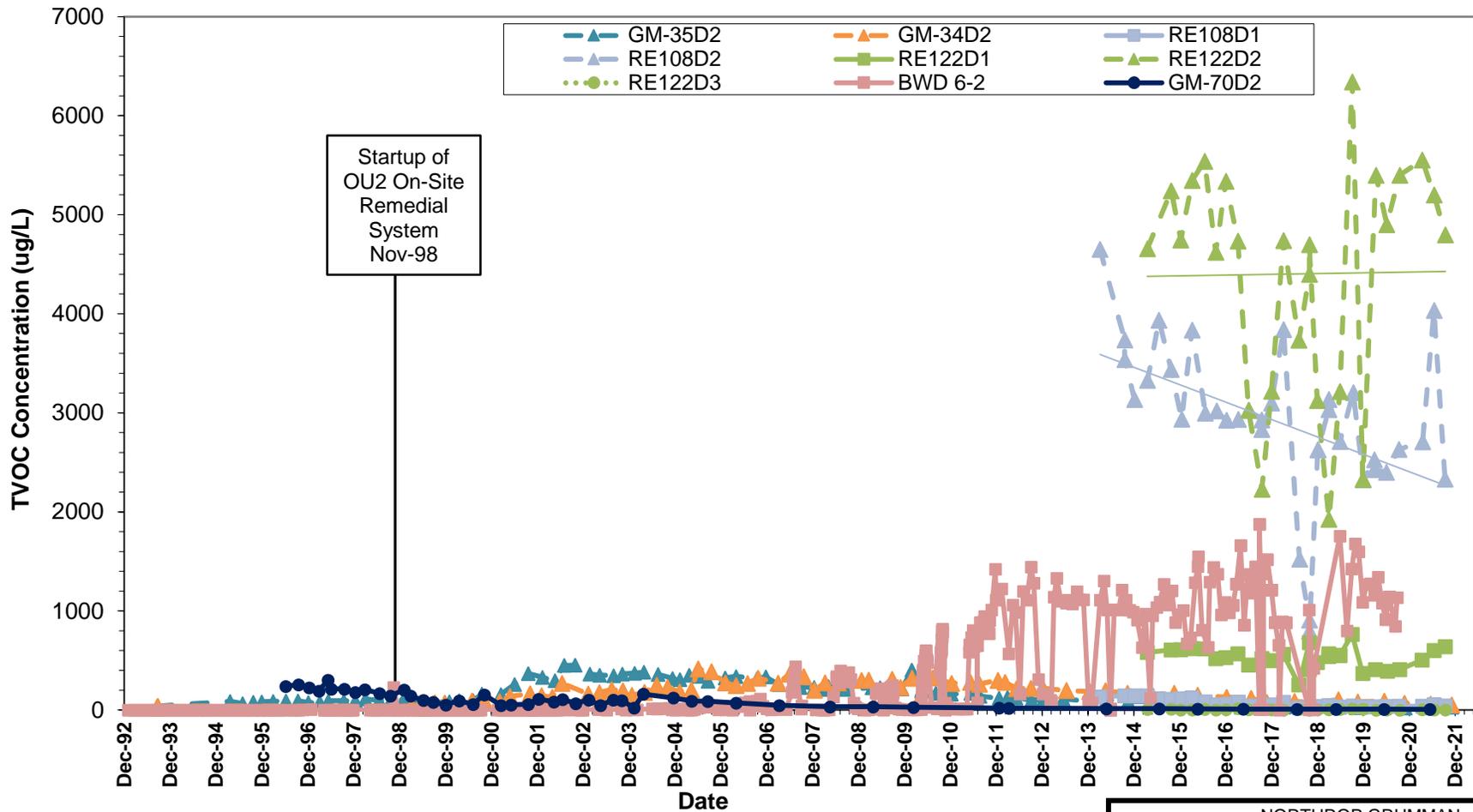




**Notes and Abbreviations:**

- TVOC: Total volatile organic compound
- Total VOCs: Sum of VOCs detected
- µg/L: micrograms per liter
- Trend line shown for RE-126D2

NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Volatile Organic Compound          Concentrations in          Zones 2 and 3 Monitoring Wells          Downgradient of OU2 ONCT System          (Near Central)</b>	
	<b>FIGURE          10A</b>



**Notes and Abbreviations:**

TVOC: Total volatile organic compound

Total VOCs: Sum of VOCs detected

µg/L: micrograms per liter

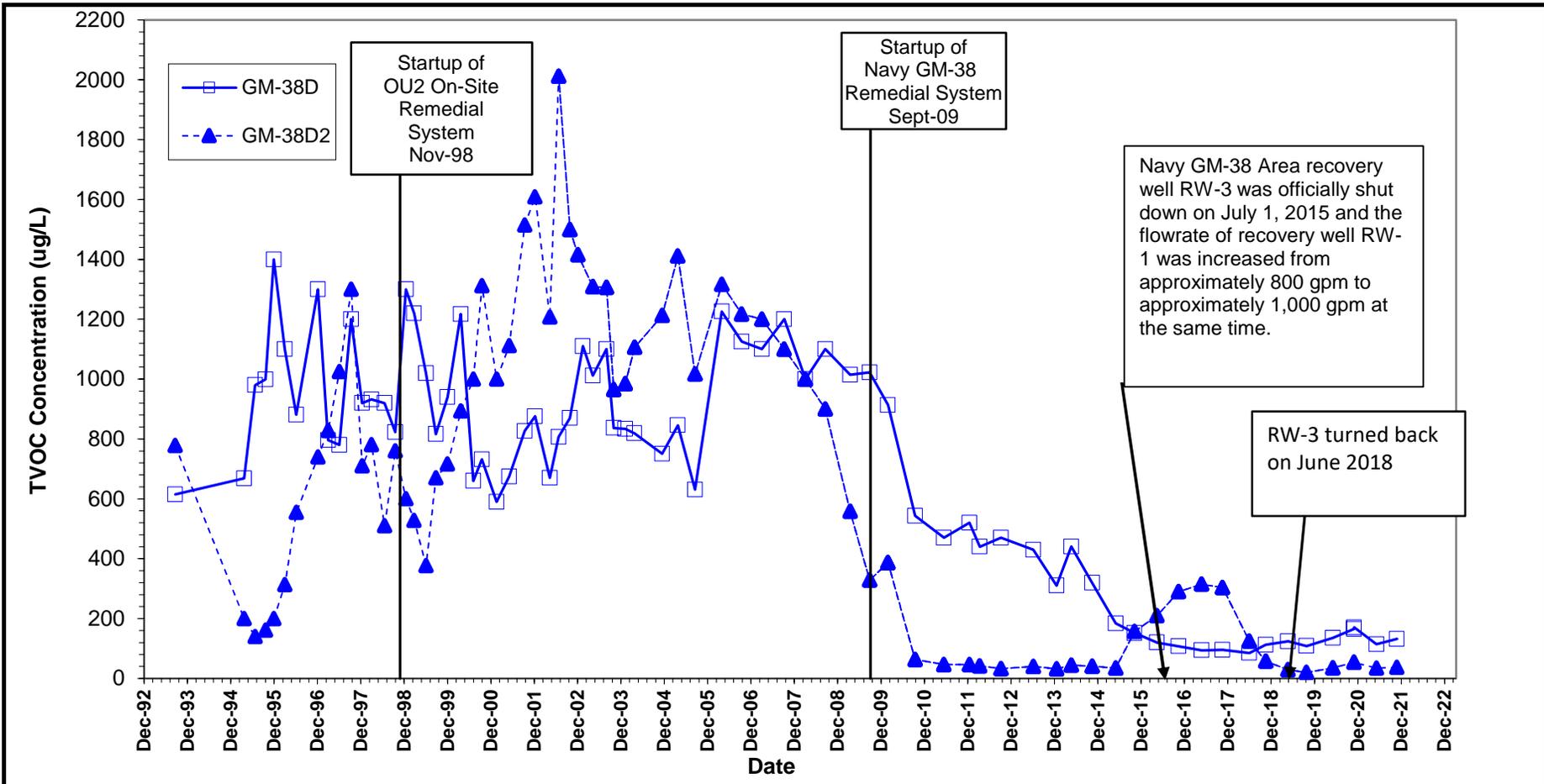
Trend lines shown for RE-108D2 and RE-122D2

NORTHROP GRUMMAN  
BETHPAGE, NEW YORK  
OPERABLE UNIT 2

**Total Volatile Organic Compound  
Concentrations in  
Zone 3 and 4 Monitoring Wells  
Downgradient of OU2 ONCT System  
(Far Central)**

 **ARCADIS**

**FIGURE  
10B**



**Notes and Abbreviations:**

TVOC: Total volatile organic compound  
 Total VOCs: Sum of VOCs detected  
 µg/L: micrograms per liter

