FOURTH FIVE-YEAR REVIEW REPORT FOR WOODLAND TOWNSHIP ROUTE 532 AND 72 SUPERFUND SITES BURLINGTON COUNTY, NEW JERSEY

Prepared by

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

Pat Evangelista Digitally signed by Pat Evangelista Date: 2024.01.30 15:18:30 -05'00'

Pat Evangelista, Director
Superfund and Emergency Management Division

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Date

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Contents

LIST OF ABBREVIATIONS & ACRONYMS

ACO	Administrative Consent Order
ARAR	Applicable or Relevant and Appropriate Requirement
AS/SVE	Air Sparging and Soil Vapor Extraction
BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CEA	Classification Exception Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CIC	Community Involvement Coordinator
CFR	Code of Federal Regulations
COC	Contaminant of Concern
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ND	Non Detect
NPL	National Priorities List
OBS	Oxygen Biosparging System
O&M	Operation and Maintenance
OU	Operable Unit
PQL	Practical Quantitation Level
PRP	Potentially Responsible Party
RAOs	Remedial Action Objectives
RAWP	Remedial Action Work Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
VOCs	Volatile Organic Compounds
WRA	Well Restriction Area
SVOCs	Semivolatile Organic Compounds

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 fourth FYR for the Woodland Township Route 532 and Route 72 Superfund Sites (sites). The triggering action for this policy review is the completion date of the previous FYR. The FYR has been prepared due to the fact that the remedial action will not leave hazardous substances, pollutants or contaminants on site above levels that allow for unlimited use and unrestricted exposure but requires five or more years to complete.

The sites consist of Operable Units 1 and 2 (OU1 and OU2). OU1 will be addressed in this FYR. OU1 addresses contaminated surface materials, surface soils, sediment and groundwater on both Route 532 and Route 72. OU2 addressed the remediation of contaminated subsurface soils, also in both Route 532 and Route 72. The selected remedy for OU2 was no further action; therefore, it is not included in this FYR.

The sites FYR was led by Grisell V. Díaz-Cotto, Remedial Project Manager, EPA. Participants included the following EPA personnel: Stephanie Kim, Human Health and Ecological Risk Assessor; Kathryn Flynn, Hydrologist; and Pat Seppi, Community Involvement Coordinator (CIC). The relevant entities such as the potentially responsible parties (PRPs) were notified of the initiation of the five-year review.

Site Background

The sites are situated in an uninhabited area of the Pinelands. The Woodland Township Route 72 Site (Route 72) is approximately 12 acres in size and is located 1/4 mile south of Route 72 along Crawley Road. Approximately 800 acres of wetlands, including cedar swamp, bog hardwood swamp, and pitch-pine lowland are located in close proximity to the Route 72 site. Pope Branch, an intermittent stream, is located approximately 500 feet to the north and 1,000 feet west of the site (Figure 1).

The Woodland Township Route 532 Site (Route 532) is located approximately three miles from the Woodland Township Route 72 Site. The site is approximately 20 acres in size and is located at the end of an access road approximately 1/8 mile south of Route 532. The unnamed site access road meets Route 532 approximately 1 and 1/8 mile west of the intersection of Route 532 and Route 72. Goodwater Run, an intermittent stream, and Bailey Road border the Route 532 site to the east. An unpaved forest fire control road runs along the southern edge of the site. More than 200 acres of wetland, including cedar swamp, bog, hardwood swamp and pitch-pine lowland are located downgradient of the former disposal area of the Route 532 site. Inactive commercial cranberry bogs are located approximately one mile west-southwest of the site (Figure 2).

The sites were operated concurrently as chemical manufacturing waste disposal areas from the early 1950s until about 1962. At the Woodland Township Route 72 Site, concrete pads, possible basements, a utility building, and sidewalks existed prior to disposal activities. Liquids, drums, and general refuse were disposed of in several excavated trenches. At the Woodland Township Route 532 Site, a pine forest existed prior to the beginning of disposal operations. Liquids, drums, and general refuse were disposed into a series of bermed areas. By 1962, most of the disposal areas at both sites had been graded, and cover conditions were established.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Woodland Township Route 532 Woodland Township Route 72		
EPA ID: Woodland Township Route 532: NJD980505887 Woodland Township Route 72: NJD980505879		
Region: 2	**State:** NJ	**City/County:** Woodland Township/Burlington
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: State		
Author name (Federal or State Project Manager): Grisell V. Díaz-Cotto		
Author affiliation: EPA		
Review period: 4/27/2023 – 12/15/23		
Date of site inspection: 8/23/2023		
Type of review: Policy		
Review number: 4		
Triggering action date: 6/19/2019		
Due date *(five years after triggering action date)*: 6/19/2023		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

A remedial investigation/feasibility study (RI/FS) was conducted in phases from 1985 through 1989. The RI activities primarily consisted of sample collection and analysis of soils, wastes, groundwater, potable wells, air, surface water, sediments, and cranberries.

It was determined that soil at the sites was contaminated with volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics. The soil contaminants included benzene, creosols, toluene, ethylbenzene, xylenes, polychlorinated biphenyls, arsenic, cadmium, chromium, lead, nickel, silver, and zinc.

Groundwater was contaminated at the sites with VOCs, SVOCs and inorganics. The major contaminants included 1,2-dichloroethane (1,2-DCA), ethylbenzene, toluene and xylenes.

The human health risk assessment performed during the RI/FS demonstrated that the soil, waste, and groundwater exceeded carcinogenic and noncarcinogenic target risks at both sites. Ecological risk assessments indicated that the risk to receptors in the downgradient wetlands from groundwater discharge was negligible at the Route 72 site, and no measurable impact to the ecosystem related to the groundwater plume was observed or anticipated downgradient of the Route 532 site.

Response Actions

In April 1979, the Burlington County Health Department advised the New Jersey Department of Environmental Protection (NJDEP) of environmental problems at the sites. In December 1979, soil samples were collected by the PRPs consultant. NJDEP subsequently conveyed the information to EPA. In September 1981, a field investigation report was submitted to EPA by its Field Investigation Team contractor. Monitoring wells were installed, and groundwater samples were collected. The sites were proposed for inclusion on the National Priorities List (NPL) on September 8, 1983, and finalized on the NPL on September 21, 1983.

On March 4, 1985, NJDEP issued a directive to the Rohm and Haas Company, the Minnesota Mining and Manufacturing (3M) Company, Hercules, Inc., and other companies identified as PRPs to arrange for the investigation and remediation of the sites. On March 27, 1985, NJDEP entered into an Administrative Consent Order (ACO) with Hercules, Inc. to help pay for the investigative and administrative costs. On July 6, 1987, NJDEP entered into a similar ACO with 3M and Rohm and Haas Company.

During March and July of 1985, the PRPs collected soil and waste samples. In 1986, a temporary six-foot high chain-link security fence was built around the former disposal areas at the sites.

On January 2, 1990, NJDEP entered into a Second Administrative Consent Order (ACO II) with Hercules, 3M and Rohm and Hass. The purpose of ACO II was to compel the PRPs to remove liquids and sludges from isolated locations on the site's surfaces.

A third order, ACO III, was signed with Hercules, 3M and Rohm and Hass on June 15, 1990. It required the PRPs to excavate for off-site disposal all visibly contaminated surface soils from the sites, as specified in the OU1 Record of Decision (ROD), dated May 16, 1990.

1990 ROD – OU1

OU1 Remedial Action Objectives (RAOs)

- Satisfy applicable or relevant and appropriate local, state, and federal requirements (ARARs).
- Reduce direct contact risks and stop continued degradation of the groundwater.

Surface Materials – Remedy Components

- Excavation and further characterization of contaminated surface materials and sediments (soil, sludges, debris, etc.): 26,000 cubic yards from the Route 532 site and 28,000 cubic yards from the Route 72 site.
- Disposal of the excavated materials at a permitted off-site facility.
- Off-site disposal of an estimated 19 cubic yards (combined total from the Route 72 and Route 532 sites) of radiologically contaminated surface materials. This material included a drum containing radioactive pellets found at the Route 532 site.

