THIRD FIVE-YEAR REVIEW REPORT FOR ROCKAWAY TOWNSHIP WELLS SUPERFUND SITE MORRIS COUNTY, NEW JERSEY

Prepared by

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

Approved by:

Evangelista, Pat Digitally signed by Evangelista, Pat
Date: 2020.09.23 16:27:03 -04'00'

Pat Evangelista, Director
Superfund and Emergency Management Division

Date:

See Signature Block

598799

Table of Contents

LIST OF ABBREVIATIONS & ACRONYMS

CFR	Code of Federal Regulations
DTP	Denville Technical Park
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICs	Institutional Controls
MCL	Maximum Contaminant Limit
MW	Monitoring Well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NJDEP	New Jersey Department of Environmental Protection
NJGWQS	New Jersey Ground Water Quality Standards
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVE	Soil Vapor Extraction
VI	Vapor Intrusion
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of remedies in order to determine if the remedies are 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 identify recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR 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 third FYR for the Rockaway Township Wells Superfund site. The triggering action for this policy review is the signing date of the previous FYR report, September 28, 2015. 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 site consists of two Operable Units (OUs), which will be addressed in this FYR. OU 1 addresses the contaminated groundwater, and OU 2 addresses soils which adversely impact the groundwater.

The Rockaway Township Wells Superfund site FYR was led by Lawrence Granite, the EPA Remedial Project Manager (RPM). Participants included Dr. John Mason (Geologist), Pat Seppi (Community Involvement Coordinator (CIC)), Michael Clemetson (Ecological Risk Assessor) and Dr. Lora Smith (Human Health Risk Assessor) of EPA. EPA notified the Potentially Responsible Party (PRP) of the initiation of the FYR on May 31, 2019.

Site Background

The site is located in both Rockaway and Denville Townships in Morris County, New Jersey. The site, as defined by the areal extent of the contaminated groundwater plume, lies in the center of a Y-shaped valley in an otherwise hilly area of the New Jersey Highlands on approximately 0.29 square miles located immediately north of Interstate 80 (Figure 1). The general area is predominantly non-residential industrial-zoned land which includes the Denville Technical Park (DTP), an industrial building complex. Area development includes commercial businesses, light industries including service stations, restaurants, hotels, plastic manufacturers, truck/transit companies and commercial office complexes.

The source area of site-related contamination is predominantly located in Denville Township, while the impacted downgradient water supply wells are located in Rockaway Township. The site sits atop the Buried Valley Aquifer Complex in the Rockaway River Basin. Both a shallow (not uniformly present over the entire site) and deep aquifer are present at the site. The municipal wells that are impacted by Site contamination are high-yielding (approximately 500 gallons per minute) municipal supply/production wells which are located approximately 1,000 feet north-northwest of the initial release/spill source zone (near Buildings 1 and 2 in the DTP). The municipal wells are screened in sand and gravel deposits approximately 130 to 160 feet below the ground surface. The capture zone (area of influence) of the municipal wells extends horizontally and vertically to the source area in the DTP.

Groundwater is used as a drinking water source for approximately 14,000 residents in Rockaway Township. The groundwater will continue to be the source of drinking water for the foreseeable future. The surface waters of the White Meadow Brook and the Beaver Brook (nearby surface water bodies) flow into the Rockaway River and are not used for drinking water. Wetlands associated with these brooks exist in the vicinity of the site.

Water samples collected by Rockaway Township and the New Jersey Department of Environmental Protection (NJDEP) from the Rockaway Township wells in late 1979 and early 1980 indicated the presence of trichloroethene (TCE) and other volatile organic compounds (VOCs). The Township installed an activated carbon adsorption treatment system in response to this contamination. In October 1980, the treated water developed an unpleasant taste and odor. Analysis showed it to be contaminated with the gasoline additives, di-isopropyl ether (DIPE) and methyl tertiary-butyl ether (MTBE).

Following the discovery of contamination in the wellfield, NJDEP performed an area-wide industrial survey to identify potential sources of the groundwater contamination. The survey, along with additional information, revealed that petroleum hydrocarbon products were present in groundwater at a Shell Gas Station and the Town and Country Gas Station, which are both located on Green Pond Road to the west of the wellfield. Chlorinated VOCs were present in groundwater at the DTP.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION	
Site Name:	Rockaway Township Wells Superfund Site
EPA ID:	NJD980654214

Region: 2	**State:** NJ	**City/County:** Rockaway Township, Morris County
SITE STATUS		
NPL Status: Final		
Multiple OUs? Yes	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA ***[If "Other Federal Agency", enter Agency name]*:** Click here to enter text.		
Author name (Federal or State Project Manager): Lawrence A. Granite		
Author affiliation: EPA Region 2		
Review period: 11/26/2019 - 7/2/2020		
Dates of site inspections: 8/20/19 and 10/3/19		
Type of review: Policy		
Review number: 3		
Triggering action date: 9/28/2015		
Due date *(five years after triggering action date)*: 9/28/2020		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The Remedial Investigation/Feasibility Study (RI/FS) documents, which addressed the groundwater contamination, were completed in June 1993. A focused RI was subsequently completed to address the contaminated soils.

The contaminants of concern (COCs) presented in the baseline human health risk assessment for groundwater (OU 1) were VOCs including TCE, 1,1,1-trichloroethane (TCA), vinyl chloride, methylene chloride and arsenic. The OU 2 COCs identified for both soil and outdoor soil gas include TCE, tetrachloroethene (PCE), TCA and cis-1,2-dichloroethene (cis-1,2-DCE).

Potential impacted resources/targets included potable water supply users on the township public supply, as well as employees working in buildings overlying the plume where the vapor intrusion (VI) pathway was completed.

The baseline risk assessment stated that the domestic use of untreated groundwater was considered unlikely under both current and future land use scenarios because the groundwater is treated at the wellfield prior to distribution to the public. The evaluation of hypothetical use of untreated groundwater yielded risks above acceptable limits. The baseline risk assessment also indicated that adverse impacts to ecological receptors were unlikely. A risk assessment was conducted for OU 2 and found that while subsurface soils did not present an adverse impact to human or ecological receptors from direct contact, the COC concentrations were above New Jersey Impact to Groundwater screening levels and, as a result, soil remediation was warranted in order to protect groundwater. In conjunction with the groundwater and soil remedies being implemented for the site, NJDEP performed VI assessments of Buildings 1 and 2 within the DTP. The VI assessment identified exceedances of the NJDEP and EPA screening levels for both indoor air and sub-slab soil gas at a number of locations within the technical park which required remediation to protect workers.

Response Actions

In June 1986, pursuant to the New Jersey Spill Compensation and Control Act (Spill Act), N.J.S.A. 58:10-23.11 et. seq., NJDEP issued Directives to Morton Thiokol Incorporated (Thiokol) (then owner of the DTP property), Shell Oil Company (Shell), and the Town and Country Gas Station requiring payment to NJDEP to conduct a RI/FS, and payment to Rockaway Township for the operation and maintenance of the air stripping unit. In May 1987, pursuant to the Spill Act, NJDEP entered into an Administrative Consent Order (ACO) with Thiokol and Shell in which the two companies agreed to make the above payments. An RI was performed and completed in November 1988.

Based on the information from the 1988 RI Report, NJDEP determined that additional studies were necessary and began a Phase II RI. The Phase II RI Report and an FS Report were finalized in September 1992 and December 1992, respectively.

Alliant Techsystems (ATK) (a successor to Thiokol) continues to pay for the operation and maintenance costs of the Township's air stripping unit. In addition, ATK, in accordance with ACO requirements, continues to implement the groundwater and soil remedial actions at the site.

EPA issued an OU l ROD on October 5, 1993. The remedial action objectives (RAOs) as identified in the ROD are as follows:

- Prevent potential human exposure to contaminants in the deep aquifer groundwater which pose a carcinogenic risk to human health in excess of 10^{-4} to 10^{-6} and/or which have a Hazard Index greater than 1;

- Prevent potential human exposure to contaminants in the shallow aquifer groundwater which pose a carcinogenic risk to human health in excess of 10^{-4} to 10^{-6} and/or which have a Hazard Index greater than 1; and
- Restoration of water quality of the shallow and deep aquifers to appropriate Federal and New Jersey water quality standards.

The major components of the OU 1 groundwater remedy include:

- Extraction of contaminated groundwater and restoration of the aquifer to the more stringent of the federal and New Jersey Maximum Contaminant Limits (MCLs) and New Jersey Ground Water Quality Standards (NJGWQS);
- Treatment of the extracted groundwater to levels attaining the more stringent of the federal and New Jersey MCLs and NJGWQS;
- Reinjection of the treated groundwater to the extent needed to promote groundwater restoration, with discharge of any surplus to the public water supply; (this was subsequently changed in the OU 2 ROD to surface water discharge);
- Replacement of the deteriorated air stripping treatment system at the Rockaway Township Wellfield; and,
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

Three distinct groundwater contaminant plumes are associated with the discrete source areas at the site (see Figures 2 and 3). The areas of concern are as follows: the eastern plume (associated with the Former Degreaser Area in DTP Building 2); the middle plume (associated with the Former Waste Oil Underground Storage Tank (UST) Area between DTP Buildings 1 and 2); and the western plume (associated with Building 1).

The primary contaminant of concern in the eastern and western plume areas is TCE. The middle plume contains both 1,1,1-TCA and TCE with lesser concentrations of their respective decay products.

The October 8, 2002 OU 2 ROD addressed contaminated soil adversely impacting the groundwater. The RAOs established for the soils at the Rockaway Township Wells site, OU 2, are: to provide protection for the Rockaway Township Wells, and to remediate the contaminant source areas in the soil at the DTP to meet the Impact to Groundwater New Jersey Soil Cleanup Criteria. The major components of the OU 2 remedy included the following:

- Soil vapor extraction (SVE) of VOCs in both the Former Degreaser Pit Area and the Former UST Area;
- Treatment, if required, for the extracted vapors prior to release to the atmosphere; and,
- Operation of the SVE system for approximately 3 to 5 years to attain the New Jersey Impact to Groundwater Soil Cleanup Criteria.

In addition, the 1993 ROD was modified to allow the treated groundwater to be discharged to the surface water (Beaver Brook) instead of being re-injected or reused as a potable source.

For soil/source areas, seven areas of concern were initially evaluated which were then reduced to two major areas of contamination requiring soil remediation. The two areas included the Former UST adjacent to Building 2 and a Former Degreaser Area in Building 2.

NJDEP performed VI assessments of Buildings 1 and 2 within the DTP. The VI assessment identified exceedances of the NJDEP and EPA screening levels for both indoor air and sub-slab soil gas at a number of locations within the technical park. Upon determination that the heating and ventilation system adjustments could not rectify the indoor air condition, it was determined that a sub-slab depressurization system (SSDS) would be installed.

Status of Implementation

The groundwater and SVE remediation systems were put into service in 2005 and operation of both systems is ongoing.

Groundwater Remedy

Groundwater Extraction and Treatment System

Operation of the groundwater extraction and treatment system was initiated in June 2005. The extraction wells were constructed in geographic locations that allowed for groundwater remediation of the most contaminated portion of the plume, thereby reducing the contamination migrating to the Rockaway Township Wellfield and aiding in the restoration of groundwater to the existing quality standards. Figure 3 shows the location of the extraction wells, designated as EW. Extracted groundwater is treated through use of an air stripper to remove VOCs prior to discharge to surface water. Discharge is regulated in accordance with a New Jersey Pollution Discharge Elimination System permit. The air from the groundwater treatment system's (GWTS's) air stripper is discharged to the atmosphere in accordance with an NJDEP air permit.