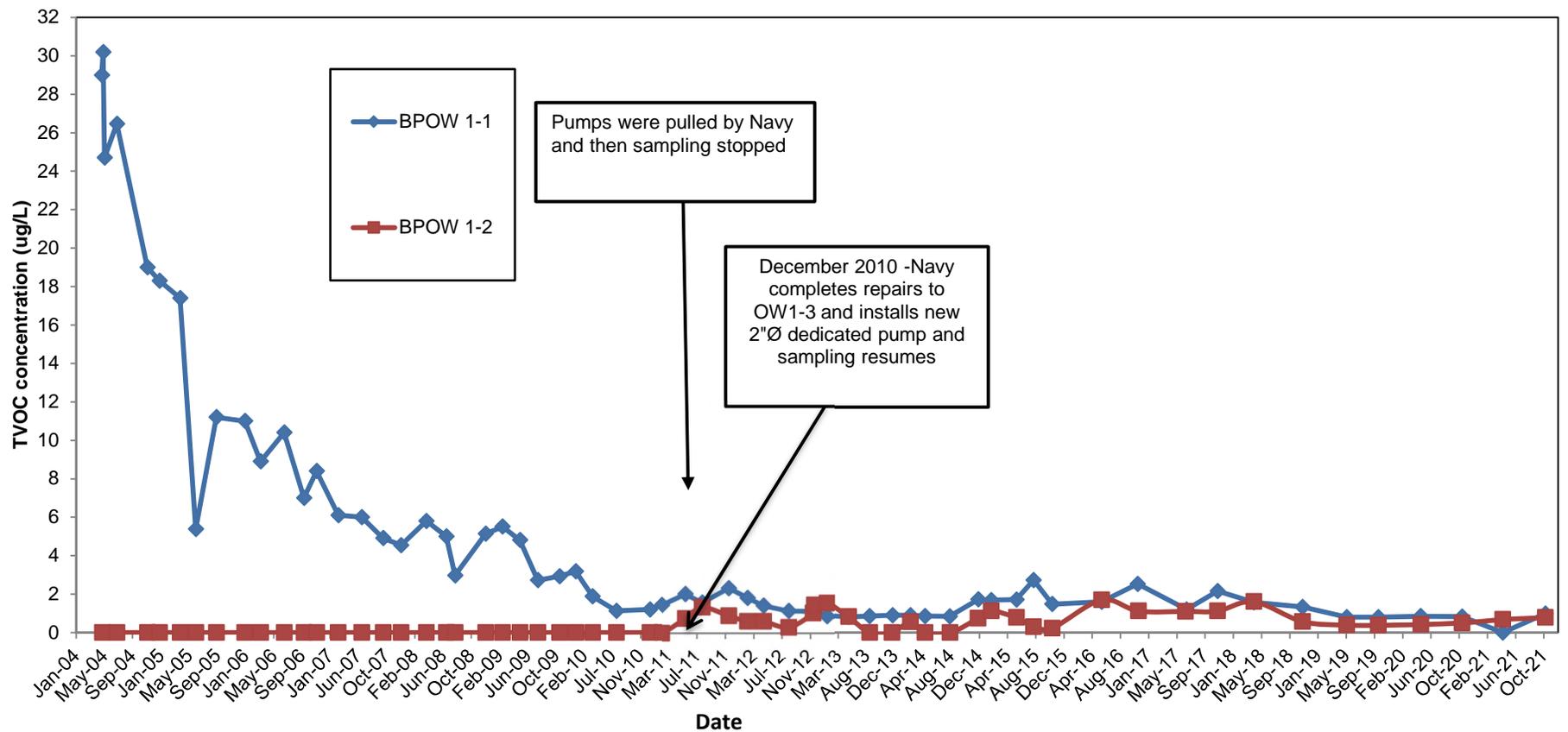
Startup of OU2 On-Site Remedial System Nov-98

Startup of Navy GM-38 Remedial System Sept-09

Navy GM-38 Area recovery well RW-3 was officially shut down on July 1, 2015 and the flowrate of recovery well RW-1 was increased from approximately 800 gpm to approximately 1,000 gpm at the same time.

RW-3 turned back on June 2018

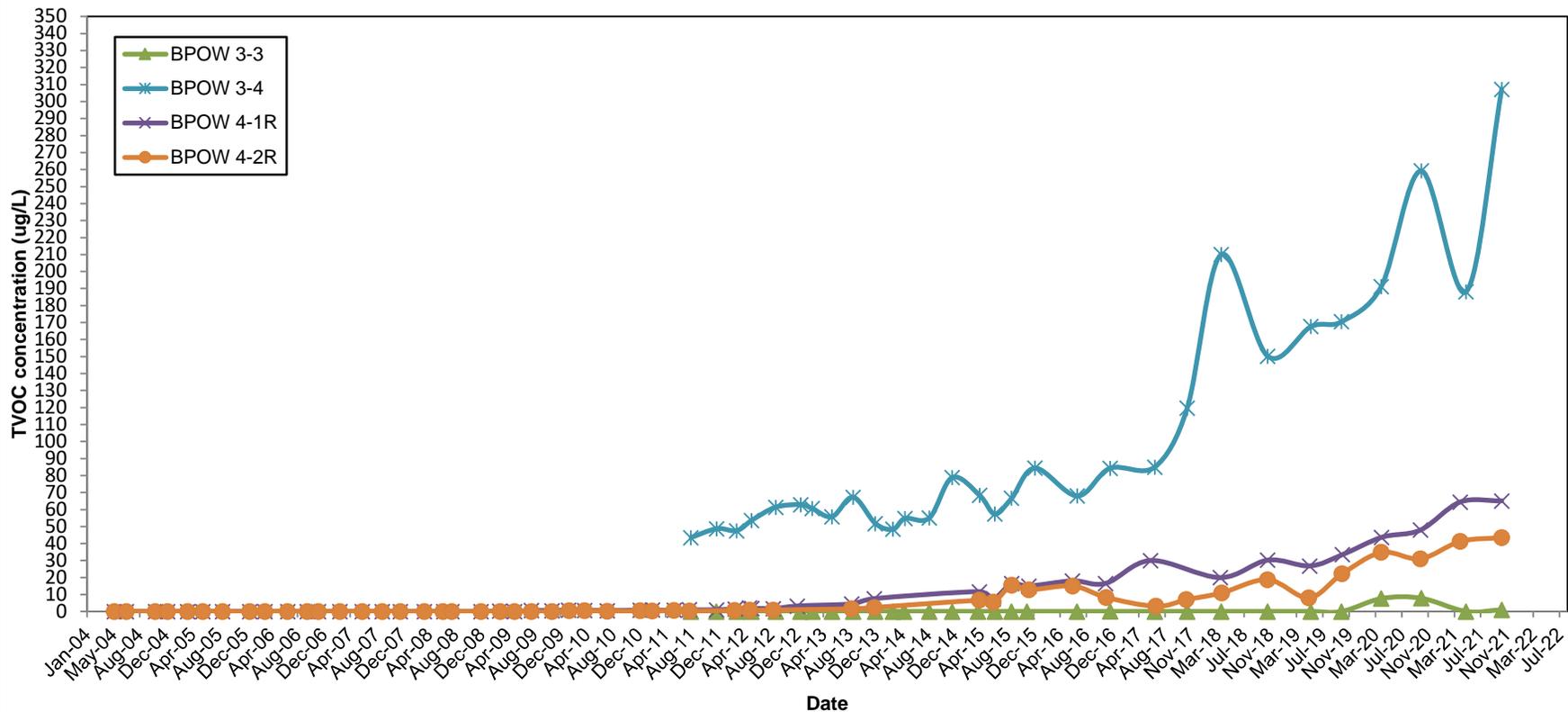
NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Volatile Organic Compound Concentrations in GM-38 Area Zones 1 and 2 Monitoring Wells</b>	
	FIGURE <b>11</b>



**Notes and Abbreviations:**

TVOC: Total volatile organic compound  
 SFWD: South Farmingdale Water District  
 ug/L: micrograms per Liter  
 Total VOCs: Sum of VOCs detected