Groundwater – Remedy Components

- Extraction of the contaminated groundwater plume, estimated to be 4,000 feet long, and 25 to 50 feet deep.
- Treatment of the extracted groundwater prior to reinjection. The specific components of the treatment system were to be developed during the remedial design. The feasibility study discussed treatment via air stripping, metals removal, biological treatment, and advanced oxidation. Activated carbon adsorption was to be used as a contingency if the advanced oxidation process was determined to be unsuitable. Treatment of the groundwater was to continue for an estimated 30 years or until the remedial objectives were obtained.

Table 1: Soil Cleanup Objectives

Contaminant	Concentration (mg/Kg)	Contaminant	Concentration (mg/Kg)
Total Volatiles	1	(DDT) and metabolites	10
Total Acid Extractables	10	Lead	250-1000*
Total Base-Neutrals (excluding phthalates)	10	Mercury	1
Total Phthalates	25	Molybdenum	1
Antimony	10	Nickel	100
Arsenic	20	Selenium	4
Barium	400	Silver	5
Berylium	1	Thallium	5
Cadmium	3	Uranium and Thorium Series Radionuclides	**
Chlordane	1	Vanadium	100
Chromium (total)	100	Zinc	350
Copper	170		

*The cleanup objective for lead is not representative of background concentrations. It is based on a risk assessment that has been completed by the New Jersey Department of Health.
**Cleanup in accordance with 40 CFR 192.

1999 ROD AMENDMENT – OU1 (Groundwater Only)

An assessment of environmental impacts associated with the groundwater extraction and treatment remedy was completed to satisfy the requirements of the 1990 ROD. The assessment led to the determination that air sparging and soil vapor extraction (AS/SVE) was a more appropriate remedy for the sites, because this technology would have minimal impact to the surrounding wetlands and remediate the groundwater contamination in less time and at substantially lower costs than groundwater extraction and treatment.

Modified Remedy Components

- Groundwater in the site disposal areas at both the sites was to be remediated using an air sparging system to inject air into the saturated zone and strip away volatile and semi-volatile organic compounds dissolved in groundwater and adsorbed to the soil; a soil vapor extraction system to capture sparged vapors; and a vapor treatment system to treat the soil vapor extraction offgas.
- The downgradient portion of the plumes at both sites would be allowed to naturally attenuate.

Remedial Action Objectives

- The groundwater at the sites is classified as 1-PL (Preservation Area). Pursuant to the Groundwater Quality Standards (N.J.A.C. 7:9-6 et seq.), the groundwater quality criterion for Class 1-PL areas is the natural quality for each constituent. For a constituent whose natural quality is less than the Practical

Quantitation Level (PQL), which is the lowest concentration of a constituent that can be reliably detected during routine laboratory operating conditions, then the PQL is the Groundwater Quality Criterion. The Groundwater Remediation Goals (GWRGs) for site related contaminants are listed in Table 2 below.

- Adverse environmental impacts and permanent ecological damage in sensitive areas must be avoided.
- Human health and the environment must continue to be protected through remediation and institutional controls.
- A standard of performance equivalent to the groundwater extraction and treatment remedy specified in the ROD must be attained.
- All parts of the groundwater plume containing chemical concentrations exceeding either the NJDEP's Groundwater Quality Standards (GWQS) or the Federal Maximum Contaminant Levels (MCLs) must be remediated. Groundwater within the sites disposal areas that is considered to potentially impact groundwater quality downgradient will be actively remediated, while remaining areas outside of the vertical and horizontal extent of these areas will naturally attenuate. Those areas where groundwater contains aromatic hydrocarbon concentrations (ethylbenzene, toluene and total xylenes) in excess of one percent solubility or 1,2-DCA concentrations in excess of 100 times the groundwater quality standards are considered areas impacting groundwater quality (AIGWQ).

Contingency Remedy

The 1999 ROD Amendment included a contingency remedy that would be a remedy modified from the 1990 ROD. The contingency remedy would be implemented at the sites if it were determined that:

- The Monitored Natural Attenuation (MNA) remedy for the downgradient plume was not adequately protective of human health and the environment, or
- the AS/SVE remedial action was no longer decreasing the levels of contamination and levels of contamination remain onsite at levels requiring active remediation, or
- the groundwater plume was migrating toward the potable wells at Dukes Bridge.

The conditions identified in the 1999 ROD Amendment that would trigger a contingency remedy have not occurred.

Table 2: Groundwater Remediation Goals

COCs	AIGWQ Criteria (ug/l)	GWRGs (ug/l)
1,2-Dichloroethane	200	2
Ethylbenzene	1,500	5
Toluene	5,400	5
Xylenes, total	2,000	2

1993 ROD – OU2

OU2 is the second and final operable unit for the sites. The OU2 decision document addressed subsurface soils. NJDEP selected no further action for OU2. EPA concurred with the selected remedy.

Status of Implementation

OU1

Surface Materials: The excavation and off-site disposal of the surface materials was conducted in 1990. The total amount of contaminated materials and sediments removed from the Route 72 and 532 sites was 37,200 and 60,200 cubic yards, respectively. Contaminated subsurface soils were removed along with the removal of the

visibly contaminated surface material. These soils had been acting as a source of continuing contamination of the groundwater.

Groundwater: The remedial action work plan (RAWP) for air sparging and soil vapor extraction at the Route 532 and Route 72 sites presented a phased approach for implementing the AS/SVE groundwater remedy in the former disposal areas of both sites. Construction and operation of the AS/SVE systems were implemented in phases so that operating and performance data collected during Phase 1 could be used to optimize the construction and operation of the full systems Phase 2. The AS/SVE RAWP was approved on July 8, 2000.

The transition from active remediation by AS/SVE to MNA was outlined in the AS/SVE RAWP. The process involved ceasing AS/SVE operations when the AIGWQ RAO was achieved. The aquifer beneath the former disposal areas would no longer be a source and natural attenuation processes could complete the remediation and attain site-wide GWRGs.

AS/SVE – Route 72 Site

Construction activities were separated into two phases, addressing different areas of the site. Phase 1 start-up of operations at the site occurred on July 9, 2001.

Phase 2 employed an oxygen biosparging system (OBS), rather than air sparging, to promote organic contaminant removal. The OBS system for Phase 2 is comprised of five treatment zones. The full Phase 2 OBS system became operational in January 2004, and was expanded in 2008 with the addition of 32 OBS wells upgradient of the Phase 2 area. OBS operation reduced contaminant concentrations to below AIGWQ criteria and sparging concluded in October 2009. Quarterly rebound monitoring indicated elevated VOC concentrations in several zones of the Phase 2 area, and lower oxygen demand in the aquifer. In 2011, the OBS system was reconfigured for air sparging and biosparging resumed in October 2011 in OBS Zone 2 and the OBS Expansion Area. In January 2012, biosparging resumed in sections of OBS Zones 3 and 5. Sparging in all areas ended in August 2012 and was followed by rebound monitoring.

Due to the results of expanded rebound monitoring performed in September 2015, the biosparge system was reactivated in November 2015, as a Phase 3, to treat residual Toluene, Ethylbenzene and Total Xylenes (TEX) and reduce downgradient flux from the Phase 2 Area. However, the system was shut down on December 11, 2018, following sustained monitoring results below the AIGWQs. Subsequent to the shutdown of the system, rebound monitoring was conducted in 2018 through 2021.

AS/SVE - Route 532 Site

Operation of the Phase 1 AS/SVE system at the Woodland Route 532 site began on April 11, 2001. On March 27, 2003, AS/SVE operations began on the Phase 2 portion of the system. Phase 2 AS/SVE was concluded in December 2004 and Phase 1 operations ended in July 2005, when concentrations of contaminants declined to below AIGWQ criteria in both areas. No rebound effects were observed during the post-remediation monitoring period, and concentrations of 1,2-DCA and other VOCs in the source area were below the AIGWQ criteria.

AS/SVE systems and unused monitoring wells were decommissioned in 2011 and 2012, respectively.