Treated water meets surface water discharge requirements through a NJPDES permit.

Soil Remedy

The soil vapor extraction remediation system was installed in June 2005 and consists of 10 SVE wells used in conjunction with three dual-phase wells capable of removing both vapor and liquid phase contamination. Figure 5 shows the location of these wells. Extracted vapors are routed to vapor-phase carbon for treatment prior to discharge in accordance with an air permit issued by the State of New Jersey. Air samples collected from the carbon treatment system effluent show that air permit discharge requirements for the system are being met.

Since start-up, a number of SVE wells have been closed to optimize withdrawal from the remaining wells. In 2018, eight SVE points remained active. These wells continue to withdraw VOCs. The estimate provided in the 2019 progress report indicates that approximately 18 pounds of VOCs were extracted from the soil during the 2019 operating period. Since the initial SVE system start-up in June 2005, approximately 1,610 pounds of VOCs have been removed.

In conjunction with the groundwater and soil remedies being implemented for the site, the SSDS was constructed and became operational in Buildings 1 and 2 in 2010. Following installation of the SSDS Mitigation Systems, indoor air and soil vapor sampling results indicated areas requiring additional monitoring in Building 2. Subsequent sampling in 2011 indicated the systems were functioning properly. The PRP does not perform annual sampling in Buildings 1 and 2 as part of the vapor intrusion mitigation measures at the site. However, as per the NJDEP's vapor intrusion guidance, the PRP performs annual performance inspections of the SSDS Mitigation Systems. This includes physical inspections of the system equipment and piping and measurements of vacuum and air flow for each suction point. Repairs/replacements are based on the comparison of these values to those established at the time of system commissioning. The results of these inspections indicate that the SSDS Mitigation Systems remain protective of vapor intrusion in their respective buildings. A round of indoor air sampling performed by the responsible party in both buildings in 2018 confirmed these results.

Institutional Controls

A Classification Exception Area/Well Restriction Area (CEA/WRA) (Site CEA ID# NJD980654214/Case ID# G000004876) was established for the site by NJDEP on November 17, 2000. This institutional control mechanism will ensure no unacceptable future use of the contaminated groundwater in the vicinity of the site until groundwater quality standards are achieved. The CEA/WRA remains in place. Figure 6 provides a site base map with the groundwater area of impact (approximate areal boundary of the CEA/WRA) delineation.

System Operations/Operation & Maintenance

Long-term groundwater and soil vapor monitoring is performed to track the performance of the remedial systems, delineate the extent of the contaminant plumes, and to evaluate compliance with the remediation goals. The groundwater monitoring network consists of 16 monitoring wells which are sampled for VOCs, and 23 monitoring wells measured for groundwater levels. In addition, three extraction wells are sampled for VOCs and monitored for groundwater levels.

The effectiveness of the SVE system is monitored by collecting influent air samples from each SVE well and dual-phase wells for laboratory analysis for VOCs. Sample collection is currently

performed on a semi-annual basis to monitor the effectiveness of the SVE and GWTS. Air permit requirements are being met for operation of the SVE vapor-phase carbon treatment systems.

The SSDS was constructed and became operational in Building 2 in July 2010 and the Building 1 system went on-line in November 2010. The results of quarterly rounds of indoor air/soil vapor sampling performed in 2011 indicated that site-related contaminants were below a level of concern but a non-site related chemical that was being used in an industrial operation was contributing to the elevated VOC concentrations in Building 2. The PRP performs annual performance inspections of the SSDS Mitigation Systems to ensure that the Systems remain protective of vapor intrusion in their respective buildings. A round of indoor air sampling performed in both buildings in 2018 confirmed that the subslab system continues to reduce indoor air concentrations below those seen in 2010; however, the use of products containing TCE and chloroform by some of the tenants continues to impact indoor air.

The frequency for inspections for the SSDS Mitigation System was changed from quarterly in 2011 to annual in 2012. Operation, maintenance and monitoring activities for these systems are ongoing.

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 changes in the region and near the site.

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 1: Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Protectiveness Deferred	A protectiveness determination of the groundwater remedy cannot be made until additional information is obtained regarding the vapor intrusion exposure pathway, groundwater is sampled for hexavalent chromium and 1,4-dioxane, the downgradient plume is delineated, and the effectiveness of EW-1 is evaluated.
2	Short-term Protective	The OU 2 remedy protects human health and the environment in the short term because the SVE

		continues to remove contaminant mass from the source area and the site is covered with buildings and pavement. In order for the remedy to be protective in the long-term, a deed notice needs to be established for soils.
Sitewide	Protectiveness Deferred	A protectiveness determination of the groundwater remedy cannot be made until additional information is obtained regarding the vapor intrusion exposure pathway, groundwater is sampled for hexavalent chromium and 1,4-dioxane, the downgradient plume is delineated, and the effectiveness of EW-1 is evaluated.

Table 2: Status of Recommendations from the 2015 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
1	No prior testing for hexavalent chromium or 1,4-dioxane	Groundwater samples should be collected for hexavalent chromium and 1,4-dioxane from both the site and the municipal supply wells to ensure they are not present in groundwater or drinking water.	Completed	Starting in 2016, groundwater samples collected from the site and the municipal supply wells have been analyzed for both of these compounds.	2016
1	Downgradient plume monitoring	A well cluster should be installed with one well within ten feet below the water table and a second at about a 50-foot depth in a location between Extraction Well No. 1 and 701 Ford Road (the parcel across/ north of Ford Road opposite of Building 2)	Completed	In lieu of a new well cluster, it was decided to utilize existing monitoring wells with screen intervals encompassing the recommended depths on the property downgradient of EW-1. These wells [MW-5D and MW-4 (701)] have been sampled during each annual round of groundwater sampling performed since 2016.	2016
1	Performance of Groundwater Extraction Well No. 1	Extraction Well No. 1 should be rehabilitated so that it can perform at its operation flow rate of five gallons per minute.	Completed	Well rehabilitation activities have been performed at EW-1 in 2016, 2017 and 2018 to restore pumping rates to approximately 5-6 gpm. The well operated at an average pumping rate of 4.5 gpm in 2019.	2018

1	Indoor Air Monitoring/Downgradient area indoor air monitoring	Sub-slab depressurization system operations and performance for Buildings 1 and 2 have been documented through the presentation of vacuum pressure readings. Indoor air samples should be collected and analyzed for Buildings 1 and 2 to confirm system performance. Additional efforts to identify indoor sources should also occur. Indoor air data at structures overlying the downgradient plume area have not been collected/ analyzed. Indoor air samples should be collected at 701 Ford Road and Buildings 3, 5 and 6.	Completed	Indoor air samples were collected from Buildings 1 and 2 in February 2018. The results of this sampling indicated that the sub-slab depressurization systems remained protective of vapor intrusion in both buildings. Investigations performed since the last FYR indicate that there is a clean lens of water beneath the 701 Ford Road building and a vapor intrusion investigation is not warranted at this time. Buildings 3 and 5 were investigated in 2016 and results indicated that the soil vapor intrusion (SVI) pathway is not a concern for these buildings. Building 6 is greater than 200 feet from the contaminated groundwater and farther away from the plume than Buildings 3 and 5 where the SVI pathway is determined to not be a concern at this time.	2018
2	Surface soil exposure was not evaluated in the risk assessment because most surfaces of the DTP are covered with buildings or paved; therefore, the direct contact pathway has been interrupted.	A deed notice is needed to ensure long-term protectiveness	Under Discussion	NJDEP is coordinating between the property owner and EPA. It is anticipated that a deed notice will be recorded by January 31, 2021.	

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, 2019, 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 Rockaway Township Wells site. The announcement can be found at the following web address: https://www.epa.gov/aboutepa/fiscal-year-2020-five-year-reviews.

In addition to this notification, EPA provided a public notice to Rockaway and Denville Townships with a request that the notice be posted to their web sites. The purpose of the public notice was to inform the community that EPA is conducting a FYR to ensure that the remedy implemented at the site remains protective of human health and the environment and is

functioning as intended by the decision documents. In addition, the notice included the RPM and CIC email addresses and telephone numbers. Rockaway and Denville Townships posted the notice to their web sites in February 2020. EPA has not been contacted by any members of the community regarding this FYR.

EPA has made site-related documents available to the public on-line and in the record repository maintained at the EPA Region 2 office (290 Broadway, New York, New York 10007). Furthermore, when this FYR is completed, copies will be sent to the record repository, representatives of the Townships, as well as posted on the website for the site: https://www.epa.gov/superfund/rockaway-township-wellfield.

Data Review

Groundwater Monitoring Results

Groundwater monitoring occurs on an annual basis and has been performed consistently since 2005. The current monitoring well network consists of 16 monitoring wells sampled for target compound list (TCL) VOCs and 1,4-dioxane, and 25 monitoring wells measured for groundwater elevations measured to the nearest 0.01 ft. Additionally, the three extraction wells are sampled for TCL VOCs and 1,4-dioxane as well as monitored for groundwater elevations.

The direction of groundwater flow, as measured in the monitoring well network prior to the start-up of the GWTS, is in the north-northwest direction. Thus, groundwater in the vicinity of the site flows toward the wellfield and is thought to be recharged by natural precipitation falling on the area, groundwater drainage along the valley walls, groundwater flowing from areas upgradient of the site and infiltration from surface streams. Since the start-up of the GWTS, groundwater flow has been locally influenced by the extraction wells. The groundwater flow direction is still generally to the north toward the wellfield, but some localized effects from pumping are evident, particularly at extraction well EW-3 where there is a noticeable cone of depression. During 2019, EW-1, EW-2, and EW-3 were maintained at average pumping rates of 4.5 gpm, 15.7 gpm, and 60.5 gpm, respectively. Well rehabilitation was performed on EW-1 several times during the current review period and will continue to be performed as needed moving forward. Rehabilitation removes scaling and temporarily allows the well to return to the designed operational flow rate of approximately 5 gpm, although variability in water table elevation can counteract the restoration of the extraction rate at this location.

This FYR covers groundwater sampling data from May 2015 through June 2019. Groundwater sampling results collected during this review period generally indicate steady to decreasing concentrations for site-related COCs, with some exceptions (discussed below). TCE and 1,1,1-TCA are the primary contaminants. Concentrations have generally remained consistently above the NJGWQS in affected wells (TCE GWQS = 1 µg/L; 1,1,1-TCA GWQS = 30 µg/L). Most recently, the maximum concentrations of TCE and 1,1,1-TCA detected onsite were 410 µg/L

(EW-1, 06/2019) and 3,010 µg/L (MW-2, 06/2019), respectively. The maximum concentration of TCE detected during this review period was 554 µg/L in 2015 (EW-1) a decrease from 8,130 µg/L in the previous review period (MW-3, 06/2011). The June 2019 1,1,1-TCA concentration of 3,010 µg/L at MW-1 represents the highest concentration of this contaminant on-site since 3,200 µg/L of 1,1,1-TCA was detected in November 2007 at the same well (see *Central Plume* section for further analysis). This value remains below the historically observed 1,1,1-TCA concentration at this well, which was most elevated in 2004 at 100,000 µg/L. Other site-related COCs which were detected above regulatory standards during the review period include PCE, 1,1-dichloroethene (1,1-DCE), 1,4-dioxane, carbon tetrachloride and 1,1,2-TCA.