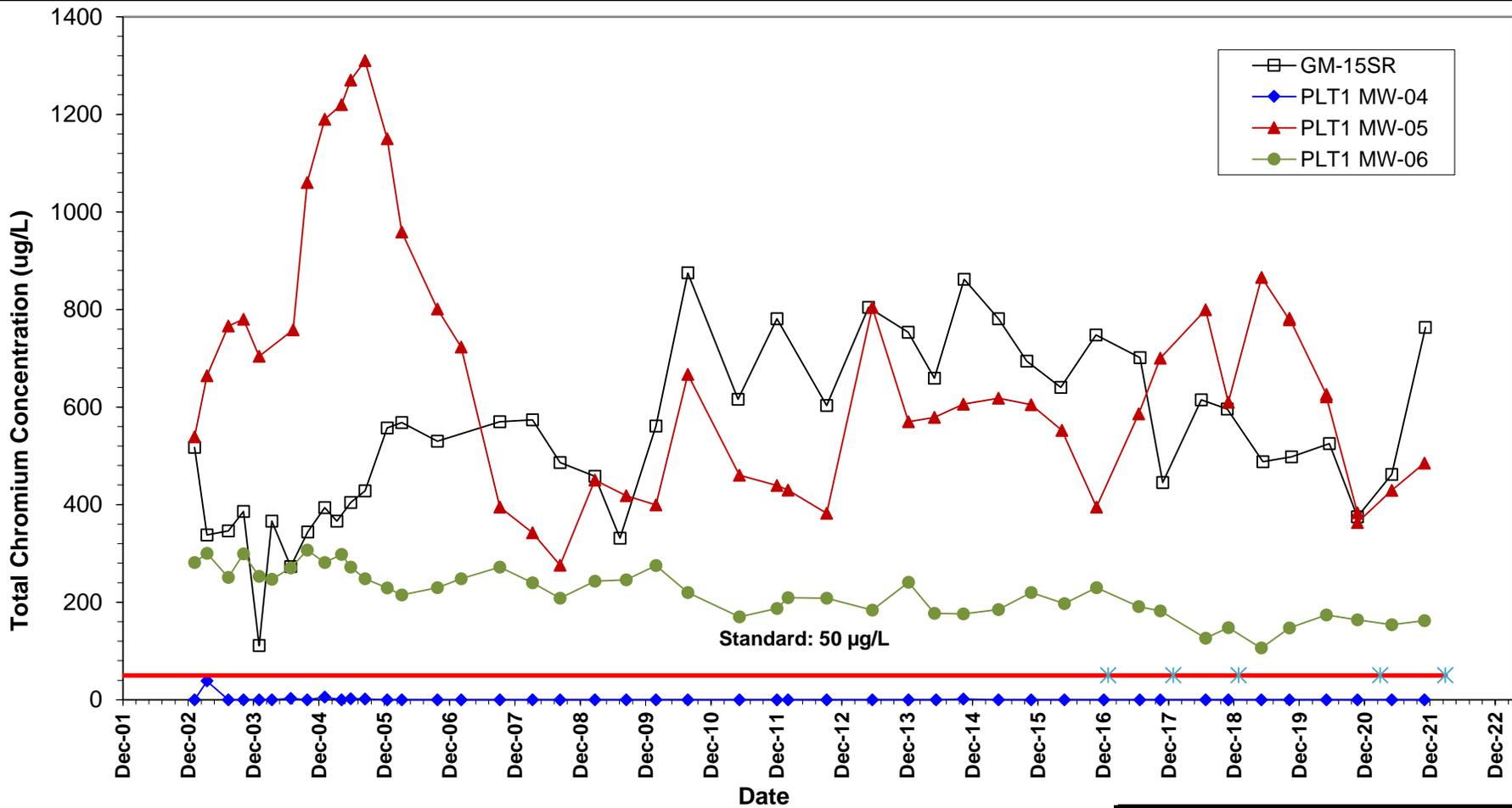
NORTHROP GRUMMAN BETHPAGE, NEW YORK <b>OPERABLE UNIT 2</b>	
<b>Total Volatile Organic Compound          Concentrations in Offsite Outpost Wells          BPOW 1-1, BPOW 1-2, (Wells Monitor          SFWD Well Field 1)</b>	
	<b>12</b>



**Notes and Abbreviations:**

TVOCs for both BPOW 3-1 and BPOW 3-2 are non-detect for the duration of the sample history  
 TVOC: Total volatile organic compound  
 NYAW: New York American Water  
 ug/L: micrograms per Liter  
 Total VOCs: Sum of VOCs detected

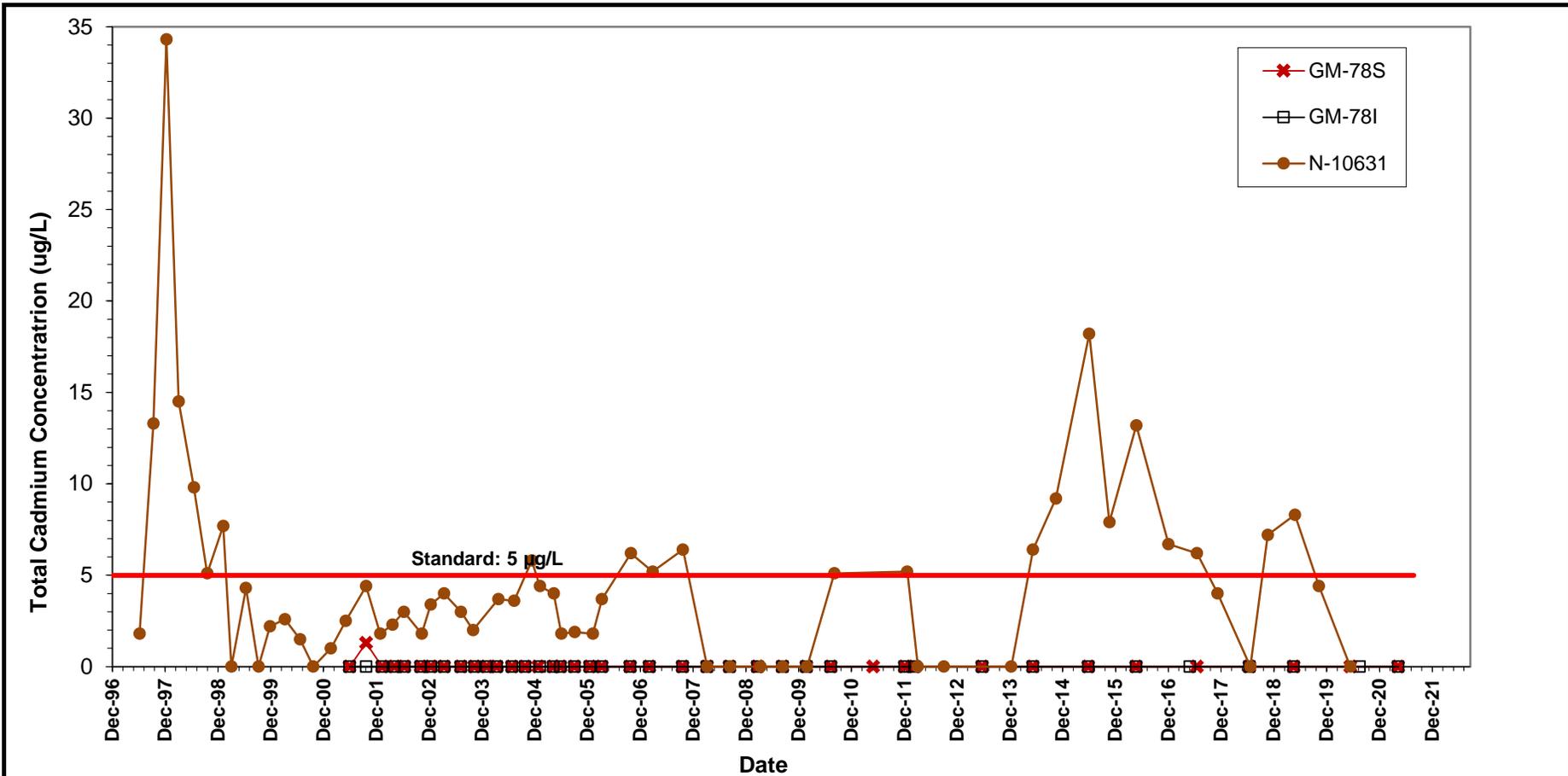
NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Volatile Organic Compound          Concentrations in Outpost Wells BPOW 3-3,          BPOW 3-4, BPOW 4-1R, and BPOW 4-2R          (Wells Monitor NYAW Seaman's Neck Well          Field and Town of Hempstead Levittown          Water District Well N-5303)</b>	
 <b>ARCADIS</b>	<b>13</b>



