

**Fifth Five-Year Review Report For  
Davis Park Road TCE Superfund Site  
Gastonia, Gaston County, North Carolina**



**Prepared by**

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**TABLE OF CONTENTS**

**LIST OF ABBREVIATIONS & ACRONYMS ..... 3**

**I. INTRODUCTION ..... 4**

    SITE BACKGROUND ..... 4

    FIVE-YEAR REVIEW SUMMARY FORM ..... 5

**II. RESPONSE ACTION SUMMARY ..... 6**

    BASIS FOR TAKING ACTION ..... 6

    RESPONSE ACTIONS ..... 6

    REMEDY COMPONENTS ..... 6

    STATUS OF IMPLEMENTATION ..... 7

    INSTITUTIONAL CONTROLS ..... 8

    SYSTEMS OPERATION/OPERATION & MAINTENANT (O&M) ..... 9

**III. PROGRESS SINCE THE LAST REVIEW ..... 10**

**IV. FIVE-YEAR REVIEW PROCESS ..... 10**

**V. TECHNICAL ASSESSMENT ..... 11**

    QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS? ..... 11

    QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF THE REMEDY STILL VALID? ..... 12

    QUESTIONS C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY? ..... 13

**VI. ISSUES AND RECOMMENDATIONS ..... 14**

    OTHER FINDINGS: ..... 14

**VII. PROTECTIVENESS STATEMENTS ..... 15**

**VIII. NEXT REVIEW ..... 15**

**APPENDIX ..... A-1**

    APPENDIX A ..... A-1

    APPENDIX B ..... B-1

    APPENDIX C ..... C-1

    APPENDIX D ..... D-1

    APPENDIX E ..... E-1

    APPENDIX F ..... F-1

    APPENDIX G ..... G-1

    APPENDIX H ..... H-2

    APPENDIX I ..... I-1

## LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulation
CRQL	Contract Required Quantitation Limit
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
ESI	Expanded Site Inspection
FS	Feasibility Study
FYR	Five-Year Review
HQ	Hazard Quotient
IC	Institutional Control
MCL	Maximum Contaminant Level
MW	Monitoring Well
NC 2L	North Carolina Groundwater Standard
NC DENR	North Carolina Department of Environment and Natural Resources
NC DEQ	North Carolina Department of Environment Quality
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PCE	Tetrachloroethene
RAO	Remedial Action Objective
RI	Remedial Investigation
ROD	Record of Decision
RPM	Remedial Project Manager
SI	Site Inspection
TCE	Trichloroethene
mg/L	Microgram per Liter
VOC	Volatile Organic Compound

## **I. INTRODUCTION**

The purpose of a Five-Year Review (FYR) is to evaluate the implementation and performance of a remedy 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 five-year review reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them. The North Carolina Department of Environmental Quality (NCDEQ) is preparing this FYR for the U.S. Environmental Protection Agency pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) 40 Code of Federal Regulation (CFR) Section 300.430(f)(4)(ii) and considering EPA policy.

This is the fifth FYR for the Davis Park Road TCE Site (also known as Davis Park Road Site or Site). The triggering action for this policy review is the completion date of the previous FYR, September 29, 2020. The FYR has been prepared because hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. The Site consists of one operable unit (OU). The remedial action provides remediation of contaminated groundwater. The Davis Park Road Site FYR was led by Xaimara Santiago-Maldonado (EPA, Remedial Project Manager (RPM)), Tessa Monday (NC DEQ, RPM), and Ben Ammerman (NC DEQ, Hydrogeologist). Participants included Graham Burkhalter (EPA, Attorney), Katherine Schroer (EPA, Hydrologist), Ayana Cunningham (EPA, Human Health Risk Assessor), Scott Martin (EPA, FYR Coordinator) and Rosemarie Nelson (EPA, Community Involvement Coordinator). The review began on November 6, 2024.

### **SITE BACKGROUND**

The Davis Park Road Site is located within the Gastonia Extra Territorial Jurisdiction area along Davis Park Road, south of Hudson Boulevard and north of Blackwood Creek in the southwestern portion of Gastonia, Gaston County, North Carolina. The Site includes approximately 20 acres of residential homes and private businesses in unincorporated Gaston County (Figure D1). The Site consists of an area of previously contaminated soil behind a building that is located at 2307 Davis Park Road and a plume of contaminated groundwater that emanates from this property and extends south along Davis Park Road to Blackwood Creek. In 1966, the property was leased to Acme Petroleum and Fuel Company (ACME) of Gastonia in 1966. ACME held this lease until 1981. During the lease period, the property was subleased to various service stations and repair shops.

In the early 1990s, sampling events conducted by the Gaston County Environmental Health Department and the Environmental Services Division of the EPA revealed the presence of Tetrachloroethene (PCE), Trichloroethene (TCE) and chloroform in groundwater samples from drinking water wells above State and Federal drinking water standards. The highest concentration of TCE (101.4 µg/L) was detected in a sample collected from the private well located at 2419 Davis Park Road, 200 feet south of the Davis Park Auto Repair facility (located at 2307 Davis Park Road). Several potential sources of the contamination at the Davis Park Road Site were reviewed. Considering proximity, regional and local groundwater flow directions, and groundwater sample analytical data, Davis Park Road Auto Repair facility was identified as the most likely contaminant source (NCDENR Site Inspection, 1993).

On February 18, 1991, two underground storage tanks at the former auto repair shop were removed from the property. At the time of removal one tank was reported to have five to seven inches of unknown petroleum product and the other tank three to four inches of unknown petroleum product. Upon removal of the tanks, soils in the vicinity of the tanks were tested for contamination, and results showed no contamination present from the soils around the tanks. However, during the removal by the State of North Carolina, a drainpipe was discovered exiting the repair shop. A sample collected at the pipe's discharge point revealed concentrations of 700 µg/L trichloroethene (TCE). However, during the RI sampling in 1995, no contamination was found within the upper 0-6 feet soil zone behind the repair facility.

### FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Davis Park Road TCE Site		
EPA ID: NCD986175644		
Region: 4	State: NC	City/County: Gastonia, Gaston County
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Xaimara Santiago-Maldonado		
Author affiliation: EPA with support from NCDEQ		
Review period: 11/06/24 – 4/04/25		
Date of site inspection: 02/13/25		
Type of review: Policy		
Review number: 5 (Fifth)		
Triggering action date: 09/29/2020 (signature date of Fourth Five-Year Review)		
Due date ( <i>five years after triggering action date</i> ): 09/29/2025		

## II. RESPONSE ACTION SUMMARY

### BASIS FOR TAKING ACTION

A series of environmental assessments were conducted in the 1990s, including the Site Inspection (SI) Addendum (May 1993), Expanded Site Investigation (ESI) (May 1994), and Remedial Investigation (RI) (1996-1998). Based on the source investigation, the RI report indicated that solvents including PCE and TCE were introduced to the environment from the property at 2307 Davis Park Road and migrated through the vadose zone and the saprolite/partially weathered rock aquifer, and into the bedrock aquifer. Based on results of the RI and Feasibility Study (FS), the following groundwater contaminants of concern (COCs) were identified in the Record of Decision (ROD): Chloroform, 1,1-Dichloroethene (1,1-DCE), Methyl-tert-butyl-ether (MTBE), PCE, TCE. Contaminated groundwater is the major source of potential exposure for human receptors, which include on-site industrial/commercial workers or residents exposed to groundwater from the bedrock aquifer, as well as residents exposed to groundwater from existing private drinking water wells. Groundwater-related exposure routes include ingestion of drinking water, and inhalation and dermal contact from a variety of home activities such as showering, cooking, dish washing and laundering clothes.

### RESPONSE ACTIONS

#### *Summary of Pre-ROD Activities*

Several neighborhoods within the Site were connected to the City of Gastonia municipal water supply to reduce the potential health threat from the contaminants. In 1996, many of the houses within the Hedgewood Circle neighborhood, which borders the northern edge of the Site, were connected to the Gastonia municipal water system. In late 1997 and early 1998, after petitioning the city for water services, all the homes in the Cedar Oak Circle subdivision that were on the eastern side of the Site, were also connected to the Gastonia municipal water system.

#### *Remedial Action Objectives*

The 1998 ROD stated under Section 8: Remedial Action Objective that, *“The goal of the Remedial Action for the Site is to limit exposure to groundwater contaminated above risk-based standards and to restore groundwater to below risk-based standards.”* No other specified RAOs were defined in the 1998 ROD; however, remediation goals for groundwater were specified (Table 1).

### REMEDY COMPONENTS

#### *1998 Record of Decision*

The remedies set forth in the September 1998 ROD provide for remediation of contaminated groundwater.

The major components of the selected groundwater remedy, as stated in the ROD, include:

- Reduction of groundwater exposure by connecting homes, churches, and businesses in the Davis Park Road area to the City of Gastonia municipal water system.
- Optional wellhead treatment for affected private wells, including the installation of granular activated carbon unit as well as operation and maintenance of the filter for one year with a filter replacement after the first year of operation.
- Monitored natural attenuation of the bedrock aquifer groundwater plume. Groundwater shall be treated until the performance standards summarize in Table 1 are attained throughout the contaminant plumes.
- Continued analytical monitoring for contaminants in groundwater. Starting in 2002,

groundwater monitoring was to be conducted on a quarterly basis for three years from construction completion and annually for the next 27 years.

- Implementation of a contingency remedy if the data collected during the Natural Attenuation Study cannot substantiate the occurrence of natural attenuation. The remedy included the implementation of an active treatment of the contaminated bedrock aquifer groundwater plume using a pump and treat system. Implementation of measures for long-term management if determined that certain portions of the aquifer could not be restored. These measures included engineering controls, institutional controls (ICs), continued monitoring, and reevaluation of remedial technologies.

**TABLE 1: Groundwater Remediation Goals as Specified in the 1998 ROD**

Contaminant of Concern	ROD Cleanup Levels (µg/L)	ROD Cleanup Level Rationale
Tetrachloroethene	1	CRQL
Trichloroethene	2.8	2L
1,1-Dichloroethene	7	2L
Chloroform	1	CRQL
Methyl-tert-butyl-ether	200	2L
<p><b>Notes:</b>            ROD = Record of Decision            CRQL = Contract Required Quantitation Limit            µg/L = micrograms per liter            2L = NC 2L of NC Administrative Code, Title 15A, Subchapter 2L, Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina</p>		

**2000 Explanation of Significant Difference (ESD)**

The information collected during the Remedial Design and the Remedial Action (RD/RA) indicated that natural attenuation will achieve the groundwater clean-up goals for the Site, eliminating the requirement for the implementation of an active groundwater remediation system described in the ROD contingency remedy. Accordingly, an ESD was signed on September 27, 2000, to modify the ROD. The modifications included:

- Natural Attenuation will achieve the cleanup levels for the Site, eliminating the need for a contingency remedy.
- Extension of the projected clean-up time for groundwater to reach remediation goals for TCE and PCE. The worst-case estimates were 26 years for TCE and 43 years for PCE to achieve remediation goals.

**STATUS OF IMPLEMENTATION**

Installation of water lines throughout the Davis Park Road Site began in May 2000. Seventy residences were connected to the City of Gastonia Public Water Supply by September 9, 2000. Figure 1 shows the properties connected to the alternate water supply. On July 13, 2000, the installation of carbon filtration units began and was completed by August 4, 2000. Five carbon filtration units were installed

at five residences where the homeowners did not agree to be connected to the Gastonia municipal water system. The EPA approved this design, installation and one year's maintenance of five carbon filtration units at the Site. Residential well abandonment began on August 21, 2000, and 17 wells were abandoned by August 25, 2000. In addition, one residential well was converted into a monitoring well. Figure D3 shows the monitoring well sampling network.

Two residences where filters had been installed, 2400 and 2500 Skyland Road, had continuous non-detectable concentrations of site COCs and thus filter use and monitoring of these ended in 2005. One residence, 2717 Davis Park Road, could not be contacted in 2009, and all further sampling attempts were denied. The residence at 2837 Davis Park Road was also continuously non-detect, and sampling was discontinued in 2011. The residence at 2639 Springbrook Circle was the last potable well utilizing a filter system. In 2019, the post filter sample indicated breakthrough was imminent and the owners were given the choice of filter replacement or connection to the community water system. The homeowners chose to be connected to the community water system, and the well was converted to a monitoring well.

**INSTITUTIONAL CONTROLS**

ICs are defined as non-engineered instruments, such as administrative and legal controls, that help minimize the potential for human exposure to contamination and/or protect the integrity of the remedy. The use of ICs regarding the future installation of water supply wells within the area of contaminated groundwater were recommended. Governmental controls based on state regulations, such as 15A NCAC 02C .0100 & 15A NCAC 02C .0300 (Appendix I), prohibit the installation of drinking water wells into contaminated aquifers. These regulations pertain to the permitting and installation of water supply wells and the role of the local health departments as the permitting authority. NCDEQ and Gaston County Health Department use the groundwater sampling data to screen against well installation permits. Additionally, NCDEQ, in conjunction with Gaston County Health Department, will rely on North Carolina Residential Property Disclosure Act which requires the seller of a residential property to disclose any known defects and conditions of the property to potential buyers before a sale. Table 2 is a summary of the ICs called for in the decision documents, impacted parcels and IC objective. Figure D1 shows the IC Parcel Map.

**TABLE 2: Summary of Planned and/or Implemented ICs**

OU	Media	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Instruments in Place
OU1	Groundwater	Yes	Yes, if it is determined that certain portion of the aquifer cannot be	3534847852 3534753796 3534756951	To prevent human exposure to contaminated groundwater	North Carolina Administrative Code (15A NCAC 02C .0100 and 15A NCAC 02C .0300)

OU	Media	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Instruments in Place
			restored to beneficial use			North Carolina Residential Property Disclosure Act

**SYSTEMS OPERATION/OPERATION & MAINTENANT (O&M)**

In 2012, the EPA transferred the Davis Park Road Superfund Site O&M responsibilities to NCDEQ, after expiration of the ten-year Long-Term Response Action (LTRA) period. NCDEQ is responsible for implementing the O&M until the groundwater cleanup objectives have been met. The data collected for this FYR represents the twentieth annual sampling event. No sampling event was performed in 2007, 2020-2022, or 2024. Currently, the primary activities associated with Operations and Maintenance (O&M) include groundwater monitoring to be performed annually until cleanup levels are achieved. The purpose of groundwater monitoring is to confirm that:

- natural attenuation is occurring
- no changing conditions arise that might reduce efficacy of this remedy
- there is continued absence of toxic and/or mobile transformation products
- the plume is not expanding
- there is no impact downgradient
- there are no new releases
- the remediation objectives are attained

No samples were collected onsite from 2020-2022 and in 2024. During the 2023 sampling NC DEQ personnel were unable to visually locate flush-mounted monitoring wells MW-2 and MW-21 which had become obscured by vegetative overgrowth and/or accumulated soil and leaf litter. Both wells were subsequently located using a metal detector and uncovered during a site drive-by in 2024. In 2025, MW-21 was found to have fouled, with ponded rainwater and ease of access for outside contaminants to migrate into the wellhead which was not properly secured or sealed. For well MW-9, DEQ used the passive diffusion bags (PDB) sampler to collect a groundwater sample during the 2023 sampling event. However, when DEQ personnel arrived at the property for the 2025 event, the owner verbally rescinded access and no sample was collected. During both the 2023 and 2025 sampling events, MW-15 was successfully sampled and its duplicate PDB samplers replaced for future sampling. During the 2023 sampling event, another attempt was made to sample converted well MW-17 using peristaltic tubing. However, the tubing again met obstruction at approximately 20 feet depth, and pumping from that depth yielded no groundwater. Because of prolonged relatively dry regional conditions prior to the 2025 sampling event, no further attempt was made to sample the well.

The anticipated annual expenditures for the O&M are expected to be \$61,000 or less. Onsite well deterioration requiring maintenance has increased the cost since the last FYR.

### III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last five-year review. The last five-year review did not include any recommendations.

**TABLE 3: Protectiveness Determinations/Statements from the 2020 FYR**

OU1	Protectiveness Determination	Protectiveness Statement
Sitewide	Protective	<p><i>The remedy at the Davis Park Road TCE Site is currently protective of human health and the environment. The exposure pathway to contaminated groundwater has been mitigated by connecting the residents in the affected areas to city water. Routine annual sampling is ongoing, and the groundwater plume is naturally attenuating. The remedy at the site currently protects human health and the environment in the short term. Groundwater contamination is being remediated by natural attenuation and is actively monitored with environmental sampling. Currently, no human exposure pathways exist to groundwater.</i></p> <p><i>Through state and county regulations that restrict the installation of drinking water wells into contaminated aquifers, the remedy will remain protective in the long term until cleanup levels are met.</i></p>

### IV. FIVE-YEAR REVIEW PROCESS

#### Community, Notification and Interviews

The EPA issued an online news release on October 30, 2024, to announce that the FYR was underway. A copy of the news release is available online at [www.epa.gov/newsreleases/epa-review-cleanups-47-southeast-superfund-sites-year](http://www.epa.gov/newsreleases/epa-review-cleanups-47-southeast-superfund-sites-year) and is included in Appendix G. It stated that the FYR was underway and invited the public to submit any comments to the EPA. The results of the review and the report will be made available on the EPA website <https://www.epa.gov/superfund/search-superfund-five-year-reviews> [epa.gov]. The FYR will also be available online at the Site’s public information repository and at the Gaston County Public Library located at 1555 E. Garrison Boulevard, Gastonia, NC 28054. During the FYR process, interviews were conducted to document any perceived problems or successes with the remedy that has been implemented to date. The City of Gastonia was contacted for a community interview. According to the Public Services Director, there have been no reported environmental issues on record for the Site. Additionally, there have been no reports of unusual or unexpected activities at the Site, such as vandalism or trespassing. EPA could improve communications by providing information to the City of Gastonia (Stormwater Division, as well as Planning and Zoning) and Gaston County (through the Environmental Health and Natural Resources Departments). This allows for better planning and public services to be provided at the local level. To increase awareness, the suggestion was made to share the GIS layers for all Superfund sites and reports to City and County GIS managers so that better community planning, outreach, and services can be provided. Per the city’s Planning Office, this Site is outside the city limits and the area is not scheduled for annexation.

## Data Review

### Groundwater

Previous sampling had indicated the plume was following the apparent groundwater flow southeast toward Blackwood Creek (Figure D3). The current response action includes monitoring the bedrock aquifer contaminant plume by sampling a network of bedrock wells for VOCs currently on an annual basis to ensure the plume is naturally attenuating. During the 2023 sampling event, TCE was detected in two wells: MW-9 and MW-15. During the February 2025 sampling event, three wells were sampled. TCE and/or PCE were detected in two wells, MW-2 and MW-15. MW-26 had no detections of COCs. All detections of site COCs during this FYR period were less than the cleanup levels:

MW-2 (Approximately 2000 feet south southeast of MW-5):

- TCE: 0.968 µg/L (2025)
- PCE: 0.897 µg/L (2025)

MW-9 (western plume offshoot):

- TCE: 2.4 µg/L (2023)

MW-15 (western body of main plume):

- TCE: 1.6 µg/L (2023) and 0.719 µg/L (2025)

### Site Inspection

The Site inspection was conducted on February 13, 2025. In attendance were Tessa Monday (RPM, NC DEQ), Ben Ammerman (NC DEQ), and Stuart Parker (NC DEQ). The purpose of the inspection was to assess the protectiveness of the remedy. It was noted during the inspection that locating wells was difficult, all well casings had flooded due to recent precipitation events and poor conditions of well housing, and MW-21 had fouled completely. The completed *Site Inspection Checklist* document can be found in Appendix C.

## V. TECHNICAL ASSESSMENT

### QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

Yes. The EPA and the State of North Carolina have determined that all the remedial action construction activities were performed according to specifications and the remedy component selected to address impacted groundwater, MNA, continues to operate as designed. All detections of site COCs during this FYR period were below ROD-selected cleanup levels. All properties surrounding the Site previously identified with having private drinking water wells are currently supplied drinking water from either the City of Gastonia municipal water supply or community wells. Currently, no human exposure pathways exist to contaminated soil or groundwater. However, the status of the monitoring wells calls into question the long-term protectiveness of the remedy. Groundwater monitoring wells have not been regularly maintained. The wells are deteriorating and show signs of flooding and fouling. NCDEQ will continue sampling of the groundwater monitoring well network for groundwater contaminant concentrations and evaluate repair or replacement of the fowled wells. Institutional controls through a State-wide prohibition of installing drinking water wells into contaminated aquifers are in place to prevent exposure to impacted groundwater. This will be protective of human health while the state pursues options to repair or replace the fowled wells so that sampling of those wells can be resumed,

and a determination can be made on the progress toward achieving groundwater cleanup levels in all wells.

**QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEAN-UP LEVELS AND REMEDIAL ACTION OBJECTIVES (RAOs) USED AT THE TIME OF THE REMEDY STILL VALID?**

The exposure assumptions, toxicity data, performance standards, and RAOs used at the time of the remedy are still protective of human health and the environment. There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Although there have been changes to the standards on which the ROD cleanup levels were set, these changes do not impact the protectiveness of the remedy as summarized below.

**Groundwater**

The NC Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina, NCAC Title 15A Subchapter 2L (NC 2L), on which several of the cleanup levels are based were last amended on April 1, 2022. CERCLA requires that the remedy comply with any standard, requirement, criteria, or limitation under any Federal environmental law (such as Federal MCLs here), as well as any promulgated State standard that is more stringent than any federal standard. Table 5 shows a comparison for groundwater remediation goals (cleanup levels) and Applicable or Relevant and Appropriate Requirements (ARARs). Two COCs have ROD cleanup levels less stringent than the current NC 2L standards for those compounds. The ROD cleanup level for MTBE is 200 µg/L and the current NC 2L standard is 20 µg/L. The ROD cleanup level for PCE is 1 µg/L and the current NC 2L standard is 0.7 µg/L. TCE, 1,1-DCE, and chloroform NC 2L standards were also amended in 2013; however, the current ROD cleanup levels for these compounds are more stringent. The only COCs detected during this FYR’s sampling events (TCE, PCE) are below the ROD remediation goals. Groundwater continues to be monitored, houses with impacted wells have been connected to municipal water, and implemented ICs ensure that there is no use of impacted groundwater.

**TABLE 4: ARAR Comparison of the Groundwater Remediation Goals and Current Standards**

Contaminant of Concern	ROD Cleanup Levels (µg/L)	ROD Cleanup Level Rationale	Current NC 2L <sup>a</sup> (As of April 1, 2022) (µg/L)	Current Federal MCL <sup>b</sup> /CRQL (µg/L)	Change in ARAR Yes/No
Tetrachloroethene	1	CRQL	0.7	5/0.50	<u>Yes</u>
Trichloroethene	2.8	2L	3	5/0.50	Yes <sup>b</sup>
1,1-Dichloroethene	7	2L	350	7/0.50	Yes <sup>b</sup>
Chloroform	1	CRQL	70	80 <sup>c</sup> /0.50	Yes <sup>b</sup>
Methyl-tert-butyl-ether	200	2L	20	NA/0.50	<u>Yes</u>

**Notes:**

ROD = Record of Decision

MCL = Maximum Contaminant Level

CRQL = Contract Required Quantitation Limit

ARAR = Applicable or Relevant and Appropriate Requirements

NA = Not Available

<sup>a</sup> NC 2L of NC Administrative Code, Title 15A, Subchapter 2L, Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina

<sup>b</sup> ARAR has changed but ROD remediation goal is more stringent than the current new standard.

<sup>c</sup> As total trihalomethanes.

**BOLD** and underlined indicates current NC 2L standard is more stringent than previous remediation goal.

µg/l = micrograms per liter

**Vapor Intrusion**

For this FYR, Vapor Intrusion Screening Levels (VISLs) were calculated using the highest concentration of COCs detected in the groundwater sampling events during this FYR period. None resulted in a cancer risk greater than  $1 \times 10^{-4}$  for carcinogens or a noncancer HQ of greater than 1; therefore, there is no unacceptable risk to human health from vapor intrusion.

**TABLE 4: VISLs for COCs Detected During FYR Period**

Contaminant of Concern	Groundwater Concentration (µg/L)	Predicted Indoor Air Concentration (µg/m <sup>3</sup> ) for Residential Exposure	VISL model-Potential Carcinogenic Risk for Residential Exposure	VISL Model-Potential Hazard Quotient for Residential Exposure
Tetrachloroethene (PCE)	0.897	0.65	6.0E-08	1.6E-02
Trichloroethene (TCE)	2.4	0.97	2.0E-06	4.6E-01

**Notes:**

µg/m<sup>3</sup> = micrograms per cubic meter

µg/L = micrograms per liter

**QUESTIONS C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?**

No.

**VI. ISSUES AND RECOMMENDATIONS**

<b>ISSUES/RECOMMENDATIONS</b>				
<b>OU(s) without Issues/ Recommendations Identified in the Five-Year Review:</b>				
None				
<b>Issues/Recommendations Identified in the Five-Year Review:</b>				
<b>OU1 (Sitewide)</b>	<b>Issue Category:</b> Operations & Maintenance (O&M)			
	<b>Issue:</b> Groundwater monitoring wells have not been regularly maintained. The wells are deteriorating and show signs of flooding and fouling.			
	<b>Recommendation:</b> Upgrades are required to the monitoring well network to ensure wells can be adequately sampled and the resulting data is reliable to make determinations about the site groundwater status.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	NC DEQ	EPA	09/13/2027
<b>OU1 (Sitewide)</b>	<b>Issue Category:</b> Monitoring			
	<b>Issue:</b> Monitoring water wells were not sampled in 2020, 2021, 2022, and 2024.			
	<b>Recommendation:</b> Monitoring wells must be sampled annually as described in the ROD to confirm protectiveness by enabling the state to screen against well permits with current data and as required to determine when the site will be a candidate for deletion from the NPL.			
<b>Affect Current Protectiveness</b>	<b>Affect Future Protectiveness</b>	<b>Party Responsible</b>	<b>Oversight Party</b>	<b>Milestone Date</b>
No	Yes	NC DEQ	EPA	09/13/2027

**OTHER FINDINGS:**

- The North Carolina Administrative Code (15A NCAC 02C .0100 and 15A NCAC 02C .0300) is the current instrument in place functioning as an IC. The EPA should consider drafting an ESD to further clarify the IC requirements for the Site and ensure their proper implementation.
- Two COCs have ROD cleanup levels less stringent than the current NC 2L standards for those compounds. An evaluation of whether the ROD cleanup levels must be updated should be conducted.

**VII. PROTECTIVENESS STATEMENTS**

<b>PROTECTIVENESS STATEMENT</b>	
<b>Operable Unit:</b> OU1	<b>Protectiveness Determination:</b> Short Term Protective
<b>Protectiveness Statement:</b> The remedy at the Davis Park Road TCE Site is currently protective of human health and the environment. The exposure pathway to contaminated groundwater has been mitigated by connecting the residents in the affected areas to city water and implementing ICs to prevent use of impacted groundwater. Routine annual sampling has resumed, and the groundwater plume is naturally attenuating. To be protective in the long-term the following recommendations need to be implemented (1) upgrades to the monitoring well network to ensure wells can be adequately sampled and the resulting data is reliable, and (2) monitoring wells must be sampled annually as described in the ROD to confirm protectiveness by enabling the state to screening against well permits with current data and as required to determine when the site will be a candidate for deletion from the NPL.	

**VIII. NEXT REVIEW**

The next FYR for the Site is required five years from completion date of this review.

## APPENDIX A

### Reference List

U. S. EPA. September 2000. Superfund Preliminary Close-Out Report, Davis Park Road TCE, National Priorities List Site, Gastonia, Gaston County, North Carolina.

U. S. EPA. September 29,1998. Record of Decision, Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

U. S. EPA. September 27,2000. Explanation of Significant Differences. Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

North Carolina Administrative Code, Title 15A Subchapter 2L, Section .0100, .0200, .0300, Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina, April 1, 2013.

NC DEQ, Superfund Section. May 2016. LTRA Sampling Event. Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

NC DEQ, Superfund Section. June 2017. LTRA Sampling Event. Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

NC DEQ, Superfund Section. April 2018. LTRA Sampling Event. Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

NC DEQ, Superfund Section. 2019. LTRA Sampling Event. Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

NC DEQ, Superfund Section. 2023, 2025. OU-1 Monitored Natural Attenuation Operation & Maintenance Monitoring Well Sampling Report, Davis Park Road TCE Site, Gastonia, Gaston County, North Carolina.

## APPENDIX B

### Site Chronology

Event	Date
Carl Bell (owner of the property at 2307 Davis Park Rd.) subleased to ACME Petroleum and Fuel Co. ACME subleased to Mr. Welch, who admitted to a crankcase oil release on the property.	1966
Acme Petroleum and Fuel Company subleased the property to Mr. Reeves McAllister.	1976-1978
Subleased the property to Mr. James Clark. A transmission shop was opened on the property, Clarks Transmission and Wrecker Service.	1978-1980
Subleased to Mr. Ray Moore. Mr. Moore was cited by the State of North Carolina for kerosene spills and admitted to dumping water from his parts cleaner on the ground.	1980-1996
Gaston County Environmental Health collected groundwater samples from a community supply well within the Cedar Oak Park Subdivision, as part of a routine community well sampling procedure. The sampling revealed elevated levels of TCE, PCE and chloroform within the water.	March 31,1990
Confirmation sampling from the Cedar Oak Park community well and three additional private wells were sampled. Elevated levels of TCE were detected.	April - May 1990
Environmental Services Division from the EPA collected groundwater samples from wells along Davis Park Rd. and within the Cedar Oak Park subdivision. Elevated levels of TCE were detected. Site added to Comprehensive Environmental Response Compensation Liability Information System.	July 26,1990
Two Underground Storage Tanks (USTs) were removed from the machine shop property. During the tank removal a soil sample was collected at the discharge point of the tanks. High levels of TCE and DCE were detected in this sample.	February 1991
Preliminary Assessment (PA) completed	March 7, 1991
Phase I Site Screening Inspection completed	October 1992
Site Inspection (SI) completed	June 28, 1993
Expanded Site Inspection (ESI) completed	September 9, 1994
The EPA proposed the Site for inclusion on the National Priority List (NPL).	July 28, 1998
Combined Remedial Investigation and Feasibility Study (RI/FS) completed and Record of Decision (ROD) signed.	September 29, 1998
Remedial Design started	September 30, 1998
Site finalized on the NPL	January 19,1999

On-site construction initiated (RA start) and the trigger date for the FYR	May 15, 2000
Remedial Design completed	September 27, 2000
ROD modified with Explanation of Significant Difference (BSD). Information collected during the RD/RA confirmed that Natural Attenuation will achieve the groundwater goals, that active groundwater cleanup remedy is not needed nor is a contingency remedy needed.	September 27, 2000
Superfund Preliminary Close-Out Report (POOR) completed	September 27, 2000
Remedial Action Final Report completed and the establishment that the remedy is Operational and Functional.	September 17, 2001
Final Monitored Natural Attenuation Plan	October 2002
First FYR completed	June 1, 2005
NCDENR is tasked to complete the final four years of the Long Term Response Action under a cooperative agreement and conducts annual sampling event.	August 2008
Second FYR completed	June 1, 2010
The EPA transferred the response action (former the LTRA) at the Site, including annual monitoring activities, to the NCDENR.	August 12, 2012
Second FYR Addendum completed	December 14, 2012
Annual LTRA sampling events	2013-2019
Third Five Year Review Completed	June 1, 2015
Fourth Five Year Review Completed	September 22, 2020
O&M Sampling Event	May 24, 2023
Fifth Five Year Review Kick-off meeting	November 6, 2024
O&M Sampling Event and Site Visit	February 13, 2025

**APPENDIX C**

**Site Inspection Checklist**

<b>FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST</b>			
<b>I. SITE INFORMATION</b>			
<b>Site Name:</b> Davis Park Rd TCE	<b>Date of Inspection:</b> 2/13/2025		
<b>Location and Region:</b> Gastonia NC, Region 4	<b>EPA ID:</b> NCD986175644		
<b>Agency, Office or Company Leading the Five-Year Review:</b> NC DEQ	<b>Weather/Temperature:</b> Cloudy / 50° F		
<b>Remedy Includes:</b> (Check all that apply) <table style="width:100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Landfill cover/containment  <input type="checkbox"/> Access controls  <input type="checkbox"/> Institutional controls  <input type="checkbox"/> Ground water pump and treatment  <input type="checkbox"/> Surface water collection and treatment  <input type="checkbox"/> Other:                 </td> <td style="width: 50%; vertical-align: top;"> <input checked="" type="checkbox"/> Monitored natural attenuation  <input type="checkbox"/> Ground water containment  <input type="checkbox"/> Vertical barrier walls                 </td> </tr> </table>		<input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Ground water pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Ground water containment <input type="checkbox"/> Vertical barrier walls
<input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Ground water pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other:	<input checked="" type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Ground water containment <input type="checkbox"/> Vertical barrier walls		
<b>Attachments:</b> <input checked="" type="checkbox"/> Inspection team roster attached <input checked="" type="checkbox"/> Site map attached			
<b>II. INTERVIEWS</b> (check all that apply)			
<b>1. O&amp;M Site</b>			
<b>Manager</b>	Name _____ Title _____ Date _____		
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone :	_____		
Problems, suggestions <input type="checkbox"/> Report attached:	_____		
<b>2. O&amp;M Staff</b>			
	Name _____ Title _____ Date _____		
Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone :	_____		
Problems/suggestions <input type="checkbox"/> Report attached:	_____		
<b>3. Local Regulatory Authorities and Response Agencies</b> (i.e., state and tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices). Fill in all that apply.			
Agency _____			
Contact _____	_____		
Name _____	Title _____ Date _____ Phone No. _____		
Problems/suggestions <input type="checkbox"/> Report attached:	_____		

Agency \_\_\_\_\_

Contact \_\_\_\_\_

Name

Title

Date

Phone No.