There are three main source areas contributing to the plume of groundwater contamination that migrates toward the municipal wellfield: the eastern plume (Former Degreaser Pit Area), the central plume (Former Waste Oil UST Area), and the western plume (Figures 2 and 3).

Eastern Plume

EW-1 is located on the north side of Building 2, downgradient of the Former Degreaser Area. EW-1 was designed specifically to provide source-area capture and treatment of groundwater impacted from the Former Degreaser Pit Area. TCE and PCE are the primary COCs at EW-1, although TCE was the only VOC detected during the most recent measurements in June 2019, at 410 µg/L. TCE concentrations consistently remained above the MCL (1 µg/L) at EW-1, and concentrations fluctuated significantly. This fluctuation may be a result of residual soil contamination that is being intercepted by the rising water table in years in which there was above-average precipitation and recharge. During this review period, TCE concentrations varied between 57.5 µg/L (06/2018) and 554 µg/L (05/2015). Well rehabilitation, which is performed as needed and annually since 2016, has been an effective means of temporarily improving the flow rate of EW-1 while water levels in the aquifer permit. Continued monitoring of the eastern plume and downgradient wells during the next review period will ensure the effectiveness of EW-1 at reducing contamination concentrations in the subsurface.

Monitoring well MW-14D is located downgradient of the Former Degreaser Area and immediately adjacent to EW-1. TCE groundwater concentrations at MW-14D have decreased over time from 10,600 µg/L in 2001 (prior to the initiation of the GWTS) to less than 11 µg/L since 2008. The most recent TCE concentration at MW-14D was 1.6 µg/L. Long-term (ten-year) TCE concentration trends at MW-14D and two other wells in the eastern plume cited in the previous FYR (MW-9D and MW-12D) show that TCE concentrations generally remain above the MCL, and that concentrations are gently decreasing in MW-9D, and oscillatory in MW-12D and MW-14D. The eastern plume monitoring network has been augmented through the addition of MW-4(701) and MW-5D to the groundwater sampling plan (See section *Downgradient Monitoring Wells* below).

Central Plume

The central plume consists of both 1,1,1-TCA and TCE as well as the decay products 1,1,2-TCA, cis-l,2-DCE and 1,1-DCE. In addition, PCE and chloroform have been detected within the central plume. Monitoring wells MW-l, MW-2 and MW-3 demarcate the central plume source area.

EW-2 is located between Buildings 1 and 2, in the vicinity of the Former Waste Oil UST Area. This well was designed specifically to provide source-area capture and treatment of groundwater impacted by the Former Waste Oil UST Area. The primary COC captured by EW-2 is TCE. At this well, concentrations between 7.2 µg/L (06/2017) and 11.0 µg/L (06/2019) were observed during this review period. PCE, which was observed at concentrations as high as 278 µg/L in the previous review period, was not detected at EW-2 during this review period.

At shallow aquifer well MW-3, the TCE concentrations have decreased significantly from the historical high of 23,000 µg/L. Although concentrations remained above the regulatory standard of 1 µg/L, the most recent sampling event detected 2.6 µg/L (06/2019), and the maximum observed concentration during the review period was 16 µg/L (06/2017). Similarly, TCE concentrations at shallow well MW-2 have decreased significantly from historical highs (43,000 µg/L in 2005). However, during the current review period, increases were observed as TCE concentrations increased from 6.9 µg/L in 05/2015 to 105 µg/L in 2019. Downgradient of these Former Waste Oil UST Area wells, monitoring well MW-32D provides a monitoring point in the deep regional aquifer. At MW-32D, a thin (~5 ft) silt and clay layer provides some degree of isolation from overlying contamination within the shallow overburden aquifer. Here, TCE concentrations were stable above the regulatory standard, and consistently less than 10 µg/L during the review period (maximum concentration of 7.5 µg/L in 2015). 1,1,1-TCA concentrations at this well were consistently declining and below the regulatory standard of 30 µg/L, with a maximum concentration of 2.7 µg/L (05/2015).

Concentrations of 1,1,1-TCA, PCE and 1,1-DCE were highest in MW-1 with maximum concentrations during this review period of 3,010 µg/L (06/2019), 13.4 µg/L (06/2018) and 68.6 µg/L (06/2019), respectively. VOC concentrations at this well have decreased significantly since the historical high concentrations observed at the start-up of the GWTS (110,900 µg/L, 06/2004). However, since 2015, 1,1,1-TCA concentrations at MW-1 have risen sharply from 143 µg/L to 3,010 µg/L. This well is screened within the shallow aquifer and appears to be effectively separated from the deep aquifer in the immediate vicinity by a silt and clay unit. Neither EW-2 nor MW-21D, deep aquifer wells with surface positions within 100 feet of MW-1, recorded any 1,1,1-TCA detections during this review period. Similarly, no regulatory exceedances of 1,1,1-TCA were recorded by nearby shallow aquifer wells MW-2 or MW-3. These wells have had respective maximum concentrations of 0.66 µg/L (06/2019) and 2.5 µg/L (06/2019) since 2015.

The mechanism for the sudden and sustained concentration spikes of VOCs including 1,1,1-TCA and TCE at MW-1 and MW-2 has not been definitively characterized; however, rising concentrations may be related to fluctuation in the elevation of the water table in the shallow aquifer. These concentration increases were not accompanied by concurrent concentration spikes in groundwater from the dual phase wells, and the amount of VOC mass removed annually via the SVE system has decreased (see below). This indicates that 1,1,1-TCA and TCE are entering the shallow groundwater system and are not being effectively captured by the remedy. It is recommended that the SVE-dual phase well system be evaluated and optimized in order to effectively treat the shallow central plume such that downward contaminant migration is prevented.

Western Plume

EW-3 is located downgradient of the potential source area beneath Building 1. EW-3 was designed specifically to provide source-area capture and treatment of groundwater impacted from historical Building 1 operations. TCE is the primary COC at EW-3 with concentration ranges during this review period of 31 to 50 µg/L. Low levels of other VOCs, including 1,1,1-TCA and cis-1,2-DCE, were routinely detected at EW-3 throughout the review period, however concentrations of these contaminants were decreasing to stable, and did not exceed regulatory limits. Most recently, 1,1,1-TCA was not detected and a concentration of 2.0 µg/L of cis-1,2-DCE was recorded.

The monitoring network for the western plume is defined by samples collected from MW-11S, MW-20D and MW-29D and is associated with historical operations in the vicinity of Building 1. MW-11S recorded non-detectable concentrations of TCE throughout the review period and has consistently remained beneath the GWRS since 2008. MW-20D consistently recorded regulatory exceedances of TCE at concentrations less than 10 µg/L. TCE concentrations observed at this well during this review period were universally lower than those observed during the previous review period (2010-2015). MW-29D exhibited the greatest variability and the highest contaminant concentrations within the western plume. During this review period, regulatory exceedances were recorded at MW-29D for TCE, 1,1-DCE and carbon tetrachloride. Maximum concentrations of these contaminants were 48.4 µg/L (06/2018), 11.9 (06/2016), and 1.4 µg/L (05/2015), respectively. At MW-29D TCE was detected over the MCL during every sampling event, however concentrations at this well, as well as at MW-20D, have exhibited a decreasing trend since 2010.

Downgradient Monitoring Wells

Four monitoring wells (MW-4(701), MW-5D, MW-5DB and MW-6D) make up the downgradient monitoring network which is sampled in order to provide data that characterize the VOC plume as

it migrates toward the Rockaway Township Wellfield. These wells are located adjacent to the property where the discharges occurred.

Well MW-6D is located approximately 500 ft from the southeastern extent of the Rockaway Township Wellfield. At this well, regulatory exceedances were recorded during this review period for TCE and 1,1-DCE. Concentrations of TCE were consistently above the MCL and highly variable from year to year. A sharp increase occurred in 2016, when the maximum observed TCE concentration of 187 µg/L was recorded—this value represents the highest observed concentration of the review period amongst deep aquifer monitoring wells at the site. At MW-6D, TCE concentrations may be related to higher water levels intercepting zones of residual soil contamination. Most recently, TCE was present at 32.8 µg/L. 1,1-DCE concentrations were relatively lower and less variable, with a maximum concentration of 3.3 µg/L (06/2016).

MW-5DB is a deep regional aquifer well that is located west of the Rockaway Township Wellfield. Historically, this area has been impacted by petroleum-related compounds from the Shell Service Station at 8 Green Pond Road. At present, the primary COC in these wells is TCE. During the current review period, concentrations at MW-5DB have generally been below the MCL and fit within a longer 10-year trend of decreasing concentrations. One regulatory exceedance was observed at this well during this time (1.3 µg/L in June 2018).

MW-4(701) and MW-5D were added to the regular sampling plan in 2016. Since sampling was initiated at these wells, data have indicated concentrations of TCE at less than the regulatory limit during each annual event.

At the Rockaway Township Wellfield, two wells (PW-7 and PW-7A) currently pump water from the deep regional aquifer. These wells are sampled monthly for VOCs, and VOC concentrations in untreated groundwater sampled from these public supply wells have decreased significantly since the onset of treatment operations in 2005. During this review period, concentrations were stable, although concentrations of TCE in exceedance of the regulatory standard of 1 µg/L were regularly recorded. Similar to the previous five-year review period, well PW-7 generally recorded TCE concentrations between 1 and 2 µg/L, with a maximum concentration of 2.04 in 2017. Well PW-7A, which became operational in 2015, recorded higher concentrations, with a maximum concentration during the review period of 27 µg/L. These TCE concentrations are lower than the values observed at the wellfield during the RI (300 µg/L at PW-6; 130 µg/L at P-7; 51 µg/L at PW-7). The water treatment system at the Rockaway Township facility reduces VOC concentrations in the public water supply to non-detectable levels.

New Site Investigation Data

The previous FYR recommended sampling for hexavalent chromium and 1,4-dioxane within the site monitoring network. Samples from each well in the network were analyzed for hexavalent

chromium in 2016. Detections were observed in five wells on site, but concentrations were uniformly beneath the MCL for total chromium (70 µg/L), with a maximum observed concentration of 36 µg/L in MW-3. Given these results, hexavalent chromium has not been added to the regular monitoring program.

Similarly, groundwater samples were first analyzed for 1,4-dioxane in 2016. Concentrations above NJDEP's October 2015 interim specific groundwater quality criterion (0.4 µg/L; now a GWQS) were observed at four wells within the monitoring network at that time. Given these results, 1,4-dioxane was added to the regular monitoring program. Since 2016, five wells have exceeded the MCL for 1,4-dioxane: MW-1, MW-5D, MW-5DB, MW-6D and MW-29D. The highest recorded concentration occurred at well MW-6D. This well is located slightly upgradient of the Rockaway Township Wellfield, and concentrations here increased from 1.62 µg/L in 2016 to 6.82 µg/L in 2019. Concentrations of 1,4-dioxane in the public supply wells varied between 0.0718 µg/L (PW-7, 2016) and 0.216 µg/L (PW-6, 2019). The highest observed 1,4-dioxane concentration in the public supply wells was 0.216 µg/L during the most recent sampling event. Given that the highest observed concentration of 1,4-dioxane within the monitoring network occurred at a location proximal to the public supply wells (MW-6D), as well as the elevated and variable concentrations within this well which gradually increased during the review period, quarterly groundwater sampling of well MW-6D is recommended for the analysis of 1,4-dioxane.

In 2018, a new site investigation was conducted in on-site soils east of Building 2. This area was identified by NJDEP as a potential former dumping ground using historical aerial photographs. No contamination above regulatory limits was found in any samples, and no further investigation is currently planned at this location.