**Notes and Abbreviations:**

µg/L: micrograms per liter

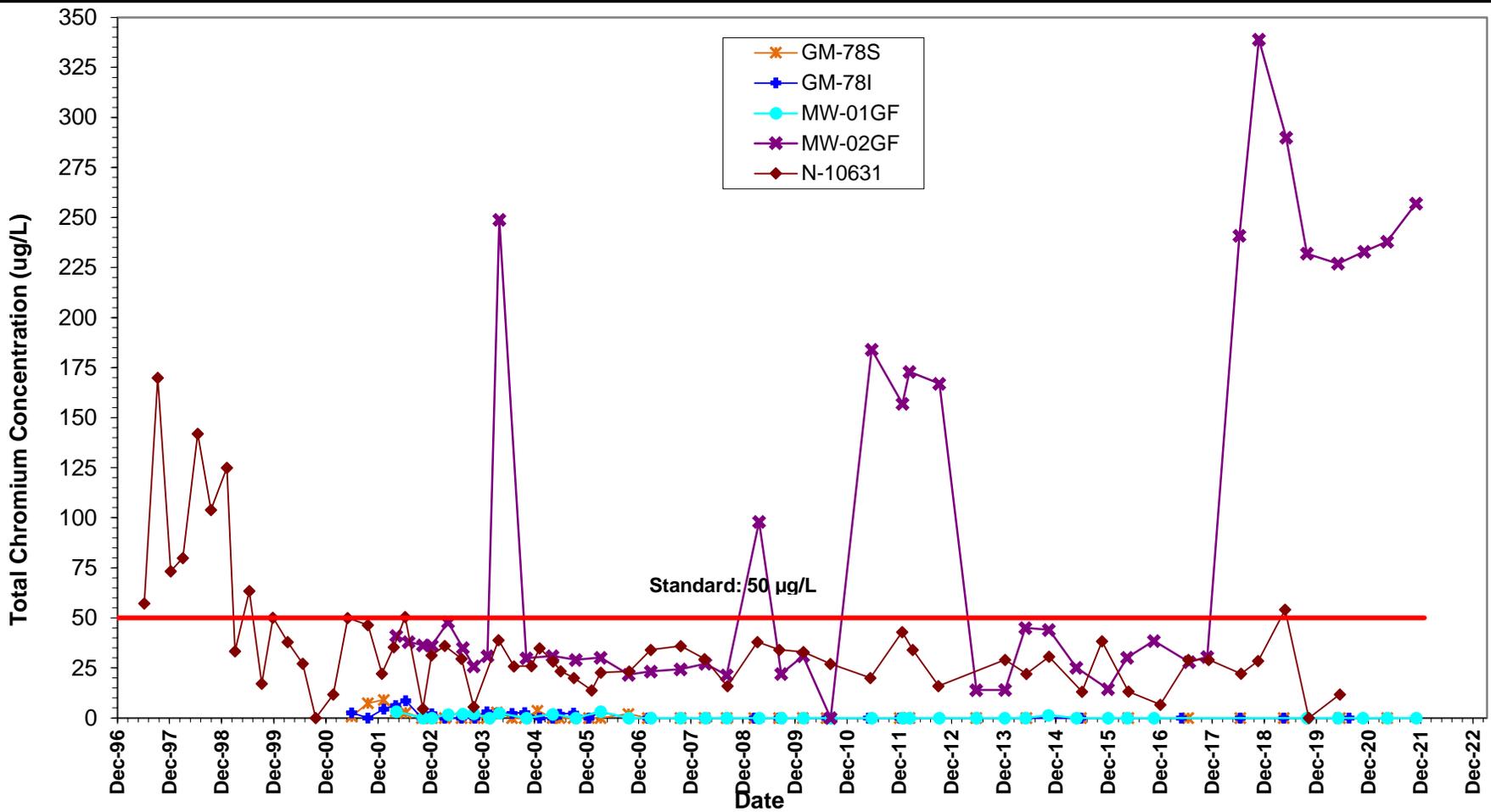
NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Chromium (unfiltered)          Concentrations in Zone 1 Monitoring          Wells          Near Former Plant 1</b>	
 <b>ARCADIS</b>	FIGURE <b>14</b>



**Notes and Abbreviations:**

µg/L: micrograms per liter

NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Cadmium (unfiltered) Concentrations in Zone 1 Monitoring Wells Near Former Plant 2</b>	
<b>ARCADIS</b>	<b>FIGURE 15</b>



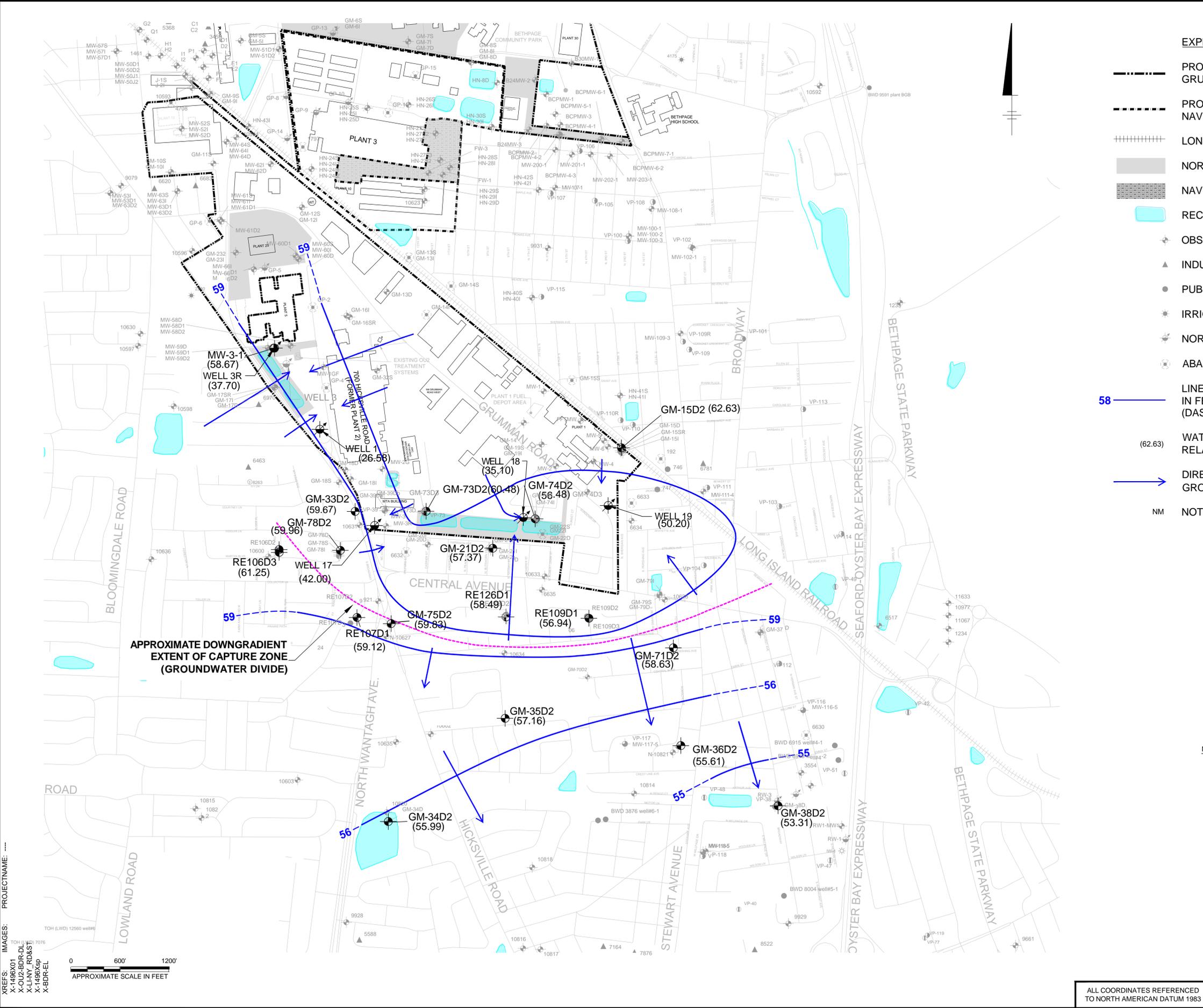
**Notes and Abbreviations:**

µg/L: micrograms per liter

NORTHROP GRUMMAN BETHPAGE, NEW YORK OPERABLE UNIT 2	
<b>Total Chromium (unfiltered)          Concentrations in Zone 1 Monitoring          Wells          Near Former Plant 2</b>	
	<b>FIGURE          16</b>



CITY/SYRACUSE, NY DIVISION/PROJECT: DBA, SANCHEZ, LD, ALS, RIC(O), PM (Rev), TM(O), LVS(O), CH(O), OFE-REF-  
 C:\Users\roberta\BIM\390\Arcadis\NA - Northrop Grumman\Project Files\OU2 ONCT OM&M Program\2021\01-DWG\NSC-BP-ONCT-GW-D2-ZONE.ang LAYOUT: 18 SAVED: 3/29/2021 9:19 AM ACADVER: 23.15 (LMS TECH) PAGES: 18 PLOT SETUP: PLOT STYLE: TABLE: PLOTTED: 3/29/2021 9:19 AM BY: OBERLANDER, ROSEANNE  
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**EXPLANATION:**

