SIXTH FIVE-YEAR REVIEW REPORT FOR AMERICAN CYANAMID SUPERFUND SITE SOMERSET COUNTY, NEW JERSEY

Prepared by

U.S. Environmental Protection Agency
Region 2
New York, New York

Evangelista, Pat Digitally signed by Evangelista, Pat
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Pat Evangelista, Director
Superfund and Emergency Management Division

Date

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LIST OF ABBREVIATIONS & ACRONYMS

ACO	Administrative Consent Orders
ARACO	Amended and Restated Administrative Consent Order
ARAR	Applicable or Relevant and Appropriate Requirement
BERA	Baseline Ecological Risk Assessment
CAMU	Corrective Action Management Unit
CD	Consent Decree
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Community Involvement Coordinator
COCs	Contaminants of Concern
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ESD	Explanation of Significant Differences
FEMA	Federal Emergency Management Agency
FEPP	Flood Emergency Procedures Plan
FHA	Flood Hazard Area
FMRP	Flood Management Response Plan
FS	Feasibility Study
FYR	Five-Year Review
GWCS	Groundwater Conveyance System
GWEIS	Groundwater Extraction/Injection System
GWTF	Groundwater Treatment Facility
GWQS	Groundwater Quality Standard
HBW	Hydraulic Barrier Wall
IC	Institutional Controls
ISS	In-Situ Stabilization
LSIWTS	Lagoon Seven Interim Water Treatment System
MLOW	Multiple Lines of Evidence
NCP	National Contingency Plan
NJGWQS	New Jersey Ground Water Quality Standards
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCB	Polycyclic biphenyls
PFAS	Perfluorinated alkyl substances
PFNA	Perfluorononanoic acid
PFOA	Perfluoro-n-octanoic acid
PFOS	Perfluoro-1-Octanesulfonate
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PRP	Potentially Responsible Party

RAR	Remedial Action Report
RAO	Remedial Action Objectives
RCRA	Resource Conservation and Recovery Act
RDR	Remedial Design Report
RGMP	Routine Groundwater Monitoring Program
RI/FS	Remedial Investigation/Feasibility Study
RD/RA	Remedial Design/Remedial Action
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional screening levels
SEL	Severe Effects Level
SIGMP	Surface Impoundment Groundwater Monitoring Program
STS	Somerset Tire Service
SVOCs	Semi-Volatile Organic Compounds
TSD	Treatment/Storage/Disposal
UU/UE	Unlimited use/unrestricted exposure
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds
WH	Wyeth Holdings
WRA	Well Restriction Area

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP)(40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the sixth FYR for the American Cyanamid Superfund Site (Site). The triggering action for this statutory review is the completion of the previous FYR on September 11, 2019. A FYR is required at this Site due to the fact that hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site originally consisted of seven Operable Units (OUs), and an eighth OU was subsequently added.

- A remedy was selected and has been implemented, or partially implemented, for OU1, OU2, OU3 and OU6.
- The remedy for OU6, the Hill Property portion of the Site, consisted of no further action with monitoring and institutional controls (ICs). As part of the remedy, the New Jersey Department of Environmental Protection (NJDEP) established a classification exception area (CEA) and a well restriction area (WRA) for the Hill Property, which was subsequently removed in June 2008 based on sampling results. OU6 was deleted from the National Priorities List (NPL) in 1998 and was redeveloped for commercial use (i.e., retail stores, a professional baseball stadium and a commuter/stadium parking lot). As such, OU6 is not subject to this FYR.
- OU4, OU5 and OU7, as well as the portions of the remedies for OU1, OU2 and OU3 that were not already implemented, have been combined and are being addressed under the existing OU4, for which a remedy was selected in 2012. Design and implementation of the OU4 remedy is currently underway.
- While the OU4 remedy was being developed, EPA decided to address impoundments 1 and 2 separately as part of an eighth operable unit. A remedy for OU8 was selected in 2018, and the design of the remedy is being initiated. As such, OU8 is also not part of this FYR.

In Summary, the following OUs are addressed in this FYR:

- OU 1 (impoundments 11 and 19);
- OU 2 (impoundments 15, 16 and 18);
- OU 3 (impoundments 14, 20 and 26); and
- OU 4 (impoundments 3, 4, 5, 13, 17 and 24, Site-wide contaminated soil, groundwater and wetlands).

The Site's sixth FYR team was led by the EPA Remedial Project Manager (RPM) Mark Schmidt. Participants from EPA also included: Stephanie Vaughn – Section Supervisor, Mega Projects Section; Michael Grossman – RPM, Dan Patel - RPM, Paul Zarella – Hydrogeologist; Julie McPherson – Ecological and Human Health Risk Assessor; and Shereen Kandil – Community Involvement Coordinator (CIC). The PRP was notified of the initiation of the five-year review. The review began on 11/29/2023.

Site Background

The 435-acre Site is located within the southeastern section of Bridgewater Township, Somerset County, in the north-central portion of New Jersey (Attachment 1). Bridgewater Township has a population of approximately 45,000 people. Due to its size, the Site is divided into five identifiable areas: North Area, South Area, West Area, East Area, and the Impoundment 8 Facility (Attachment 2). The Impoundment 8 Facility is designated as a Corrective Action Management Unit (CAMU), included as part of a previous Record of Decision (ROD) for OU3 and regulated under the Resource Conservation and Recovery Act (RCRA). The Site was used for more than eight decades to manufacture a range of products including rubber-based chemicals, dyes, pigments, chemical intermediates, petroleum-based products, and pharmaceuticals.

The surrounding land use is a mix of light industrial and residential. The nearest residences are towards the southeast approximately 1,800 feet away from the Site. The nearest local business is approximately 400 feet to the north. To the immediate north of the Site, a baseball stadium, a commuter train rail station and several commercial businesses are located on redeveloped land that was once part of the Site.

According to the Federal Emergency Management Agency (FEMA), the entire Site, with the exception of the CAMU located in the far northwest portion, lies within a Special Flood Hazard Area designated as Zone AE (base flood elevations are established using a 100-year flood event). Over the past twenty or so years, the area has been subject to frequent, and sometimes intense flooding, such as from Tropical Storm Ida (2021), Hurricane Irene (2011) and Hurricane Floyd (1999) to name a few.

The Site has had several owners/operators since a chemical and dye manufacturing facility was built in 1915. The American Cyanamid Company purchased the facility in 1929 and expanded it into one of the nation's largest dye and organic chemical plants. As production increased from the 1930s through the 1970s, buildings and support services were expanded to accommodate increased demands for the products. The manufacture of bulk pharmaceuticals continued

throughout the early 1990s, generating untreated waste material that was managed in on-site waste impoundments.

In 1981, preliminary investigations verified that approximately one-half of the Site was utilized to support manufacturing, waste storage, or waste disposal activities. Most of the wastes were stored in as many as twenty-seven (27) on-site surface impoundments, while general facility wastes, debris and other materials were primarily disposed of on the ground at various locations resulting in extensive on-site soil and groundwater contamination.

Through investigations conducted in the late 1980s and early 1990s, sixteen (16) of the 27 impoundments were identified for remediation under CERCLA (Attachment 2). The remaining 11 impoundments are regulated under RCRA and generally contain non-hazardous substances. A summary of the Site impoundments is presented in Appendix A.

In 1988, the 16 CERCLA impoundments-were organized into three groups resulting in a separate ROD for each:

- OU1 Group I – Impoundments 11*, 13, 19*, and 24
- OU2 Group II – Impoundments 1, 2, 15, 16, 17, and 18*
- OU3 Group III – Impoundments 3, 4, 5, 14*, 20*, and 26*

("*" – remediation complete)

Due to the toxicity of Impoundments 1 and 2, EPA subsequently decided to move them into Group III. A ROD for the revised listing of Group III Impoundments was issued in September 1998. However, a pilot test confirmed that the selected remedy for Impoundments 1 and 2 (low temperature thermal treatment and placement of material in the CAMU) was technically infeasible due to anticipated difficulties in both the extensive handling of the acid tar material and complications with controlling air emissions during the treatment phase of remedy implementation. This finding resulted in the suspension of some remediation activities for the Group III Impoundments. However, some impoundments under the 1998 ROD (Impoundments 14, 20, and 26) have since been remediated and the contents permanently placed in the CAMU.

Due to the complexity of the remaining Group III Impoundments (1,2,3,4 and 5), a comprehensive FS was conducted in 2004 to re-evaluate remedial alternatives for the remaining impoundments and included on-site soils and Site-wide groundwater. By 2009, both Impoundments 1 and 2 were separated from the other planned remedial work (now known as OU4) into a new OU called OU8.

On September 27, 2012, a ROD for OU4 was finalized which included a remedy for six impoundments (3, 4, 5, 13, 17, and 24) and all Site-wide contaminated soil, groundwater (originally OU5) and wetlands (originally OU7). The design and implementation of the OU4 remedy is currently underway.

On September 23, 2018, a ROD for OU8 was finalized which included a remedy for impoundments 1 and 2. Plans for the remedial design are currently underway. OU8 is expected to be the last operable unit at the Site.

In 1983, EPA listed the Site on the NPL, and environmental remediation and restoration activities have been ongoing at the Site since that time under CERCLA. NJDEP was the lead agency for the Site until March 2009, when EPA assumed the lead role.

On July 19, 2011, the PRP, Wyeth Holdings entered an Administrative Settlement Agreement and Order on Consent with EPA requiring Wyeth Holdings to address Site-wide contaminated groundwater, soil and impoundments 3, 4, 5, 13, 17 and 24.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: American Cyanamid Superfund Site		
EPA ID: NJD002173276		
Region: 2	**State:** NJ	**City/County:** Somerset
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the Site achieved construction completion?** No	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Mark Schmidt & Michael Grossman		
Author affiliation: US EPA Region 2		
Review period: 11/29/2023 - 6/14/2024		
Date of Site inspection: 2/1/2024		
Type of review: Statutory		
Review number: 6		
Triggering action date: 9/11/2019		
Due date *(five years after triggering action date)*: 9/11/2024		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Since the NPL placement, Site conditions have been characterized through a series of remedial investigations in order to characterize the nature and extent of the contamination. An

impoundment characterization program was completed in 1990 and a soils investigation was completed in May 1992 to characterize and delineate contaminated soils. A remedial investigation of groundwater was completed in February 2006 and a supplemental groundwater investigation was completed in February 2008.

A number of human health and ecological risk assessments have been conducted at the Site. A baseline endangerment assessment was conducted in 1992 to evaluate cancer risks and noncancer health hazards associated with potential exposures to the impoundments, surface soils and groundwater.

A human health risk assessment was conducted in 2006 for the same exposures as in the 1992 baseline endangerment assessment. A streamlined human health risk assessment was also completed in February 2010 to evaluate the cancer risks and noncancer hazards. These assessments generally concluded that impoundments, soils and groundwater presented an unacceptable human health risk to current and potential future receptors. Ecological risks at the Site were addressed through the 1992 baseline endangerment assessment, as well as through a baseline ecological risk assessment (BERA) conducted in 2005. The baseline ecological risk assessment concluded that the level of potential impact of Site-related contaminants to ecological receptors is likely to be low. As required by the September 2012 OU4 ROD, an additional ecological risk assessment was performed for impoundments 13, 17 and 24 to confirm the appropriate treatment for these materials. This assessment determined that their contents require relocation to the North Area, as per the September 2012 OU4 ROD.

The following are the main COCs for the affected media at the Site:

- Impoundments: benzene, nitrobenzene, naphthalene, N-nitrosodiphenylamine and 1,2- dichlorobenzene;
- Site soils: antimony, arsenic, benzo(a)pyrene, chromium IV, cobalt and total polychlorinated biphenyls; and,
- Groundwater: benzene, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, nitrobenzene, n-Nitrosodiphenylamine, toluene and xylene.

Response Actions

Due to the size of nature of contamination, the Site was originally divided into the following seven OUs:

- OU1 (Group I): Impoundments 11, 13, 19 and 24
- OU2 (Group II): Impoundments 15, 16, 17 and 18
- OU3 (revised Group III): Impoundments 1, 2, 3, 4, 5, 14, 20 and 26
- OU4: Site soil
- OU5: Site groundwater
- OU6: Hill Property soil
- OU7: Site-related wetlands

OU6 was deleted from the NPL in 1998. A groundwater CEA/WRA was established as part of the OU6 ROD; however, the CEA/WRA was closed in June 2008 after residual groundwater contaminant concentrations were reported below NJDEP groundwater quality standards.

Therefore, this OU is not covered in this FYR.

The portions of OU1, OU2 and OU3 that were not completed or undergoing active remediation, as well as the remaining OUs (OU4, OU5 and OU7) that had not been addressed at the time of the issuance of the OU4 ROD were combined and added to the existing OU4, as documented in the OU4 ROD, with the exception of impoundments 1 and 2 which are being addressed under OU8.

The following elements are specifically included in this FYR:

- Operable Unit 1: Impoundments 11 and 19
    - A ROD was signed for Impoundments 11, 13, 19 and 24 in September 1993. The remedies for Impoundments 11 and 19 were completed in November 1997 and November 1995, respectively. Note: The remedial activities for Impoundments 13 and 24 are now being addressed under OU4.
    - The 1993 OU1 ROD called for the excavation of impoundments 11 and 19, the on-site solidification of excavated material, and the consolidation of solidified material into the impoundment 8 facility.
    - The remedial action objectives per the 1993 OU1 ROD were to:
        - Eliminate source of contamination; and
        - Contribute to compliance with applicable or relevant and appropriate requirements (ARARs) for groundwater.
- Operable Unit 2: Impoundments 15, 16, and 18
    - A ROD was signed for impoundments 15, 16, 17 and 18 in July 1996. The remedy for impoundment 18 was completed in April 1998. The remedy for impoundments 15 and 16 was modified through an ESD in November 1998, and their remediation is ongoing.
    - The 1998 OU2 ESD for impoundments 15 and 16 called for the excavation of iron oxide material, transport and reuse of the material at an off-site recycling facility, the backfilling and revegetation of the former impoundment areas and the monitoring of groundwater. The remedial action objectives for the 1998 OU2 ESD remained the same as the remedial action objectives in the 1996 OU2 ROD.
    - The remedial activities for impoundment 17 are now being addressed under OU4.
    - The 1996 OU2 ROD called for the construction of a fence, maintenance of natural vegetation and groundwater monitoring for impoundment 18.
    - The remedial action objectives per the 1996 OU2 ROD were to:
        - Eliminate and/or control source(s) of contamination;
        - Eliminate the potential for incidental ingestion, dermal contact and inhalation of impoundments' solids; and,
        - Contribute to compliance with groundwater ARARs.
- Operable Unit 3: Impoundments 14, 20 and 26
    - A ROD was signed for impoundments 1, 2, 3, 4, 5, 14, 20 and 26

in September 1998. The remedy for impoundment 26 was completed in March 2002 per the OU3 ROD. The remedies for impoundments 14 and 20 were completed in December 2009 per a 2007 ESD.

- The remedial activities for impoundments 1 and 2 are now being addressed under OU8, and the remedial activities for impoundments 3, 4 and 5 are now being addressed under OU4. The OU3 ROD for impoundment 26 called for the excavation, solidification and placement of silts, tars and underlying soils within into the impoundment 8 facility.
- The 2007 ESD for impoundments 14 and 20 called for the excavation, solidification and placement of materials into the impoundment 8 facility.
- The remedial action objectives per the OU3 ROD were to:
  - Eliminate the migration of constituents from the impoundments to air, soil, groundwater and surface water at levels representing an unacceptable human health or environmental risk or resulting in exceedance of ARARs; and,
  - Reduce the risk associated with potential exposure from contaminated material in the impoundments.

- Operable Unit 4: Impoundments 3, 4, 5, 13, 17, and 24, and Site-wide contaminated soil, groundwater and wetlands
  - The OU4 ROD was signed in September 2012. The remedy called for:
    - The treatment of all waste material located within Impoundments 3, 4 and 5 through in-situ solidification/stabilization followed by placement of an engineered vapor control barrier and engineered soil cover system.
    - Placement of either a vapor control or direct contact barrier cap over contaminated Site-wide soil, as determined to be appropriate.
    - Relocation and consolidation of waste material in impoundments 13, 17 and 24, if determined to be necessary based on the results of an ecological risk assessment.
    - Improvement of the existing groundwater collection and treatment system.
    - Institutional controls, monitoring and periodic reviews.
  - The remedial action objectives per the OU4 ROD for Principal Threat Waste are to:
    - Remove or treat material that meets the definition of principal threat waste, to the extent practical
    - Prevent current or potential future migration of material that meets the definition of principal threat waste from the Site that would result in direct contact or inhalation exposure, to the extent practicable.

- The remedial action objectives per the OU4 ROD for soil/impoundment material are to:
    - Prevent or minimize human and ecological exposure to contaminants in soils and impoundment materials at levels above relevant risk-based remediation criteria.
    - Prevent or minimize sources of groundwater impacts (i.e., reduce chemical loadings to groundwater) resulting in long term improvement of groundwater quality and eventual achievement of applicable regulatory standards.
- The remedial action objectives per the OU4 ROD for groundwater are to:
    - Restore, as practicable, the overburden and bedrock aquifers within the area of attainment to its expected beneficial use and to concentrations below the more stringent federal MCLs and NJ GWQS within a reasonable period.
    - Eliminate the migration of contaminants exceeding the more stringent of federal MCLs and NJ GWQS in the overburden and bedrock aquifers beyond the point of compliance through a combination of source actions and hydraulic controls to the extent practicable.

Status of Implementation

The following is a summary of the implemented remedies that are the subject of this FYR.

Operable Unit 1: Impoundments 11 and 19

The remediation of impoundment 11 was initiated in August 1996 and concluded in June 1997 following restoration and demobilization work. The closure consisted of the excavation, solidification and placement of approximately 30,000 cubic yards of sludge and underlying soils into the impoundment 8 facility. A certification closure report was approved by NJDEP in November 1997.

The remediation of impoundment 19 was initiated in October 1994 and concluded in June 1995. The closure consisted of the excavation, solidification and placement of approximately 12,000 cubic yards of sludge into the impoundment 8 facility. A certification closure report was completed in August 1995 and revised in November 1995 with NJDEP approval.

Operable Unit 2: Impoundment 15, 16 and 18

The remediation of impoundments 15 and 16 was initiated in 2000 and is ongoing. To date, approximately 147,086 tons of iron oxide material has been transported to an off-site recycling facility for reuse. The backfilling, grading and revegetation of these areas will be completed along with the implementation of the OU4 remedy.

The remediation of impoundment 18 was initiated in September 1997 and concluded in January

1998. The closure of impoundment 18 consisted of fencing around the perimeter of the impoundment, harvesting of large diameter trees, and the construction of a spillway to control potential erosion during large flood events.

Operable Unit 3: Impoundments 14, 20 and 26

The remediation of impoundment 26 was initiated in November 2000 and concluded in June 2001. The closure consisted of the excavation, solidification and placement of approximately 20,600 cubic yards of silt, tar and underlying soils into the impoundment 8 facility. A certification closure report for impoundment 26 was completed in November May 2002, with NJDEP approval.

The remediation of impoundments 14 and 20 was initiated in September 2007 and concluded in September 2009. The closure consisted of the excavation, solidification and placement of approximately 33,101 cubic yards of material into the impoundment 8 facility. A certification closure report was completed with NJDEP approval in December 2009.

Operable Unit 4: Impoundments 3, 4, 5, 13, 17, and 24, and Site-wide contaminated soil, groundwater and wetlands

Soils and Impoundments 3, 4, 5, 13, 17 and 24

The Site-wide FS report was completed in February 2012 to develop and evaluate remedial alternatives for impoundments 3, 4, 5, 13, 17 and 24, as well as Site soils and groundwater. The OU4 ROD was issued in September 2012 and called for the treatment via in-situ solidification/stabilization and/or the installation of engineered capping systems to address three highly contaminated impoundments (Impoundments 3, 4, and 5) and all Site soils, as well as the collection and treatment of Site-related contaminated groundwater. Based on discussions with Wyeth the design and remedial action of these components have been, or will be, completed in a phased approach as described below.

Somerset County required the construction of a new pedestrian access ramp to the New Jersey Transit (NJ Transit) Bridgewater train station adjacent to the Site and the ramp needed to be placed over a small portion of the northeastern corner of the Site. Remedial activities in that corner were expedited in order to accommodate this work. The remedial construction of the engineered soil cover system was completed by Wyeth between May 13, 2023 and July 12, 2023 and a remedial action report (RAR) was approved by EPA in February 2024. The construction of the ramp on top of the engineered soil cover system was completed by Somerset County in February 2024 (Attachment 3).

The soil cover system beneath the ramp, the stairs to the ramp, and adjacent to the ramp consists of the following:

- Subgrade consisting of Site soils or concrete footings for the adjacent retaining wall.
- 18-inch-thick protective cover soil layer.
- Nonwoven geotextile demarcation layer.
- 12-inch-thick protective cover soil layer.

- 6-inch-thick soil layer capable of supporting vegetation (i.e., vegetative support layer).

The RD for Soils and Impoundments 13 and 24 was approved in March 2024 and the remedial action is expected to be completed in 2025. The RD for Soils and Impoundments 17 is expected to begin in 2024, with the RA likely to begin in 2026. For Soils and Impoundments 3, 4 and 5, due to the volatile nature of the contents of these impoundments, the RD and pilot testing will likely begin once the acid tar removal work in Impoundments 1 & 2 is complete (as part of OU8) so that emissions sources will be minimized at the Site.

Site-wide Groundwater Remedy

The Site-wide groundwater remedy consists of a groundwater extraction/injection system (GWEIS), a groundwater conveyance system (GWCS), a hydraulic barrier wall (HBW) and a groundwater treatment facility (GWTF). Historically, the impacted bedrock groundwater was being extracted by an existing bedrock groundwater extraction system and was discharged to the Somerset Raritan Valley Sewerage Authority (SRVSA) for treatment prior to discharge to the Raritan River. As called for in the OU4 remedy, the existing bedrock production well system was expanded to comprehensively address Site-wide groundwater. The design activities have been completed for the groundwater component and the new groundwater system became operational in March 2019. EPA provided approval of the Remedial Action Reports (RARs) for each of the respective components of the groundwater remedy in September 2019. The groundwater remedy has been fully implemented and is currently in operation as follows:

- The GWTF/GWCS was commissioned from March 2019 to June 2019 and is currently being operated in accordance with the Site-Wide Groundwater Treatment Facility Operations and Maintenance Plan (Brown and Caldwell, 2018).
- The GWEIS was commissioned from June 2019 to August 2019, and it is currently being operated in accordance with the Interim GWEIS OM&M Plan (Golder, 2019d).
- Five HBWs were installed at the Site in 2018.
- Due to the presence of 1,4-dioxane in the Site groundwater and influent/effluent of the GWTF (see Data Review and Question A), a pilot study commenced in 2023 at the GWTF to evaluate the ability of propane to serve as a primary growth substrate for the biodegradation of this chemical. If successful, a full-scale treatment process will be developed and added to the GWTF process.
- Groundwater hydraulic monitoring and plume assessment monitoring is conducted semi-annually.

In addition, the following activities have been completed:

- Vapor intrusion (VI) evaluations have been performed from 2015 to 2021 to monitor the potential for VI at the Somerset Tire Services (STS) older warehouse building, which is located on an off-site, adjacent third-party property and is currently unoccupied. The VI sampling was done to evaluate the potential of vapor migrating from VOCs in groundwater and concluded that the VI pathway for the migration of contaminants from the Site related

groundwater plume to indoor air in the STS older warehouse building is not complete. Based on discussions with USEPA, NJDEP, and WH, two monitoring wells (MW-3SR-STS, and MW-15S-STS) within one hundred feet of the building have been added to the RGMP to evaluate potential increases in VOCs in overburden groundwater that could indicate a potential VI concern. It should be noted that MW-3SR-STS was identified as damaged on April 10, 2023 and is currently not able to be sampled. If groundwater concentrations are found to exceed vapor intrusion groundwater screening levels, the need to conduct additional VI sampling will be evaluated.

- Additional sampling relative to the planned GWTF/GWEIS temporary shutdown from September 12, 2022, through October 24, 2022, was conducted to assess groundwater from well locations that may be sensitive to the shutdown.
- Wetlands monitoring of the 1.12-acre forested riparian zone mitigation area that runs approximately 485 feet along the northern bank of the Raritan River south of Impoundment 18. The mitigation area was created pursuant to the Site-wide Flood Hazard Area Permit Equivalency (FHA PEq) approved by EPA on July 28, 2016. The mitigation area was completed in April 2018 to offset permanent impacts to forested portions of the riparian zone along Cuckel's Brook as a result of construction of the HBW and groundwater conveyance lines in 2018 associated with the groundwater remedial component. 2020 was the third and final year of the required 3-year monitoring period and the vegetative success criteria were met. A Site visit was conducted by representatives of NJDEP on December 28, 2021, to view the mitigation area and to confirm that the 3-year monitoring period was adequate, and that the mitigation area was successful.

Operable Unit 8: Impoundments 1 and 2

Though OU8 is not part of this FYR, for completeness, a brief summary of its status is as follows. A Record of Decision was issued in September 2018 for OU8. The ROD identified excavation and dewatering of contaminated material within two waste disposal areas, followed by shipment out of the area to a facility, for treatment and disposal as the remedy for this OU. The Remedial Design and Demonstration Project for the removal of the Acid Tar is currently underway and is expected to be completed by the fall of 2024. An In-Situ Stabilization (ISS) treatability study is also underway to determine the components for the ISS design and remedial action. The study is expected to be completed in 2025.

IC Summary

There are no formal ICs related specifically to OU1, OU2 or OU3. Engineering and Site access controls that include fencing, Site security and access restrictions are in place. The September 2012 OU4 ROD requires that the following ICs be implemented as part of the remedy: deed restrictions, restrictive covenants and the establishment of a groundwater CEA/WRA.

The Site-wide deed notice and restrictive covenants will be completed after the implementation of the impoundment contents and Site-wide soil remedial actions. The establishment of deed notices and restrictive covenants at the site is not expected to begin until sometime after 2030.

A Site-wide CEA and WRA was established on September 9, 2020, by NJDEP. The biennial certification was submitted to NJDEP on September 1, 2022 (Golder, 2022b). The biennial certification included the addition of PFAS compounds PFOA and PFOS to the CEA. The CEA will restrict potable use of groundwater until groundwater has been restored and chemical-specific ARARs have been met.

In addition to the Site-wide CEA, there is a 2nd CEA at the site established by a New Jersey Discharge Elimination System (NJPDES) DGWPEq associated with the injection of treated groundwater at the site. This PEq-related CEA is regulated separately from the site-wide CEA and encompasses the area between the discharge points (i.e., injection wells) and the compliance wells. For additional details regarding the NJPDES DGW PEq, please refer to the Systems Operations/Operation and Maintenance section.

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	Yes	The area between the injection wells and the compliance wells.	PEq-related CEA to restrict groundwater use in the area where treated water is discharged to groundwater.	CEA February 2017
Groundwater	Yes	Yes	Block 162 Lot 2 Block 305 Lot 2, 3 Block 306.01 Lot 1 Block 340 Lot 1, 2, 3 ,4 Block 341.01 Lot 1 Block 341.02 Lot 1 Block 342 Lot 1, 2 Block 347 Lot 1.03, 1.04	Restrict groundwater use (CEA) and restrict installation of groundwater wells (WRA).	CEA/WRA September 2020
Impoundment Contents and Site-wide Soils	Yes	Yes	Impoundment contents and Site-wide soils	Deed restrictions to maintain the protectiveness and functional integrity of the cap and restrictive covenants to prevent future land uses that interfere with the implementation or protectiveness of the remedy.	Site-wide deed notice and restrictive covenants will be implemented after the completion of the RA for Site-wide soils and impoundment contents.

Systems Operations/Operation & Maintenance

Groundwater, Surface water, Sediment and Ambient Air Monitoring

The Site-wide monitoring program was revised in 2015 and is on-going on a semi-annual basis. The following is a list of the ongoing monitoring programs at the Site. The monitoring data is compiled in a report which is submitted to EPA and NJDEP on a yearly basis.

- Groundwater hydraulic monitoring includes synoptic gauging of Site monitoring wells, select off-site monitoring wells, surface water staff gauges and collection trench sumps, and continuous recording with transducers in selected wells continued from the Performance Verification Monitoring Program (PVMP), conducted semi-annually.
- Hydraulic Control groundwater monitoring and sampling including South Area perimeter locations, conducted semi-annually.
- Plume Assessment groundwater monitoring and sampling per the revised Routine Groundwater Monitoring Program (RGMP) well list, conducted semi-annually.
- RCRA-D well sampling as per the Amended and Restated Administrative Consent Order (ARACO) and RCRA Surface Impoundment Groundwater Monitoring Program (SIGMP) Plan, conducted semi-annually.
- Sampling and analysis of perfluorinated alkyl substances (PFAS) (perfluoro-n-octanoic acid [PFOA], perfluoro-1-octanesulfonate [PFOS], and perfluorononanoic acid [PFNA]) in selected wells as per agreements with EPA and NJDEP, conducted semi-annually.
- Compliance well sampling as per the Discharge to Groundwater (DGW) Permit Equivalent (PEq), conducted semi-annually.
- Surface water and sediment: Surface water and sediment samples are collected semi-annually which include eight locations in Cuckel's Brook, seven locations in the Raritan River, one location in Middle Brook, and one location in the Millstone River (surface water only) for a total of 17 sample locations.
- Due to historic concentrations of VOCs identified in the pond 287, sampling is conducted semi-annually at 5 locations. Pond 287, located in the South Area, can be considered a surface water feature, since it is fed by overburden groundwater and is more closely connected to groundwater than to the adjacent surface water bodies. Pond 287 discharges to the Raritan River periodically through a controlled swale via the use of a gate valve at the culvert. A passive system is in place to treat the water flowing through the swale via activated carbon and resin bags prior to discharge through the gate valve.
- Ambient air monitoring is undertaken on an annual basis and consists of air sampling at eight locations along the perimeter of the Site and another four locations in the vicinity of impoundments 1 and 2. Air samples are collected using 6- liter summa canisters with 24-hour flow controllers and were analyzed for benzene and naphthalene following USEPA method TO-15 SIM.
- Stormwater: Surface water discharge monitoring is conducted on a monthly basis. Until the

completion of the engineering protective covers, stormwater generated at the Site's North Area is conveyed to Lagoon 7 located in the Site's West Area. Leachate and groundwater from the Impoundment 8 Facility and interceptor trench is also conveyed to Lagoon 7 and will continue until the pilot testing for 1,4-dioxane is complete and EPA approval to connect these flows to the Site's GWTF is received. The water accumulated in Lagoon 7 is subsequently treated via a water treatment system known as the Lagoon 7 Interim Water Treatment System (LSIWTS) on an as needed basis due to seasonality of stormwater flows. The LSIWTS has operated under a NJPDES Discharge to Surface Water Permit Equivalence (NJPDES-DSW PEq) since it commenced operations in 2015. Discharge Monitoring Reports (DMRs) are certified on a monthly basis and submitted to NJDEP, with copy to EPA.

Groundwater: As determined early in the GWEIS design process and based in part on extensive hydrogeologic testing, groundwater injection was evaluated and identified as the most appropriate treated groundwater discharge option.

To meet the substantive provisions of New Jersey permitting regulations associated with groundwater reinjection at the site, a NJPDES DGW PEq Proposal was submitted to NJDEP in 2016, finalized by NJDEP on February 14, 2017, and issued by EPA to WH on February 27, 2017. The DGW PEq established a permit-related CEA for the injection of treated groundwater. As required by the DGW PEq, this permit-related CEA continues to be monitored via the sampling of GWTF effluent and selected groundwater monitoring wells along the downgradient perimeter of the permit-related CEA. A renewal request for the DGW PEq was submitted to NJDEP and USEPA on February 13, 2023, and underwent a 30-day public comment period. The renewal DGW Peq, which included the compounds PFOA, PFOS, PFNA and 1,4-dioxane was approved by EPA on December 28, 2023.

The layout of the GWEIS consists of sixteen overburden extraction wells, five HBWs, the South Area overburden groundwater collection trench, seven bedrock extraction wells, and nine bedrock injection wells along with numerous monitoring wells, as shown on Attachments 5 and 6. The extraction wells and the South Area collection trench extract impacted groundwater from overburden and bedrock. The five HBWs extend through the overburden and are keyed into bedrock to improve the effectiveness of overburden groundwater extraction and to provide a second level of hydraulic control. Extracted groundwater is conveyed via the GWCS to the GWTF for treatment. Treated groundwater from the GWTF is recharged back into bedrock through a series of GWEIS injection wells located in the Impoundment 8 Facility Area and the northwestern perimeter of the West Area.

The GWCS consists of a series of force mains with supporting electrical and mechanical equipment that run through the South Area, West Area, and North Area to above ground equalization (EQ) tanks located in the northwest corner of the North Area. Groundwater is pumped from the equalization tanks through a force main to the GWTF located in the southern portion of the Impoundment 8 Facility area. The GWTF includes several processes with supporting electrical and mechanical equipment for the treatment of extracted groundwater which is reinjected into bedrock as per the NJPDES DGW PEq. Flows to the GWTF are

historically in the range of approximately 200 gpm to 400 gpm. The GWTF design capacity is 500 gpm.

The major GWTF treatment processes include metals precipitation, an aerobic biological reactor (primarily for organic compound removal), ultra-filtration membrane system, liquid granular activated carbon, an arsenic adsorption unit and bulk chemical storage to support the treatment process. Sludge generated by the metals precipitation units and biological system are dewatered and shipped off-site for disposal. An additional Fenton's Oxidation System is available for use as an alternative organic treatment process in case there is a disruption of the biological reactor. A conceptual layout of the GWTF is presented in Attachment 7.

There are numerous groundwater monitoring programs at the Site that are discussed in Section III below. The Site-wide groundwater monitoring program consisted of quarterly monitoring from 1988 to 2008 and semi-annual monitoring from 2009 to present. The locations of all the groundwater monitoring wells are presented in Attachments 8 and 9 The Site-wide groundwater monitoring program is consistent with the requirements of the OU1, OU2, OU3 and OU4 RODs.

Surface Water and Sediment: During the preparation of the 2005 baseline ecological risk assessment, NJDEP requested that a monitoring program be developed to evaluate the impacts of affected media to Cuckel's Brook and the Raritan River. The monitoring program consisted of semi-annual surface water and sediment monitoring and included a number of Site-specific contaminants. This program was discontinued in 2008 after it was concluded that contaminants of concern were not migrating from the Site into Cuckel's Brook and the Raritan River, based upon the consistency between current concentrations and historical concentrations. Following the discovery of an overburden groundwater discharge from the Site into the Raritan River in December 2010 and the initiation of a removal action to address the discharge of contamination in the impoundments 1 and 2 area, an updated surface water and sediment monitoring program was developed. This monitoring program began in 2012 and includes 17 monitoring stations located throughout the Raritan River, Cuckel's Brook, Millstone River and Middle Brook. In addition, Pond 287, located in the South Area is sampled in 5 locations as part of the surface water monitoring program. The locations of the monitoring stations are as shown in Attachment 10 and Attachment 11. The monitoring program, undertaken on a semi-annual basis, includes additional sampling locations for both surface water and sediment and a more expansive analyte list than previously used and is discussed in Section III below. In August 2013, two groundwater discharges were observed in Cuckel's Brook during standard Site reconnaissance activities. In order to address these discharges, which were found to contain elevated levels of VOCs, carbon bags were installed as an interim measure. The carbon bags were removed with the implementation of the OU4 Site-wide groundwater remedy, which is functioning to contain these discharges.

Ambient Air: An ambient air monitoring program was initiated in mid-2012 to collect ambient air sampling data to use as a baseline during the implementation of the OU4 Site-wide remedy. The monitoring program, undertaken on an annual basis, includes eight locations along the perimeter of the Site and another four locations in the vicinity of impoundments 1 and 2 (Attachment 12).