An investigation was carried out in 2018 at 701 Ford Road in order to determine the risk of VI within the structure on the property. Four temporary monitoring points were installed, and the groundwater was sampled for VOCs. No detections of site-related contaminants were recorded in any of the temporary sample points, and regular sampling of the permanent shallow monitoring well co-located on the property [MW-4(701)] did not record any regulatory exceedances.

In summary, three distinct groundwater contaminant plumes originate from three different source areas. Extraction wells EW-1, EW-2 and EW-3 are dedicated to reducing contaminant mass in the eastern, central and western plumes, respectively. Data from this review period indicate that EW-3 removes the most VOC mass from the system while EW-1 has shown the highest and most variable contaminant concentrations observed in the extraction wells. MW-1 had the highest 1,1,1-TCA concentration during this review period at 3,010 µg/L in 2019. TCE concentrations in monitoring wells within the network were the most elevated at downgradient well MW-6D (187 µg/L, 2016). Regularly performed well rehabilitation efforts have been able to temporarily restore the flow rates of extraction wells, in particular EW-1. New investigations and the addition of downgradient wells to the regular sampling plan have augmented the monitoring capability of the well network. No regulatory exceedances were observed in the shallow subsurface

investigations east of Building 2 and at 701 Ford Road. Concentrations of hexavalent chromium were universally below the regulatory limit across the site, while several wells were above the GWQS for 1,4-dioxane. At the Rockaway Township Municipal Wellfield, concentrations of TCE remained relatively steady above the MCL in untreated water. Municipal treatment operations have remained effective at removing VOCs from these wells.

Soil-Vapor Extraction System

During the current review period, the SVE system was operational for at least 94% of each year. Five wells (the three dual-phase wells, SVE-7 and SVE-8) have been inactive since 2011 as a result of optimization efforts intended to increase the efficacy of the soil remedy via an increase in vacuum pressure at the active monitoring points. Currently, six of the eight active wells are recording higher concentrations than were observed prior to the effort to increase efficacy of the remedy.

In order to ensure permit compliance, air samples were collected monthly for VOC analysis from the carbon effluent, and SVE effluent analytical results indicate that air emissions were below the permit requirements throughout the review period. Individual soil-vapor samples are collected twice annually from each active SVE well within the SVE network and analyzed for targeted VOCs as another metric of remedy effectiveness. During the previous review period, the maximum observed total VOC concentration was 5.6 ppmv at SVE-9 (12/2014). The maximum total VOC concentration recorded during this review period was 4.2 ppmv at VW-4 (12/2016), and this quantity was solely comprised of TCE. The maximum observed concentration of 1,1,1-TCA was 1.7 ppmv at SVE-9 (2015, 2016).

Total VOC concentration data are acquired from combined SVE influent sampling which occurs during four sampling events per year. Measurements are collected from the combined SVE line prior to entering the SVE carbon unit and are used to estimate the total VOC mass removed annually from affected soils. Based upon these measurements, approximately 18 pounds of VOCs were extracted from the soil during the 2019 operating period, compared with 75 pounds during 2015. The rate of mass recovery decreased significantly over the course of the review period, which is indicative of an effective remediation system. Between the onset of SVE treatment in 2005 and June 2019, approximately 1,628 pounds of VOCs were removed. While the time to reach soil remediation goals was estimated to initially be in the three- to five-year range, based on data through 2019, the system will need to be operated for at least another five years or longer.

In the last five years, indoor air samples were collected from Buildings 1 and 2 and groundwater samples were collected at 701 Ford Road. In Building 1, TCE and chloroform were the two site-related contaminants detected above one or both of the NJDEP indoor air screening levels (IASLs). In fact, indoor air concentrations have increased since the post-SDS sampling round.

TCE was detected up to 10 µg/m^3 (IASL = 3 µg/m^3) and chloroform was detected up to 476 µg/m^3 (IASL = 2 µg/m^3 and IARAL = 50 µg/m^3). The contamination appears to be the result of indoor air sources although changes in the subsurface due to SVE cannot be ruled out. In Building 2, it appears that TCE concentrations have been decreasing since the SSDSs were installed; however, TCE was detected above the screening level in four out of ten indoor air samples, up to 17 µg/m^3. Optimization of the SSDS, where the negative system pressure has been decreasing with time, may be necessary in Building 2 although the SVE appears to be functioning as intended since concentrations suggest a downward trend. Four temporary well points were installed beneath the 701 Ford Road building in 2018 which confirmed no site-related contaminants were present in the shallow overburden groundwater.

Site Inspection

The GWTS and SVE system are automated systems that are located within a stand-alone treatment building at the south end of the property. The treatment building is unstaffed. The entire site is a State-lead PRP site. Under NJDEP oversight, the PRP monitors the site several times per week via a mobile connection. The PRP's operator is alerted by phone of any system alarms or shutdowns. In addition, the PRP's operator performs monthly inspections. The PRP performs annual inspections of the SSDSs.

Inspections of the site were conducted on August 20, 2019 and October 3, 2019. In attendance at the August 20 inspection were Lawrence Granite and Dr. Lora Smith (EPA representatives); Donna Gaffigan (NJDEP); Gene Garabrant (Rockaway Township Municipal Utilities) and Jonas Holliss (a technical representative of the PRP). In attendance at the October 3 inspection were Lawrence Granite and Dr. John Mason (EPA representatives); Donna Gaffigan and Jill Monroe (NJDEP representatives); Gene Garabrant and Jonas Hollis. The purpose of the inspections was to assess the protectiveness of the remedy. The site is being properly maintained. No issues impacting current protectiveness of the remedy were observed. The site is relatively flat. Surface water run-off is directed to a storm sewer system associated with the parking areas for the site. Deciduous wooded wetlands border the site to the east and south.

V. TECHNICAL ASSESSMENT

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

Groundwater contamination exists on-site as a result of three contaminant sources located on the western, central and eastern portions of the site. The western plume is tied to historical operations in the vicinity of Building 1 and is being intercepted by groundwater extraction well EW-3. EW-3 removes significant contaminant mass from the site and creates a significant cone of depression in the water table which acts as a hydraulic boundary to the contamination. The monitoring wells in this location show declining to stable concentrations within this review

period, and declining concentrations since treatment operations began. The remedy is functioning as intended by the decision documents. As further discussed in the following paragraphs, EPA has recommendations which could further improve site conditions.

The plume originating from the central source area is addressed by the SVE system in the shallow aquifer. Contamination within the deeper aquifer is captured by EW-2, where TCE and 1,1,1-TCA levels are well below historic highs. However, significant and sustained increases in 1,1,1-TCA (MW-1) and TCE (MW-2) concentrations in shallow monitoring wells have occurred during the review period. Overall, the VOC mass removal rate via the SVE wells and dual-phase wells has decreased since 2015. The low concentrations of 1,1,1-TCA in EW-2 suggest that the majority of the contamination in this area is not migrating into the deep regional aquifer in this location, although the low-permeability horizon above the deep aquifer is not universally present. Evaluation of residual source contamination distribution is recommended, in order to inform optimization and potentially support augmentation of the soil vapor/dual-phase well network in the shallow source area of the central plume. This action is recommended in order to halt groundwater concentration increases in the shallow aquifer and prevent downgradient contaminant migration.

Within the eastern plume, the performance of EW-1 has been addressed through well rehabilitation efforts on several occasions during the review period. These activities have been effective at restoring the flow rate to its original operational level, as conditions in the aquifer allow. EW-1 is capturing contaminant mass in its immediate vicinity, and contaminant concentrations in MW-9D, MW-12D and MW-14D, which were wells of concern in the previous FYR, have stable to decreasing levels of site-related contamination.

Elevated and significantly variable contaminant concentrations at downgradient well MW-6D and sustained regulatory exceedances in untreated water at the Rockaway Township Municipal Wellfield indicate that, at least for some portion of this review period, some contamination escaped the extraction well network. Continued monitoring of this well as well as the other extraction and monitoring wells is an effective tool for evaluating the remedy effectiveness following remedy optimization activities. Given that the highest concentrations of 1,4-dioxane have been detected in monitoring well MW-6D, and that concentrations have risen here during the review period, it is recommended that 1,4-dioxane be added to the analyte list for quarterly sampling for this well.

New site investigations detected no contamination in the shallow groundwater surrounding 701 Ford Road or in the shallow soils east of Building 2. Additionally, hexavalent chromium was not present above the MCL at any point within the monitoring network.

The extraction wells continue to remove contaminant mass from groundwater, and concentrations have decreased across the monitoring network since the remedy became

operational. The municipal supply wells downgradient of the contaminant release zone continue to treat water in order to prevent human exposure to contaminants. Although the remedy is currently protective of human health and the environment, optimization of the SVE-dual phase well system will further improve the performance of the existing remedy.

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 1991 baseline and 1997 focused risk assessments were completed prior to much of the Risk Assessment Guidance for Superfund used currently by EPA. However, the process that was used remains valid.

The 1991 baseline risk assessment evaluated exposures to hypothetical future residents (children and adults) via ingestion of groundwater as drinking water and/or inhalation of volatiles while showering and current/future residents via dermal contact with surface water and/or sediments from on-site water bodies. The 1991 baseline risk assessment stated that the domestic use of untreated groundwater was considered unlikely under both current and future land use scenarios because the groundwater is treated at the wellfield prior to distribution to the public. The evaluation of hypothetical use of untreated groundwater yielded risks above acceptable limits. However, as noted, these risks are being addressed by the remedial action selected for OU1 in addition to a CEA/WRA restricting the use of groundwater for potable purposes outside of the municipal wells. Exposure to the onsite streams and lagoon/marshy area were and are expected to be infrequent. The following lines of evidence support not quantitatively evaluating this pathway: low concentrations of contaminants detected in surface water and sediment; a vast majority are metals which are not readily dermally absorbed; and the surface water is very shallow, making the ingestion pathway unlikely.

The 1997 focused risk assessment evaluated exposures to future industrial/commercial workers, construction workers and trespassers who may have dermal contact with or incidentally ingest contaminated subsurface site soils or who may breathe contaminated site air and current/future industrial/commercial workers and construction workers who may breathe contaminated indoor air at the site.

The 1997 focused risk assessment found that the subsurface soils did not present an adverse impact to human or ecological receptors. The subsurface soil COC concentrations were above New Jersey Impact to Groundwater screening levels and, as a result, soil remediation was warranted. Surface soils were not evaluated as the media of concern was groundwater, however, most surfaces of the DTP are covered with buildings or paved so the direct contact pathway has been interrupted. A deed notice for Building 2 is pending which will restrict future use to commercial/industrial in the future. Also, if the buildings were to be demolished and the current

paving removed, surface soil sampling will likely be necessary to determine whether direct contact would pose a risk. Indoor air (using modeling) and outdoor air did not pose an unacceptable risk in the risk assessment, but indoor air was subsequently re-evaluated. The SVE system addressed soil and source area contamination and is monitored by collecting influent air samples from each SVE well and dual-phase well for laboratory analysis for VOCs. Sample collection is currently performed on a semi-annual basis and all air permit requirements are being met for operation of the SVE vapor-phase carbon treatment systems.

The COCs presented in the OU1 baseline human health risk assessment for groundwater were VOCs, including TCE, 1,1,1-trichloroethane (TCA), vinyl chloride and methylene chloride as well as arsenic. The primary COCs identified in the OU2 focused risk assessment for soil were cis-1,2-dichloroethene, PCE, TCA and TCE based upon impact to groundwater.