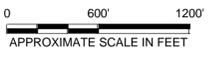
- PROPERTY BOUNDARY OF THE FORMER GRUMMAN AEROSPACE SITE
- PROPERTY BOUNDARY OF THE FORMER NAVY SITE
- +++++ LONG ISLAND RAILROAD
- █ NORTHROP GRUMMAN PROPERTY AS OF 2009
- █ NAVY PROPERTY AS OF 2014
- █ RECHARGE BASIN
- ⊕ OBSERVATION/MONITORING WELL
- ▲ INDUSTRIAL WELL
- PUBLIC SUPPLY WELL
- ⊙ IRRIGATION WELL
- ⊙ NORTHROP GRUMMAN ONCT WELL
- ⊙ ABANDONED WELL
- 58 --- LINE OF EQUAL WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL (DASHED WHERE LESS CONTROL)
- (62.63) --- WATER-LEVEL ELEVATION IN FEET RELATIVE TO MEAN SEA LEVEL
- DIRECTION OF HORIZONTAL COMPONENT OF GROUNDWATER FLOW
- NM NOT ACCESSIBLE

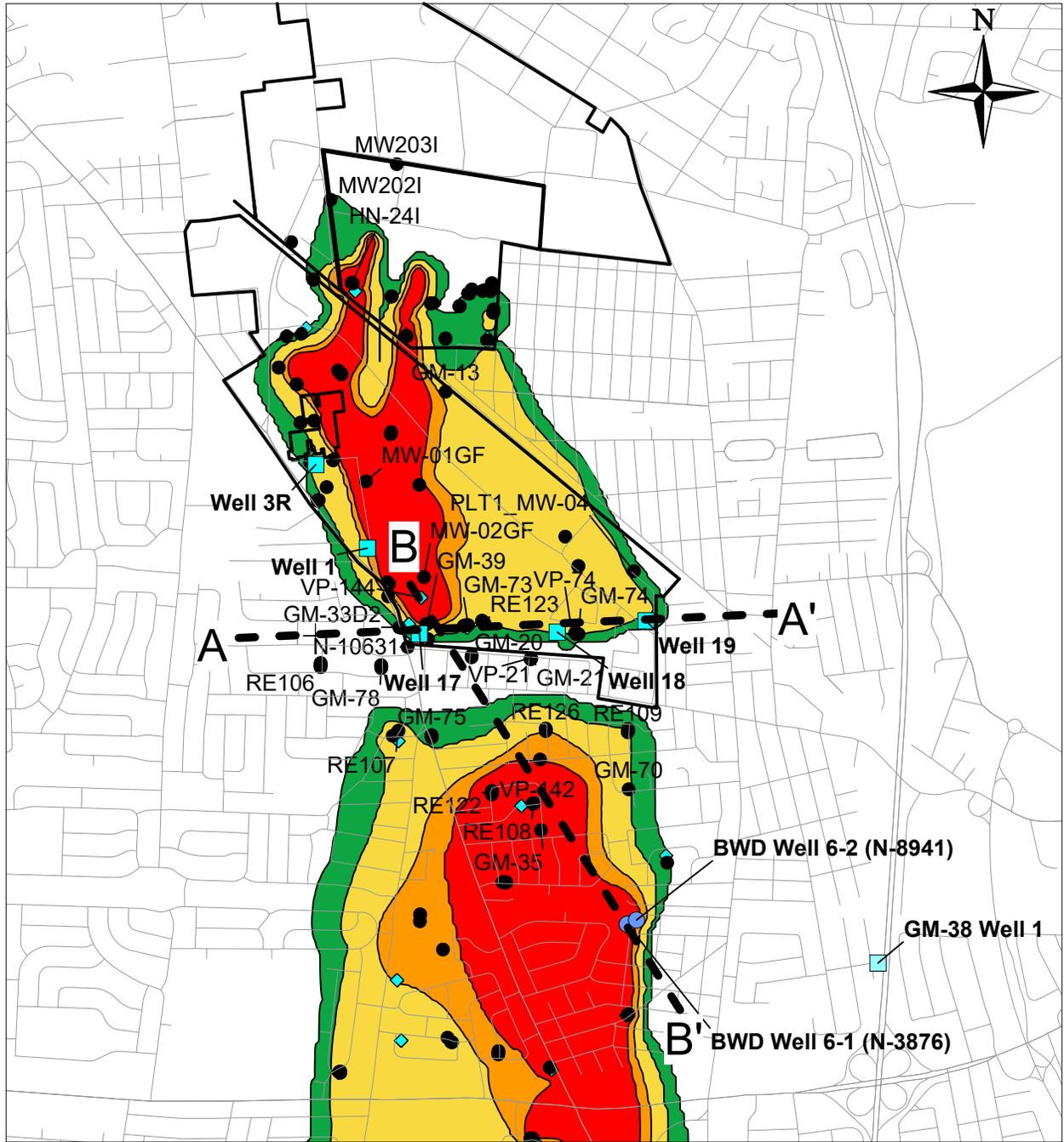
**NOTES:**

1. NORTHROP GRUMMAN ONCT WELLS 1, 3R, 17, 18 AND 19 SCREENED IN ZONE 3.
2. BETHPAGE WATER DISTRICT WELL 3876 SCREENED IN ZONE 2.
3. BETHPAGE WATER DISTRICT WELLS 6915 AND 6916 SCREENED IN ZONE 3.
4. BETHPAGE WATER DISTRICT WELL 8941 SCREENED IN ZONE 4.

**NORTHROP GRUMMAN  
 BETHPAGE, NEW YORK  
 OPERABLE UNIT 2**  
**POTENTIOMETRIC SURFACE ELEVATION  
 AND GENERALIZED HORIZONTAL  
 GROUNDWATER FLOW DIRECTIONS IN  
 ZONE 3 (500-700 FEET BELOW LAND SURFACE),  
 OCTOBER 2021**

ALL COORDINATES REFERENCED TO NORTH AMERICAN DATUM 1983





Total Volatile Organic Compound (TVOC)  
Concentrations ( $\mu\text{g/L}$ )

1,000  
500  
50  
5  
Non-detect

— Boundary of the Former Northrop Grumman / NWIRP Site

**A-A'** — Cross-Section Line

- Monitoring Wells
- ◆ Vertical Profile Borings
- Remediation Well
- Public Supply Well

Plume is based on the most recently available data from each sampling location collected between 2015 and 2021. Data were collected from monitoring wells, vertical profile borings, remedial wells, and public supply wells.

Horizontal Scale (Feet)