Climate Change and Resiliency

Potential site impacts from climate change have been assessed, and the Site is extremely vulnerable to flooding. Most of the Site is located within the 100-year floodplain, and the Site periodically experiences the impacts of tropical storms associated with hurricane strikes along the U.S. East Coast. For example, in 2021 a tropical depression resulting from Hurricane Ida released eight inches of rainfall within 24 hours and caused widespread flooding. The floodwaters caused significant damage across the Site, including washout of berms, roads and destruction of office trailers. However, due to the number of resiliency measures that had already been implemented at the Site, no major surficial release of contaminants occurred. A number of the resilience measures that have been completed at this Site are presented in Attachment 4 and include:

- Developed a Flood Management Response Plan (FMRP) and a Flood Emergency Procedures Plan (FEPP) for the Site and updated both in 2024.
- Incorporated into the Site-wide remedy a requirement that all onsite capping systems be designed to withstand a 500-year flood event, at minimum.
- Constructed the groundwater treatment facility outside the Raritan River 500-year floodplain, in the only onsite area where flooding has not occurred in the past.
- Encased system controls and relevant supplies in reinforced concrete block structures attached to deep concrete foundations and protected by bollards.
- Raised the elevation of critical electrical instrumentation for groundwater extraction and treatment.
- Installed submersible pumps in bedrock wells to provide increased hydraulic control during future flood events.
- Relocated onsite office trailers to positions outside the Raritan River 100-year floodplain.
- Developed a flood management and response plan that includes river stage monitoring.
- Raised the elevation and reinforced the Impoundment 1 and 2 perimeter berms to prevent erosion and protect the Impoundments from another major flood event during OU-8 remediation efforts.
- Replaced washed out sections of the berm in the North Area.
- Raised certain electrical and control equipment related to the GWEIS in both the North and West areas of the Site to elevation above the 500-year flood level.
- Replaced the Contractors Bridge located at the West Flood Gate within the North Area with bridge jumpers.

See Appendix C for additional climate change evaluation information.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the **last** FYR as well as the recommendations from the **last** FYR and the current status of those recommendations.

Table 2: Protectiveness Determinations/Statements from the 2019 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 is protective of human health and the environment.
2	Will be Protective	The remedy at OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.
3	Protective	The remedy at OU3 is protective of human health and the environment.
4	Will be Protective	The remedy at OU4 will be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.

No issues, recommendations or follow-up actions were identified during the completion of the 2019 FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On August 7, 2023, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the U.S. Virgin Islands, including the American Cyanamid Superfund Site. The announcement can be found at the following web address: www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, the EPA Community Involvement Coordinator for the Site, Joel Waddell, posted a public notice on 8/19/24 on the EPA Site webpage, www.epa.gov/superfund/americancyanamid, and provided notice to Bridgewater Township by email on 8/16/24 with a request that the notice be posted in municipal offices and on the township webpages. This notice indicated that a Five-Year Review (FYR) would be conducted at the American Cyanamid Superfund Site to ensure that the cleanup of the Site continues to be protective of people's health and the environment.

Once the FYR is completed, the results will be made available at the local Site repository, which is at the Bridgewater Township Library located at 1 Vogt Drive, Bridgewater, New Jersey. In addition, the final report will be posted on the following website: https://www.epa.gov/superfund/american-cyanamid. Efforts will be made to reach out to local public officials to inform them of the results. Communications with the property owners,

surrounding community and local government officials is an ongoing and critical component of the remedial work.

Data Review

Following the completion of the GWEIS Initial Operations, the monitoring program transitioned from the Interim Groundwater Monitoring Program (IGMP) to the Routine Groundwater Monitoring Program (RGMP), which continued hydrogeological and groundwater chemistry monitoring at the Site. The RGMP replaced the IGMP and the PVMP, which were the monitoring programs conducted during GWEIS Commissioning and Initial Operations. The PVMP was implemented as a hydrogeologic monitoring program designed to assess the performance of the GWEIS following commissioning and verified hydraulic control based on groundwater potentiometric data. The IGMP was conducted as a groundwater chemistry monitoring program, which consisted of perimeter monitoring of bedrock and overburden groundwater and incorporated other routine groundwater monitoring activities. While many aspects of the IGMP are incorporated into the RGMP, the scope and objectives of the RGMP have been refined to reflect the transition to the routine operation of the GWEIS and is tailored based on the 2012 OU4 Record of Decision Remedial Action Objectives. The RGMP includes the following groundwater programs: RCRA SIGMP, NJPDES DGW PEq, overburden & bedrock hydraulic control, overburden & bedrock plume assessment, proximal & distal Blue Lot Programs, South Area perimeter & plume assessment, Pond 287 area monitoring and routine PFAS monitoring. In addition, the RGMP has been periodically updated following EPA approval with additional hydrogeologic and groundwater chemistry monitoring locations based of continued groundwater investigations and findings.

Groundwater

Groundwater sampling results from monitoring wells within each OU addressed in this FYR are discussed in the following section. Due to the wide range of VOCs and SVOCs detected on Site, annual sampling reports and this data review focus on CEA short-list parameters and arsenic. These parameters tend to be indicators of Site-related data trends and drivers for remediation. The CEA short list parameters include: VOCs: benzene, chlorobenzene 1,2-dichlorobenzene and 1,4-dichlorobenzene; SVOCs: aniline, naphthalene, nitrobenzene and n-nitrosodiphenylamine (note that all COCs are analyzed and reported on in the annual monitoring reports). Emerging contaminants including PFAS are discussed in a separate section below. 1,4-Dioxane, an emerging contaminant with a recently published NJDEP groundwater quality standard, has been integrated into the RGMP and is discussed in the general groundwater data review.

The NJDEP GWQS in µg/L for CEA short-list parameters are:

- 1,2-dichlorobenzene 600
- 1,4-dichlorobenzene 75
- 1,4-dioxane 0.4
- Aniline 6
- Arsenic 3
- Benzene 1
- Chlorobenzene 50
- Napthalene 300
- Nitrobenzene 6
- N-Nitrosodiphenylamine 10

OU1 (Impoundments 11 and 19):

- Impoundment 11 is located in the northern portion of the West Area adjacent to Lagoon-7. Well 42-R, adjacent to impoundment 11 exhibited VOCs and SVOCs above the NJDEP GWQS in 2022. Maximum detections of CEA short-list parameters are as follows: benzene ranged up to 24 µg/L (1H2018), chlorbenzene 810 µg/L (1H2018), aniline 20 µg/L (2H2019), total arsenic 22.6 µg/L (2H2022). 1,4-Dioxane ranged up to 0.47 µg/L (2H2019). See attachments 13a, 13b, and 13c.

- Impoundment 19 is located on the southern portion of the West Area, south of impoundment 6. Well 38-R, adjacent to impoundment 19, is located outside of the HBW. The 1H2022 sample exhibited the lowest concentrations in the well to date with no VOCs or SVOCs above NJDEP GWQS. Maximum detections of CEA short-list parameters during the review period are as follows: benzene 66 µg/L (1H2021), chlorobenzene 390 µg/L (1H2021), aniline 29 µg/L (2H2021), total arsenic 9.3 µg/L (1H2019), and dissolved arsenic 4.2 µg/L (1H2022). See attachments 14a, 14b, and 14c which show that although arsenic is slightly elevated during the review period, concentrations are generally stable compared to historic results. The only detection of 1,4-dioxane during the review period was 2.1 µg/L (2H2022).

- OBMW-24 is located on the southeastern boundary of the West Area outside of the HBW. During the review period there were low-level CEA short-list exceedances of the GWQS: benzene at 4.1 and 3.2 µg/L in 2H2022 and 2H2018, respectively. Chlorobenzene was detected at 120 µg/L in 2H2018 but has remained below the GWQS since. Total and dissolved arsenic were detected above the GWQS ranging up to 15.9 µg/L for dissolved in 2H2022 and 4.1 µg/L for total in 2H2020. See attachments 15a and15b which show that concentrations were generally stable during the review period. 1,4-Dioxane was not detected during the review period.

OU2 (Impoundments 15, 16, and 18):

- Impoundments 15 and 16 are located in the central portion of the South Area adjacent to Cuckels Brook.
    - 16-MW-2/2R located just south of impoundment 16 exhibited concentrations of aniline up to 33 µg/L (2H2021) and total arsenic up to 28.2 µg/L (2H2022).

Attachments 16a and 16b show that aniline has fluctuated while arsenic has remained stable during the review period. 1,4-Dioxane was not detected.
    - Well AAA located southwest of 16-MW-2R, showed similar results with aniline ranging up to 45 µg/L (1H2022), total arsenic ranging up to 25.1 µg/L (2H2018), and dissolved arsenic ranging up to 23.8 µg/L (1H2022) (Attachment 17a, 17b). 1,4-Dioxane was not detected during the review period.

- Impoundment 18 lies southeast of impoundments 15 and 16 in the central portion of the South Area west of Cuckels brook.
    - Well CCC-R, located south of impoundment 18 showed stable concentrations of total and dissolved arsenic up to 12.4 and 12.9 µg/L, respectively (1H2019) (Attachment 18). The only detection of 1,4-dioxane during the review period was at 0.48 µg/L (1H2018).
    - Well EEE-R, southwest of CCC-R and adjacent to the southern extent of impoundment 18 also showed minor exceedances of the GWQS for total and dissolved arsenic ranging up to 12.3 µg/L (2H2020) and 13.1 µg/L (1H2019), respectively. 1,4-Dioxane was not detected during the review period. Neither well in the impoundment vicinity showed detections of VOCs or SVOCs during the review period (Attachment 19).

OU3 (Impoundments 14, 20 and 26)

- Impoundments 14 and 20 are located along the northern boundary of the North Area and impoundment 26 lies on the western boundary of the North Area.
    - MP03-W1S, located west of impoundments 14 and 20 exhibited no VOCs or SVOCs above NJDEP GWQS in 2022, in contrast with the results from 2H2020 from which multiple VOCS/SVOCs were detected above NJDEP GWQS: benzene (55 µg/L), chlorobenzene (6,400 µg/L), 1,2-dichlorobenzene (3,400 µg/L), 1,4-dichlorobenzene (1,400 µg/L), and aniline (36 µg/L). Total arsenic ranged up to 28.2 µg/L in 2H2020 but has decreased since (Attachments 20a, 20b and 20c). 1,4-Dioxane was detected at 2.2 µg/L (2H2020).
    - OBTW-5 is located west of impoundments 14 and 20 and east of impoundment 26. During the review period, benzene ranged up to 1,100 µg/L (2H2020) but was reduced to 130 µg/L in 2H2022. Additionally, aniline ranged up to 36 µg/L (2H2020), N-nitrosodiphenylamine ranged up to 22 µg/L (2H2020), and arsenic ranged up to 45.8 µg/L (2H2021). 1,4-Dioxane ranged up to 8.9 µg/L (2H2020) (Attachments 21a, 21b and 21c). The cause for the reductions in COC concentrations in 2022 in these wells may be due to the influx of less impacted groundwater from the north, as hydraulic gradients have changed in this area compared with pre-GWEIS conditions.

In general, groundwater concentrations in monitoring wells downgradient or near the remediated impoundments have generally shown decreasing trends since the remedies for these impoundments have been implemented.

OU4 Groundwater Remedy

The Site-wide groundwater remedy consists of the GWEIS, the GWCS, the HBW and GWTF. For more information on the status of the groundwater remedy and groundwater monitoring activities, please refer to the Status of Implementation Section.

Emerging Contaminants

Groundwater samples for PFOS, PFOA, and PFNA, have been collected at the Site since April 2017. In 2022, bedrock groundwater samples were collected and analyzed for the selected PFAS from eight bedrock monitoring locations (YY-P3, WW-P1, MW-33S, ZZ-P1, JJJJ-D, LA07-MP1-P2, MP03-MP1-P4, and AAAA-O) and samples of the GWTF influent and effluent were collected and analyzed for PFOA, PFOS, PFNA, and 1,4-dioxane on a semi-annual basis as described in the final Emerging Contaminants Report. The locations of the monitoring wells are shown in Attachment 22. The NJDEP GWQS are 0.014 µg/L for perfluorooctanoic acid (PFOA) and 0.013 µg/L for perfluorooctane sulfonic acid (PFOS) and perfluorononanoic acid (PFNA). In April 2024, EPA finalized federal MCLs for PFOA and PFOS which consists of 0.004 µg/L for each compound in addition to 0.010 µg/L for PFNA.

While concentrations of PFOS and/or PFOA were above the NJDEP GWQS and EPA MCL in all of the Site-related overburden well samples (01-MW-02, 19R, AAA, MW-2, MW-7, OBE-04, OBMW-21, OBTW-5, and TWPMW- 1A), the concentrations were only slightly elevated above the NJDEP GWQS and EPA MCL (i.e., 0.026 µg/L for PFOA and 0.028 µg/L for PFOS).

In all of the background and side-gradient bedrock monitoring well samples (WW-P1, ZZ-P1, and JJJJ-D), PFOS and PFOA concentrations, for most samples collected from WW-P1 (off-site to the east) and ZZ-P1 (off-site to the southwest across the Raritan River), were at similar or even higher concentrations (i.e., 0.026 µg/L to 0.052 µg/L for PFOA, etc.). This is particularly evident in the recent sample results for these monitoring wells obtained since 2020.

Of the on-site bedrock wells, BRE-02/PW-2 and PW-3 were the high-capacity pumping wells that operated prior to the GWEIS. The samples collected prior to GWEIS operation (pre-June 2019) showed concentrations for PFOS and PFOA ranging up to approximately 0.060 µg/L (the highest detections of PFOS and PFOA were 0.057 µg/L and 0.031 µg/L). Lower results have been observed under GWEIS operations with detections slightly above and below NJDEP GWQS and EPA MCL. PFNA was detected below the NJDEP GWQS and EPA MCL in all samples except for one non-detect sample. These wells captured both on-site and off-site groundwater pre-GWEIS and were not sampled in 2021 or 2022.

PFOS has been detected in most of the other on-site bedrock monitoring wells (AAAA-O, LA07 nest, MP03- MP1-P4, MW05-MP1-P1/P4, MW-32D2, PDI-OW-4S/4D, RCRA-D1/D9, and YY-P3). These detections are typically observed at concentrations below the NJDEP GWQS but occurrences of up to a factor of approximately two times the NJDEP GWQS (i.e., 0.028 µg/L) and one higher detection of 0.136 µg/L (PDIOW- 4S) have been observed. Detections exceeding the EPA MCL for PFOS are moderately more frequent than those exceeding the NJDEP GWQS. PFOA has been detected at concentrations from below the NJDEP GWQS and EPA MCL to a

factor of about four times the NJDEP GWQS (i.e., 0.052 µg/L), with a few higher detections (0.0678 µg/L in June 2020 at well AAAA-O, 0.102 µg/L and 0.0572 µg/L in YY-P3).

PFNA concentrations have been below or essentially equivalent to the NJDEP GWQS and EPA MCL (maximum concentration of 0.0102 µg/L) in samples from standard construction monitoring wells (PVC inner casing with slotted PVC well screens that monitor the overburden or bedrock) but have varied greatly in monitoring wells fitted with FLUTe systems (used for multilevel groundwater monitoring). The observed concentrations of PFNA obtained from wells with FLUTe systems have ranged from below detection limits (<0.017 µg/L) to 12.3 µg/L. Additional evidence of PFNA variability in wells containing a FLUTe system are demonstrated by the results for the field duplicate sample collected at well YY-P3 during the 2H2022 monitoring event for which the results differ by a factor of 3.9 (0.0176 µg/L, 0.00457 µg/L). This is similar to the high variability in the previous field duplicate samples obtained from FLUTe wells WW-P1, ZZP1, MW05-MP1-P4, and TT-P2.

While PFOS and PFOA were detected above the NJDEP GWQS and EPA MCL in the GWTF influent samples collected in 2022, concentrations were below the NJDEP GWQS for both the May 2022 and October 2022 GWTF effluent samples. Concentrations of PFOS and PFOA were detected below the EPA MCL for the May 2022 effluent sample, but exceeded the EPA MCL for both compounds in the October 2022 effluent sample.

1,4-Dioxane concentrations were above the NJDEP GWQS (0.4 ug/L) in both the GWTF influent (2.03/2.01 ug/L in 1H2022, 2.34/2.17 ug/L in 2H2022) and GWTF effluent samples (2.4 ug/L in 1H2022, 2.29 ug/L in 2H2022). Please note that a pilot system has been installed and is expected to operate through the 2nd quarter of 2024 to evaluate potential 1,4-dioxane treatment options.

In summary, these data collected to date have indicated that regardless of whether the wells monitor the overburden or bedrock for either on-site or off-site/background locations, PFOA and PFOS concentrations are generally detected within similar, narrow, low-level ranges of concentrations, (i.e. within a factor of one to up to at most four times the NJDEP GWQS), in a large majority of samples. PFNA is not detected above GWQS except in the FLUTe wells. This level of uniformity is consistent with a broad, regional level of background PFAS impacts, but does not exclude the potential for on-site sources of PFAS. The groundwater samples collected as part of the emerging contaminants monitoring in 2022 represent the second and final year of the emerging contaminants monitoring program described in Section 5.2 of the final Emerging Contaminants Report. WH has evaluated the dataset (more than 5 years of PFAS data) and based on the detections of PFAS in groundwater at concentrations above the NJDEP GWQS for PFAS compounds, PFAS compounds have been added to the Site-wide CEA and the Site's NJPDES DGW PEq. Nine bedrock monitoring wells associated with the DGW PEq and influent and effluent from the GWTF are sampled semi-annually for PFAS compounds. Additionally, 7 bedrock monitoring wells have been proposed for incorporation into the RGMP for PFAS sampling on a semi-annual basis (YY-P3, WW-P1, ZZ-P1, JJJJ-D, LA07-MP1-P2, MP03-MP1-P4, and AAAA-O).

Hydraulic Control

In 2019, WH completed construction of the OU4 ROD Groundwater Component systems (GWTF, GWCS, HBW and GWEIS), began operating these systems, and implemented comprehensive hydraulic and groundwater chemistry monitoring programs that have demonstrated continued progress during the review period in achieving the OU4 ROD Groundwater Component objective for providing hydraulic control over impacted groundwater at the Site. As described in the Final GWEIS RDR, a multiple line of evidence (MLOE) approach has been implemented to demonstrate hydraulic control of impacted groundwater at the Site. This includes the monitoring and potentiometric contouring of three groundwater zones (overburden, shallow bedrock and deep bedrock); demonstrating the drawdown performance of key overburden and bedrock monitoring wells; and demonstrating capture rates to be comparable to or greater than the estimated natural groundwater fluxes.

Overburden

Altogether, the overburden groundwater extraction wells, South Area collection trench, and the HBWs provide hydraulic control of impacted groundwater inside of the HBWs. As described in the final RAR for HBW construction (Golder, 2019c), four relatively small gaps in the HBWs that could not be closed during construction due to active utility penetrations or physical obstructions remain present. Monitoring data collected during the review period supported the HBW RAR, that concluded the gaps would have negligible effects on the ability of the extraction wells to control impacted groundwater within the limits of the HBWs. These gaps will be addressed as part of the ICSWS remedial design.

Groundwater elevation contour figures for the water-level synoptic rounds conducted during the review period show that the overburden extraction system controls the mounding of groundwater, primarily upgradient of the HBWs. Attachment 23a and 23b illustrates that drawdown zones around each active GWEIS overburden extraction wells are pronounced, and the hydraulic depression in the southwest portion of the South Area (east of Cuckels Brook) due to the collection trench pumping is evident. Drawdown continues to be observed in all monitoring wells located between active extraction wells in the West Area and along the southern HBW reach in the North Area, demonstrating that groundwater mounding is effectively controlled by the GWEIS overburden extraction system.

Bedrock

The two-dimensional shallow bedrock groundwater contours show mostly connected zones of hydraulic influence around extraction wells BRE- 05, 06, 07, 09 and 10, providing hydraulic control over most of the North and West Areas (Attachment 24a and 24b). Although extraction wells BRE-05 and BRE-07 exhibit weaker hydraulic control in the area between these wells, groundwater flow between these wells is sourced from the upgradient injection of treated groundwater at BRI-09. The groundwater collected from the extraction wells and monitoring wells in this area continue to exhibit reduced concentrations, likely due to the influence of extraction as well as the flushing action. In the deep bedrock groundwater zone, the contour map

also shows connected zones of hydraulic control around BRE-05, 06, 07 and 10 (Attachment 25a and 25b).

Shallow bedrock groundwater in the Blue Lot area of the Site is being hydraulically controlled by GWEIS shallow bedrock extraction well BRE-09. The extent of shallow bedrock groundwater hydraulic control extends off-site onto the STS property to the east and off-site to the north, as upgradient groundwater from north of the Site is captured by BRE-09. The extent of hydraulic control of deep bedrock groundwater in the northeast portion of the North Area is not as apparent east of BRE-06 and in the vicinity of shallow bedrock well BRE-09. However, the vertical component of the hydraulic gradient is upward from the deep bedrock groundwater to shallow bedrock groundwater and thus only upward migration can occur, and VOC and SVOC concentrations in deep bedrock groundwater in this area of the Site are very low or non-detect.

Groundwater Chemistry

A detailed assessment of the groundwater chemistry results in relation to the extraction systems has been presented as part of this report. In the overburden, some extraction wells in the North Area have exhibited increasing concentrations reflecting the capture of higher concentration groundwater from the interior. Areas that exhibited remnant concentrations outside the HBW in overburden have demonstrated decreasing to stable concentrations during the review period, or in some areas higher concentrations of the same compounds, indicative of the movement of pockets of contamination outside the HBW that can be expected to attenuate with time. Interior overburden monitoring wells indicate decreasing VOC/SVOC concentrations. An evaluation of the monitoring well pairs across the HBWs further supports that the impacts outside of the HBWs are, in most cases, remnant concentrations.

In summary, the GWTF and GWEIS have substantively met the hydraulic control objective of the OU4 ROD Groundwater Component. Based on the monitoring data collected since 2019, GWTF and GWEIS system adjustments were made to further improve hydraulic control and will continue to be made as necessary. Hydraulic control evaluations will continue to be completed in 2024 under GWEIS Routine Operations.

Surface Water and Sediment

Surface water and sediment have been monitored on a quarterly basis since August 2012 and semi-annually starting in 2015 with 17 monitoring stations located throughout the Raritan River, Cuckel's Brook, Millstone River and Middle Brook.

In surface water, concentrations of total aluminum, total arsenic, total iron, total and dissolved manganese, total mercury, and benzene were reported above surface water quality criteria or the NJDEP GWQS in at least one location in Cuckel's Brook and the Raritan River. The concentrations were relatively similar to the previous sampling events and there is no observable trend in the data.

For sediment, the data from samples collected from the Raritan River sediments during the 10-year monitoring program shows there have been only two, seemingly anomalous, reported

concentrations (for lead and manganese) in Raritan River sediment samples that exceeded both the NJDEP Severe Effects Level (SEL) and the Exposure Point Concentrations (EPCs) calculated at the time of the BERA.

Similarly, in Cuckel's Brook, concentrations of arsenic at CB-03 and CB-04 are not increasing when viewed over the entire data record. Sediment sampling at these locations may yield variable results from event to event based on the seasonal conditions and the need to adjust sample locations accordingly. However, when reviewing the results over the entire data record, a non-increasing trend in concentration is evident.

While concentrations of benzene and metals in the Raritan River and Cuckel's Brook have been reported above surface water quality standards in recent monitoring events, the data indicates the exceedances are localized and are not indicative of an increasing trend. Continued operation of the OU4 Site-wide remedy is expected to reduce these concentrations over time.

Ambient Air

The ambient air monitoring program initiated in mid-2012 collects quarterly ambient air sampling data throughout the Site to use as a baseline during the implementation of the OU4 Site-wide remedy. The results of the quarterly monitoring events generally have exhibited low level concentrations of constituents consistent with urban background monitoring stations measured by the NJDEP.

Site Inspection

The inspection of the Site was conducted on 2/1/2024. In attendance were Mark Schmidt - RPM, Dan Patel – RPM, Paul Zarella – Hydrogeologist; and Julie McPherson – Human and Ecological Risk Assessor. Representatives from Pfizer and BSI were also in attendance. Representatives from NJDEP were invited but were not able to attend. The purpose of the inspection was to assess the protectiveness of the remedy.

The Site visit began with a review and presentation of the major events and activities that have occurred over the past five years pertaining to the FYR. These items included a review of the completed remediation of OU1, OU2 and OU3 as well as updates on the ongoing Site-wide monitoring program, OU4 NJ ADA Ramp, OU4 Site-wide groundwater and soils remedial activities, climate resiliency projects and OU8 remedial activities.

A tour of the GWTF was conducted. The facility has been in operation since 2019 and only minor modifications have been made to the system. To meet the substantive requirements of the revised NJDEP discharge to groundwater permit equivalence issued on 2023, a pilot test for 1,4-dioxane is currently being implemented in the existing GWTF.

A visual inspection of impoundments 11, 14, 18, 19, 20 and 26 was completed to assess the protectiveness of their respective remedies. A visual inspection of impoundments 15 and 16 was completed to evaluate the status of the remedy under the OU2 ESD. The recently completed

impoundment 8 facility closure was visually inspected and the maintenance and monitoring activities for the facility were discussed with the Pfizer representatives.

A visual inspection of the bedrock groundwater extraction wells, HBW and conveyance system was completed and the current status of the bedrock and overburden groundwater capture was discussed.

The Site inspection included an inspection of the processed dredge material (PDM) area as well as an inspection of the Blue Lot, which is occasionally used for parking by various entities that have access agreements with WH.

The Site inspection did not identify any issues that affected the protectiveness of the previously implemented remedies, or the progress of the ongoing remediation efforts.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

The remedies selected and implemented in the OU1, OU2 and OU3 RODs, as well as the OU2 and OU3 ESDs, are functioning as intended. The objectives of the remedies selected for impoundments 11, 14, 15, 16, 19, 20 and 26 were to eliminate/control the sources of contamination and migration of contaminants, reduce the risk of potential exposures and contribute to compliance with ARARs for groundwater. The remedies for impoundments 11, 14, 19, 20 and 26 included excavation, solidification and placement in the impoundment 8 facility, while the remedy for impoundments 15 and 16 required the excavation and off-site recycling of iron oxide material. The remediation of impoundments 15 and 16 is ongoing and is expected achieve the remedial action objectives for these impoundments. The OU2 ROD for impoundment 18 consisted of fencing, berm improvements and groundwater monitoring to eliminate/control the sources of contamination, eliminate potential exposures and contribute to compliance with ARARs for groundwater. The implemented OU1, OU2 and OU3 remedies have achieved their respective RAOs and the completed activities are providing source control which is contributing to the compliance with groundwater ARARs under the OU4 ROD. The implemented remedies have eliminated the exposure of humans to contaminated impoundment material and have eliminated these sources of contamination. Although groundwater remedial goals have not yet been met, overall groundwater trends for most Site-related contaminants in areas downgradient of the remediated impoundments indicate decreasing concentrations. As such, the remedies selected for OU1, OU2 and OU3 are functioning as intended, although the remedy for OU2 is ongoing and being addressed under OU4.

The groundwater remedy selected for OU4, that includes the GWEIS, GWCS, HBW and GWTF, is functioning as intended. The operation of the GWTF and GWEIS have substantively met the hydraulic control objective of the OU4 ROD Groundwater Component. Based on the monitoring data collected since 2019, GWTF and GWEIS system adjustments were made to further improve hydraulic control and will continue to be made as necessary. Hydraulic control evaluations will continue to be completed under GWEIS Routine Operations. The collection and treatment of Site-related contaminated groundwater has prevented the discharge of contaminated groundwater

to nearby surface water bodies and is contributing to the restoration of groundwater quality in the overburden and bedrock aquifers. Monitoring of the groundwater during the implementation of the OU4 groundwater remedy has generally demonstrated either a decrease or stability in groundwater concentrations. Semi-annual groundwater monitoring will continue to assess changes in groundwater quality over time. In addition, concentrations of PFAS and 1,4-dioxane have fluctuated across the Site and have exceeded their applicable NJDEP groundwater standards and EPA MCLs. Although these compounds have been detected in site groundwater and select GWTF influent and effluent samples, the PFAS constituents have been added to the CEA and are being treated by the groundwater treatment system. 1,4-Dioxane is not being treated and concentrations in the influent are similar to the effluent. However, the concentrations slightly exceed the NJDEP Groundwater Quality Standard of 0.4 ug/l and are within EPAs cancer risk range. Nevertheless, a pilot study to evaluate the ability of propane to serve as a primary growth substrate for the biodegradation of this chemical continues.

An updated surface water and sediment monitoring program was developed in July 2012 to evaluate the potential migration of contaminated groundwater into adjacent surface water bodies. Concentrations of benzene in the Raritan River have decreased significantly since the installation of the removal action groundwater collection and treatment system. At times, some contaminant concentrations in both Cuckel's Brook and the Raritan River sediment have been reported above ecological screening values and contaminant concentrations in surface water have been reported above surface water quality standards. The on-going operation of the groundwater remedy and the implementation of the OU4 Site-wide soil and impoundment remedy will improve the capture and treatment of contaminated groundwater and control stormwater run-off that currently is impacting surface water and sediment.

In addition, due to the historic flooding at the Site, significant resiliency work has been completed. These resiliency projects are designed to ensure that Site related remedial infrastructure would remain operational during major flood events.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?

The exposure assumptions, toxicity data, cleanup levels and RAOs that were identified for the Site may have changed since the time the RODs were completed; however, the processes used to evaluate risks as well as the cleanup goals selected remain valid. The remedies for the impoundments included in this FYR generally consist of excavation and solidification or natural vegetation covers and fencing to restrict access. Although a review of the groundwater data indicates that concentrations of the Site related contaminants of concern continue to exceed their respective cleanup goals, residents in the area are connected to the water supply. In addition, a vapor intrusion assessment was completed in 2008 and concluded that there is no risk of vapor intrusion via the groundwater pathway for residential and commercial areas surrounding the Site. In 2021, groundwater concentrations of Site related contamination near the STS property increased significantly and vapor intrusion sampling was conducted on the property. The data indicated that the concentrations detected in the indoor air space were associated with secondary sources related to operations of the building. This evaluation confirmed the 2008 determination and, therefore, all potential exposure pathways are incomplete.

Although the ecological risk assessment screening and toxicity values used to support the various RODs may not necessarily reflect the current values, the excavation, solidification, and capping of contaminated materials eliminates any potential risk from surface soil contaminants to terrestrial receptors. A baseline ecological risk assessment conducted in 2005 concluded that the potential risks to ecological receptors from exposure to Raritan River sediment and/or surface water were low. Groundwater discharge mass loading calculations completed as part of this assessment suggested that exposure to overburden groundwater discharge of Site contaminants is unlikely to affect the health and diversity of aquatic biota in the Raritan River. An ecological risk assessment was also completed in May 2016 for impoundments 13, 17 and 24 as part of the OU4 remedy. This ecological risk assessment concluded that there is potential for unacceptable risk to ecological receptors within the ecological exposure zone (top two feet of soil) in these impoundments. Potential ecological risk associated with these impoundments is being addressed through the actions being performed under OU2 and OU4 by removing the ecological exposure zone (i.e., the top 2 feet), relocating the excavated materials to the North Area for consolidation beneath the appropriate cap(s) based on available analytical data, and replacement of the ecological exposure zone with imported clean soils. While recent surface water and sediment monitoring data do not suggest significant impacts to the environment, the continued monitoring of surface water and sediment will be performed to assess impacts to the river and the brook. The migration of contaminated groundwater or stormwater to surface water will be addressed by the continued operation of the groundwater remedy and implementation of the soils and impoundment remedy for OU4.

QUESTION C: Has any **other** information come to light that could call into question the protectiveness of the remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OUs 1, 2, 3 and 4

Issues and Recommendations Identified in the Five-Year Review: None

No issues and recommendations were identified as part of this FYR.

OTHER FINDINGS

Although no formal issues and recommendations are provided, the following item was identified during the FYR and may improve performance of the remedy but does not affect current and/or future protectiveness:

- 1,4-Dioxane has been detected in GWTF influent and effluent and is currently not being treated by the system. Although the concentrations only slightly exceed the NJDEP Groundwater Quality Standard and there is no current exposure through drinking water, a pilot study to evaluate the ability of propane to serve as a primary growth substrate for the biodegradation of this chemical will continue into the next FYR period. If successful, a full-scale treatment process will be developed and added to the GWTF process.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: OU1	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU1 is protective of human health and the environment	

Protectiveness Statement(s)	
Operable Unit: OU2	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at OU2 is expected to be protective of human health and the environment upon completion of the OU4 remedy. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.	

Protectiveness Statement(s)	
Operable Unit: OU3	*Protectiveness Determination:* Protective
Protectiveness Statement: The remedy at OU3 is protective of human health and the environment	

Protectiveness Statement(s)	
Operable Unit: OU4	*Protectiveness Determination:* Will be Protective
Protectiveness Statement: The remedy at OU4 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks.	