Groundwater is screened against NJ MCLs and NJGWQS. Groundwater sampling results collected during this review period generally indicate steady to decreasing concentrations for site-related COCs (see Data Review section). TCE and 1,1,1-trichloroethane (1,1,1-TCA) are the primary COCs and concentrations have generally remained consistently above NJGWQS. Other site-related COCs which were detected above regulatory standards during the review period include PCE, 1,1-dichloroethene (1,1-DCE), 1,4-dioxane, carbon tetrachloride, and 1,1,2-TCA. While site-related COCs remain in groundwater above standards, the treated drinking water remains in compliance and is suitable for human consumption. A CEA/WRA remains in place to restrict use of other Site-related groundwater for drinking water purposes.

Soil vapor intrusion (SVI) is evaluated when soils and/or groundwater are known or suspected to contain VOCs. Due to elevated concentrations of VOCs in the groundwater at the Site, soil gas sampling was performed in Buildings 1 and 2. TCE in Building 1 and TCE and PCE in Building 2 appeared to have a complete vapor intrusion pathway. As a result of the soil gas investigation, sub-slab depressurizations systems were installed in both buildings.

Confirmatory indoor air sampling was recently conducted (February 2018). In Building 1, TCE and chloroform were the two site-related contaminants detected above one or both of the NJDEP indoor air screening levels. In fact, indoor air concentrations have increased since the post-SDS sampling round. TCE was detected up to 10 $\mu g/m^3$ (IASL = 3 $\mu g/m^3$) and chloroform was detected up to 476 $\mu g/m^3$ (IASL = 2 $\mu g/m^3$ and IARAL = 50 $\mu g/m^3$). TCE exceeded the NJDEP IASL in three of eight samples, all of which are within the PlanITROI unit where a product containing 50-55% TCE is reportedly used. The maximum concentration of 10 $\mu g/m^3$ is greater than the current EPA action level for commercial workers (8 $\mu g/m^3$). Chloroform was greater than the IASL in all seven IA samples and above the IARAL in four, all of which are in the RiconPharma unit where it is reported that their research and development utilizes chloroform. A recommendation to better store and handle TCE- and chloroform-containing products as well as potentially optimizing the HVAC system should be made as the contamination appears to be

the result of indoor air sources. Modification of the SSDS should also be considered as changes in the subsurface due to SVE cannot be ruled out as the negative system pressure has been decreasing over time and may need adjustment and optimization. EPA recommends that NJDEP collect another round of indoor air samples to confirm that modifications were effective.

In Building 2, it appears that TCE concentrations have been decreasing since the SSDSs were installed; however, TCE was detected above the IASL in four out of ten samples, up to 17 $\mu g/m^3$. This is the only location above the EPA action level. It is reported that one of the tenants where elevated indoor air TCE was detected uses two TCE-containing products. EPA recommends better storage and handling of TCE-containing chemicals as well as potential modification of the HVAC system in the short term. Optimization of the SSDS may be necessary as well, as the negative pressure underneath the slab has been decreasing over time. PCE was not detected above screening levels in the last five years.

In the last FYR, it was recommended that indoor air samples be collected at 701 Ford Road and Buildings 3, 5 and 6. Investigations performed since the last FYR suggest that a perched groundwater unit sits below the 701 Ford Road building which is underlain by a clay aquitard unit. Further, four temporary well points were installed in 2018 and confirmed no site-related contaminants were present in the shallow overburden groundwater. Based on this information, it appears there is a clean lens of water beneath the 701 Ford Road building and a vapor intrusion investigation is not warranted at this time. Buildings 3 and 5 were investigated in 2016 when sub-slab soil samples were collected beneath both buildings. Concentrations of site-related contaminants were below screening levels indicating that the SVI pathway is not a concern for these buildings either. Finally, Building 6 is greater than 200 feet from the contaminated groundwater and farther than Buildings 3 and 5 where the SVI pathway is determined to be incomplete at this time. If property use changes to a more sensitive population or regional groundwater flow changes due to pumping, this pathway may need to be reevaluated.

The RAOs remain valid and no additional sources of contamination, exposed populations or exposure pathways have been identified since the last five-year review.

Although the ecological risk assessment screening values used to support the 1993 ROD may not necessarily reflect the current values, the site is covered with buildings and pavement and may not provide suitable habitat for ecological receptors. Samples collected from the Beaver Brook and associated marsh during the RI indicated that the sediment and surface water contaminant levels were not significant. Additionally, the groundwater plume flow is toward the extraction wells rather than the Brook. Therefore, the exposure assumptions for ecological receptors are still valid.

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

At this time there is no information that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

<table>
<tr><th colspan="5">Issues/Recommendations</th></tr>
<tr><td colspan="5">OU(s) without Issues/Recommendations Identified in the Five-Year Review:</td></tr>
<tr><td colspan="5">OU 1</td></tr>
<tr><td colspan="5">Issues and Recommendations Identified in the Five-Year Review:</td></tr>
<tr><td rowspan="3">OU(s): OU 2</td><td colspan="4">Issue Category: Institutional Controls</td></tr>
<tr><td colspan="4">Issue: Surface soil exposure was not evaluated in the risk assessment.</td></tr>
<tr><td colspan="4">Recommendation: A deed notice is needed to ensure long-term protectiveness.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>PRP</td><td>State</td><td>3/31/2021</td></tr>
<tr><td rowspan="3">OU(s): OU 2</td><td colspan="4">Issue Category: Operations and Maintenance</td></tr>
<tr><td colspan="4">Issue: Increasing concentrations of 1,1,1-TCA and TCE have been observed in the shallow groundwater system.</td></tr>
<tr><td colspan="4">Recommendation: It is recommended that further characterization of shallow contaminant distribution be conducted. This data will inform the optimization of the SVE-dual phase well system in order to reduce contaminant concentrations in the shallow groundwater.</td></tr>
<tr><td>Affect Current Protectiveness</td><td>Affect Future Protectiveness</td><td>Party Responsible</td><td>Oversight Party</td><td>Milestone Date</td></tr>
<tr><td>No</td><td>Yes</td><td>PRP</td><td>State</td><td>12/31/2021</td></tr>
<tr><td rowspan="3">OU(s): OU 2</td><td colspan="4">Issue Category: Operations and Maintenance</td></tr>
<tr><td colspan="4">Issue: Recent indoor air data confirms that the subslab system continues to reduce indoor air concentrations below those seen in 2010; however, the use of products containing TCE and chloroform in some businesses continues to impact indoor air quality. Additionally, the negative pressure underneath the slab has been steadily decreasing over the years.</td></tr>
<tr><td colspan="4">Recommendation: Optimize subslab depressurization systems in buildings 1 and 2 to improve negative pressure on the system and sample spaces that are not currently using TCE and chloroform to ensure they are not impacted from concentrations in the subslab or neighboring businesses.</td></tr>
</table>

Affect Current Protectiveness	Affect Future Protectiveness	Party Responsible	Oversight Party	Milestone Date
No	Yes	PRP	State	12/31/2021

The PRP should continue to analyze groundwater samples for 1,4-dioxane across the monitoring well network and continue to perform rehabilitations as needed at extraction wells. Additionally, it is recommended that the groundwater sampling frequency be increased to quarterly for the analysis of 1,4-dioxane at MW-6D. Lastly, EPA agrees with NJDEP's recommendation to incorporate analysis for per- and polyfluoroalkyl substances in groundwater samples within the next five years.

In addition to the recommendation related to vapor intrusion above, EPA also suggests that NJDEP work with the PRP to ensure that all tenants are practicing safe handling practices of chemicals that minimize worker exposure.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU 1	*Protectiveness Determination:* Protective	*Planned Addendum Completion Date:* N/A
Protectiveness Statement: The groundwater remedy at OU 1 is protective of human health and the environment.		
Operable Unit: OU 2	*Protectiveness Determination:* Short-term Protective	*Planned Addendum Completion Date:* N/A Click here to enter a date.
Protectiveness Statement: The OU 2 remedy protects human health and the environment in the short-term because the SVE continues to remove contaminant mass from the source area and the site is covered with buildings and pavement. In order for the remedy to be protective in the long-term, further characterization of the shallow contaminant distribution should be conducted in order to inform the evaluation and optimization of the SVE-dual phase well system; a deed notice should be established for site soils; and optimization of the subslab depressurization systems for buildings 1 and 2 should occur.		
Sitewide Protectiveness Statement		
Protectiveness Determination: Short-term Protective		*Planned Addendum Completion Date:* N/A

Click here to enter a date.
Protectiveness Statement: The remedies are protective of human health and the environment in the short-term because the SVE continues to remove contaminant mass from the source area and the site is covered with buildings and pavement. In order for the remedy to be protective in the long-term, further characterization of the shallow contaminant distribution should be conducted in order to inform the evaluation and optimization of the SVE-dual phase well system; a deed notice should be established for site soils; and optimization of the subslab depressurization systems for buildings 1 and 2 should occur.

VIII. NEXT REVIEW

The next FYR report for the Rockaway Township Wells Superfund site is required five years from the completion date of this review.

Tables

Table 1a: Remediation Goals for Soil (all concentrations in µg/kg) From the OU 2 ROD			
Contaminants of Concern	**Soil - Protection of Groundwater**	**Human Health Risk**	**Remediation Goals**
cis-1,2-Dichloroethene	500	-	**500**
Tetrachloroethene	1,000	100,000	**1,000**
Trichloroethene	500	-	**500**
Vinyl chloride	500	-	**500**

Table 1b: Remediation Goals for Groundwater (all concentrations in µg/L)			
Contaminants of Concern	**National Primary Drinking Water Standards (Federal MCLs)**	**New Jersey Class II Groundwater Quality Standards (GWQS)**	**Remediation Goals**
cis-1,2-Dichloroethene	70	70	70
Tetrachloroethene	5	1	1
1,1,1-Trichloroethane	200	30	30
Trichloroethene	5	1	1
Vinyl chloride	2	1	1