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_

Name

Title

Date

Phone No.

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_

Name

Title

Date

Phone No.

Problems/suggestions  Report attached: \_\_\_\_\_

Agency \_\_\_\_\_

Contact \_\_\_\_\_

Name

Title

Date

Phone No.

Problems/suggestions  Report attached: \_\_\_\_\_

4. **Other Interviews** (optional)  Report attached: \_\_\_\_\_

**III. ON-SITE DOCUMENTS AND RECORDS VERIFIED (check all that apply)**

1. **O&M Documents**

O&M manual       Readily available       Up to date       N/A

As-built drawings       Readily available       Up to date       N/A

Maintenance logs       Readily available       Up to date       N/A

Remarks:

2. **Site-Specific Health and Safety Plan**       Readily available       Up to date       N/A

Contingency plan/emergency response plan       Readily available       Up to date       N/A

Remarks:

3. **O&M and OSHA Training Records**       Readily available       Up to date       N/A

Remarks:

4.	<b>Permits and Service Agreements</b>			
	<input type="checkbox"/> Air discharge permit	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Effluent discharge	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Waste disposal, POTW	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Other permits: _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
5.	<b>Gas Generation Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
6.	<b>Settlement Monument Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
7.	<b>Groundwater Monitoring Records</b>	<input checked="" type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input type="checkbox"/> N/A
	Remarks: _____			
8.	<b>Leachate Extraction Records</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
9.	<b>Discharge Compliance Records</b>			
	<input type="checkbox"/> Air	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	<input type="checkbox"/> Water (effluent)	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
10.	<b>Daily Access/Security Logs</b>	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date	<input checked="" type="checkbox"/> N/A
	Remarks: _____			
<b>IV. O&amp;M COSTS</b>				
1.	<b>O&amp;M Organization</b>			
	<input checked="" type="checkbox"/> State in-house	<input type="checkbox"/> Contractor for state		
	<input type="checkbox"/> PRP in-house	<input type="checkbox"/> Contractor for PRP		
	<input type="checkbox"/> Federal facility in-house	<input type="checkbox"/> Contractor for Federal facility		

\_\_\_\_\_

2. **O&M Cost Records**

- Readily available                       Up to date  
 Funding mechanism/agreement in place     Unavailable

Original O&M cost estimate: \_\_\_\_\_  Breakdown attached

Total annual cost by year for review period if available

From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	<input type="checkbox"/> Breakdown attached

3. **Unanticipated or Unusually High O&M Costs during Review Period**

Describe costs and reasons: No Unusual or unanticipated costs have occurred during this review period.

**V. ACCESS AND INSTITUTIONAL CONTROLS**     Applicable     N/A

**A. Fencing**

1. **Fencing Damaged**     Location shown on site map     Gates secured     N/A  
Remarks:

**B. Other Access Restrictions**

1. **Signs and Other Security Measures**     Location shown on site map     N/A  
Remarks:

**C. Institutional Controls (ICs)**

**1. Implementation and Enforcement\***

Site conditions imply ICs not properly implemented

Yes  No  N/A

Site conditions imply ICs not being fully enforced

Yes  No  N/A

Type of monitoring (e.g., self-reporting, drive by): \_\_\_\_\_

Frequency: \_\_\_\_\_

Responsible party/agency: \_\_\_\_\_

Contact

_____	_____	_____	_____
Name	Title	Date	Phone no.

Reporting is up to date

Yes  No  N/A

Reports are verified by the lead agency

Yes  No  N/A

Specific requirements in deed or decision documents have been met

Yes  No  N/A

Violations have been reported

Yes  No  N/A

Other problems or suggestions:  Report attached

**2. Adequacy**

ICs are adequate

ICs are inadequate

N/A

Remarks:

**D. General**

**1. Vandalism/Trespassing**

Location shown on site map

No vandalism evident

Remarks:

**2. Land Use Changes On Site**

N/A

Remarks:

**3. Land Use Changes Off Site**

N/A

Remarks: While offsite land use has not changed entirely, during the visit a posted plan for a housing development upgradient of the site was observed.

**VI. GENERAL SITE CONDITIONS**

**A. Roads**

Applicable

N/A

**1. Roads Damaged**

Location shown on site map

Roads adequate

N/A

Remarks:

<b>B. Other Site Conditions</b>		
Remarks: _____		
<b>VII. LANDFILL COVERS</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A		
<b>A. Landfill Surface</b>		
1.	<b>Settlement</b> (low spots) Aerial extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map  <input type="checkbox"/> Settlement not evident Depth: _____
2.	<b>Cracks</b> Lengths: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map Widths: _____ <input type="checkbox"/> Cracking not evident Depths: _____
3.	<b>Erosion</b> Aerial extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Erosion not evident Depth: _____
4.	<b>Holes</b> Aerial extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Holes not evident Depth: _____
5.	<b>Vegetative Cover</b> <input type="checkbox"/> No signs of stress Remarks: _____	<input type="checkbox"/> Grass <input type="checkbox"/> Trees/shrubs (indicate size and locations on a diagram) <input type="checkbox"/> Cover properly established
6.	<b>Alternative Cover</b> (e.g., armored rock, concrete) Remarks: _____	<input type="checkbox"/> N/A
7.	<b>Bulges</b> Aerial extent: _____ Remarks: _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> Bulges not evident Height: _____
8.	<b>Wet Areas/Water Damage</b> <input type="checkbox"/> Wet areas	<input type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site      Aerial extent: _____

<input type="checkbox"/> Ponding	map <input type="checkbox"/> Location shown on site map	Arial extent: _____
<input type="checkbox"/> Seeps	map <input type="checkbox"/> Location shown on site map	Arial extent: _____
<input type="checkbox"/> Soft subgrade	map <input type="checkbox"/> Location shown on site map	Arial extent: _____
Remarks: _____		

9. <b>Slope Instability</b>	<input type="checkbox"/> Slides	<input type="checkbox"/> Location shown on site map
<input type="checkbox"/> No evidence of slope instability		
Arial extent: _____		
Remarks: _____		

**B. Benches**       Applicable     N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. <b>Flows Bypass Bench</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____		

2. <b>Bench Breached</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____		

3. <b>Bench Overtopped</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A or okay
Remarks: _____		

**C. Letdown Channels**       Applicable     N/A

(Channel lined with erosion control mats, riprap, grout bags or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. <b>Settlement</b> (Low spots)	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of settlement
Arial extent: _____		Depth: _____
Remarks: _____		

2.	<b>Material Degradation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of degradation
	Material type: _____		Arial extent: _____
	Remarks: _____		
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of erosion
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	<b>Undercutting</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	<b>Obstructions</b>	Type: _____	<input type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Arial extent: _____	
	Size: _____		
	Remarks: _____		
6.	<b>Excessive Vegetative Growth</b>	Type: _____	
	<input type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Arial extent: _____	
	Remarks: _____		
<b>D. Cover Penetrations</b>			
		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	<b>Gas Vents</b>	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
		<input type="checkbox"/> Good condition	
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
	Remarks: _____		
2.	<b>Gas Monitoring Probes</b>		
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled
		<input type="checkbox"/> Good condition	
	<input type="checkbox"/> Evidence of leakage at penetration	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
	Remarks: _____		

3.	<b>Monitoring Wells</b> (within surface area of landfill)	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
Remarks: _____					
4.	<b>Extraction Wells Leachate</b>	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled	<input type="checkbox"/> Good condition
		<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A
Remarks: _____					
5.	<b>Settlement Monuments</b>	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed	<input type="checkbox"/> N/A	
Remarks: _____					
<b>E. Gas Collection and Treatment</b> <input type="checkbox"/> Applicable <input type="checkbox"/> N/A					
1.	<b>Gas Treatment Facilities</b>	<input type="checkbox"/> Flaring	<input type="checkbox"/> Thermal destruction	<input type="checkbox"/> Collection for reuse	
		<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance		
Remarks: _____					
2.	<b>Gas Collection Wells, Manifolds and Piping</b>	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance		
Remarks: _____					
3.	<b>Gas Monitoring Facilities</b> (e.g., gas monitoring of adjacent homes or buildings)	<input type="checkbox"/> Good condition	<input type="checkbox"/> Needs maintenance	<input type="checkbox"/> N/A	
Remarks: _____					
<b>F. Cover Drainage Layer</b> <input type="checkbox"/> Applicable <input type="checkbox"/> N/A					
1.	<b>Outlet Pipes Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A		
Remarks: _____					
2.	<b>Outlet Rock Inspected</b>	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A		
Remarks: _____					
<b>G. Detention/Sedimentation Ponds</b> <input type="checkbox"/> Applicable <input type="checkbox"/> N/A					

1.	<b>Siltation</b>	Area extent: _____	Depth: _____	<input type="checkbox"/> N/A
		<input type="checkbox"/> Siltation not evident		
		Remarks: _____		
2.	<b>Erosion</b>	Area extent: _____	Depth: _____	
		<input type="checkbox"/> Erosion not evident		
		Remarks: _____		
3.	<b>Outlet Works</b>	<input type="checkbox"/> Functioning		<input type="checkbox"/> N/A
		Remarks: _____		
4.	<b>Dam</b>	<input type="checkbox"/> Functioning		<input type="checkbox"/> N/A
		Remarks: _____		
<b>H. Retaining Walls</b>				
		<input type="checkbox"/> Applicable		<input type="checkbox"/> N/A
1.	<b>Deformations</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident	
		Horizontal displacement: _____	Vertical displacement: _____	
		Rotational displacement: _____		
		Remarks: _____		
2.	<b>Degradation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident	
		Remarks: _____		
<b>I. Perimeter Ditches/Off-Site Discharge</b>				
		<input type="checkbox"/> Applicable		<input type="checkbox"/> N/A
1.	<b>Siltation</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident	
		Area extent: _____	Depth: _____	
		Remarks: _____		
2.	<b>Vegetative Growth</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A	
		<input type="checkbox"/> Vegetation does not impede flow		
		Area extent: _____	Type: _____	
		Remarks: _____		
3.	<b>Erosion</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident	
		Area extent: _____	Depth: _____	
		Remarks: _____		
4.	<b>Discharge Structure</b>	<input type="checkbox"/> Functioning		<input type="checkbox"/> N/A
		Remarks: _____		

<b>VIII. VERTICAL BARRIER WALLS</b> <input type="checkbox"/> Applicable <input checked="" type="checkbox"/> N/A			
1.	<b>Settlement</b>	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Area extent: _____		Depth: _____
	Remarks: _____		
2.	<b>Performance Monitoring</b>	Type of monitoring: _____	
	<input type="checkbox"/> Performance not monitored		
	Frequency: _____	<input type="checkbox"/> Evidence of breaching	
	Head differential: _____		
	Remarks: _____		
<b>IX. GROUND WATER/SURFACE WATER REMEDIES</b> <input checked="" type="checkbox"/> Applicable <input type="checkbox"/> N/A			
<b>A. Ground Water Extraction Wells, Pumps and Pipelines</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Pumps, Wellhead Plumbing and Electrical</b>		
	<input type="checkbox"/> Good condition	<input type="checkbox"/> All required wells properly operating	<input type="checkbox"/> Needs maintenance <input checked="" type="checkbox"/> N/A
	Remarks: _____		
2.	<b>Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances</b>		
	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance		
	Remarks: _____		
3.	<b>Spare Parts and Equipment</b>		
	<input type="checkbox"/> Readily available	<input type="checkbox"/> Good condition	<input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided
	Remarks: <u>System age will likely require readily available parts and equipment.</u>		
<b>B. Surface Water Collection Structures, Pumps and Pipelines</b>		<input type="checkbox"/> Applicable	<input checked="" type="checkbox"/> N/A
1.	<b>Collection Structures, Pumps and Electrical</b>		
	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance		
	Remarks: _____		
2.	<b>Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances</b>		
	<input type="checkbox"/> Good condition <input type="checkbox"/> Needs maintenance		
	Remarks: _____		

**3. Spare Parts and Equipment**

Readily available

Good condition

Requires upgrade

Needs to be provided

Remarks: \_\_\_\_\_

**C. Treatment System**

Applicable  N/A

**1. Treatment Train** (check components that apply)

Metals removal

Oil/water separation

Bioremediation\*

Air stripping

Carbon adsorbers

In-situ chemical oxidation\*

Filters: \_\_\_\_\_

Monitored natural attenuation\*

Additive (e.g., chelation agent, flocculent): \_\_\_\_\_

Others: \_\_\_\_\_

Good condition

Needs maintenance

Sampling ports properly marked and functional

Sampling/maintenance log displayed and up to date

Equipment properly identified

Quantity of ground water treated annually: \_\_\_\_\_

Quantity of surface water treated annually: \_\_\_\_\_

Remarks: System is clearly aged and will need to be replaced

**2. Electrical Enclosures and Panels** (properly rated and functional)

N/A

Good condition

Needs maintenance

Remarks: \_\_\_\_\_

**3. Tanks, Vaults, Storage Vessels**

N/A

Good condition

Proper secondary containment

Needs maintenance

Remarks: \_\_\_\_\_

**4. Discharge Structure and Appurtenances**

N/A

Good condition

Needs maintenance

Remarks: \_\_\_\_\_

5. **Treatment Building(s)**

N/A       Good condition (esp. roof and doorways)       Needs repair

Chemicals and equipment properly stored

Remarks: \_\_\_\_\_

6. **Monitoring Wells** (pump and treatment remedy)

Properly secured/locked       Functioning       Routinely sampled       Good condition

All required wells located       Needs maintenance       N/A

Remarks:

**D. Monitoring Data\***

1. **Monitoring Data**

Is routinely submitted on time       Is of acceptable quality

2. **Monitoring Data Suggests:**

Ground water plume is effectively contained       Contaminant concentrations are declining

**E. Monitored Natural Attenuation\***

1. **Monitoring Wells** (natural attenuation remedy)

Properly secured/locked       Functioning       Routinely sampled       Good condition

All required wells located       Needs maintenance       N/A

Remarks: The majority of wells were flooded due to recent rains as well as improperly placed and/or deteriorated well heads/casings/housing.

**X. OTHER REMEDIES**

If there are remedies applied at the site and not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

**XI. OVERALL OBSERVATIONS**

**A. Implementation of the Remedy**

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is designed to accomplish (e.g., to contain contaminant plume, minimize infiltration and gas emissions).

Monitored Natural Attenuation is progressing smoothly, but the monitoring wells are in a state which may compromise sampling results. These wells should be rehabilitated in order to prepare for site closure and ensure there is no fouling of these wells.

**B. Adequacy of O&M**

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

Although there were no costs related to O&M previously, well maintenance and upgrades have been neglected in the past few years as the site has not been routinely sampled. This may compromise the long-term viability of sampling these current wells without fouling issues.

**C. Early Indicators of Potential Remedy Problems**

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future.

As stated above, the remedy may involve extra costs due to the state of the monitoring well array. One well is flooded and fouled and should be abandoned or risk potential future exposure. Other wells should be raised to stick up wells or have a mounding installed over the casing.

**D. Opportunities for Optimization**

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Monitoring tasks should happen with more frequency and wells should be secured to ensure accurate data is gathered. As these upgrades are made, more reliable data will help close out the site, saving funds in the long run. Constituents of Concern have been trending downward for decades and this site has the potential be de-listed if reliable data is provided.

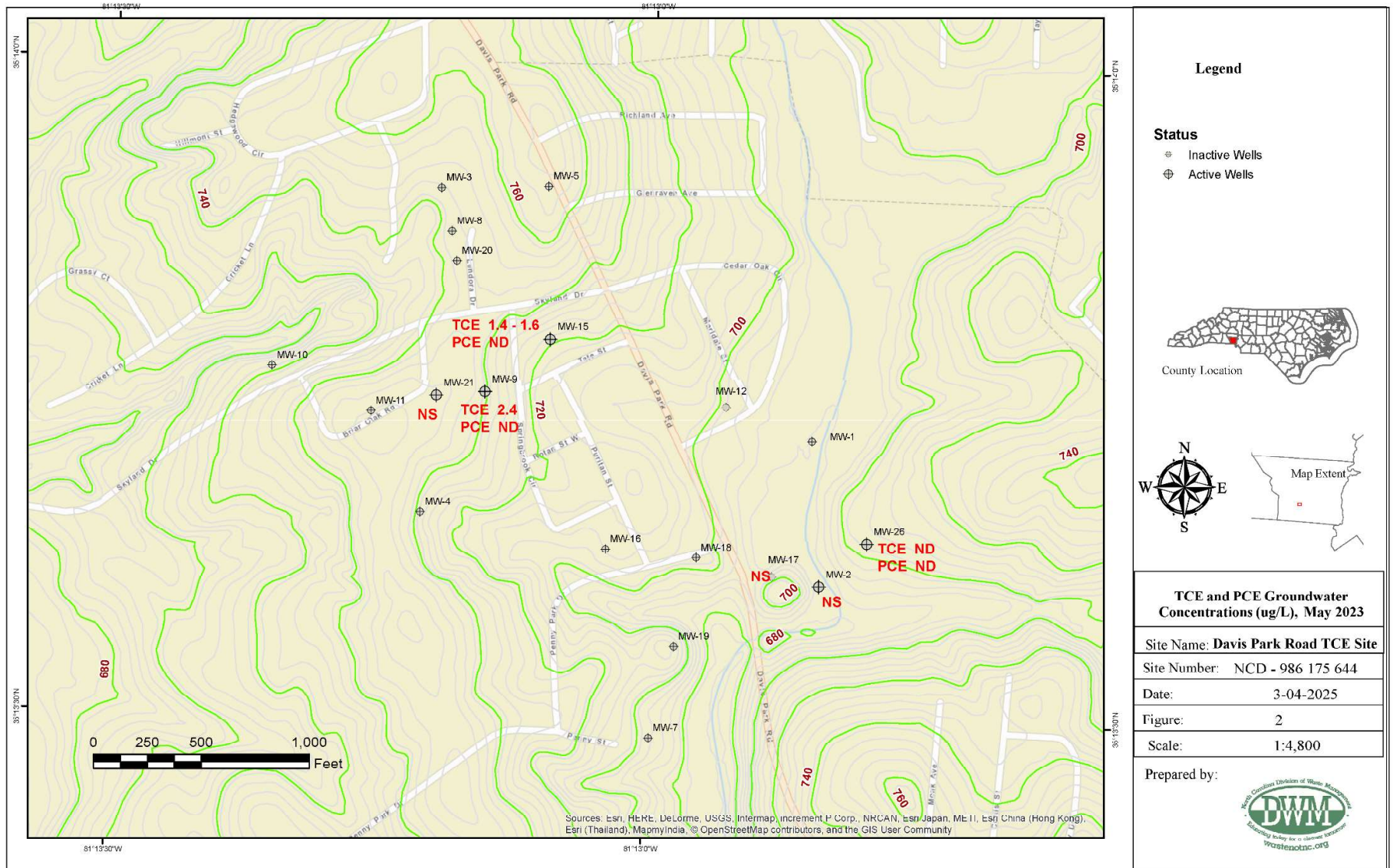
**Site Inspection Participants:**

Tessa Monday, Environmental Engineer, NC DEQ

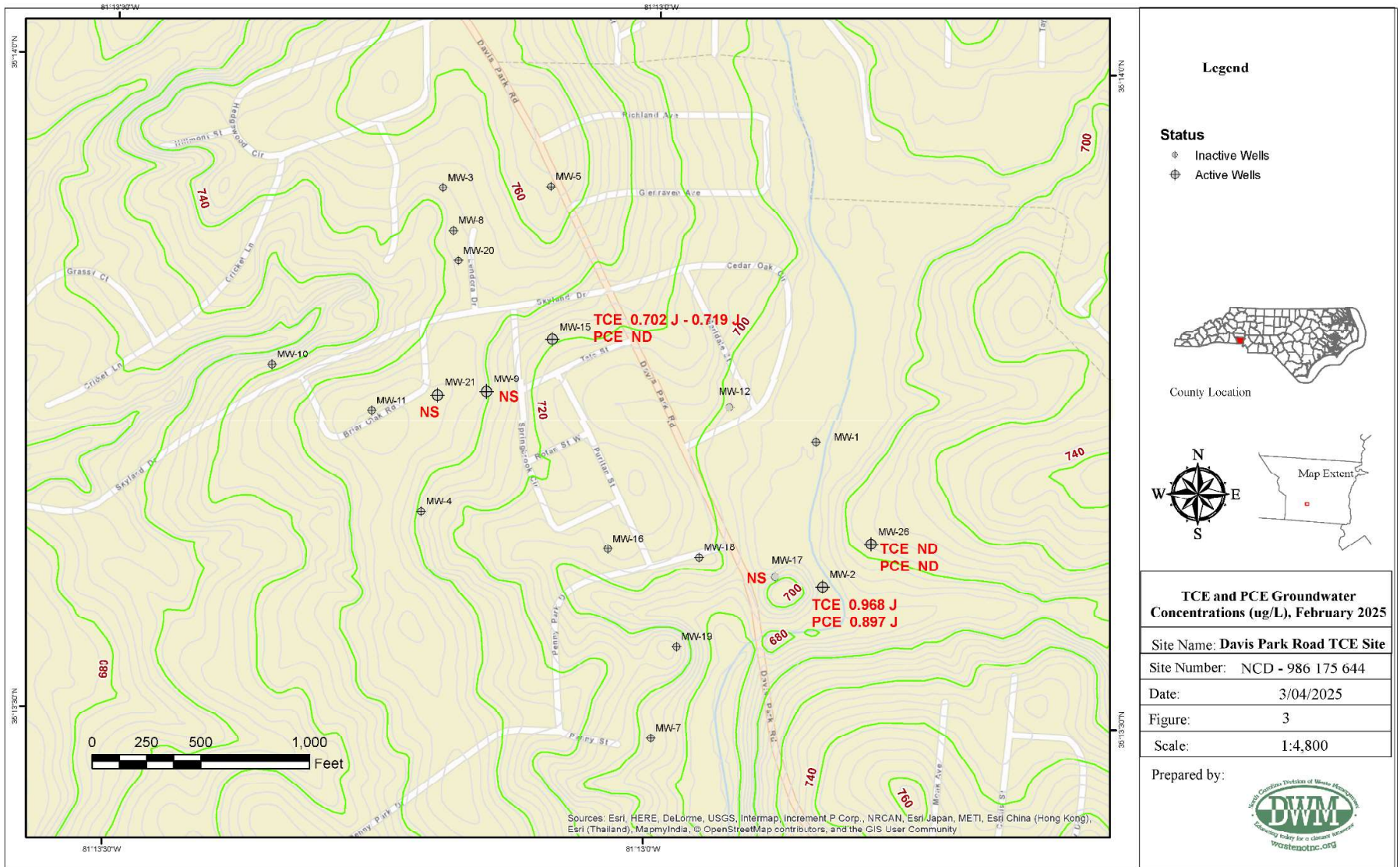
Ben Ammerman, Hydrogeologist, NC DEQ

Stuart Parker, Hydrogeologist, NC DEQ

**FIGURE C1: TCE and PCE Groundwater Concentrations May 2023**



**FIGURE C2: TCE and PCE Groundwater Concentrations February 2025**



**FIGURE C3 : MW-21 Flooding and fouling**



**FIGURE C4 : MW-15 Well pad after clearing debris and sediment**



**FIGURE C5 : MW-15 Inside housing flooded. Well was able to be sampled, but casing infiltration required constant pumping**



**FIGURE C6 : MW-2 located in the floodplain adjacent to a river**



**FIGURE C7: MW-2 Well manhole covering, 1/4" of sediment cleared from well cover**



**FIGURE C8: MW-2 inner casing was cleared and pumped before sampling**



**FIGURE C9: Purge of MW-26**



**FIGURE C10: State of MW-26 pad**



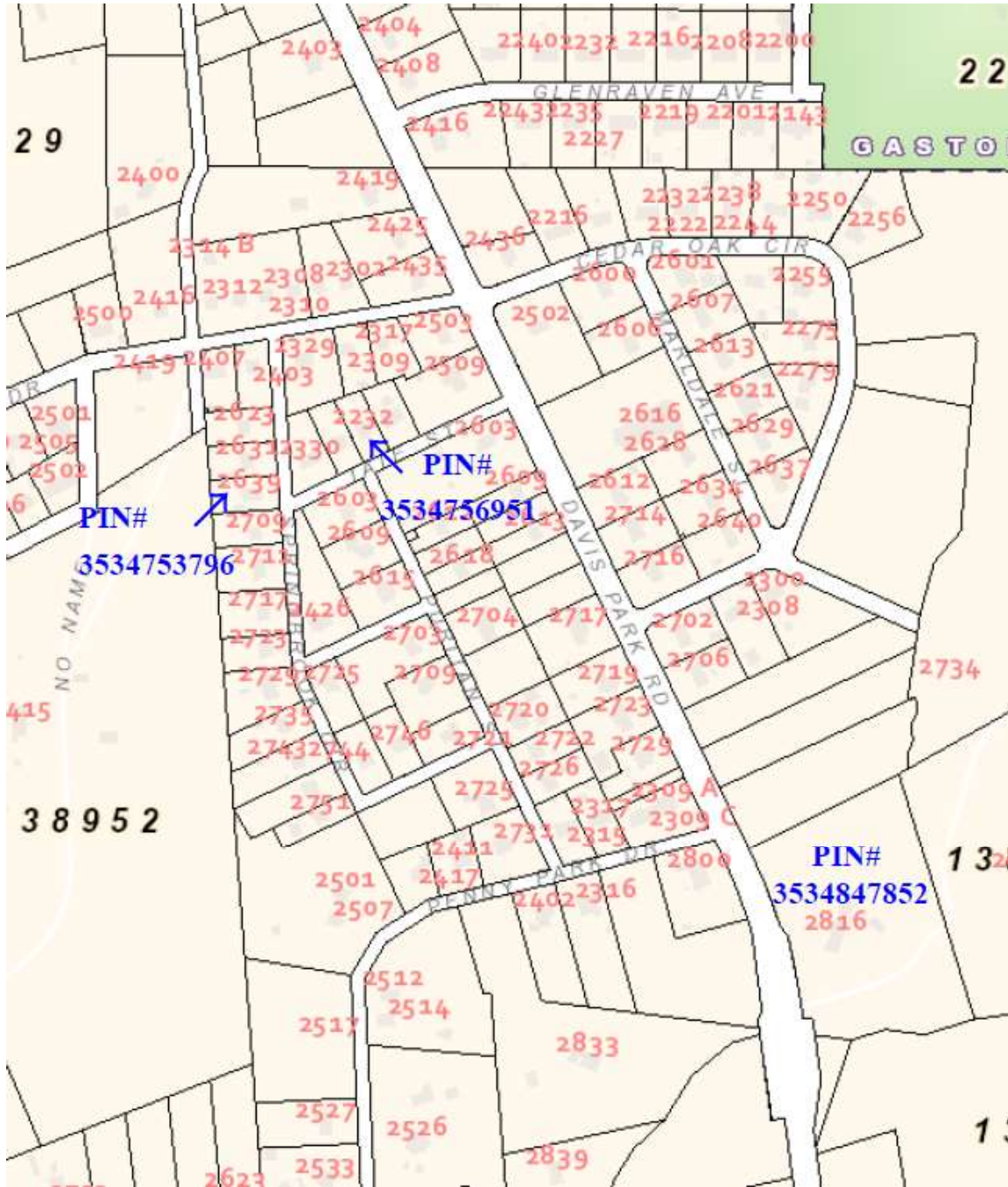
**FIGURE C11: Former Davis Park Rd Site Condition**



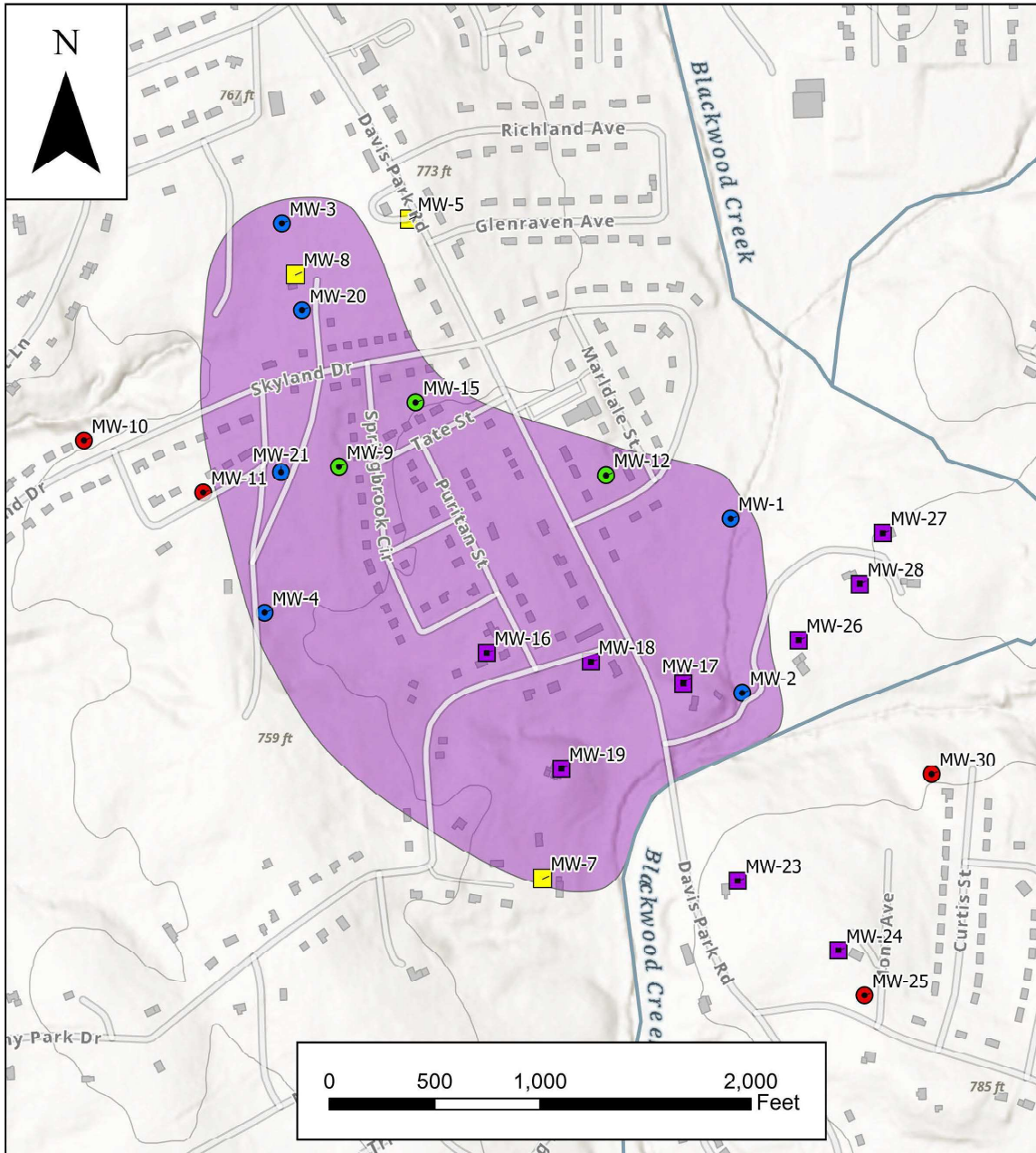
**APPENDIX D**

**FIGURES**

FIGURE D1: IC Parcel Map



**FIGURE D2: TCE and PCE Historic Plume Boundaries and Site Well Map**



**Davis Park Road Historic Plume Boundaries**

**Legend**

- Community Well
- Former Production Well
- Monitoring Well
- Private Production Well
- Private Production Well with Carbon Filtration
- Historic Plume Boundary

Esri, NASA, NGA, USGS, FEMA, Sources: Esri, TomTom, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community, Esri Community Maps Contributors, County of Gaston, State of North Carolina DOT, © OpenStreetMap, Microsoft, Esri, TomTom,

**APPENDIX E**

**Current Site Status**

**Environmental Indicators**

*-Current human exposures at the Site are under control.  
-Contaminated groundwater mitigation is under control*

**Are Necessary Institutional Controls in Place?**

All  Some  None

*The use of ICs, including governmental controls, regarding the future installation of water supply wells within the area of contaminated groundwater should be considered. Governmental controls based on state regulations, such as 15A NCAC 02C .0100 and .0300, may be one option. These regulations pertain to the permitting and installation of water supply wells and the role of the local health departments as the permitting authority.*

**Has EPA Designated the Site as Sitewide Ready for Anticipated Use?**

Yes  No

**Has the Site Been Put into Reuse?**

Yes  No

## APPENDIX F

### ARAR Review

Section 121 (d)(2)(A) of CERCLA specifies that Superfund remedial actions must meet any federal standards, requirements, criteria, or limitations that are determined to be legally Applicable or Relevant and Appropriate Requirements (ARARs). ARARs are those standards, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, action, location, or other circumstance at a CERCLA site. To-Be-Considered criteria (TBCs) are non-promulgated advisories and guidance that are not legally binding but should be considered in determining the necessary level of cleanup for protection of human health or the environment. While TBCs do not have the status of ARARs, the EPA's approach to determining if a remedial action is protective of human health and the environment involves consideration of TBCs along with ARARs. Chemical-specific ARARs are specific numerical quantity restrictions on individually listed contaminants in specific media. Examples of chemical-specific ARARs include the MCLs specified under the Safe Drinking Water Act (SDWA) as well as the ambient water quality criteria that are enumerated under the Clean Water Act. Because there are usually numerous contaminants of potential concern for any site, various numerical quantity requirements can be ARARs. In performing the Five-Year Review for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed. Because the remedy at the Site currently addresses only groundwater contamination, this Five-Year Review will discuss compliance with chemical-specific groundwater ARARs only.