VIII. NEXT REVIEW

The next FYR report for the American Cyanamid Superfund Site, located in the Township of Bridgewater, Somerset County, New Jersey, is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Table 1: Chronology of Site Events	
Event	**Date(s)**
Calco Chemical Company began manufacturing intermediate chemicals and dyes	1915
Calco facility purchased by American Cyanamid	1929
American Cyanamid notified EPA of release of hazardous substances	1981
Final NPL listing	Sep 1983
American Cyanamid enters ACO with NJDEP to address 16 impoundments, contaminated soils and groundwater	May 1988
Soils Remedial Investigation completed	May 1992
OU1 ROD executed for impoundments 11, 13, 19 & 24	Sep 1993
NJDEP executes ACO Amendment to include additional groundwater monitoring requirements	May 1994
American Cyanamid purchased by American Home Products Corporation	Dec 1994
Remediation of impoundment 19 completed per OU1 ROD	Nov 1995
OU2 ROD executed for impoundments 15, 16, 17 & 18	Jul 1996
OU6 ROD executed for Hill Property	Jul 1996
Remediation of impoundment 11 completed per OU1 ROD	Nov 1997
OU3 ROD executed for impoundments 1, 2, 3, 4, 5, 14, 20 & 26	Sep 1998
NJDEP issued ESD for part of OU2 (impoundments 15 & 16)	Nov 1998
Remediation of impoundment 18 completed per OU2 ROD	April 1998
OU6 Hill Property deleted from NPL	Dec 1998
All manufacturing at the site ceased	June 1999
First FYR	Sep 1999
American Home Products Corporation changes its name to Wyeth Holdings Corporation	Mar 2002
Most remedial activities at the site are suspended pending the reevaluation of previously selected remedies. Initiation of a Comprehensive Site-Wide FS	Spring 2004

Table 1: Chronology of Site Events	
Second FYR	Sep 2004
Baseline Ecological Risk Assessment	Jan 2005
Human Health Risk Assessment	Dec 2006
Remedial Investigation for Groundwater	Apr 2007
NJDEP issued ESD for part of OU3 (impoundments 14 & 20)	May 2007
EPA and NJDEP agree to separate impoundments 1 & 2 from the OU4 Site-wide remedy and address the two impoundments through a FFS under a newly created OU8	2009
Third FYR	Sep 2009
Pfizer, Inc. purchases Wyeth Holdings Corporation	Oct 2009
Remediation of impoundments 14 & 20 completed per 2007 OU3 ESD	Aug 2010
EPA Removal Action initiated following discovery of groundwater discharges into the Raritan River containing elevated levels of benzene	Dec 2010
Removal Action AOC executed between EPA and PRP to address groundwater discharges	July 2011
Comprehensive Site-wide FS completed	Feb 2012
EPA issues proposed plan for the OU4 Site-wide remedy	Feb 2012
Removal Action groundwater capture system completed and begins operating	May 2012
OU4 ROD executed for impoundments 3, 4, 5, 13, 17, 24, and Site groundwater and soils	Sep 2012
AOC executed between EPA and PRP for the OU4 RD and OU8 FFS	Mar 2013
OU4 Remedial Design Start	Mar 2013
Execution of Amendments to OU4 RD/OU8 FFS AOC and Removal Action AOC	Aug 2013
Initiation of impoundments 1 & 2 pilot study	Jan 2014
Fourth FYR	Jun 2014
Quarterly & Semi-Annual Groundwater Monitoring	2006-Present
Quarterly & Semi-Annual Surface Water & Sediment Monitoring	2005-Present

Table 1: Chronology of Site Events	
Ambient Air Monitoring	2012-Present
Consent Decree for OU4 remedy construction/O&M	2015
OU8 ROD for Impoundments 1and 2 Remedy	Sep 2018
Complete Design for OU4 groundwater component	Sep 2018
Consent Decree for OU8 remedial design	Sep 2018
Fifth FYR	Sep 2019
Complete RDR GWEIS and HBW	Sep 2019
Complete RDR GWCS	Sep 2019
Commissioning of GWTF	2019-2020
Commissioning of GWEIS	2019-2020
Complete RDR GWTF	Oct 2020
Consent Decree for OU8 remedial action	Nov 2021
Complete Remedial Action for Engineered Soil Cover in Vicinity of Proposed NJ Transit Bridgewater Train Station Ramp	Feb 2024
Complete Remedial Design for Impoundments 13 and 24	Mar 2024

Table 2A: Summary of CERCLA Impoundments subject to this Five-Year Review					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 11	2.6	30,000 cubic yards (CY)	Disposal of sludges, furnace ash, and klinkers	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1993 OU1 ROD.	acetone, ethylbenzene, chlorobenzene, methylene chloride, toluene, xylenes, acenaphthalene, benzo(a)anthracene, fluorene, naphthalene, 2-methylnaphthalene, chromium, copper, lead, mercury, nickel, zinc
Impoundment 14	0.9	33,101 CY	Storage of organic tars	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 2007 ESD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methylnaphthalene, 1,2-dichlorobenzene, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc
Impoundment 20	1.0		Settling basin for on-site treatment of dye and pigment operation wastewater	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 2007 ESD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, cyanide, mercury, nickel, selenium, silver, vanadium, zinc
Impoundment 18	15.4	217,000 CY	Storage of primary sludge from settlement of lime-neutralized effluent from on-site wastewater treatment	Remediation completed; Closed with No Further Action per remedy selected in 1996 OU2 ROD	acetone, chlorobenzene, 2-methylnaphthalene, naphthalene, 4-chloroaniline, acenaphthalene, benzo(a)anthracene, phenanthrene, bis(2-ethyl hexyl)phthalate, fluorene, arsenic, chromium, copper, lead, zinc
Impoundment 19	2.3	12,000 CY	Storage of lime for use in wastewater treatment	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1993 OU1 ROD.	benzene, ethylbenzene, chlorobenzene, methylene chloride, toluene, xylenes, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, 1,2,4- trichlorobenzene, arsenic, chromium, copper, iron, lead, magnesium, nickel
Impoundment 26	2.3	20,600 CY	Storage of organic tars and, later, construction material, general plant debris and fill material	Remediation completed; Contents excavated, solidified ex-situ and consolidated in Impoundment 8 Facility per 1998 OU3 ROD.	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc

Table 2B: Summary of CERCLA Impoundments to be addressed under OU4 Remedy					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 3	1.3	Not Yet Remediated (Approx. 30,200 CY Remaining)	Storage of organic tars from the distillation of coal oil and consolidation of construction material, general plant debris and fill material	Being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, naphthalene, n-nitrosodiphenylamine, 2-methylnaphthalene, 1,2-dichlorobenzene, nitrobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, pH of 4-8
Impoundment 4	1	18,700 CY Remediated (Approx. 4,300 CY remaining in Impoundment 4 and 110,330 CY remaining in Impoundment 5)	Storage of sludges and organic tars from various production processes	Approximately 3.8 MG of pumpable sludge removed and recycled; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, 1,2- dichlorobenzene, naphthalene, pH of 1-3
Impoundment 5 (wet)	5.2		Storage of sludges and organic tars from various production processes	Approximately 3.8 MG of pumpable sludge removed and recycled; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, zinc, pH of 3.7-9.0
Impoundment 5 (dry)	2.5	17,500 CY Remediated	Storage of sludges and, later, mixed fill materials (layered over the sludge)	Approximately 33% excavated, solidified and placed in Impound 8; remaining material not yet remediated, being addressed as part of OU4 Site-wide remedy	benzene, toluene, xylene, n-nitrosodiphenylamine, naphthalene, 2-methyl naphthalene, 1,2-dichlorobenzene, antimony, arsenic, barium, beryllium, cadmium, chromium, copper, cyanide, lead, mercury, nickel, selenium, silver, vanadium, zinc, pH of 3.7-9.0
Impoundment 13	3.9	Not Applicable (N/A) (Approx. 55,000 CY Remaining)	Storage of lime and disposal of wastewater treatment sludges	Being addressed as part of OU4 Site-wide remedy	benzene, toluene, ethylbenzene, xylene, chlorobenzene, acenaphthalene, fluorine, 2-methylnapthalene, naphthalene, 1,2,4-trichlorobenzene, arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, pH of 6.5-9.0
Impoundment 17	6.2	N/A (Approx. 69,300 CY Remaining)	Storage of primary sludge from settlement of lime-neutralized effluent from on-site wastewater treatment	Being addressed as part of OU4 Site-wide remedy	acetone, toluene, ethylbenzene, and xylene, chlorobenzene, 1,2,4- trichlorobenzene, benzo(a)anthracene, bis(2-ethyl hexyl)phthalate, naphthalene, n-nitrosodiphenylamine, chromium, copper, lead, nickel, zinc. pH of 7-8
Impoundment 24	3.2	N/A (Approx. 65,000 CY Remaining)	Storage of lime for primary treatment and, later, storage for sludges and general plant wastes	Being addressed as part of OU4 Site-wide remedy	acetone, chlorobenzene, methylene chloride, toluene, xylene, dibenzofuran, 1,2-dichlorobenzene, 2-methylnaphthalene, naphthalene, arsenic, chromium, copper, iron, lead, nickel, pH of 7-12.7

Table 2C: Summary of CERCLA Impoundments to be addressed under OU8					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 1	2.1	3.0 MG (Approx. 26,900 CY Remaining)	Storage of sludges from the coal oil ("light oil") refining process	Approx. 3.0 million gallons (MG) of light oil sludge (LOS) layer removed and recycled; solids not yet remediated, to be addressed as part of the OU8 FFS	benzene, toluene, xylene, 1,2-dichlorobenzene, naphthalene, nitrobenzene, arsenic, barium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc. pH less than 2
Impoundment 2	2.3	3.1 MG (Approx. 26,700 CY Remaining)	Storage of sludges from the coal oil ("light oil") refining process	Approx. 3.1 MG of light oil sludge (LOS) layer removed and recycled; solids not yet remediated, to be addressed as part of the OU8 FFS	benzene, toluene, 1,2 –dichlorobenzene, naphthalene, chromium, copper, lead, mercury, nickel, selenium, zinc. pH less than 2

Table 2D: Summary of CERCLA Impoundments Currently Undergoing Remediation					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 15	2.8	66,000 CY remediated to date (Approx. 15,000 CY Remaining)	Storage of iron oxide material resulting from iron use in aniline production	Remediation in progress - iron oxide materials being excavated and sent off-site for recycling	iron oxide, acetone, benzene, methylene chloride, xylenes, 4-chloroaniline, n-nitrosodiphenylamine, anthracene, naphthalene, phenanthrene, arsenic, copper, lead, zinc, PCBs
Impoundment 16	3		Storage of iron oxide material resulting from iron use in aniline production	Remediation in progress - iron oxide materials being excavated and sent off-site for recycling	iron oxide, acetone, benzene, methylene chloride, xylenes, 4-chloroaniline, n-nitrosodiphenylamine, anthracene, naphthalene, phenanthrene, pyrene, arsenic, copper, lead, zinc, PCBs

Table 2E: Summary of CERCLA Impoundments with No Remediation Required					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Impoundment 9	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 10	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 12	-	No Remediation Required	Never Used	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 21	-	No Remediation Required	Contains emergency fire water	No remediation required based on 1990 Impoundment Characterization Program	-
Impoundment 22	-	No Remediation Required	Previously contained emergency fire water	No remediation required based on 1990 Impoundment Characterization Program; Impoundment was backfilled with clean fill	-
Impoundment 23	-	No Remediation Required	Previously used to collect river sediment from the facility's former river water treatment plant	No remediation required based on 1990 Impoundment Characterization Program	-

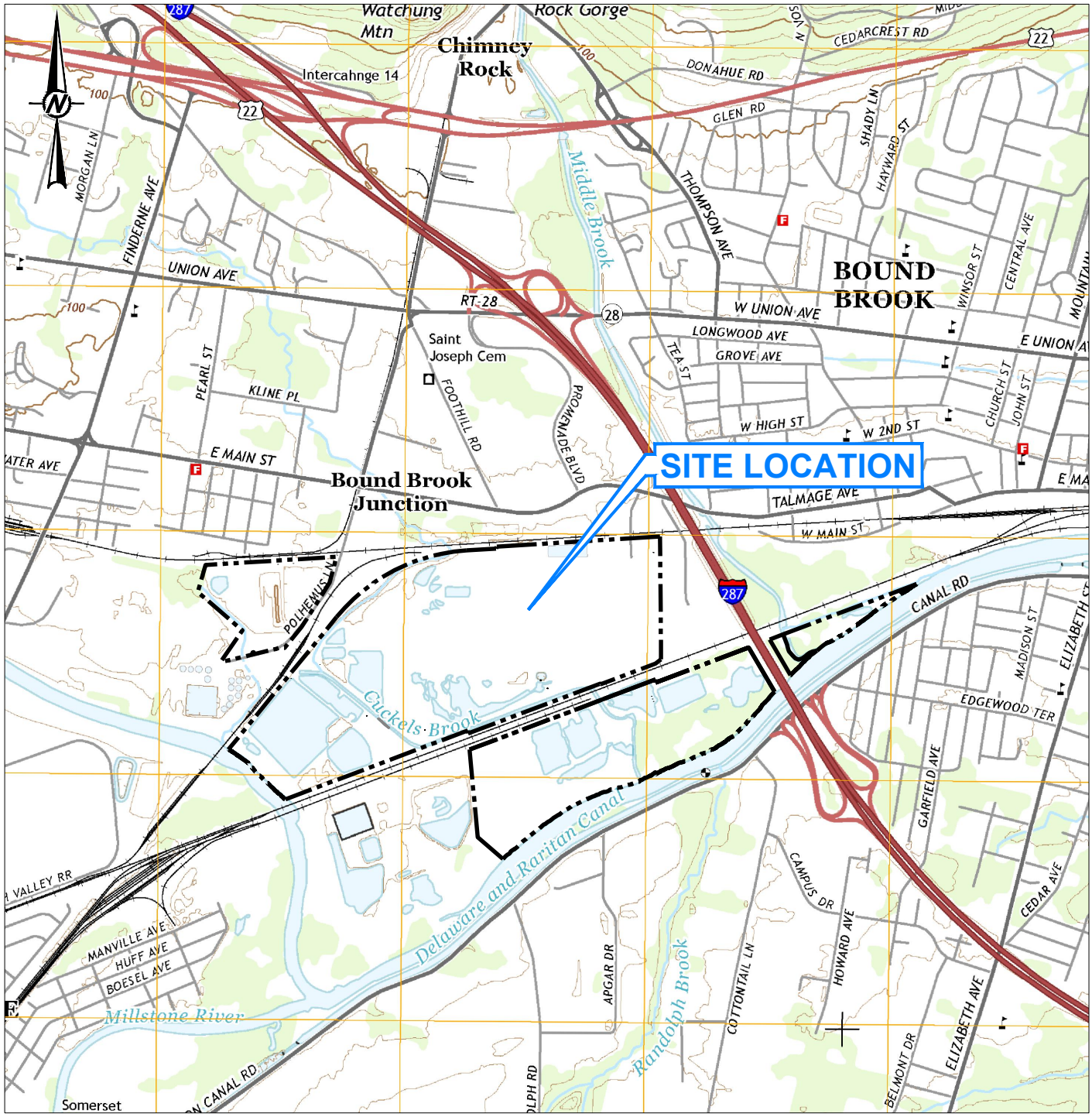
Table 2F: Summary of Impoundments Addressed under RCRA					
Impoundment	**Area (acres)**	**Volume Remediated**	**Description/Use**	**Current Status**	**COCs** *Please note that this list may not be exhaustive
Lagoon 6	5.5	113,500 CY	RCRA impoundment; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA. Waste in Lagoon 6 has been removed, solidified and placed in the Impoundment 8 Facility.	NA
Lagoon 7	20.9	241,400 CY	RCRA impoundment; in the process of being closed in accordance with approved RCRA closure plan	Remediation partially completed; Approx. 95% of waste in Lagoon 7 has been removed, solidified and placed in the Impoundment 8 Facility.	NA
Lagoon 8	11.5	60.8 MG	RCRA impoundment; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA. Waste in Impoundment 8 [Old] has been removed, solidified and placed in the Impoundment 8 Facility.	NA for Lagoon 8 (Old); Impoundment 8 Facility COCs: chloroform, tetrachloroethene, trichloroethene
Lagoon 9A	4.1	52,900 CY	RCRA impoundments; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA; Impoundment 9A (plant effluent sludge) was closed in-place by installing a double synthetic liner capping system	chloroform, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, 1,1,1-trichloroethane, carbon tetrachloride, iron, manganese
Impoundment 25	0.2	1,600 CY	RCRA impoundments; addressed in accordance with approved RCRA closure plan	Remediation completed under RCRA Effluent Collection Basin for Plant Effluent (sludge removed and closed in 1988 with NJDEP approval)	NA

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
OU1 ROD, EPA Region 2	Sep 1993
OU2 ROD, EPA Region 2	Jul 1996
OU2 ESD, NJDEP	Nov 1998
OU3 ROD, EPA Region 2	Sep 1998
OU3 ESD, NJDEP	May 2007
OU6 ROD, EPA Region 2	Jul 1996
NJDEP ACO, NJDEP	May 1988
NJDEP ACO (Amended), NJDEP	May 1994
Removal Action AOC, EPA Region 2	Jul 2011
OU4 RD/OU8 FFS AOC, EPA Region 2	Mar 2013
Certification Report for Impoundment 19 Closure, O'Brien & Gere (OBG)	Nov 1995
Certification Report for Impoundment 11 Closure, OBG	Nov 1997
Certification Report for Impoundment 18 Closure, OBG	Apr 1998
Certification Report for Impoundment 26 Closure, OBG	May 2002
Certification Report for Impoundments 14 and 20 Closure, OBG	Dec 2009
First FYR Report, EPA Region 2	Sep 1999
Second FYR Report, EPA Region 2	Sep 2004
Third FYR Report, EPA Region 2	Sep 2009
Impoundment Characterization Program Report, Blasland, Bouck & Lee (BBL)	Aug 1990
Natural Resource Assessment, BBL	Apr 1994

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Soils Remedial Investigation Report, BBL	May 1992
Remedial Investigation Report for Groundwater, OBG	Feb 2006
Supplemental Remedial Investigation Report for Groundwater, OBG	Apr 2007
Baseline Endangerment Assessment, BBL	Mar 1992
Baseline Ecological Risk Assessment, OBG	Jan 2005
Human Health Risk Assessment, OBG	Dec 2006
Streamlined Human Health Risk Assessment, EPA Region 2	Feb 2010
Comprehensive Site-wide Feasibility Study, OBG	Feb 2012
OU4 ROD, EPA Region 2	Sep 2012
Quarterly & Semi-Annual Groundwater Monitoring Reports, OBG & Golder Associates	2006-2018
Quarterly & Semi-Annual Surface Water & Sediment Monitoring Reports, OBG & Golder Associates	2005-2018
Quarterly Ambient Air Monitoring Reports, CH2M Hill	2012-2014
Semi-Annual Ambient Air Monitoring Reports, CH2M Hill	2014-2016
Annual Monitoring Report, Golder	2017
OU8 ROD, EPA Region 2	Sep 2018
Annual Monitoring Report, Golder	2018
Annual Monitoring Report, Golder	2019
Final GWEIS and HBW RDR, Golder	Sep 2019
Final GWCS RDR, Golder	Sep 2019
Interim GWEIS OM&M Plan, Golder	2019
A Site-wide CEA and WRA, Golder	2020
Annual OU4 Remedy OM&M Reporting & Assessment Report, Golder	2020

Table 3: Documents, Data and Information Reviewed in Completing the Five-Year Review	
Annual OU4 Remedy OM&M Reporting & Assessment Report, Golder	2021
Final Remedial Design Report and Remedial Action Work Plan for Engineered Soil Cover in Vicinity of Proposed NJ Transit Bridgewater Train Station Ramp, WSP	Jun 2021
Annual OU4 Remedy OM&M Reporting & Assessment Report, WSP	2022
Remedial Action Report for Engineered Soil Cover in Vicinity of Proposed NJ Transit Bridgewater Train Station Ramp, WSP	Feb 2024
Final Remedial Design Report Impoundments 13 and 24, WSP	Mar 2024

APPENDIX B - Attachments



LEGEND

PROPERTY LINE

REFERENCE(S)

1. MAP FROM 7.5 MINUTE U.S.G.S. QUADRANGLE OF BOUND BROOK, NEW JERSEY, DATED 2014.
2. PROPERTY LINE FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.

0 1000 2000
1" = 2000' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

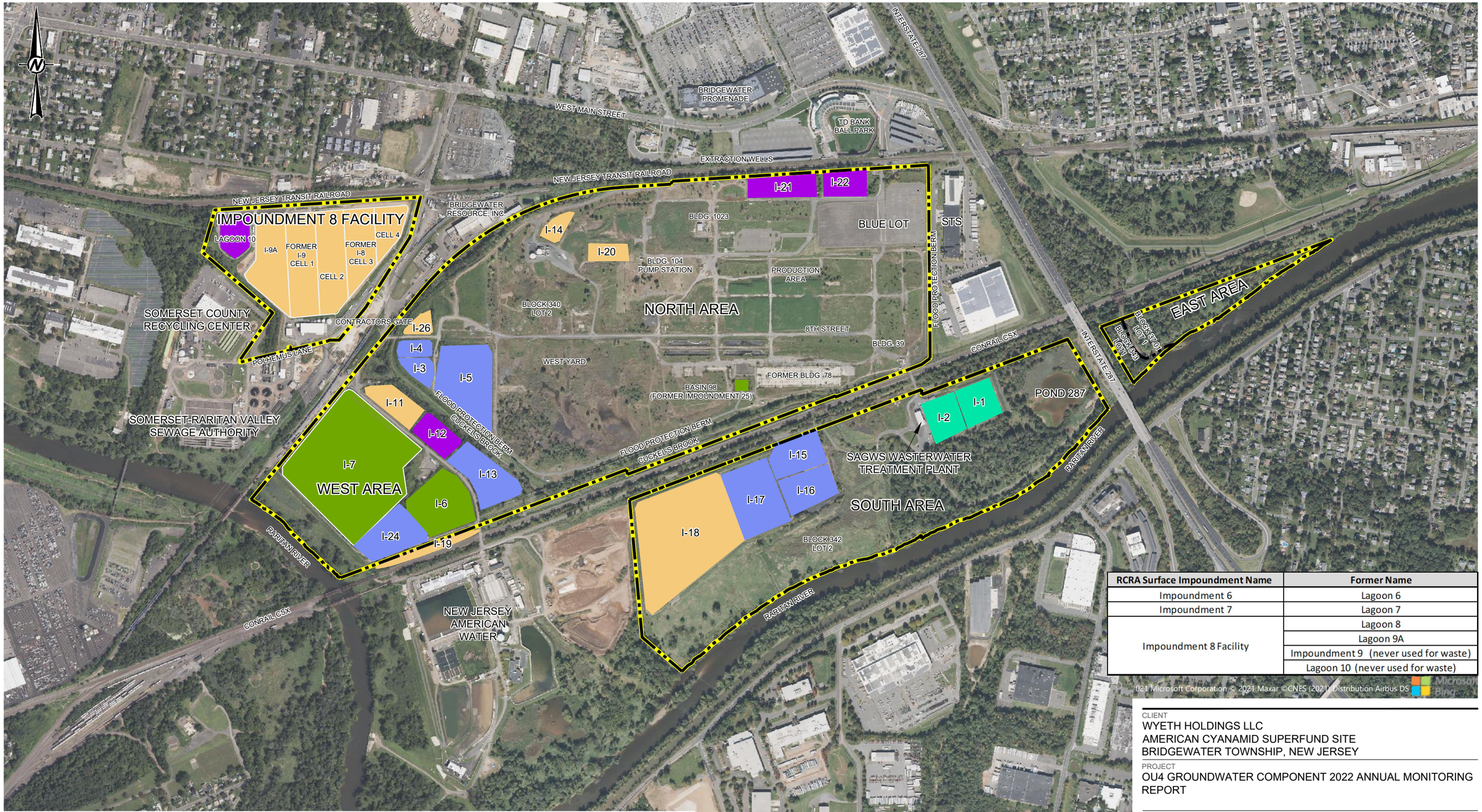
PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SITE LOCATION MAP

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-017	0	1



RCRA Surface Impoundment Name	Former Name
Impoundment 6	Lagoon 6
Impoundment 7	Lagoon 7
Impoundment 8 Facility	Lagoon 8
	Lagoon 9A
	Impoundment 9 (never used for waste)
	Lagoon 10 (never used for waste)

LEGEND

- PROPERTY BOUNDARY
- RCRA SURFACE IMPOUNDMENTS
- IMPOUNDMENTS NEVER USED FOR DISPOSAL
- SURFACE IMPOUNDMENTS - REMEDIATION COMPLETE
- OU-4 SURFACE IMPOUNDMENTS (INCLUDING IMPOUNDMENTS 15 AND 16 UNDER OU2)
- OU-8 SURFACE IMPOUNDMENTS

REFERENCE(S)

1. PROPERTY BOUNDARY FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES.
2. AERIAL COURTESY OF © 2018 MICROSOFT CORPORATION © 2018 DIGITALGLOBE © CNES (2018) DISTRIBUTION AIRBUS DS, BING.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SITE FEATURES

CONSULTANT
wsp

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-016	0	2

LEGEND

- PROPERTY LINE
- LIMIT OF WORK
- 35 EXISTING TOPOGRAPHIC CONTOUR - MAJOR
- 32 EXISTING TOPOGRAPHIC CONTOUR - MINOR
- 35 PROPOSED FINAL COVER - MAJOR
- 32 PROPOSED FINAL COVER - MINOR
- EXISTING FENCE
- EXISTING SIDEWALK
- EXISTING CURB
- EXISTING RETAINING WALL
- EXISTING UTILITY MANHOLE
- EXISTING STORMWATER INLET
- EXISTING LIGHT POLE
- NEW CHAIN LINK FENCE, SEE DETAIL 4/10
- SURVEY MARKER, SEE DETAIL 6/10
- VEGETATED ENGINEERED SOIL COVER SYSTEM, SEE DETAIL 1/9
- ENGINEERED SOIL COVER SYSTEM BENEATH ADA RAMP, SEE DETAIL 2/9
- ENGINEERED SOIL COVER SYSTEM TRANSITION 1, SEE DETAIL 3/9
- ENGINEERED SOIL COVER SYSTEM BENEATH STAIRS, SEE DETAIL 5/10
- ENGINEERED SOIL COVER SYSTEM TRANSITION 2, SEE DETAIL 4/9
- ENGINEERED SOIL COVER SYSTEM TRANSITION 3, SEE DETAIL 5/9
- ENGINEERED SOIL COVER SYSTEM TRANSITION 4, SEE DETAIL 1/10
- TEMPORARY VEGETATED ENGINEERED SOIL COVER SYSTEM TRANSITION 1, SEE DETAIL 2/10
- TEMPORARY VEGETATED ENGINEERED SOIL COVER SYSTEM TRANSITION 2, SEE DETAIL 3/10

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED AUGUST 5, 2015), PREPARED BY VARGO ASSOCIATES. UPDATES TO BASE MAP TAKEN FROM DIGITAL CADD FILE EQ TANK AREA AS BUILT.DWG, PROVIDED BY NORDIC CONTRACTING COMPANY, INC.; VARGO BL305 LOT 2 3 BRIDGEWATER 051519.DWG, PROVIDED BY VARGO ASSOCIATES; UPDATES TO BASE MAP TAKEN FROM DIGITAL CADD FILE VARGO 13089 BRIDGEWATER 123019.DWG, PROVIDED BY VARGO ASSOCIATES; UPDATES TO BASE MAP TAKEN FROM DIGITAL CADD FILE FINAL VARGO IMP 8 ASB BRIDGEWATER 7_2_19.DWG, PROVIDED BY VARGO ASSOCIATES; UPDATES TO BASE MAP TAKEN FROM DIGITAL CADD FILE 13089 ADDITIONAL TOPO 012420.DWG, PROVIDED BY VARGO ASSOCIATES.
2. HORIZONTAL DATUM REFERENCES THE NEW JERSEY STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. LOCATION OF PEDESTRIAN PATH, SIDEWALK TO STAIRS, AND SIDEWALK TO PUMP STATION, TAKEN FROM DRAWING ENTITLED "CONSTRUCTION PLAN", PROVIDED BY MOTT MACDONALD, LCC VIA ELECTRONIC CAD FILE CONSTRUCTIONPLANPBC.DWG, DATED OCTOBER 2020.

0 15 30
1" = 30' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
REMEDIAL DESIGN REPORT AND REMEDIAL ACTION WORK PLAN -
NJ TRANSIT BRIDGEWATER TRAIN STATION RAMP AREA

TITLE
FINAL GRADING PLAN

CONSULTANT
GOLDER
MEMBER OF WSP
NJ Authorization #24GA28029100

YYYY-MM-DD	2021-06-30
DESIGNED	GPH
PREPARED	GLS
REVIEWED	GPH
APPROVED	FTA

PROJECT NO.	CONTROL	REV.	FIGURE
10386245	0062-008	0	8

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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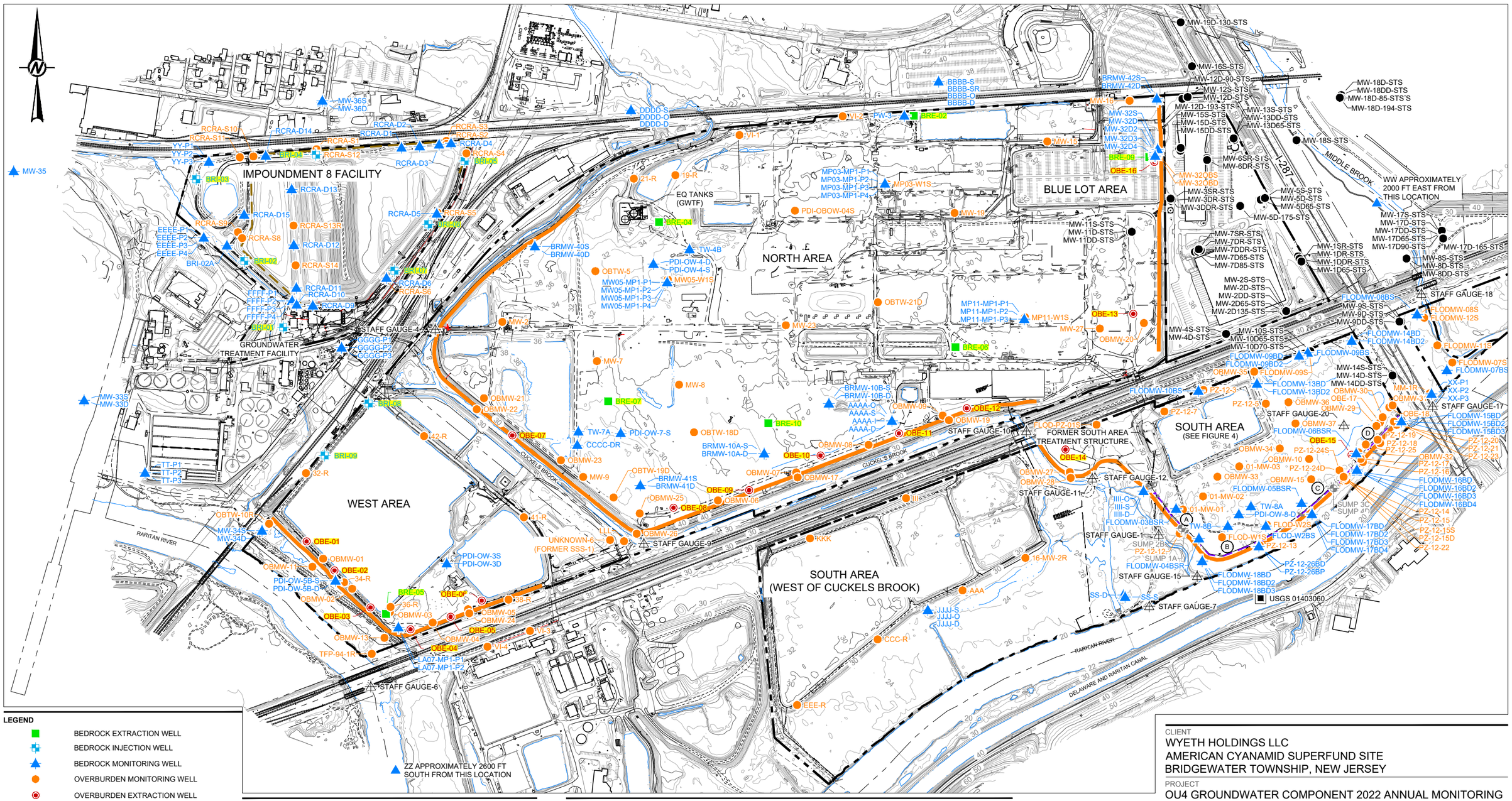
Additional Raised Protection Infrastructure Improvements (After TD Ida)

AmCy Restoration



LEGEND

- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL
- OVERBURDEN EXTRACTION WELL
- STS MONITORING WELL
- STAFF GAUGE
- USGS STATION
- TRENCH SEGMENTS A-D
- SOUTH AREA SUMP LOCATION
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 3)
- AS-BUILT HYDRAULIC BARRIER WALL ALIGNMENT (SEE REFERENCES 3 AND 6)
- IMPOUNDMENT 8 GROUNDWATER INTERCEPTOR TRENCH (SEE REFERENCE 5)
- GWEIS INJECTION AND EXTRACTION WELLS
- PROPERTY LINE

NOTE(S)

1. GWEIS - GROUNDWATER EXTRACTION AND INJECTION SYSTEM
2. THE AS-BUILT ALIGNMENTS OF THE HYDRAULIC BARRIER WALLS ARE BASED ON SURVEY DRAWINGS PROVIDED BY D.A. COLLINS ENVIRONMENTAL SERVICES (SEE REFERENCE 6).
3. HBW - HYDRAULIC BARRIER WALL.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG UPDATED 11-07-2022.
2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
3. SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
4. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.
5. GROUNDWATER INTERCEPTOR TRENCH DIGITIZED FROM FIGURE 401, ENTITLED "IMPOUNDMENT 8 MONITORING WELL LOCATION PLAN," PREPARED BY O'BRIEN & GERE, DATED FEBRUARY 16, 2012.
6. AS-BUILT LOCATIONS OF HYDRAULIC BARRIER WALL SHOWN TAKEN FROM CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS.DWG RECEIVED MARCH 11, 2019 FROM D.A. COLLINS ENVIRONMENTAL SERVICES.

0 300 600
1" = 300' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SITE-WIDE GWEIS EXTRACTION, INJECTION AND MONITORING WELLS AND HBWs

CONSULTANT
wsp

YYYY-MM-DD	2024-03-22
DESIGNED	ACK
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-014	0	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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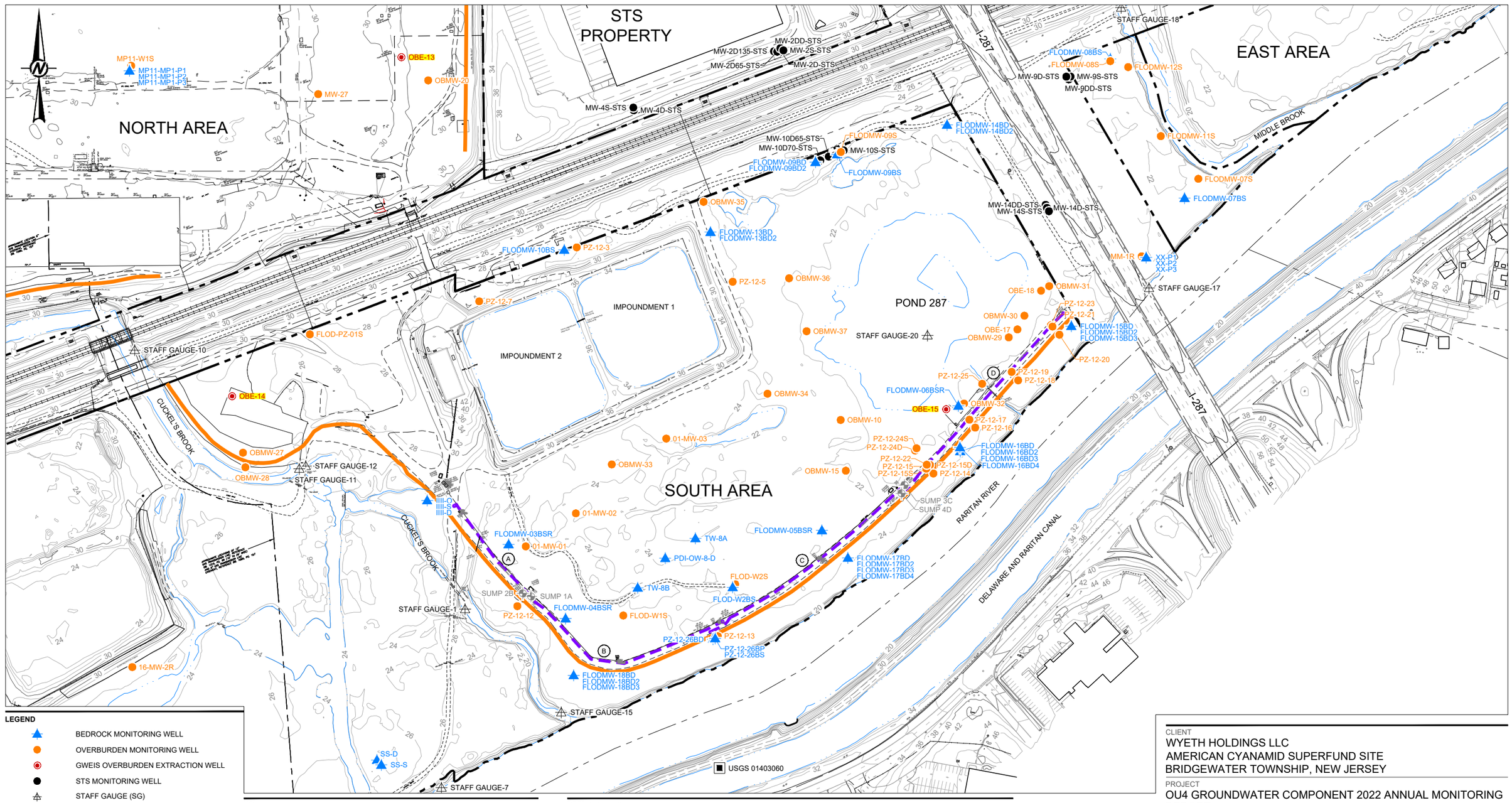

LEGEND

- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL
- GWEIS OVERBURDEN EXTRACTION WELL
- STS MONITORING WELL
- STAFF GAUGE (SG)
- SOUTH AREA TRENCH SUMP LOCATION
- USGS STATION
- (A) TRENCH SEGMENT A
- (B) TRENCH SEGMENT B
- (C) TRENCH SEGMENT C
- (D) TRENCH SEGMENT D
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 3)
- AS-BUILT HYDRAULIC BARRIER WALL ALIGNMENT (SEE REFERENCES 3 AND 6)
- GWEIS EXTRACTION WELLS
- PROPERTY LINE

NOTE(S)

1. GWEIS - GROUNDWATER EXTRACTION AND INJECTION SYSTEM
2. THE AS-BUILT ALIGNMENTS OF THE HYDRAULIC BARRIER WALLS ARE BASED ON SURVEY DRAWINGS PROVIDED BY D.A. COLLINS ENVIRONMENTAL SERVICES (SEE REFERENCE 6).
3. HBW - HYDRAULIC BARRIER WALL.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG UPDATED 11-07-2022.
2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
3. SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
4. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.
5. GROUNDWATER CUT-OFF WALL AND GROUNDWATER INTERCEPTOR TRENCH DIGITIZED FROM FIGURE 401, ENTITLED "IMPOUNDMENT 8 MONITORING WELL LOCATION PLAM," PREPARED BY O'BRIEN & GERE, DATED FEBRUARY 16, 2012.
6. AS-BUILT LOCATIONS OF HYDRAULIC BARRIER WALL SHOWN TAKEN FROM CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS.DWG RECEIVED MARCH 11, 2019 FROM D.A. COLLINS ENVIRONMENTAL SERVICES.