Figures

Figure 1A – Site Plan/General Location

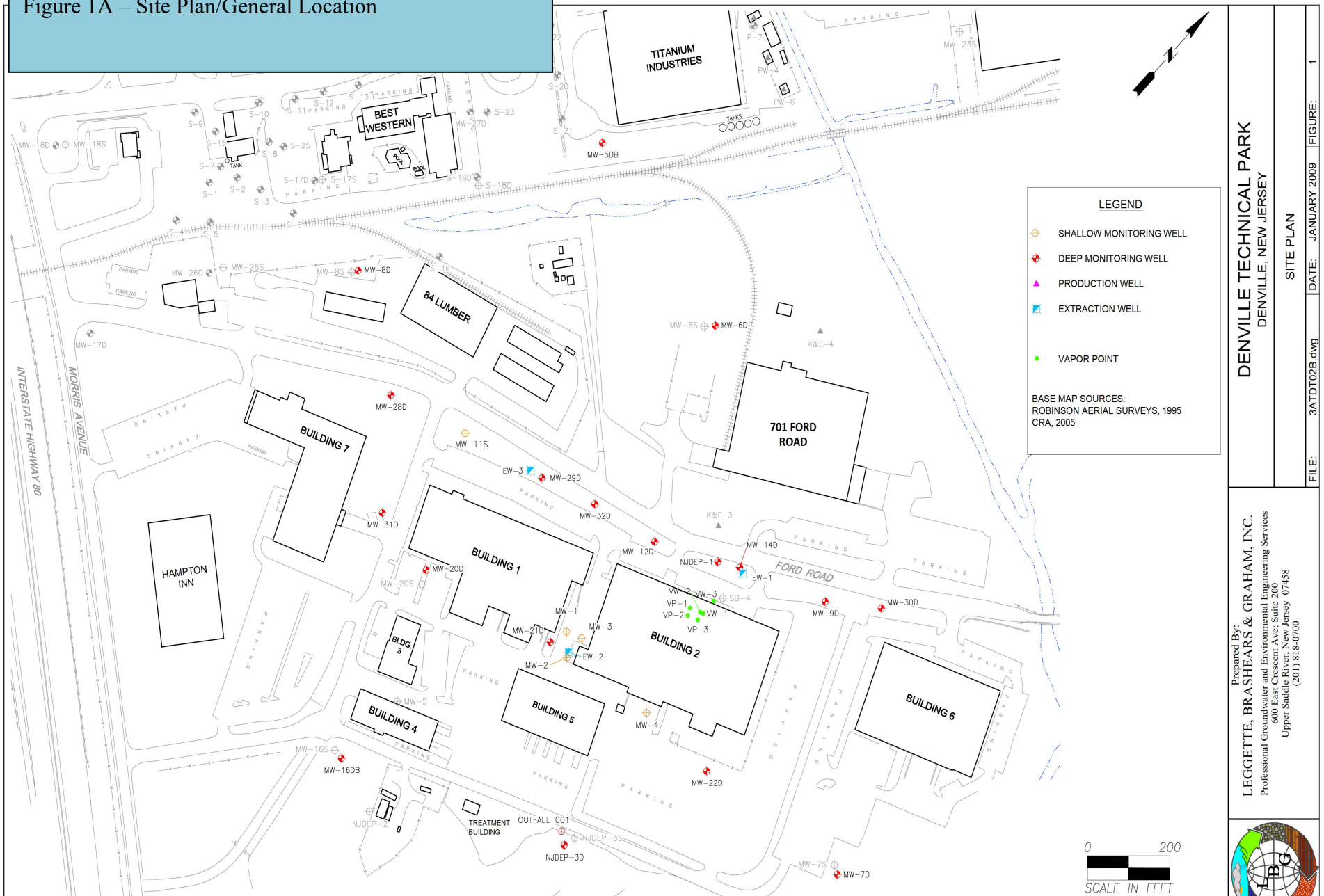


Figure 4: Extraction Well Locations

Legend

- Rockaway Township Municipal Well
- DTP Extraction Well

250 0 250 500 Feet

Morris County Location

BASE SOURCE: NJGIN 2007-08 Orthophotos

Denville Technical Park
Denville Township, New Jersey

DTP and Rockaway Township Well Field

Prepared by:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Services
6 Arrow Road, Suite 103
Ramsey, NJ 07446
(201) 818-0700 www.lbgweb.com

DATE: 1/11/11

FILE: B:\ATK Sites\DTP\GIS \Rock-twp-wellfield.apr | DRAWN BY: JH | CHECKED BY: DT | FIGURE: 1

Figure 5: Dual-Phase and SVE Well Locations

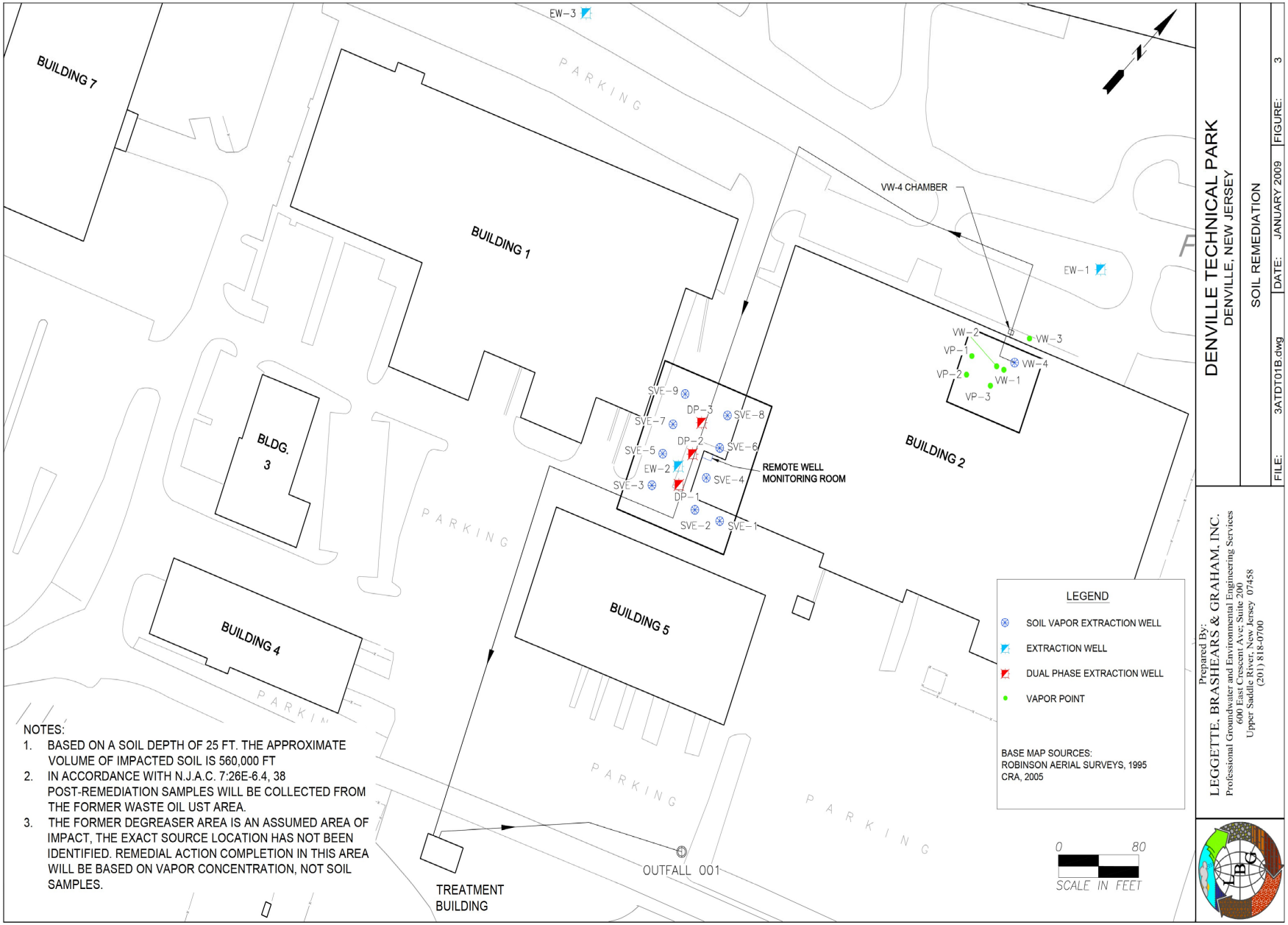
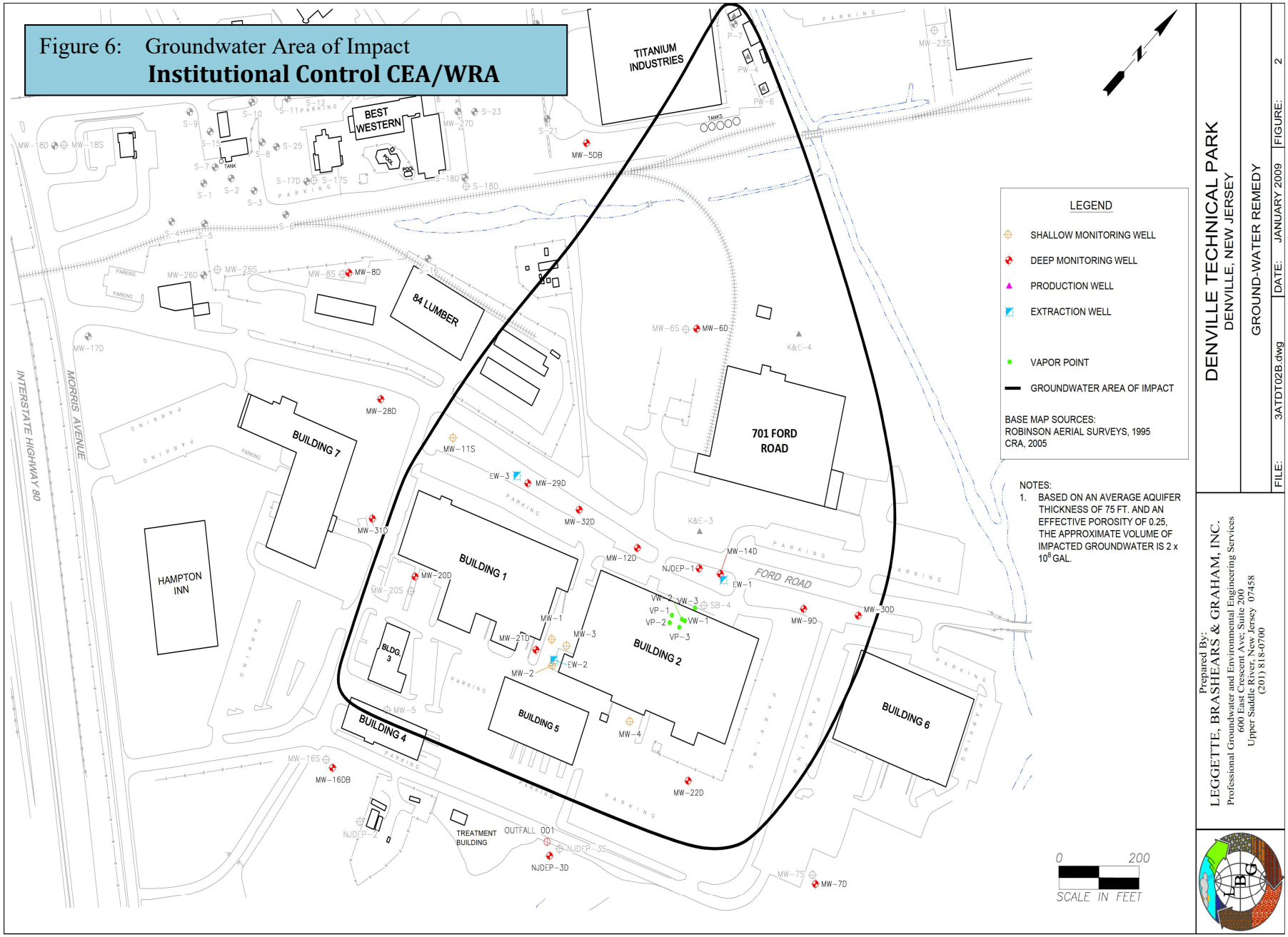