MNA - Route 72 Site and Route 532 Site

The requirements for natural attenuation monitoring for the Route 72 site were included in the 1999 RAWP and the requirements for the Route 532 site were included in the 2005 Revised RAWP. The following three networks of monitoring wells were chosen to monitor the plumes at both sites and are categorized according to performance objectives and monitoring strategy:

- Source Depletion Monitoring Wells: This set of wells is located immediately downgradient of the fenced former disposal area at each site where Contaminants of Concern (COC) concentrations are expected to decrease relatively quickly in response to the on-site groundwater remedy (AS/SVE). The wells are screened in both shallow and intermediate depths to ensure source remediation is effectively addressing the entire vertical plume profile. The Route 532 site also has disposal area wells to monitor groundwater concentrations near the source.

- Plume Stability Monitoring Wells: The plume stability wells are designed to provide data used to define the horizontal and vertical plume dynamics, and the extent and mechanisms of natural attenuation of the plumes. As such, plume stability wells are located primarily along the principal flow path of the plumes and at the toe and edges of the plume. Screen zones were selected to represent shallow, intermediate, deep plume conditions.

- Sentinel Monitoring Wells: The sentinel monitoring wells are designed to provide protection of downgradient potable groundwater users.

Table 3: IC Summary Table

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	Both sites	Restrict installation of groundwater wells and potable water use.	Classification Exception Area and Well Restriction Area established in October 1999

The remedy required the implementation of a Classification Exception Area (CEA) and a Well Restriction Area (WRA) as institutional controls at the sites. The CEA suspends the designated original uses of the groundwater beneath each site until groundwater applicable or relevant and appropriate requirements (ARARs) are attained, and the WRA restricts the use of potable water at a CEA. CEAs and WRAs were established separately for the Woodland Township Route 532 and Route 72 sites on October 1, 1999. As required by the CEAs, the PRPs have submitted biennial certifications. The most recent biennial certification monitoring reports for the groundwater CEAs were submitted in September 2022.

Systems Operations/Operation & Maintenance

AS/SVE – Route 72

At the Route 72 site, the AS/SVE system was reconfigured in 2011 to address the Phase 2 and OBS expansion areas where concentrations of TEX rebounded. Sparging resumed in October 2011, and sparging in all areas ended in August 2012. Due to the results of the expanded rebound monitoring performed in September 2015, the biosparge system was reactivated in November 2015, as a Phase 3, to treat residual TEX and reduce downgradient flux from the Phase 2 Area. The system was shut down on December 11, 2018, following sustained monitoring results below the AIGWQs. Performance monitoring in these areas was conducted quarterly throughout 2017. Semiannual monitoring was completed from 2018 to 2021.

MNA – Route 72
The MNA program at the **Route 72 site** initially consisted of the following:

- Quarterly groundwater sampling at 21 Source Depletion wells for the first two years of the MNA program and semi-annually thereafter.
- Annual groundwater sampling at 47 Plume Stability and Sentinel wells.
- Biennial sediment sampling at Pope Branch and Long Cripple Branch, and biennial surface water sampling at Pope Branch, Long Cripple Branch, and Shoal Branch.

Surface water and sediment sampling locations were revised after 2006 to focus on areas of known groundwater discharge. Two new locations were added and sampled for surface water and sediment during the 2018 biennial sampling event. A new sentinel well cluster, 72-WPSG-29, was installed in July 2020.

As the MNA program progressed, monitoring wells were removed from the MNA sampling program when it was determined that they no longer provided useful information regarding the extent or magnitude of contaminant migration. In 2022, the MNA network consisted of 37 monitoring wells and the monitoring well network has been further reduced to 30 monitoring wells to optimize the monitoring program.

MNA- Route 532
The MNA program at the **Route 532 site** involves annual monitoring at all wells in the groundwater monitoring well network. In 2022, the number of monitoring wells sampled in the MNA sampling program was reduced from 14 monitoring wells to 8 monitoring wells due to declining COC concentrations in groundwater.

Climate Change
Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the sites (See Appendix C).

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 4: Protectiveness Determinations/Statements from the 2019 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The OU1 remedy is protective of human health and the environment.
Sitewide	Protective	The remedies at the Woodland Township Route 72 and the Woodland Township Route 532 sites are protective of human health and the environment.

There were no issues and recommendations included in the last 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 Woodland Township Route 532 and Route 72 Superfund sites. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews.

In addition to this notification, the EPA CIC for the site, Pat Seppi, posted a public notice on the EPA site webpages https://www.epa.gov/superfund/woodland-route-532 and https://www.epa.gov/superfund/woodland-route-72 and provided the notice to the Woodland Township by email on January 29, 2024, with a request that the notice be posted in municipal offices and on the village/town webpages. This notice indicated that a FYR would be conducted at the Woodland Township Route 72 and Route 532 Superfund sites to ensure that the cleanup at the sites continues to be protective of human health and the environment. Once the FYR is completed, the results will be made available at the following repositories:

EPA Region 2, Superfund Records Center
290 Broadway, 18th Floor
New York, NY 10007-1866
Phone (212) 637-4308

and

NJDEP Office of Community Relations
401 East State Street, 5th Floor
Mail Code 401-05H
PO Box 420 Trenton, NJ 08625
Phone (609) 984-3081

In addition, the final report will be posted on the following websites:
https://www.epa.gov/superfund/woodland-route-532 and https://www.epa.gov/superfund/woodland-route-72. Efforts will be made to reach out to local public officials to inform them of the results.

Data Review

Route 72 Site

AS/SVE

Biosparging ended in 2018 and monitoring became semiannual.

In 2019, the xylene at 72-PMW-2 had declined from 2,100 micrograms per liter (ug/l) in 2018 to 6.4 ug/l. However, in the same year, there were three locations with elevated VOC concentrations: OS6012, OS6019, and OS6029. These wells are in the upgradient areas posing a potential problem for rebound in downgradient locations.

In 2020, in the Phase 3 Biosparge Area, there were three wells above criteria in one or both of the sampling events: PMW-13, OS6012, and OS6029. In 2019, OS6019 contained elevated concentrations in one event, but PMW-13 did not, and the 2020 results were similar. 2021 was the final year of performance monitoring in the biosparge area. In 2021, three Phase 3 Biosparge Area wells were above the criteria: OS6029, OS6012, and PMW-7. Two wells in the disposal area were sampled in 2022 and did not show rebounding VOC concentrations (Figure 4 and Figure 5).

MNA

In 2020, the monitoring results were similar to past events. The downgradient sentinel well WPSG-28C had 120 ug/l of 1,2-DCA, compared to 100 ug/l in 2019 and 80 ug/l in 2018. The downgradient well cluster, WPSG-29, did not have detections of 1,2-DCA, but had low chloroform and toluene detections. The surface water and sediment results showed low concentrations of benzene, toluene, ethylbenzene and xylene (BTEX) and 1,2-DCA.

In 2022, the 1,2-DCA concentration at WPSG-28C was 180 ug/l, compared to 160 ug/l in 2021. The trend of 1,2-DCA at WPSG-28C has been increasing since 2019. There is also an increasing trend in benzene at downgradient well 72-WPSG-25C, where benzene has been above the 1 ug/l GWRG since 2015 and the 2022 concentration was 4.7 ug/l. In 2022, the sentinel wells at WPSG-29 were non-detect for 1,2-DCA. The 2022 groundwater data was used to recalculate the transport of 1,2-DCA. The model predicted concentrations at the nearest private well downgradient of the site would be below the GWRGs and that there is no immediate risk at the private well. The VOC concentration trends at WPSG-28C and WPSG-25C and the transport model will be reevaluated with future monitoring data (Figure 6 and Figure 7).

Surface water and Sediment

The 2020 surface water and sediment results had low concentrations of BTEX and 1,2-DCA, below the Tier 1 toxicity thresholds. The 2022 surface water samples showed benzene and chlorobenzene elevated above their maximum historic levels. The SS10, SS19, and SS20 concentrations of benzene were 17, 19, and 20 ug/l, respectively, compared to non-detect (ND), 0.93J ug/l, and ND in 2020. 1,2-DCA also increased significantly at these locations to 43, 50, and 52 ug/l, respectively, compared to ND, 2.2 ug/l, and ND in 2020. Sediment samples in Long Cripple Branch and one sample in Pope Branch exceeded the baseline maximum or historical maximum for ethylbenzene at SS10, SS19, SS20, and SS09 and for chlorobenzene at SS10 and SS09. The elevated results may be a result of dryer than normal conditions at the Site during the 2022 sampling and will continue to be monitored.