0 120 240
1" = 120' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SOUTH AREA GWEIS EXTRACTION, INJECTION AND MONITORING WELLS AND HBWs

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	ACK
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-015	0	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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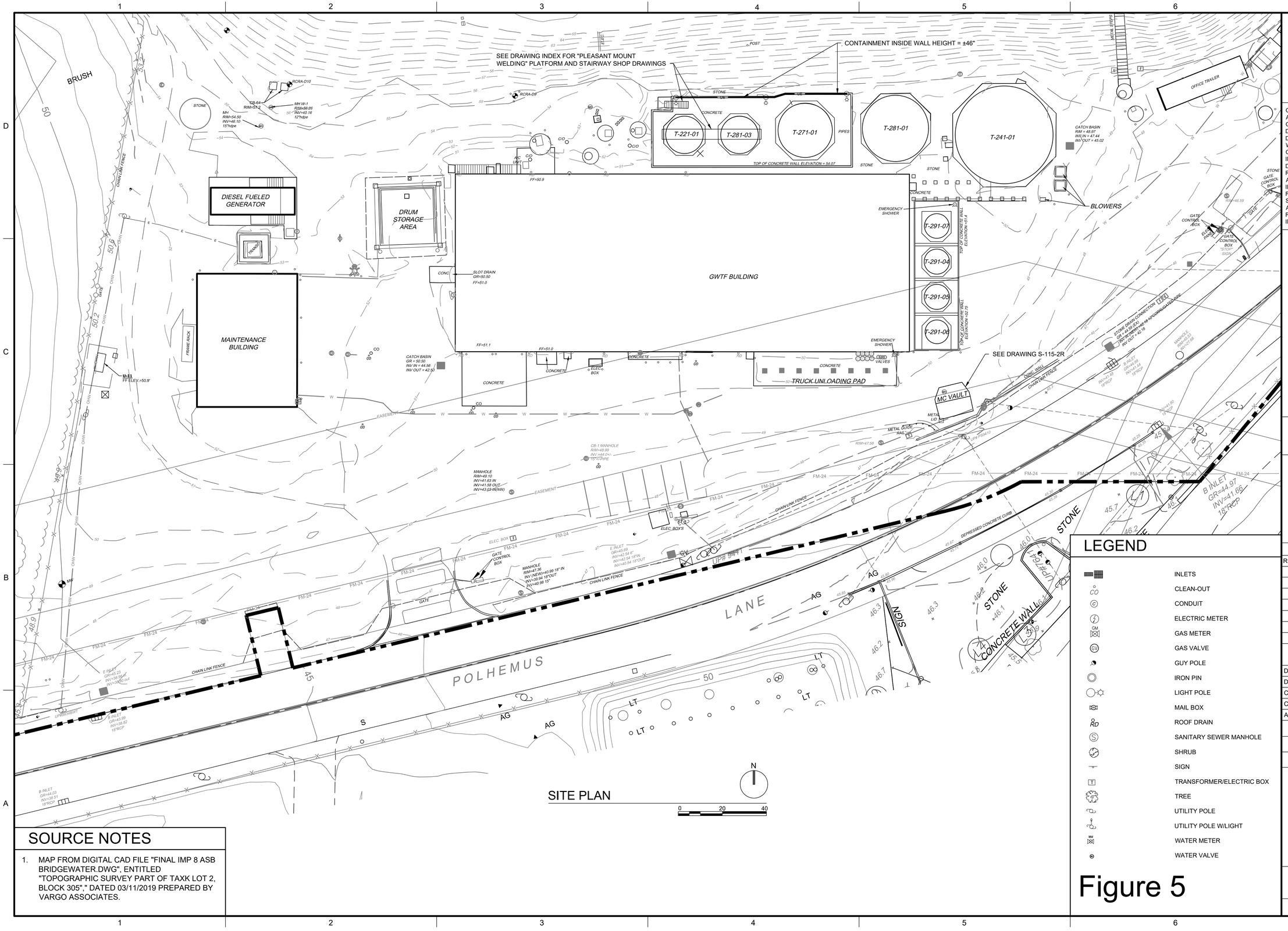


SOURCE NOTES

1. MAP FROM DIGITAL CAD FILE "FINAL IMP 8 ASB BRIDGEWATER.DWG", ENTITLED "TOPOGRAPHIC SURVEY PART OF TAXK LOT 2, BLOCK 305"," DATED 03/11/2019 PREPARED BY VARGO ASSOCIATES.

LEGEND

- INLETS
- CLEAN-OUT
- CONDUIT
- ELECTRIC METER
- GAS METER
- GAS VALVE
- GUY POLE
- IRON PIN
- LIGHT POLE
- MAIL BOX
- ROOF DRAIN
- SANITARY SEWER MANHOLE
- SHRUB
- SIGN
- TRANSFORMER/ELECTRIC BOX
- TREE
- UTILITY POLE
- UTILITY POLE W/LIGHT
- WATER METER
- WATER VALVE

Figure 5

Brown AND Caldwell

N.J. C.A. 24GA280431000

RAMSEY, NJ

CONSTRUCTION OF THE REMEDIAL ACTION HAS BEEN COMPLETED IN CONFORMANCE WITH THE REMEDIAL DESIGN, OU 4 ROD, AND THE CONSENT DECREE. THESE AS-BUILT DRAWINGS WERE PREPARED TO THE STANDARD AND CUSTOMARY LEVEL OF DETAIL, BASED ON INFORMATION PROVIDED BY OTHERS. THE DRAWINGS SHOULD NOT BE SOLELY RELIED UPON FOR EXACT DIMENSIONS AND FEATURES. ALL DIMENSIONS AND IDENTIFICATION OF EXISTING AND NEW FEATURES SHOWN ON THE DRAWINGS SHALL BE CONSIDERED APPROXIMATE AND SUBJECT TO VERIFICATION IN THE FIELD BEFORE RELIANCE ON INFORMATION.

WYETH HOLDINGS LLC

AMERICAN CYANAMID SUPERFUND SITE - BRIDGEWATER NJ

REVISIONS

REV	DATE	DESCRIPTION
	01/31/20	RECORD DRAWINGS

LINE IS 2 INCHES AT FULL SIZE

DESIGNED:	P. PETRINO
DRAWN:	R. NEAR
CHECKED:	C. OLIVEIRA
CHECKED:	A. FUNG
APPROVED:	A. FUNG

FILENAME C-102R.DWG

BC PROJECT NUMBER 153078

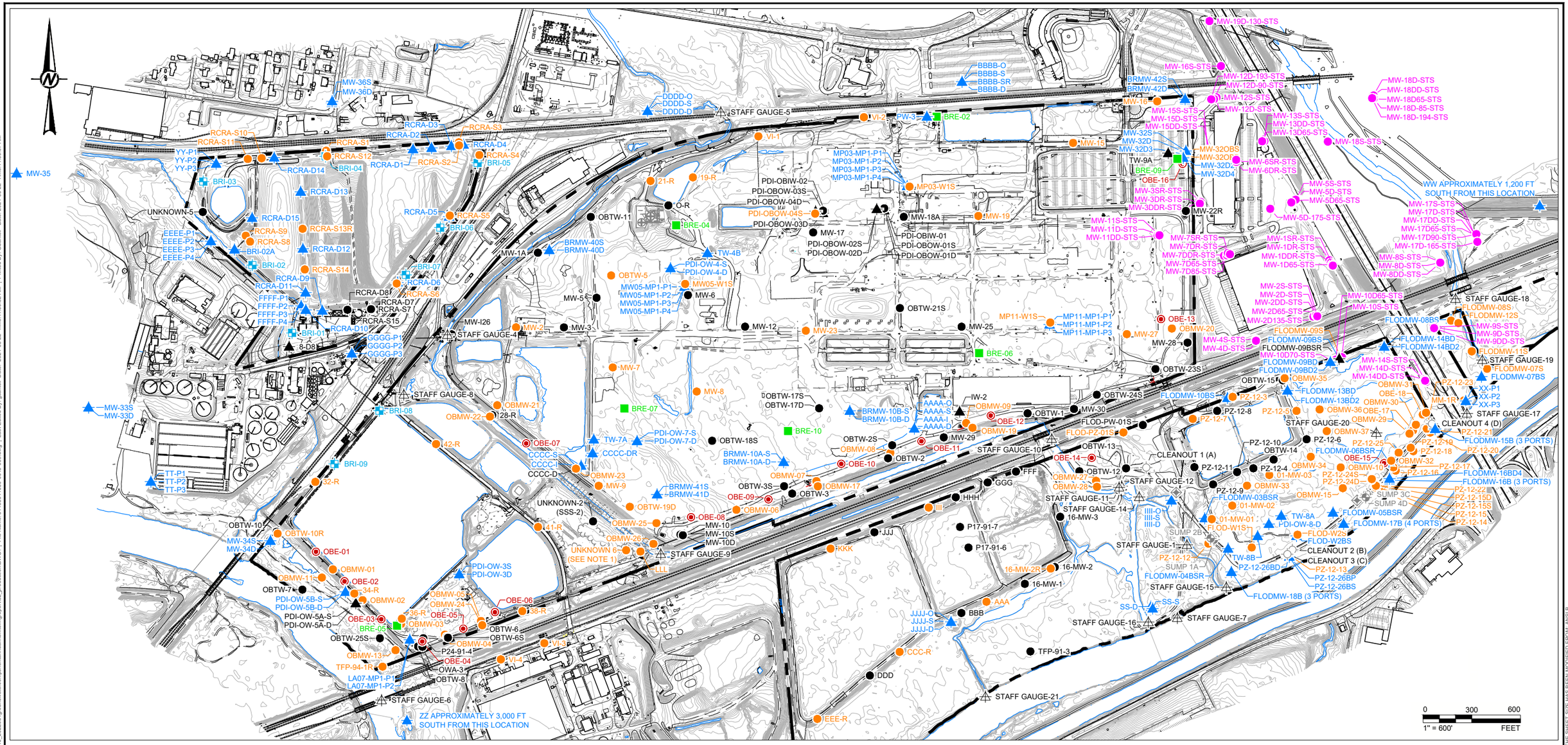
CLIENT PROJECT NUMBER

CIVIL

IMPOUNDMENT 8 SITE PLAN

DRAWING NUMBER C-102R

SHEET NUMBER OF



LEGEND

- BEDROCK EXTRACTION WELL (SEE NOTE 1)
- BEDROCK INJECTION WELL (SEE NOTE 1)
- BEDROCK MONITORING WELL
- OVERBURDEN MONITORING WELL
- GWEIS OVERBURDEN EXTRACTION WELL (SEE NOTE 1)
- STS MONITORING WELL
- SOUTH AREA SUMP LOCATION
- SOUTH AREA CLEANOUT LOCATION
- SOUTH AREA ELECTRIC CONTROL TOWER
- STAFF GAUGE
- DECOMMISSIONED BEDROCK MONITORING WELL
- DECOMMISSIONED OVERBURDEN MONITORING WELL

NOTE(S)

1. WELL UNKNOWN 6 PREVIOUSLY LABELED AS SSS-1 PRIOR TO 2020, HOWEVER CONFIRMATION OF THE CORRECT WELL IDENTIFICATION IS PENDING.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089-051713.DWG, SHEET 1 OF 36, ENTITLED "GENERAL LOCATION MAP AND SHEET KEY," DATED APRIL 12, 2011 (REVISED MAY 17, 2013), PREPARED BY VARGO ASSOCIATES. IMPOUNDMENTS 15 AND 16 REVISED JULY 30, 2015 (BRIDGEWATER_SURVEY-080515A-26 OF.DWG). PLACEMENT AREA E REVISED USING XML RECEIVED FROM VARGO ASSOCIATES (VARGO BRIDGEWATER BOUND BOOK 102218.XML); UPDATE 2018-11-02 WITH AS-BUILT PLACEMENT AREA E TOPO SURFACE FROM XML RECEIVED FROM VARGO (TOPO 101918); UPDATED 2019-05-20: WITH AB-TOPO-05152019 FROM VARGO ASSOCIATES SURVEY OF AREA AROUNF NEW BUILDING AND INFRASTRUCTURE AT BL 305 LOT AT IMP-8 FACILITY (TAKEN FROM CADD FILE VARGO BL305 LOT 2 3 BRIDGEWATER 051519.DWG); UPDATED 2019-06-25 WITH SURFACE FROM COGO POINTS FROM AS-BUILT OF EQ TANK AREA DATE 03-25-19 BY NORDIC CONTRACTING CO.,INC (TAKEN FROM CAD FILE EQ TANK AREA AS BUILT.DWG); UPDATED 2019-06-25: REMOVED SMALL STOCKPILE IN IMPACT AREA NEAR EQ TANK; UPDATED 2019-08-02: REMOVED STONE STOCKPILE AT IMP 8 FACILITY (DS-IMP8-STONE-STOCKPILE-REMOVED-2019-08-02).
2. HORIZONTAL DATUM REFERENCES THE NEW JERSEY STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. WELL LOCATIONS SURVEYED BY VARGO ASSOCIATES.
4. SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
5. EQ TANK AREA TAKEN FROM DIGITAL CAD FILE EQ TANK AREA AS BUILT.DWG, DATED 03-25-2019, PROVIDED BY NORDIC CONTRACTING COMPANY INCORPORATED.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
EXISTING AND DECOMMISSIONED WELLS

CONSULTANT
wsp

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-009	0	A-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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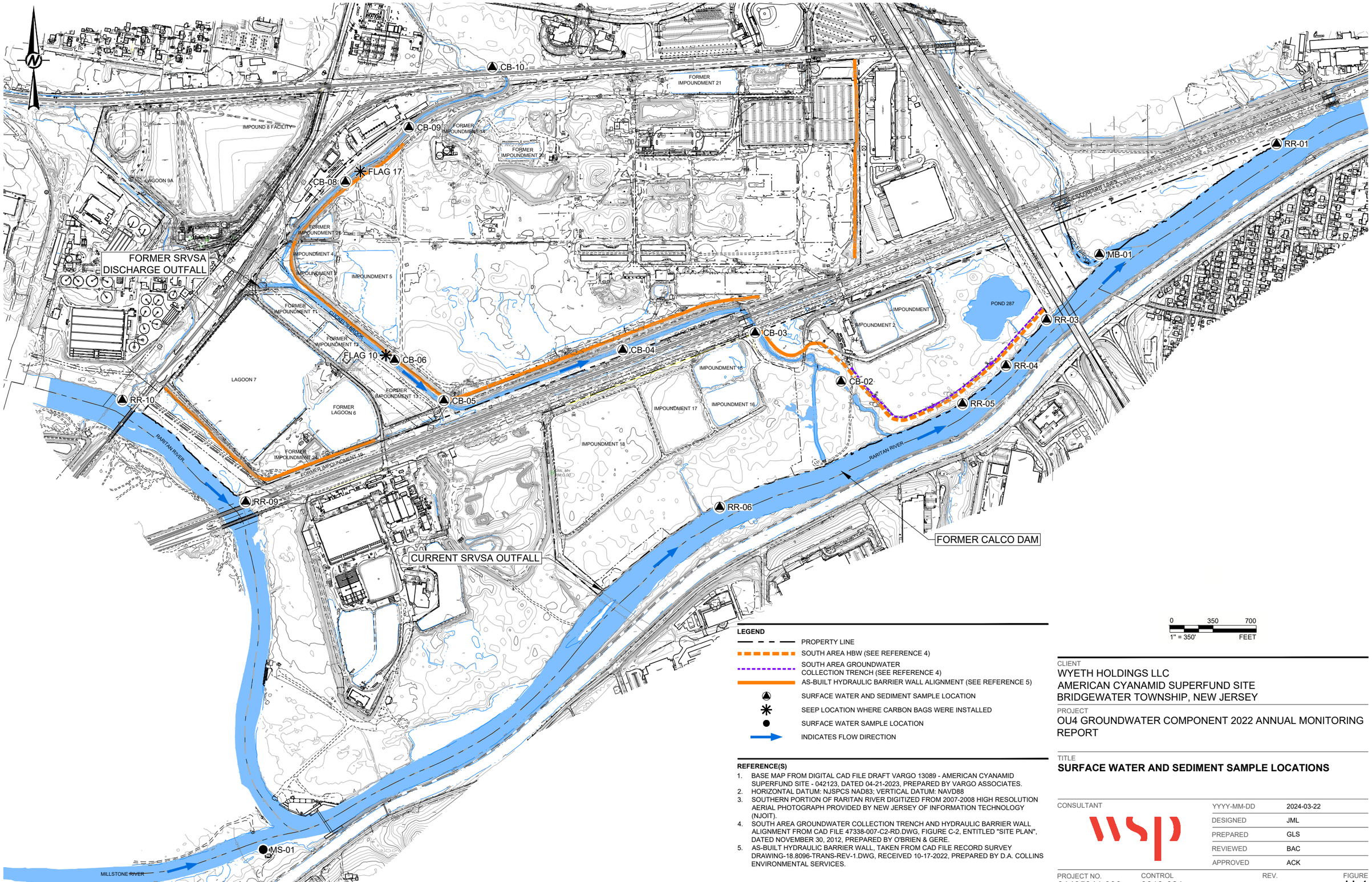
Site-Wide GW Control, Extraction, Treatment & Injection

AmCy Restoration



LEGEND

- PROPERTY LINE
- SOUTH AREA HBW (SEE REFERENCE 4)
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 4)
- AS-BUILT HYDRAULIC BARRIER WALL ALIGNMENT (SEE REFERENCE 5)
- SURFACE WATER AND SEDIMENT SAMPLE LOCATION
- SEEP LOCATION WHERE CARBON BAGS WERE INSTALLED
- SURFACE WATER SAMPLE LOCATION
- INDICATES FLOW DIRECTION

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE DRAFT VARGO 13089 - AMERICAN CYANAMID SUPERFUND SITE - 042123, DATED 04-21-2023, PREPARED BY VARGO ASSOCIATES.
2. HORIZONTAL DATUM: NJSPCS NAD83; VERTICAL DATUM: NAVD88
3. SOUTHERN PORTION OF RARITAN RIVER DIGITIZED FROM 2007-2008 HIGH RESOLUTION AERIAL PHOTOGRAPH PROVIDED BY NEW JERSEY OF INFORMATION TECHNOLOGY (NJOIT).
4. SOUTH AREA GROUNDWATER COLLECTION TRENCH AND HYDRAULIC BARRIER WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN", DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
5. AS-BUILT HYDRAULIC BARRIER WALL, TAKEN FROM CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS-REV-1.DWG, RECEIVED 10-17-2022, PREPARED BY D.A. COLLINS ENVIRONMENTAL SERVICES.

0 350 700
1" = 350' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

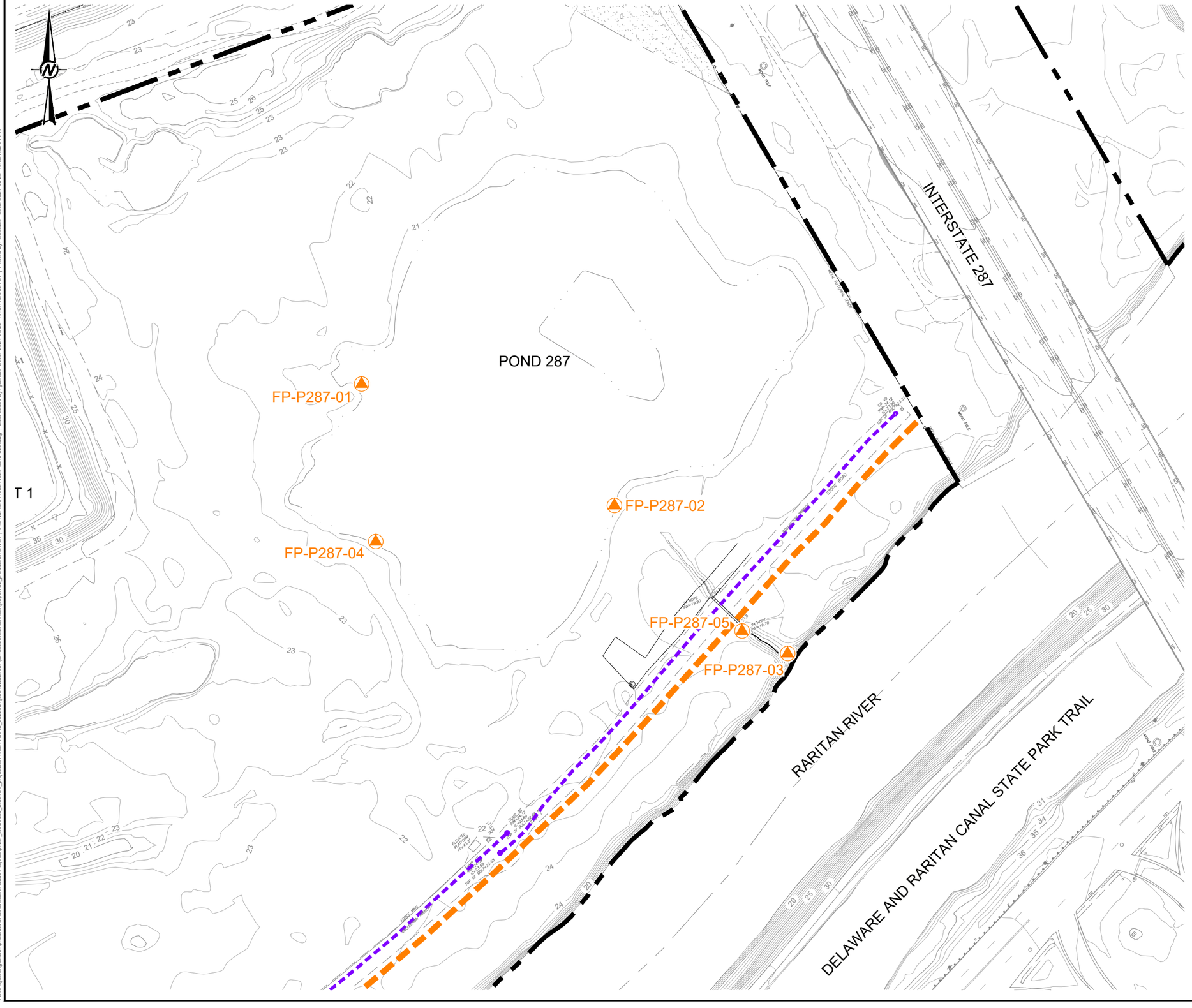
PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-021	0	H-1



LEGEND

- SOUTH AREA HBW (SEE REFERENCE 2)
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 2)
- POND 287 SAMPLE LOCATION

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG UPDATED 11-07-2022.
2. SOUTH AREA GROUNDWATER SYSTEM COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.

0 50 100
1" = 100' FEET

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
POND 287 SURFACE WATER SAMPLE LOCATIONS

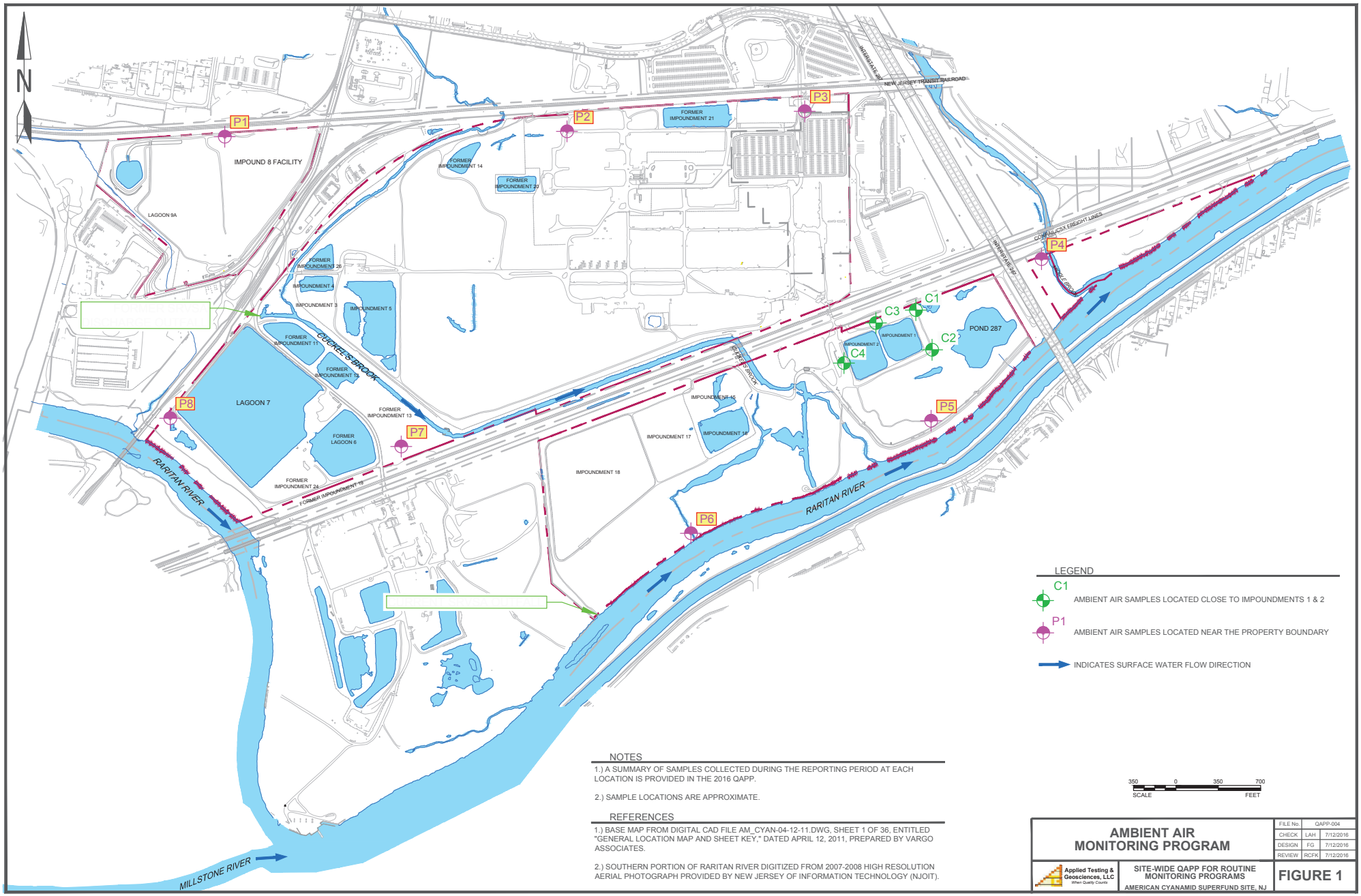
CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-022	0	H-2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Attachment 12



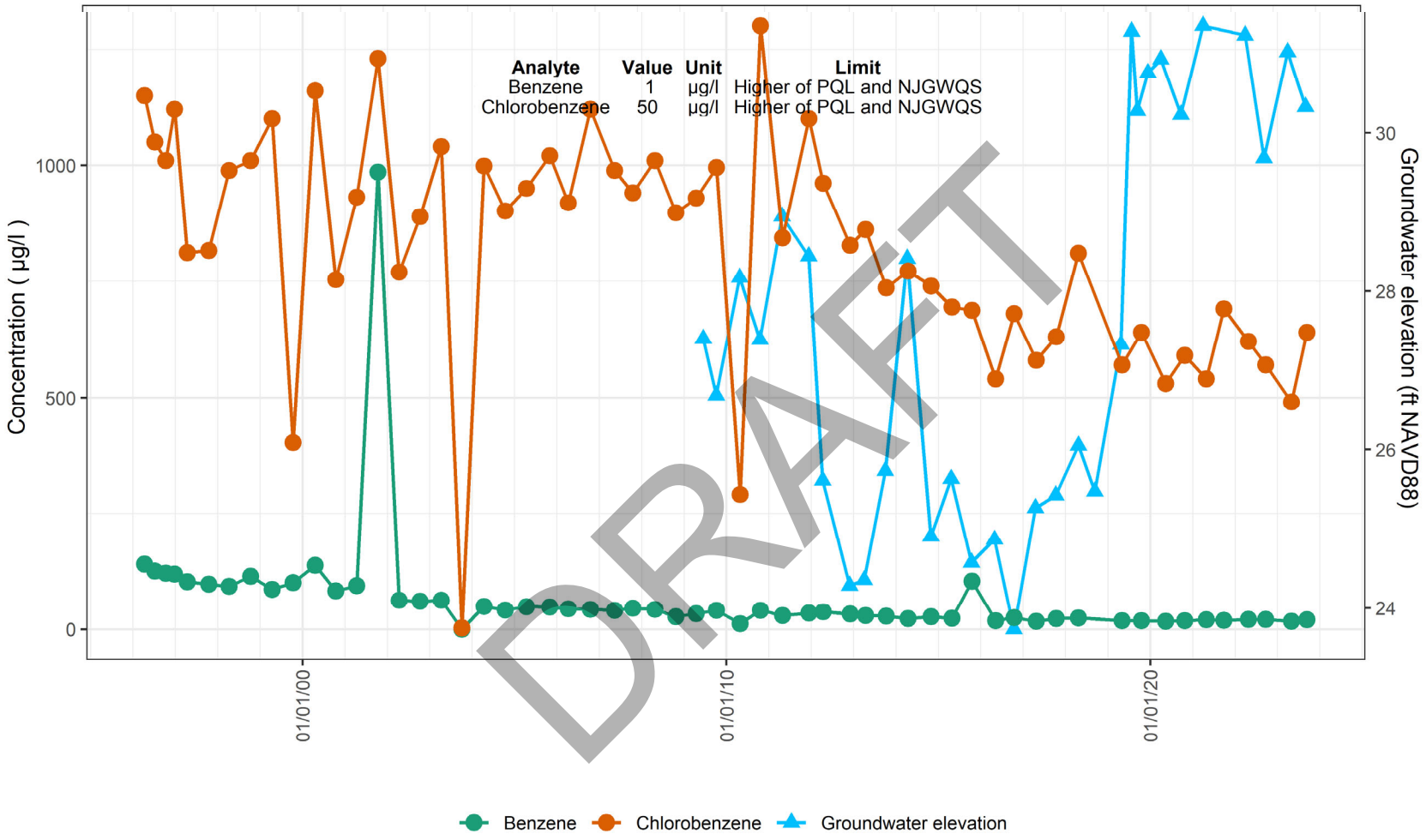
D-1-1-1

Groundwater Concentration Exceedances vs. Time Trends

American Cyanamid Superfund Site

Bridgewater Township, New Jersey

42R



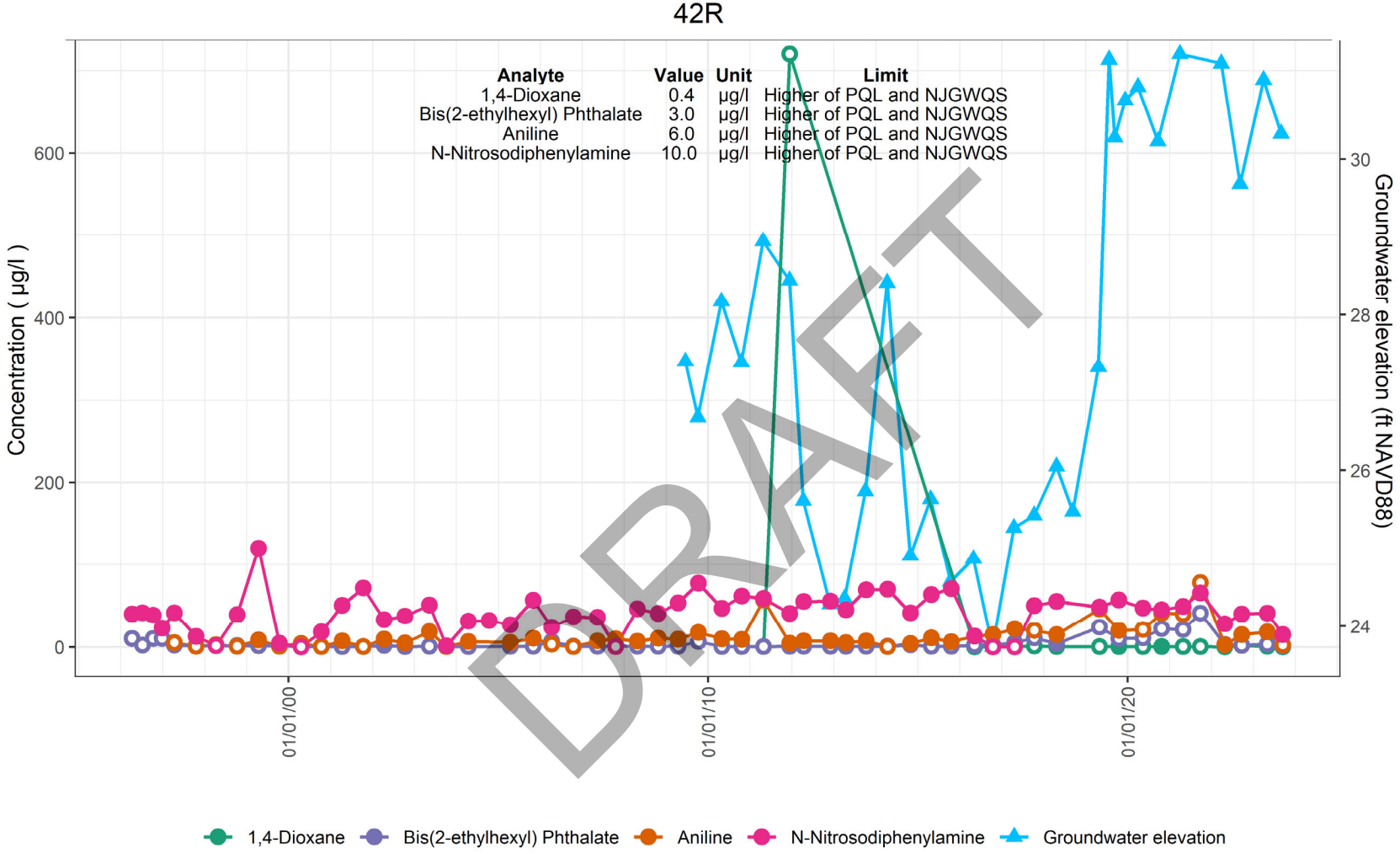
Note:
Non-detects plotted at the method detection limit and shown as open circles

D-1-2-1

Groundwater Concentration Exceedances vs. Time Trends

American Cyanamid Superfund Site

Bridgewater Township, New Jersey



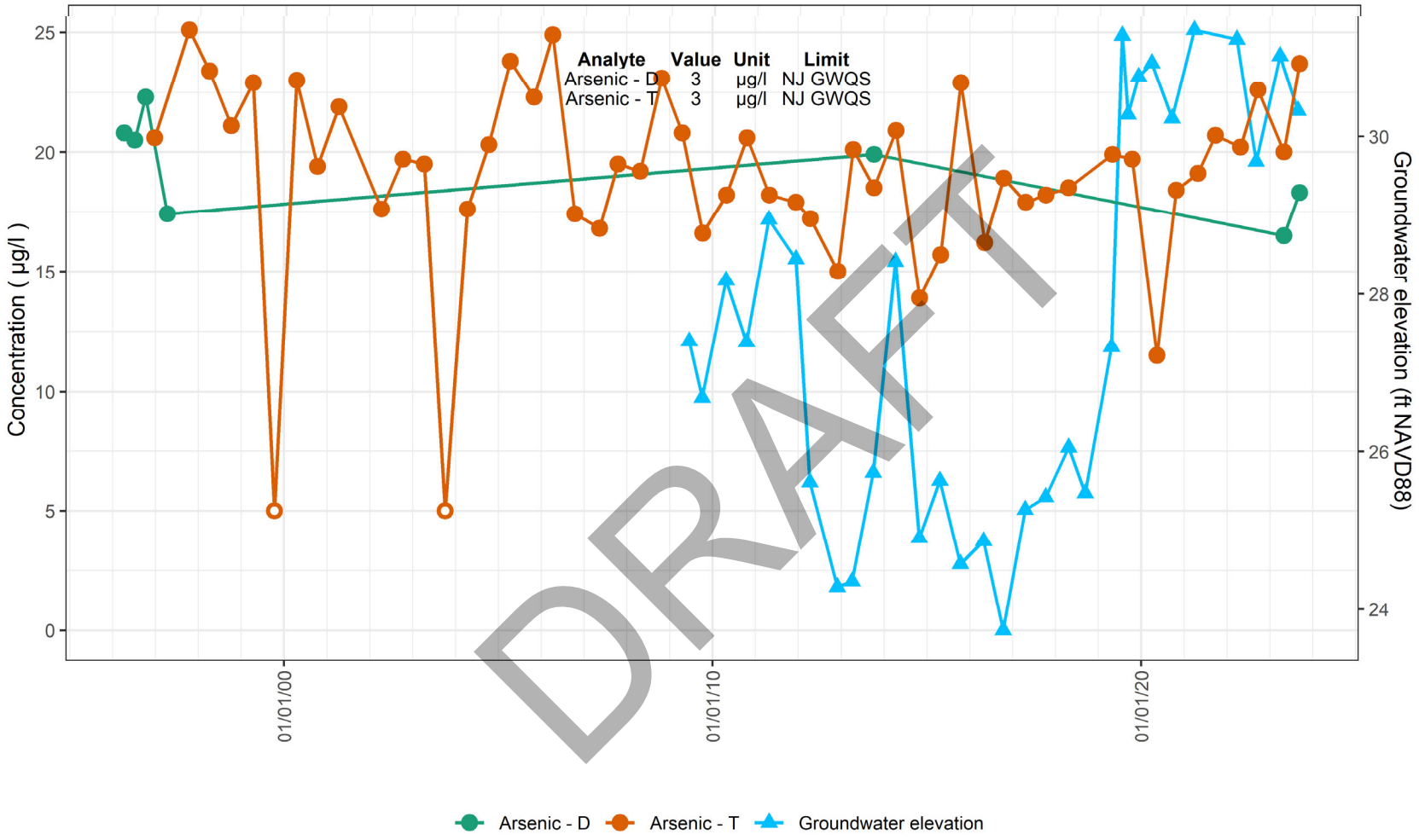
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends

American Cyanamid Superfund Site

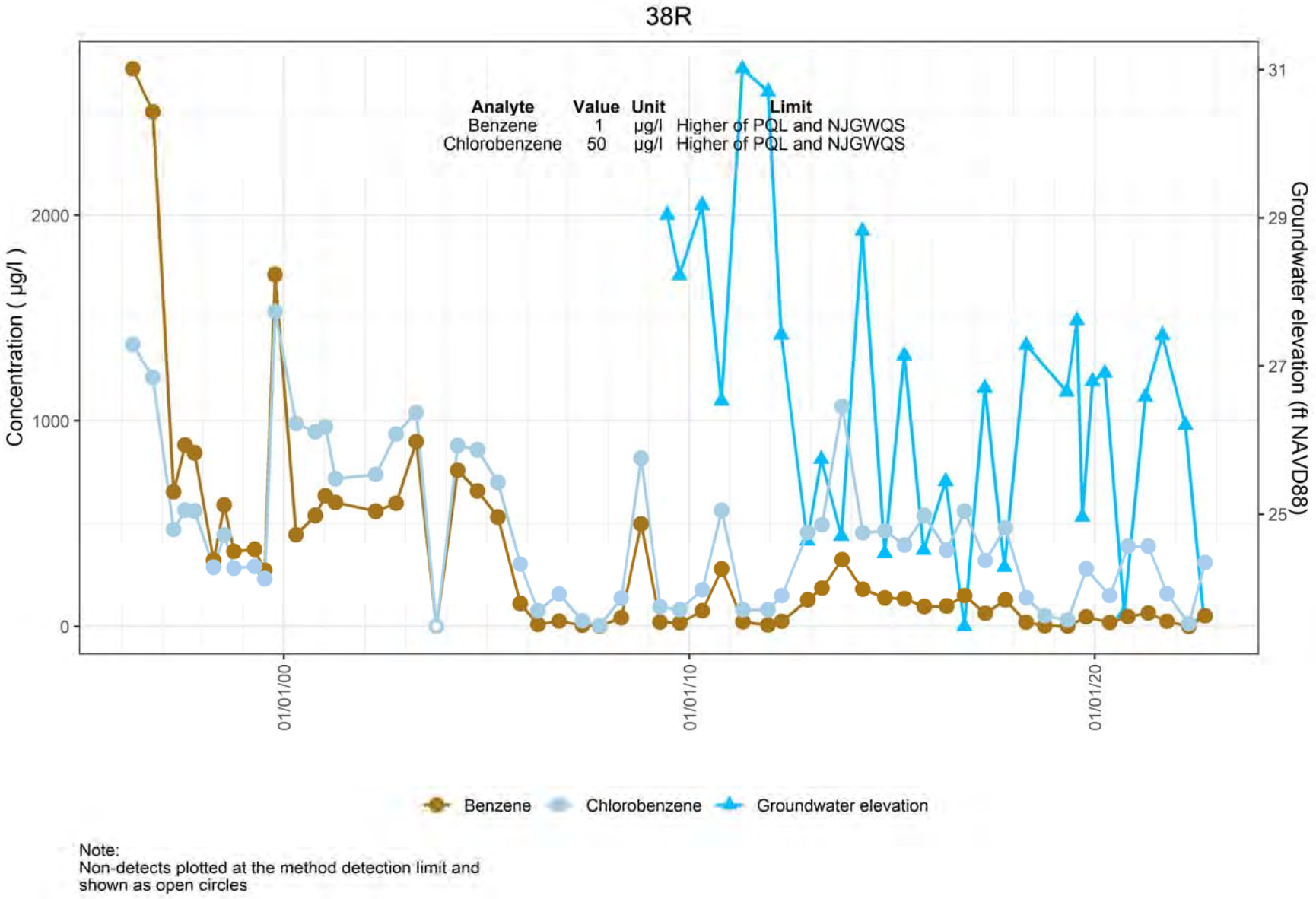
Bridgewater Township, New Jersey

42R



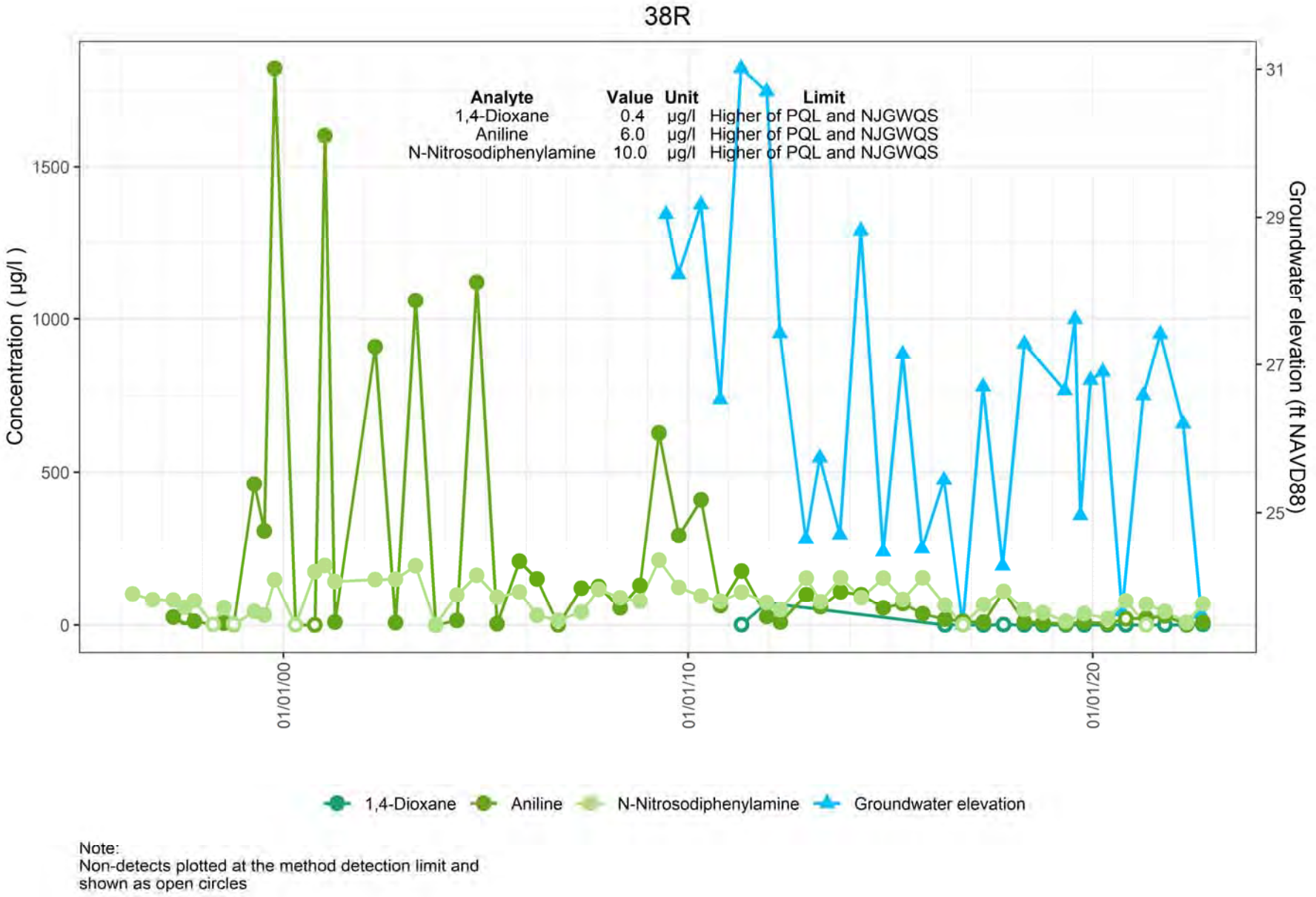
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



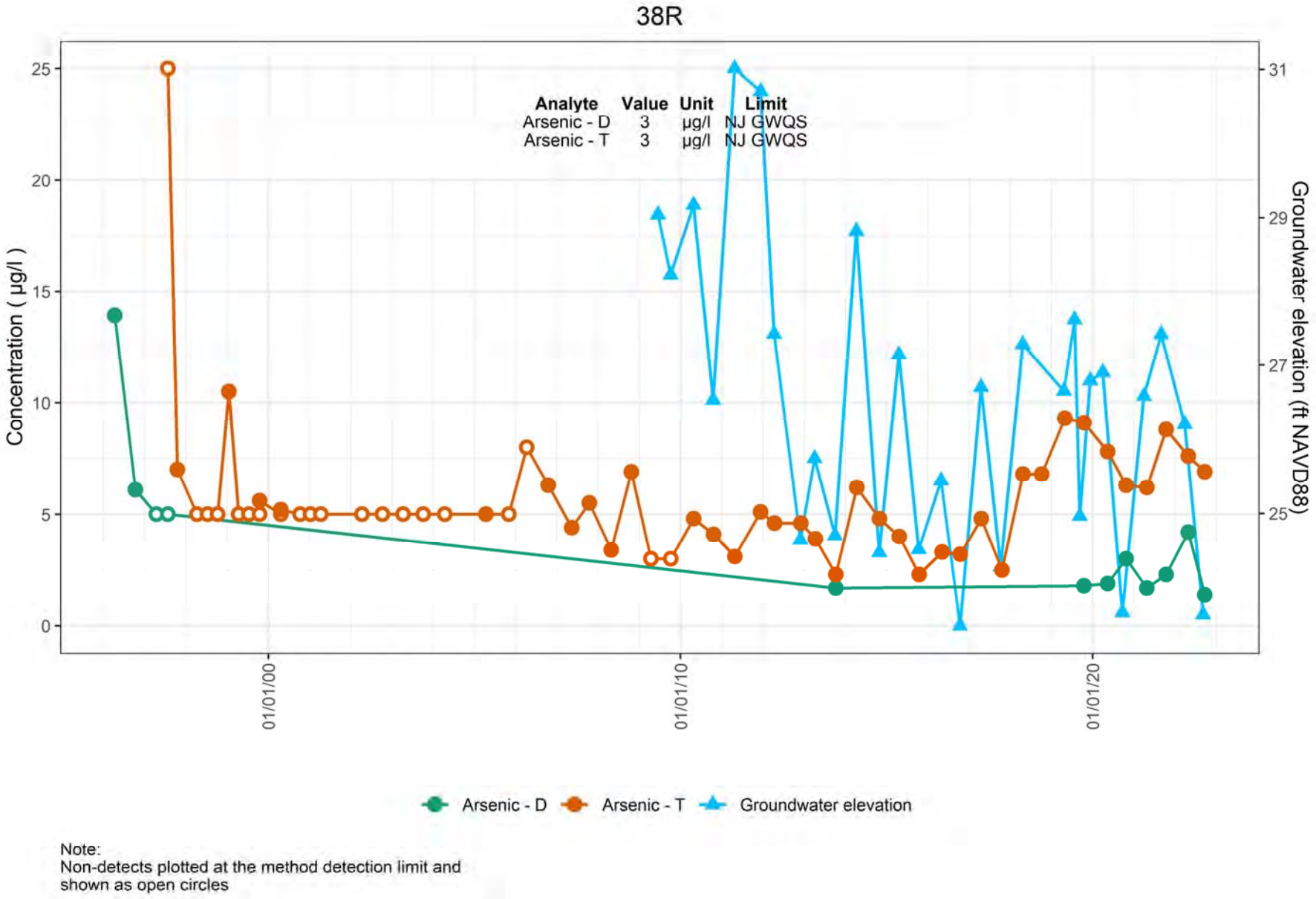
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



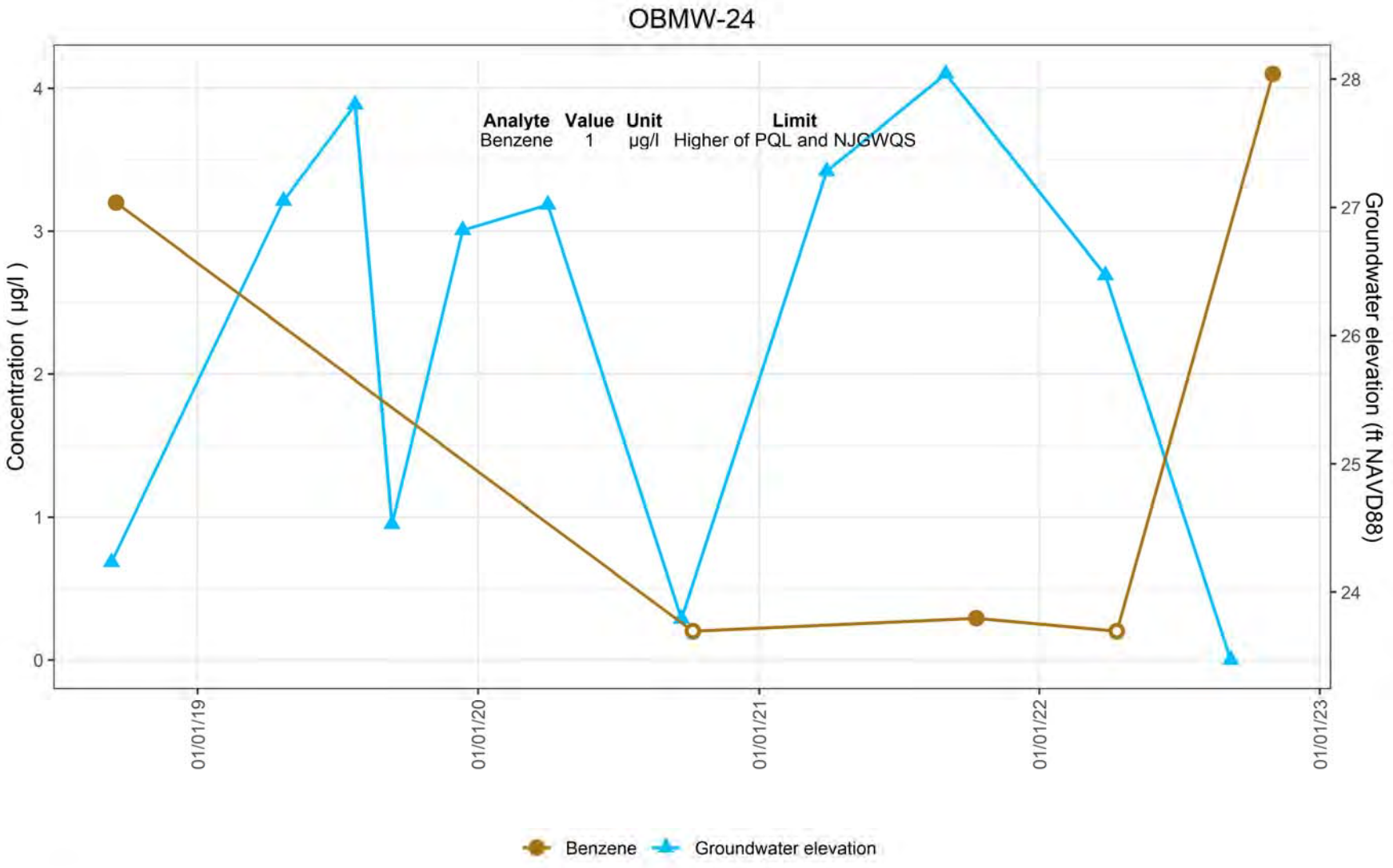
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



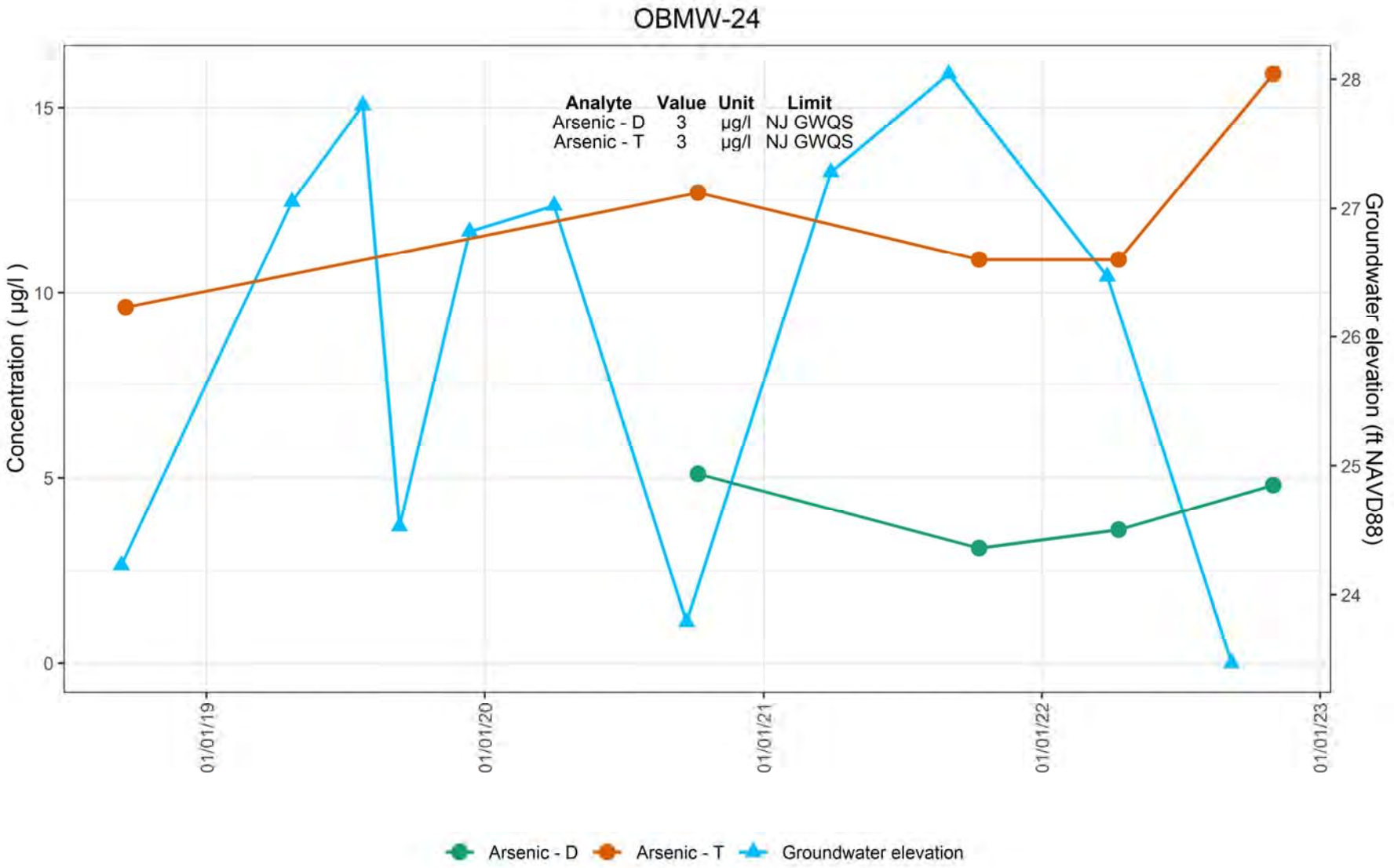
March 2024 D-3-1-55 31405041.030

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



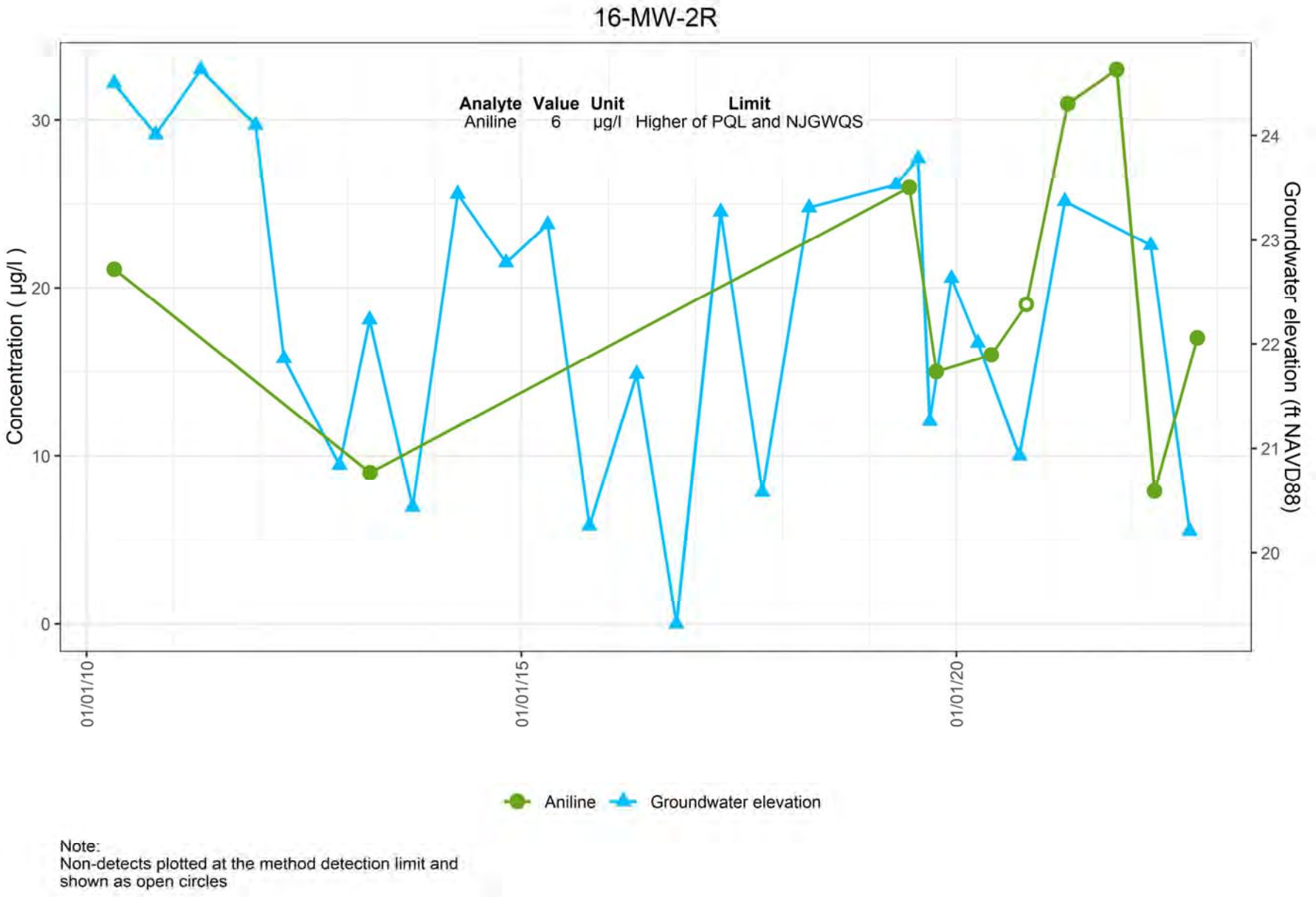
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