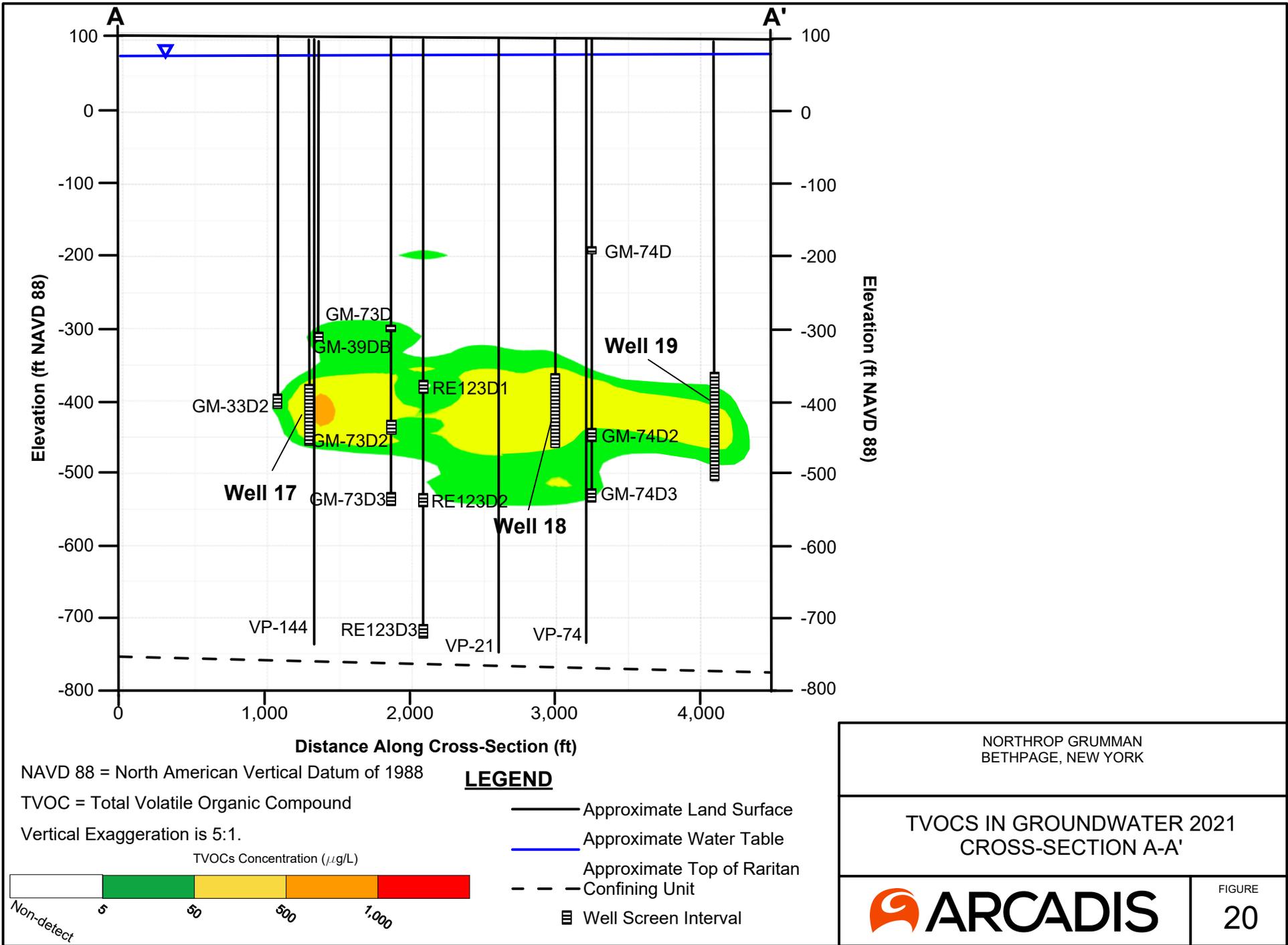
Northrop Grumman  
Bethpage, New York

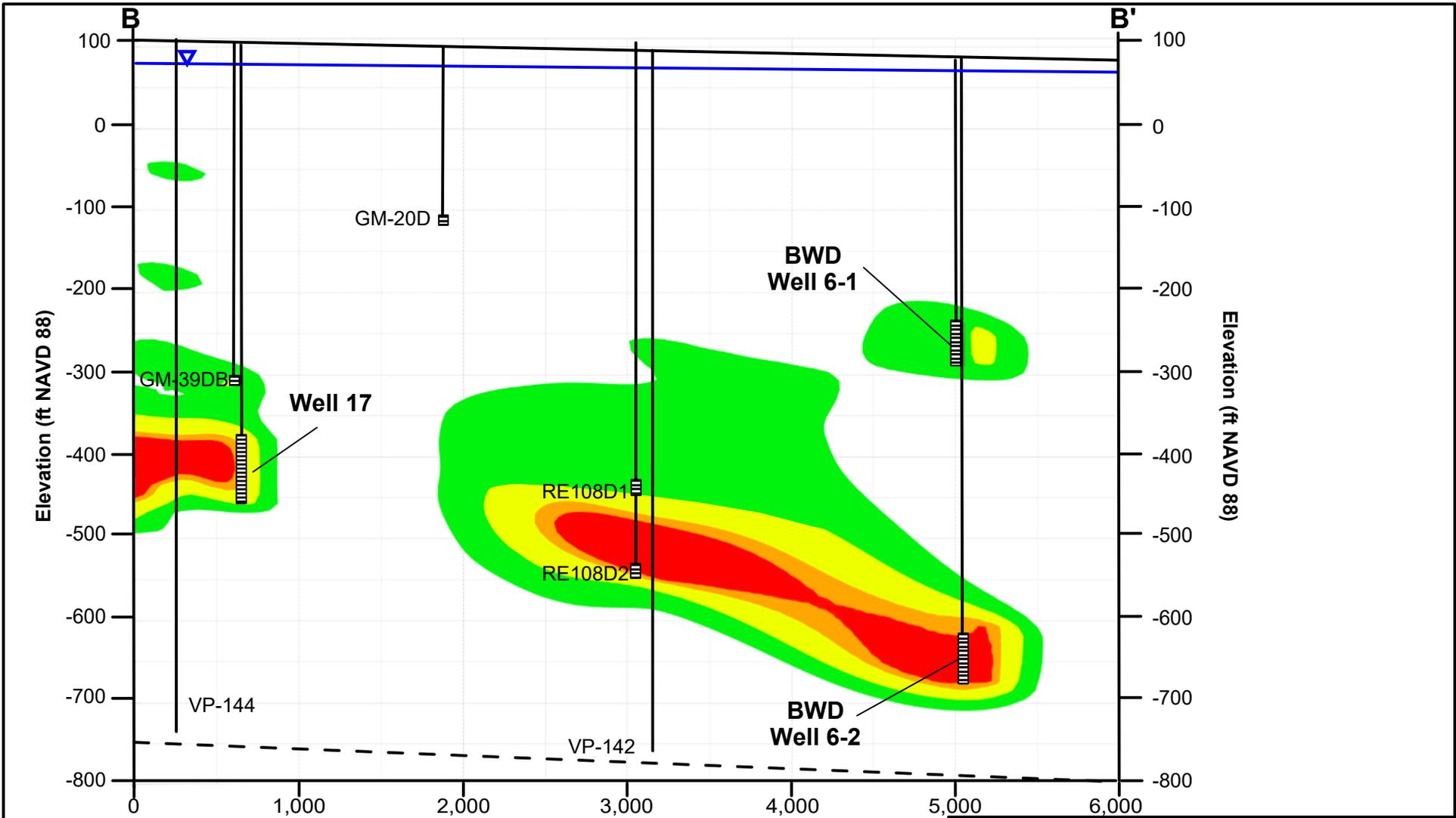
CROSS-SECTION LINES AND MAXIMUM TVOC CONCENTRATIONS 2021

ARCADIS

FIGURE

19



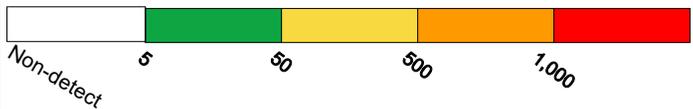


NAVD 88 = North American Vertical Datum of 1988

TVOC = Total Volatile Organic Compound

Vertical Exaggeration is 5:1.

TVOCs Concentration ( $\mu\text{g/L}$ )



Distance Along Cross-Section (ft)

**LEGEND**

- Approximate Land Surface
- Approximate Water Table
- Approximate Top of Raritan
- - - Confining Unit
- ▤ Well Screen Interval

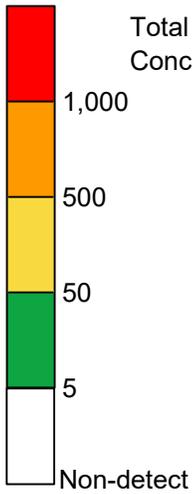
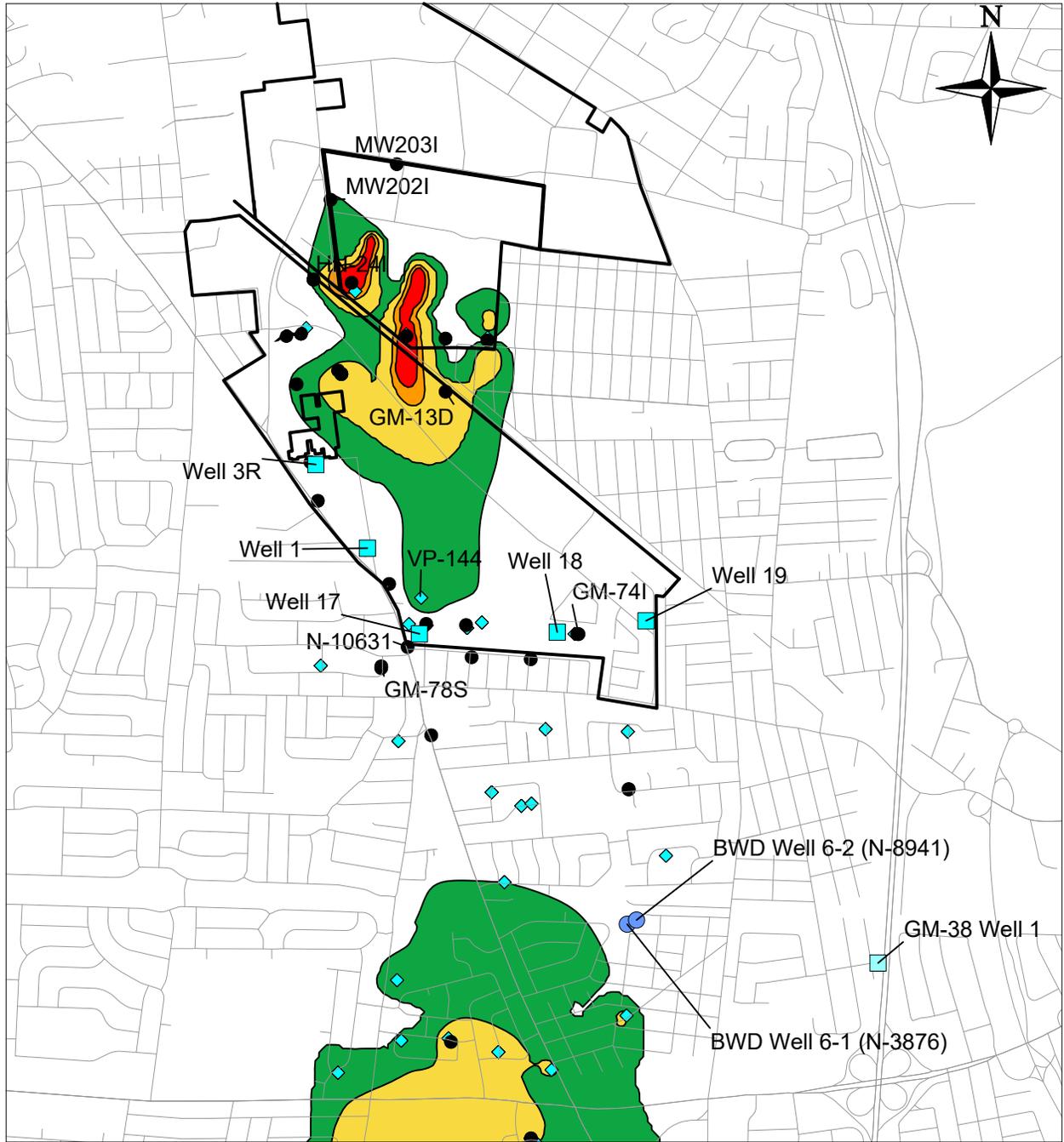
NORTHROP GRUMMAN  
BETHPAGE, NEW YORK