Route 532 Site

AS/SVE

AS/SVE systems and unused monitoring wells were decommissioned in 2011 and 2012, respectively.

MNA

In 2020, the 1,2-DCA concentration at the most contaminated well in the disposal area, 532-PMW-16, increased to 290 ug/l from 130 ug/l in 2019. At the downgradient well, WPSG-210S, the 1,2-DCA concentration was 6.2 ug/l compared to 6.3 ug/l in 2019. The farthest downgradient sentinel wells at the site, WPSG-211S and WPSG-211D, did not have 1,2-DCA detections in 2020.

The 1,2-DCA concentration at 532-PMW-16 decreased to 67 ug/l in 2021, although 1,2-DCA subsequently increased again to 190 ug/l in 2022. The fluctuations observed between 2020 and 2022 indicate that data variability exists. At the most downgradient contaminated well, WPSG-210S, the 1,2-DCA concentration was 12 ug/l compared to 6.2 ug/l in 2020. The most downgradient sentinel wells at the site, WPSG-211S and WPSG-211D, did not have 1,2-DCA detections (Figure 3).

In this review period, there were isolated exceedances of GWRGs for other VOCs; however, the groundwater monitoring data generally shows decreasing trends or attainment of GWRGs (Figure 3).

Emerging Contaminants

Sampling for 1,4-dioxane and PFAS compounds was performed in 2020 at the Route 72 and Route 532 sites. Samples were collected at four wells at Route 72: disposal area/source well 72-DEP-24SI and also an upgradient well cluster (72-DEP-10 cluster) to serve as a background location. The 1,4-dioxane result from DEP-24SI was 7 ug/l. 1,4-Dioxane was voluntarily added to the sampling program in 2021 for eight locations. In 2021 and 2022, the 72-DEP-10 cluster and 72-DEP-24SI were sampled again, along with the eight additional wells. In 2022, seven of the eight locations showed exceedances. The 1,4-dioxane detections at the Route 72 site ranged from

0.41 ug/l to 45 ug/l in 2022. NJDEP has requested some side gradient groundwater sampling for 1,4-dioxane to confirm if its distribution is similar to other CVOCs at the site.

In 2020, PFAS sampling at the four Route 72 wells (72-DEP-24SI and well cluster 72-DEP-10) did not identify any detections above the NJ groundwater standards. The perfluorooctane sulfonic acid (PFOS) concentration at upgradient well DEP-10S was 0.86J ng/l and six PFAS compounds were detected at 72-DEP-24SI, none above New Jersey standards.

At the Route 532 site, the 1,4-dioxane result from PMW-16 was 12 ug/l, above the 0.4 ug/l standard in NJ. PMW-16 was resampled in 2021 and 2022, along with wells WPSG-207, WPSG-210S, and WPSG-210S. In those events, PMW-16 had the highest 1,4-dioxane concentration (14 and 12 ug/l) and WPSG-210S was 0.46 ug/l in 2022. The other results were below 0.4 ug/l. The PFAS sampling at PMW-16 at the Route 532 site showed detections of three PFAS compounds, but did not include perfluorooctanoic acid (PFOA), PFOS, or perfluorononanoic acid (PFNA).

Site Inspection

The inspection of the sites was conducted on 8/23/2023. In attendance were Grisell V. Díaz-Cotto from EPA, Joshi Ashish of the NJDEP, Lindsey Kitchen from demaximis, and Gregg McFadden and Robert Grigg from Envirogen Technologies. The purpose of the inspection was to assess the protectiveness of the remedy.

Several of the monitoring well network locations at the sites were inspected. They were found to be accessible and in good condition. No physical disturbances were noted. EPA discussed the sites management with the PRP consultant and its contractors. No significant issues were noted. After the site inspections, EPA queried the NJDEP site manager Joshi Ashish and he reported no concerns about the remedy at this time.

V. TECHNICAL ASSESSMENT

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

Yes, the remedies for the sites are functioning as intended by the decision documents. The remedy selected in 1990 addressed surface materials and groundwater. Excavation of surface materials was conducted in 1990. The total amount of contaminated materials and sediments removed from the Route 72 and 532 sites was 37,200 and 60,200 cubic yards, respectively.

The 1999 ROD Amendment addressed contaminated groundwater at OU1. The selected remedy was AS/SVE in the source areas and natural attenuation of the downgradient plumes.

AS/SVE is complete at the Route 72 site Phase 1 area. An estimated 46,500 pounds of organic constituents were biodegraded and another 2,960 pounds of VOCs were stripped from the subsurface through January 2007, when AS/SVE operations concluded in the Phase 1 area. Sparging began in the Phase 2 area in 2003 and was discontinued in 2009. Mass removal from the Phase 2 area was estimated at 81,400 pounds of organic constituents. Biosparging began again in 2011 and ran through 2012, in the Phase 2 expansion area, and then resumed from 2015 to 2018, as Phase 3. For the 2011-2012 and 2015-2018 periods, mass removed was not quantified. The performance of the system was based on groundwater concentration reductions and post-operation rebound monitoring.

Groundwater concentrations of COCs generally continue to decline in the plume stability and sentinel monitoring wells. Although groundwater at the sites has not yet met the groundwater remedial goals established in the OU1 ROD, and increasing trends for 1,2-DCA and benzene have been observed at sentinel wells 72-WPSG-28C and 72-WPSG-25C, respectively, there are currently no receptors that could be exposed to groundwater and a

CEA/WRA is in place to prevent the installation of drinking water wells in the contaminated plume. In addition, the new sentinel well cluster (72-WPSG-29A, 72-WPSG-29B, and 72-WPSG-29C) will be used to assess if the extent of 1,2-DCA contamination requires further evaluation. Concentrations of 1,2-DCA and BTEX appear to be increasing in the surface water and sediments in Long Cripple Branch and Pope Branch. However, the concentrations identified continue to remain below their respective Tier 1 toxicity thresholds and do not present a threat to the environment. Nevertheless, surface water and sediment monitoring will continue to evaluate these trends.

At the Route 532 site, an estimated 44,500 pounds of organic constituents were biodegraded, and another 1,600 pounds of VOCs were stripped from the subsurface by July 2005, when AS/SVE operations ceased. Although annual monitoring of MNA wells shows that there is variability the in 1,2-DCA concentrations remaining in the disposal area, contaminant concentrations in downgradient locations at the Route 532 site are approaching GWRGs.

The required institutional controls of CEA/WRA are in place at both sites and continue to prohibit any contact with the groundwater through well installation. The conditions identified in the 1999 ROD Amendment which would require the contingency remedy have not occurred.

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?

Human Health Risk Assessment

The toxicity data, exposure assumptions, pathways, and receptors that were used to estimate the potential risks and hazards to human health followed the standard risk assessment paradigm in use at the time. Some of the toxicity values used to calculate the risks and hazards in the ROD have changed; however, the changes would not impact the remedial decision that was made for the site. The groundwater cleanup levels (e.g., NJDEP GWQS for the Pinelands) identified in the ROD were based on cleanup values used at that time; and these standards are still valid even if some of the standards have been revised to be more stringent. Emerging contaminant 1,4-dioxane, was sampled at the Route 72 and Route 532 sites in 2020, 2021, and 2022. In 2022, 1,4-dioxane was not detected in the background and sentinel wells at Route 72 but was detected above the NJDEP GWQS of 0.4 ug/l in the centerline wells at Route 72 as well as a couple of centerline wells at Route 532. Despite these exceedances, concentrations are still relatively low and there is no use of groundwater as drinking water in this area. Monitoring of 1,4-dioxane will continue, and any further updates related to toxicity values will be monitored through the next FYR period.