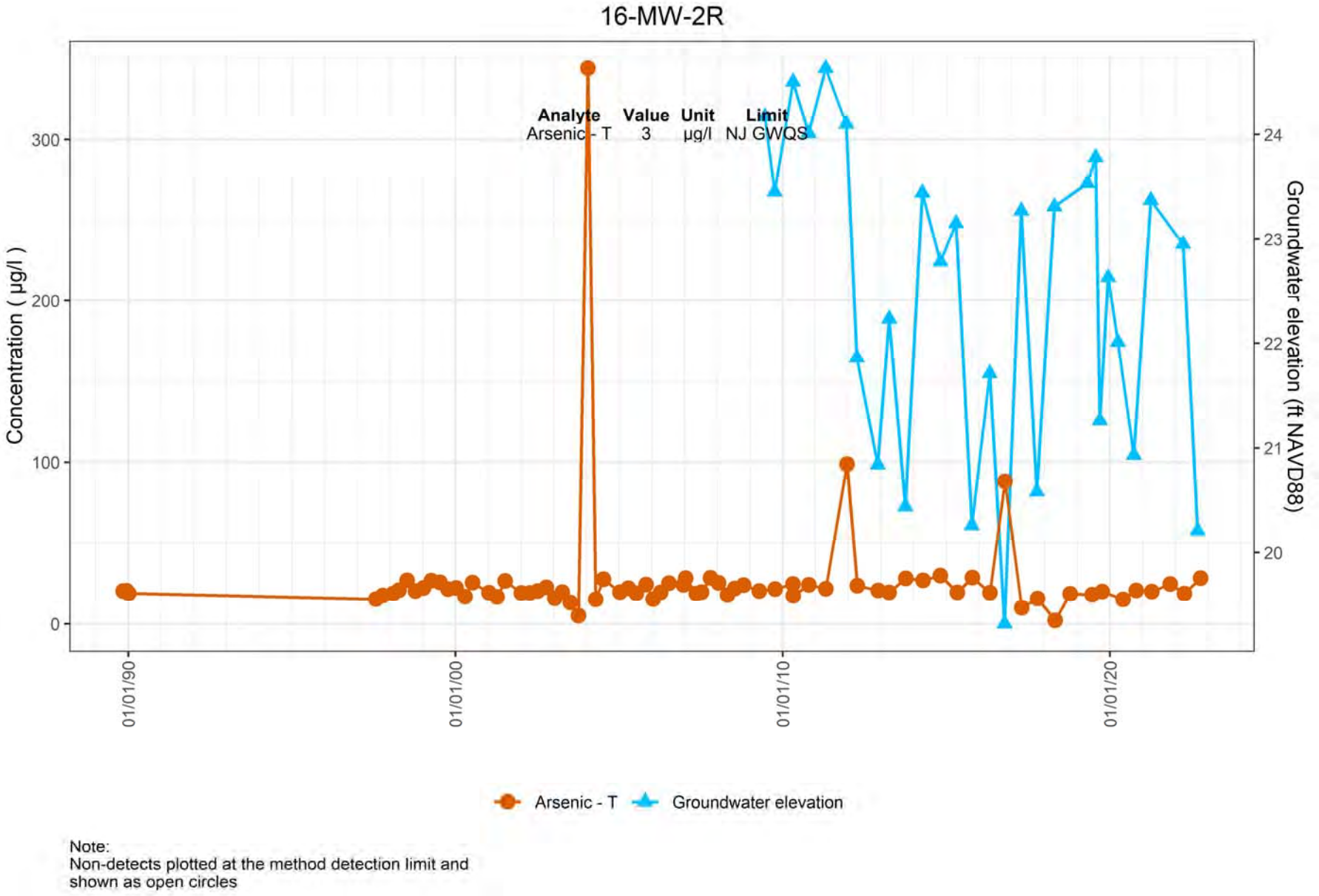


Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

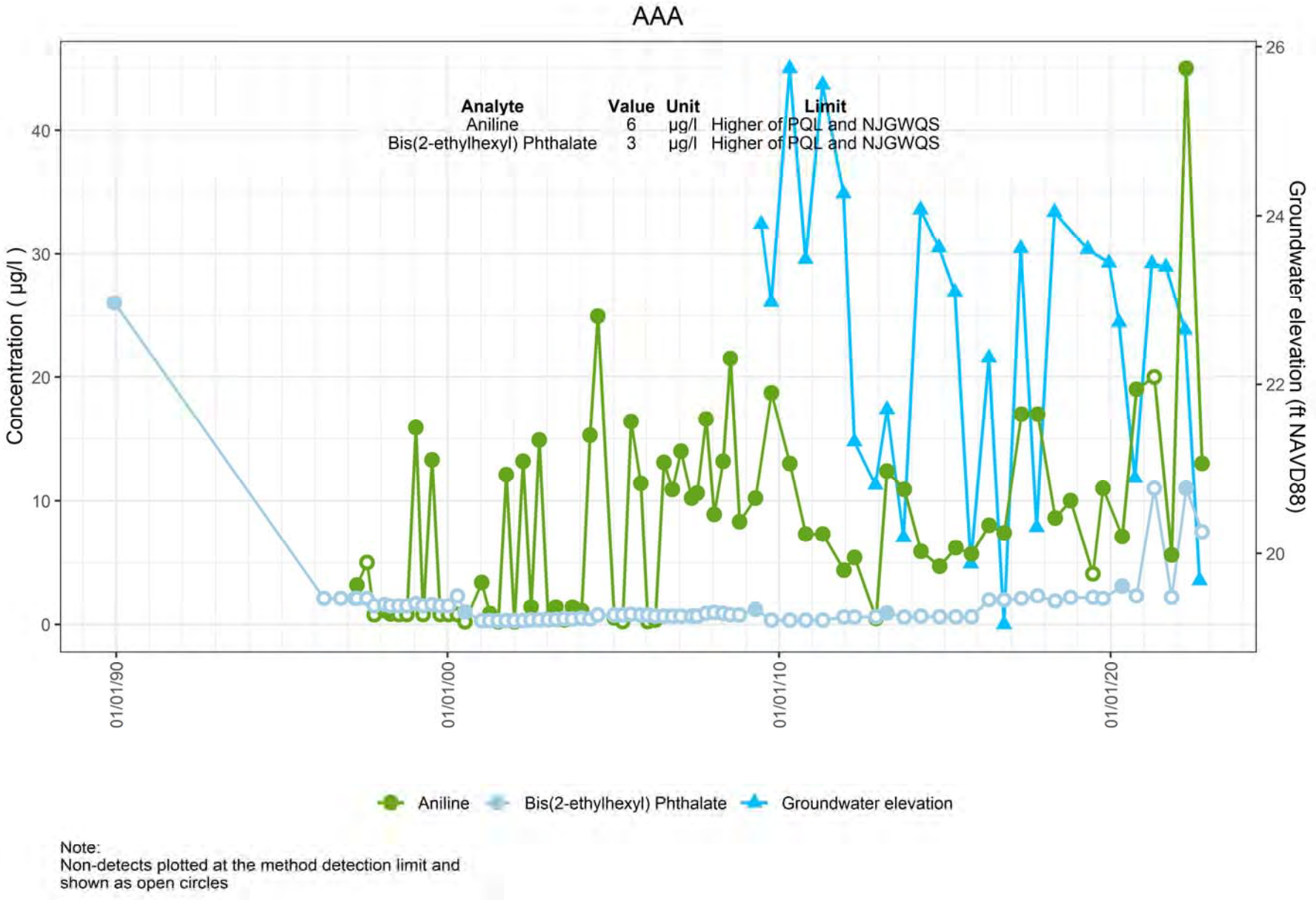


Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

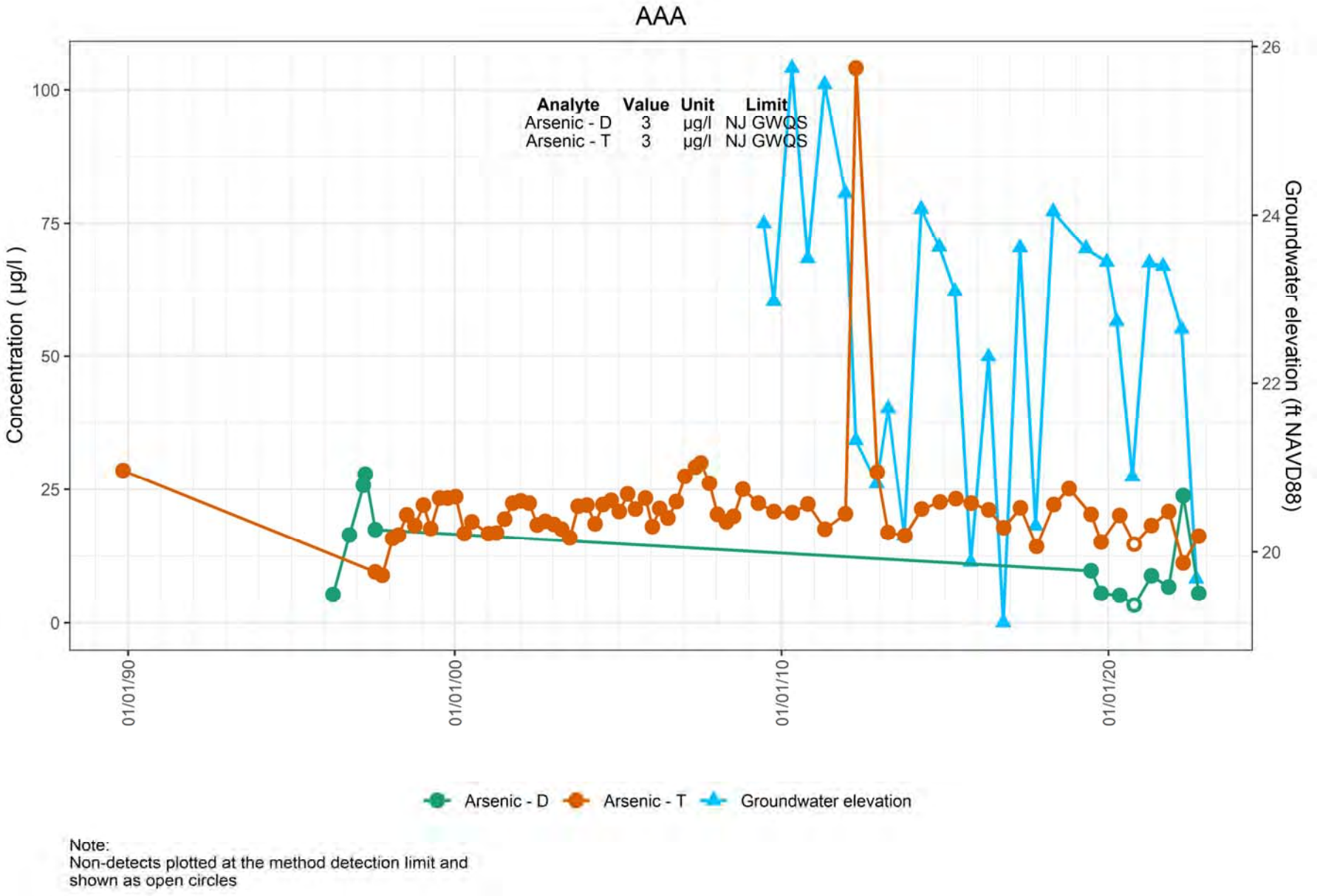


Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

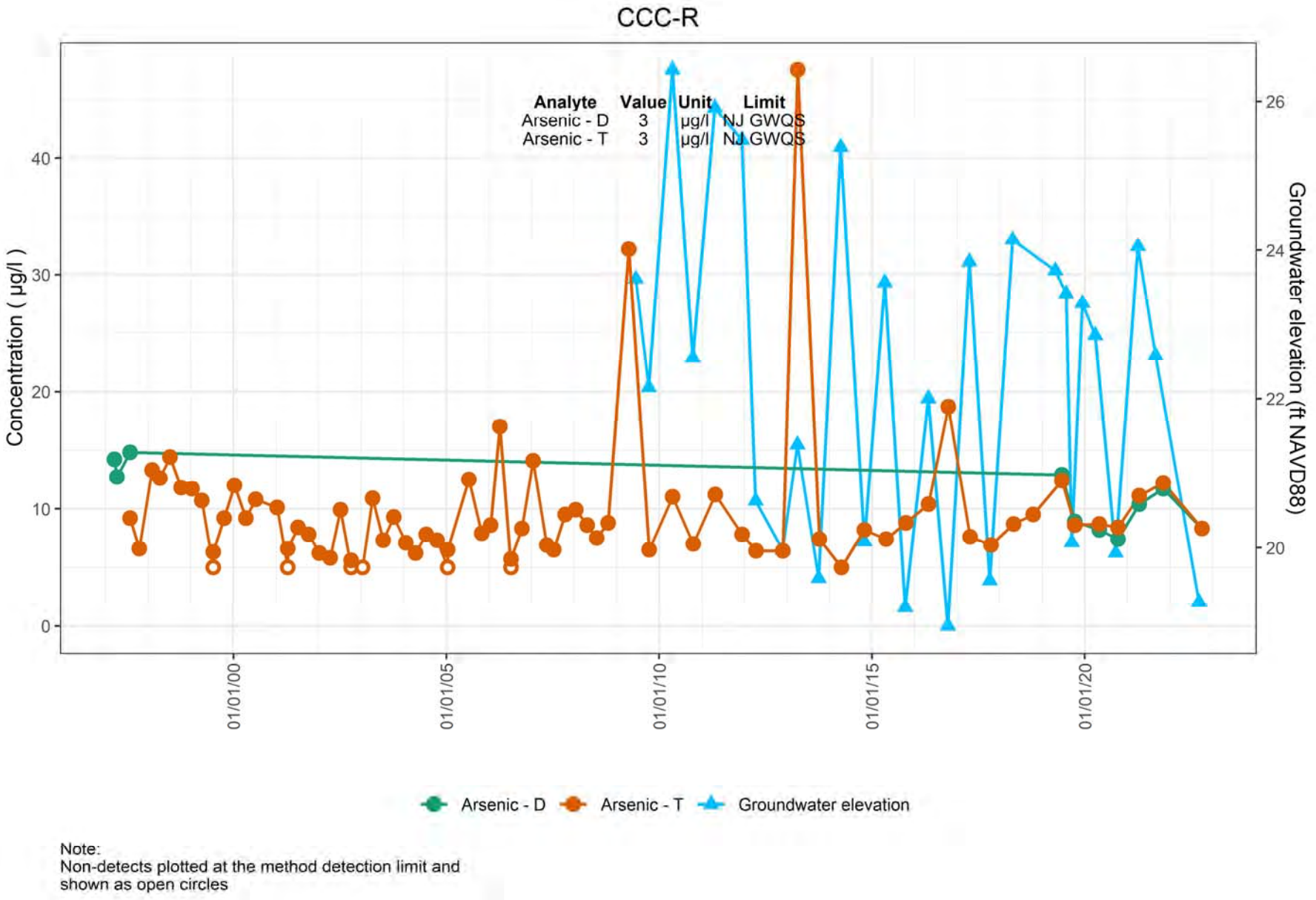


Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

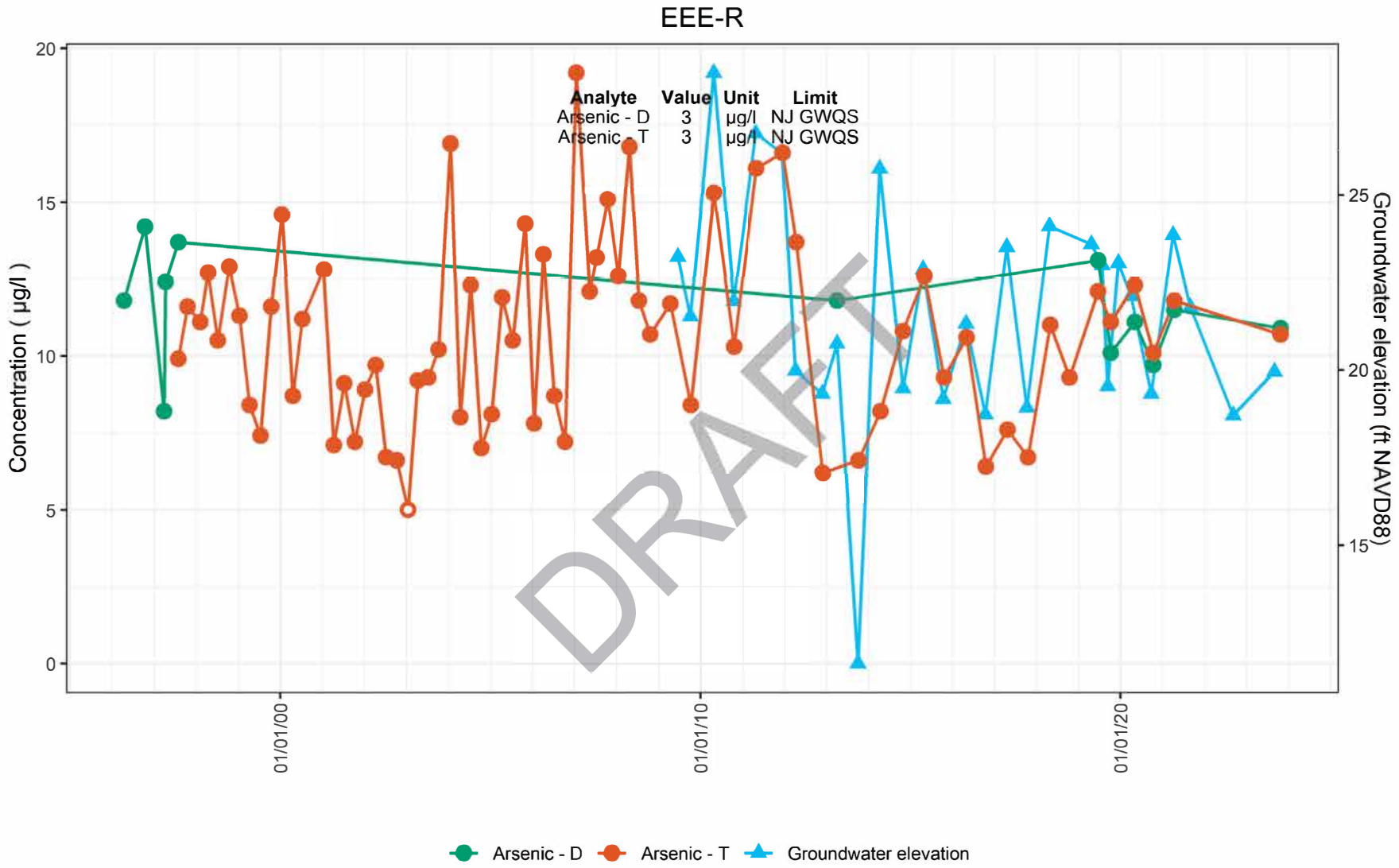


Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



Note:
Non-detects plotted at the method detection limit and shown as open circles



Note:
Non-detects plotted at the method detection limit and shown as open circles

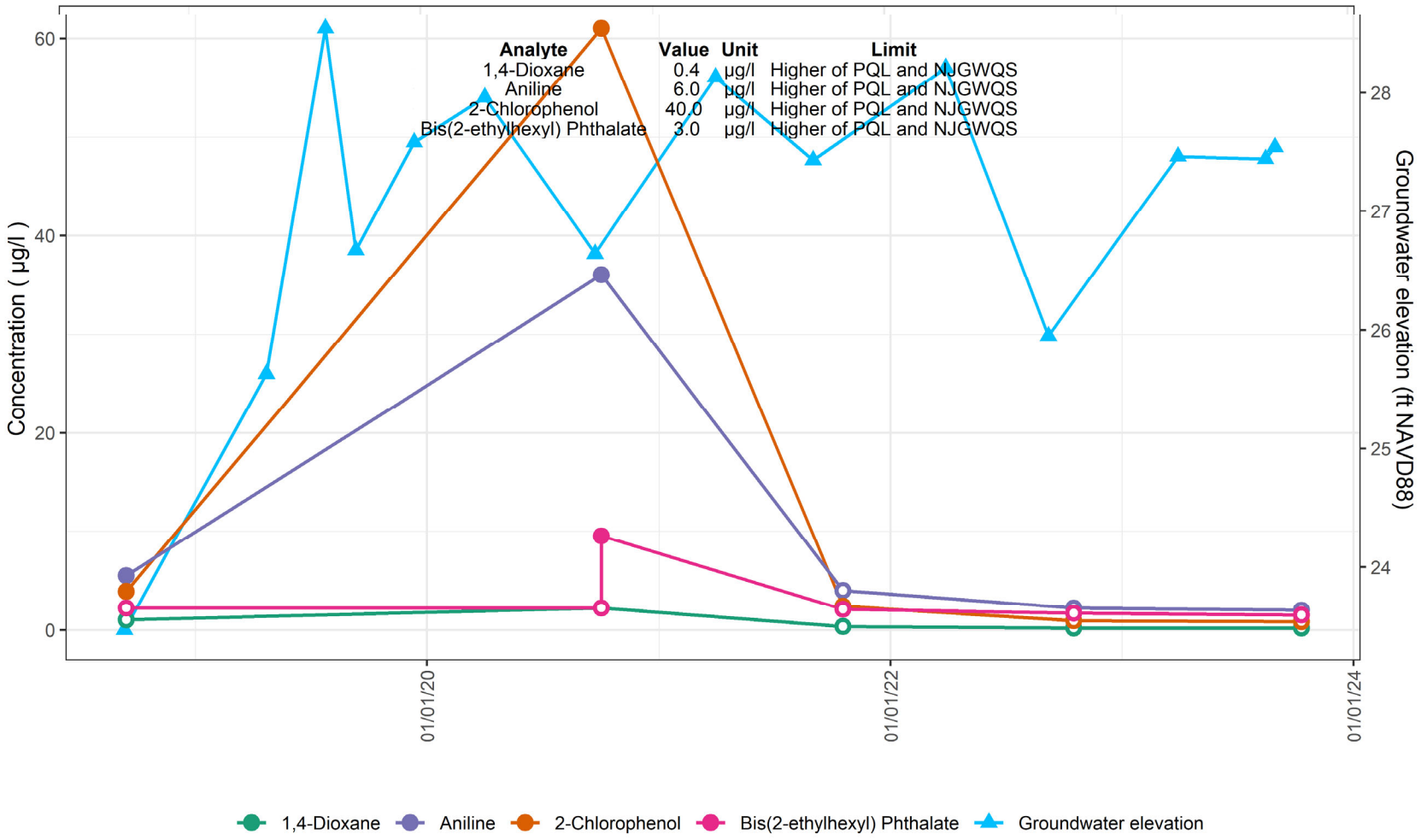
D-1-2-1

Groundwater Concentration Exceedances vs. Time Trends

American Cyanamid Superfund Site

Bridgewater Township, New Jersey

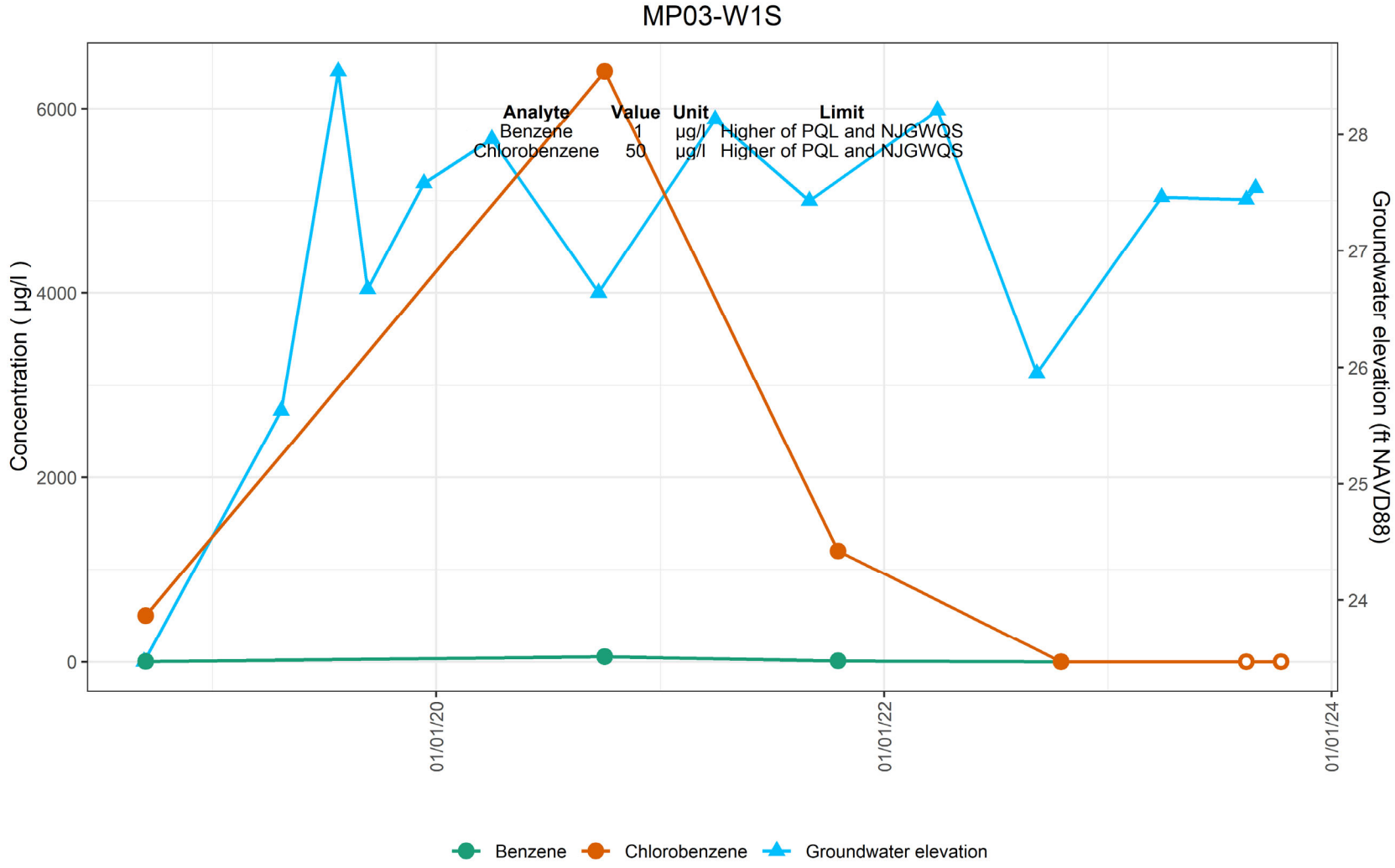
MP03-W1S



Note:
Non-detects plotted at the method detection limit and shown as open circles

April 2024 D-1-1-1 31405041

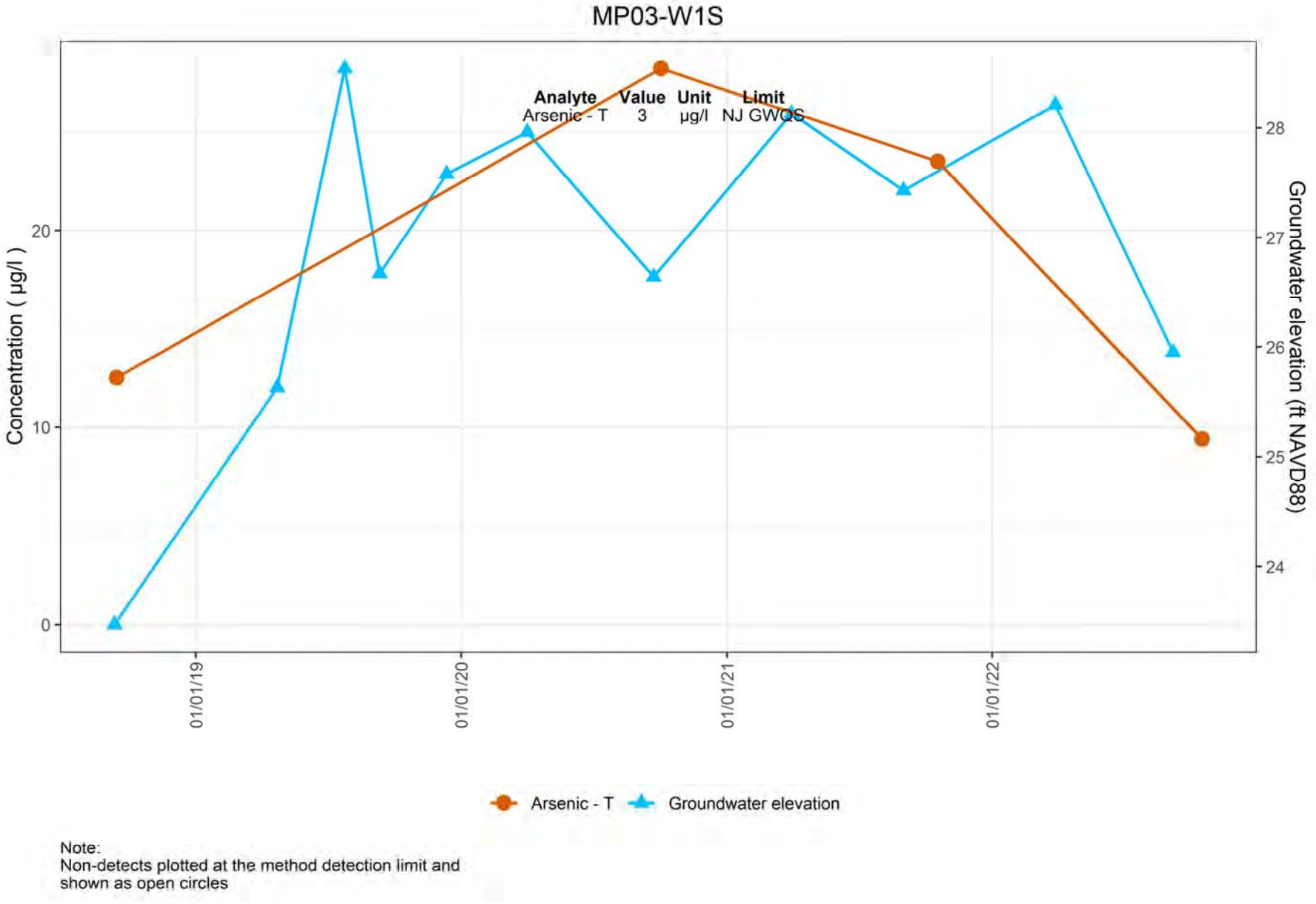
Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



Note:
Non-detects plotted at the method detection limit and shown as open circles

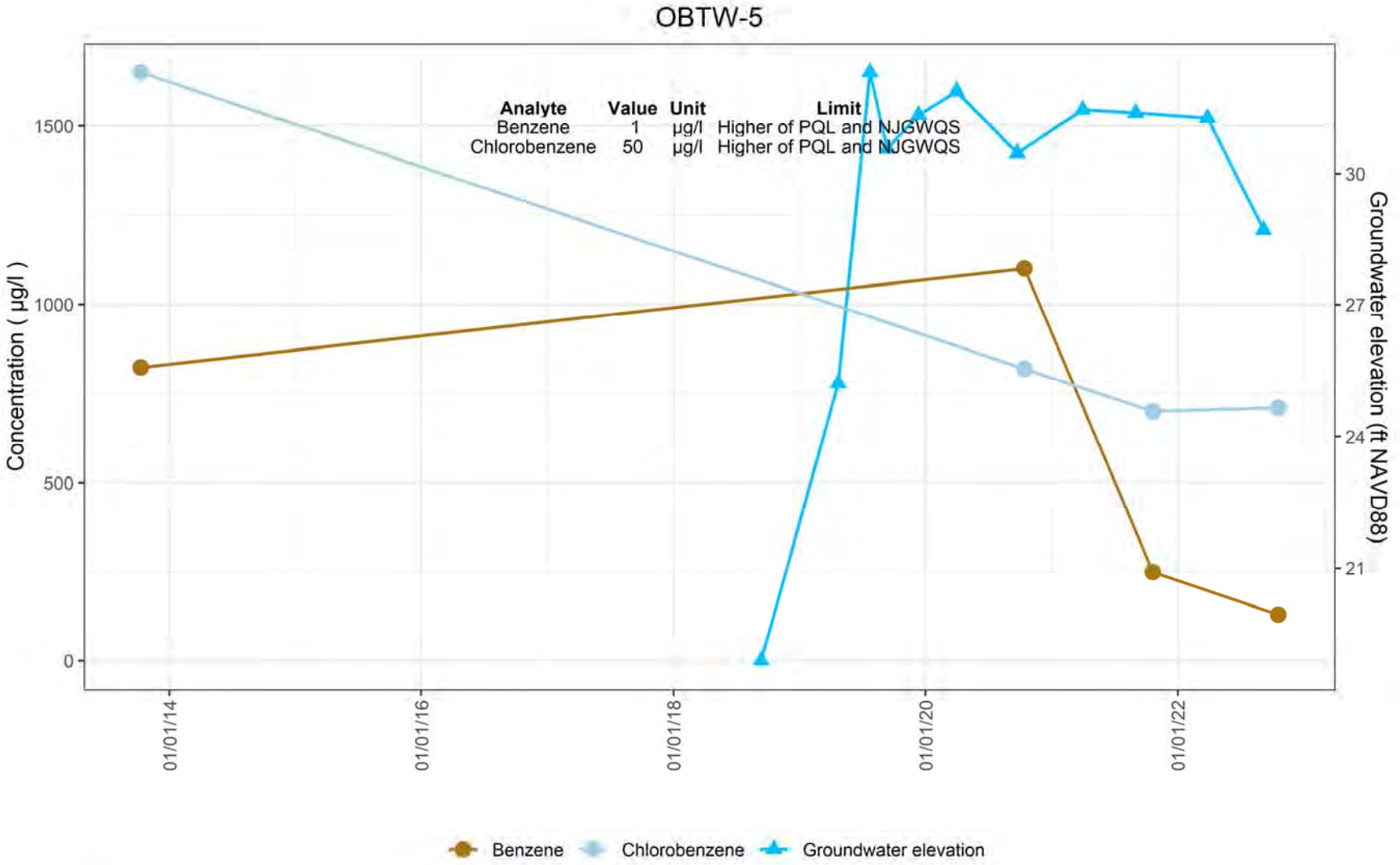
4/1/2024

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



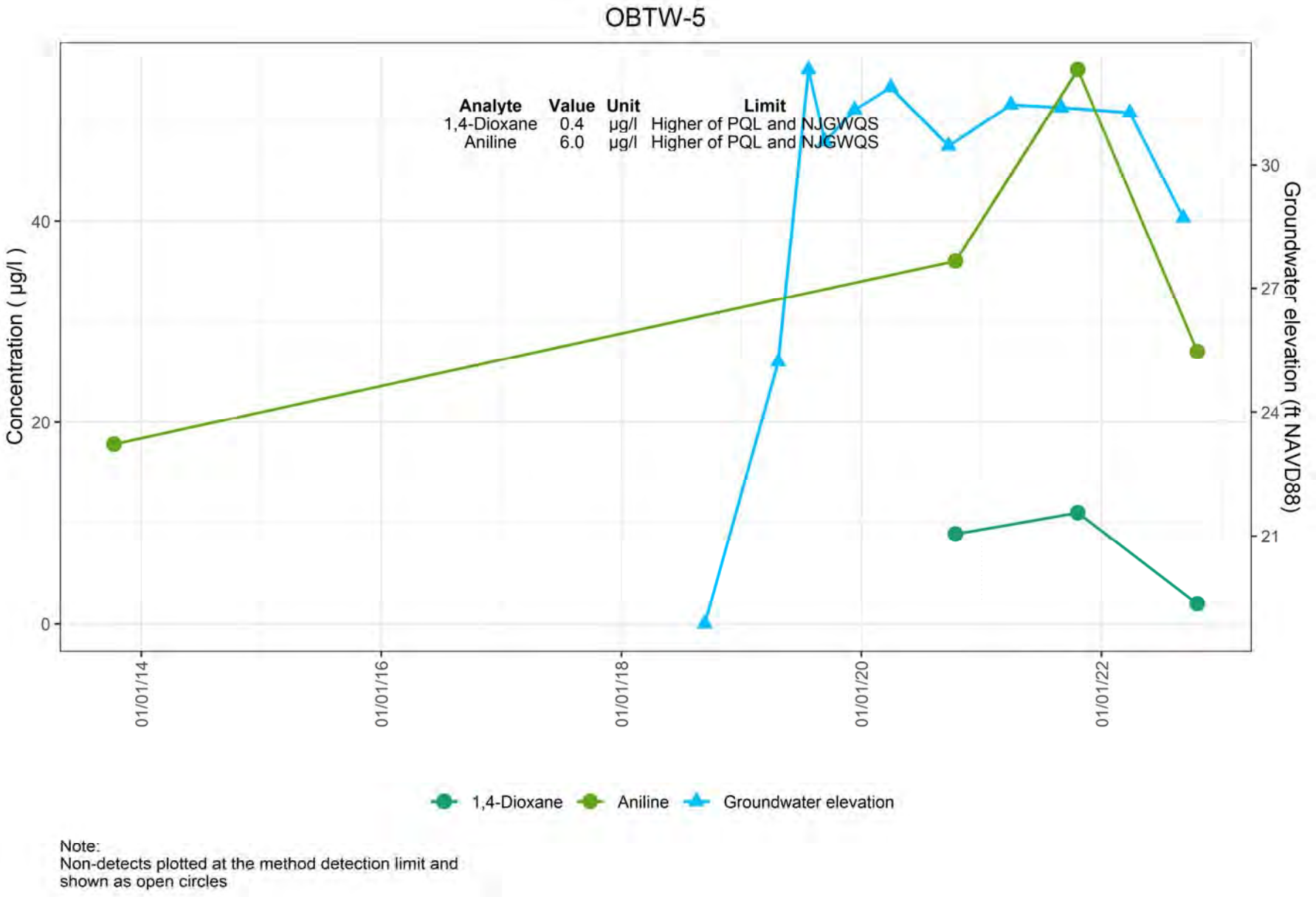
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



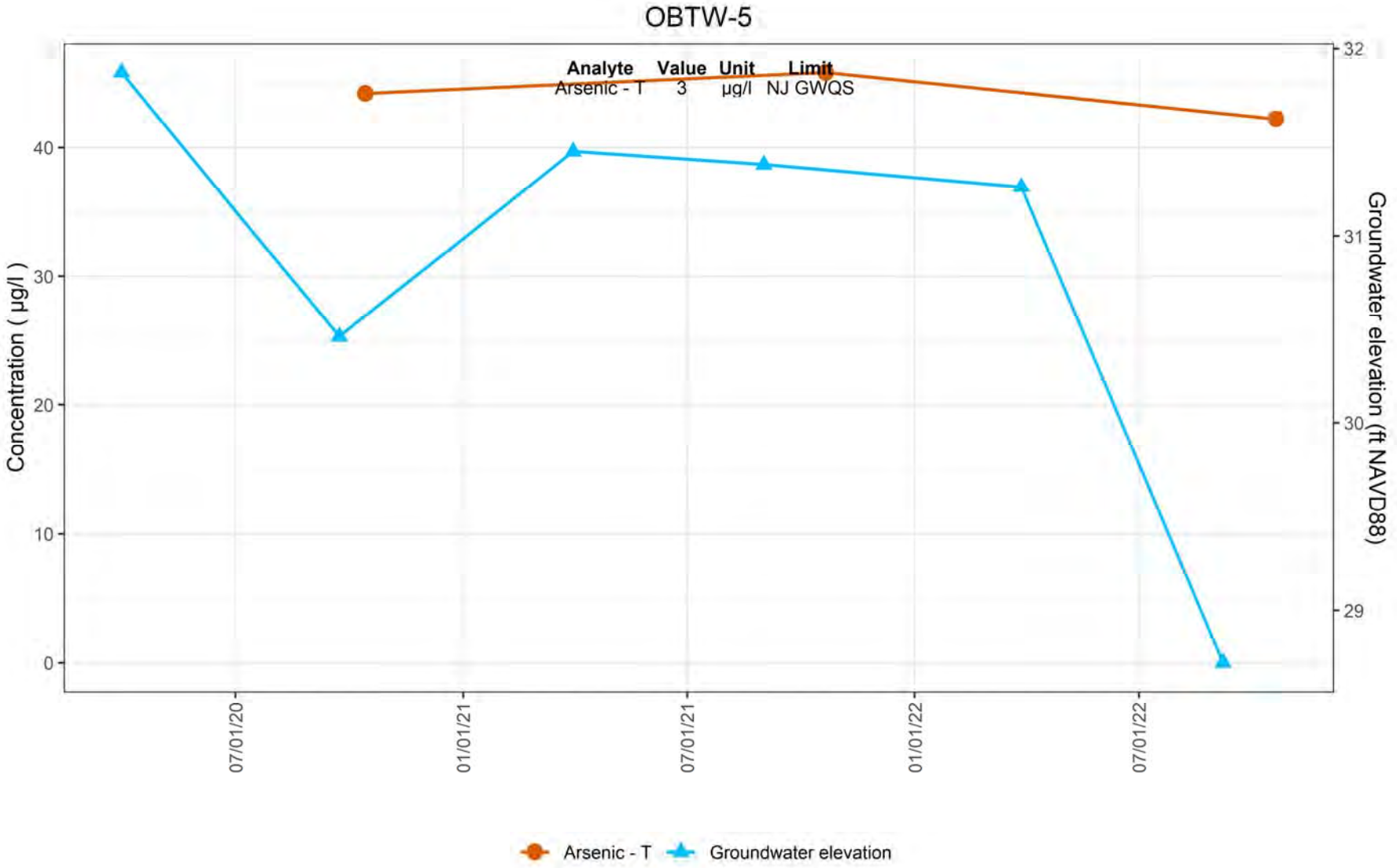
Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey

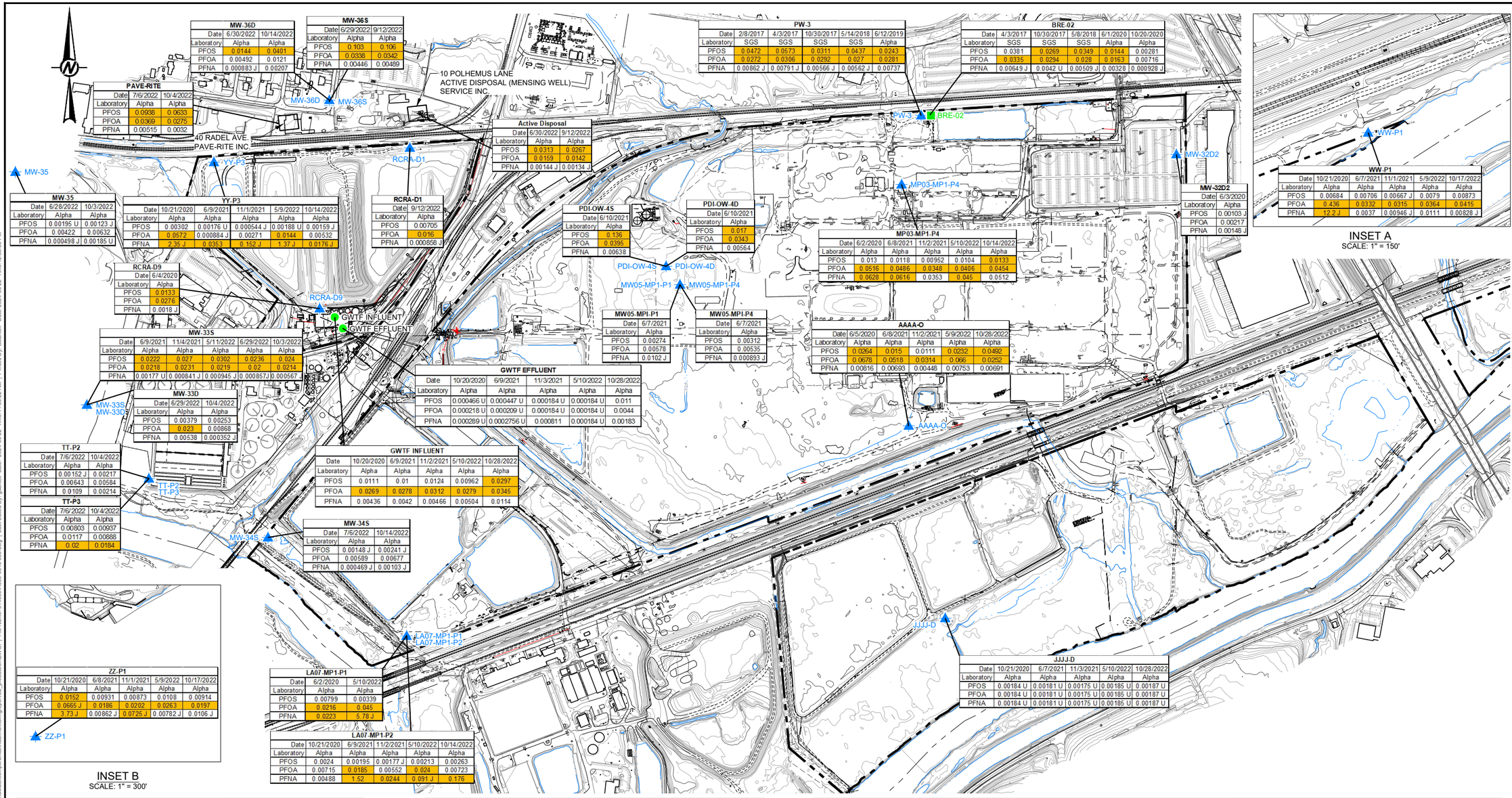


Note:
Non-detects plotted at the method detection limit and shown as open circles

Groundwater Concentration Exceedances vs. Time Trends
American Cyanamid Superfund Site
Bridgewater Township, New Jersey



Note:
Non-detects plotted at the method detection limit and shown as open circles



MW-36D

Date	6/30/2022	10/14/2022
Laboratory	Alpha	Alpha
PFOS	0.0144	0.0401
PFOA	0.00492	0.0121
PFNA	0.000883 J	0.00207

MW-36S

Date	6/29/2022	9/12/2022
Laboratory	Alpha	Alpha
PFOS	0.103	0.106
PFOA	0.0338	0.0342
PFNA	0.00446	0.00489

PAVE-RITE

Date	7/6/2022	10/4/2022
Laboratory	Alpha	Alpha
PFOS	0.0938	0.0633
PFOA	0.0369	0.0275
PFNA	0.00515	0.0032

Active Disposal

Date	6/30/2022	9/12/2022
Laboratory	Alpha	Alpha
PFOS	0.0313	0.0267
PFOA	0.0159	0.0142
PFNA	0.00144 J	0.00134 J

PW-3

Date	2/8/2017	4/3/2017	10/30/2017	5/14/2018	6/12/2019
Laboratory	SGS	SGS	SGS	SGS	Alpha
PFOS	0.0472	0.0573	0.0311	0.0437	0.0243
PFOA	0.0272	0.0306	0.0292	0.027	0.0281
PFNA	0.00862 J	0.00791 J	0.00566 J	0.00562 J	0.00737

BRE-02

Date	4/3/2017	10/30/2017	5/8/2018	6/1/2020	10/20/2020
Laboratory	SGS	SGS	SGS	Alpha	Alpha
PFOS	0.0381	0.0269	0.0349	0.0144	0.00281
PFOA	0.0335	0.0294	0.028	0.0153	0.00716
PFNA	0.00649 J	0.0042 U	0.00509 J	0.00328 J	0.000928 J

WW-P1

Date	10/21/2020	6/7/2021	11/1/2021	5/9/2022	10/17/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.00684	0.00706	0.00667 J	0.0079	0.00873
PFOA	0.436	0.0332	0.0315	0.0364	0.0415
PFNA	12.2 J	0.0037	0.00946 J	0.0111	0.00828 J

INSET A
SCALE: 1" = 150'

MW-32D2

Date	6/3/2020
Laboratory	Alpha
PFOS	0.00103 J
PFOA	0.00217
PFNA	0.00148 J

MW-35

Date	6/28/2022	10/3/2022
Laboratory	Alpha	Alpha
PFOS	0.00195 U	0.00123 J
PFOA	0.00422	0.00632
PFNA	0.000498 J	0.00185 U