#### **Current Potentially Applicable ARARs**

It is the EPA's policy that ARARs are generally "frozen" at the time of the ROD signature unless a "new or modified requirement calls into question the protectiveness of the selected remedy", 55 Fed. Reg. 8757 (March 8, 1990). The NC Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina, NCAC Title 15A Subchapter 2L, (NC 2L) on which several of the cleanup levels are based were last amended in April 2022. Title 15A of the North Carolina Administrative Code, Subchapter 2L (NCAC 2L) is a Chemical-Specific State ARAR for this Site.

#### **Groundwater**

The ARAR review indicates none of the ROD cleanup levels resulted in a cancer risk greater than  $1 \times 10^{-4}$  for carcinogens or a noncancer HQ of greater than 1 and therefore remain protective of human health.

**TABLE F1: Groundwater ARAR Review**

Contaminant of Concern	ROD Cleanup Levels (µg/L)	ROD Cleanup Level Rationale	Current NC 2L <sup>a</sup> (As of April 1, 2022) (µg/L)	Current Federal MCL <sup>b</sup> /CRQL (µg/L)	Change in ARAR Yes/No
Tetrachloroethene	1	CRQL	<b>0.7</b>	5/0.50	<u>Yes</u>
Trichloroethene	2.8	2L	3	5/0.50	Yes <sup>c</sup>
1,1-Dichloroethene	7	2L	350	7/0.50	Yes <sup>c</sup>
Chloroform	1	CRQL	70	80 <sup>d</sup> /0.50	Yes <sup>c</sup>
Methyl-tert-butyl-ether	200	2L	<b>20</b>	NA/0.50	<u>Yes</u>

**Notes:**

ROD = Record of Decision

CRQL = Contract Required Quantitation Limit

ARAR = Applicable or Relevant and Appropriate Requirements

NA = Not Available

<sup>a</sup> NC 2L of North Carolina Administrative Code, Title 15A, Subchapter 2L, Classifications and Water Quality Standards Applicable to the Groundwater of North Carolina

<sup>b</sup> Maximum Contaminant Level (MCL) for compound

<sup>c</sup> ARAR has changed but ROD remediation goal is more stringent than the current new standard.

<sup>d</sup> As total trihalomethanes.

**BOLD** and underlined indicates current NC 2L standard is more stringent than previous remediation goal.

µg/L = micrograms per liter

**TABLE F2: Review of Risk-Based Groundwater Remediation Goals or Remediation Goals with a Change in ARAR**

Contaminant of Concern	Groundwater Remedial Goal (µg/L)	Tapwater RSL <sup>a</sup> 10 <sup>-6</sup> Risk (µg/L)	Tapwater RSL <sup>a</sup> HQ = 1 (µg/L)	Risk <sup>b</sup>	HQ <sup>c</sup>
Tetrachloroethene	1	1.1E+01	4.1E+01	9.1E-08	2.4E-02
Trichloroethene	2.8	4.9E-01	2.8E+00	5.7E-06	1.0E+00
1,1-Dichloroethene	7	NA	2.9E+02	NA	2.5E-02
Chloroform	1	2.2E-01	4.0E+00	4.5E-06	2.5E-01
Methyl-tert-butyl ether	200	1.4E+01	6.3E+03	1.4E-05	3.2E-02
<p><b>Notes:</b>            NA = Not Available            a) Current EPA Regional Screening Levels (RSLs), dated November 2024, are available at <a href="https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables">https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables</a>            b) Cancer risk = (remedial goal / cancer-based RSL) x 10<sup>-6</sup>            c) HQ = Hazard Quotient = (remedial goal / noncancer RSL)            µg/L = micrograms per liter</p>					

**APPENDIX G**

**Press Release/Interviews**



U.S. ENVIRONMENTAL PROTECTION AGENCY

# NEWS RELEASE

EPA.GOV/NEWSROOM

## EPA to review cleanups at 47 Southeast Superfund Sites this year

**Contact:** EPA Region 4 Press Office - (404) 562-8400, [region4press@epa.gov](mailto:region4press@epa.gov)

**ATLANTA (October 29, 2024)** – Today, the U.S. Environmental Protection Agency (EPA) announced that comprehensive reviews will be conducted of completed cleanup work at 47 Superfund sites in the Southeast.

The sites, located in Alabama, Florida, Georgia, North Carolina, South Carolina, and Tennessee, will undergo a legally required Five-Year Review to ensure that previous remediation efforts at the sites continue to protect public health and the environment.

"Five-Year Reviews are an integral part of the site remediation process because they help make sure remedies are still protective," said **Acting Regional Administrator Jeaneanne Gettle**. "The Southeast Region will benefit tremendously from the full restoration of Superfund sites, which can become valuable parts of the community landscape."

The Superfund Sites where EPA will conduct Five-Year Reviews in 2025 are listed below. The web links provide detailed information on site status as well as past assessment and cleanup activity. Once the Five-Year Review is complete, its findings will be posted in a final report at <https://www.epa.gov/superfund/search-superfund-five-year-reviews>.

### Alabama

[ANNISTON ARMY DEPOT \(SOUTHEAST INDUSTRIAL AREA\)](#)  
[ANNISTON PCB SITE \(MONSANTO CO\)](#)  
[TRIANA/TENNESSEE RIVER](#)

### Florida

[AGRICO CHEMICAL CO.](#)  
[ARKLA TERRA PROPERTY](#)  
[BROWN'S DUMP](#)  
[CHEMFORM, INC.](#)  
[HIPPS ROAD LANDFILL](#)  
[HOMESTEAD AIR FORCE BASE](#)  
[JACKSONVILLE ASH SITE](#)  
[JJ SEIFERT MACHINE](#)  
[MADISON COUNTY SANITARY LANDFILL](#)  
[NORTHWEST 58TH STREET LANDFILL](#)  
[PEAK OIL CO./BAY DRUM CO.](#)  
[PETROLEUM PRODUCTS CORP.](#)

[PIONEER SAND CO.](#)  
[SANFORD DRY CLEANERS](#)  
[SANFORD GASIFICATION PLANT](#)  
[SHERWOOD MEDICAL INDUSTRIES](#)  
[STANDARD AUTO BUMPER CORP.](#)  
[STAUFFER CHEMICAL CO \(TAMPA\)](#)  
[STAUFFER CHEMICAL CO. \(TARPON SPRINGS\)](#)  
[YELLOW WATER ROAD](#)

### **Georgia**

[MONSANTO CORP. \(AUGUSTA PLANT\)](#)

### **North Carolina**

[CHARLES MACON LAGOON AND DRUM STORAGE](#)  
[CAMP LEJEUNE MILITARY RES. \(USNAVY\)](#)  
[CAROLINA TRANSFORMER CO.](#)  
[DAVIS PARK ROAD TCE](#)  
[FCX, INC. \(WASHINGTON PLANT\)](#)  
[JFD ELECTRONICS/CHANNEL MASTER](#)  
[SIGMON'S SEPTIC TANK SERVICE](#)  
[WEYERHAEUSER CO PLYMOUTH WOOD TRTNG PT](#)

### **South Carolina**

[AQUA-TECH ENVIRONMENTAL INC \(GROCE LABS\)](#)  
[MACALLOY CORPORATION](#)  
[PARA-CHEM SOUTHERN, INC.](#)  
[PARRIS ISLAND MARINE CORPS RECRUIT DEPOT](#)  
[SANGAMO WESTON, INC./TWELVE-MILE CREEK/LAKE HARTWELL PCB CONTAMINATION](#)  
[SAVANNAH RIVER SITE \(USDOE\)](#)  
[SCRDI DIXIANA](#)  
[TOWNSEND SAW CHAIN CO.](#)

### **Tennessee**

[CARRIER AIR CONDITIONING CO.](#)  
[ICG ISELIN RAILROAD YARD](#)  
[MALLORY CAPACITOR CO.](#)  
[MILAN ARMY AMMUNITION PLANT](#)  
[NORTH HOLLYWOOD DUMP](#)  
[SIXTY-ONE INDUSTRIAL PARK](#)  
[WRIGLEY CHARCOAL PLANT](#)

### **Background**

Throughout the process of designing and constructing a cleanup at a hazardous waste site, EPA's primary goal is to make sure the remedy will be protective of public health and the environment. At many sites, where the remedy has been constructed, EPA continues to ensure it remains protective by requiring reviews of cleanups every five years. It is important for EPA to regularly check on these sites

to ensure the remedy is working properly. These reviews identify issues (if any) that may affect the protectiveness of the completed remedy and, if necessary, recommend action(s) necessary to address them.

There are many phases of the Superfund cleanup process including considering future use and redevelopment at sites and conducting post cleanup monitoring of sites. EPA must ensure the remedy is protective of public health and the environment and any redevelopment will uphold the protectiveness of the remedy into the future.

The Superfund program, a federal program established by Congress in 1980, investigates and cleans up the most complex, uncontrolled, or abandoned hazardous waste sites in the country and endeavors to facilitate activities to return them to productive use. In total, there are more than 280 Superfund sites across the Southeast.

**More information:**

EPA's Superfund program: <https://www.epa.gov/superfund>

###



EPA.GOV

## **APPENDIX H**

### **Operation & Maintenance Report 2023 & 2025**

**North Carolina Department of Environmental Quality**  
**Division of Waste Management, Superfund Section**  
217 West Jones Street  
Raleigh, NC 27603



**OU-1 Monitored Natural Attenuation Operation & Maintenance**  
**Monitoring Well Sampling Report**  
**Davis Park Road TCE Superfund Site**  
Gastonia, North Carolina  
Dates of Study:  
May 24, 2023,  
February 13, 2025  
NCD 986 175 644

NCDEQ Remedial Project Manager: Tessa Monday  
NC Superfund Section  
217 West Jones Street  
1646 Mail Service Center  
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217 West Jones Street  
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Raleigh, NC 27699

**March 2025**

Section	Title	Page
1	INTRODUCTION.....	1
	1.1 Purpose.....	1
	1.2 Background.....	1
	1.3 Groundwater Contaminant Description.....	2
	1.3.1 Contaminant Source Area.....	2
	1.3.2 Groundwater Plume Concentration and Extent.....	3
	1.4 Site Geology and Hydrogeology.....	3
2	LONG TERM RESPONSE ACTION.....	3
	2.1 Quarterly and Semiannual Groundwater Monitoring.....	4
	2.2 First Year Quarterly LTRA Sampling Events (2002/2003).....	4
	2.3 Semiannual LTRA Sampling Events (August 2003/February 2004/August 2004/February 2005).....	5
	2.4 Annual LTRA Sampling (February 2006 through December 2019).....	6
3	RESUMPTION OF LTRA SAMPLING IN 2023 AND 2025.....	15
	3.1 Groundwater Sampling.....	15
	3.1.1 Monitor Well Sampling Procedures.....	15
	3.1.2 Private Well Sampling Procedures.....	16
	3.1.3 Field Quality Assurance/Quality Control Samples.....	16
	3.2 Groundwater Analytical Results.....	16
4	CONCLUSIONS AND RECOMMENDATIONS.....	17
	4.1 LTRA Results Summary.....	17
	4.2 Conclusions.....	17
	4.3 Recommendations.....	17

#### LIST OF TABLES

Table	Title
1	Groundwater Sampling Results (2023; 2025)
2	Historical Laboratory Analytical Results
3	Monitoring Well Locations and Specifications

#### LIST OF FIGURES

Figure	Title
1	Site Location and Monitoring Well Sampling Network
2	TCE and PCE Groundwater Concentrations, May 2023
3	TCE and PCE Groundwater Concentrations, February 2025
4	Historical Monitoring Well Chloroalkene Concentrations

#### LIST OF APPENDICES

- APPENDIX A - Quality Assurance Project Plan
- APPENDIX B - Field Log Books
- APPENDIX C - Laboratory Reports of Analyses

## 1.0 INTRODUCTION

### 1.1 PURPOSE

North Carolina Division of Waste Management – Superfund Section (Superfund) has been tasked by the U.S. Environmental Protection Agency (EPA) Region 4 to perform the Long Term Response Action (LTRA) at the Davis Park Road Trichloroethene (TCE) Site in Gastonia, North Carolina. The work is conducted under Cooperative Agreement between EPA Region 4 and NC DENR Superfund. The current LTRA includes monitoring the bedrock aquifer contaminant plume by sampling a network of bedrock wells for volatile organic compounds (VOCs) on a quarterly basis for one year, semiannually for two years, and annually thereafter for 27 years, pending review of analytical results, to ensure the plume is in fact naturally attenuating. This report presents data from the ninth year of the LTRA; however, it is only the fifth annual sampling event. No sampling event was performed in 2007. Section 3 of this report summarizes sampling activities conducted in May 2014.

### 1.2 BACKGROUND

The Davis Park Road TCE Site is located within the Gastonia Extra Territorial Jurisdiction area along Davis Park Road, south of Hudson Boulevard and north of Blackwood Creek in the southwestern portion of Gastonia, Gaston County, North Carolina. The site consists of an area of reportedly contaminated soil behind a building that is located at 2307 Davis Park Road (Davis Park Auto Repair), and a plume of contaminated groundwater that emanates from this property and extends south along Davis Park Road to Blackwood Creek. The site also includes the Cedar Oak Park subdivision located on the east side of Davis Park Road within the confines of Cedar Oak Circle as well as areas along the western side of Davis Park Road. Figure 1 presents a site map for the Davis Park Road TCE Site.

The plume of contaminated groundwater underlies residential areas along the plume's entire horizontal extent. The contaminant levels and aerial extent are further described in Section 1.3.2. At the time of the discovery of contaminants in the groundwater (March 1990), a majority of the residences throughout the site were supplied water by residential water supply wells. As a result of the continued migration of the plume, groundwater supplying many of these residential water wells became contaminated with the chlorinated hydrocarbons found in the plume. Since that time, several neighborhoods within the site have been connected to the Gastonia public water supply to reduce the potential health threat from the contaminants. In 1996, many of the houses within the Hedgewood Circle neighborhood, which borders the northern edge of the site, were connected to the public water supply. In late 1997 and early 1998, after petitioning the city for water services, all of the homes in the Cedar Oak Circle subdivision, which dominates the eastern side of the site, were connected to the public water supply. Approximately 130 homes within the site were receiving water from residential water supply wells prior to Remedial Action (RA) activities. Over half of these homes (approximately 75) had water supply wells that were or could potentially be affected by the contaminant plume as depicted in the 1998 Remedial Investigation (RI) report. In August 2000, five of these residences were supplied with carbon filtration units, and in September 2000, sixty-four (64) of the residences were connected to the Gastonia public water supply as part of the RA to execute the provisions of the Record of Decision (ROD) for the site. The locations of the residences connected to carbon filtration units are presented in Table 3.

### 1.3 GROUNDWATER CONTAMINANT DESCRIPTION

This section describes the potential source area of the contamination, current knowledge of the groundwater plume, and the extent of the plume.

#### 1.3.1 Contaminant Source Area

According to preliminary site investigation reports (see RI Report, 1998, for summary), a groundwater sample was collected on 31 March 1990 from a supply well within the Cedar Oak Park subdivision by Gaston County Environmental Health representatives as part of a routine sampling procedure in accordance with "Community Well Rules." Analysis of the sample revealed concentrations of TCE (34.9 micrograms per liter [(ug/l)], tetrachloroethene (PCE) (23.7 ug/l), and chloroform (9.2 (ug/l). Analytical results for a confirmation sample collected from this well on 17 April 1990 were similar to the original sample. Groundwater samples collected from three nearby private wells in May 1990 by the Gaston County Health Department indicated that the groundwater was contaminated with TCE. The highest concentration of TCE (101.4 (ug/l) was detected in a sample collected from the private well located at 2419 Davis Park Road , 200 feet south of the Davis Park Auto Repair facility (located at 2307 Davis Park Road). The current EPA Drinking Water Maximum Contaminant Level (MCL) for TCE and PCE is 5 ug/l. Current State (North Carolina Department of Environment and Natural Resources [NCDENR]) standards for TCE and PCE are 2.8 ug/l and 0.7 ug/l respectively.

The Environmental Services Division of EPA collected groundwater samples from the contaminated wells along Davis Park Road and within the Cedar Oak Park subdivision in July 1990. TCE was detected at concentrations of 82 ug/l and 31 ug/l in groundwater sampled from the private well located at 2419 Davis Park Road and a Cedar Oak Park subdivision well (2719 Davis Park Road), respectively.

Additional investigations and groundwater sampling events prior to the initiation of the RI continued to reveal levels of contaminants above State and Federal drinking water standards. Investigation activities focused on a possible source location(s). Several potential sources of the contamination at the Davis Park Road TCE Site were reviewed. Consideration of proximity, regional and local groundwater flow directions, and groundwater sample analytical data indicated that the Davis Park Road Auto Repair facility was the most likely contaminant source at the Davis Park Road TCE Site (NCDENR Site Inspection, 1993).

As a result of these findings and in an effort to further define the source area for the water supply well contaminants, environmental assessments were conducted, including the Site Inspection Addendum (SI) (May 1993), Expanded Site Investigation (ESI) (May 1994), and RI (1996- 1998). The RI report summarizes the source investigation as follows: "...according to data generated from this and previous investigations, solvents such as PCE or TCE were introduced to the environment from the property at 2307 Davis Park Road. This 'spill' migrated through the vadose zone and the saprolite/partially weathered rock aquifer, and into the bedrock aquifer.

Once introduced into the environment, various biophysiochemical processes acted on the contaminants to reduce the overall concentration as well as spread the contaminant mass throughout various matrices. Currently, the VOC contaminants, principally TCE and PCE, appear to be present only within the bedrock aquifer and may continue to be drawn towards active residential wells scattered throughout the site, specifically those wells to the west of Davis Park Road.

#### 1.3.2 Groundwater Plume Concentration and Extent

Five potential sources for water supply were identified in the Davis Park Road Area and presented in the RI report. These include the following: City of Gastonia Public Water Supply System; City of Gastonia Restricted Use Water Line; water supply well as part of a Community Water System; a water supply well as part of a Private Well System, and private water supply wells. Nine monitor wells were installed during completion of the RI (MW-1S, MW-1D, MW- 2S, MW-2D, MW-3S, MW-3D, MW-4S, MW-4D, and MW-5S). Following connection to City Water in August 2000, seventeen private wells were abandoned, seven wells were converted into monitor wells (CW-1 through CW-7), and five residences were supplied with carbon filtration units (2400 Skyland, 2419 Davis Park Road, 2717 Davis Park Road, 2839 Davis Park Road, and 2639 Springbrook).

#### 1.4 SITE GEOLOGY AND HYDROGEOLOGY

The geologic profile across the site generally consists of a saprolite layer, underlain by a partially weathered rock zone and the underlying fractured crystalline bedrock. The saprolite is a silty, clay-rich, residual material derived from in-place weathering of rock. The saprolite zone appears to be thickest (approximately 80 feet) near the ridge crest along the northern edge of the site, thinning towards the lower elevations or stream valleys to approximately 20 feet in thickness. A partially weathered rock layer typically underlies the saprolite, and ranges in thickness from approximately 5 to 25 feet. This layer is composed of saprolite and fragments of weathered bedrock. The bedrock is generally observed to be a fractured quartz biotite granite or granitic gneiss.

#### 2.0 LONG TERM RESPONSE ACTION (LTRA)

The ROD for the Davis Park Road TCE Site (September 1998) states that following initiation of a natural attenuation study, groundwater monitoring will be conducted on a quarterly basis for three years and annually for the next 27 years. First year LTRA sampling results indicated a continued decrease in contaminant concentrations as the plume migrates south and away from the source area. Additionally, contamination concentrations did not vary significantly between sequential quarters for any of the wells in the monitoring network. It was therefore recommended that the sampling program be reduced from quarterly to semiannual monitoring after the first year of the LTRA, then semiannually for the next 2 years. Results from the quarterly and semiannual sampling are summarized below. Results from the most recent sampling (the fourth annual) event, are summarized in Section 3.0. Data obtained from the long term groundwater monitoring are used to evaluate natural attenuation of contaminant constituents within the bedrock aquifer plume at the Davis Park Road Site following provision of city water to 64 residences in August 2000.

In April 2002 a baseline sampling event was conducted to establish current conditions and to evaluate the need for installation of additional wells for the LTRA. Based on analytical results, it was determined that natural attenuation was occurring at rates consistent with expectations, and that the wells currently available for sampling were sufficient to evaluate natural attenuation in long term performance monitoring. A Monitored Natural Attenuation Plan (submitted to EPA in October 2002) was developed to include sampling a network of bedrock wells for VOCs to effectively characterize contaminant levels (VOCs) in the bedrock aquifer within the contaminant plume as well as the surrounding area for the potential migration of contaminants from within the existing groundwater plume.

The eighteen bedrock wells initially included for groundwater sampling in each LTRA monitoring event included four bedrock monitor wells installed in December 1997 (MW-1 through MW-4), the five private wells provided with carbon filtration units in August 2000 (MW-5 through MW-9), two community wells located west of Davis Park Road (MW-10 and MW-11), four converted wells (MW-12 through MW-15),

and three private wells (MW-16 through MW-18). Monitor wells MW-2, MW-5, MW-6, MW-9, MW-12, MW-15, MW-16, MW-17, and MW-18 were selected to provide groundwater quality information within the contaminant plume. The remaining monitor wells (MW-1, MW-3, MW-4, MW-7, MW-8, MW-10, MW-11, MW-13, and MW-14), located outside the contaminant plume, were selected to provide evidence of potential contaminant migration.

Beginning with the first year fourth quarter sampling event, MW-13 was removed from the sampling network and replaced with MW-19, located south of the site, just outside the contaminant plume. Additionally, following the fourth quarter sampling event, two bedrock wells were installed west of the plume to monitor the area between the plume and the currently pumping community wells to the west of the site (MW-10 and MW-11). These wells were incorporated into the monitoring network and are designated MW-20 and MW-21. Figure 1 provides the locations of the monitor wells in the sampling network. Table 3 provides monitored natural attenuation monitoring stations cross-referenced with addresses and geographic coordinates.

## 2.1 QUARTERLY AND SEMI-ANNUAL GROUNDWATER MONITORING

The purpose of LTRA groundwater monitoring is to verify the following:

- Natural attenuation is occurring at rates according to expectations,
- No changing conditions arise that might reduce efficacy of this remedy,
- The continued absence of toxic and/or mobile transformation products,
- The plume is not expanding,
- There is no impact downgradient,
- There are no new releases, and
- Attainment of remediation objectives.

The samples are collected in accordance with the following documents:

- Final Monitored Natural Attenuation Plan, dated October 2002,
- U.S. Environmental Protection Agency Science and Ecosystem Support Division (EPA- SESD), Region 4, revised Environmental Investigation Standard Operating procedure and Quality Assurance Manual (EISOPQAM), May 1996, and
- U.S. Geological Survey, User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells, 2001.

All samples were initially analyzed by laboratories in the Contract Laboratory Program (CLP) and later by NC Contract Laboratories. Samples are analyzed for VOCs using EPA Method 8260.

## 2.2 FIRST YEAR OF QUARTERLY LTRA SAMPLING EVENTS (2002-2003)

The first quarter sampling event, performed in April 2002, was originally developed as the baseline event to establish current conditions and to evaluate the need for installation of additional wells. Based on analytical results, it was determined that the wells then available for sampling were sufficient to evaluate natural attenuation in long term performance monitoring. Thirteen of the 18 wells selected for the sampling network and two additional wells were sampled in the baseline-sampling event. All 18 wells in the LTRA sampling network were sampled during the second and third quarter sampling events, performed in

September and December 2002, respectively.

During the fourth quarter sampling event, performed in March 2003, monitor well MW-13 could not be sampled due to hostile property owners. The residence at 2833 Davis Park Road was sampled instead, and incorporated into the monitor well network as MW-19. Because the owners of the property were not willing to allow samplers to pass through their yard to access the well, and because VOCs have not historically been detected in groundwater sampled from the well, MW-13 was removed from the monitor well network permanently and replaced with MW-19. All of the remaining 17 wells in the LTRA sampling network were sampled during the fourth quarter sampling event.

Depth to water was recorded where possible (MW-1 through MW-4, MW-12 through MW-15) prior to sampling. Field parameters (pH, specific conductivity, temperature, dissolved oxygen, oxidation reduction potential, and turbidity) were also recorded. The potentiometric maps for the bedrock aquifer in first through fourth quarter LTRA sampling events indicated a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component of flow to the southeast. This is consistent with previously reported data.

TCE and PCE concentrations detected in groundwater during the first through fourth quarter sampling events suggest the contaminant plume is migrating slightly to the west and also southeast. Concentrations were significantly less than those detected in 1990 for wells in the northern portion of the plume. However, concentrations increased slightly in wells to the west and southeast. Levels were consistent with a naturally attenuating plume that is shifting due to pumping (community wells on Skyland Drive and Briar Oak Drive located west of the site) and to a groundwater flow direction trending to the southeast and Blackwood Creek. First through fourth quarter analytical results are detailed in the LTRA Second, Third, and Fourth Quarter Sampling Event Reports submitted to EPA in January, April, and June 2003, respectively.

### **2.3 SEMIANNUAL LTRA SAMPLING EVENTS (AUGUST 2003, FEBRUARY 2004, AUGUST 2004 AND FEBRUARY 2005)**

Following the first year of quarterly sampling at the Davis Park Road Site, two additional monitor wells were installed between the contaminant plume and the currently pumping community wells MW-10 and MW-11. These wells, designated MW-20 and MW-21, were incorporated into the LTRA monitor well network and sampled in August 2003, February 2004, August 2004, and February 2005.

During these sampling events, the nine wells in the monitor well network that could be accessed at the well-head were sampled using both low-flow technology and passive diffusion bag (PDB) samplers. PDBs were evaluated and found to be an effective sampling alternative to the low-flow method of sampling. PDBs were subsequently recommended as the select method for sampling monitor wells that can be accessed for the remainder of the LTRA.

PDBs are polymer membranes filled with deionized water that are placed at select depths into the groundwater column. Organic analytes permeate the membrane, diffusing deionized water out of the device until equilibrium is reached with the surrounding groundwater. Advantages to using PDBs versus traditional sampling methods include decreased spending on labor and equipment and elimination of containing and disposing of sampling purge and decontamination fluids.

The potentiometric maps for the bedrock aquifer based on the semiannual LTRA sampling events indicated a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component to the southeast, consistent with previous reports. However, the addition of three new survey points (MW-15, MW-20, and MW-21) provided data indicating that to the north of the site there is

also a west to southwest component to the groundwater flow. This flow component was attributed in part to the actively pumping community wells to the west of the site.

TCE and PCE concentrations detected in groundwater during the semiannual LTRA sampling events continued to suggest the contaminant plume is migrating slightly to the west and also to the south. TCE and PCE levels were consistent with a naturally attenuating plume that is shifting slightly due to pumping and to a groundwater flow direction trending to the southeast. The semiannual analytical results are detailed in the LTRA August 2003, February 2004, August 2004, and February 2005 Semiannual Sampling Event Reports submitted to EPA in December 2003, April 2004, November 2004, and May 2005 respectively.

Following the February 2005 sampling event, the owner of monitor well MW-14, located north and upgradient of the current contaminant plume, requested permission to abandon the monitor well on her property at 2403 Davis Park Road. Because samples from this well had not contained COCs at levels exceeding the reporting limit since LTRA sampling began in September 2002, it was agreed this well was no longer necessary to the monitoring well network, and MW-14 was abandoned and removed from the LTRA monitoring program.

#### **2.4 ANNUAL LTRA SAMPLING EVENTS (FEBRUARY 2006 THROUGH DECEMBER 2019)**

LTRA groundwater sampling occurred on an approximately annual basis from February 2006 through December 2019. The initial sampling event was conducted by WESTON, and subsequent events were conducted by NC Department of Environment and Natural Resources (DENR) Superfund Section personnel.

Sampling of installed monitoring wells (MW-1 through MW-4, MQW-12, MW-15, MW-20 and MW-21) was conducted using PDBs, while potable private or community wells were sampled by running the well water for an approximately 15-minute purge, while periodically monitoring field parameters (temperature, pH, specific conductivity and turbidity) for stabilization. Samples were collected into 40-milliliter glass septum vials pre-preserved with hydrochloric acid, and overnight-shipped on wet ice in custody-sealed coolers for laboratory analysis. Initially, samples were analyzed for VOCs (EPA method 8260) under CLP protocol at the EPA-SESD Laboratory located in Athens, GA. Later sample events were processed at NC DENR State contract laboratories.

##### **FEBRUARY 2006:**

Sampling of all of the monitoring wells in the network for the February 2006 sampling event, except MW-6, was done by WESTON from February 7 through February 8, 2006. All LTRA sampling points were logged by with a Global Positioning System (GPS) unit during this sampling event. The results from the GPS survey are presented in Table 3.

The two community wells MW-10 and MW-11 and the remaining private wells were purged from the in-situ pumping system and sampled prior to any filter mechanism that may have been in place. Depth to groundwater data was collected from all of the directly accessible wells. MW-21 was again considered to be anomalously high and was not included in the development of the potentiometric maps. The potentiometric map for the bedrock aquifer based on this annual LTRA sampling event indicated a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component to the southeast, consistent with previous reports.

TCE and PCE concentrations detected in groundwater during this annual LTRA sampling event continued

to suggest the contaminant plume is attenuating as it migrates to the south.

#### **MARCH 2008:**

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on March 25, 2008. Three wells could not be sampled: MW-03 and MW-12, which contained no PDB setups when uncapped, and MW-05, whose owners (at 2419 Davis Park Road) did not respond to contact efforts.

Collected groundwater elevation data continued to indicate groundwater flow in the bedrock aquifer from south to east across the site, with the strongest component to the southeast, consistent with previous reports.

The March 2008 LTRA sampling event confirmed that the contaminated plume is naturally attenuating as expected; while the plume was migrating it did not appear to be expanding and the source area monitoring wells attained the remediation objectives. s.

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on February 11, 2009 to place Passive Diffusion Bag (PDB) samplers in wells MW-3 and MW- 12 for the March LTRA sampling event. A new PDB was placed on the existing rope in well MW-12. When MW-3 was located, a sampling apparatus with PDB was already in place. An additional well in the vicinity of MW-3 was located, which had mistakenly been identified as MW-3 during the 2008 LTRA sampling event.

#### **MARCH 2009:**

NC DENR personnel mobilized to the site on March 31, 2009. Three wells could not be sampled. No contact could be made with 2717 Davis Park Road, so no sample was collected from MW-06. The potable well owner at 2816 Davis Park Road (MW-17) reported that the well had been (permanently) disconnected. Pre-arranged sampling at AQUA community well MW-10 was cancelled due to lack of available personnel to provide access.

The community well MW-11 and the remaining private wells except MW-06 and MW-17 were purged from and sampled prior to any filter mechanism that may have been in place.

DENR collected water level measurements from the top of casing for MW-1 through MW-4, MW-12, MW-15, MW-20 and MW-21 with an electronic water level meter. The water elevation for MW-21 has historically been considered unusable due to its drastic difference with all other data in the area. This has not changed during this sampling event and again MW-21 was not included in the development of the potentiometric maps. The potentiometric map for the bedrock aquifer based on this annual LTRA sampling event indicated a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component to the southeast, consistent with previous reports.