Vapor intrusion

The previous five-year reports indicated that soil vapor intrusion was not evaluated in the original risk assessment. The vapor intrusion pathway was considered in the first FYR in that if buildings were constructed on or adjacent to the contaminated plumes, they would need to be sampled or constructed to include a vapor mitigation system. However, development is still extremely unlikely, given the sites are in a protected area of the Pinelands. This evaluation is still valid, and therefore, vapor intrusion is still not an issue at this site.

Ecological Risk Assessment

The previous five-year reports states that the ecological risk assessments indicated that the risk to receptors in the downgradient wetlands from chemicals discharging from groundwater was negligible at the Route 72 site, and no measurable impact to the ecosystem related to the groundwater plume was observed or anticipated in the surface water and wetlands downgradient of the Route 532 site. Contaminated surface materials and sediments (soils, sludges, debris, etc.) were excavated and disposed at a permitted off-site facility. Surface water and sediment samples have been collected on a biennial basis at Route 72. The recent 2022 surface water and sediment sampling data at Route 72 were compared to baseline and historic maximum values as well as to conservative Tier 1 toxicity thresholds used in the ecological risk assessment, and the contaminant concentrations in surface water and sediment were below their respective Tier 1 toxicity thresholds.

Thus, the remedial actions objectives used at the time of the remedy selection are still valid and protective of the human health and the environment.

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 would call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)	
Operable Unit: 1	*Protectiveness Determination:* Protective
Protectiveness Statement: The OU1 remedy is protective of human health and the environment.	

Sitewide Protectiveness Statement
Protectiveness Determination: Protective
Protectiveness Statement: The remedies at the Woodland Township Route 72 and the Woodland Township Route 532 sites are protective of human health and the environment.

VIII. NEXT REVIEW

The next FYR report for the Woodland Township Route 532 and Route 72 Superfund Sites is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Progress Reports

07/25/19, Q2 2019 (04/01/19-06/30/19)
10/21/19, Q3 2019 (07/01/19-09/30/19)
01/29/20, Q4 2019 (10/01/19-12/31/19)
05/14/20, Q1 2020 (01/01/20-03/31/20)
07/21/20, Q2 2020 (04/01/20-06/30/20)
10/21/20, Q3 2020 (07/01/20-09/30/20)
01/21/21, Q4 2020 (10/01/20-12/31/20)
07/15/21, Q2 2021 (04/01/21-06/30/21)
01/31/22, Q3 and Q4 2021 (07/01/21-12/31/21)
07/18/22, Q1 and Q2 2022 (01/01/22-06/30/22)
01/27/23, Q3 and Q4 2022 (07/01/22-12/31/22)

Route 532 Well Reduction Memorandum
December 20, 2019

Monitoring Well Installation and Construction Details Memorandum
Route 72 Treatment Area
March 6, 2020

Emerging Contaminants Conceptual Sampling Outline Memorandum
March 18, 2020

2018 Annual Groundwater Remedy Update
Phase 3 Biosparging Performance and
Natural Attenuation Monitoring
June 26, 2019

2019 Annual Groundwater Remedy Update
Phase 3 Biosparging Performance and
Natural Attenuation Monitoring
April 17, 2020

Biennial Certification Form (Groundwater)
Route 72
November 19, 2020

Biennial Certification Form (Groundwater)
Route 532
November 19, 2020

Biennial Certification Form (Groundwater)
Route 72
September 9, 2022

Biennial Certification Form (Groundwater)
Route 532
September 9, 2022

2020 Annual Groundwater Remedy Update
Phase 3 Biosparging Performance and
Natural Attenuation Monitoring
May 3, 2021

Route 72 Recommended Groundwater Monitoring Optimization [Well Reduction]
May 9, 2022