Figure 6: Groundwater Area of Impact
Institutional Control CEA/WRA



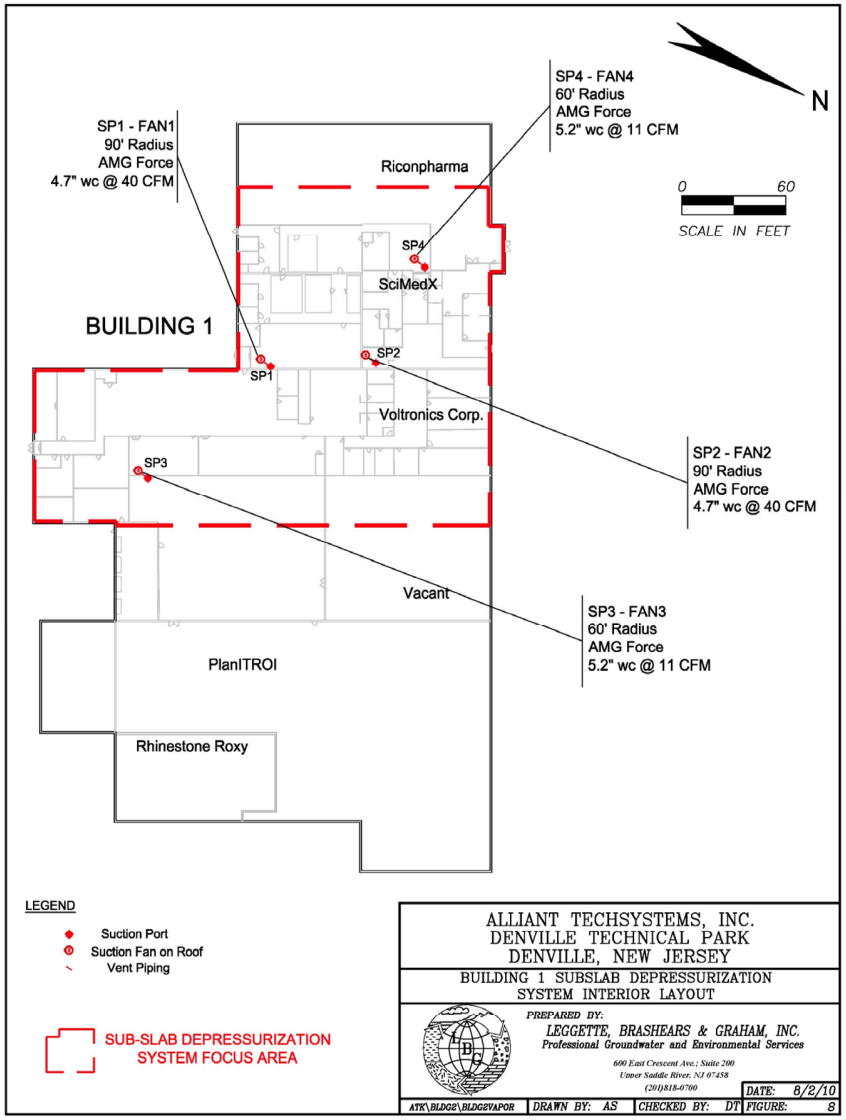
DENVILLE TECHNICAL PARK
DENVILLE, NEW JERSEY

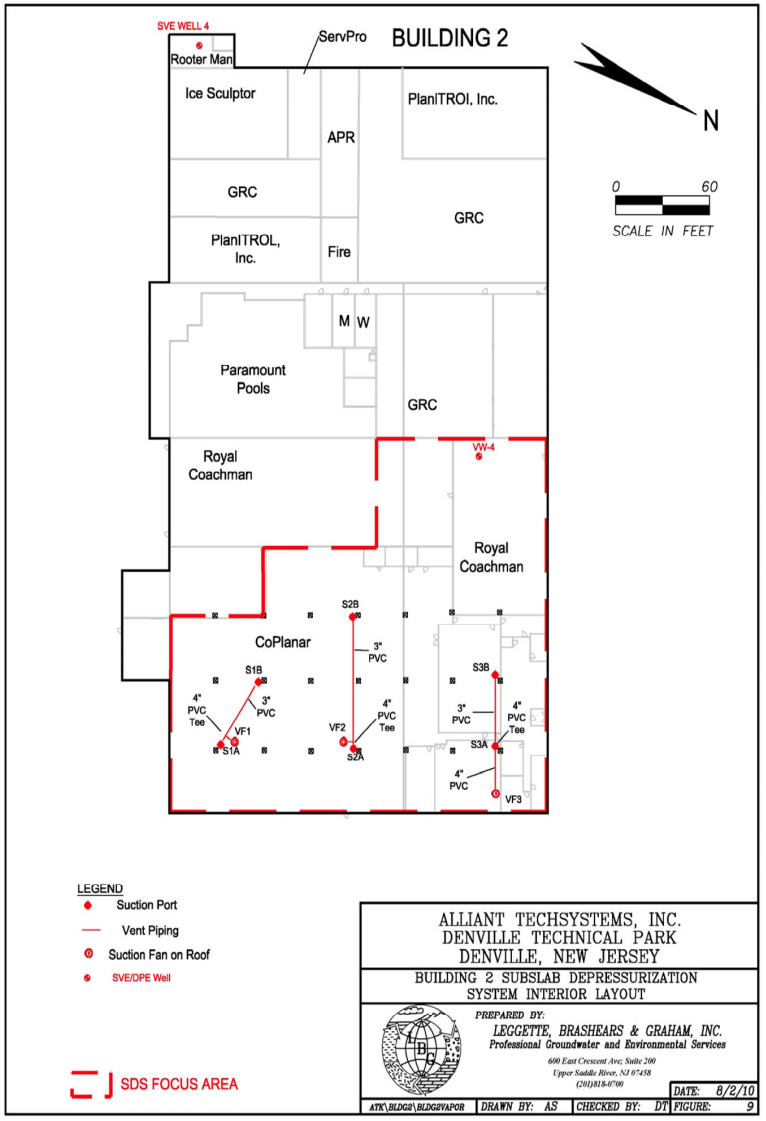
GROUND-WATER REMEDY

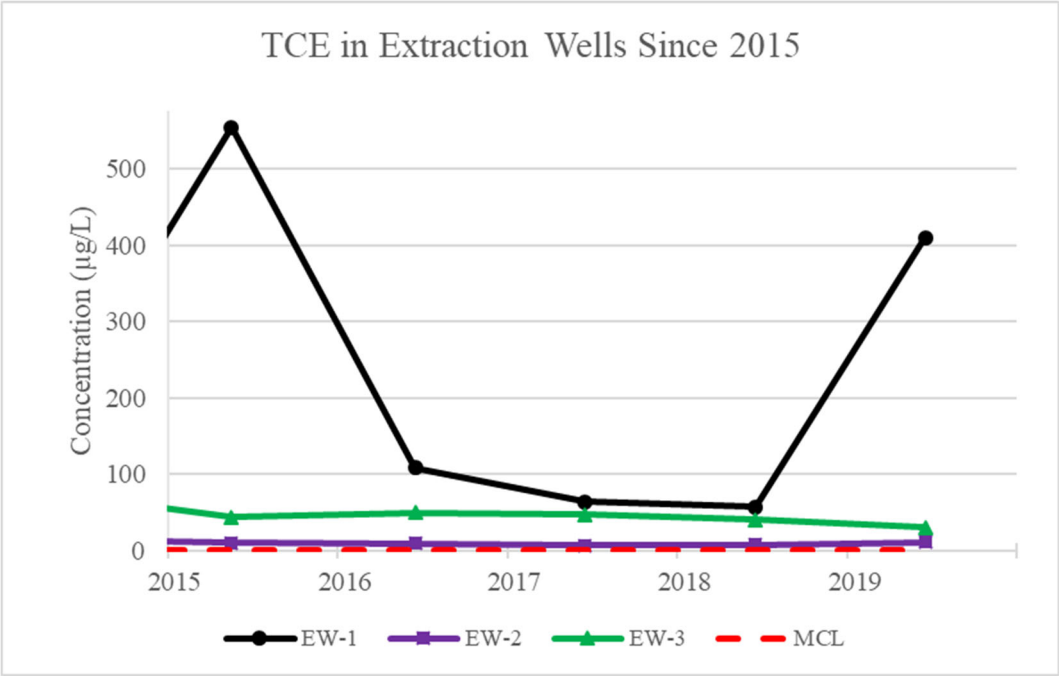
FILE: 3ATDT02B.dwg | DATE: JANUARY 2009 | FIGURE: 2

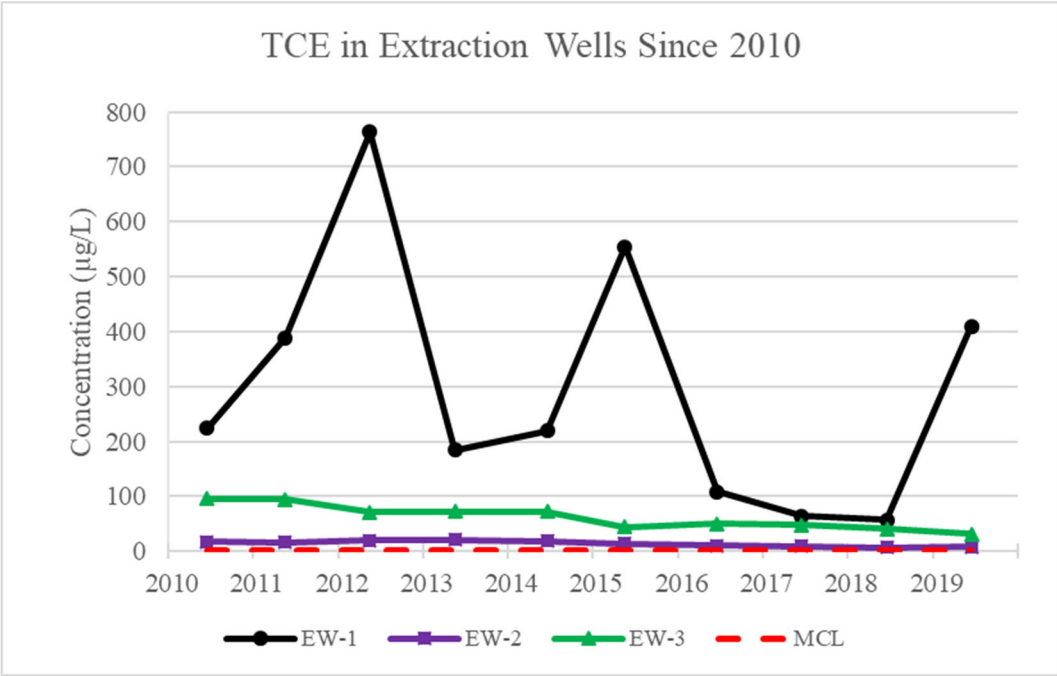
Prepared By:
LEGGETTE, BRASHEARS & GRAHAM, INC.
Professional Groundwater and Environmental Engineering Services
600 East Crescent Ave; Suite 200
Upper Saddle River, New Jersey 07458
(201) 818-0700

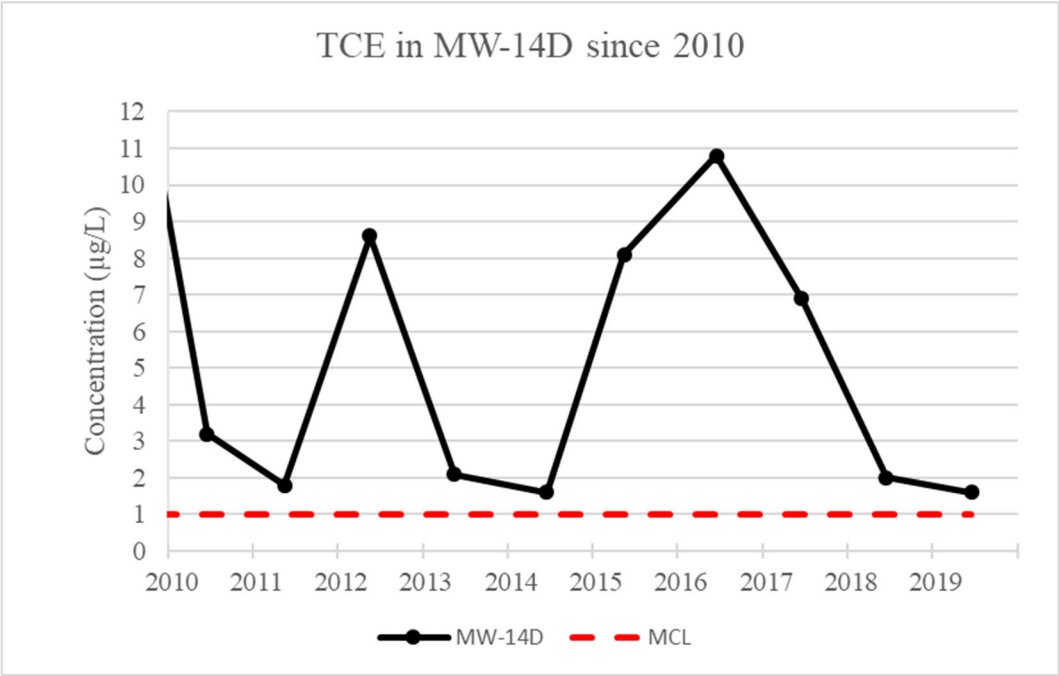
Figure 7: Sub Slab Depressurization System Interior Layout