YY-P3

Date	10/21/2020	6/9/2021	11/1/2021	5/9/2022	10/14/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.00302	0.00176 U	0.000544 J	0.00188 U	0.00159 J
PFOA	0.0572	0.000884 J	0.00271	0.0144	0.00532
PFNA	2.35 J	0.0353	0.152 J	1.37 J	0.0176 J

RCRA-D1

Date	9/12/2022
Laboratory	Alpha
PFOS	0.00705
PFOA	0.016
PFNA	0.000658 J

PDI-OW-4S

Date	6/10/2021
Laboratory	Alpha
PFOS	0.136
PFOA	0.0395
PFNA	0.00638

PDI-OW-4D

Date	6/10/2021
Laboratory	Alpha
PFOS	0.017
PFOA	0.0343
PFNA	0.00564

MP03-MP1-P4

Date	6/2/2020	6/8/2021	11/2/2021	5/10/2022	10/14/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.013	0.0118	0.00952	0.0104	0.0133
PFOA	0.0516	0.0486	0.0348	0.0406	0.0454
PFNA	0.0628	0.0616	0.0353	0.045	0.0512

RCRA-D9

Date	6/4/2020
Laboratory	Alpha
PFOS	0.0133
PFOA	0.0276
PFNA	0.0018 J

MW05-MP1-P1

Date	6/7/2021
Laboratory	Alpha
PFOS	0.00274
PFOA	0.00578
PFNA	0.0102 J

MW05-MP1-P4

Date	6/7/2021
Laboratory	Alpha
PFOS	0.00312
PFOA	0.00535
PFNA	0.000893 J

AAAA-O

Date	6/5/2020	6/8/2021	11/2/2021	5/9/2022	10/28/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.0264	0.015	0.0111	0.0232	0.0492
PFOA	0.0678	0.0518	0.0314	0.066	0.0252
PFNA	0.00816	0.00693	0.00448	0.00753	0.00691

MW-33S

Date	6/9/2021	11/4/2021	5/11/2022	6/29/2022	10/3/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.0222	0.027	0.0302	0.0236	0.024
PFOA	0.0218	0.0231	0.0219	0.02	0.0214
PFNA	0.00177 U	0.000841 J	0.000945 J	0.000857J	0.000567

GWTF EFFLUENT

Date	10/20/2020	6/9/2021	11/3/2021	5/10/2022	10/28/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.000466 U	0.000447 U	0.000184 U	0.000184 U	0.011
PFOA	0.000218 U	0.000209 U	0.000184 U	0.000184 U	0.0044
PFNA	0.000289 U	0.0002756 U	0.000811	0.000184 U	0.00183

MW-33D

Date	6/29/2022	10/4/2022
Laboratory	Alpha	Alpha
PFOS	0.00379	0.00253
PFOA	0.023	0.00868
PFNA	0.00538	0.000352 J

GWTF INFLUENT

Date	10/20/2020	6/9/2021	11/2/2021	5/10/2022	10/28/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.0111	0.01	0.0124	0.00962	0.0297
PFOA	0.0269	0.0278	0.0312	0.0279	0.0345
PFNA	0.00436	0.0042	0.00466	0.00504	0.0114

TT-P2

Date	7/6/2022	10/4/2022
Laboratory	Alpha	Alpha
PFOS	0.00152 J	0.00217
PFOA	0.00643	0.00584
PFNA	0.0109	0.00214

TT-P3

Date	7/6/2022	10/4/2022
Laboratory	Alpha	Alpha
PFOS	0.00803	0.00937
PFOA	0.0117	0.00888
PFNA	0.02	0.0184

MW-34S

Date	7/6/2022	10/14/2022
Laboratory	Alpha	Alpha
PFOS	0.00148 J	0.00241 J
PFOA	0.00589	0.00677
PFNA	0.000469 J	0.00103 J

LA07-MP1-P1

Date	6/2/2020	5/10/2022
Laboratory	Alpha	Alpha
PFOS	0.00799	0.00339
PFOA	0.0216	0.045
PFNA	0.0223	5.78 J

LA07-MP1-P2

Date	10/21/2020	6/9/2021	11/2/2021	5/10/2022	10/14/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.0024	0.00195	0.00177 J	0.00213	0.00263
PFOA	0.00715	0.0185	0.00552	0.024	0.00723
PFNA	0.00488	1.52	0.0244	0.091 J	0.176

JJJJ-D

Date	10/21/2020	6/7/2021	11/3/2021	5/10/2022	10/28/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.00184 U	0.00181 U	0.00175 U	0.00185 U	0.00187 U
PFOA	0.00184 U	0.00181 U	0.00175 U	0.00185 U	0.00187 U
PFNA	0.00184 U	0.00181 U	0.00175 U	0.00185 U	0.00187 U

ZZ-P1

Date	10/21/2020	6/8/2021	11/1/2021	5/9/2022	10/17/2022
Laboratory	Alpha	Alpha	Alpha	Alpha	Alpha
PFOS	0.0152	0.00931	0.00873	0.0108	0.00914
PFOA	0.0665 J	0.0186	0.0202	0.0263	0.0197
PFNA	3.73 J	0.00862 J	0.0725 J	0.00782 J	0.0106 J

INSET B
SCALE: 1" = 300'

LEGEND

- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- BEDROCK MONITORING WELL
- STAFF GAUGE
- STAFF GAUGE DECOMMISSIONED
- GWTF INFLUENT/EFFLUENT

NOTE(S)

1. CRITERIA = NJ GWQS NJAC 7:9C (HTTPS://WWW.NJ.GOV/DEP/WMS/BEARS/GWQS.HTM)
2. RESULTS SHADED IN ORANGE ARE ABOVE THE NJ GWQS.
3. NON-DETECTS ARE REPORTED TO THE MDL.
4. IF A FIELD DUPLICATE WAS ANALYZED, THE HIGHER OF THE PRIMARY SAMPLE OR FIELD DUPLICATE RESULT IS SHOWN.
5. RESULTS AND STANDARDS ARE REPORTED IN MICROGRAMS PER LITER (UG/L).
6. DATA SHOWN HAS BEEN VALIDATED.

ABBREVIATIONS:
MDL = METHOD DETECTION LIMIT
PFNA = PERFLUORONONANOIC ACID (CAS ID: 375-95-1)
PFOA = PERFLUORO-N-OCTANOIC ACID (CAS ID: 335-67-1)
PFOS = PERFLUORO-1-OCTANESULFONATE (CAS ID: 1763-23-1)

QUALIFIERS:
J = ESTIMATED RESULT
J+ = ESTIMATED RESULTS, BIASED HIGH
U = NOT DETECTED ABOVE MDL

Analyte	Criteria
PFOS	0.013
PFOA	0.014
PFNA	0.013

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG UPDATED 11-07-2022.
2. HORIZONTAL DATUM REFERENCES THE NEW JERSEY STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM OF 1983 (NAD83). THE VERTICAL DATUM REFERENCES THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
3. SOUTH AREA GROUNDWATER COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
4. WETLAND DELINEATION WAS PERFORMED BY AMY S. GREENE ENVIRONMENTAL CONSULTANTS, INC. DURING SITE VISITS IN APRIL 2016. BOUNDARIES WERE SURVEYED BY VARGO ASSOCIATES, INC. AND PROVIDED IN CAD FILE PFIZER_WETLANDS-06-02-16.DWG, DATED JUNE 2, 2016.
5. AS-BUILT LOCATIONS OF HYDRAULIC BARRIER WALL, FORCEMAINS, CONDUITS, CLEANOUTS, ELECTRICAL STRUCTURES AND PLATFORM SHOWN TAKEN FROM DIGITAL CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS.DWG, RECEIVED MARCH 11, 2019 FROM D.A. COLLINS ENVIRONMENTAL SERVICES.
6. AS-BUILT LOCATIONS OF ACCESS ROADS SHOWN TAKEN FROM DIGITAL CAD FILE PFIZER ASBUILT ACCESS ROADS 0-28-19.DWG, PROVIDED BY VARGO ASSOCIATES.
7. THE NJAW WATER LINE SHOWN WAS TAKEN FROM THE NATIONAL STARCH 36" TRANSMISSION MAIN REHABILITATION PHASE 2 RECORD DRAWINGS P-1 THROUGH P-3, ENTITLED "PLAN AND PROFILE," DATED 09-16-13, BY HATCH MOTT MACDONALD.
8. EQ TANK AREA TAKEN FROM DIGITAL CAD FILE EQ TANK AREA AS BUILT.DWG, DATED 03-25-2019, PROVIDED BY NORDIC CONTRACTING COMPANY INCORPORATED.
9. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
10. STS WELLS FROM EXCEL FILE STS_DEPTH_TO_GW-121219.XLSX, PROVIDED BY THE ELM GROUP, INC.
11. FLODMW-09BD, FLODMW-09BD2, FLODMW-13BD AND FLODMW-13BD2 FROM MW DATA 07-12-18.XLSX SURVEYED BY VARGO ASSOCIATES.
12. FLODMW-14BD AND FLODMW-14BD2 FROM MW AND SG DATA 080918.XLSX SURVEYED BY VARGO ASSOCIATES.
13. SUPPLEMENTAL HBW SAMPLE DIRECT PUSH LOCATIONS FROM BORING DATA_07-10-17.XLSX SURVEYED BY VARGO ASSOCIATES.
14. 16-MW-2R, FLODMW-15B, FLODMW-16B, FLODMW-17B, FLODMW-18B FROM MW DATA 01-07-20.XLSX SURVEYED BY VARGO ASSOCIATES.
15. GS-5 FROM MW DATA 09-16-19.XLSX SURVEYED BY VARGO ASSOCIATES.
16. STS WELLS FROM EXCEL FILE STS_DEPTH_TO_GW-121219.XLSX, PROVIDED BY THE ELM GROUP, INC.

0 300 600
1" = 300' FEET

REV.	YYYY-MM-DD	DESCRIPTION	PREPARED	REVIEWED	APPROVED
0	2024-03-22	ISSUED FINAL	JML	GLS	BAC	ACK

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

CONSULTANT
WSP
MARLTON
401 ROUTE 73 NORTH, SUITE 205
MARLTON, NEW JERSEY 08053
USA
(856) 793-2005
www.golder.com

PROJECT
OU4 GROUNDWATER COMPONENT 2022
ANNUAL MONITORING REPORT

TITLE
PFOS, PFOA, PFNA - BEDROCK

PROJECT NO.
31405041.030

CONTROL
0013-030

REV.
0

of

FIGURE
G-1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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IMPOUNDMENT 8 FACILITY

NORTH AREA

STS PROPERTY

EAST AREA

WEST AREA

SOUTH AREA

RARITAN RIVER

DELAWARE AND RARITAN CANAL

0 300 600

1" = 300' FEET

LEGEND

- BUILDING
- PROPERTY LINE
- 28 TOPOGRAPHIC CONTOUR LINE
- RAILROAD
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 3)
- OVERBURDEN MONITORING WELL
- GWEIS OVERBURDEN EXTRACTION WELL
- USGS STATION 01403060
- STAFF GAUGE
- SOUTH AREA SUMP LOCATIONS
- AS-BUILT HYDRAULIC BARRIER WALL ALIGNMENT (SEE REFERENCES 3 AND 5)
- GWEIS INJECTION AND EXTRACTION WELLS
- 26 GROUNDWATER ELEVATION CONTOUR
- 23.76 GROUNDWATER ELEVATION (FT-NAVD88) - MARCH 28-29, 2022
- 3.0 FLOW RATE (GPM)

NOTE(S)

1. MW-9, 01-MW-02, AND 36-R GROUNDWATER ELEVATION VALUES ARE ANOMALOUS AND WERE NOT USED IN THE CONSTRUCTION OF GROUNDWATER CONTOURS.
2. MONITORING WELLS CCC-R AND EEE-R WERE NOT GAUGED FOR WATER LEVELS IN 1H2022 DUE TO A NESTING BALD EAGLE IN THE VICINITY OF THE WELLS.
3. GROUNDWATER ELEVATION FROM MONITORING WELLS OUTSIDE THE HYDRAULIC BARRIER WALL (HBW) WERE NOT USED IN GROUNDWATER CONTOURING.
4. GROUNDWATER CONTOURS WERE HAND-DRAWN IN ARCMAP 10.8.1.
5. NM = NOT MEASURED
6. LEVELS IN OVERBURDEN EXTRACTION WELLS ARE CORRECTED FOR WELL EFFICIENCY BASED ON STEP TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG
2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
3. SOUTH AREA GROUNDWATER SYSTEM COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
4. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.
5. AS-BUILT LOCATIONS OF HYDRAULIC BARRIER WALL SHOWN TAKEN FROM CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS.DWG RECEIVED MARCH 11, 2019 FROM D.A. COLLINS ENVIRONMENTAL SERVICES.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
OVERBURDEN GROUNDWATER ELEVATION CONTOUR MAP - MARCH 28-29, 2022

CONSULTANT
wsp

YYYY-MM-DD	2024-03-22
DESIGNED	RCL
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-005	0	C-5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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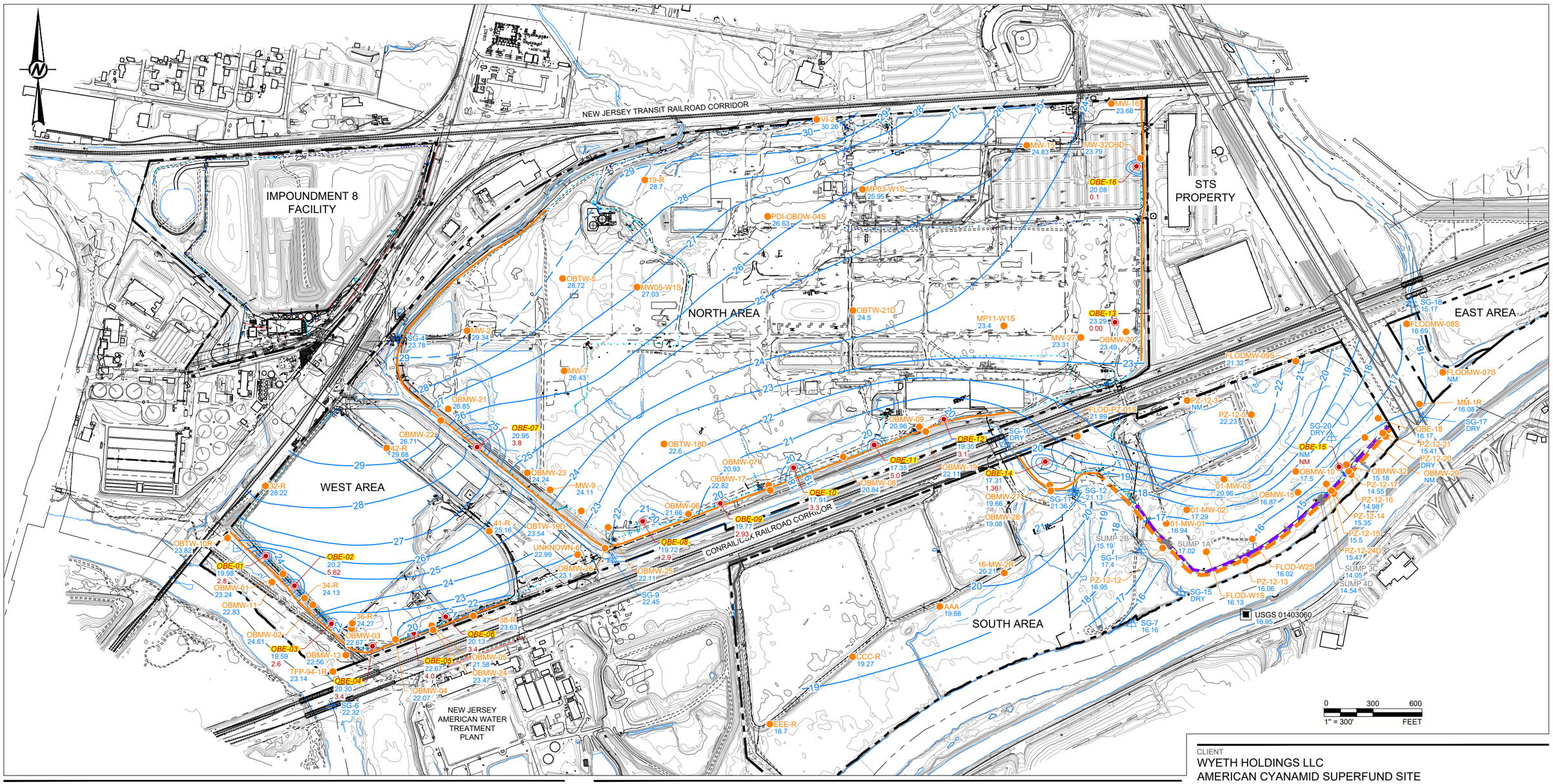

0 300 600
1" = 300' FEET

LEGEND

- BUILDING
- PROPERTY LINE
- 28 — TOPOGRAPHIC CONTOUR LINE
- RAILROAD
- SOUTH AREA GROUNDWATER COLLECTION TRENCH (SEE REFERENCE 3)
- OVERBURDEN MONITORING WELL
- GWEIS OVERBURDEN EXTRACTION WELL
- USGS STATION 01403060
- STS MONITORING WELL
- STAFF GAUGE
- SOUTH AREA SUMP LOCATIONS
- AS-BUILT HYDRAULIC BARRIER WALL ALIGNMENT (SEE REFERENCES 3 AND 5)
- GWEIS INJECTION AND EXTRACTION WELLS
- 26 — GROUNDWATER ELEVATION CONTOUR
- 23.76 GROUNDWATER ELEVATION (FT-NAVD88) - SEPTEMBER 7, 2022 TO SEPTEMBER 8, 2022
- 3.0 FLOW RATE (GPM)

NOTE(S)

1. GWEIS - GROUNDWATER EXTRACTION AND INJECTION SYSTEM.
2. OVERBURDEN EXTRACTION WELL OBE-13 WAS OFFLINE DURING SEPTEMBER 2022 SYNOPTIC WATER LEVEL EVENT AND WAS NOT CORRECTED FOR WELL EFFICIENCY. ALL OTHER OVERBURDEN EXTRACTION WELLS WERE ONLINE AND WERE CORRECTED FOR WELL EFFICIENCY.
3. OVERBURDEN MONITORING WELL 36-R HAD ANOMALOUS GROUNDWATER VALUE AND WAS NOT USED IN THE CONSTRUCTION OF GROUNDWATER CONTOURS.
4. GROUNDWATER ELEVATION FROM MONITORING WELLS OUTSIDE THE HYDRAULIC BARRIER WALL (HBW) WERE NOT USED TO GENERATE GROUNDWATER CONTOURS INSIDE THE HBW.
5. GROUNDWATER CONTOURS WERE HAND-DRAWN IN ARCMAP 10.8.1.
6. NM = NOT MEASURED
7. LEVELS IN OVERBURDEN EXTRACTION WELLS ARE CORRECTED FOR WELL EFFICIENCY BASED ON STEP TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 MASTER - 101722.DWG, DATED 10-17-2022, PREPARED BY VARGO ASSOCIATES. REVISED WITH TOPO FOR IMPOUNDMENTS 13 AND 24 FROM CAD FILE ACAD-13089 - 101022 TOPO W 110722-MODEL.DWG UPDATED 11-07-2022.
2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
3. SOUTH AREA GROUNDWATER SYSTEM COLLECTION TRENCH AND CONTAINMENT WALL ALIGNMENT FROM CAD FILE 47338-007-C2-RD.DWG, FIGURE C-2, ENTITLED "SITE PLAN," DATED NOVEMBER 30, 2012, PREPARED BY O'BRIEN & GERE.
4. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.
5. AS-BUILT LOCATIONS OF HYDRAULIC BARRIER WALL SHOWN TAKEN FROM CAD FILE RECORD SURVEY DRAWING-18.8096-TRANS-REV 1.DWG RECEIVED MAY 2021 FROM D.A. COLLINS ENVIRONMENTAL SERVICES.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
OVERBURDEN GROUNDWATER ELEVATION CONTOUR MAP - SEPTEMBER 7-8, 2022

CONSULTANT
wsp

YYYY-MM-DD	2024-03-22
DESIGNED	RCL
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-006	0	C-6

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

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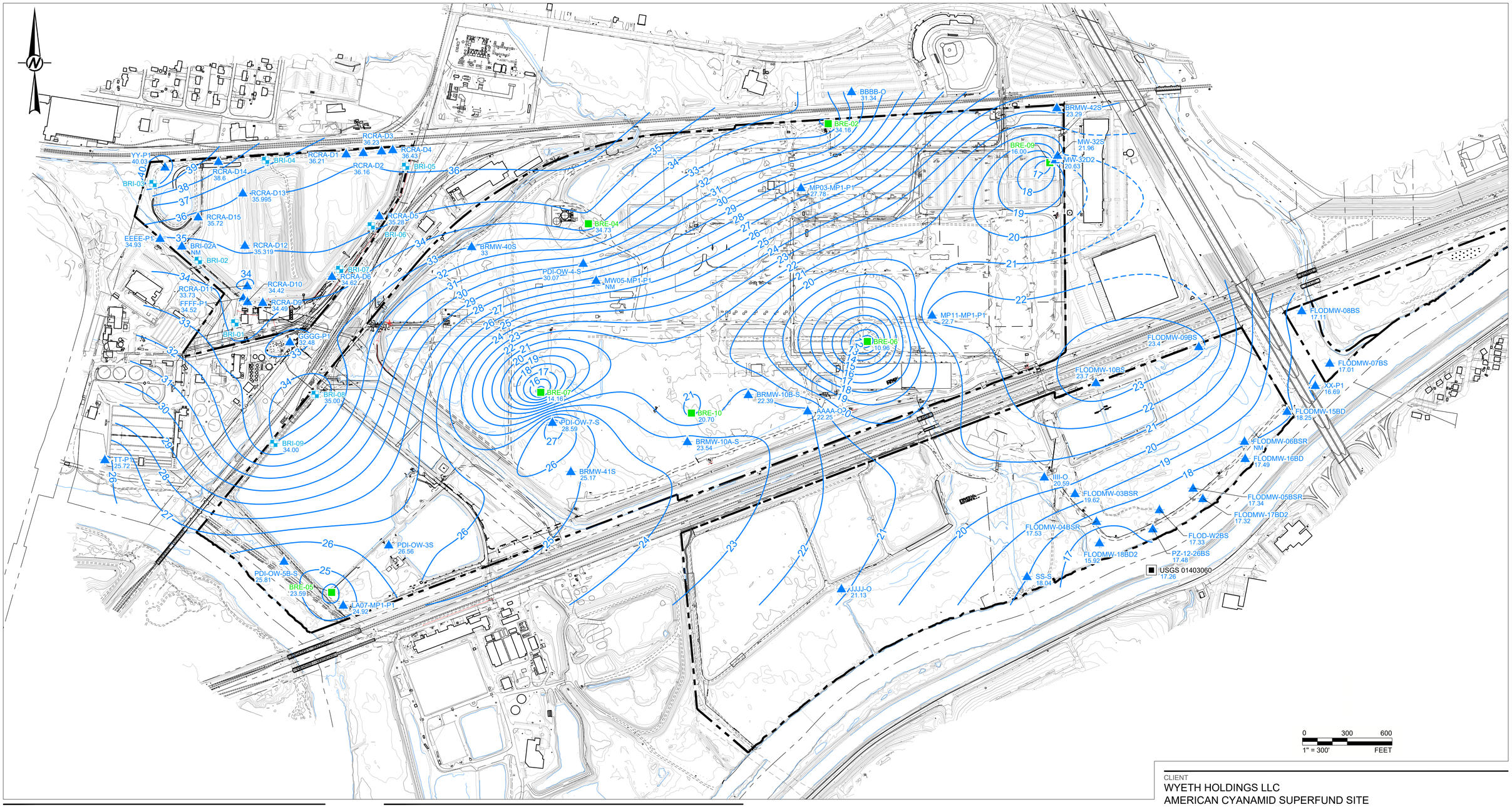

LEGEND

- BEDROCK MONITORING WELL
- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- STAFF GAUGE
- USGS STATION 0143060
- 15 — GROUNDWATER CONTOUR (FT-NAVD88)
- 14.8 GROUNDWATER ELEVATION (FT-NAVD88)

NOTE(S)

1. GROUNDWATER ELEVATION CONTOURS WERE GENERATED BY KRIGING INTERPOLATION METHOD USING DATA VISUALIZATION SOFTWARE, SURFER (GOLDEN SOFTWARE V. 22).
2. LEVELS IN BEDROCK EXTRACTION WELLS WERE CORRECTED FOR WELL EFFICIENCY BASED ON PDI STEP TESTS OR TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

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3. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
MARCH 2022 BEDROCK GROUNDWATER CONTOURS - SHALLOW

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	ACK
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-032	0	C-7

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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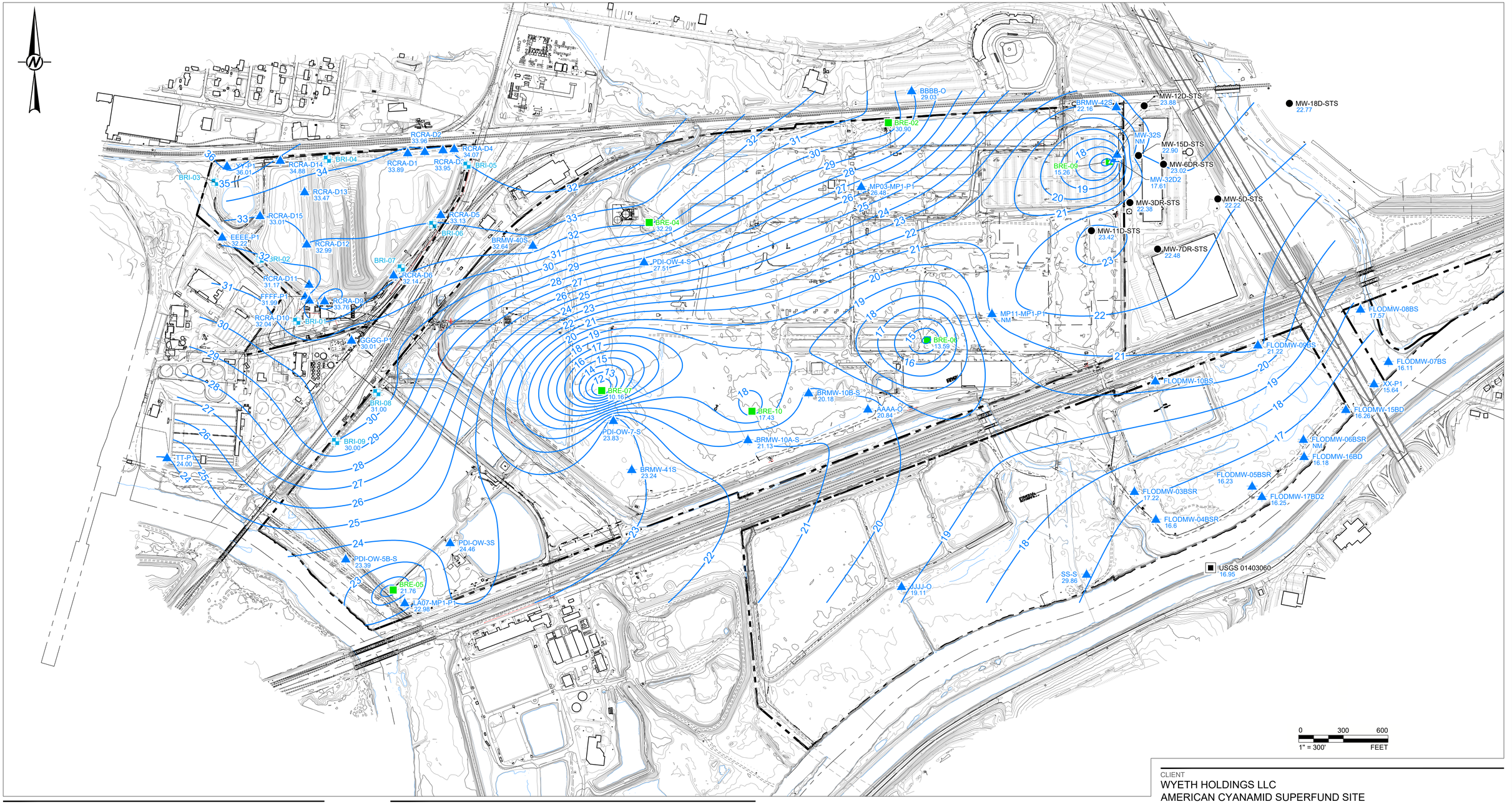

LEGEND

- BEDROCK MONITORING WELL
- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- STS MONITORING WELL
- USGS MONITORING 01403060
- 15 — GROUNDWATER CONTOUR (FT-NAVD88)
- 14.8 — GROUNDWATER ELEVATION (FT-NAVD88)

NOTE(S)

1. GROUNDWATER ELEVATION CONTOURS WERE GENERATED BY KRIGING INTERPOLATION METHOD USING DATA VISUALIZATION SOFTWARE, SURFER (GOLDEN SOFTWARE V. 22)
2. MONITORING WELL FLODMW-10BS WAS NOT GAUGED IN SEPTEMBER DUE TO DAMAGE RELATED TO OU-8 CONSTRUCTION ACTIVITIES.
3. LEVELS IN BEDROCK EXTRACTION WELLS WERE CORRECTED FOR WELL EFFICIENCY BASED ON PDI STEP TESTS OR TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

REFERENCE(S)

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2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
3. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

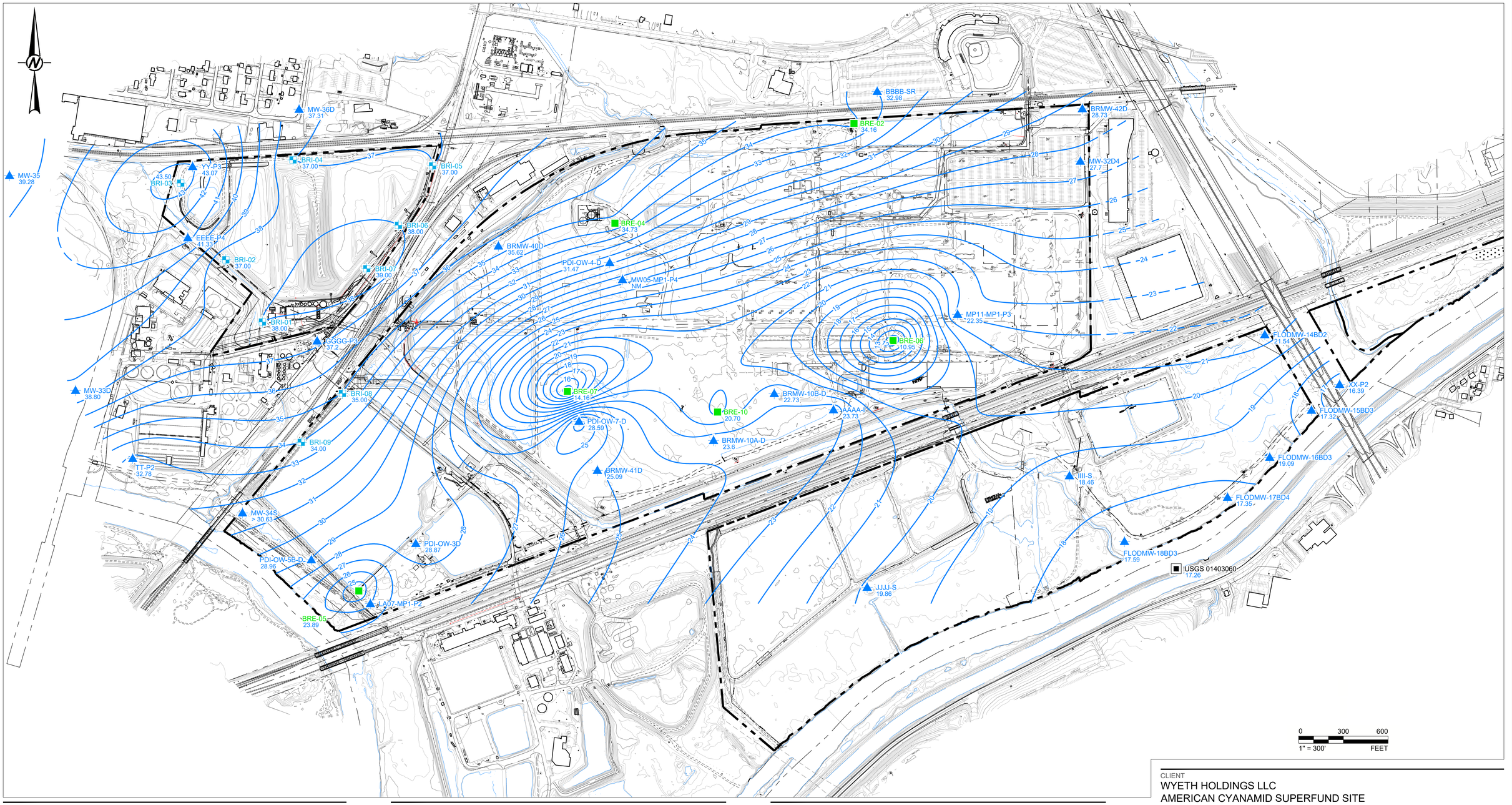
PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SEPTEMBER 2022 BEDROCK GROUNDWATER CONTOURS – SHALLOW

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	ACK
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-033	0	C-8



LEGEND

- BEDROCK MONITORING WELL
- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- STS MONITORING WELL
- USGS MONITORING 01403060
- 15 — GROUNDWATER CONTOUR (FT-NAVD88)
- 14.8 — GROUNDWATER ELEVATION (FT-NAVD88)

NOTE(S)

1. OBSERVED VALUES OF LA07-MP1-P2 IS NOT USED DIRECTLY FOR CONTOURING AS IT IS NOT REPRESENTATIVE OF THE FULL DRAWDOWN BASED ON THE PDI PUMPING TESTS, DUE TO THE WELL SCREEN PLACEMENT NEAR THE BOTTOM OF BRE-05.
2. GROUNDWATER ELEVATION CONTOURS WERE GENERATED BY KRIGING INTERPOLATION METHOD USING DATA VISUALIZATION SOFTWARE, SURFER (GOLDEN SOFTWARE V. 22).
3. LEVELS IN BEDROCK EXTRACTION WELLS WERE CORRECTED FOR WELL EFFICIENCY BASED ON PDI STEP TESTS OR TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

REFERENCE(S)

1. BASE MAP FROM DIGITAL CAD FILE 13089 ACAD MASTER-040722.DWG, DATED 04-07-2022, PREPARED BY VARGO ASSOCIATES.
2. WELL LOCATIONS FROM FILES BRIDGEWATER_MON WELLS.XLS, VARGO LOCATIONS 101013.XLSX, VARGO LOCATIONS 121613.XLSX, MW DATA-110413.XLSX, BRIDGWATER_SURVEY_DATA-031115.DWG AND MW-SB DATA 10-12-16.XLSX, BRI-02A FORM B.PDF, PROVIDED BY VARGO ASSOCIATES.
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CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
MARCH 2022 BEDROCK GROUNDWATER CONTOURS – DEEP

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
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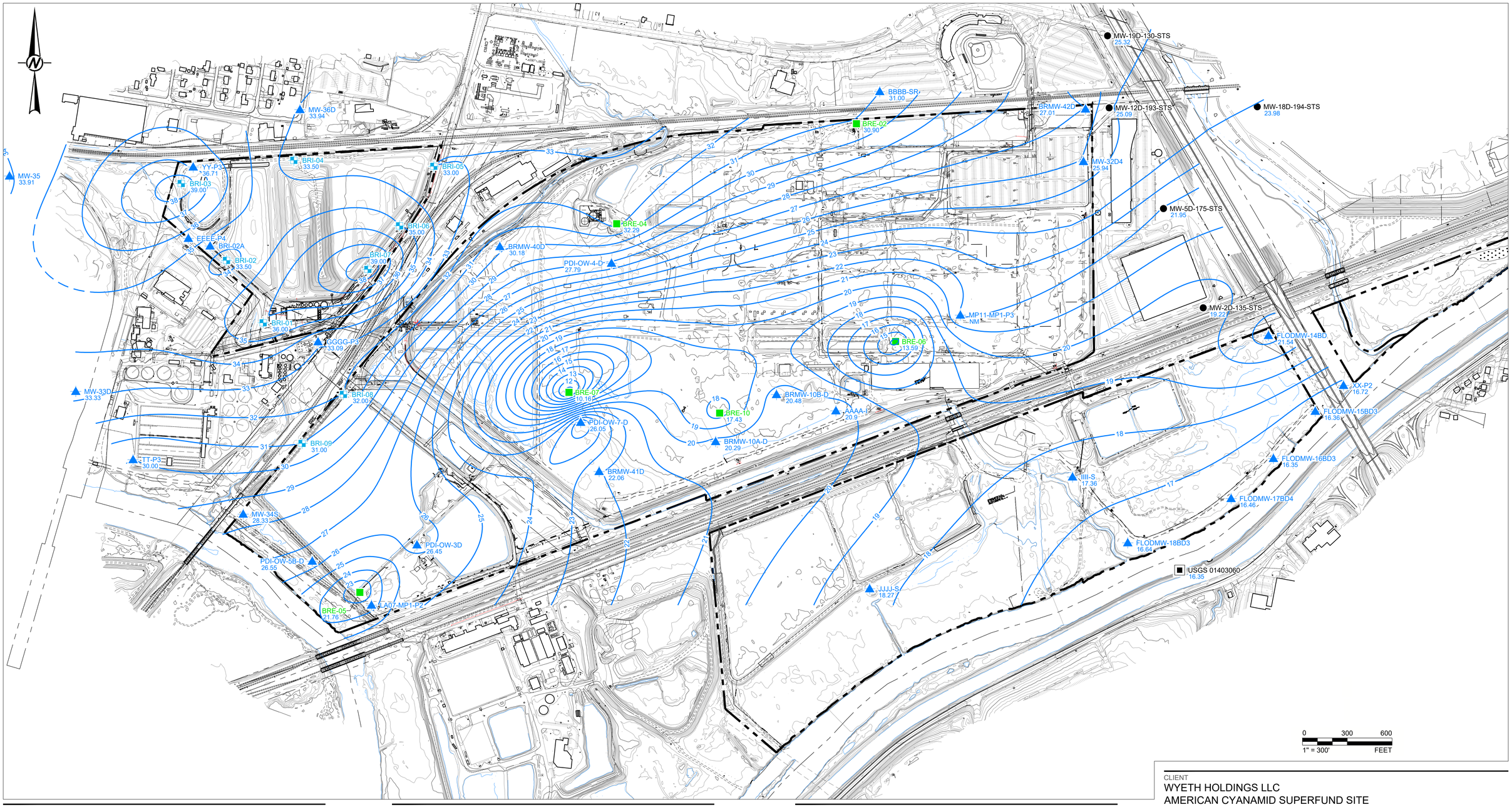

LEGEND

- BEDROCK MONITORING WELL
- BEDROCK EXTRACTION WELL
- BEDROCK INJECTION WELL
- STS MONITORING WELL
- USGS MONITORING 01403060
- 15 — GROUNDWATER CONTOUR (FT-NAVD88)
- 14.8 — GROUNDWATER ELEVATION (FT-NAVD88)

NOTE(S)

1. OBSERVED VALUES OF LA07-MP1-P2 IS NOT USED DIRECTLY FOR CONTOURING AS IT IS NOT REPRESENTATIVE OF THE FULL DRAWDOWN BASED ON THE PDI PUMPING TESTS, DUE TO THE WELL SCREEN PLACEMENT NEAR THE BOTTOM OF BRE-05.
2. GROUNDWATER ELEVATION CONTOURS WERE GENERATED BY KRIGING INTERPOLATION METHOD USING DATA VISUALIZATION SOFTWARE, SURFER (GOLDEN SOFTWARE V. 22).
3. LEVELS IN BEDROCK EXTRACTION WELLS WERE CORRECTED FOR WELL EFFICIENCY BASED ON PDI STEP TESTS OR TESTS CONDUCTED DURING GWEIS INITIAL OPERATIONS CONSISTENT WITH THE 2021 ANNUAL REPORT. SEE TABLE C-3 IN APPENDIX C OF THE 2022 ANNUAL REPORT.