2021 Annual Groundwater Remedy Update
Phase 3 Biosparging Performance and
Natural Attenuation Monitoring
May 9, 2022

2022 Annual Groundwater Remedy Update
Phase 3 Biosparging Performance and
Natural Attenuation Monitoring
April 10, 2023

1990 ROD OU1 - https://semspub.epa.gov/work/02/99347.pdf

1993 ROD OU2 Route 72 - https://semspub.epa.gov/work/02/99348.pdf

1993 ROD OU2 Route 532 - https://semspub.epa.gov/work/02/99346.pdf

1999 ROD Amendment OU1 - https://semspub.epa.gov/work/02/451956.pdf

2009 (First) Five-Year Review - https://semspub.epa.gov/work/02/105107.pdf

2014 (Second) Five-Year Review - https://semspub.epa.gov/work/02/265513.pdf

2019 (Third) Five-Year Review - https://semspub.epa.gov/work/02/568956.pdf

APPENDIX B – FIGURES

Figure 1

Route 72

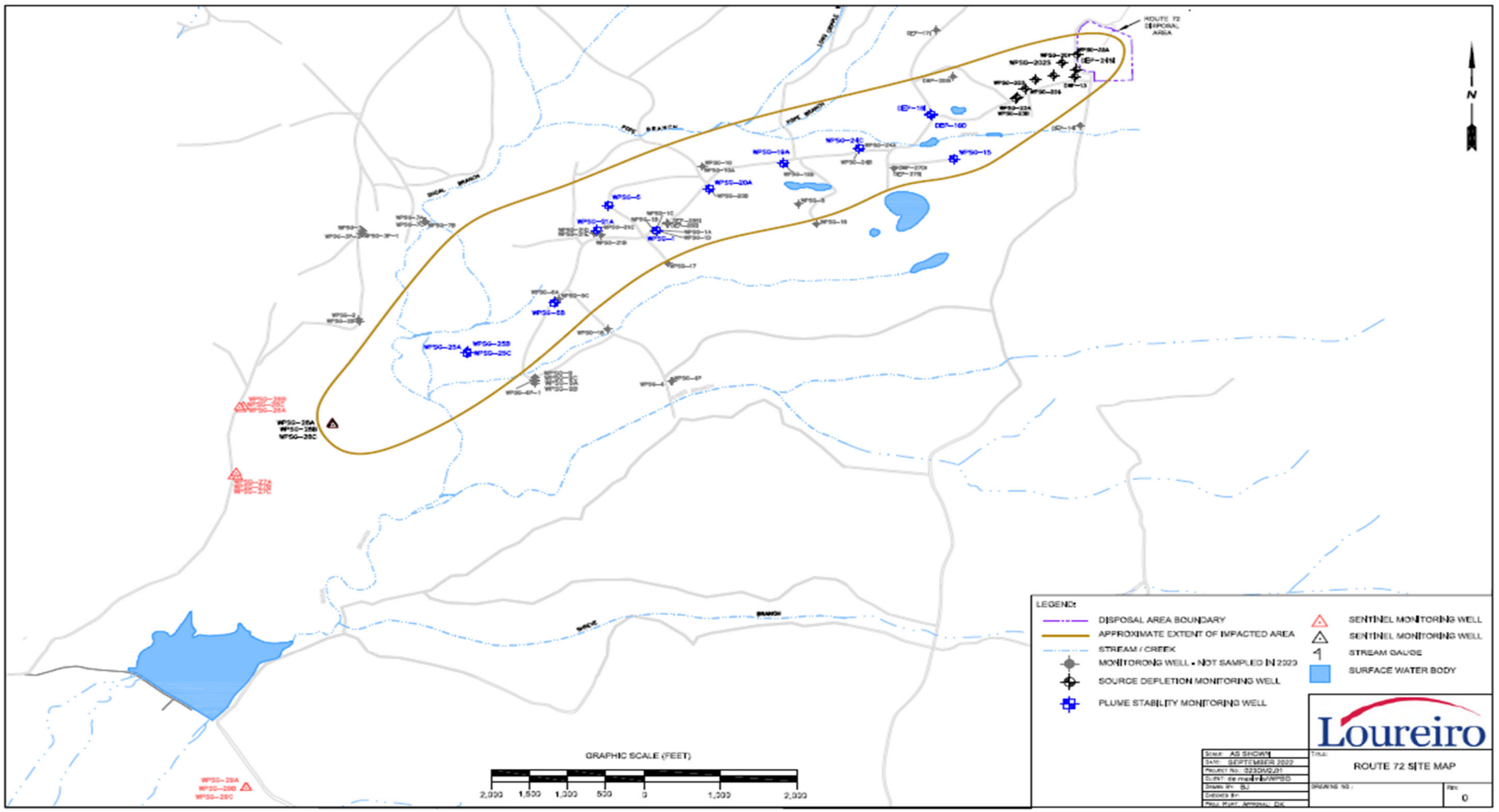


Figure 2

Route 532

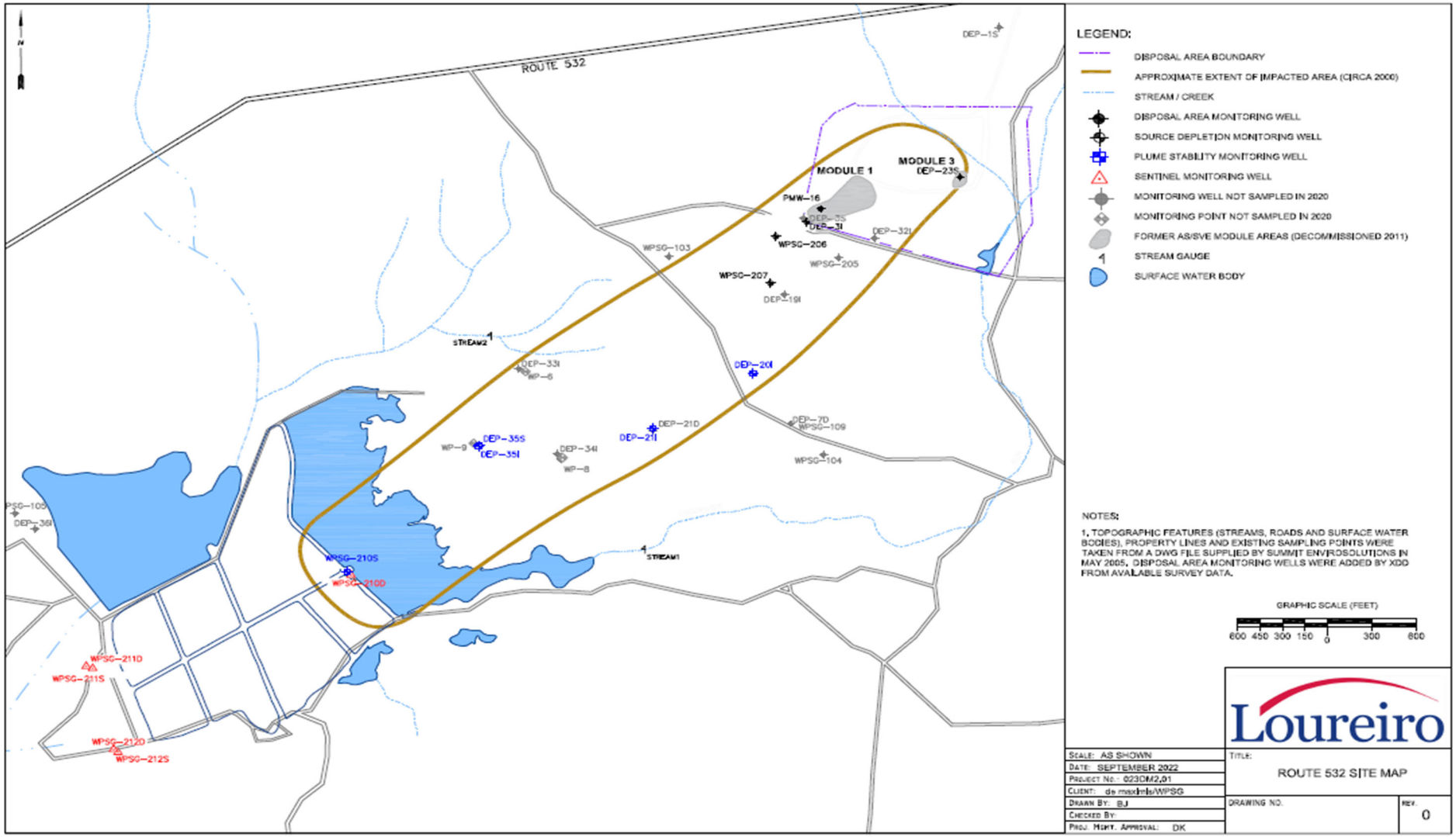


Figure 3

2022 Statistical Trend Analysis - Route 532 Site

		Monitoring Well	1,2-Dichloroethane						
			# Samples	S Statistic	Z Statistic	Probability of Trend	Coeff. of Variation (Cv)	Quantitative Interpretation	Comments
INCREASING DISTANCE FROM FORMER DISPOSAL AREA	DISPOSAL AREA	532-DEP-23S	44	-822	-8.30	> 99.5%	--	DECREASING	Below GWRG since 2009
		532-PMW-16	47	-172	-1.57	94.1%	--	DECREASING	290 µg/L to 67 µg/L - 2020 to 2021. 190 µg/L in 2022
	SOURCE DEPLETION	532-WPSG-206	32	-179	-2.89	> 99.5%	--	DECREASING	62 µg/L to 6 µg/L - 2018 to 2022
		532-WPSG-207	26	-255	-5.60	> 99.5%	--	DECREASING	Below GWRG since 2006
	PLUME STABILITY	532-WPSG-210S	21	-47	-1.39	91.7%	--	DECREASING	1.7 µg/L to 12 µg/L - 2012 - 2022
		532-WPSG-211S	--	--	--	--	--	--	All samples below GWRG
		532-WPSG-211D	--	--	--	--	--	--	All samples below GWRG

Note:
Only location monitored in 2022 were included in the analysis.
The number of samples represents detections only; non-detects were excluded.

For trend determination, minimum number of COC detections = 4.
Z-Statistic is only applicable to sample size greater than 10.

Mann Kendall analyses were performed for constituents of concern (COC) at monitoring wells included in the June 17, 2005 Revised Remedial Action Work Plan. All available data (1987 to 2022) were used in the analysis, except as follows:

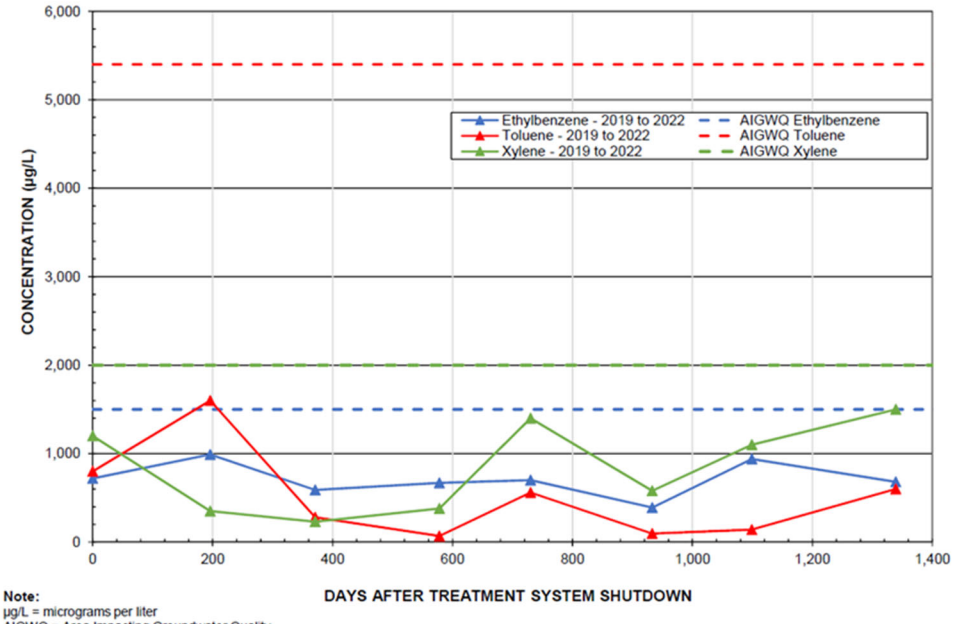
* - Non detect values were not included in the analyses.
For an in-depth explanation of the Mann-Kendall Analysis see "Guidance for Data Quality Assessment: Practical Methods for Data Analysis" EPA QA/G-9