TVOCs IN GROUNDWATER 2021  
CROSS-SECTION B-B'



FIGURE

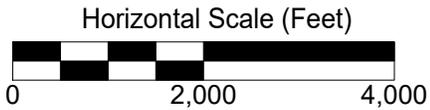
21



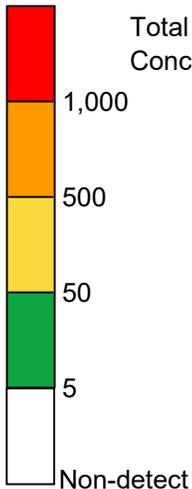
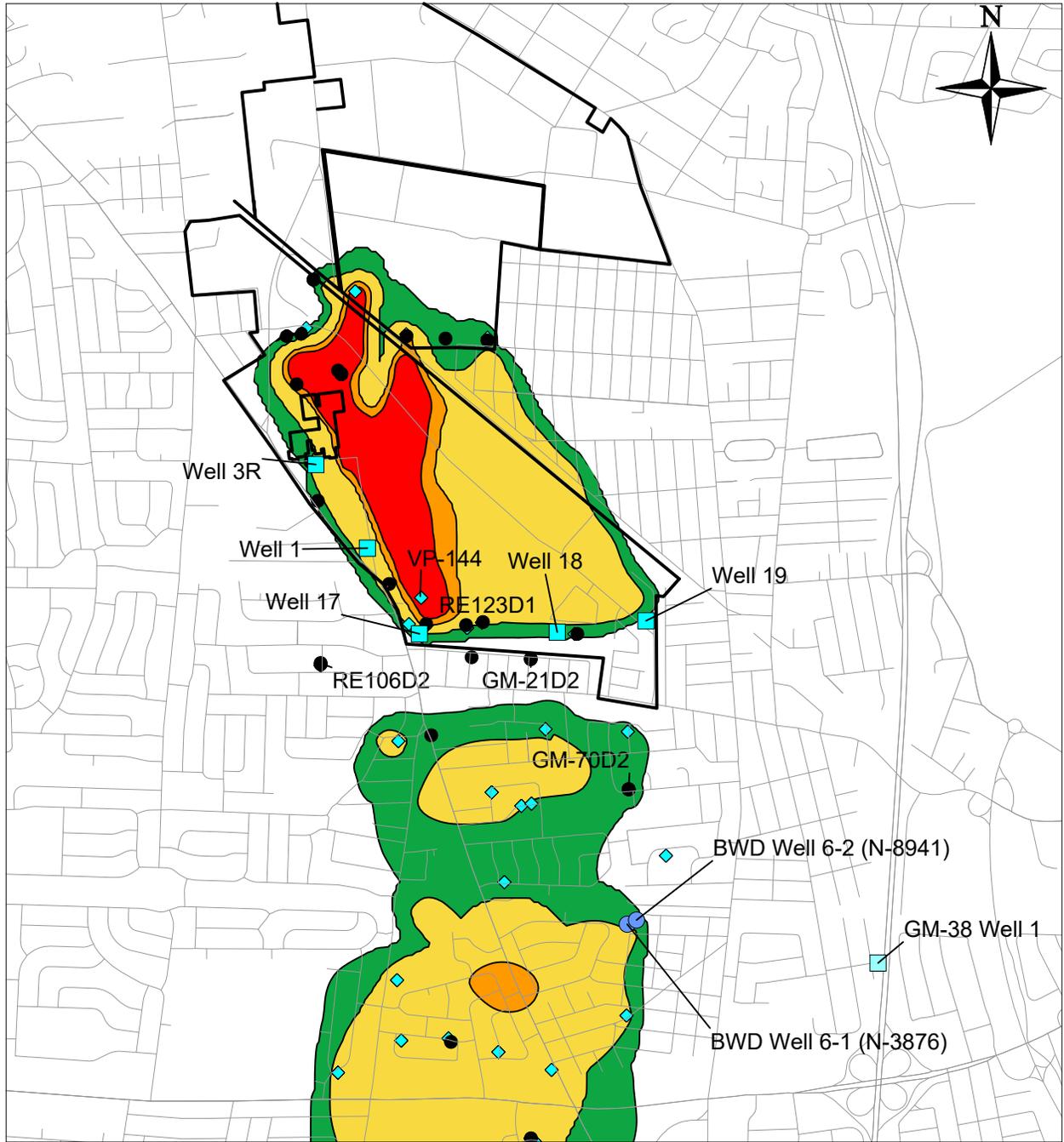
Total Volatile Organic Compound (TVOC)  
Concentrations (µg/L)

- Boundary of the Former Northrop Grumman / NWIRP Site
- Monitoring Wells
- ◆ Vertical Profile Borings
- Remediation Well
- Public Supply Well

Remediation and public supply wells are shown for reference and are not necessarily screened in this zone. Plume is based on the most recently available data from each sampling location collected between 2015 and 2021. Data were collected from monitoring wells, vertical profile borings, remedial wells, and public supply wells.



Northrop Grumman Bethpage, New York	
<b>ZONE 1 (0 TO 300 FEET BELOW LAND SURFACE) MAXIMUM TVOC CONCENTRATIONS 2021</b>	
	FIGURE <b>22</b>



Total Volatile Organic Compound (TVOC)  
Concentrations ( $\mu\text{g/L}$ )

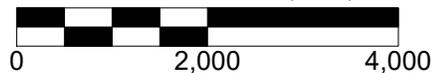
— Boundary of the Former  
Northrop Grumman / NWIRP Site

- Monitoring Wells
- ◆ Vertical Profile Borings
- Remediation Well
- Public Supply Well

Remediation and public supply wells are shown for reference and are not necessarily screened in this zone.

Plume is based on the most recently available data from each sampling location collected between 2015 and 2021. Data were collected from monitoring wells, vertical profile borings, remedial wells, and public supply wells.

Horizontal Scale (Feet)