The March 2009 LTRA sampling event confirmed that the contaminated plume is naturally attenuating as expected, and that source area monitoring wells attained the remediation objectives.

#### **APRIL 2010:**

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on April 5, 2010. Again, no sample access was achieved to MW-6, or to MW-20 at 2416 Skyland Drive. The community well MW-11 and the remaining private wells except MW-06 were purged and sampled. MW-

17 had a disabled pump but was purged by peristaltic pump from a depth of approximately 25 feet. Post-carbon-filtration samples were collected from potable wells MW-05, MW-07 and MW- 09 in support of a second 5 Year Review for the site.

DENR collected water level measurements from the top of casing for MW-1 through MW-4, MW-12, MW-15, MW-17 and MW-21 with an electronic water level meter. The potentiometric map for the bedrock aquifer based on this annual LTRA sampling event indicated a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component to the southeast, consistent with previous reports.

The April 2010 LTRA sampling event confirmed that the contaminated plume was naturally attenuating as expected, and the source area monitoring wells attained the remediation objectives.

**APRIL 2011:**

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on April 26 and 27, 2011. The owner at 2717 Davis Park Road curtailed access permission and so no further sampling attempts occurred at MW-06. In addition to the eighteen wells that have been routinely sampled, nine additional wells located across Blackwood Creek from MW-2 and MW- 17 were also sampled to confirm that the contaminated groundwater plume had not migrated across Blackwood Creek and was not impacting other residential drinking water wells.

MW-23	2920 Davis Park Road
MW-24	802 Davis Park Road
MW-25	Monk Trailer Park
MW-26	2840 Davis Park Road
MW-27	2828 Davis Park Road
MW-28	2822 Davis Park Road
MW-29	Pineview Subdivision
MW-30	Fleetwood #4
MW-31	Ridgeview Subdivision

Four surface water samples from Blackwood Creek and two surface water samples from Crowder's Creek were collected during the April 2011 LTRA sampling event. These surface water samples, along with the nine additional drinking water well samples, were collected to confirm the protectiveness of the ROD as discussed in the second 5-Year Review. Because low concentrations of PCE, TCE and 1,1-DCE were detected in one of the additional drinking water wells, a second round of samples were collected from seven of the nine wells on December 13, 2011.

PDB samplers were used to sample accessible monitoring wells (MW-1 thru MW-4, MQW-12, MW-15, and MW-21) except for MW-20. The community well (MW-11) and all of the remaining private wells were purged using the in-situ pumping system and sampled prior to any filter mechanism that may have been in place. Disabled well MW-17 was again purged and sampled vis peristaltic pump

DENR collected water level measurements from the top of casing for MW-1 through MW-4, MW-12, MW-15, MW-20 and MW-21. The potentiometric map for the bedrock aquifer based on this annual LTRA sampling event indicates a groundwater flow direction in the bedrock aquifer ranging from south to east across the site, with the strongest component to the southeast, consistent with previous reports.

The April 2011 LTRA sampling event confirmed that the contaminated plume is naturally attenuating as expected; while the plume was migrating it did not appear to be expanding and the source area monitoring wells attained the remediation objectives. Blackwood Creek.

**DECEMBER 2011:**

A second round of samples were collected from 7 of the nine wells sampled in April 2011. Similar results were obtained. While low levels of TCE and PCE were detected, MW-29 was the farthest well from the site. Because several uncontaminated wells existed between it and the site groundwater plume, the contamination in MW-29 is not considered to be attributable to the site. MW-29 was the southernmost well, and three uncontaminated wells existed between it and Blackwood Creek. The elevation of MW-29 was approximately 740 feet msl and the well depth was 150 feet, therefore, the bottom of the well was approximately 590 feet msl. MW-31 was located 1,630 feet west of MW-29. The elevation of MW-31 was approximately 750 feet msl and the well depth was 185 feet. The bottom of MW-31 was approximately 565 feet msl. MW-24 is located 2,750 feet WNW of MW-29. The elevation of MW-24 was approximately 760 feet msl and the well depth was 250-300 feet. The bottom of MW-24 was approximately 460-510 feet msl. MW-30 was located 2,890 feet NW of MW-29. The elevation of MW-30 was approximately 730 feet msl and the well depth was 630 feet. The bottom of MW-30 was approximately 100 feet msl. Wells at the same elevations, and a well that is much deeper than MW-29, were located between MW-29 and Blackwood Creek but had not been impacted. The contamination in MW-29 is not related to the site. No site related contamination had been documented across Blackwood Creek from the site. Therefore, Blackwood creek was supported to act as a hydraulic boundary for the site. The sample results of the remaining addition wells and the surface water confirmed that the ROD was being protective of human health and the environment.

**MAY 2012:**

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on May 15, 2012. The sampling plan approved for this sampling event consisted of the following;

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road
MW-15	2232 Tate Street
MW-16	2725 Puritan
MW-17	2816 Davis Park Road
MW-18	2800 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells MW-2, MW-12, MW-15, and MW-21. The remaining private wells were purged using their in-situ pumping systems and sampled prior to any filter mechanism that may have been in place. Disabled well MW-17 was again purged and sampled at 25 foot depth via peristaltic pump.

DENR collected water level measurements from the top of casing for MW-2, MW-12, MW-15 and MW-21. No significant change in the water levels occurred from previous observations and the previous groundwater flow direction in the bedrock aquifer, ranging from south to east across the site, with the strongest component to the southeast, are considered current.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 4 of the 9 wells sampled during the May 2012 sampling event. TCE was detected above the Performance Standard in MW-2 (3.2 ug/l), MW-9 (6.1 ug/l), MW-15 (12 ug/l), and MW-17 (5.5 ug/l). PCE was detected above the Performance Standard in MW-2 (2.3 ug/l) MW-17 (3.7 ug/l) and MW-18 (1.0 ug/l).

The May 2012 LTRA sampling event confirmed that the contaminated plume was naturally attenuating as expected; while the plume was migrating it did not appear to be expanding and the source area monitoring wells attained the remediation objectives.

### MARCH 2013:

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on March 19, 2013. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road
MW-15	2232 Tate Street
MW-16	2725 Puritan
MW-17	2816 Davis Park Road
MW-18	2800 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that could be directly accessed (MW-2, MW-12, MW-15 and MW-21).

MW-18 had power disconnected, therefore, no sample was obtained from it. The remaining private wells were purged using their in-situ pumping systems and sampled prior to any filter mechanism that may have been in place. MW-17 was again purged and sampled via peristaltic pump.

DENR collected water level measurements from the top of casing for MW-2, MW-12 and MW-15. Because data were available for only three additional wells, in a linear configuration, the water levels were compared to the previous readings of these wells. No significant change in the water levels occurred.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 5 of the 9 wells sampled during the May 2014 sampling event. TCE was

detected above the Performance Standard in MW-9 (6.6 ug/l), MW-15 (12 ug/l), and MW-17 (4.8 ug/l). PCE was detected above the Performance Standard in MW-2 (1.9 ug/l) and MW-17 (3.5 ug/l).

During the March 2013 sampling event, all wells were sampled for 1,4-dioxane, which has been associated with TCE solvent plumes at some locations. No detections of 1,4-dioxane were identified.

**MAY 2014:**

North Carolina Department of Environment and Natural Resources (DENR) mobilized to the site on May 6, 2014. The sampling plan approved for this sampling event consisted of the following;

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road
MW-15	2232 Tate Street
MW-16	2725 Puritan
MW-17	2816 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that can be directly accessed (MW-2, MW-12, MW-15 and MW-21). The private wells were purged using the in-situ pumping system and sampled prior to any filter mechanism that may have been in place. MW-17 was again purged and sampled at approximately 25 feet depth via peristaltic pump.

DENR collected water level measurements from the top of casing for MW-2, MW-12 and MW-15 with an electronic water level meter. No significant change in the water levels has occurred from the previous observations.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 6 of the 8 wells sampled during the May 2014 sampling event. TCE was detected above the Performance Standard in MW-9 (7.4 ug/l), MW-15 (9.9 ug/l), and MW-17 (4.5 ug/l). PCE was detected above the Performance Standard in MW-17 (3.2 ug/l).

**MAY 2015:**

North Carolina Department of Environmental Quality (DEQ, formerly DENR) mobilized to the site on March 24, 2015. The sampling plan approved for this sampling event consisted of the following;

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road

MW-15	2232 Tate Street
MW-16	2725 Puritan
MW-17	2816 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that can be directly accessed (MW-2, MW-12 and MW-15 and MW-21).

Potable well MW-16 had no electrical power and no prior history of contamination and was therefore removed from the monitoring network. The remaining private wells were purged using their in-situ pumping systems and sampled prior to any filter mechanism that may have been in place.

DENR collected water level measurements from the top of casing for MW-2, MW-12, MW-15, MW-20 and MW-21 with an electronic water level meter. No significant change in the water levels occurred from the previous observations and the previous groundwater flow direction in the bedrock aquifer, ranging from south to east across the site, with the strongest component to the southeast, remained current.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 4 of the 7 wells sampled during the March 2015 sampling event. TCE was detected above the Performance Standard in MW-9 (6.7 ug/l), MW-15 (9.7 ug/l), and MW-17 (4.3 ug/l). PCE was detected above the Performance Standard in MW-2 (1.4ug/l) and MW-17 (3.3 ug/l).

**MAY 2016:**

NCDEQ mobilized to the site on May 14, 2016. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road
MW-15	2232 Tate Street
MW-17	2816 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that could be directly accessed (MW-2, MW-12 and MW-15 and MW-21). Ownership of the residence at MW-20 had changed and the new owners could not be contacted despite numerous attempts. Because of this, and because the well had no history of contamination (except for MTBE and other petroleum hydrocarbons associated with a nearby underground storage tank), the well was removed from the site monitoring network.

The remaining private wells were purged using the in-situ pumping system and sampled prior to any filter mechanism that may have been in place. MW-17 was again purged and sampled at 20 feet depth via peristaltic pump.

No significant change in the water levels has occurred from the previous observations and the previous groundwater flow direction in the bedrock aquifer, ranging from south to east across the site, with the strongest component to the southeast, remained current.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 4 of the 7 wells sampled during the May 2016 sampling event. TCE was detected above the Performance Standard in MW-9 (5.6 ug/l), MW-15 (7.9 ug/l), and MW-17 (4.3 ug/l). PCE was detected above the Performance Standard in MW-2 (1.6 ug/l) and MW-17 (3.1 ug/l).

**JUNE 2017:**

NCDEQ mobilized to the site on June 1, 2017. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-12	2719 Davis Park Road
MW-15	2232 Tate Street
MW-17	2816 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that could be directly accessed (MW-2, MW-15 and MW-21). The well house for MW-12 was padlocked, and no resident was present to grant access. Subsequently, the owner at the residence denied knowledge of the padlock and no surviving heirs of the previous property owner could be contacted. Because well contaminant concentrations had been below the NC 2L standards since 2011, and had been non-detect since 2015, the well was removed from the site monitoring network.

The remaining private wells were purged using their in-situ pumping systems and sampled prior to any filter mechanism that may have been in place. MW-17 was again purged and sampled at 20 feet depth via peristaltic pump.

DENR collected water level measurements from the top of casing for MW-2, MW-15 and MW-21 with an electronic water level meter. No significant change in the water levels occurred from the previous observations and the previous groundwater flow direction in the bedrock aquifer, ranging from south to east across the site, with the strongest component to the southeast, remained current.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 4 of the 6 wells sampled during the June 2017 sampling event. TCE was detected above the Performance Standard in MW-9 (4.8 ug/l), MW-15 (5.9 ug/l), and MW-17 (3.5 ug/l). PCE was detected above the Performance Standard in MW-2 (1.7 ug/l) and MW-17 (2.3 ug/l).

**APRIL 2018:**

NCDEQ mobilized to the site on April 18, 2018. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-15	2232 Tate Street
MW-17	2816 Davis Park Road
MW-19	2833 Penny Park
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that can be directly accessed (MW-2, MW-15 and MW-21). Ownership of the residence containing converted monitoring well MW-15 had changed and the new owners could not be contacted, despite multiple attempts. Ownership of the residence at carbon-equipped potable well MW-9 had also changed, with similar results. Therefore, MW 9 and MW-15 were not sampled. The remaining potable wells were purged using the in-situ pumping system and sampled prior to any filter mechanism that may have been in place. MW-17 was again purged and sampled at 20 feet depth via peristaltic pump.

DENR collected water level measurements from the top of casing for MW-2 and MW-21 with an electronic water level meter. No significant change in the water levels occurred from the previous observations and the previous groundwater flow direction in the bedrock aquifer, ranging from south to east across the site, with the strongest component to the southeast, remained current.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 2 of the 4 wells sampled during the April 2018 sampling event. TCE was detected at the Performance Standard in MW-17 (2.8 ug/l). PCE was detected above the Performance Standard in MW-2 (1.4 ug/l) and MW-17 (1.9 ug/l).

**DECEMBER 2019:**

NCDEQ mobilized to the site on December 4, 2019. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-15	2232 Tate Street
MW-17	2816 Davis Park Road
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

PDB samplers were used to sample the monitoring wells that can be directly accessed (MW-2, MW-15 and MW-21). The remaining potable wells were purged using their in-situ pumping systems and sampled prior

to any filter mechanism that may have been in place. Attempts to sample disabled former potable well MW- were unsuccessful, due either to an unusually low static water level, or to an obstruction preventing installation of tubing to 20 feet depth.

Trichloroethene (TCE) and tetrachloroethene (PCE) were the only contaminants detected above the Record of Decision Performance Standards (PS) of 2.8 micrograms per liter (ug/l) for TCE and 1.0 ug/l for PCE. TCE and or PCE were detected in 3 of the 5 wells sampled during the December 2019 sampling event. TCE was detected above the Performance Standard in MW-9 (4.1 ug/l) and MW-15 (3.4 ug/l). PCE was detected above the Performance Standard in MW-2 (1.4ug/l).

### 3.0 RESUMPTION OF LTRA SAMPLING IN 2023 AND 2025

#### 3.1 GROUNDWATER SAMPLING

NCDEQ mobilized to the site on May 24, 2023 and again on February 13, 2025. The sampling plan approved for this sampling event consisted of the following:

MW-02	2816 Davis Park Road
MW-09	2639 Springbrook Circle
MW-15	2232 Tate Street
MW-17	2816 Davis Park Road
MW-21	Lendora Drive
MW-26	2840 Davis Park Road

#### 3.1.1 MONITORING WELL SAMPLING

The MW-9 residence had reportedly been connected to municipal water in 1919 or 1920. The well pump and carbon filtration system had been removed and a removable cap installed on the well casing, from which DEQ personnel suspended a PDB sampler prior to the 2023 sampling event, after obtaining access permission from the current owner. DEQ used the PDB sampler to collect a groundwater sample during the 2023 sampling event. However, when DEQ personnel arrived at the property for the 2025 event, the owner verbally rescinded access and no sample was collected. During both the 2023 and 2025 sampling events, MW-15 was successfully sampled and its duplicate PDB samplers replaced for future sampling .

The DEQ field sampling manager for the Davis Park Road site retired following the 2019 sampling event, and a delay followed in project reassignment. During the 2023 LTRA sampling event, replacement personnel were unable to visually locate flush-mounted monitoring wells MW-2 and MW-21 which had become obscured by vegetative overgrowth and/or accumulated soil and leaf litter. The wells were subsequently located using a metal detector and uncovered during a site drive-by in 2024. However, during the 2025 sampling event, the MW-21 flush-mount was discovered to be covered in ponded rainwater extending tens of feet out from the well, with no down-slope option to drain the water away. The ponded water had filled both the surface roadway box and the inner well casing to the surface, compromising the well's integrity for sampling. In addition, field personnel observed a billboard adjacent to the southward extension of Lendora Drive, describing a future residential development whose layout "footprint" appeared to impinge upon the MW-21 location.

Flush-mounted MW-21, adjacent to Blackwood Creek, was successfully sampled during the 2025 sampling event and its PDB sampler replaced for future sampling. It should be noted that the well location

was in the upper flood zone of the creek, the surrounding area having been covered in sediment from a past flooding event.

During the 2023 sampling event, another attempt was made to sample converted well MW-17 using peristaltic tubing. However, the tubing again met obstruction at approximately 20 feet depth, and pumping from that depth yielded no groundwater. Because of prolonged relatively dry regional conditions prior to the 2025 sampling event, no further attempt was made to sample the well.

### 3.1.2 POTABLE WELL SAMPLING

During both the 2023 and 2025 sampling events, potable well MW-26 was purged at the wellhead for approximately 15 minutes using the in-situ pumping system. Specific conductivity, pH, temperature and turbidity were measured every 5 minutes during the 2023 purge process. Groundwater temperature was monitored every 5 minutes during the 2025 purge process. Samples were collected directly into 40 milliliter (ml) septa vials pre-preserved with hydrochloric acid.

### 3.1.3 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

One trip blank and one duplicate sample were collected during both the May 2023 and the February 2025 LTRA sampling events. The trip blank was prepared by filling the 40 milliliter (ml) septa vials, pre-preserved with hydrochloric acid, directly from the laboratory source of organic free water and was stored with the collected samples throughout the sampling event. Duplicate samples during both events were collected out of MW-15, which was equipped with two PDBs.

All PDB and potable well samples were placed on ice prior to shipment to DEQ contract laboratories for VOC analysis using EPA Method 8260. The 2023 samples were shipped to Pace South Carolina Laboratory in West Columbia, South Carolina, and the 2025 samples were shipped to Eurofins Environmental Testing in Cary, North Carolina.

## 3.2 GROUNDWATER SAMPLING RESULTS

Laboratory analytical results from the May 2023 and February 2025 LTRA sampling events are summarized in Table 1 and included as Appendix C of this report. TCE and PCE detections in May 2023 and in February 2025 are illustrated in Figures 2 and 3 of this report. Figure(s) 4 graphs the sample results for the above-mentioned monitoring and potable wells over time.

During the May 2023 LTRA sampling event, the highest TCE concentration (2.4 ug/l) was present in MW-9, located in the west-central portion of the site. TCE was also detected (1.4 -1.6 ug/L) in nearby monitoring well MW-15. Neither concentration exceeded the Site Remediation Goal (RG) of 2.8 ug/L or the current NCAC-2L Groundwater Standard of 3.0 ug/l. No PCE or other chlorinated alkenes were detected in the sampled wells.

During the February 2025 LTRA sampling event, the highest detected TCE concentration (0.968 J ug/l) was present in MW-2, located to the southeast adjacent to Blackwood Creek. TCE was also detected (0.702 J - 0.719 J ug/L) in monitoring well MW-15. Neither concentration exceeded the Site RG or the current NCAC-2L Standard. PCE was also detected (0.897 J ug/L) in MW-2, slightly exceeding its NCAC 2L Standard of 0.7 ug/L but not its RG of 1 ug/L.

Acetone was reported in MW-9 and MW-15 during the 2023 sampling event and in MW-15 and the Trip

QC blank during the 2025 sampling event. All results (up to 34 ug/L) exceeded the NCAC 2L standard, however, the blank detection was consistent with past laboratory contamination during Method 8260 analysis for VOCs.

#### **4.0 CONCLUSIONS AND RECOMMENDATIONS**

##### **4.1 LTRA RESULTS SUMMARY**

The source of the TCE/PCE contamination in groundwater at the Davis Park Road TCE Site has been depleted or removed, based on all of the groundwater sampling results reported from the time of the contaminated plume discovery (1990) up to the current May 2014 LTRA sampling events.

Westernmost “active” monitoring well MW-21 has remained non-detect for VOCs from August 2004 to when last sampled in December 2019, and levels of TCE in monitoring wells MW-9, MW-15 and MW-17 have consistently decreased from 2014 to 2023.

##### **4.2 CONCLUSIONS**

Sampling results to date have indicated the groundwater contaminant plume was following the apparent groundwater migration pathway southeast toward Blackwood Creek. The levels of VOCs in all of the wells sampled have decreased over time, with minimal concentrations detected during the most recent (2025) sample analysis. Decreasing levels of TCE and/or PCE in all wells indicates that the contaminants in the plume are being attenuated by natural processes. No wells have indicated an increase since 2017. These trends indicate that the contaminant plume is naturally attenuating as it migrates eastward toward the hydrogeologic discharge boundary of Blackwood Creek. Potable well MW-26, east of the creek, has remained non-detect since August 2004, and results from other, previously-sampled monitoring wells south and east of the creek also support that the creek serves as a boundary to plume migration. The cumulative results indicate that the contaminated plume is naturally attenuating as expected, and no conditions have changed that would impede the remedy.

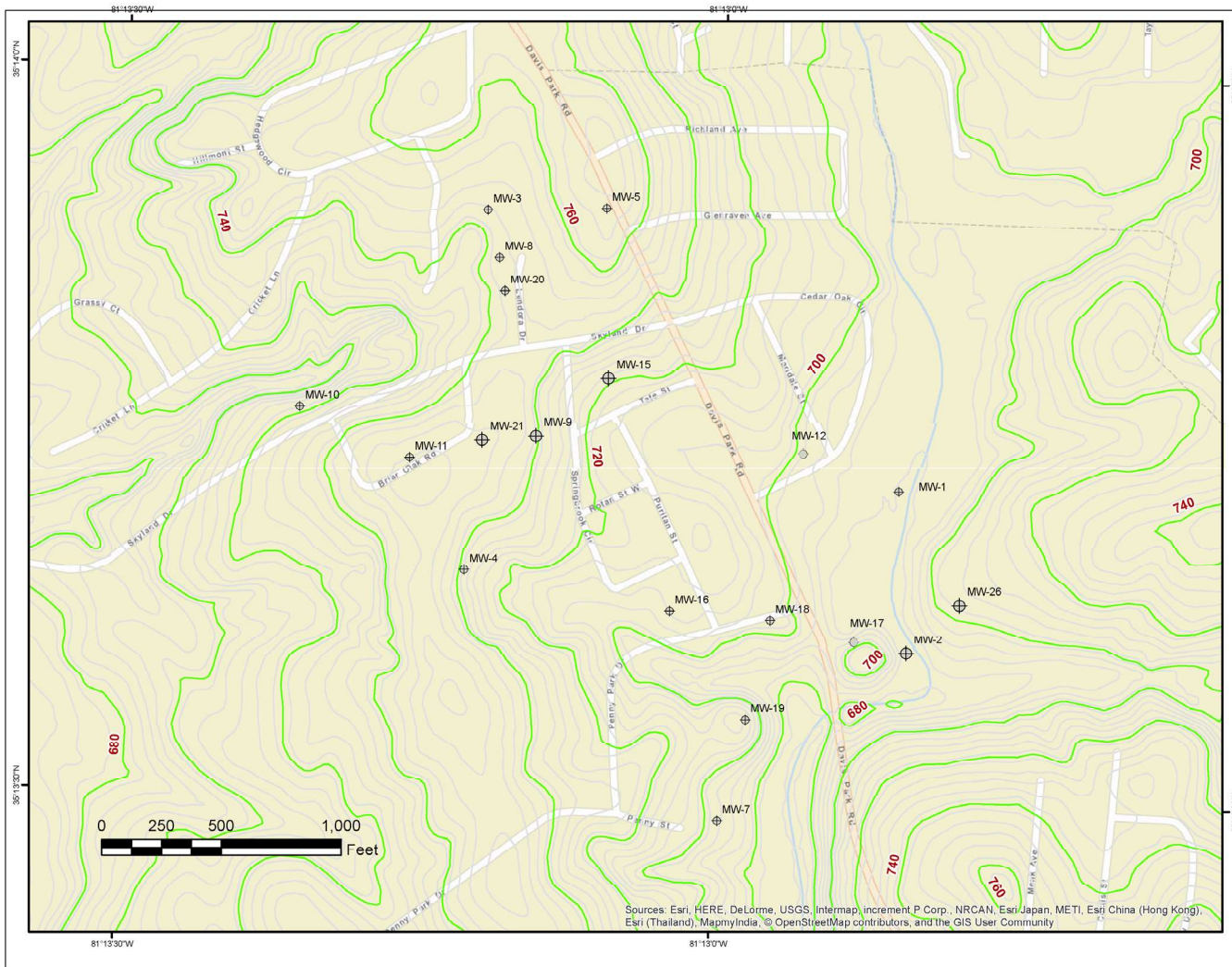
##### **4.3 RECOMMENDATIONS**

The use of passive diffusion bag (PDB) samplers since February 2005 HAS yielded representative samples in a manner that is less labor intensive and more cost effective than the traditional low flow sampling method. It is recommended that annual or semi-annual sampling continue for the duration of the LTRA. Because MW-21 remained contaminant free for 15 years and will likely be destroyed by future land development, and because none of the most recent results have exceeded Site RGs (other than PCE at Blackwood Creek), it is recommended that MW-21 be “retired” and that attenuation monitoring continue at MW-15, MW-2 and MW-26 to ensure that Site RGs have been met.

# FIGURES

Davis Park Road TCE Superfund Site  
NCD 986 175 644

NCDEQ Superfund Section  
March 2025



**Legend**

**Status**

- ⊕ Inactive Wells
- ⊕ Active Wells

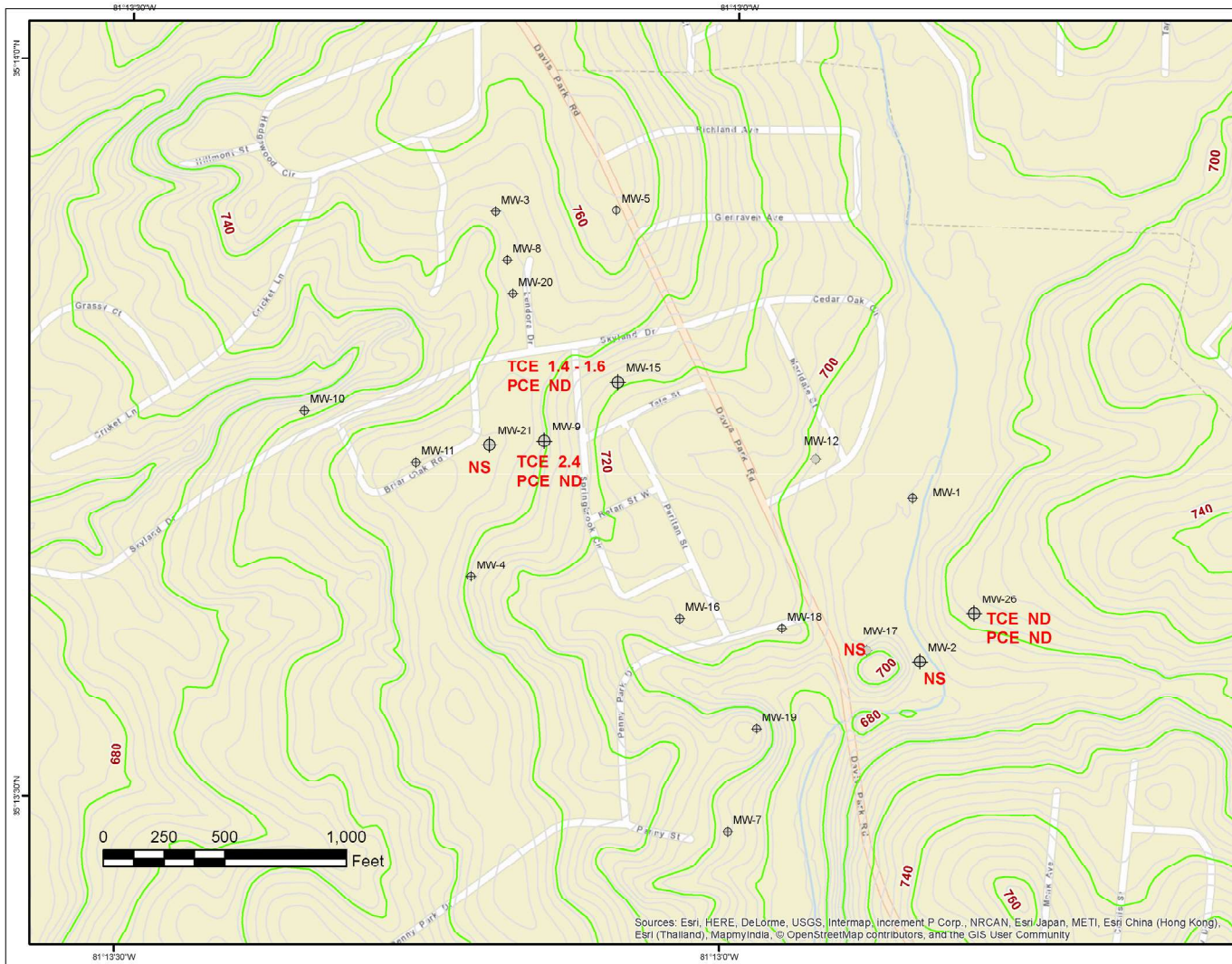
County Location

Map Extent

**Site Location and Monitoring Well Sampling Network**

Site Name:	Davis Park Road TCE Site
Site Number:	NCD - 986 175 644
Date:	3-04-2025
Figure:	1
Scale:	1:4,800

Prepared by:



**Legend**

**Status**

- ⊕ Inactive Wells
- ⊕ Active Wells

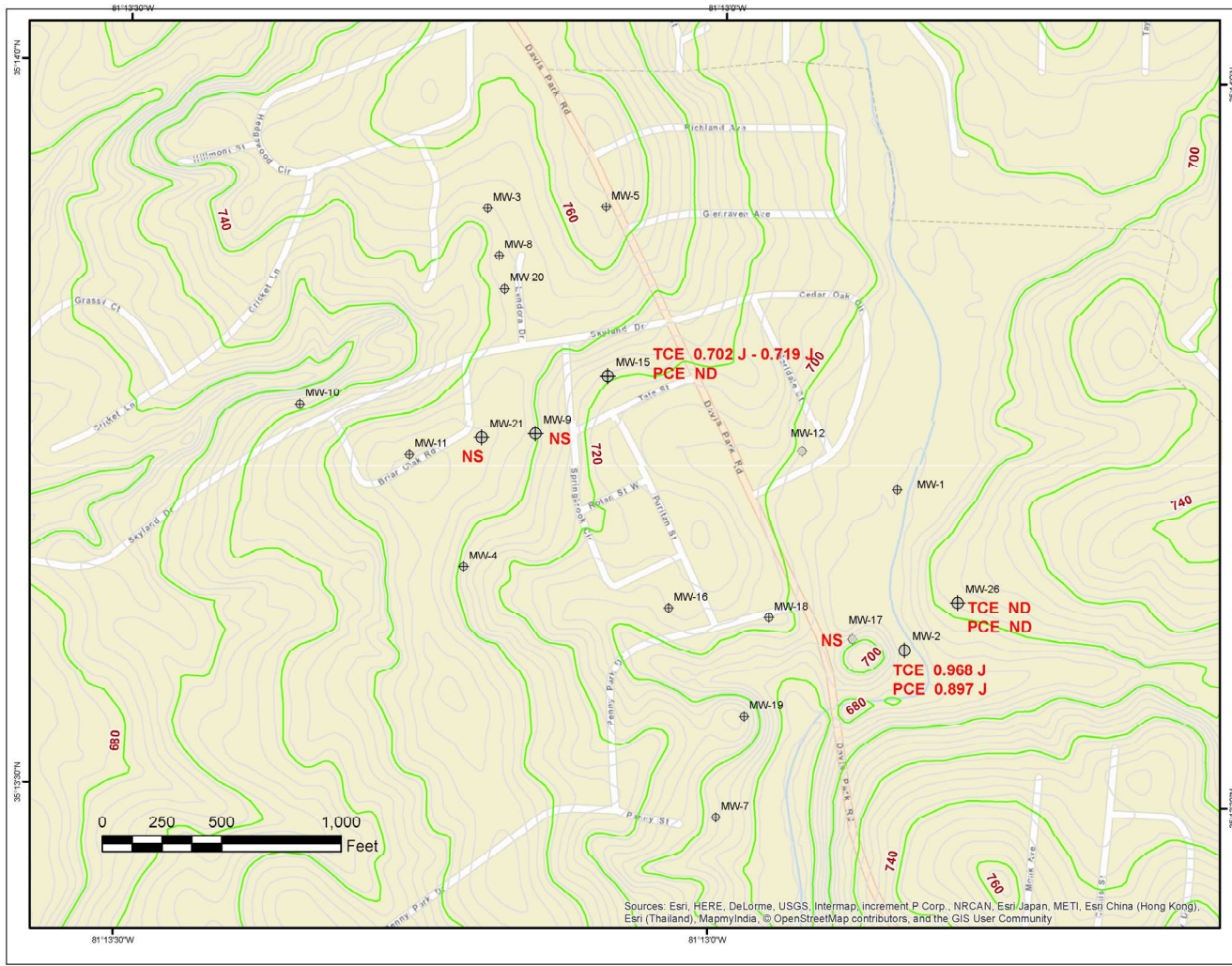
County Location

Map Extent

**TCE and PCE Groundwater Concentrations (ug/L), May 2023**

Site Name:	Davis Park Road TCE Site
Site Number:	NCD - 986 175 644
Date:	3-04-2025
Figure:	2
Scale:	1:4,800

Prepared by:



**Legend**

**Status**

- ⊕ Inactive Wells
- ⊕ Active Wells

County Location

Map Extent

**TCE and PCE Groundwater Concentrations (ug/L), February 2025**

Site Name:	Davis Park Road TCE Site
Site Number:	NCD - 986 175 644
Date:	3/04/2025
Figure:	3
Scale:	1:4,800

Prepared by:

# TABLES

Table 1  
Davis Park Road TCE Site  
NCD 986 175 644  
Groundwater Sampling Results (2023; 2025)

	Current NCAC 2L Standard (µg/L) (2022)	Remediation Goal (µg/L)	MW-21 5/24/2023	MW-21 2/13/2025	MW-9 5/24/2023	MW-9 2/13/2025	MW-15 5/24/2023	MW-15-D 5/24/2023	MW-15 2/13/2025
Acetone	6	NA	NS	NS	34	NS	--	--	12.5
Chloroform	70	1	NS	NS	--	NS	--	--	--
Trichloroethene	3	2.8	NS	NS	2.4	NS	1.4	1.6	0.702 J
Tetrachloroethene	0.7	1	NS	NS	--	NS	--	--	--

	Current NCAC 2L Standard (µg/L) (2022)	Remediation Goal (µg/L)	MW-15D 2/13/2025	MW-2 5/24/2023	MW-2 2/13/2025	MW-26 5/24/2023	MW-26 2/13/2025	Trip Blank 5/24/2023	Trip Blank 2/13/2025
Acetone	6	NA	13.8	NS	--	--	--	--	12.7
Chloroform	70	1	--	NS	--	0.51	0.274 J	--	--
Trichloroethene	3	2.8	0.719 J	NS	0.968 J	--	--	--	--
Tetrachloroethene	0.7	1	--	NS	0.897 J	--	--	--	--

NS: MW-21 location obscured (2023); roadway box and inner casing flooded (2025).  
 NS: MW-9 access permission rescinded by property owner (2025).  
 NS: MW-2 location obscured (2023).  
 J: Result is greater than Method Detection Limit but less than Reporting Limit.  
 MW-17 (former production well) casing obstructed above groundwater.  
 Bold Result exceeds current NCAC 2L Standard but not (applicable) Remediation Goal.