LEGEND

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3. STS WELLS FROM EXCEL FILE SURVEY-2013_STS WELSS.ZLSX, MW-18 SERIES DIGITIZED FROM HARD COPY OF FIGURE 13, TITLED "SUMMARY OF VOLATILE ORGANIC COMPOUNDS (VOC) SAMPLING RESULTS IN GROUND WATER," DATED JANUARY 21, 2015, PROVIDED BY THE ELM GROUP, INC.

CLIENT
WYETH HOLDINGS LLC
AMERICAN CYANAMID SUPERFUND SITE
BRIDGEWATER TOWNSHIP, NEW JERSEY

PROJECT
OU4 GROUNDWATER COMPONENT 2022 ANNUAL MONITORING REPORT

TITLE
SEPTEMBER 2022 BEDROCK GROUNDWATER CONTOURS - DEEP

CONSULTANT

YYYY-MM-DD	2024-03-22
DESIGNED	JML
PREPARED	GLS
REVIEWED	BAC
APPROVED	ACK

PROJECT NO.	CONTROL	REV.	FIGURE
31405041.030	0013-035	0	C-10

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ARCH D

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APPENDIX C – Climate Change Analysis

In accordance with the Region 2 *Guidance for Incorporating Climate Change Considerations in Five Year Reviews*, four climate tools were utilized to assess the American Cyanamid Superfund Site, located in Somerset County, NJ. Screenshots from each of the tools assessed are included herein.

The first tool used was *The Climate Explorer*. According to this tool, the primary climate concerns for Somerset County, NJ are changes in seasonal patterns, intense storm events, and an increase in extreme temperatures. These can be seen in Figure C-1. As can be seen from Figure C-2, there is a projected increase in mean annual temperature over time, especially after mid-century. Increases in temperature over time are not expected to impact the groundwater remedy including the GWTF or the GWEIS, since the infrastructure has been designed to account for temperature variations. An increase in temperature could affect groundwater levels, however, the majority of the groundwater contamination is in the deeper bedrock, and extraction of the deeper groundwater is less likely to be affected by temperature variations. Despite this increase in extreme temperature, there does not seem to be an increased risk of drought as the tool shows the number of dry days is projected to remain the fairly constant while the annual precipitation is projected to increase. This can be seen in Figure C-3 and Figure C-4, respectively. An increase in precipitation and intense storm events could impact the caps and stormwater drainage for the site-wide remedy. An increase in precipitation and associated flooding could cause damage to liner materials, cover materials, leachate collection/removal systems, and surface grade integrity. This could result in the potential spread of contaminants. Due to the historic flooding at the site, significant resiliency work has been completed as discussed in Section II of the report. In Addition, the ROD requires that the caps be designed to withstand the 500-yr storm event and O&M practices will include monthly inspections such as looking for evidence of vegetative distress, cap erosion, vegetative growth requiring cutting, and evidence of erosion or blockage of stormwater conveyance channels. These measures and practices can help identify potential problems associated with increased precipitation and storm intensity.

The second tool utilized is called *Climate Mapping for Resiliency and Adaptation*. According to this assessment tool, for Somerset County, based on the National Risk Index Rating, the risk of extreme heat is considered to be relatively moderate, the risk of drought is considered to be relatively low, the risk of wildfire is considered very low, the risk of flooding is considered to be relatively high, and the risk of coastal inundation is considered very low. Figures C-5 – C-9 provide a summary of the risks for the area. The findings from this tool are consistent with Climate Explorer for extreme heat, flooding and drought. While the site does have flooding risks since it is adjacent to the Raritan River, the resiliency measures completed for the groundwater remedy, such as constructing the GWTF outside of the flood zone above and raising critical infrastructure, will ensure that the groundwater will remain in operation during significant flood events.

The third tool utilized is called *Sea Level Rise*. According to this assessment tool, Somerset County is not vulnerable to sea level rise or high tide flooding. Figure C-10 shows the areas affected with a 10-foot sea level rise and Figure C-11 shows the areas subject to high tide

flooding. Areas downstream of the site are expected to experience flooding under this scenario, but it does not extend to the site.

The final tool utilized is called U.S. Landslide inventory. The Site is not associated with any landslide concerns, as shown on Figure C-12.

Based on this information, potential Site impacts from climate change have been assessed, and the performance of the remedy may be impacted by the following expected effects of climate change in the region and near the Site: extreme heat, increased precipitation and inland flooding. However, the resiliency measures that have been put in place at the site and the requirements of the ROD will enable the remedy to properly function under these anticipated effects of climate change. Nevertheless, climate change monitoring will continue in the future.

Figure C-1 – Top climate concerns for Somerset County, NJ

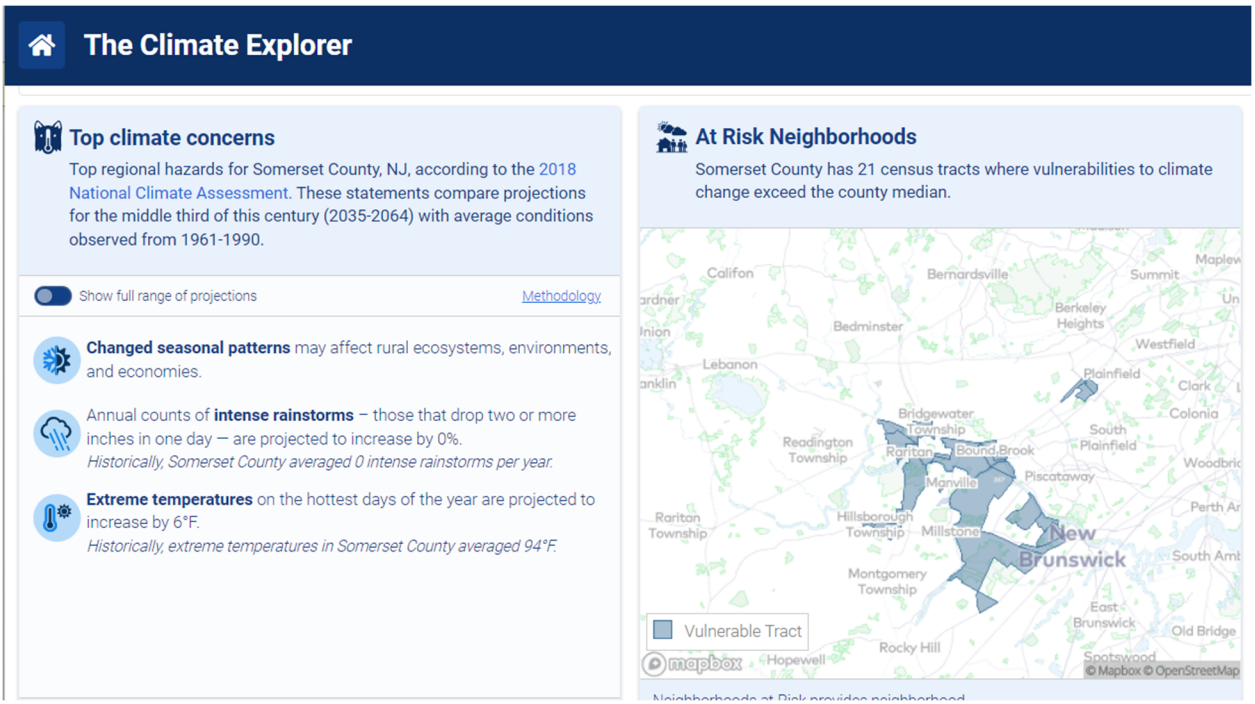


Figure C-2 – Average daily max. temperature

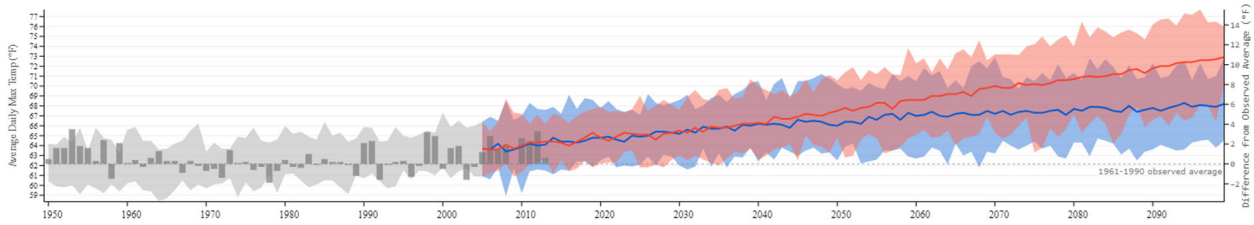


Figure C-3 – Dry days

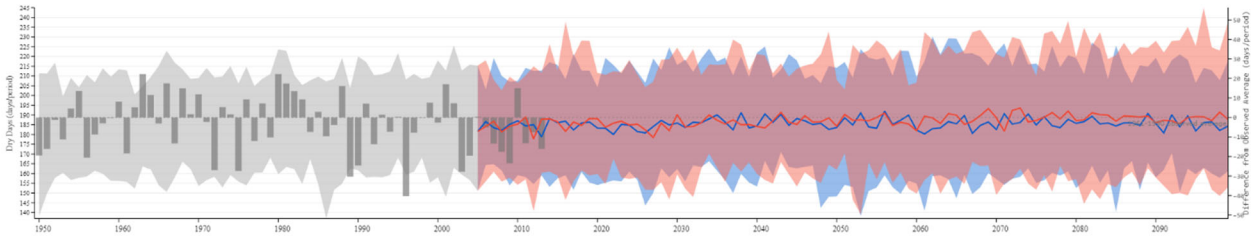


Figure C-4 – Total precipitation

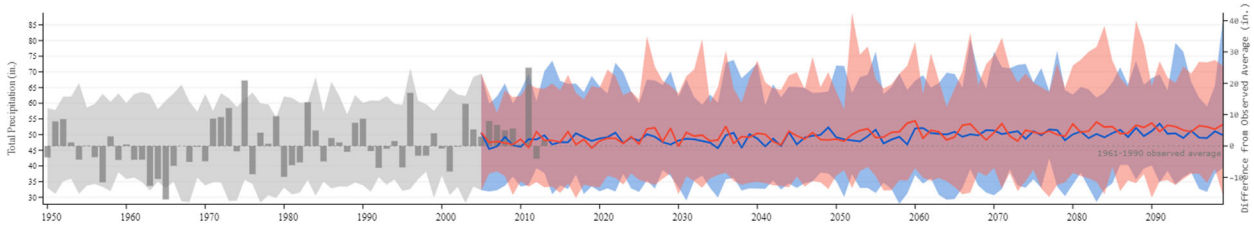
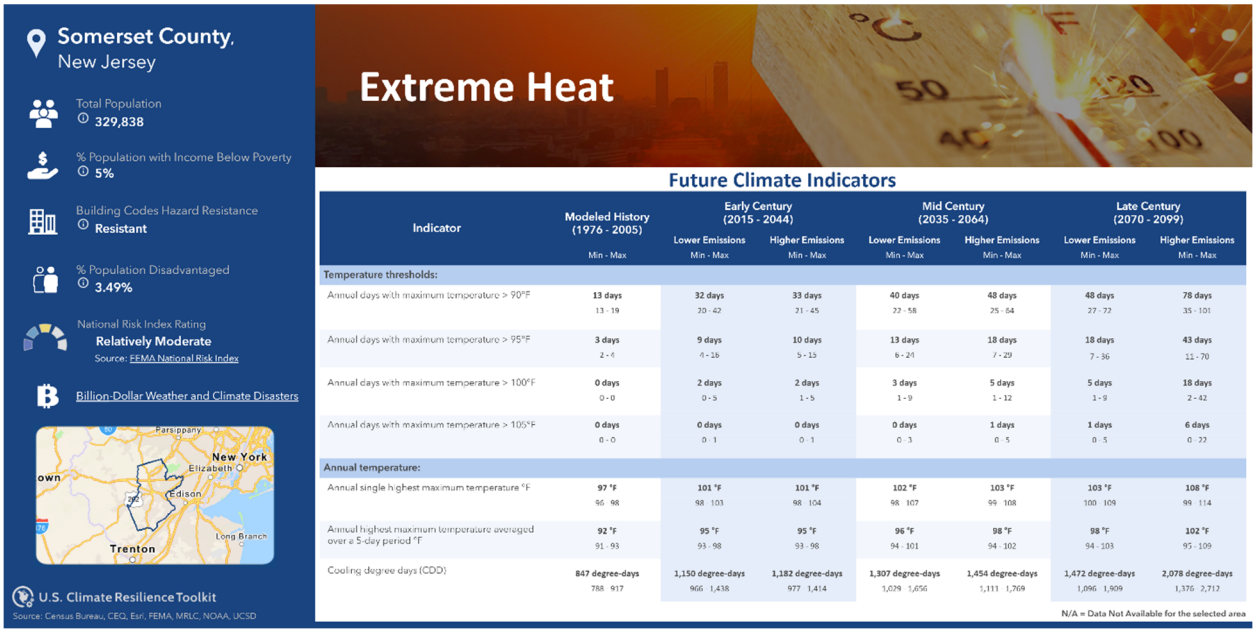


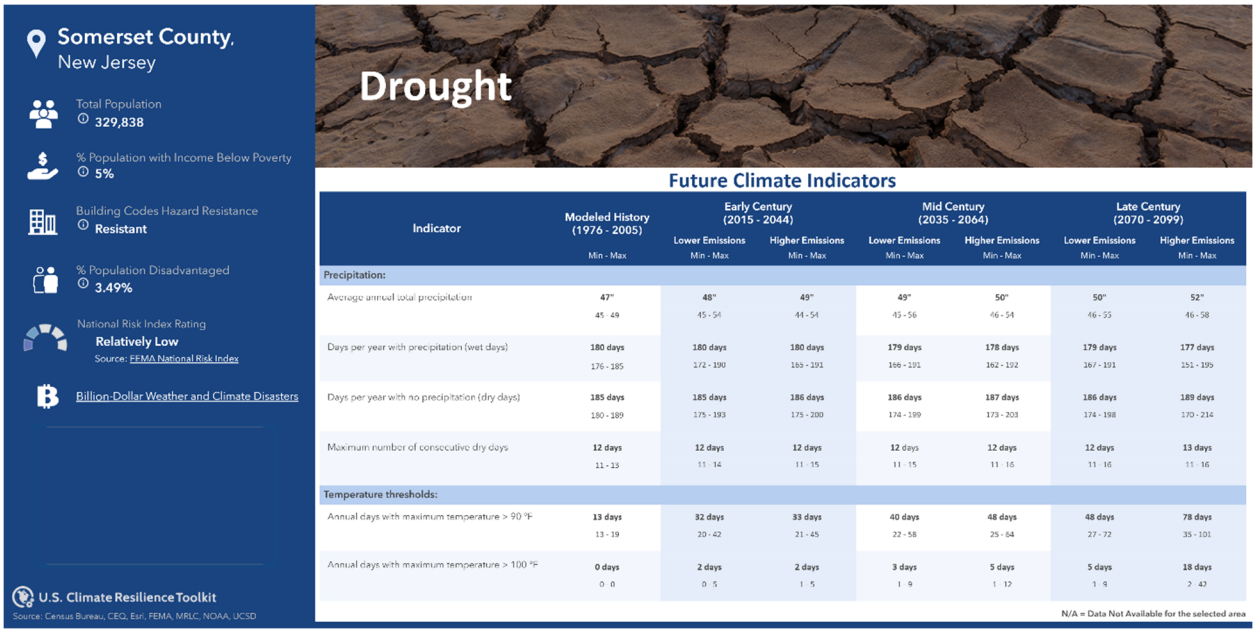
Figure C-5 – Extreme Heat



Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Temperature thresholds:							
Annual days with maximum temperature > 90°F	13 days 13 - 19	32 days 20 - 42	33 days 21 - 45	40 days 22 - 58	48 days 25 - 84	48 days 27 - 72	78 days 35 - 101
Annual days with maximum temperature > 95°F	3 days 2 - 4	9 days 4 - 16	10 days 5 - 13	13 days 6 - 24	18 days 7 - 29	18 days 7 - 36	43 days 11 - 70
Annual days with maximum temperature > 100°F	0 days 0 - 0	2 days 0 - 5	2 days 1 - 5	3 days 1 - 9	5 days 1 - 12	5 days 1 - 9	18 days 2 - 42
Annual days with maximum temperature > 105°F	0 days 0 - 0	0 days 0 - 1	0 days 0 - 1	0 days 0 - 3	1 days 0 - 5	1 days 0 - 5	6 days 0 - 22
Annual temperature:							
Annual single highest maximum temperature °F	97 °F 96 - 98	101 °F 98 - 103	101 °F 98 - 104	102 °F 98 - 107	103 °F 99 - 108	103 °F 100 - 109	108 °F 99 - 114
Annual highest maximum temperature averaged over a 5-day period °F	92 °F 91 - 93	95 °F 93 - 98	95 °F 93 - 98	96 °F 94 - 101	98 °F 94 - 102	98 °F 94 - 103	102 °F 95 - 109
Cooling degree days (CDD)	847 degree-days 788 - 917	1,150 degree-days 966 - 1,438	1,182 degree-days 977 - 1,414	1,307 degree-days 1,029 - 1,656	1,454 degree-days 1,111 - 1,769	1,472 degree-days 1,096 - 1,909	2,078 degree-days 1,376 - 2,712

N/A = Data Not Available for the selected area

Figure C-6 – Drought



Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Average annual total precipitation	47" 45 - 49	48" 45 - 54	49" 44 - 54	49" 45 - 56	50" 46 - 54	50" 46 - 55	52" 46 - 58
Days per year with precipitation (wet days)	180 days 176 - 185	180 days 172 - 190	180 days 169 - 191	179 days 166 - 191	178 days 162 - 192	179 days 167 - 191	177 days 151 - 195
Days per year with no precipitation (dry days)	185 days 180 - 189	185 days 175 - 193	186 days 175 - 200	186 days 174 - 199	187 days 173 - 203	186 days 174 - 198	189 days 170 - 214
Maximum number of consecutive dry days	12 days 11 - 13	12 days 11 - 14	12 days 11 - 15	12 days 11 - 15	12 days 11 - 16	12 days 11 - 16	13 days 11 - 16
Temperature thresholds:							
Annual days with maximum temperature > 90 °F	13 days 13 - 19	32 days 20 - 42	33 days 21 - 45	40 days 22 - 58	48 days 25 - 64	48 days 27 - 72	78 days 35 - 101
Annual days with maximum temperature > 100 °F	0 days 0 - 0	2 days 0 - 5	2 days 1 - 5	3 days 1 - 9	5 days 1 - 12	5 days 1 - 9	18 days 2 - 42

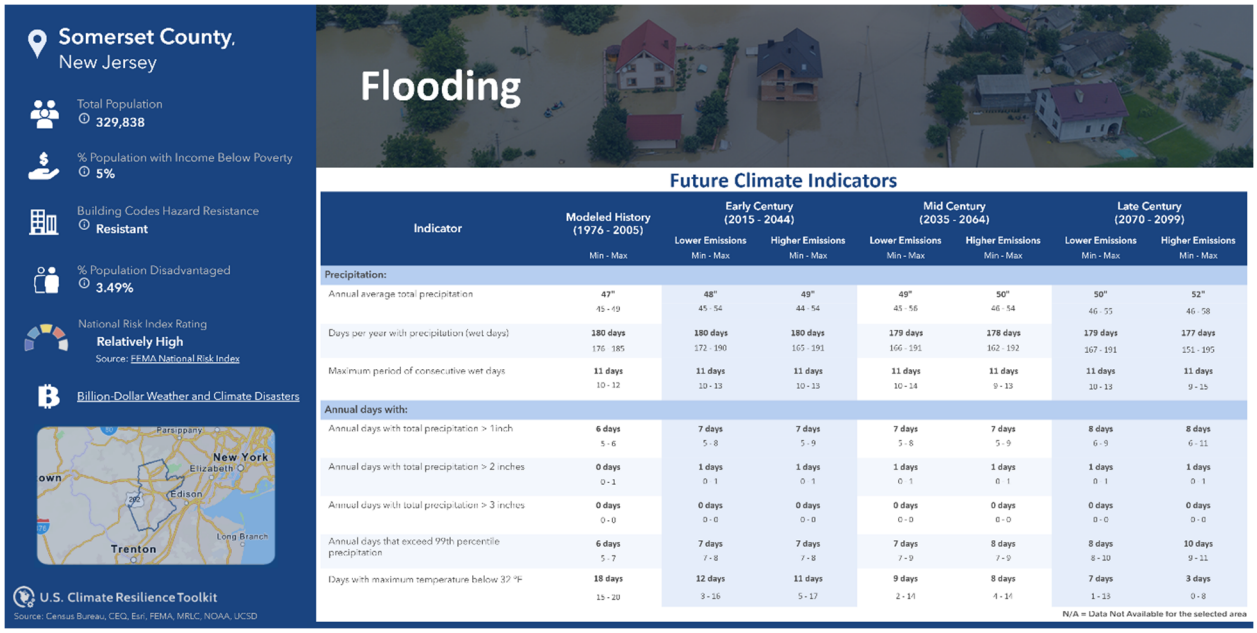
N/A = Data Not Available for the selected area

Figure C-7 – Wildfire

Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Days per year with no precipitation (dry days)	185 days 180 - 189	185 days 175 - 193	186 days 175 - 200	186 days 174 - 199	187 days 173 - 203	186 days 174 - 198	189 days 170 - 214
Maximum number of consecutive dry days	12 days 11 - 13	12 days 11 - 14	12 days 11 - 15	12 days 11 - 15	12 days 11 - 16	12 days 11 - 16	13 days 11 - 16
Days per year with precipitation (wet days)	180 days 176 - 185	180 days 172 - 190	180 days 169 - 191	179 days 166 - 191	178 days 162 - 192	179 days 167 - 191	177 days 151 - 195
Temperature thresholds:							
Annual days with maximum temperature > 90°F	13 days 13 - 19	32 days 20 - 42	33 days 21 - 45	40 days 22 - 58	48 days 25 - 64	48 days 27 - 72	78 days 35 - 101
Annual days with maximum temperature > 100°F	0 days 0 - 0	2 days 0 - 5	2 days 1 - 5	3 days 1 - 9	5 days 1 - 12	5 days 1 - 9	18 days 2 - 42

N/A = Data Not Available for the selected area

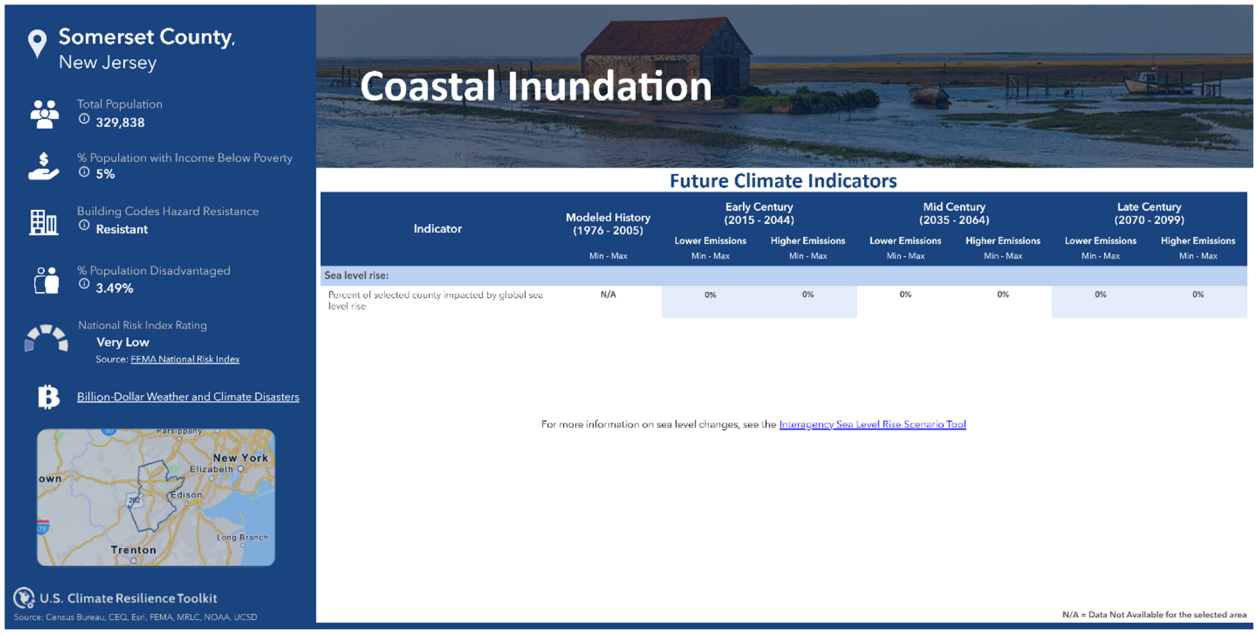
Figure C-8 – Flooding



Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Precipitation:							
Annual average total precipitation	47" 45 - 49	48" 45 - 54	49" 44 - 54	49" 45 - 56	50" 46 - 54	50" 46 - 55	52" 46 - 58
Days per year with precipitation (wet days)	180 days 176 - 185	180 days 172 - 190	180 days 165 - 191	179 days 166 - 191	178 days 162 - 192	179 days 167 - 191	177 days 151 - 195
Maximum period of consecutive wet days	11 days 10 - 12	11 days 10 - 13	11 days 10 - 13	11 days 10 - 14	11 days 9 - 13	11 days 10 - 13	11 days 9 - 15
Annual days with:							
Annual days with total precipitation > 1inch	6 days 5 - 6	7 days 5 - 8	7 days 5 - 9	7 days 5 - 8	7 days 5 - 9	8 days 6 - 9	8 days 6 - 11
Annual days with total precipitation > 2 inches	0 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1	1 days 0 - 1
Annual days with total precipitation > 3 inches	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0	0 days 0 - 0
Annual days that exceed 99th percentile precipitation	6 days 5 - 7	7 days 7 - 8	7 days 7 - 8	7 days 7 - 9	8 days 7 - 9	8 days 8 - 10	10 days 9 - 11
Days with maximum temperature below 32 °F	18 days 15 - 20	12 days 3 - 16	11 days 5 - 17	9 days 2 - 14	8 days 4 - 14	7 days 1 - 13	3 days 0 - 8

N/A = Data Not Available for the selected area

Figure C-9 – Coastal Inundation



Indicator	Modeled History (1976 - 2005)	Early Century (2015 - 2044)		Mid Century (2035 - 2064)		Late Century (2070 - 2099)	
		Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions	Lower Emissions	Higher Emissions
	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max	Min - Max
Sea level rise:							
Percent of selected county impacted by global sea level rise	N/A	0%	0%	0%	0%	0%	0%

For more information on sea level changes, see the Interagency Sea Level Rise Scenario Tool

N/A = Data Not Available for the selected area

Figure C-10 – Sea Level Rise

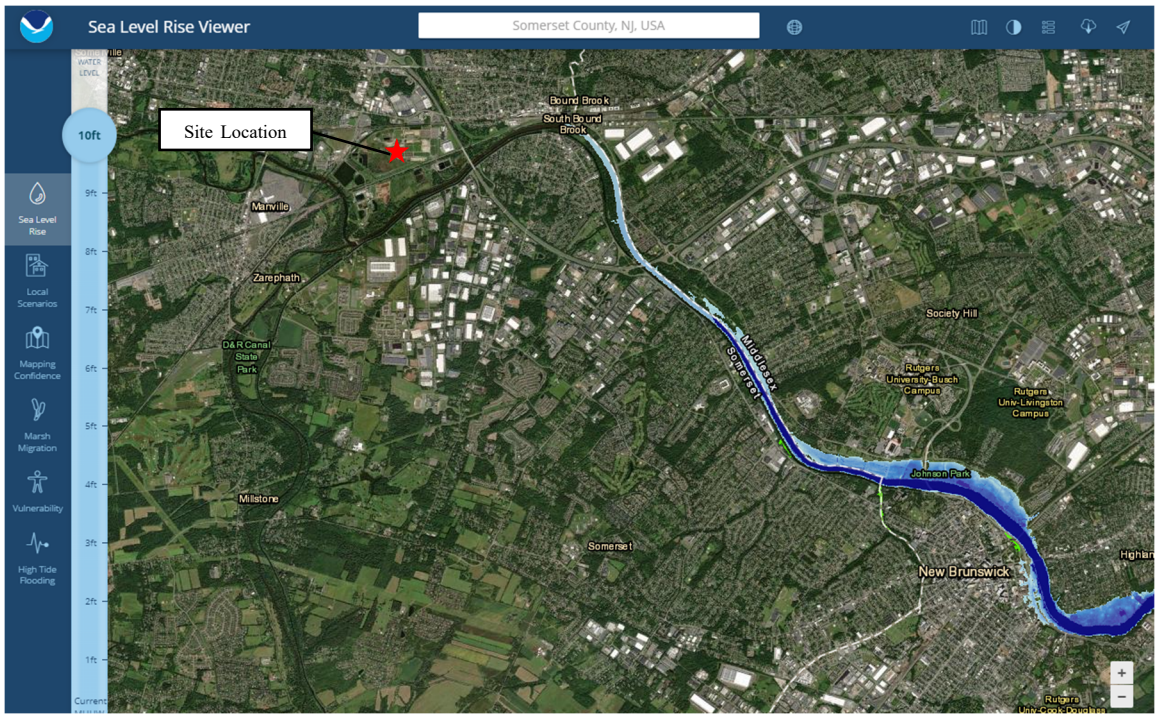


Figure C-11 – High Tide Flooding

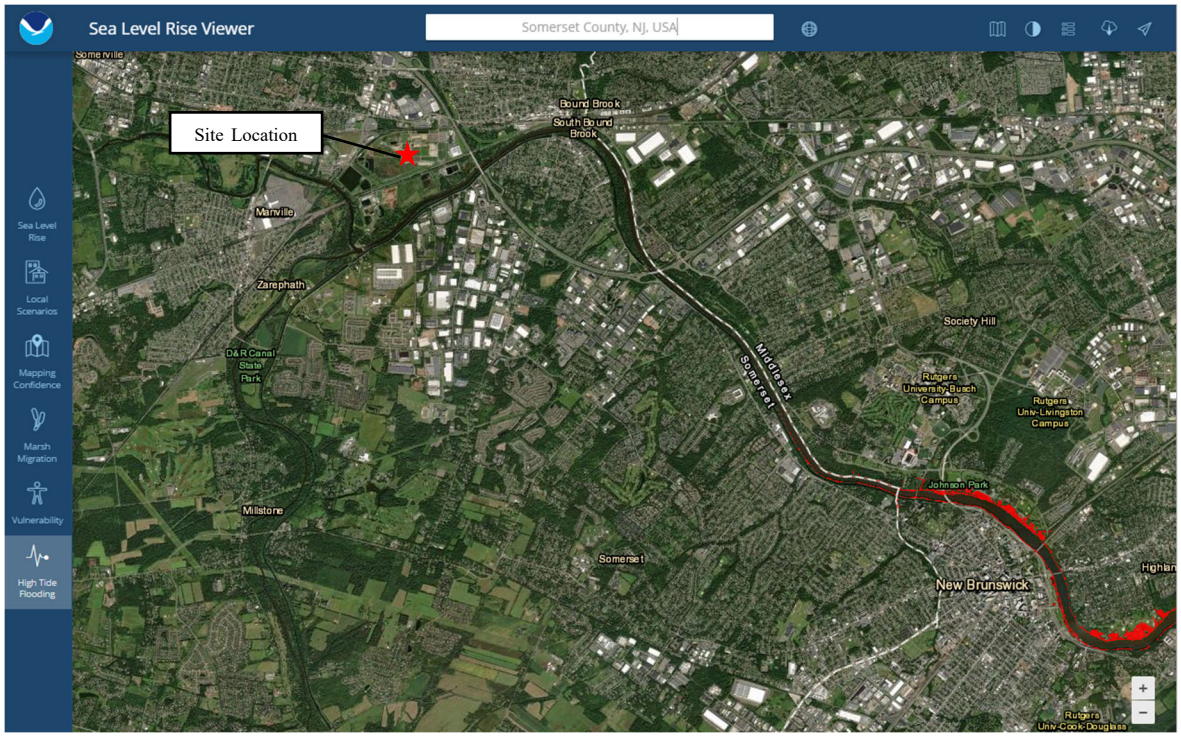


Figure C-12 – Landslide Inventory