Quantitative Analysis Assumptions

S or Z Statistics	Probability	Cv	Interpretation
<0	>90%	--	Decreasing
+ or (-)	<90%	≤1	Stable
+ or (-)	<90%	>1	No Trend
>0	>90%	--	Increasing

Figure 4

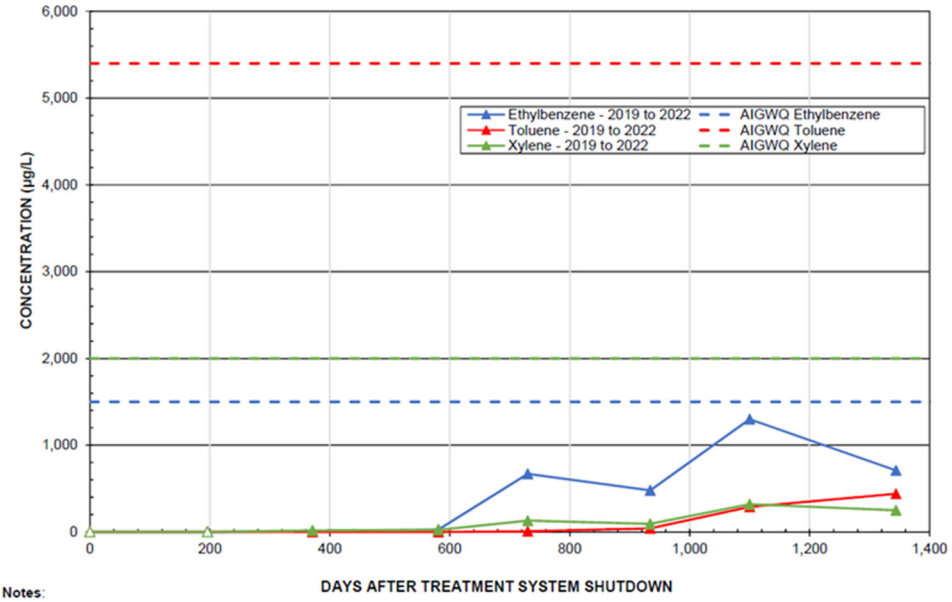
Well 72-DEP-11S Rebound VOC Concentrations – Route 72



Note:
µg/L = micrograms per liter
AIGWQ = Area Impacting Groundwater Quality

Figure 5

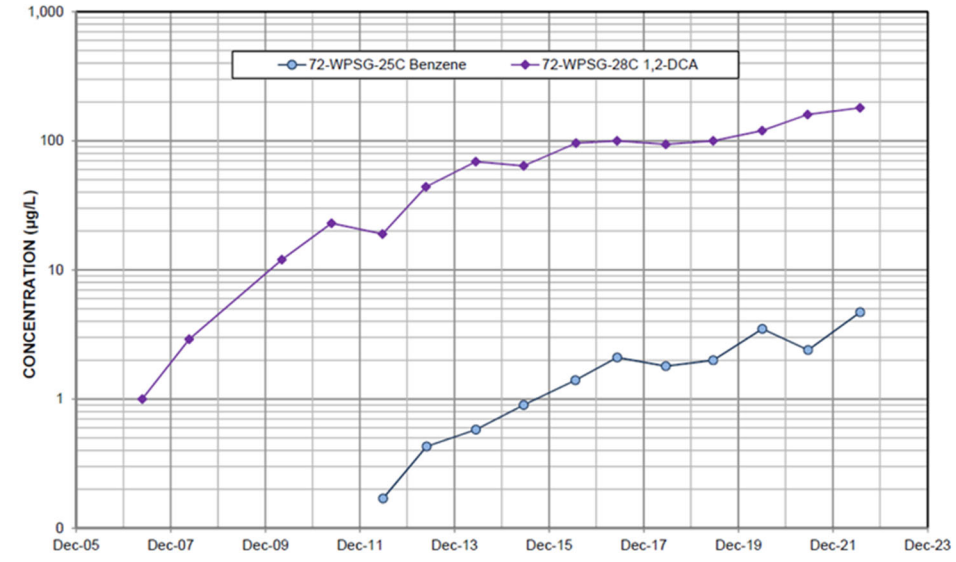
Well 72-PMW-3 Rebound VOC Concentrations – Route 72



Notes:
µg/L = micrograms per liters
AIGWQ = Area Impacting Groundwater Quality

Figure 6

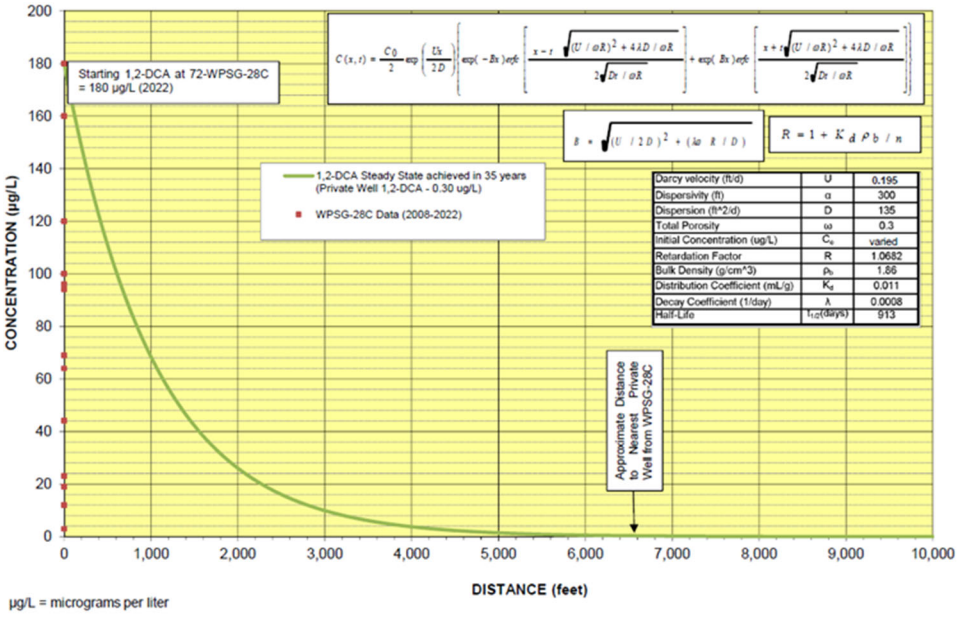
Groundwater Concentration Trends at Select Wells - Route 72 Site



Notes:
µg/L = micrograms per liter
TCE = trichloroethylene
1,2-DCA = 1,2-dichloroethane

Figure 7

1,2-Dichloroethane Transport Model for Well 72-WPSG-28C - Route 72 Site



µg/L = micrograms per liter

APPENDIX C – CLIMATE CHANGE ASSESSMENT

According to the Region 2 Guidance for Incorporating Climate Change Considerations in Five Year Reviews, two climate change tools were utilized to assess the Woodland Township Route 532 and Route 72 Superfund sites. Screenshots from each of the tools assessed are included here.

The first tool used to assess the County of Burlington was The Climate Explorer. According to this tool, average daily temperatures are projected to increase. Figure C-1 shows the projected increase in the average daily maximum temperature. However, Figures C-2 and C-3 show that days with >3" precipitation and the number of dry days are expected to remain fairly constant. Therefore, the site is not likely to be significantly impacted by drought. Figure C-4 shows a summary of the top climate concerns for Burlington County.

The second tool utilized was Risk Factor (formerly Flood Factor). This tool states that flooding is a moderate risk and wildfire is a severe risk in Woodlands Township over the next 30 years. These risk levels are based on the number of properties that are predicted to be affected (Figures C-5 and C-6). However, the Woodland sites are mostly outside of that major flood area. In addition, there are no reports of any direct evidence of flooding at either of the sites.