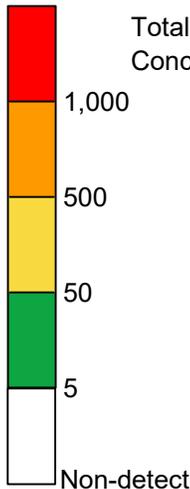
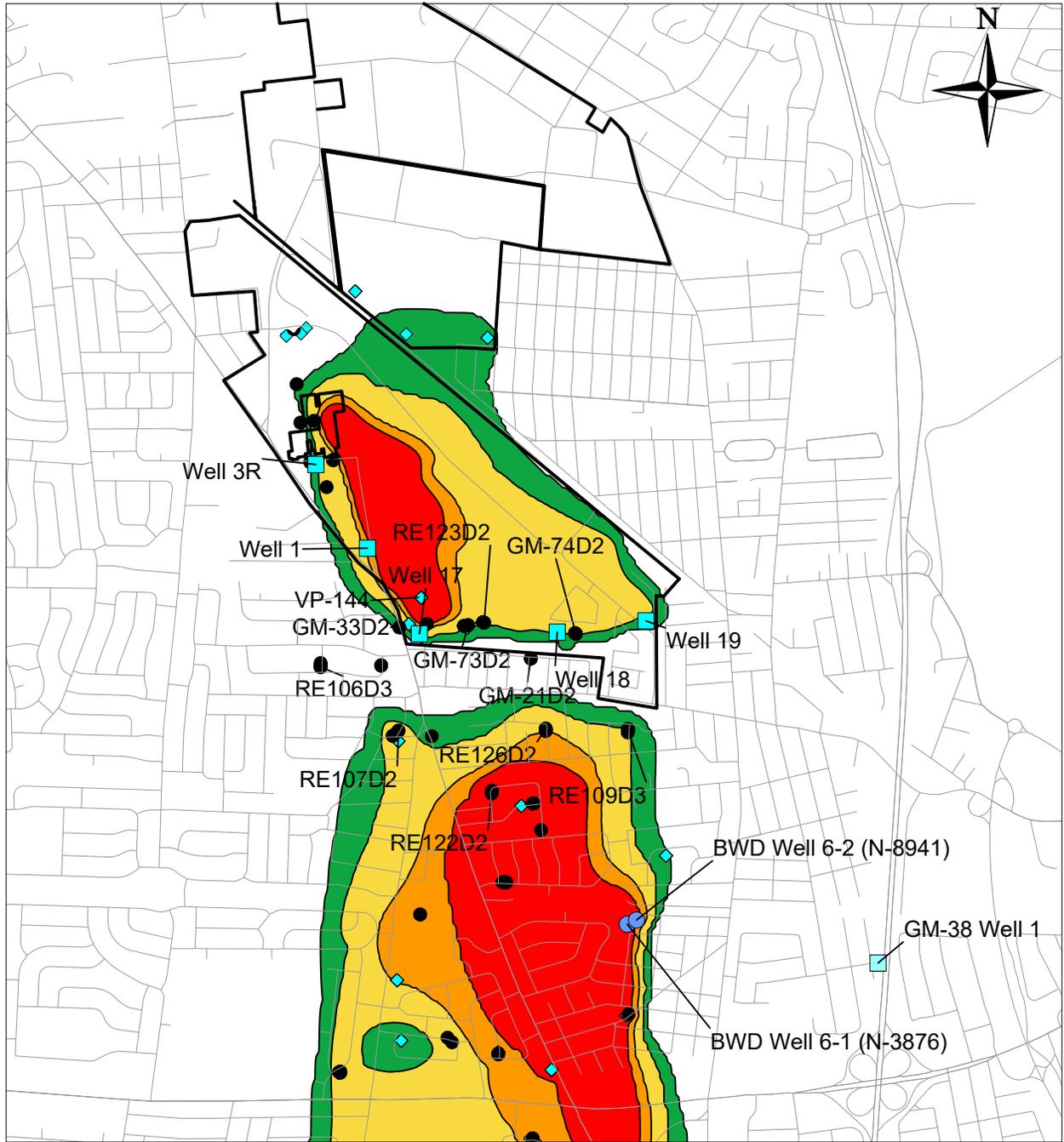
Northrop Grumman  
Bethpage, New York

**ZONE 2 (300 TO 500 FEET BELOW LAND SURFACE) MAXIMUM TVOC CONCENTRATIONS 2021**

**ARCADIS**

FIGURE

**23**



Total Volatile Organic Compound (TVOC)  
Concentrations ( $\mu\text{g/L}$ )

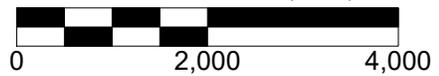
— Boundary of the Former  
Northrop Grumman / NWIRP Site

- Monitoring Wells
- ◆ Vertical Profile Borings
- Remediation Well
- Public Supply Well

Remediation and public supply wells are shown for reference and are not necessarily screened in this zone.

Plume is based on the most recently available data from each sampling location collected between 2015 and 2021. Data were collected from monitoring wells, vertical profile borings, remedial wells, and public supply wells.

Horizontal Scale (Feet)

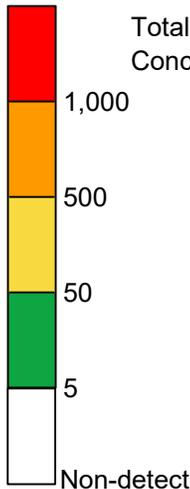
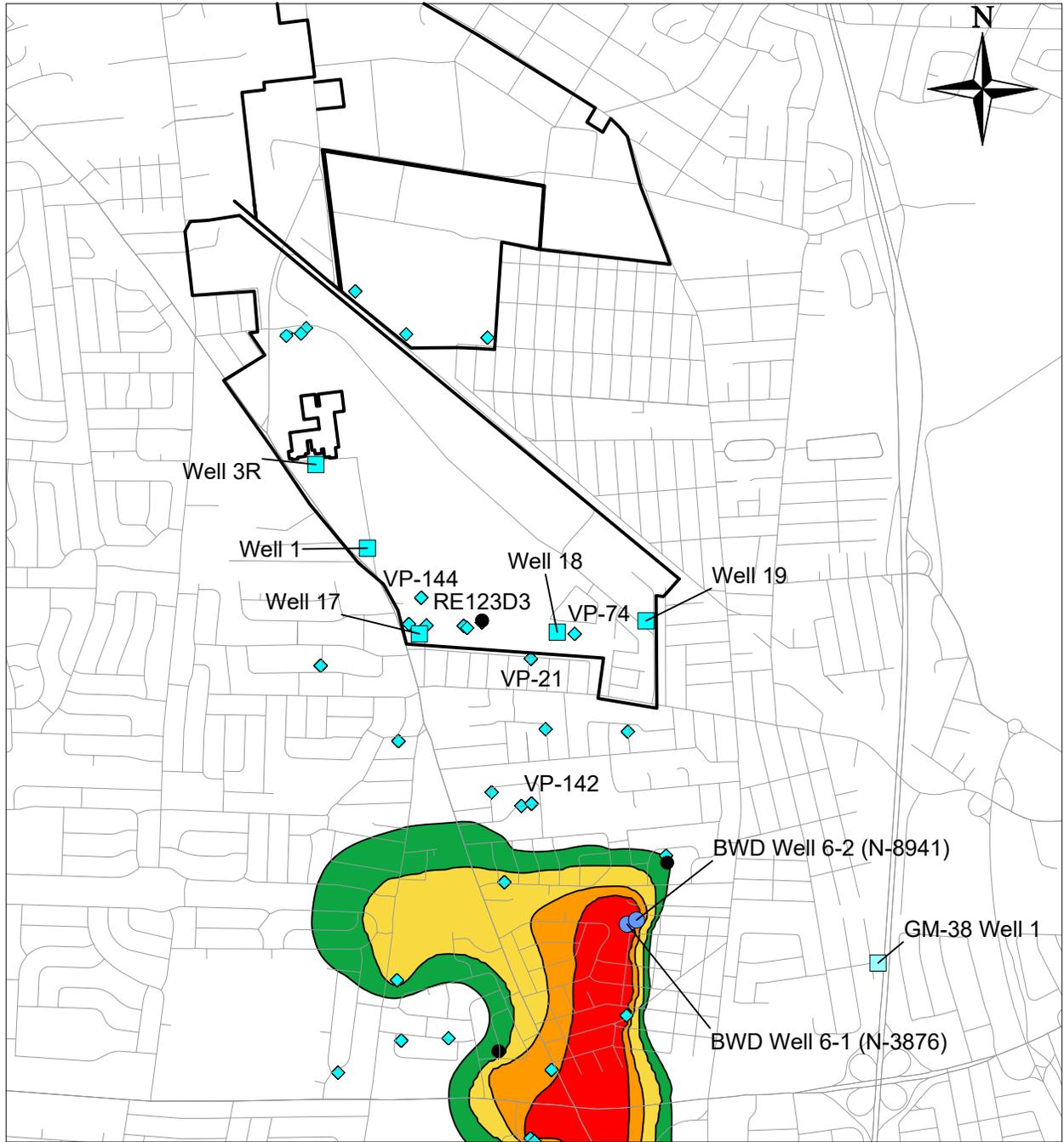


Northrop Grumman  
Bethpage, New York

**ZONE 3 (500 TO 700 FEET BELOW LAND SURFACE) MAXIMUM TVOC CONCENTRATIONS 2021**



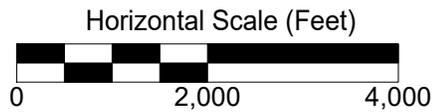
FIGURE  
**24**



Total Volatile Organic Compound (TVOC)  
Concentrations ( $\mu\text{g/L}$ )

- Boundary of the Former Northrop Grumman / NWIRP Site
- Monitoring Wells
- ◆ Vertical Profile Borings
- Remediation Well
- Public Supply Well

Remediation and public supply wells are shown for reference and are not necessarily screened in this zone. Plume is based on the most recently available data from each sampling location collected between 2015 and 2021. Data were collected from monitoring wells, vertical profile borings, remedial wells, and public supply wells.



Northrop Grumman Bethpage, New York	
<b>ZONE 4 (GREATER THAN 700 FEET BELOW LAND SURFACE) MAXIMUM TVOC CONCENTRATIONS 2021</b>	
	FIGURE <b>25</b>