Table 2  
Davis Park Road TCE Site  
NCD 986 175 644  
Historical Laboratory Analytical Results

Sample ID Location Date Sampled	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	MW-1 S of Cedar Oak		Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	
								Feb-05	Feb-06									
Volatile Organic Compounds																		
Chloromethane	---	---	---	---	---	0.28J	---	---	---	---	---	---	---	//	//	//	//	//
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Acetone	---	---	---	---	---	11	12	---	---	---	---	49	36	//	//	//	//	//
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Methyl Ethyl Ketone	---	---	---	---	---	7.0	---	---	---	---	---	1.2	---	//	//	//	//	//
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Cyclohexane	---	---	---	---	---	---	---	---	0.5	0.2J	---	1.3	---	//	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated value; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CIP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-2 2816 DPR																				
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Apr-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19
Volatile Organic Compounds																					
Chloromethane	---	---	0.28JB	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	0.51	---	---	0.31J	---	---	---	---	---	---	---	---	0.36J	---	---	---	---	---	---	---
Acetone	---	---	---	---	---	1.1J	2.8A	---	---	---	---	52	22	15	---	19	29	120	220	27n	29
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	0.49J	---	0.51	0.56	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	1.1	---	---	---	---	---	---	---	---	---
Chloroform	0.44J	0.52B	0.37J	0.5	0.32J	0.40J	---	---	---	0.18J	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	0.48J	0.58	0.43J	0.45J	0.31J	0.35J	---	0.24J	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	0.73	0.28J	---	0.56	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	3	6.1	4.3	4.1	2.9	4	2.7	2.7	2.9	4.7	3.2	4.8	4.5	3.2	2	0.96	1.5	1.7	2	1.7	1.6
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	2.5	3.7	2.7	3	2	1.3	1.9	2	2.6	3.2	1.9	3.1	3.2	2.3	1.9	0.96	1.4	1.6	1.7	1.4	1.4
Ethylbenzene	---	---	---	---	---	---	---	0.23J	0.52J	0.40J	---	0.17J	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---	---	0.19J	---	0.35J	---	0.34J	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-3 N of 2400 Skyland															
	Apr-02	Sep-02	Dec-02	Mar-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																
Chloromethane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
1,1-Dichloroethene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Acetone	---	---	---	---	8.9J	16	---	---	//	---	53	21	//	//	//	//
Methylene Chloride	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Carbon Disulfide	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Methyl T-Butyl Ether	12	14	10	15	3	13	11	17	//	11	8	3.3	//	//	//	//
1,1-Dichloroethane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Methyl Ethyl Ketone	---	---	---	---	6.6	---	---	---	//	---	1.1	---	//	//	//	//
Chloroform	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Benzene	---	---	---	---	0.49J	---	---	---	//	---	---	---	//	//	//	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Cyclohexane	---	---	---	---	---	---	---	---	//	0.18J	1.3	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Trichloroethene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Methylcyclohexane	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Toluene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Tetrachloroethene	---	0.22J	0.18J	0.23J	0.18J	---	0.20J	---	//	---	---	---	//	//	//	//
Ethylbenzene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
Total Xylenes	---	---	0.24J	0.11J	1.5	---	---	---	//	0.11J	---	---	//	//	//	//
Bromoform	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	//	---	---	---	//	//	//	//
1,4-Dichlorobenzene	---	---	0.15J	---	---	---	---	---	//	---	---	---	//	//	//	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-4 2415 Skyland																	
	Date Sampled	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																		
Chloromethane	---	---	---	---	0.18J	0.33J	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	---	---	---	---	---	11	10J	---	---	---	---	---	46	23	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	0.56	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	8.6	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	0.6	---	---	---	0.59	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	0.48J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	0.18J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	0.14J	0.66J	0.93J	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	0.17J	---	---	---	---	0.45J	---	---	---	---	0.15J	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated value; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-5 2419 DPR																	
	Date Sampled	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																		
Chloromethane	---	---	---	---	---	0.32J	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	0.11J	0.09J	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	0.15J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	0.15J	---	0.11J	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	1.4	1.9	1.5J	1.7	1.6	1.4	0.96J	0.67	0.57	0.20J	0.19J	---	---	---	---	---	---	
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	0.13J	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
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 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-6 2717 DPR													
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Mar-08	Apr-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
	Date Sampled													
Volatile Organic Compounds														
Chloromethane	---	---	---	---	0.34J	0.30J	---	//	//	//	//	//	//	//
1,1-Dichloroethene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Acetone	12	---	---	<7.3	---	---	---	//	//	//	//	//	//	//
Methylene Chloride	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Carbon Disulfide	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Methyl T-Butyl Ether	---	---	---	---	---	---	---	//	//	//	//	//	//	//
1,1-Dichloroethane	---	---	---	---	---	---	---	//	//	//	//	//	//	//
1,2-Dichloroethane	---	---	0.58J	0.33J	0.20J	0.31J	0.58	//	//	//	//	//	//	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Methyl Ethyl Ketone	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Chloroform	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Benzene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Cyclohexane	---	---	---	---	---	---	---	//	//	//	//	//	//	//
1,2-Dichloroethane	---	0.16	---	---	---	---	---	//	//	//	//	//	//	//
Trichloroethene	1.6	---	3.9J	3.4	1.9	3	5.3	//	//	//	//	//	//	//
Methylcyclohexane	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	//	//	//	//	//	//	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Toluene	0.18J	---	---	---	---	---	---	//	//	//	//	//	//	//
Tetrachloroethene	1.5	1.2	2.7J	3	1.8	2.8	5.3	//	//	//	//	//	//	//
Ethylbenzene	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Total Xylenes	---	---	---	---	---	---	---	//	//	//	//	//	//	//
Bromoform	---	---	---	---	---	---	---	//	//	//	//	//	//	//
1,3-Dichlorobenzene	---	---	---	---	---	---	0.11J	//	//	//	//	//	//	//
1,4-Dichlorobenzene	---	---	---	---	---	---	0.11J	//	//	//	//	//	//	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-7 2837 DPR																
	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	
	Date Sampled																
Volatile Organic Compounds																	
Chloromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Acetone	---	---	<7.5	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl T-Butyl Ether	0.17J	0.19J	0.12J	---	0.23J	---	0.23J	---	0.30J	0.13J	---	---	---	//	//	//	//
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Chloroform	---	---	0.10J	---	0.24J	---	0.30J	0.5	1.2	0.87	---	1	---	//	//	//	//
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Total Xylenes	---	---	---	---	---	---	---	---	---	0.12J	---	---	---	//	//	//	//
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
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 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-8															
	2400 Skyland															
Date Sampled	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																
Chloromethane	---	0.32JB	---	0.40J	---	---	---	---	---	---	---	---	//	//	//	//
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Acetone	---	---	<1.2	---	---	---	---	---	---	---	---	---	//	//	//	//
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl T-Butyl Ether	1.8	1.2J	1.7	1.1	1.2	---	0.42J	---	---	---	---	---	//	//	//	//
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl Ethyl Ketone	---	0.0J	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Toluene	---	2.0J	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Tetrachloroethene	---	0.12J	0.16J	---	0.16J	---	---	---	---	---	---	---	//	//	//	//
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	//	//	//	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
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Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-9																				
	2539 Springbrook																				
Date Sampled	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19
Volatile Organic Compounds																					
Chloromethane	---	---	---	---	---	0.30J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Acetone	---	---	---	<9.4	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Methyl T-Butyl Ether	---	0.16J	0.12J	0.14J	---	0.18J	---	0.15J	---	---	0.14J	---	---	---	---	---	---	---	---	---	//
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	0.2J	---	---	---	---	---	---	---	---	---	//
1,2-Dichloroethane	---	---	0.12J	0.18J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
cis 1,2-Dichloroethene	1.1	0.67	1.0J	1.6	0.26J	0.88	0.77J	0.53	1.3	1.7	1.3	1.2	1.5	1.1	0.95	1	1	0.64	0.6	//	
Methyl Ethyl Ketone	---	---	0.5J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Chloroform	---	---	0.14J	0.15J	---	0.14J	---	---	---	0.15J	---	---	---	---	---	---	---	---	---	---	//
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
1,2-Dichloroethane	---	0.44J	---	0.48J	0.42J	0.52	---	---	---	0.22J	---	---	---	---	---	---	---	---	---	---	//
Trichloroethene	14	8.6	12J	16	---	7.8	7.3	9.4	12	13	7.7	11	10	6.1	6.6	7.4	6.7	5.6	4.8	//	
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Toluene	---	---	2.3J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Tetrachloroethene	---	0.36J	0.36J	0.44J	---	0.39J	---	0.34J	---	0.34J	---	---	---	0.2J	---	---	---	---	---	---	//
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
Total Xylenes	---	---	---	---	---	---	---	---	---	---	0.11J	---	---	---	---	---	---	---	---	---	//
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-10 2634 Skyland																
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																	
Chloromethane	---	---	0.45J	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	0.11J	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	---	0.16J	0.15J	0.16J	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	1.1	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	---	0.18J	0.20J	0.24J	---	0.24J	---	---	---	0.25J	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-11 2606 Rear Oak																
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																	
Chloromethane	---	---	0.52J	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	11	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	0.47J	0.62J	0.36J	0.29J	---	---	0.16J	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	---	---	0.11J	0.11J	---	0.17J	---	---	---	0.19J	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
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 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-12 2710 DPR																		
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-06	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	
Volatile Organic Compounds	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Chloromethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Acetone	---	---	---	---	---	16J	---	---	---	---	//	27J	4.6	8.0	0.2J	---	82	47	61
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Methyl Ethyl Ketone	---	---	---	---	---	7.2	---	---	---	---	//	---	---	---	---	---	---	---	
Chloroform	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Benzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,1,1-Trichloroethane	0.38J	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Cyclohexane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Trichloroethene	---	3	2.3	2.1	2.4	1.5	3.5	2	2.2	2.1A	//	1	2.1	0.78	0.69	---	0.54	---	
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Toluene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Tetrachloroethene	1.0	1.1	0.45J	0.79	0.00	1.4	1.1	1.2	1.0A	//	---	1.3	0.51	0.46J	---	---	---	---	
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Total Xylenes	---	---	0.14J	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
Bromoform	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	
1,4-Dichlorobenzene	---	---	0.12J	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	

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Sample ID Location	MW-13 2241 Cedar Oak		
	Apr-02	Sep-02	Dec-02
Volatile Organic Compounds	---	---	---
Chloromethane	---	---	---
1,1-Dichloroethene	---	0.15J	---
Acetone	---	---	---
Methylene Chloride	---	---	---
Carbon Disulfide	---	---	---
Methyl T-Butyl Ether	---	---	---
1,1-Dichloroethane	---	---	---
1,2-Dichloroethane	---	---	---
trans 1,2-Dichloroethene	---	---	---
cis 1,2-Dichloroethene	---	---	---
Methyl Ethyl Ketone	---	---	---
Chloroform	---	---	---
Benzene	---	---	---
1,1,1-Trichloroethane	---	---	---
Cyclohexane	---	---	---
1,2-Dichloroethane	---	---	---
Trichloroethene	---	---	---
Methylcyclohexane	---	---	---
Methyl Isobutyl Ketone	---	---	0.16J
cis 1,3-dichloropropene	---	---	---
Toluene	00.17J	0.19J	0.59
Tetrachloroethene	---	---	---
Ethylbenzene	---	---	---
Total Xylenes	---	---	0.20J
Bromoform	---	---	0.20JB
1,3-Dichlorobenzene	---	---	---
1,4-Dichlorobenzene	---	---	0.12J

Sample ID Location	MW-14 2403 DPR					
	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04
Volatile Organic Compounds	---	---	---	---	---	---
Chloromethane	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---
Acetone	---	---	---	---	14J	30
Methylene Chloride	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	6.9	---
Chloroform	---	---	---	---	---	---
Benzene	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---
Trichloroethene	0.49J	0.28J	0.27J	0.25J	0.22J	---
Methylcyclohexane	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---
Toluene	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---
Bromoform	---	0.20JB	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---

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Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-15 2775 Puffin																				
	Date Sampled	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-05	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19
Volatile Organic Compounds																					
Chloromethane	---	0.11JB	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	---	---	---	---	15	---	---	---	---	---	---	47	6.1	15.1	---	17	49	130	160	---	18
Methylene Chloride	---	---	2.0J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	0.28J	0.16J	---	---	---	---	---	0.060J	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	0.20J	0.17J	---	---	0.27J	---	0.22J	---	0.20J	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	0.25J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	3.6	2.6	3.6	2.6	4.9	3.3	3.6	3.4	4.1	1.7	1.0	2	1.5	1.4	1.2	1.1	0.71	0.056	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	0.22J	---	---	---	---	---	---	0.22J	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	2.0J	---	---	---	---	---	0.30J	---	3	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	50	36	40	38	50	46	39	40	36	14	20	17	12	12	9.9	9.7	7.9	5.3	---	---	3.4
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	0.31J	0.21J	---	0.21J	0.22J	---	0.30J	---	0.27J	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	0.10J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	0.22J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	0.23J	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

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--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-16 2775 Puffin																
	Date Sampled	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds																	
Chloromethane	---	---	---	0.24J	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Acetone	---	---	---	2.2J	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	0.28J	0.30J	---	0.28J	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	0.35J	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	0.33J	0.20J	0.30J	---	0.34J	---	---	---	---	---	---	---	---	---	---	---	---

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--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-17 2816 DPR																					
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19	
Volatile Organic Compounds																						
Chloromethane	---	---	0.40JB	---	0.35J	0.35J	---	---	---	---	//	---	---	---	---	---	---	---	---	---	//	
1,1-Dichloroethene	---	---	---	1.6	0.6	0.98	---	---	---	---	//	---	---	0.43J	0.43J	0.43J	---	---	---	---	//	
Acetone	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Methyl T-Butyl Ether	---	0.47J	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
1,1-Dichloroethane	---	---	---	---	---	0.98	0.61J	0.88	1	---	//	---	---	---	---	---	---	---	---	---	---	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
cis 1,2-Dichloroethene	---	---	0.26J	0.26J	0.78	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Chloroform	0.31J	0.25JB	0.27J	0.26J	---	---	---	0.22J	---	35	---	---	---	---	---	---	---	---	---	---	---	//
Benzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
1,1,1-Trichloroethane	0.60	0.47J	0.45J	0.7	0.36J	0.57	---	0.5	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Cyclohexane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Trichloroethene	12	13	12J	14	8.8	17	12	12	13	---	//	5.2	7	5.5	4.8	4.5	4.3	4.3	3.5	2.8	---	//
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Toluene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Tetrachloroethene	5.7	5.7	4.8J	6.2	4.2	9	6.5	5.3	7.4	---	//	4.4	4.8	3.7	3.5	3.2	3.3	3.1	2.3	1.9	---	//
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Total Xylenes	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
Bromoform	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---	---	---	---	---	---	//

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-18 2800 DPR																
	Apr-02	Sep-02	Dec-02	Mar-03	Aug-03	Feb-04	Feb-05	Feb-06	Mar-08	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	
Volatile Organic Compounds																	
Chloromethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Acetone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Methyl T-Butyl Ether	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,1-Dichloroethane	---	---	---	---	---	---	---	---	0.10J	---	---	---	---	---	#	#	#
1,2-Dichloroethane	---	---	0.11J	---	---	---	---	---	---	---	---	---	---	---	#	#	#
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
cis 1,2-Dichloroethene	---	---	0.21J	---	0.14J	---	---	---	---	---	---	---	---	---	#	#	#
Methyl Ethyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Chloroform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Benzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Cyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,2-Dichloroethane	---	---	---	---	0.15J	---	---	---	---	---	---	---	---	---	#	#	#
Trichloroethene	4.3	6.1	4.0J	4.4	4.4	4.2	1.8	2	1.8	0.95	1.2	0.99	0.77	#	#	#	
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Toluene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Tetrachloroethene	8.6	10	6.9J	9.1	10	9.9	3.9	4.2	2.7	2.3	1.7	3.9	1	#	#	#	
Ethylbenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Total Xylenes	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
Bromoform	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	---	---	---	#	#	#

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-19 2833 Penny Park													
	Mar-03	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-06	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15
Volatile Organic Compounds														
Chloromethane		0.44J												#
1,1-Dichloroethene														#
Acetone														#
Methylene Chloride														#
Carbon Disulfide														#
Methyl T-Butyl Ether														#
1,1-Dichloroethane														#
1,2-Dichloroethane														#
trans 1,2-Dichloroethene														#
cis 1,2-Dichloroethene														#
Methyl Ethyl Ketone														#
Chloroform														#
Benzene														#
1,1,1-Trichloroethane														#
Cyclohexane														#
1,2-Dichloroethane														#
Trichloroethene	0.44J	0.24J	0.43J		0.25J		0.37J	0.26J			0.35J	0.54	0.59	#
Methylcyclohexane														#
Methyl Isobutyl Ketone														#
cis 1,3-dichloropropene														#
Toluene														#
Tetrachloroethene	0.36J	0.26J	0.39J		0.25J		0.30J				0.27J			#
Ethylbenzene														#
Total Xylenes														#
Bromoform														#
1,3-Dichlorobenzene														#
1,4-Dichlorobenzene														#

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-20 2416 Skyland													
	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-06	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	
Volatile Organic Compounds														
Chloromethane							//		//		//	//		
1,1-Dichloroethene							//		//	//	//	//		
Acetone	5.1		10A				//	39	//	//	//	//	79	
Methylene Chloride							//		//	//	//	//		
Carbon Disulfide							//		//	//	//	//		
Methyl T-Butyl Ether	77	84	64A	70	99	97	44	//	34	//	//	//	14	
1,1-Dichloroethane							//		//	//	//	//		
1,2-Dichloroethane							//		//	//	//	//		
trans 1,2-Dichloroethene							//		//	//	//	//		
cis 1,2-Dichloroethene							//		//	//	//	//		
Methyl Ethyl Ketone							//		//	//	//	//		
Chloroform							//		//	//	//	//		
Benzene							//		//	//	//	//		
1,1,1-Trichloroethane							//		//	//	//	//		
Cyclohexane						0.01	0.12J	//	0.8	//	//	//	0.76	
1,2-Dichloroethane							//		//	//	//	//		
Trichloroethene							//		//	//	//	//		
Methylcyclohexane							//		//	//	//	//		
Methyl Isobutyl Ketone							0.53J	//	//	//	//	//		
cis 1,3-dichloropropene							//		//	//	//	//		
Toluene	0.48J	0.42J		0.35J		0.36J	0.11J	//	//	//	//	//		
Tetrachloroethene	0.9						//		//	//	//	//		
Ethylbenzene		0.31J	1.1A	1.1	1.7	1.6	0.75	//	//	//	//	//	0.68	
Total Xylenes		0.48J		1.2		1.4J	0.56	//	//	//	//	//		
Bromoform							//		//	//	//	//		
1,3-Dichlorobenzene							//		//	//	//	//		
1,4-Dichlorobenzene							//		//	//	//	//		

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
 J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
 Samples were analyzed following CLP protocol.  
 --- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-21 2419 Skyland																
	Aug-03	Feb-04	Aug-04	Feb-05	Feb-06	Mar-06	Mar-09	Apr-10	Apr-11	May-12	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19
Volatile Organic Compounds																	
Chloromethane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Acetone	6.3	28J	17	---	27AJ	79J	73J	100	89	52J	---	//	81	73	190	260	79
Methylene Chloride	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Methyl T-Butyl Ether	2.3	2.6	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Methyl Ethyl Ketone	---	6.2	7.1	---	7.7AJ	19J	17	17	22	16J	12	//	18	17	12	14	14
Chloroform	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Cyclohexane	---	---	---	---	---	0.61J	0.15J	1.1	---	---	---	//	1.8	0.89	0.95	---	0.78
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Trichloroethene	0.9	0.91	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	0.78J	0.85J	---	---	---	---	//	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Toluene	0.74	1.1	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Tetrachloroethene	0.44J	0.35J	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
Ethylbenzene	---	0.48J	0.90J	1.1	0.92AJ	1.5J	0.77	---	1	0.74	0.85	//	0.91	0.78	0.69	0.63	0.68
Total Xylenes	---	2	---	1.6	---	0.86J	0.74	---	0.86	0.61	1.2	//	1.3	1.2	1.1	0.57	---
Bromoform	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---	---	//	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Sample ID Location	MW-26 2419 Skyland									
	Aug-03	Feb-04	Aug-04	Mar-13	May-14	Mar-15	May-16	Jun-17	Apr-18	Dec-19
Volatile Organic Compounds										
Chloromethane	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethene	---	---	---	---	---	---	---	---	---	---
Acetone	6.3	28J	12	---	---	---	---	---	---	---
Methylene Chloride	---	---	---	---	---	---	---	---	---	---
Carbon Disulfide	---	---	---	---	---	---	---	---	---	---
Methyl T-Butyl Ether	2.3	2.6	---	---	---	---	---	---	---	---
1,1-Dichloroethane	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---
trans 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---
cis 1,2-Dichloroethene	---	---	---	---	---	---	---	---	---	---
Methyl Ethyl Ketone	---	0.2	7.1	---	---	---	---	---	---	---
Chloroform	---	---	---	---	---	---	---	---	---	---
Benzene	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	---	---	---	---	---	---	---	---	---	---
Cyclohexane	---	---	---	---	---	---	---	---	---	---
1,2-Dichloroethane	---	---	---	---	---	---	---	---	---	---
Trichloroethene	0.9	0.91	---	---	---	---	---	---	---	---
Methylcyclohexane	---	---	---	---	---	---	---	---	---	---
Methyl Isobutyl Ketone	---	---	---	---	---	---	---	---	---	---
cis 1,3-dichloropropene	---	---	---	---	---	---	---	---	---	---
Toluene	0.74	1.1	---	---	---	---	---	---	---	---
Tetrachloroethene	0.44J	0.35J	---	---	---	---	---	---	---	---
Ethylbenzene	---	0.48J	0.90J	---	---	---	---	---	---	---
Total Xylenes	---	2	---	---	---	---	---	---	---	---
Bromoform	---	---	---	---	---	---	---	---	---	---
1,3-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	---	---	---	---	---	---	---	---	---	---

Note: Only constituents that were detected in more than one sample during the baseline sampling event are included in this table.  
J indicates estimated values; A = Analyte analyzed in replicate. Reported Value is average of the replicates.  
Samples were analyzed following CLP protocol.  
--- indicates not detected above the reporting limit // indicates not sampled

Table 3  
Davis Park Road TCE Site  
Monitoring Well Locations and Specifications

Well	Street Location	Type	Depth (Ft)	Latitude	Longitude (-)
MW-1	South of Cedar Oak Cir	MW	75	35° 13' 42.92"	81° 12' 50.89"
MW-2	2816 Davis Park Rd	MW	54	35° 13' 36.26"	81° 12' 50.35"
MW-3	Lendora Dr (north)	MW	150	35° 13' 54.20"	81° 13' 11.88"
MW-4	2415 Skyland Dr	MW	142	35° 13' 39.33"	81° 13' 12.69"
MW-5	2419 Davis Park Rd	PW-C	187	35° 13' 54.36"	81° 13' 05.91"
MW-6	2717 Davis Park Rd	PW-C	Unk	NA	NA
MW-7	2839 Davis Park Rd	PW-C	Unk	35° 13' 29.16"	81° 12' 59.69"
MW-8	2400 Skyland Dr	PW-C	Unk	35° 13' 52.24"	81° 13' 11.25"
MW-9	2639 Springbrook Cir	FPW	Unk	35° 13' 44.90"	81° 13' 09.21"
MW-10	2634 Skyland Dr	CW	Unk	35° 13' 45.91"	81° 13' 21.14"
MW-11	Briar Oak Subdivision	CW	270	35° 13' 43.91"	81° 13' 15.56"
MW-12	2719 Davis Park Rd	FPW	112	35° 13' 44.57"	81° 12' 56.72"
MW-13	2241 Cedar Oak Cir	FPW	125	NA	NA
MW-14	2403 Davis Park Rd	FPW	74	NA	NA
MW-15	2232 Tate St	FPW	145	35° 13' 47.35"	81° 13' 05.63"
MW-16	2725 Puritan St	PW	Unk	35° 13' 37.80"	81° 13' 02.30"
MW-17	2816 Davis Park Rd	PW	Unk	35° 13' 36.88"	81° 13' 53.59"
MW-18	2800 Davis Park Road	PW	Unk	35° 13' 37.49"	81° 13' 57.23"
MW-19	2833 Penny Park Dr	PW	Unk	35° 13' 33.39"	81° 13' 58.37"
MW-20	Lendora Dr (north)	MW	173	35° 13' 50.88"	81° 13' 10.94"
MW-21	Lendora Dr (south)	MW	135	35° 13' 44.69"	81° 13' 11.92"
MW-23	2920 Davis Park Rd	PW	178	35° 13' 29.08"	81° 12' 50.56"
MW-24	802 Davis Park Rd	PW	250-300	35° 13' 26.42"	81° 12' 45.85"
MW-25	Monks Trailer Park	CW	Unk	35° 13' 24.70"	81° 12' 44.63"
MW-26	2840 Davis Park Rd	PW	680	35° 13' 38.28"	81° 12' 47.71"
MW-27	2828 Davis Park Rd	PW	Unk	35° 13' 42.37"	81° 12' 43.77"
MW-28	2822 Davis Park Rd	PW	Unk	35° 13' 40.43"	81° 12' 44.85"
MW-29	Pineview Subdivision	CW	150	35° 13' 12.40"	81° 12' 17.21"
MW-30	Heetwood No 4 Well	CW	630	35° 13' 33.16"	81° 12' 41.49"
MW-31	Ridgeview Subdivision	CW	185	35° 13' 15.11"	81° 12' 36.87"




MW: Installed Monitoring Well  
PW: Private Production Well  
PW-C: Private Production Well Equipped with Carbon Filtration  
CW: Community Well  
FPW: Former Production Well Converted to Monitoring Well  
Unk: Depth not available  
NA: Coordinates not available

Appendix A

Quality Assurance Project Plan



## Quality Assurance Project Plan

Section A: Planning Elements		
<b>A1. Title (Project Name):</b>	Davis Park Road TCE site	
EPA ID#:	NCD 986 175 644	
Project Location:	Gastonia, Gaston County, North Carolina	
Project Requestor and Organization:	Cathy Amoroso US EPA Region 4	
Project Manager's Name, Position, and Organization:	Harry Zinn, Environmental Engineer, Federal Remediation Branch, NC Superfund	
Project Manager's Signature:		Date: 11-19-19
Technical Reviewer's Name and Position:	Qu Qi, Quality Assurance Manager, NC Superfund	
Technical Reviewer's Signature:		Date: 11-19-19
QA Reviewer's Name and Position:	Jim Bateson, Section Chief, NC Superfund	
QA Reviewer's Signature:		Date: 11/20/19
DAO's Name, Position, and Organization:		
DAO's Signature:		Date:
<b>A2. Table of Contents</b>	<ul style="list-style-type: none"> <li>• Page i of the NC generic QAPP</li> <li>• Section No. TOC of NC Superfund Section Health and Safety SOP Manual (<a href="#">SF QAProjectPlan Blank 02082018.docx</a>)</li> <li>• Sampling Plan Table 1, Figure 1</li> </ul>	
<b>A3. Distribution List</b>	Cathy Amoroso, US EPA Qu Qi, NC Superfund Scott Ross (File Room), NC Superfund Harry Zinn, NC Superfund Section	
<b>A4. Project Personnel</b>	<b>Organization</b>	<b>Responsibilities</b>
Stuart Parker, Hydrogeologist	NC Superfund	Sampler
Harry Zinn, Engineer	NC Superfund	Project Lead (919-707-8374)
Comments: The NC Superfund Section organizational chart and delegation of duties can be found in Section 3.1 and Appendix A of the NC generic QAPP.		
<b>A5. Background:</b>	During routine sampling of the community well serving the Cedar Oaks Park subdivision by Gaston County Environmental Health on March 31, 1990,	



## Quality Assurance Project Plan

<b>Section A: Planning Elements</b>		
<b>A1. Title (Project Name):</b>	Davis Park Road TCE site	
EPA ID#:	NCD 986 175 644	
Project Location:	Gastonia, Gaston County, North Carolina	
Project Requestor and Organization:	Cathy Amoroso US EPA Region 4	
Project Manager's Name, Position, and Organization:	Harry Zinn, Environmental Engineer, Federal Remediation Branch, NC Superfund	
Project Manager's Signature:		Date:
Technical Reviewer's Name and Position:	Qu Qi, Quality Assurance Manager, NC Superfund	
Technical Reviewer's Signature:		Date:
QA Reviewer's Name and Position:	Jim Bateson, Section Chief, NC Superfund	
QA Reviewer's Signature:		Date:
DAO's Name, Position, and Organization:		
DAO's Signature:		Date:
<b>A2. Table of Contents</b>	<ul style="list-style-type: none"> <li>• Page i of the NC generic QAPP</li> <li>• Section No. TOC of NC Superfund Section Health and Safety SOP Manual (<a href="#">SF QAProjectPlan Blank 02082018.docx</a>)</li> <li>• Sampling Plan Table 1, Figure 1</li> </ul>	
<b>A3. Distribution List</b>	Cathy Amoroso, USEPA Qu Qi, NC Superfund Scott Ross (File Room), NC Superfund Harry Zinn, NC Superfund Section	
<b>A4. Project Personnel</b>	<b>Organization</b>	<b>Responsibilities</b>
Stuart Parker, Hydrogeologist	NC Superfund	Sampler
Harry Zinn, Engineer	NC Superfund	Project Lead (919-707-8374)
Comments: The NC Superfund Section organizational chart and delegation of duties can be found in Section 3.1 and Appendix A of the NC generic QAPP.		
<b>A5. Background:</b>	During routine sampling of the community well serving the Cedar Oaks Park subdivision by Gaston County Environmental Health on March 31, 1990,	



## Quality Assurance Project Plan

	<p>concentrations of trichloroethene (TCE) (34.9 ug/l) and tetrachloroethene (PCE) (23.7 ug/l) were detected. Confirmation samples collected on April 17, 1990 were similar. These levels exceed the EPA Drinking Water Maximum Contaminant Level (MCL) for TCE and PCE of 5 ug/l and the North Carolina Department of Environment and Natural Resources (NC DENR) 2L standards of 2.8 ug/l for TCE and 0.7 ug/l for PCE. Samples collected from three additional nearby residences also were contaminated.</p> <p>Additional sampling was conducted by EPA Environmental Services Division in 1990, NC Department of Environmental Management in 1990, 1991 and 1992 and NC DENR Division of Waste Management in 1994. Based on the sampling done and the investigations performed, the site was listed on the National Priorities List in 1999. Part of the Record of Decision (ROD) approved in 1998 is the Monitored Natural Attenuation (MNA) of the ground water plume at the site.</p>
<b>A6. Project Description:</b>	Past Long Term Remedial Action involves the annual sampling of 19 wells for Volatile Organic Compounds. This sampling event recommends sampling of five of these original 19 wells and one additional well across Blackwood Creek from MW-2.
Decision(s) to be made based on data:	Is the contaminated ground water plume actually naturally attenuating? Is the ROD being protective of Human Health and the environment?
Applicable regulatory information, action levels, etc.	ROD Performance Standards of 2.8 ug/l for TCE and 1 ug/l for PCE
Field Study Date:	December 2019.
Projected Lab Completion Date:	This should be approximately one month after sampling event date.
Final Report Completion Date:	January, 2019
<b>A7. Quality Objectives and Criteria:</b>	<ol style="list-style-type: none"> <li>1. STATE THE PROBLEM Is the contaminated ground water plume continuing to naturally attenuate?</li> <li>2. IDENTIFY THE GOALS OF THE STUDY Verification of attainment of remediation objectives.</li> <li>3. IDENTIFY INFORMATION INPUTS Collect samples from 6 wells for volatile organic compound analysis.</li> <li>4. DEFINE THE BOUNDARIES OF THE STUDY Sample 5 of the 19 wells in the established monitoring network for the site and one additional well.</li> </ol>



## Quality Assurance Project Plan

<p>5. DEVELOP THE ANALYTIC APPROACH</p> <p>Sample Collection Guidance for VOC's</p> <table border="1"> <thead> <tr> <th>Matrix</th> <th>Sample Type</th> <th>Container Type</th> <th>Bottle Count</th> <th>Minimum Volume</th> <th>Important Notes</th> <th>Preservative</th> <th>Holding Time</th> </tr> </thead> <tbody> <tr> <td rowspan="2">Water</td> <td>VOA Sample</td> <td rowspan="2">40mL glass vial, 24 mm neck finish</td> <td>3</td> <td rowspan="2">Fill to capacity</td> <td rowspan="2">Vials must be filled to capacity with no headspace or air bubbles.</td> <td rowspan="2">Preserve to a pH of 2 with HCL and Cool to 4oC (+/-2oC) immediately after collection.</td> <td rowspan="2">14 days</td> </tr> <tr> <td>VOA Sample with MS/MSD</td> <td>6</td> </tr> </tbody> </table> <p><a href="http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf">http://www.epa.gov/superfund/programs/clp/download/sampler/CLPSamp-01-2011.pdf</a></p> <p>Laboratory analysis will include: Target Analyte List (TAL) volatile organic compounds (VOCs) using the <a href="#">EPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration SOM02.4 October 2016</a> or comparable methods.</p> <p>6. SPECIFY PERFORMANCE OR ACCEPTANCE CRITERIA            Analytical results for initial acceptance will be assessed during validation performed by US EPA Region 4 Science and Ecosystem Support Division (SESD) that evaluates the usability of the data defined. Any rejected data and the reasons for rejection will be summarized in the data validation report.</p> <p>7. DEVELOP THE PLAN FOR OBTAINING DATA            Sample 5 wells in the established MNA network and one additional well.</p>								Matrix	Sample Type	Container Type	Bottle Count	Minimum Volume	Important Notes	Preservative	Holding Time	Water	VOA Sample	40mL glass vial, 24 mm neck finish	3	Fill to capacity	Vials must be filled to capacity with no headspace or air bubbles.	Preserve to a pH of 2 with HCL and Cool to 4oC (+/-2oC) immediately after collection.	14 days	VOA Sample with MS/MSD	6
Matrix	Sample Type	Container Type	Bottle Count	Minimum Volume	Important Notes	Preservative	Holding Time																		
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	VOA Sample with MS/MSD		6																						



## Quality Assurance Project Plan

<b>A8. Special Training/ Certifications:</b>	<ul style="list-style-type: none"> <li>• Section 3.3 of the NC generic QAPP.</li> <li>• Section 2.1 and Appendix A of NC Superfund Section Health and Safety SOP Manual (<a href="http://portal.ncdenr.org/web/wm/div/safety/program">http://portal.ncdenr.org/web/wm/div/safety/program</a>)</li> </ul>
<b>A9. Documents and Records:</b>	Section 3.4 of the NC generic QAPP.