In regard to fires, the closest fire reported was the Penn State Forest Fire (March 30 – 31, 2019) that burned 11,000 acres. Besides the burning of the surrounding area, the only damage to the sites was to the well pump shed next to the perimeter security fence. Potential damages associated with wildfires will continue to be monitored. However, wildfires are not expected to present a significant risk to site protectiveness since there is no longer an active remedy. Only monitoring remains to be performed.

Based on the information above, potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the sites.

Figure C-1

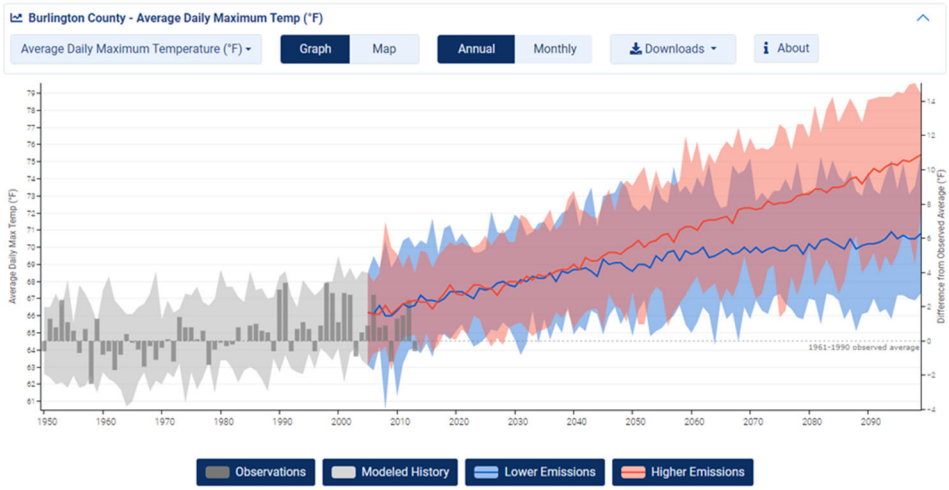


Figure C-2

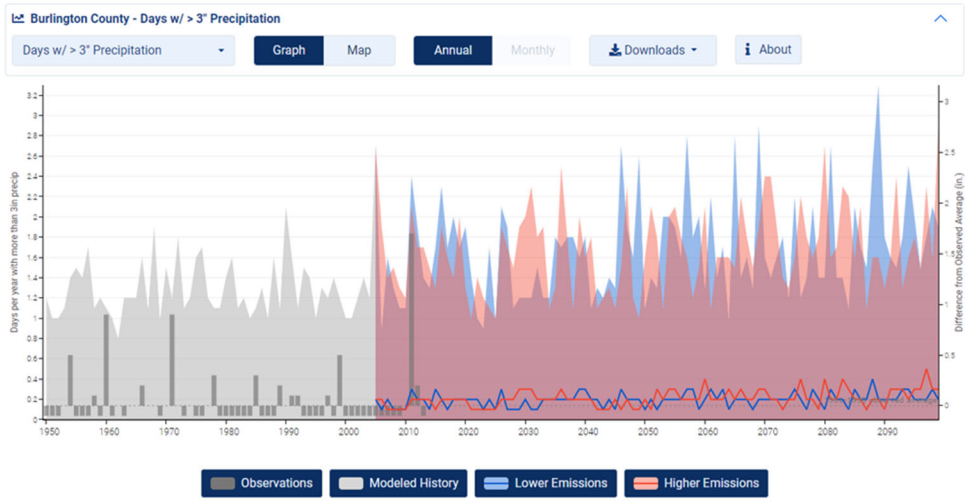


Figure C-3

Figure C-4

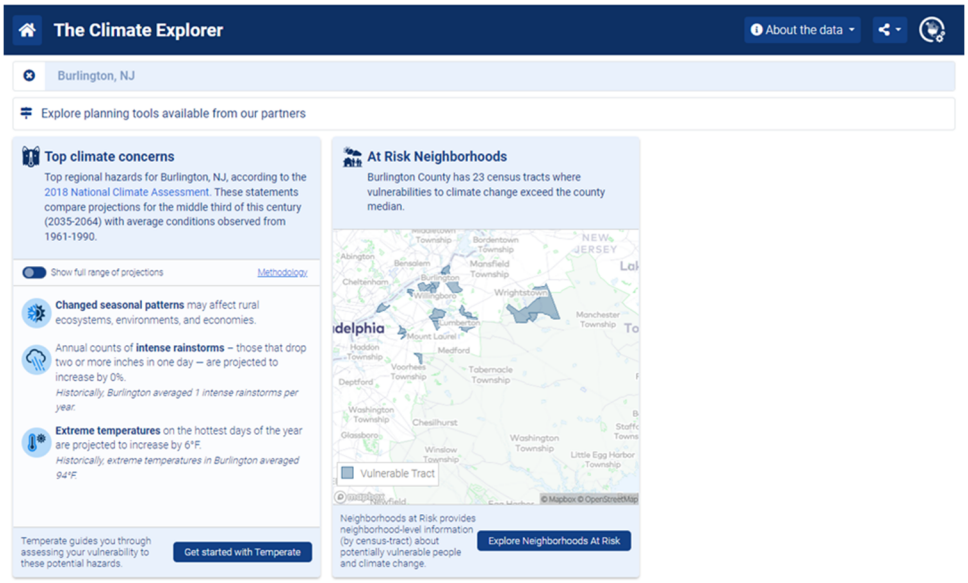


Figure C-5

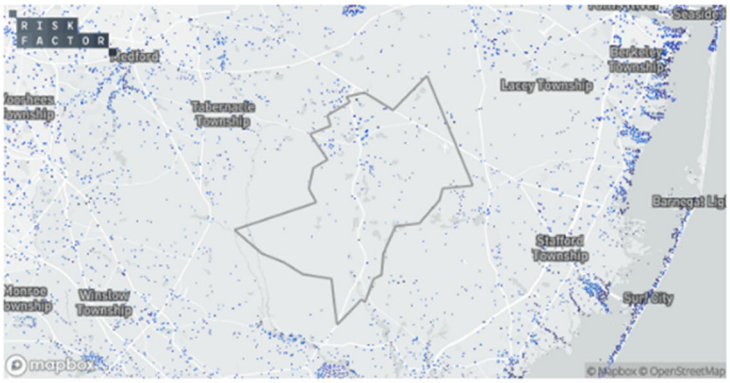
Moderate

FLOOD FACTOR

There are **1,791** properties in **08019** that have greater than a **26%** chance of being severely affected by flooding over the next 30 years. This represents **14%** of all properties in 08019.

Click here to see how your property might be affected by flood risk.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area. Overall, **08019** has a **moderate risk of flooding** over the next 30 years, which means flooding is likely to impact day-to-day life within the community. This is based on the level of risk the properties face rather than the proportion of properties with risk.



08019 Flood Risk

Residential **Moderate Risk**
43 out of **343** homes

Road **Major Risk**
208 out of **410** miles of roads

Commercial **Moderate Risk**
4 out of **14** commercial properties

Critical Infrastructure **Moderate Risk**
1 out of **9** infrastructure facilities

Social Facilities **Minimal Risk**
0 out of **3** social facilities

Minor Moderate Major Severe Extreme

Figure C-6

Does 08019 have Wildfire Risk?

Severe
FIRE FACTOR

There are **19,219** properties in **08019** that have some risk of being affected by wildfire over the next 30 years. This represents **99%** of all properties in 08019.

Click here to see how your property might be affected by fire risk.

In addition to damaging properties, wildfire can also cut off access to utilities, emergency services, impact evacuation routes, and may impact the overall economic well-being of an area. Overall, **08019** has a **severe risk of wildfire** over the next 30 years. This is based on the level of risk the properties face rather than the proportion of properties with risk.

08019 Wildfire Risk

Residential **Major Risk**
343 out of 343 homes

Commercial **Severe Risk**
14 out of 14 commercial properties

Critical Infrastructure **Extreme Risk**
9 out of 9 infrastructure facilities

Social Facilities **Severe Risk**
2 out of 3 social facilities

Minor Moderate Major Severe Extreme