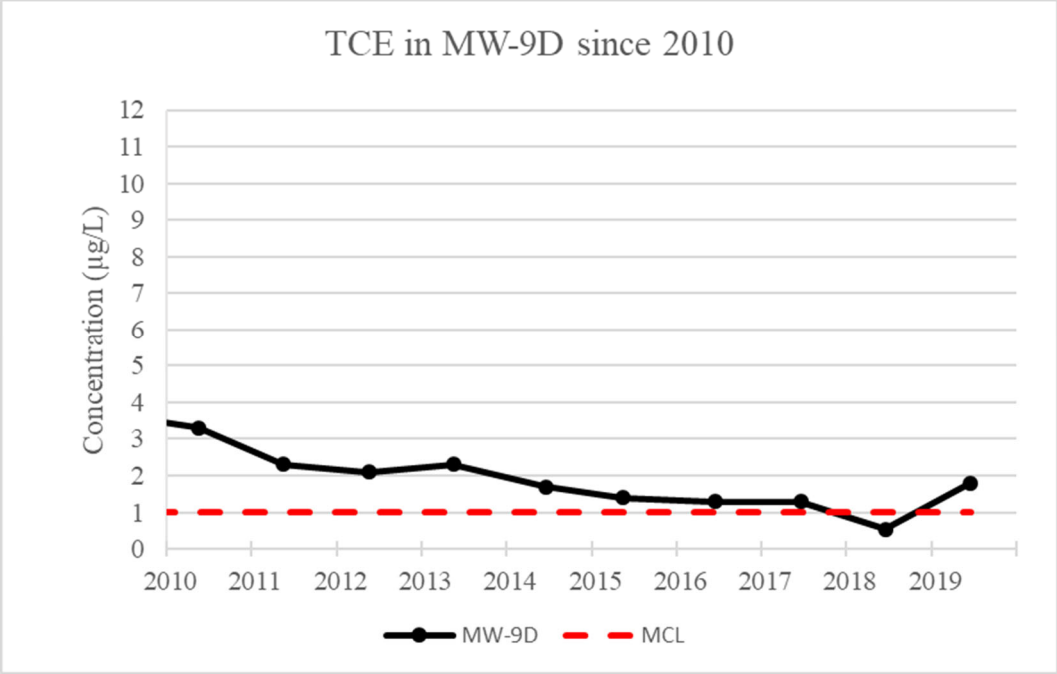


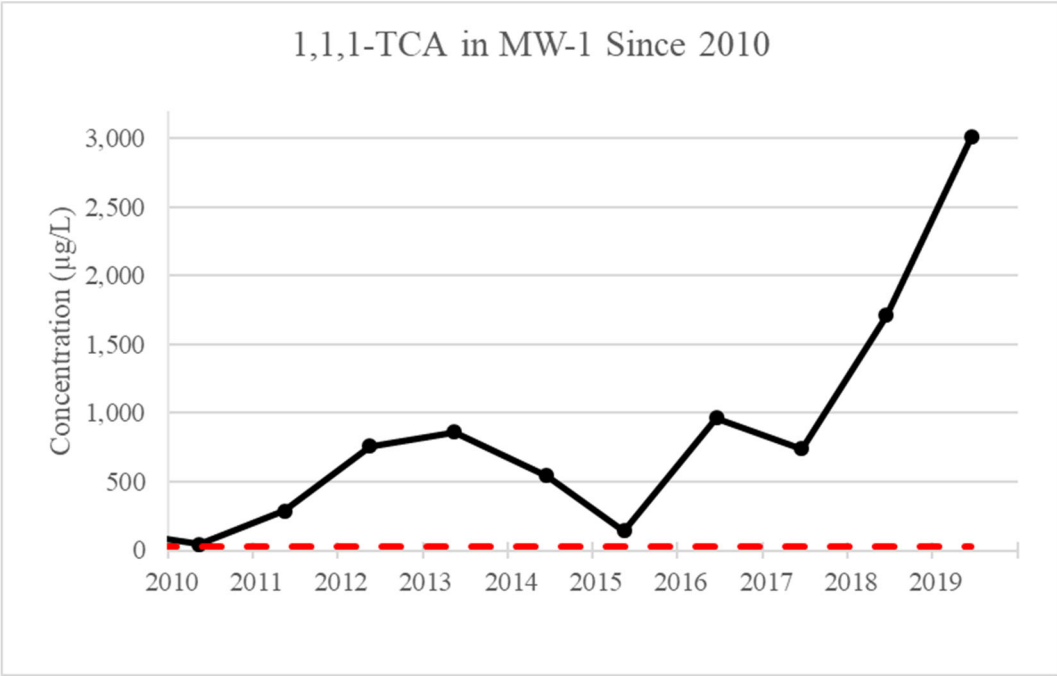


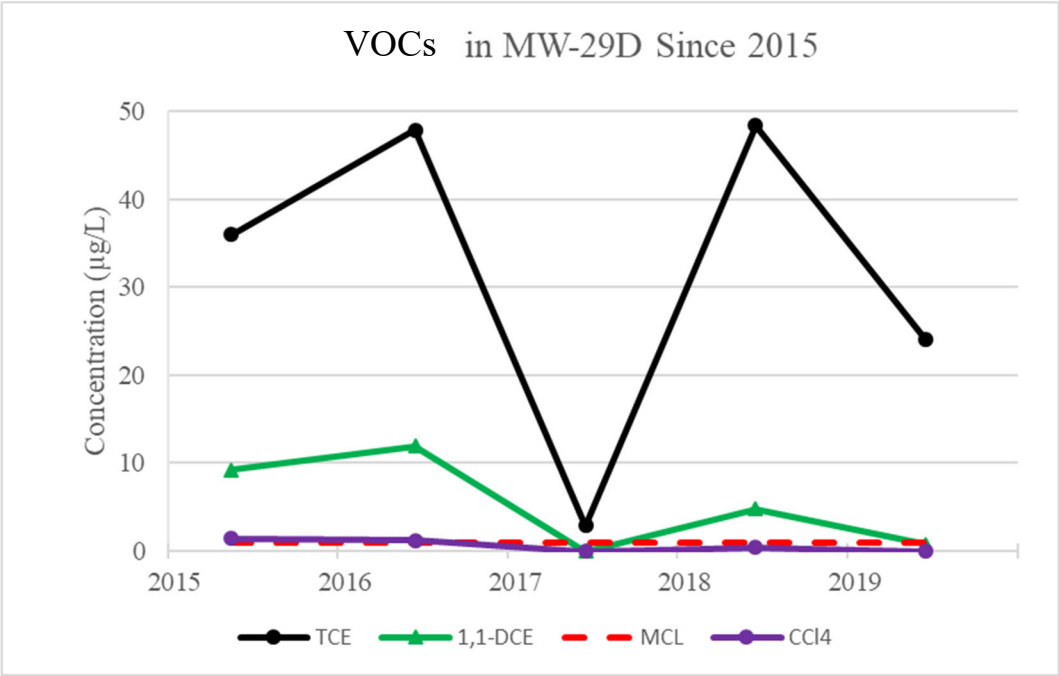

TCE in Extraction Wells Since 2015
Concentration (µg/L)
500
400
300
200
100
0
2015
2016
2017
2018
2019
EW-1
EW-2
EW-3
MCL

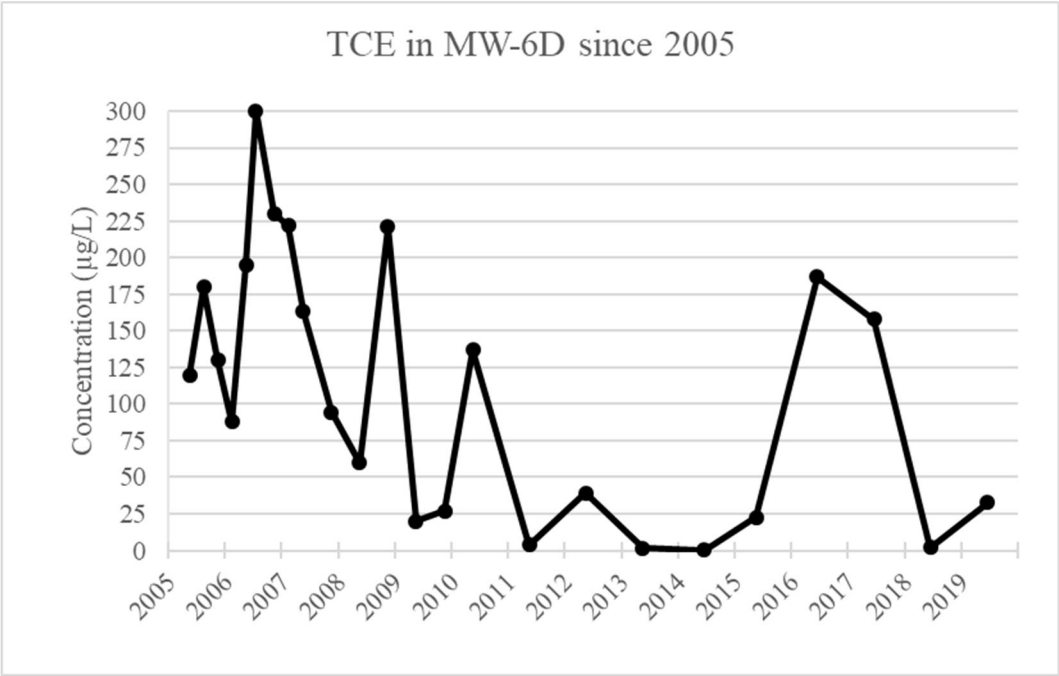

TCE in Extraction Wells Since 2010
Concentration (µg/L)
800
700
600
500
400
300
200
100
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
EW-1
EW-2
EW-3
MCL


TCE in MW-14D since 2010
Concentration (µg/L)
12
11
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
MW-14D
MCL


TCE in MW-9D since 2010
Concentration (µg/L)
12
11
10
9
8
7
6
5
4
3
2
1
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
MW-9D
MCL


1,1,1-TCA in MW-1 Since 2010
Concentration (µg/L)
3,000
2,500
2,000
1,500
1,000
500
0
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019


VOCs in MW-29D Since 2015
Concentration (µg/L)
50
40
30
20
10
0
2015
2016
2017
2018
2019
TCE
1,1-DCE
MCL
CCl4


TCE in MW-6D since 2005
Concentration (µg/L)
300
275
250
225
200
175
150
125
100
75
50
25
0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019