<b>Section B: Data Generation and Acquisition</b>	
<b>B1. Sampling Design</b>	<p>An authoritative sampling design was chosen based on the data quality objectives of the study. Sample IDs, media, analysis, location and rationale can be found in Table 1 of the sampling plan. Sample locations can also be found on Figure 1 of the sampling plan.</p> <p>Volume, Holding time, and Preservation requirements are in accordance with: SESD Analytical Support Branch Laboratory Operations and Quality Assurance Manual, Table 3-1 (<a href="https://www.epa.gov/sites/production/files/2016-06/documents/loqam_042816.pdf">https://www.epa.gov/sites/production/files/2016-06/documents/loqam_042816.pdf</a>)</p>
<b>B2. Sampling Methods, General Procedures:</b>	<p><i>SESD Field Branches Quality System and Technical Procedures</i></p> <ul style="list-style-type: none"> <li>• <a href="#">Field pH Measurement</a>, December 16, 2016, (PDF, 9pp, 339K)</li> <li>• <a href="#">Field Specific Conductance Measurement</a>, July 13, 2016, (PDF, 9pp, 593K)</li> <li>• <a href="#">Field Temperature Measurement</a>, October 23, 2014, (PDF, 8pp, 790K)</li> <li>• <a href="#">Field Turbidity Measurement</a>, July 27, 2017, (PDF, 13pp, 900K)</li> <li>• <a href="#">Groundwater Level and Well Depth Measurement</a>, November 3, 2016, (PDF, 9pp, 625K)</li> <li>• <a href="#">Groundwater Sampling</a>, April 26, 2017, (PDF, 34pp, 905K)</li> <li>• <a href="#">Packing, Marking, Labeling and Shipping of Environmental and Waste Samples</a>, February 4, 2015, (PDF, 9pp, 351K)</li> <li>• <a href="#">Field Sampling and Measurement Procedures and Procedure Validation</a>, July 13, 2016, (PDF, 10pp, 576K)</li> <li>• <a href="#">Field Sampling Quality Control</a>, April 16, 2017, (PDF, 23pp, 665K)</li> <li>• <a href="#">Logbooks</a>, May 30, 2013, (PDF, 9pp, 604K)</li> <li>• <a href="#">Sample and Evidence Management</a>, January 29, 2013, (PDF, 16pp, 529K)</li> <li>• <a href="#">Potable Water Supply Sampling</a>, May 30, 2013, (PDF, 17pp, 663K)</li> </ul>
<b>B3. Sampling Handling and Custody:</b>	All samples will be handled and custody maintained in accordance with SESD Operating Procedures for Sample Evidence Management, SESDPROC-005-R.2.



## Quality Assurance Project Plan

	<a href="https://www.epa.gov/sites/production/files/2015-06/documents/Sample-and-Evidence-Management.pdf">https://www.epa.gov/sites/production/files/2015-06/documents/Sample-and-Evidence-Management.pdf</a>
<b>B4. Analytical Methods:</b>	
CLP:	Analytical methods for organic samples are in accordance with: <a href="#">EPA Contract Laboratory Program Statement of Work for Organic Superfund Methods Multi-Media, Multi-Concentration SOM02.4 October 2016</a>
<b>B5. Quality Control:</b>	
Field:	<ul style="list-style-type: none"> <li>• Rinsate blanks are collected on a quarterly basis on equipment used for sampling during that calendar quarter.</li> <li>• Rinsate blanks are collected on a quarterly basis on gloves utilized for sampling during that calendar quarter.</li> <li>• Rinsate blanks are collected on a quarterly basis on the DI water system maintained and utilized by the NC Division of Waste Management for decontamination of sampling equipment.</li> <li>• Organic-free water is obtained from the NC Public Health lab for VOC water trip blanks</li> <li>• A minimum of one duplicate per twenty samples per media will be collected.</li> <li>• A minimum of one trip blank per twenty samples will be collected for VOC water samples.</li> <li>• Section 3.5 of the NC generic QAPP</li> </ul>
Laboratory:	<ul style="list-style-type: none"> <li>• A minimum of one MS/MSD sample per twenty samples per media will be collected.</li> <li>• Section 3.5 of the NC generic QAPP</li> </ul>
<b>B6. Instrument/Equipment Testing, Inspection and Maintenance:</b>	<ul style="list-style-type: none"> <li>• Section 3.4 and Appendix B of the NC generic QAPP</li> <li>• Section 6 of NC Superfund Section Health and Safety SOP Manual (<a href="http://portal.ncdenr.org/web/wm/div/safety/program">http://portal.ncdenr.org/web/wm/div/safety/program</a>)</li> </ul>
<b>B7. Instrument/Equipment Calibration and Frequency:</b>	<p>All monitoring equipment and instruments are calibrated a minimum of once daily, at the start of the day, when field activities requiring use of the equipment occur. Serial numbers and calibration records are maintained in the field logbook for the project. Any inconsistencies and errors during calibration are also to be noted in the field logbook.</p> <p>Equipment to be used for this project and requiring calibration includes:</p> <ul style="list-style-type: none"> <li>• MiniRae(s): MiniRae(s) are calibrated to Isobutylene at a concentration of 50.0 ppm. Acceptable range is plus or minus 2 ppm (48.0-52.0 ppm)</li> <li>• pH/Conductivity/Temperature Meter(s): pH is calibrated to three standards (pH 7, pH4, pH10); Conductivity is calibrated to one standard (1413 uS)</li> </ul>



## Quality Assurance Project Plan

	<ul style="list-style-type: none"> <li>Turbidity Meter(s): Turbidity is calibrated to three standards (Low, Medium, and High ntu)</li> </ul>
<b>B8. Inspection/Acceptance for Supplies and Consumables:</b>	All critical supplies and consumables for this field investigation are inspected and maintained by the QAO and designated staff, as discussed in Section 3.2 of the NC generic QAPP. A list of these supplies is included in Appendix B of the NC generic QAPP.
<b>B9. Non-direct Measurements:</b>	Not applicable.
<b>B10. Data Management:</b>	<p>The project manager will be responsible for ensuring that all requirements for data management are met. All data generated for this field investigation, whether hand-recorded or obtained using an electronic data logger, will be recorded, stored, and managed according to the following procedures:</p> <p>SESD Operating Procedure for Control of Records, SESDPROC-002-R6.  <a href="https://www.epa.gov/sites/production/files/2015-06/documents/Control-of-Records.pdf">https://www.epa.gov/sites/production/files/2015-06/documents/Control-of-Records.pdf</a>            SESD Operating Procedures for Logbooks, SESDPROC-010-R5.  <a href="https://www.epa.gov/sites/production/files/2015-06/documents/Logbooks.pdf">https://www.epa.gov/sites/production/files/2015-06/documents/Logbooks.pdf</a></p>

### Section C: Assessment/Oversight

<b>C1. Assessments and Response Actions:</b>	<p>Assessments will be conducted during the field investigation according to SESD Operating Procedure for Project Planning, SESDPROC-016-R5 (<a href="https://www.epa.gov/sites/production/files/2016-04/documents/project_planning016_af_r5.pdf">https://www.epa.gov/sites/production/files/2016-04/documents/project_planning016_af_r5.pdf</a>) to ensure the QAPP is being implemented as approved. The Project Manager is responsible for all corrective actions while in the field.</p> <p>Section 3.2.4 of the NC generic QAPP.</p>
<b>C2. Reports to Management:</b>	<p>The Project Manager will report to their immediate supervisor if any circumstances arise during the field investigation that may adversely impact the quality of the data collected. The Project Manager and/or their immediate supervisor will also be responsible for notifying the EPA Project Manager if any circumstances arise during the field investigation that may adversely impact the quality of the data collected.</p> <p>Section 3.2.4 of the NC generic QAPP</p>

### Section D: Data Validation and Usability

<b>D1. Data Review, Verification, and Validation:</b>	Section 3.2.4 of the NC generic QAPP.
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## Quality Assurance Project Plan

<b>D2. Verification and Validation Methods:</b>	Section 3.2.4 of the NC generic QAPP.
	<p>Review of blanks is evaluated by the Project Manager using the following guidelines:</p> <ul style="list-style-type: none"> <li>• <i>USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, EPA-540-R-2017-002, January 2017</i> (<a href="https://www.epa.gov/clp/national-functional-guidelines-organic-superfund-methods-data-review-som024">https://www.epa.gov/clp/national-functional-guidelines-organic-superfund-methods-data-review-som024</a>)</li> </ul>
<b>D3. Reconciliation with User Requirements:</b>	Review of data is evaluated by the Project Manager using the following guidelines:
	<ul style="list-style-type: none"> <li>• <i>USEPA Using Qualified Data to Document an Observed Release and Observed Contamination, EPA 540-F-94-028, Exhibit 3 and Tables 1-4</i> (<a href="https://semspub.epa.gov/work/HQ/174006.pdf">https://semspub.epa.gov/work/HQ/174006.pdf</a>)</li> </ul> <p>Section 3.2 of the NC generic QAPP</p>

Table 1

Sample ID	Status	Street Address	Sample collection	Analysis	
MW-2	monitoring well	3816 Davis Park	PDB Justin Heineius	70-864-7078	Yes
MW-9	pre-carbon unit	2639 Springbrook	Grover Johnson	704-214-3289	Yes
MW-9post	post-carbon				
MW-12	converted well	2719 Davis Park (Cedar Oak Sub)	PDB	VOC	no contact
MW-15	converted well	2232 Tate	PTDR Jeffrey Kathin	708-741-6194	Yes
MW-16	private	2411 Penny Park Drive	Donny Gibson	864-9024	well inoperable
MW-17	private	2816 Davis Park	Justin Heineius		Yes
MW-19	private	2822 Penny Park	Lec Troutman	865-6095	well inoperable
MW-21	monitoring well	Londra Drive (south of Skyland)	PDB	VOC	yes
MW-26	private & ms/msd	2840 Davis Park	Tracy Marr	704-850-7689	Yes
MW-100	blank	Trip Blank	Grab	VOC	
MW-101	blank	Equipment Blank	PDB	VOC	
MW-115	dup	Duplicate of MW-15	PDB	VOC	

1626 N New Hopr Road for report

PDB = Passive Diffusion Bag samplers

Appendix B  
Field Log Book

IF FOUND PLEASE RETURN TO:

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

PHONE \_\_\_\_\_

# JOB BOOK

2021 - JASE ALEXANDER  
DAVIS PARK RB 0649  
PROJECT NAME \_\_\_\_\_

PROJECT NUMBER NCD 986 175 644

CREW \_\_\_\_\_

DATE \_\_\_\_\_ BOOK # 1 OF \_\_\_\_\_

WEATHER \_\_\_\_\_



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DAVIS PARK RD TCE 2/13/2025  
 NCD 986125644 GW MONITORED NATURAL ATTENUATION

MW	Depth	PDB	VOAS
MW 09	1430	PDB	3 VOAS
MW 15	1600	PDB	3 VOAS
MW 15D	1505	PDB	3 VOAS
MW 02	—	PDB	NOT LOCATED
MW 17	—	(PUMP)	NO H <sub>2</sub> O @ 23'
MW 26	1522	(PUMP)	3 VOAS
MW	T <sub>OC</sub>		
5	18.6	DEPTH 680'	(1996)
10	18.1	CA SIMB 52	
15	17.6		
20	17.5		
MW 21	—	PDB	NOT LOCATED

D.P. RW

DAVIS PARK RD TCE 2/13/2025  
 NCD 986125644 GW MONITORED NATURAL ATTENUATION

MW 21 WELL UNDERWATER, INNER COAST FLOODED

MW 09 OWNER VERBALLY REVOKED ACCESS

MW 15	1340	PDB	6 VOAS
MW 15D	1345	PDB	
MW 02	1415	PDB	3 VOAS
MW 26	1436	T <sub>OC</sub>	3 VOAS
14:53	5	16.0	
SAMPLED	10	15.9	
	15	16.0	
	20		

D.P. RW

Appendix C  
Laboratory Reports of Analyses

# PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

## Case Narrative DEQ DWM Lot Number: YE25003

This Report of Analysis contains the analytical result(s) for the sample(s) listed on the Sample Summary following this Case Narrative. The sample receiving date is documented in the header information associated with each sample.

All results listed in this report relate only to the samples that are contained within this report. Where sampling is conducted by the client, results relate to the accuracy of the information provided, and as the samples are received.

Sample receipt, sample analysis, and data review have been performed in accordance with the most current approved The NELAC Institute (TNI) standards, the Pace Analytical Services, LLC ("Pace") Laboratory Quality Manual, standard operating procedures (SOPs), and Pace policies. Any exceptions to the TNI standards, the Laboratory Quality Manual, SOPs or policies are qualified on the results page or discussed below.

Pace is a TNI accredited laboratory; however, the following analyses are currently not listed on our TNI scope of accreditation: Drinking Water: VOC (excluding BTEX, MTBE, Naphthalene, & 1,2-dichloroethane) EPA 524.2, E. coli and Total coliforms SM 9223 B-2004, Solid Chemical Material: TOC Walkley-Black, Biological Tissue: All, Non-Potable Water: SGT-HEM EPA 1664B, Silica EPA 200.7, Boron, Calcium, Silicon, Strontium EPA 200.8, Bicarbonate, Carbonate, and Hydroxide Alkalinity SM 2320 B-2011, SM 9221 C E-2006 & SM 9222D-2006, Strontium SW-846 6010D, VOC SM 6200 B-2011, Fecal Coliform Colilert-18, PFAS by Isotope Dilution SOP.

Pace is a DoD/DoE and TNI accredited laboratory; however, Pace is not accredited for PFAS Direct Aqueous Injection or Method D8421.

### VOA 8260D

The following sample had an air bubble > 6mm in the sample vial: YE25003-005.

YE25003-005 (Trip Blank) (Run 1) (Analysis Batch 76936)

The laboratory control sample (LCS) for analytical batch 76936 exceeded acceptance criteria for the following analytes: Dichlorodifluoromethane (178%), Bromomethane (154%), 2-Butanone (134%). These analytes were biased high and were not detected in the associated samples: YE25003-001, YE25003-002, YE25003-003, YE25003-004, and YE25003-005.

The initial calibration verification (ICV) associated with sample(s) YE25003-001, YE25003-002, YE25003-003, YE25003-004, and YE25003-005 exceeded control criteria for analytes: Dichlorodifluoromethane (134%). The data has been reported.

YE25003-001 (MW09) (Run 1) (Analysis Batch 76936)  
YE25003-002 (MW15) (Run 1) (Analysis Batch 76936)  
YE25003-003 (MW15Dup) (Run 1) (Analysis Batch 76936)  
YE25003-004 (MW26) (Run 1) (Analysis Batch 76936)  
YE25003-005 (Trip Blank) (Run 1) (Analysis Batch 76936)

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
106 Vantage Point Drive West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacelabs.com

## PACE ANALYTICAL SERVICES, LLC

SC DHEC No: 32010001

NELAC No: E87653

NC DENR No: 329

NC Field Parameters No: 5639

Reanalysis of sample YE25003-001 was performed outside of the analytical holding time for Acetone due to high failure in the original CCV.

YE25003-001 (MW09) (Run 2) (Analysis Batch 77856)

If you have any questions regarding this report, please contact the Pace Project Manager listed on the cover page.

# PACE ANALYTICAL SERVICES, LLC

---

## Sample Summary

DEQ DWM

Lot Number: YE25003

Project Name: Davis Park Road

Project Number: NCD 986 175 644

---

Sample Number	Sample ID	Matrix	Date Sampled	Date Received
001	MW09	Aqueous	05/23/2023 1430	05/25/2023
002	MW15	Aqueous	05/23/2023 1500	05/25/2023
003	MW15Dup	Aqueous	05/23/2023 1505	05/25/2023
004	MW26	Aqueous	05/23/2023 1622	05/25/2023
005	Trip Blank	Aqueous	05/23/2023 1630	05/25/2023

---

(5 samples)

# PACE ANALYTICAL SERVICES, LLC

---

## Detection Summary

DEQ DWM

Lot Number: YE25003

Project Name: Davis Park Road

Project Number: NCD 986 175 644

Sample	Sample ID	Matrix	Parameter	Method	Result	Q	Units	Page
001	MW09	Aqueous	Acetone	8260D	34	H	ug/L	6
001	MW09	Aqueous	Trichloroethene	8260D	2.4		ug/L	7
002	MW15	Aqueous	Trichloroethene	8260D	1.6		ug/L	9
003	MW15Dup	Aqueous	Trichloroethene	8260D	1.4		ug/L	11
004	MW26	Aqueous	Chloroform	8260D	0.51		ug/L	12

(5 detections)

## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-001</b>
Description: <b>MW09</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1430</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0239	CDA		76936
2	5030B	8260D	1	06/16/2023 1543	AMR2		77856

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Acetone	67-64-1	8260D	34	H	10	ug/L	2
Benzene	71-43-2	8260D	ND		0.50	ug/L	1
Bromodichloromethane	75-27-4	8260D	ND		0.50	ug/L	1
Bromoform	75-25-2	8260D	ND		0.50	ug/L	1
Bromomethane (Methyl bromide)	74-83-9	8260D	ND	L	0.50	ug/L	1
2-Butanone (MEK)	78-93-3	8260D	ND	L	10	ug/L	1
Carbon disulfide	75-15-0	8260D	ND		0.50	ug/L	1
Carbon tetrachloride	56-23-5	8260D	ND		0.50	ug/L	1
Chlorobenzene	108-90-7	8260D	ND		0.50	ug/L	1
Chloroethane	75-00-3	8260D	ND		0.50	ug/L	1
Chloroform	67-66-3	8260D	ND		0.50	ug/L	1
Chloromethane (Methyl chloride)	74-87-3	8260D	ND		0.50	ug/L	1
Cyclohexane	110-82-7	8260D	ND		0.50	ug/L	1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260D	ND		0.50	ug/L	1
Dibromochloromethane	124-48-1	8260D	ND		0.50	ug/L	1
1,2-Dibromoethane (EDB)	106-93-4	8260D	ND		0.50	ug/L	1
1,2-Dichlorobenzene	95-50-1	8260D	ND		0.50	ug/L	1
1,3-Dichlorobenzene	541-73-1	8260D	ND		0.50	ug/L	1
1,4-Dichlorobenzene	106-46-7	8260D	ND		0.50	ug/L	1
Dichlorodifluoromethane	75-71-8	8260D	ND	L	0.50	ug/L	1
1,1-Dichloroethane	75-34-3	8260D	ND		0.50	ug/L	1
1,2-Dichloroethane	107-06-2	8260D	ND		0.50	ug/L	1
1,1-Dichloroethene	75-35-4	8260D	ND		0.50	ug/L	1
cis-1,2-Dichloroethene	156-59-2	8260D	ND		0.50	ug/L	1
trans-1,2-Dichloroethene	156-60-5	8260D	ND		0.50	ug/L	1
1,2-Dichloropropane	78-87-5	8260D	ND		0.50	ug/L	1
cis-1,3-Dichloropropene	10061-01-5	8260D	ND		0.50	ug/L	1
trans-1,3-Dichloropropene	10061-02-6	8260D	ND		0.50	ug/L	1
Ethylbenzene	100-41-4	8260D	ND		0.50	ug/L	1
2-Hexanone	591-78-6	8260D	ND		10	ug/L	1
Isopropylbenzene	98-82-8	8260D	ND		0.50	ug/L	1
Methyl acetate	79-20-9	8260D	ND		1.0	ug/L	1
Methyl tertiary butyl ether (MTBE)	1634-04-4	8260D	ND		0.50	ug/L	1
4-Methyl-2-pentanone	108-10-1	8260D	ND		10	ug/L	1
Methylcyclohexane	108-87-2	8260D	ND		5.0	ug/L	1
Methylene chloride	75-09-2	8260D	ND		0.50	ug/L	1
Styrene	100-42-5	8260D	ND		0.50	ug/L	1
1,1,2,2-Tetrachloroethane	79-34-5	8260D	ND		0.50	ug/L	1
Tetrachloroethene	127-18-4	8260D	ND		0.50	ug/L	1
Toluene	108-88-3	8260D	ND		0.50	ug/L	1
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260D	ND		1.0	ug/L	1
1,2,4-Trichlorobenzene	120-82-1	8260D	ND		0.50	ug/L	1
1,1,1-Trichloroethane	71-55-6	8260D	ND		0.50	ug/L	1

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-001</b>
Description: <b>MW09</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1430</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0239	CDA		76936
2	5030B	8260D	1	06/16/2023 1543	AMR2		77856

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
1,1,2-Trichloroethane	79-00-5	8260D	ND		0.50	ug/L	1
Trichloroethene	79-01-6	8260D	2.4		0.50	ug/L	1
Trichlorofluoromethane	75-69-4	8260D	ND		0.50	ug/L	1
Vinyl chloride	75-01-4	8260D	ND		0.50	ug/L	1
Xylenes (total)	1330-20-7	8260D	ND		1.0	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits	Q	Run 2 % Recovery	Acceptance Limits
Bromofluorobenzene		93	70-130	H	96	70-130
1,2-Dichloroethane-d4		93	70-130	H	101	70-130
Toluene-d8		94	70-130	H	105	70-130

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-002</b>
Description: <b>MW15</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1500</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0302	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Acetone	67-64-1	8260D	ND		10	ug/L	1
Benzene	71-43-2	8260D	ND		0.50	ug/L	1
Bromodichloromethane	75-27-4	8260D	ND		0.50	ug/L	1
Bromoform	75-25-2	8260D	ND		0.50	ug/L	1
Bromomethane (Methyl bromide)	74-83-9	8260D	ND L		0.50	ug/L	1
2-Butanone (MEK)	78-93-3	8260D	ND L		10	ug/L	1
Carbon disulfide	75-15-0	8260D	ND		0.50	ug/L	1
Carbon tetrachloride	56-23-5	8260D	ND		0.50	ug/L	1
Chlorobenzene	108-90-7	8260D	ND		0.50	ug/L	1
Chloroethane	75-00-3	8260D	ND		0.50	ug/L	1
Chloroform	67-66-3	8260D	ND		0.50	ug/L	1
Chloromethane (Methyl chloride)	74-87-3	8260D	ND		0.50	ug/L	1
Cyclohexane	110-82-7	8260D	ND		0.50	ug/L	1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260D	ND		0.50	ug/L	1
Dibromochloromethane	124-48-1	8260D	ND		0.50	ug/L	1
1,2-Dibromoethane (EDB)	106-93-4	8260D	ND		0.50	ug/L	1
1,2-Dichlorobenzene	95-50-1	8260D	ND		0.50	ug/L	1
1,3-Dichlorobenzene	541-73-1	8260D	ND		0.50	ug/L	1
1,4-Dichlorobenzene	106-46-7	8260D	ND		0.50	ug/L	1
Dichlorodifluoromethane	75-71-8	8260D	ND L		0.50	ug/L	1
1,1-Dichloroethane	75-34-3	8260D	ND		0.50	ug/L	1
1,2-Dichloroethane	107-06-2	8260D	ND		0.50	ug/L	1
1,1-Dichloroethene	75-35-4	8260D	ND		0.50	ug/L	1
cis-1,2-Dichloroethene	156-59-2	8260D	ND		0.50	ug/L	1
trans-1,2-Dichloroethene	156-60-5	8260D	ND		0.50	ug/L	1
1,2-Dichloropropane	78-87-5	8260D	ND		0.50	ug/L	1
cis-1,3-Dichloropropene	10061-01-5	8260D	ND		0.50	ug/L	1
trans-1,3-Dichloropropene	10061-02-6	8260D	ND		0.50	ug/L	1
Ethylbenzene	100-41-4	8260D	ND		0.50	ug/L	1
2-Hexanone	591-78-6	8260D	ND		10	ug/L	1
Isopropylbenzene	98-82-8	8260D	ND		0.50	ug/L	1
Methyl acetate	79-20-9	8260D	ND		1.0	ug/L	1
Methyl tertiary butyl ether (MTBE)	1634-04-4	8260D	ND		0.50	ug/L	1
4-Methyl-2-pentanone	108-10-1	8260D	ND		10	ug/L	1
Methylcyclohexane	108-87-2	8260D	ND		5.0	ug/L	1
Methylene chloride	75-09-2	8260D	ND		0.50	ug/L	1
Styrene	100-42-5	8260D	ND		0.50	ug/L	1
1,1,2,2-Tetrachloroethane	79-34-5	8260D	ND		0.50	ug/L	1
Tetrachloroethene	127-18-4	8260D	ND		0.50	ug/L	1
Toluene	108-88-3	8260D	ND		0.50	ug/L	1
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260D	ND		1.0	ug/L	1
1,2,4-Trichlorobenzene	120-82-1	8260D	ND		0.50	ug/L	1
1,1,1-Trichloroethane	71-55-6	8260D	ND		0.50	ug/L	1
1,1,2-Trichloroethane	79-00-5	8260D	ND		0.50	ug/L	1

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-002</b>
Description: <b>MW15</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1500</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0302	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Trichloroethene	79-01-6	8260D	1.6		0.50	ug/L	1
Trichlorofluoromethane	75-69-4	8260D	ND		0.50	ug/L	1
Vinyl chloride	75-01-4	8260D	ND		0.50	ug/L	1
Xylenes (total)	1330-20-7	8260D	ND		1.0	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Bromofluorobenzene		106	70-130
1,2-Dichloroethane-d4		94	70-130
Toluene-d8		100	70-130

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-003</b>
Description: <b>MW15Dup</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1505</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0325	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Acetone	67-64-1	8260D	ND		10	ug/L	1
Benzene	71-43-2	8260D	ND		0.50	ug/L	1
Bromodichloromethane	75-27-4	8260D	ND		0.50	ug/L	1
Bromoform	75-25-2	8260D	ND		0.50	ug/L	1
Bromomethane (Methyl bromide)	74-83-9	8260D	ND L		0.50	ug/L	1
2-Butanone (MEK)	78-93-3	8260D	ND L		10	ug/L	1
Carbon disulfide	75-15-0	8260D	ND		0.50	ug/L	1
Carbon tetrachloride	56-23-5	8260D	ND		0.50	ug/L	1
Chlorobenzene	108-90-7	8260D	ND		0.50	ug/L	1
Chloroethane	75-00-3	8260D	ND		0.50	ug/L	1
Chloroform	67-66-3	8260D	ND		0.50	ug/L	1
Chloromethane (Methyl chloride)	74-87-3	8260D	ND		0.50	ug/L	1
Cyclohexane	110-82-7	8260D	ND		0.50	ug/L	1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260D	ND		0.50	ug/L	1
Dibromochloromethane	124-48-1	8260D	ND		0.50	ug/L	1
1,2-Dibromoethane (EDB)	106-93-4	8260D	ND		0.50	ug/L	1
1,2-Dichlorobenzene	95-50-1	8260D	ND		0.50	ug/L	1
1,3-Dichlorobenzene	541-73-1	8260D	ND		0.50	ug/L	1
1,4-Dichlorobenzene	106-46-7	8260D	ND		0.50	ug/L	1
Dichlorodifluoromethane	75-71-8	8260D	ND L		0.50	ug/L	1
1,1-Dichloroethane	75-34-3	8260D	ND		0.50	ug/L	1
1,2-Dichloroethane	107-06-2	8260D	ND		0.50	ug/L	1
1,1-Dichloroethene	75-35-4	8260D	ND		0.50	ug/L	1
cis-1,2-Dichloroethene	156-59-2	8260D	ND		0.50	ug/L	1
trans-1,2-Dichloroethene	156-60-5	8260D	ND		0.50	ug/L	1
1,2-Dichloropropane	78-87-5	8260D	ND		0.50	ug/L	1
cis-1,3-Dichloropropene	10061-01-5	8260D	ND		0.50	ug/L	1
trans-1,3-Dichloropropene	10061-02-6	8260D	ND		0.50	ug/L	1
Ethylbenzene	100-41-4	8260D	ND		0.50	ug/L	1
2-Hexanone	591-78-6	8260D	ND		10	ug/L	1
Isopropylbenzene	98-82-8	8260D	ND		0.50	ug/L	1
Methyl acetate	79-20-9	8260D	ND		1.0	ug/L	1
Methyl tertiary butyl ether (MTBE)	1634-04-4	8260D	ND		0.50	ug/L	1
4-Methyl-2-pentanone	108-10-1	8260D	ND		10	ug/L	1
Methylcyclohexane	108-87-2	8260D	ND		5.0	ug/L	1
Methylene chloride	75-09-2	8260D	ND		0.50	ug/L	1
Styrene	100-42-5	8260D	ND		0.50	ug/L	1
1,1,2,2-Tetrachloroethane	79-34-5	8260D	ND		0.50	ug/L	1
Tetrachloroethene	127-18-4	8260D	ND		0.50	ug/L	1
Toluene	108-88-3	8260D	ND		0.50	ug/L	1
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260D	ND		1.0	ug/L	1
1,2,4-Trichlorobenzene	120-82-1	8260D	ND		0.50	ug/L	1
1,1,1-Trichloroethane	71-55-6	8260D	ND		0.50	ug/L	1
1,1,2-Trichloroethane	79-00-5	8260D	ND		0.50	ug/L	1

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-003</b>
Description: <b>MW15Dup</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1505</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0325	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Trichloroethene	79-01-6	8260D	1.4		0.50	ug/L	1
Trichlorofluoromethane	75-69-4	8260D	ND		0.50	ug/L	1
Vinyl chloride	75-01-4	8260D	ND		0.50	ug/L	1
Xylenes (total)	1330-20-7	8260D	ND		1.0	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Bromofluorobenzene		101	70-130
1,2-Dichloroethane-d4		96	70-130
Toluene-d8		98	70-130

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-004</b>
Description: <b>MW26</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1622</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0347	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Acetone	67-64-1	8260D	ND		10	ug/L	1
Benzene	71-43-2	8260D	ND		0.50	ug/L	1
Bromodichloromethane	75-27-4	8260D	ND		0.50	ug/L	1
Bromoform	75-25-2	8260D	ND		0.50	ug/L	1
Bromomethane (Methyl bromide)	74-83-9	8260D	ND L		0.50	ug/L	1
2-Butanone (MEK)	78-93-3	8260D	ND L		10	ug/L	1
Carbon disulfide	75-15-0	8260D	ND		0.50	ug/L	1
Carbon tetrachloride	56-23-5	8260D	ND		0.50	ug/L	1
Chlorobenzene	108-90-7	8260D	ND		0.50	ug/L	1
Chloroethane	75-00-3	8260D	ND		0.50	ug/L	1
<b>Chloroform</b>	<b>67-66-3</b>	<b>8260D</b>	<b>0.51</b>		<b>0.50</b>	<b>ug/L</b>	<b>1</b>
Chloromethane (Methyl chloride)	74-87-3	8260D	ND		0.50	ug/L	1
Cyclohexane	110-82-7	8260D	ND		0.50	ug/L	1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260D	ND		0.50	ug/L	1
Dibromochloromethane	124-48-1	8260D	ND		0.50	ug/L	1
1,2-Dibromoethane (EDB)	106-93-4	8260D	ND		0.50	ug/L	1
1,2-Dichlorobenzene	95-50-1	8260D	ND		0.50	ug/L	1
1,3-Dichlorobenzene	541-73-1	8260D	ND		0.50	ug/L	1
1,4-Dichlorobenzene	106-46-7	8260D	ND		0.50	ug/L	1
Dichlorodifluoromethane	75-71-8	8260D	ND L		0.50	ug/L	1
1,1-Dichloroethane	75-34-3	8260D	ND		0.50	ug/L	1
1,2-Dichloroethane	107-06-2	8260D	ND		0.50	ug/L	1
1,1-Dichloroethene	75-35-4	8260D	ND		0.50	ug/L	1
cis-1,2-Dichloroethene	156-59-2	8260D	ND		0.50	ug/L	1
trans-1,2-Dichloroethene	156-60-5	8260D	ND		0.50	ug/L	1
1,2-Dichloropropane	78-87-5	8260D	ND		0.50	ug/L	1
cis-1,3-Dichloropropene	10061-01-5	8260D	ND		0.50	ug/L	1
trans-1,3-Dichloropropene	10061-02-6	8260D	ND		0.50	ug/L	1
Ethylbenzene	100-41-4	8260D	ND		0.50	ug/L	1
2-Hexanone	591-78-6	8260D	ND		10	ug/L	1
Isopropylbenzene	98-82-8	8260D	ND		0.50	ug/L	1
Methyl acetate	79-20-9	8260D	ND		1.0	ug/L	1
Methyl tertiary butyl ether (MTBE)	1634-04-4	8260D	ND		0.50	ug/L	1
4-Methyl-2-pentanone	108-10-1	8260D	ND		10	ug/L	1
Methylcyclohexane	108-87-2	8260D	ND		5.0	ug/L	1
Methylene chloride	75-09-2	8260D	ND		0.50	ug/L	1
Styrene	100-42-5	8260D	ND		0.50	ug/L	1
1,1,2,2-Tetrachloroethane	79-34-5	8260D	ND		0.50	ug/L	1
Tetrachloroethene	127-18-4	8260D	ND		0.50	ug/L	1
Toluene	108-88-3	8260D	ND		0.50	ug/L	1
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260D	ND		1.0	ug/L	1
1,2,4-Trichlorobenzene	120-82-1	8260D	ND		0.50	ug/L	1
1,1,1-Trichloroethane	71-55-6	8260D	ND		0.50	ug/L	1
1,1,2-Trichloroethane	79-00-5	8260D	ND		0.50	ug/L	1

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-004</b>
Description: <b>MW26</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1622</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/06/2023 0347	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Trichloroethene	79-01-6	8260D	ND		0.50	ug/L	1
Trichlorofluoromethane	75-69-4	8260D	ND		0.50	ug/L	1
Vinyl chloride	75-01-4	8260D	ND		0.50	ug/L	1
Xylenes (total)	1330-20-7	8260D	ND		1.0	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Bromofluorobenzene		103	70-130
1,2-Dichloroethane-d4		94	70-130
Toluene-d8		99	70-130

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-005</b>
Description: <b>Trip Blank</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1630</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/05/2023 2335	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Acetone	67-64-1	8260D	ND		10	ug/L	1
Benzene	71-43-2	8260D	ND		0.50	ug/L	1
Bromodichloromethane	75-27-4	8260D	ND		0.50	ug/L	1
Bromoform	75-25-2	8260D	ND		0.50	ug/L	1
Bromomethane (Methyl bromide)	74-83-9	8260D	ND L		0.50	ug/L	1
2-Butanone (MEK)	78-93-3	8260D	ND L		10	ug/L	1
Carbon disulfide	75-15-0	8260D	ND		0.50	ug/L	1
Carbon tetrachloride	56-23-5	8260D	ND		0.50	ug/L	1
Chlorobenzene	108-90-7	8260D	ND		0.50	ug/L	1
Chloroethane	75-00-3	8260D	ND		0.50	ug/L	1
Chloroform	67-66-3	8260D	ND		0.50	ug/L	1
Chloromethane (Methyl chloride)	74-87-3	8260D	ND		0.50	ug/L	1
Cyclohexane	110-82-7	8260D	ND		0.50	ug/L	1
1,2-Dibromo-3-chloropropane (DBCP)	96-12-8	8260D	ND		0.50	ug/L	1
Dibromochloromethane	124-48-1	8260D	ND		0.50	ug/L	1
1,2-Dibromoethane (EDB)	106-93-4	8260D	ND		0.50	ug/L	1
1,2-Dichlorobenzene	95-50-1	8260D	ND		0.50	ug/L	1
1,3-Dichlorobenzene	541-73-1	8260D	ND		0.50	ug/L	1
1,4-Dichlorobenzene	106-46-7	8260D	ND		0.50	ug/L	1
Dichlorodifluoromethane	75-71-8	8260D	ND L		0.50	ug/L	1
1,1-Dichloroethane	75-34-3	8260D	ND		0.50	ug/L	1
1,2-Dichloroethane	107-06-2	8260D	ND		0.50	ug/L	1
1,1-Dichloroethene	75-35-4	8260D	ND		0.50	ug/L	1
cis-1,2-Dichloroethene	156-59-2	8260D	ND		0.50	ug/L	1
trans-1,2-Dichloroethene	156-60-5	8260D	ND		0.50	ug/L	1
1,2-Dichloropropane	78-87-5	8260D	ND		0.50	ug/L	1
cis-1,3-Dichloropropene	10061-01-5	8260D	ND		0.50	ug/L	1
trans-1,3-Dichloropropene	10061-02-6	8260D	ND		0.50	ug/L	1
Ethylbenzene	100-41-4	8260D	ND		0.50	ug/L	1
2-Hexanone	591-78-6	8260D	ND		10	ug/L	1
Isopropylbenzene	98-82-8	8260D	ND		0.50	ug/L	1
Methyl acetate	79-20-9	8260D	ND		1.0	ug/L	1
Methyl tertiary butyl ether (MTBE)	1634-04-4	8260D	ND		0.50	ug/L	1
4-Methyl-2-pentanone	108-10-1	8260D	ND		10	ug/L	1
Methylcyclohexane	108-87-2	8260D	ND		5.0	ug/L	1
Methylene chloride	75-09-2	8260D	ND		0.50	ug/L	1
Styrene	100-42-5	8260D	ND		0.50	ug/L	1
1,1,2,2-Tetrachloroethane	79-34-5	8260D	ND		0.50	ug/L	1
Tetrachloroethene	127-18-4	8260D	ND		0.50	ug/L	1
Toluene	108-88-3	8260D	ND		0.50	ug/L	1
1,1,2-Trichloro-1,2,2-Trifluoroethane	76-13-1	8260D	ND		1.0	ug/L	1
1,2,4-Trichlorobenzene	120-82-1	8260D	ND		0.50	ug/L	1
1,1,1-Trichloroethane	71-55-6	8260D	ND		0.50	ug/L	1
1,1,2-Trichloroethane	79-00-5	8260D	ND		0.50	ug/L	1

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## Volatile Organic Compounds by GC/MS

Client: <b>DEQ DWM</b>	Laboratory ID: <b>YE25003-005</b>
Description: <b>Trip Blank</b>	Matrix: <b>Aqueous</b>
Date Sampled: <b>05/23/2023 1630</b>	Project Name: <b>Davis Park Road</b>
Date Received: <b>05/25/2023</b>	Project Number: <b>NCD 986 175 644</b>

Run	Prep Method	Analytical Method	Dilution	Analysis Date	Analyst	Prep Date	Batch
1	5030B	8260D	1	06/05/2023 2335	CDA		76936

Parameter	CAS Number	Analytical Method	Result	Q	LOQ	Units	Run
Trichloroethene	79-01-6	8260D	ND		0.50	ug/L	1
Trichlorofluoromethane	75-69-4	8260D	ND		0.50	ug/L	1
Vinyl chloride	75-01-4	8260D	ND		0.50	ug/L	1
Xylenes (total)	1330-20-7	8260D	ND		1.0	ug/L	1

Surrogate	Q	Run 1 % Recovery	Acceptance Limits
Bromofluorobenzene		100	70-130
1,2-Dichloroethane-d4		95	70-130
Toluene-d8		96	70-130

LOQ = Limit of Quantitation      B = Detected in the method blank      E = Quantitation of compound exceeded the calibration range      Q = Surrogate failure  
 ND = Not detected at or above the LOQ      N = Recovery is out of criteria      P = The RPD between two GC columns exceeds 40%      L = LCS/LCSD failure  
 H = Out of holding time      W = Reported on wet weight basis      S = MS/MSD failure

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## QC Summary

## Volatile Organic Compounds by GC/MS - MB

Sample ID: YQ76936-001	Matrix: Aqueous
Batch: 76936	Prep Method: 5030B
Analytical Method: 8260D	

Parameter	Result	Q	Dil	LOQ	Units	Analysis Date
Acetone	ND		1	10	ug/L	06/05/2023 2144
Benzene	ND		1	0.50	ug/L	06/05/2023 2144
Bromodichloromethane	ND		1	0.50	ug/L	06/05/2023 2144
Bromoform	ND		1	0.50	ug/L	06/05/2023 2144
Bromomethane (Methyl bromide)	ND		1	0.50	ug/L	06/05/2023 2144
2-Butanone (MEK)	ND		1	10	ug/L	06/05/2023 2144
Carbon disulfide	ND		1	0.50	ug/L	06/05/2023 2144
Carbon tetrachloride	ND		1	0.50	ug/L	06/05/2023 2144
Chlorobenzene	ND		1	0.50	ug/L	06/05/2023 2144
Chloroethane	ND		1	0.50	ug/L	06/05/2023 2144
Chloroform	ND		1	0.50	ug/L	06/05/2023 2144
Chloromethane (Methyl chloride)	ND		1	0.50	ug/L	06/05/2023 2144
Cyclohexane	ND		1	0.50	ug/L	06/05/2023 2144
1,2-Dibromo-3-chloropropane (DBCP)	ND		1	0.50	ug/L	06/05/2023 2144
Dibromochloromethane	ND		1	0.50	ug/L	06/05/2023 2144
1,2-Dibromoethane (EDB)	ND		1	0.50	ug/L	06/05/2023 2144
1,2-Dichlorobenzene	ND		1	0.50	ug/L	06/05/2023 2144
1,3-Dichlorobenzene	ND		1	0.50	ug/L	06/05/2023 2144
1,4-Dichlorobenzene	ND		1	0.50	ug/L	06/05/2023 2144
Dichlorodifluoromethane	ND		1	0.50	ug/L	06/05/2023 2144
1,1-Dichloroethane	ND		1	0.50	ug/L	06/05/2023 2144
1,2-Dichloroethane	ND		1	0.50	ug/L	06/05/2023 2144
1,1-Dichloroethene	ND		1	0.50	ug/L	06/05/2023 2144
cis-1,2-Dichloroethene	ND		1	0.50	ug/L	06/05/2023 2144
trans-1,2-Dichloroethene	ND		1	0.50	ug/L	06/05/2023 2144
1,2-Dichloropropane	ND		1	0.50	ug/L	06/05/2023 2144
cis-1,3-Dichloropropene	ND		1	0.50	ug/L	06/05/2023 2144
trans-1,3-Dichloropropene	ND		1	0.50	ug/L	06/05/2023 2144
Ethylbenzene	ND		1	0.50	ug/L	06/05/2023 2144
2-Hexanone	ND		1	10	ug/L	06/05/2023 2144
Isopropylbenzene	ND		1	0.50	ug/L	06/05/2023 2144
Methyl acetate	ND		1	1.0	ug/L	06/05/2023 2144
Methyl tertiary butyl ether (MTBE)	ND		1	0.50	ug/L	06/05/2023 2144
4-Methyl-2-pentanone	ND		1	10	ug/L	06/05/2023 2144
Methylcyclohexane	ND		1	5.0	ug/L	06/05/2023 2144
Methylene chloride	ND		1	0.50	ug/L	06/05/2023 2144
Styrene	ND		1	0.50	ug/L	06/05/2023 2144
1,1,2,2-Tetrachloroethane	ND		1	0.50	ug/L	06/05/2023 2144
Tetrachloroethene	ND		1	0.50	ug/L	06/05/2023 2144
Toluene	ND		1	0.50	ug/L	06/05/2023 2144
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND		1	1.0	ug/L	06/05/2023 2144
1,2,4-Trichlorobenzene	ND		1	0.50	ug/L	06/05/2023 2144
1,1,1-Trichloroethane	ND		1	0.50	ug/L	06/05/2023 2144
1,1,2-Trichloroethane	ND		1	0.50	ug/L	06/05/2023 2144

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

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## Volatile Organic Compounds by GC/MS - MB

Sample ID: YQ76936-001

Matrix: Aqueous

Batch: 76936

Prep Method: 5030B

Analytical Method: 8260D

Parameter	Result	Q	Dil	LOQ	Units	Analysis Date
Trichloroethene	ND		1	0.50	ug/L	06/05/2023 2144
Trichlorofluoromethane	ND		1	0.50	ug/L	06/05/2023 2144
Vinyl chloride	ND		1	0.50	ug/L	06/05/2023 2144
Xylenes (total)	ND		1	1.0	ug/L	06/05/2023 2144
Surrogate	Q	% Rec	Acceptance Limit			
Bromofluorobenzene		102	70-130			
1,2-Dichloroethane-d4		94	70-130			
Toluene-d8		98	70-130			

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

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## Volatile Organic Compounds by GC/MS - LCS

Sample ID: YQ76936-002	Matrix: Aqueous
Batch: 76936	Prep Method: 5030B
Analytical Method: 8260D	

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Acetone	100	120		1	122	60-140	06/05/2023 1945
Benzene	50	54		1	108	70-130	06/05/2023 1945
Bromodichloromethane	50	48		1	96	70-130	06/05/2023 1945
Bromoform	50	40		1	80	70-130	06/05/2023 1945
Bromomethane (Methyl bromide)	50	77	N	1	154	70-130	06/05/2023 1945
2-Butanone (MEK)	100	130	N	1	134	70-130	06/05/2023 1945
Carbon disulfide	50	58		1	117	70-130	06/05/2023 1945
Carbon tetrachloride	50	47		1	93	70-130	06/05/2023 1945
Chlorobenzene	50	50		1	100	70-130	06/05/2023 1945
Chloroethane	50	65		1	129	70-130	06/05/2023 1945
Chloroform	50	53		1	106	70-130	06/05/2023 1945
Chloromethane (Methyl chloride)	50	67		1	133	60-140	06/05/2023 1945
Cyclohexane	50	44		1	89	70-130	06/05/2023 1945
1,2-Dibromo-3-chloropropane (DBCP)	50	54		1	108	70-130	06/05/2023 1945
Dibromochloromethane	50	45		1	91	70-130	06/05/2023 1945
1,2-Dibromoethane (EDB)	50	50		1	101	70-130	06/05/2023 1945
1,2-Dichlorobenzene	50	49		1	99	70-130	06/05/2023 1945
1,3-Dichlorobenzene	50	49		1	99	70-130	06/05/2023 1945
1,4-Dichlorobenzene	50	52		1	104	70-130	06/05/2023 1945
Dichlorodifluoromethane	50	89	N	1	178	60-140	06/05/2023 1945
1,1-Dichloroethane	50	56		1	112	70-130	06/05/2023 1945
1,2-Dichloroethane	50	51		1	103	70-130	06/05/2023 1945
1,1-Dichloroethene	50	56		1	112	70-130	06/05/2023 1945
cis-1,2-Dichloroethene	50	55		1	109	70-130	06/05/2023 1945
trans-1,2-Dichloroethene	50	53		1	106	70-130	06/05/2023 1945
1,2-Dichloropropane	50	52		1	104	70-130	06/05/2023 1945
cis-1,3-Dichloropropene	50	52		1	104	70-130	06/05/2023 1945
trans-1,3-Dichloropropene	50	50		1	101	70-130	06/05/2023 1945
Ethylbenzene	50	51		1	101	70-130	06/05/2023 1945
2-Hexanone	100	100		1	102	70-130	06/05/2023 1945
Isopropylbenzene	50	52		1	104	70-130	06/05/2023 1945
Methyl acetate	50	56		1	111	70-130	06/05/2023 1945
Methyl tertiary butyl ether (MTBE)	50	51		1	102	70-130	06/05/2023 1945
4-Methyl-2-pentanone	100	90		1	90	70-130	06/05/2023 1945
Methylcyclohexane	50	54		1	108	70-130	06/05/2023 1945
Methylene chloride	50	61		1	122	70-130	06/05/2023 1945
Styrene	50	53		1	105	70-130	06/05/2023 1945
1,1,2,2-Tetrachloroethane	50	53		1	106	70-130	06/05/2023 1945
Tetrachloroethene	50	49		1	98	70-130	06/05/2023 1945
Toluene	50	50		1	99	70-130	06/05/2023 1945
1,1,2-Trichloro-1,2,2-Trifluoroethane	50	59		1	118	70-130	06/05/2023 1945
1,2,4-Trichlorobenzene	50	59		1	118	70-130	06/05/2023 1945
1,1,1-Trichloroethane	50	50		1	100	70-130	06/05/2023 1945
1,1,2-Trichloroethane	50	50		1	99	70-130	06/05/2023 1945

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

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## Volatile Organic Compounds by GC/MS - LCS

Sample ID: YQ76936-002	Matrix: Aqueous
Batch: 76936	Prep Method: 5030B
Analytical Method: 8260D	

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Trichloroethene	50	49		1	98	70-130	06/05/2023 1945
Trichlorofluoromethane	50	63		1	126	70-130	06/05/2023 1945
Vinyl chloride	50	60		1	120	70-130	06/05/2023 1945
Xylenes (total)	100	99		1	99	70-130	06/05/2023 1945
Surrogate	Q	% Rec			Acceptance Limit		
Bromofluorobenzene		97			70-130		
1,2-Dichloroethane-d4		99			70-130		
Toluene-d8		100			70-130		

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

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## Volatile Organic Compounds by GC/MS - MB

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Sample ID: YQ77856-001	Matrix: Aqueous
Batch: 77856	Prep Method: 5030B
Analytical Method: 8260D	

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Parameter	Result	Q	Dil	LOQ	Units	Analysis Date
Acetone	ND		1	10	ug/L	06/16/2023 1200
Surrogate	Q	% Rec	Acceptance Limit			
Bromofluorobenzene	101		70-130			
1,2-Dichloroethane-d4	105		70-130			
Toluene-d8	103		70-130			

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LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**

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## Volatile Organic Compounds by GC/MS - LCS

Sample ID: YQ77856-002	Matrix: Aqueous
Batch: 77856	Prep Method: 5030B
Analytical Method: 8260D	

Parameter	Spike Amount (ug/L)	Result (ug/L)	Q	Dil	% Rec	% Rec Limit	Analysis Date
Acetone	100	92		1	92	60-140	06/16/2023 0938
Surrogate	Q	% Rec	Acceptance Limit				
Bromofluorobenzene		95	70-130				
1,2-Dichloroethane-d4		96	70-130				
Toluene-d8		101	70-130				

LOQ = Limit of Quantitation

ND = Not detected at or above the LOQ

N = Recovery is out of criteria

P = The RPD between two GC columns exceeds 40%

\* = RSD is out of criteria

+ = RPD is out of criteria

**Note: Calculations are performed before rounding to avoid round-off errors in calculated results**


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**Chain of Custody  
and  
Miscellaneous Documents**

Client: NC DWM Superfund  
 217 West Jones St, Raleigh, NC 27603  
 Report to: Stuart F Parker  
 (919) 707-8377 / stuart.parker@ncdeq.gov

CHAIN OF CUSTODY RECORD  
 Site #: DPR  
 Project No. NCD 986 176 644  
 Davis Park Road TCE

No: 05/24/23-0001  
 Lab: Pace South Carolina  
 106 Vantage Point Dr, West Columbia SC  
 Lab Phone (803) 791-9700

Lab #	Location	Sample ID	Media	Sample Time	Sampler	Analyses	Numb Cont	Container	Preservati ve	Collected	Lab QC
	MW09	MW09	Groundwater	14:30	Stuart F Parker	(VOA) Volatile Organics	3	40 mL glass w/separator	HCl pH <2	5/23/2023	N
	MW15	MW15	Groundwater	15:00	Stuart F Parker	(VOA) Volatile Organics	3	40 mL glass w/separator	HCl pH <2	5/23/2023	N
	MW15	MW15Dup	Groundwater	15:05	Stuart F Parker	(VOA) Volatile Organics	3	40 mL glass w/separator	HCl pH <2	5/23/2023	Y
	MW26	MW26	Groundwater	16:22	Stuart F Parker	(VOA) Volatile Organics	3	40 mL glass w/separator	HCl pH <2	5/23/2023	N
	#R4DART#	Trip Blank	Trip Blank Water	16:30	Stuart F Parker	(VOA) Volatile Organics	3	40 mL glass w/separator	HCl pH <2	5/23/2023	Y
 YE25003 030											

*1 vial rec'd w/separator*

Special Instructions: \_\_\_\_\_

SAMPLES TRANSFERRED FROM  
CHAIN OF CUSTODY # \_\_\_\_\_

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
	<i>Stuart Parker NCDEQ</i>	<i>5/24/23 18:00</i>			
			<i>Theresa N Roberts/PAAS</i>	<i>5/25/23 10:10</i>	<i>See above</i>

*T=4,100*

*See above*

PACE ANALYTICAL SERVICES, LLC

Pace Analytical Services, LLC (formerly Shealy Environmental Services, Inc.)  
 106 Vantage Point Drive, West Columbia, SC 29172 (803) 791-9700 Fax (803) 791-9111 www.pacedlabs.com

# PACE ANALYTICAL SERVICES, LLC

DCR Title: ENV-FRM-WCOL-0286 v02\_Samples Receipt Checklist (SRC)  
 Effective Date: 8/7/2022

## Sample Receipt Checklist (SRC)

Client: NCDWM Cooler Inspected by/date: KNR / 05/25/2023 Lot #: YE25003

Means of receipt: <input type="checkbox"/> Preced <input type="checkbox"/> Client <input type="checkbox"/> UPS <input checked="" type="checkbox"/> FedEx <input type="checkbox"/> Other: _____	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	1. Were custody seals present on the cooler?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	2. If custody seals were present, were they intact and unbroken?
pH Strip ID: NA Chlorine Strip ID: NA Tested by: NA	
Original temperature upon receipt / Derived (Corrected) temperature upon receipt: %Solid Snap-Cup ID: NA	
4.2 / 12 °C NA / NA °C NA / NA °C NA / NA °C	
Method: <input checked="" type="checkbox"/> Temperature Blank <input type="checkbox"/> Against Bottles IR Gun ID: 8 IR Gun Correction Factor: 0 °C	
Method of coolant: <input checked="" type="checkbox"/> Wet Ice <input type="checkbox"/> Ice Packs <input type="checkbox"/> Dry Ice <input type="checkbox"/> None	
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	3. Were all coolers received at or below 6.0°C? If no, was Project Manager notified? PM was Notified by: phone / email / face-to-face (circle one).
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA	4. Is the commercial courier's packing slip attached to this form?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	5. Were proper custody procedures (relinquished/received) followed?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	6. Were sample IDs listed on the COC and all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7. Was collection date & time listed on the COC and all sample containers?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	8. Did all container label information (ID, date, time) agree with the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9. Were tests to be performed listed on the COC?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	10. Did all samples arrive in the proper containers for each test and/or in good condition (unbroken, lids on, etc.)?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	11. Was adequate sample volume available?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	12. Were all samples received within 1/2 the holding time or 48 hours, whichever comes first?
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	13. Were all samples containers accounted for? (No missing/excess)
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA	14. Were VOA, SO15C and RSE-175 samples free of bubbles >"pea-size" (1/4" or 6mm in diameter) in any of the VOA vials?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	15. Were all DRO/metals/nutrient samples received at a pH of < 2?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	16. Were all cyanide samples received at a pH > 12 and sulfide samples received at a pH > 9?
<input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> NA	17. Were all applicable NH <sub>3</sub> /TKN/cyanide/phenol/625.14608.3 (< 0.5mg/L) samples free of residual chlorine?
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> NA	18. Was the quote number listed on the container label? If yes, Quote # _____
<b>Sample Preservation</b> (Must be completed for any sample(s) incorrectly preserved or with headspace.)	
Sample(s) NA were received incorrectly preserved and were adjusted accordingly in sample receiving with NA mL of circle one: H2SO4, HNO3, HCl, NaOH using SR # NA.	
Time of preservation NA. If more than one preservative is needed, please note in the comments below.	
Sample(s) 00500 were received with bubbles >6 mm in diameter.	
Sample(s) NA were received with TRC > 0.5 mg/L (If #19 is no) and were adjusted accordingly in sample receiving with sodium thiosulfate (Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> ) with Unique ID: NA.	
Comments:	

Qualtrax ID: 56360

Pace Analytical Services, LLC

Page 1 of 1

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

# ANALYTICAL REPORT

## PREPARED FOR

Attn: Stuart Parker  
North Carolina Dept of Env Quality  
NCDEQ-DWM-Superfund Section  
1646 Mail Service Center  
Raleigh, North Carolina 27699

Generated 2/24/2025 10:50:46 AM

## JOB DESCRIPTION

Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

## JOB NUMBER

752-29563-1

# Eurofins Raleigh

## Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing Southeast, LLC Project Manager.

## Authorization



Authorized for release by  
Nikita Kuruganty, Project Manager  
[Nikita.Kuruganty@et.eurofinsus.com](mailto:Nikita.Kuruganty@et.eurofinsus.com)  
(912)354-7858

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- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15



# Table of Contents

Cover Page . . . . .	1
Table of Contents . . . . .	3
Definitions/Glossary . . . . .	4
Case Narrative . . . . .	5
Detection Summary . . . . .	6
Client Sample Results . . . . .	7
Surrogate Summary . . . . .	17
QC Sample Results . . . . .	18
QC Association Summary . . . . .	26
Lab Chronicle . . . . .	27
Certification Summary . . . . .	28
Method Summary . . . . .	29
Sample Summary . . . . .	30
Chain of Custody . . . . .	31
Receipt Checklists . . . . .	33

## Definitions/Glossary

Client: North Carolina Dept of Env Quality  
Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
TCE)

Job ID: 752-29563-1

### Qualifiers

#### GC/MS VOA

Qualifier	Qualifier Description
*+	LCS and/or LCSD is outside acceptance limits, high biased.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

### Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

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## Case Narrative

Client: North Carolina Dept of Env Quality  
Project: Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

Job ID: 752-29563-1

**Job ID: 752-29563-1**

**Eurofins Raleigh**

### Job Narrative 752-29563-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers and/or narrative comments are included to explain any exceptions, if applicable.

- Matrix QC may not be reported if insufficient sample is provided or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method.
- Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

#### Receipt

The samples were received on 2/14/2025 3:17 PM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 4.8°C.

#### GC/MS VOA

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.



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## Detection Summary

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

**Client Sample ID: DPR-TB-2025**

**Lab Sample ID: 752-29563-1**

Analyte	Result	Qualifier	RL	MDL	Unit	Dil	Fac	D	Method	Prep Type
Acetone	12.7		10.0	3.70	ug/L	1			8260D	Total/NA

**Client Sample ID: MW-02-2025**

**Lab Sample ID: 752-29563-2**

Analyte	Result	Qualifier	RL	MDL	Unit	Dil	Fac	D	Method	Prep Type
Tetrachloroethene	0.897	J	1.00	0.350	ug/L	1			8260D	Total/NA
Trichloroethene	0.968	J	1.00	0.200	ug/L	1			8260D	Total/NA

**Client Sample ID: MW-15-2025**

**Lab Sample ID: 752-29563-3**

Analyte	Result	Qualifier	RL	MDL	Unit	Dil	Fac	D	Method	Prep Type
Acetone	12.5		10.0	3.70	ug/L	1			8260D	Total/NA
Trichloroethene	0.702	J	1.00	0.200	ug/L	1			8260D	Total/NA

**Client Sample ID: MW-15Dup-2025**

**Lab Sample ID: 752-29563-4**

Analyte	Result	Qualifier	RL	MDL	Unit	Dil	Fac	D	Method	Prep Type
Acetone	13.8		10.0	3.70	ug/L	1			8260D	Total/NA
Trichloroethene	0.719	J	1.00	0.200	ug/L	1			8260D	Total/NA

**Client Sample ID: MW-26-2025**

**Lab Sample ID: 752-29563-5**

Analyte	Result	Qualifier	RL	MDL	Unit	Dil	Fac	D	Method	Prep Type
Chloroform	0.274	J	1.00	0.270	ug/L	1			8260D	Total/NA

This Detection Summary does not include radiochemical test results.

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: DPR-TB-2025**

**Lab Sample ID: 752-29563-1**

**Date Collected: 02/13/25 12:00**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	12.7		10.0	3.70	ug/L			02/21/25 13:08	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 13:44	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 13:44	1
Bromofom	ND		1.00	0.590	ug/L			02/20/25 13:44	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 13:44	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 13:44	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 13:44	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 13:44	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 13:44	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 13:44	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 13:44	1
Chloroform	ND		1.00	0.270	ug/L			02/20/25 13:44	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 13:44	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 13:44	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 13:44	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 13:44	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 13:44	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 13:44	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 13:44	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 13:44	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 13:44	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 13:44	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 13:44	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 13:44	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/20/25 13:44	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 13:44	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 13:44	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 13:44	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 13:44	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 13:44	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 13:44	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 13:44	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 13:44	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 13:44	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 13:44	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 13:44	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 13:44	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 13:44	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/20/25 13:44	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 13:44	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 13:44	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 13:44	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 13:44	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 13:44	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 13:44	1
Trichloroethene	ND		1.00	0.200	ug/L			02/20/25 13:44	1
Trichlorofluoromethane	ND	*+	1.00	0.330	ug/L			02/20/25 13:44	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 13:44	1

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: DPR-TB-2025**

**Lab Sample ID: 752-29563-1**

**Date Collected: 02/13/25 12:00**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 13:44	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 13:44	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	102		70 - 130		02/20/25 13:44	1
4-Bromofluorobenzene (Surr)	103		70 - 130		02/21/25 13:08	1
Dibromofluoromethane (Surr)	105		70 - 130		02/20/25 13:44	1
Dibromofluoromethane (Surr)	108		70 - 130		02/21/25 13:08	1
1,2-Dichloroethane-d4 (Surr)	92		60 - 124		02/20/25 13:44	1
1,2-Dichloroethane-d4 (Surr)	96		60 - 124		02/21/25 13:08	1
Toluene-d8 (Surr)	97		70 - 130		02/20/25 13:44	1
Toluene-d8 (Surr)	104		70 - 130		02/21/25 13:08	1



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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-02-2025**

**Lab Sample ID: 752-29563-2**

**Date Collected: 02/13/25 14:13**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	ND		10.0	3.70	ug/L			02/20/25 14:07	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 14:07	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 14:07	1
Bromofom	ND		1.00	0.590	ug/L			02/20/25 14:07	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 14:07	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 14:07	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 14:07	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 14:07	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 14:07	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 14:07	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 14:07	1
Chloroform	ND		1.00	0.270	ug/L			02/20/25 14:07	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 14:07	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 14:07	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 14:07	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 14:07	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 14:07	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:07	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:07	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:07	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 14:07	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 14:07	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 14:07	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 14:07	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/20/25 14:07	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 14:07	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 14:07	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 14:07	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 14:07	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 14:07	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 14:07	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 14:07	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 14:07	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 14:07	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 14:07	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 14:07	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 14:07	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 14:07	1
<b>Tetrachloroethene</b>	<b>0.897</b>	<b>J</b>	1.00	0.350	ug/L			02/20/25 14:07	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 14:07	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 14:07	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 14:07	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 14:07	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 14:07	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 14:07	1
<b>Trichloroethene</b>	<b>0.968</b>	<b>J</b>	1.00	0.200	ug/L			02/20/25 14:07	1
Trichlorofluoromethane	ND	*+	1.00	0.330	ug/L			02/20/25 14:07	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 14:07	1

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-02-2025**

**Lab Sample ID: 752-29563-2**

**Date Collected: 02/13/25 14:13**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 14:07	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 14:07	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	107		70 - 130					02/20/25 14:07	1
Dibromofluoromethane (Surr)	105		70 - 130					02/20/25 14:07	1
1,2-Dichloroethane-d4 (Surr)	92		60 - 124					02/20/25 14:07	1
Toluene-d8 (Surr)	96		70 - 130					02/20/25 14:07	1



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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-15-2025**

**Lab Sample ID: 752-29563-3**

**Date Collected: 02/13/25 13:40**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	12.5		10.0	3.70	ug/L			02/20/25 14:29	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 14:29	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 14:29	1
Bromofom	ND		1.00	0.590	ug/L			02/20/25 14:29	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 14:29	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 14:29	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 14:29	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 14:29	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 14:29	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 14:29	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 14:29	1
Chloroform	ND		1.00	0.270	ug/L			02/20/25 14:29	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 14:29	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 14:29	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 14:29	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 14:29	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 14:29	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:29	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:29	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:29	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 14:29	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 14:29	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 14:29	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 14:29	1
1,2-Dichloropropene	ND		1.00	0.220	ug/L			02/20/25 14:29	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 14:29	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 14:29	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 14:29	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 14:29	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 14:29	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 14:29	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 14:29	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 14:29	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 14:29	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 14:29	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 14:29	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 14:29	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 14:29	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/20/25 14:29	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 14:29	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 14:29	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 14:29	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 14:29	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 14:29	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 14:29	1
Trichloroethene	0.702	J	1.00	0.200	ug/L			02/20/25 14:29	1
Trichlorofluoromethane	ND	*+	1.00	0.330	ug/L			02/20/25 14:29	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 14:29	1

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-15-2025**

**Lab Sample ID: 752-29563-3**

**Date Collected: 02/13/25 13:40**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 14:29	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 14:29	1

Surrogate	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	105		70 - 130		02/20/25 14:29	1
Dibromofluoromethane (Surr)	107		70 - 130		02/20/25 14:29	1
1,2-Dichloroethane-d4 (Surr)	94		60 - 124		02/20/25 14:29	1
Toluene-d8 (Surr)	97		70 - 130		02/20/25 14:29	1



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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-15Dup-2025**

**Lab Sample ID: 752-29563-4**

**Date Collected: 02/13/25 13:45**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	13.8		10.0	3.70	ug/L			02/20/25 14:52	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 14:52	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 14:52	1
Bromofom	ND		1.00	0.590	ug/L			02/20/25 14:52	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 14:52	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 14:52	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 14:52	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 14:52	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 14:52	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 14:52	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 14:52	1
Chloroform	ND		1.00	0.270	ug/L			02/20/25 14:52	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 14:52	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 14:52	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 14:52	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 14:52	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 14:52	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:52	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:52	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 14:52	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 14:52	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 14:52	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 14:52	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 14:52	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/20/25 14:52	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 14:52	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 14:52	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 14:52	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 14:52	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 14:52	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 14:52	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 14:52	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 14:52	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 14:52	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 14:52	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 14:52	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 14:52	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 14:52	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/20/25 14:52	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 14:52	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 14:52	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 14:52	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 14:52	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 14:52	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 14:52	1
Trichloroethene	0.719	J	1.00	0.200	ug/L			02/20/25 14:52	1
Trichlorofluoromethane	ND	*+	1.00	0.330	ug/L			02/20/25 14:52	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 14:52	1

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-15Dup-2025**

**Lab Sample ID: 752-29563-4**

**Date Collected: 02/13/25 13:45**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 14:52	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 14:52	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	106		70 - 130					02/20/25 14:52	1
Dibromofluoromethane (Surr)	107		70 - 130					02/20/25 14:52	1
1,2-Dichloroethane-d4 (Surr)	93		60 - 124					02/20/25 14:52	1
Toluene-d8 (Surr)	96		70 - 130					02/20/25 14:52	1



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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-26-2025**

**Lab Sample ID: 752-29563-5**

**Date Collected: 02/13/25 14:36**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Acetone	ND		10.0	3.70	ug/L			02/20/25 15:15	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 15:15	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 15:15	1
Bromofom	ND		1.00	0.590	ug/L			02/20/25 15:15	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 15:15	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 15:15	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 15:15	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 15:15	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 15:15	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 15:15	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 15:15	1
Chloroform	0.274	J	1.00	0.270	ug/L			02/20/25 15:15	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 15:15	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 15:15	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 15:15	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 15:15	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 15:15	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 15:15	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 15:15	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 15:15	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 15:15	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 15:15	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 15:15	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 15:15	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/20/25 15:15	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 15:15	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 15:15	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 15:15	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 15:15	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 15:15	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 15:15	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 15:15	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 15:15	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 15:15	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 15:15	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 15:15	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 15:15	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 15:15	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/20/25 15:15	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 15:15	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 15:15	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 15:15	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 15:15	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 15:15	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 15:15	1
Trichloroethene	ND		1.00	0.200	ug/L			02/20/25 15:15	1
Trichlorofluoromethane	ND	*+	1.00	0.330	ug/L			02/20/25 15:15	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 15:15	1

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## Client Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

**Client Sample ID: MW-26-2025**

**Lab Sample ID: 752-29563-5**

**Date Collected: 02/13/25 14:36**

**Matrix: Water**

**Date Received: 02/14/25 15:17**

**Method: SW846 8260D - Volatile Organic Compounds by GC/MS (Continued)**

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 15:15	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 15:15	1
<b>Surrogate</b>	<b>%Recovery</b>	<b>Qualifier</b>	<b>Limits</b>				<b>Prepared</b>	<b>Analyzed</b>	<b>Dil Fac</b>
4-Bromofluorobenzene (Surr)	105		70 - 130					02/20/25 15:15	1
Dibromofluoromethane (Surr)	107		70 - 130					02/20/25 15:15	1
1,2-Dichloroethane-d4 (Surr)	94		60 - 124					02/20/25 15:15	1
Toluene-d8 (Surr)	98		70 - 130					02/20/25 15:15	1



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## Surrogate Summary

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

Job ID: 752-29563-1

**Method: 8260D - Volatile Organic Compounds by GC/MS**

**Matrix: Water**

**Prep Type: Total/NA**

Lab Sample ID	Client Sample ID	Percent Surrogate Recovery (Acceptance Limits)			
		BFB (70-130)	DBFM (70-130)	DCA (60-124)	TOL (70-130)
752-29563-1	DPR-TB-2025	102	105	92	97
752-29563-1	DPR-TB-2025	103	108	96	104
752-29563-2	MW-02-2025	107	105	92	96
752-29563-3	MW-15-2025	105	107	94	97
752-29563-4	MW-15Dup-2025	106	107	93	96
752-29563-5	MW-26-2025	105	107	94	98
LCS 680-876433/5	Lab Control Sample	98	104	105	99
LCS 680-876567/5	Lab Control Sample	95	104	99	99
LCSD 680-876433/6	Lab Control Sample Dup	99	105	106	97
LCSD 680-876567/6	Lab Control Sample Dup	95	106	100	100
MB 680-876433/9	Method Blank	101	105	92	98
MB 680-876567/9	Method Blank	101	109	98	105

**Surrogate Legend**

BFB = 4-Bromofluorobenzene (Surr)  
 DBFM = Dibromofluoromethane (Surr)  
 DCA = 1,2-Dichloroethane-d4 (Surr)  
 TOL = Toluene-d8 (Surr)



## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1



### Method: 8260D - Volatile Organic Compounds by GC/MS

Lab Sample ID: MB 680-876433/9  
 Matrix: Water  
 Analysis Batch: 876433

Client Sample ID: Method Blank  
 Prep Type: Total/NA

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Acetone	ND		10.0	3.70	ug/L			02/20/25 12:55	1
Benzene	ND		1.00	0.270	ug/L			02/20/25 12:55	1
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/20/25 12:55	1
Bromoform	ND		1.00	0.590	ug/L			02/20/25 12:55	1
Bromomethane	ND		5.00	3.70	ug/L			02/20/25 12:55	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/20/25 12:55	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/20/25 12:55	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/20/25 12:55	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/20/25 12:55	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/20/25 12:55	1
Chloroethane	ND		5.00	4.60	ug/L			02/20/25 12:55	1
Chloroform	ND		1.00	0.270	ug/L			02/20/25 12:55	1
Chloromethane	ND		1.00	0.540	ug/L			02/20/25 12:55	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/20/25 12:55	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/20/25 12:55	1
Cyclohexane	ND		1.00	0.280	ug/L			02/20/25 12:55	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/20/25 12:55	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 12:55	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 12:55	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/20/25 12:55	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/20/25 12:55	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/20/25 12:55	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/20/25 12:55	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/20/25 12:55	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/20/25 12:55	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/20/25 12:55	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/20/25 12:55	1
2-Hexanone	ND		10.0	3.20	ug/L			02/20/25 12:55	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/20/25 12:55	1
Methyl acetate	ND		5.00	3.20	ug/L			02/20/25 12:55	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/20/25 12:55	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/20/25 12:55	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/20/25 12:55	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/20/25 12:55	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/20/25 12:55	1
o-Xylene	ND		1.00	0.260	ug/L			02/20/25 12:55	1
Styrene	ND		1.00	0.270	ug/L			02/20/25 12:55	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/20/25 12:55	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/20/25 12:55	1
Toluene	ND		1.00	0.250	ug/L			02/20/25 12:55	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/20/25 12:55	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/20/25 12:55	1
1,2,4-Trichlorobenzene	ND		5.00	0.530	ug/L			02/20/25 12:55	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/20/25 12:55	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/20/25 12:55	1
Trichloroethene	ND		1.00	0.200	ug/L			02/20/25 12:55	1
Trichlorofluoromethane	ND		1.00	0.330	ug/L			02/20/25 12:55	1

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## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

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### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: MB 680-876433/9  
 Matrix: Water  
 Analysis Batch: 876433

Client Sample ID: Method Blank  
 Prep Type: Total/NA

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/20/25 12:55	1
Vinyl chloride	ND		1.00	0.400	ug/L			02/20/25 12:55	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/20/25 12:55	1

Surrogate	MB MB		Limits	Prepared	Analyzed	Dil Fac
	%Recovery	Qualifier				
4-Bromofluorobenzene (Surr)	101		70 - 130		02/20/25 12:55	1
Dibromofluoromethane (Surr)	105		70 - 130		02/20/25 12:55	1
1,2-Dichloroethane-d4 (Surr)	92		60 - 124		02/20/25 12:55	1
Toluene d8 (Surr)	98		70 - 130		02/20/25 12:55	1

Lab Sample ID: LCS 680-876433/5  
 Matrix: Water  
 Analysis Batch: 876433

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA

Analyte	Spike Added	LCS LCS		Unit	D	% Rec	% Rec Limits
		Result	Qualifier				
Acetone	250	202.2		ug/L		81	67 - 120
Benzene	50.0	53.95		ug/L		108	70 - 130
Dichlorobromomethane	50.0	53.14		ug/L		106	70 - 130
Bromoform	50.0	47.66		ug/L		95	69 - 129
Bromomethane	50.0	74.73		ug/L		149	28 - 192
2-Butanone (MEK)	250	209.7		ug/L		84	69 - 120
Carbon disulfide	50.0	49.46		ug/L		99	70 - 130
Carbon tetrachloride	50.0	52.88		ug/L		106	70 - 130
Chlorobenzene	50.0	50.74		ug/L		101	70 - 130
Dibromochloromethane	50.0	50.83		ug/L		102	70 - 130
Chloroethane	50.0	80.60		ug/L		161	31 - 213
Chloroform	50.0	51.95		ug/L		104	70 - 130
Chloromethane	50.0	58.42		ug/L		117	59 - 127
cis-1,2-Dichloroethene	50.0	52.60		ug/L		105	70 - 130
cis-1,3-Dichloropropene	50.0	52.89		ug/L		106	70 - 130
Cyclohexane	50.0	53.04		ug/L		106	23 - 175
1,2-Dibromo-3-Chloropropane	50.0	36.07		ug/L		72	70 - 130
1,2-Dichlorobenzene	50.0	50.94		ug/L		102	70 - 130
1,3-Dichlorobenzene	50.0	52.65		ug/L		105	70 - 130
1,4-Dichlorobenzene	50.0	51.98		ug/L		104	70 - 130
Dichlorodifluoromethane	50.0	56.80		ug/L		114	70 - 130
1,1-Dichloroethane	50.0	53.31		ug/L		107	70 - 130
1,2-Dichloroethane	50.0	53.99		ug/L		108	70 - 130
1,1,1-Dichloroethene	50.0	53.39		ug/L		107	70 - 130
1,2-Dichloropropane	50.0	53.60		ug/L		107	70 - 130
Ethylbenzene	50.0	53.87		ug/L		108	70 - 130
1,2-Dibromoethane	50.0	51.76		ug/L		104	70 - 130
2-Hexanone	250	205.3		ug/L		82	70 - 130
Isopropylbenzene	50.0	53.31		ug/L		107	70 - 130
Methyl acetate	100	68.47		ug/L		68	67 - 120
Methylcyclohexane	50.0	54.53		ug/L		109	70 - 130
Methylene Chloride	50.0	51.62		ug/L		103	70 - 130

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## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

Job ID: 752-29563-1

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### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCS 680-876433/5 Matrix: Water Analysis Batch: 876433		Client Sample ID: Lab Control Sample Prep Type: Total/NA							
Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
4-Methyl-2-pentanone (MIBK)	250	216.9		ug/L		87	68 - 120		
Methyl tert-butyl ether	50.0	47.24		ug/L		94	70 - 130		
m-Xylene & p-Xylene	50.0	52.64		ug/L		105	70 - 130		
o-Xylene	50.0	52.51		ug/L		105	70 - 130		
Styrene	50.0	52.21		ug/L		104	70 - 130		
1,1,2,2-Tetrachloroethane	50.0	52.77		ug/L		106	70 - 130		
Tetrachloroethene	50.0	51.78		ug/L		104	70 - 130		
Toluene	50.0	53.84		ug/L		108	70 - 130		
trans-1,2-Dichloroethene	50.0	52.50		ug/L		105	70 - 130		
trans-1,3-Dichloropropene	50.0	52.50		ug/L		105	70 - 130		
1,2,4-Trichlorobenzene	50.0	48.02		ug/L		96	70 - 130		
1,1,1-Trichloroethane	50.0	52.54		ug/L		105	70 - 130		
1,1,2-Trichloroethane	50.0	53.37		ug/L		107	70 - 130		
Trichloroethene	50.0	49.38		ug/L		99	70 - 130		
Trichlorofluoromethane	50.0	149.5	*+	ug/L		299	63 - 142		
1,1,2-Trichloro-1,2,2-trifluoroethane	50.0	53.02		ug/L		106	63 - 141		
Vinyl chloride	50.0	53.02		ug/L		106	66 - 129		
Xylenes, Total	100	105.2		ug/L		105	70 - 130		
		LCS %Recovery	LCS Qualifier			Limits			
4-Bromofluorobenzene (Surr)		98				70 - 130			
Dibromofluoromethane (Surr)		104				70 - 130			
1,2-Dichloroethane-d4 (Surr)		105				60 - 124			
Toluene-d8 (Surr)		99				70 - 130			

Lab Sample ID: LCSD 680-876433/6 Matrix: Water Analysis Batch: 876433		Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA							
Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits		RPD
Acetone	250	208.4		ug/L		83	67 - 120	3	30
Benzene	50.0	53.72		ug/L		107	70 - 130	0	30
Dichlorobromomethane	50.0	53.78		ug/L		108	70 - 130	1	30
Bromoform	50.0	48.20		ug/L		96	69 - 129	1	30
Bromomethane	50.0	75.98		ug/L		152	28 - 192	2	30
2-Butanone (MEK)	250	218.2		ug/L		87	69 - 120	4	30
Carbon disulfide	50.0	48.09		ug/L		96	70 - 130	3	30
Carbon tetrachloride	50.0	52.04		ug/L		104	70 - 130	2	30
Chlorobenzene	50.0	50.64		ug/L		101	70 - 130	0	30
Dibromochloromethane	50.0	52.46		ug/L		105	70 - 130	3	30
Chloroethane	50.0	79.32		ug/L		159	31 - 213	2	30
Chloroform	50.0	52.40		ug/L		105	70 - 130	1	30
Chloromethane	50.0	58.14		ug/L		116	59 - 127	0	30
cis-1,2-Dichloroethene	50.0	52.63		ug/L		105	70 - 130	0	30
cis-1,3-Dichloropropene	50.0	53.82		ug/L		108	70 - 130	2	20
Cyclohexane	50.0	52.19		ug/L		104	23 - 175	2	30
1,2-Dibromo-3-Chloropropane	50.0	36.35		ug/L		73	70 - 130	1	30

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## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

Job ID: 752-29563-1

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### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCSD 680-876433/6			Client Sample ID: Lab Control Sample Dup							
Matrix: Water			Prep Type: Total/NA							
Analysis Batch: 876433										
Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit	
1,2-Dichlorobenzene	50.0	51.46		ug/L		103	70 - 130	1	30	
1,3-Dichlorobenzene	50.0	53.21		ug/L		106	70 - 130	1	30	
1,4-Dichlorobenzene	50.0	51.37		ug/L		103	70 - 130	1	30	
Dichlorodifluoromethane	50.0	55.84		ug/L		112	70 - 130	2	40	
1,1-Dichloroethane	50.0	53.14		ug/L		106	70 - 130	0	30	
1,2-Dichloroethane	50.0	54.65		ug/L		109	70 - 130	1	50	
1,1-Dichloroethene	50.0	52.18		ug/L		104	70 - 130	2	20	
1,2-Dichloropropane	50.0	54.55		ug/L		109	70 - 130	2	20	
Ethylbenzene	50.0	53.55		ug/L		107	70 - 130	1	20	
1,2-Dibromoethane	50.0	53.78		ug/L		108	70 - 130	4	30	
2 Hexanone	250	212.7		ug/L		85	70 - 130	4	20	
Isopropylbenzene	50.0	52.54		ug/L		105	70 - 130	1	30	
Methyl acetate	100	71.40		ug/L		71	67 - 120	4	30	
Methylcyclohexane	50.0	52.83		ug/L		106	70 - 130	3	30	
Methylene Chloride	50.0	51.47		ug/L		103	70 - 130	0	30	
4-Methyl-2-pentanone (MIBK)	250	226.1		ug/L		90	68 - 120	4	30	
Methyl tert-butyl ether	50.0	48.62		ug/L		97	70 - 130	3	30	
m-Xylene & p-Xylene	50.0	52.61		ug/L		105	70 - 130	0	30	
o-Xylene	50.0	52.62		ug/L		105	70 - 130	0	30	
Styrene	50.0	52.73		ug/L		105	70 - 130	1	30	
1,1,2,2-Tetrachloroethane	50.0	55.23		ug/L		110	70 - 130	5	30	
Tetrachloroethene	50.0	51.14		ug/L		102	70 - 130	1	30	
Toluene	50.0	54.04		ug/L		108	70 - 130	0	30	
trans-1,2-Dichloroethene	50.0	51.96		ug/L		104	70 - 130	1	30	
trans-1,3-Dichloropropene	50.0	54.17		ug/L		108	70 - 130	3	30	
1,2,4-Trichlorobenzene	50.0	48.61		ug/L		97	70 - 130	1	30	
1,1,1-Trichloroethane	50.0	52.23		ug/L		104	70 - 130	1	30	
1,1,2-Trichloroethane	50.0	55.02		ug/L		110	70 - 130	3	30	
Trichloroethene	50.0	49.01		ug/L		98	70 - 130	1	30	
Trichlorofluoromethane	50.0	144.6	+	ug/L		289	63 - 142	3	30	
1,1,2-Trichloro-1,2,2-trifluoroethane	50.0	52.86		ug/L		106	63 - 141	0	30	
Vinyl chloride	50.0	56.40		ug/L		113	66 - 129	6	30	
Xylenes, Total	100	105.2		ug/L		105	70 - 130	0	30	

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
4-Bromofluorobenzene (Surr)	99		70 - 130
Dibromofluoromethane (Surr)	105		70 - 130
1,2-Dichloroethane-d4 (Surr)	106		60 - 124
Toluene-d8 (Surr)	97		70 - 130

Lab Sample ID: MB 680-876567/9			Client Sample ID: Method Blank							
Matrix: Water			Prep Type: Total/NA							
Analysis Batch: 876567										
Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac	
Acetone	ND		10.0	3.70	ug/L			02/21/25 12:37	1	
Benzene	ND		1.00	0.270	ug/L			02/21/25 12:37	1	

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### QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1



#### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: MB 680-876567/9  
 Matrix: Water  
 Analysis Batch: 876567

Client Sample ID: Method Blank  
 Prep Type: Total/NA

Analyte	MB MB		RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
	Result	Qualifier							
Dichlorobromomethane	ND		1.00	0.250	ug/L			02/21/25 12:37	1
Bromoform	ND		1.00	0.590	ug/L			02/21/25 12:37	1
Bromomethane	ND		5.00	3.70	ug/L			02/21/25 12:37	1
2-Butanone (MEK)	ND		10.0	6.40	ug/L			02/21/25 12:37	1
Carbon disulfide	ND		2.00	0.430	ug/L			02/21/25 12:37	1
Carbon tetrachloride	ND		1.00	0.300	ug/L			02/21/25 12:37	1
Chlorobenzene	ND		1.00	0.150	ug/L			02/21/25 12:37	1
Dibromochloromethane	ND		1.00	0.390	ug/L			02/21/25 12:37	1
Chloroethane	ND		5.00	4.60	ug/L			02/21/25 12:37	1
Chloroform	ND		1.00	0.270	ug/L			02/21/25 12:37	1
Chloromethane	ND		1.00	0.540	ug/L			02/21/25 12:37	1
cis-1,2-Dichloroethene	ND		1.00	0.250	ug/L			02/21/25 12:37	1
cis-1,3-Dichloropropene	ND		1.00	0.260	ug/L			02/21/25 12:37	1
Cyclohexane	ND		1.00	0.280	ug/L			02/21/25 12:37	1
1,2-Dibromo-3-Chloropropane	ND		5.00	1.80	ug/L			02/21/25 12:37	1
1,2-Dichlorobenzene	ND		1.00	0.310	ug/L			02/21/25 12:37	1
1,3-Dichlorobenzene	ND		1.00	0.310	ug/L			02/21/25 12:37	1
1,4-Dichlorobenzene	ND		1.00	0.310	ug/L			02/21/25 12:37	1
Dichlorodifluoromethane	ND		1.00	0.360	ug/L			02/21/25 12:37	1
1,1-Dichloroethane	ND		1.00	0.330	ug/L			02/21/25 12:37	1
1,2-Dichloroethane	ND		1.00	0.250	ug/L			02/21/25 12:37	1
1,1-Dichloroethene	ND		1.00	0.330	ug/L			02/21/25 12:37	1
1,2-Dichloropropane	ND		1.00	0.220	ug/L			02/21/25 12:37	1
Ethylbenzene	ND		1.00	0.200	ug/L			02/21/25 12:37	1
1,2-Dibromoethane	ND		1.00	0.330	ug/L			02/21/25 12:37	1
2-Hexanone	ND		10.0	3.20	ug/L			02/21/25 12:37	1
Isopropylbenzene	ND		1.00	0.260	ug/L			02/21/25 12:37	1
Methyl acetate	ND		5.00	3.20	ug/L			02/21/25 12:37	1
Methylcyclohexane	ND		1.00	0.330	ug/L			02/21/25 12:37	1
Methylene Chloride	ND		5.00	3.20	ug/L			02/21/25 12:37	1
4-Methyl-2-pentanone (MIBK)	ND		10.0	2.70	ug/L			02/21/25 12:37	1
Methyl tert-butyl ether	ND		5.00	0.810	ug/L			02/21/25 12:37	1
m-Xylene & p-Xylene	ND		1.00	0.490	ug/L			02/21/25 12:37	1
o-Xylene	ND		1.00	0.260	ug/L			02/21/25 12:37	1
Styrene	ND		1.00	0.270	ug/L			02/21/25 12:37	1
1,1,2,2-Tetrachloroethane	ND		1.00	0.400	ug/L			02/21/25 12:37	1
Tetrachloroethene	ND		1.00	0.350	ug/L			02/21/25 12:37	1
Toluene	ND		1.00	0.250	ug/L			02/21/25 12:37	1
trans-1,2-Dichloroethene	ND		1.00	0.340	ug/L			02/21/25 12:37	1
trans-1,3-Dichloropropene	ND		1.00	0.230	ug/L			02/21/25 12:37	1
1,2,4-Trichlorobenzene	0.5361	J	5.00	0.530	ug/L			02/21/25 12:37	1
1,1,1-Trichloroethane	ND		1.00	0.210	ug/L			02/21/25 12:37	1
1,1,2-Trichloroethane	ND		1.00	0.320	ug/L			02/21/25 12:37	1
Trichloroethene	ND		1.00	0.200	ug/L			02/21/25 12:37	1
Trichlorofluoromethane	ND		1.00	0.330	ug/L			02/21/25 12:37	1
1,1,2-Trichloro-1,2,2-trifluoroethane	ND		1.00	0.230	ug/L			02/21/25 12:37	1
Vinyl chloride	ND		1.00	0.400	ug/L			02/21/25 12:37	1
Xylenes, Total	ND		1.00	0.230	ug/L			02/21/25 12:37	1

Eurofins Raleigh

## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Surrogate	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
4-Bromofluorobenzene (Surr)	101		70 - 130		02/21/25 12:37	1
Dibromofluoromethane (Surr)	109		70 - 130		02/21/25 12:37	1
1,2-Dichloroethane-d4 (Surr)	98		60 - 124		02/21/25 12:37	1
Toluene-d8 (Surr)	105		70 - 130		02/21/25 12:37	1

Lab Sample ID: LCS 680-876567/5  
 Matrix: Water  
 Analysis Batch: 876567

Client Sample ID: Lab Control Sample  
 Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	% Rec	% Rec Limits
Acetone	250	214.8		ug/L		86	67 - 120
Benzene	50.0	50.54		ug/L		101	70 - 130
Dichlorobromomethane	50.0	48.44		ug/L		97	70 - 130
Bromofom	50.0	48.91		ug/L		98	69 - 129
Bromomethane	50.0	57.74		ug/L		115	28 - 192
2-Butanone (MEK)	250	215.1		ug/L		86	69 - 120
Carbon disulfide	50.0	48.53		ug/L		97	70 - 130
Carbon tetrachloride	50.0	49.67		ug/L		99	70 - 130
Chlorobenzene	50.0	49.63		ug/L		99	70 - 130
Dibromochloromethane	50.0	50.50		ug/L		101	70 - 130
Chloroethane	50.0	72.90		ug/L		146	31 - 213
Chloroform	50.0	51.18		ug/L		102	70 - 130
Chloromethane	50.0	45.16		ug/L		90	59 - 127
cis-1,2-Dichloroethene	50.0	51.17		ug/L		102	70 - 130
cis-1,3-Dichloropropene	50.0	52.07		ug/L		104	70 - 130
Cyclohexane	50.0	46.42		ug/L		93	23 - 175
1,2-Dibromo-3-Chloropropane	50.0	43.77		ug/L		88	70 - 130
1,2-Dichlorobenzene	50.0	50.99		ug/L		102	70 - 130
1,3-Dichlorobenzene	50.0	50.62		ug/L		101	70 - 130
1,4-Dichlorobenzene	50.0	50.02		ug/L		100	70 - 130
Dichlorodifluoromethane	50.0	47.08		ug/L		94	70 - 130
1,1-Dichloroethane	50.0	49.85		ug/L		100	70 - 130
1,2-Dichloroethane	50.0	52.18		ug/L		104	70 - 130
1,1-Dichloroethene	50.0	50.18		ug/L		100	70 - 130
1,2-Dichloropropane	50.0	48.82		ug/L		98	70 - 130
Ethylbenzene	50.0	50.68		ug/L		101	70 - 130
1,2-Dibromoethane	50.0	51.98		ug/L		104	70 - 130
2-Hexanone	250	221.6		ug/L		89	70 - 130
Isopropylbenzene	50.0	46.20		ug/L		92	70 - 130
Methyl acetate	100	77.37		ug/L		77	67 - 120
Methylcyclohexane	50.0	46.37		ug/L		93	70 - 130
Methylene Chloride	50.0	46.88		ug/L		94	70 - 130
4-Methyl-2-pentanone (MIBK)	250	227.2		ug/L		91	68 - 120
Methyl tert-butyl ether	50.0	47.96		ug/L		96	70 - 130
m-Xylene & p-Xylene	50.0	49.83		ug/L		100	70 - 130
o-Xylene	50.0	50.96		ug/L		102	70 - 130
Styrene	50.0	51.89		ug/L		104	70 - 130
1,1,2,2-Tetrachloroethane	50.0	54.07		ug/L		108	70 - 130
Tetrachloroethene	50.0	51.33		ug/L		103	70 - 130
Toluene	50.0	50.10		ug/L		100	70 - 130

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## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road TCE)

Job ID: 752-29563-1

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### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCS 680-876567/5 Matrix: Water Analysis Batch: 876567		Client Sample ID: Lab Control Sample Prep Type: Total/NA							
Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits		
trans-1,2-Dichloroethene	50.0	50.53		ug/L		101	70 - 130		
trans-1,3-Dichloropropene	50.0	51.54		ug/L		103	70 - 130		
1,2,4-Trichlorobenzene	50.0	47.49		ug/L		95	70 - 130		
1,1,1-Trichloroethane	50.0	50.87		ug/L		102	70 - 130		
1,1,2-Trichloroethane	50.0	48.99		ug/L		98	70 - 130		
Trichloroethene	50.0	47.23		ug/L		94	70 - 130		
Trichlorofluoromethane	50.0	50.19		ug/L		100	63 - 142		
1,1,2-Trichloro-1,2,2-trifluoroethane	50.0	46.75		ug/L		94	63 - 141		
Vinyl chloride	50.0	44.02		ug/L		88	66 - 129		
Xylenes, Total	100	100.8		ug/L		101	70 - 130		
Surrogate	LCS %Recovery		LCS Qualifier			Limits			
4-Bromofluorobenzene (Surr)	95					70 - 130			
Dibromofluoromethane (Surr)	104					70 - 130			
1,2-Dichloroethane-d4 (Surr)	99					60 - 124			
Toluene-d8 (Surr)	99					70 - 130			

Lab Sample ID: LCSD 680-876567/6 Matrix: Water Analysis Batch: 876567		Client Sample ID: Lab Control Sample Dup Prep Type: Total/NA							
Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits		RPD Limit
Acetone	250	216.0		ug/L		86	67 - 120		1 30
Benzene	50.0	50.86		ug/L		102	70 - 130		1 30
Dichlorobromomethane	50.0	49.60		ug/L		99	70 - 130		2 30
Bromofom	50.0	48.64		ug/L		97	69 - 129		1 30
Bromomethane	50.0	59.75		ug/L		119	28 - 192		3 30
2-Butanone (MEK)	250	217.5		ug/L		87	69 - 120		1 30
Carbon disulfide	50.0	49.22		ug/L		98	70 - 130		1 30
Carbon tetrachloride	50.0	50.02		ug/L		100	70 - 130		1 30
Chlorobenzene	50.0	50.07		ug/L		100	70 - 130		1 30
Dibromochloromethane	50.0	50.36		ug/L		101	70 - 130		0 30
Chloroethane	50.0	72.48		ug/L		145	31 - 213		1 30
Chloroform	50.0	50.76		ug/L		102	70 - 130		1 30
Chloromethane	50.0	46.53		ug/L		93	59 - 127		3 30
cis-1,2-Dichloroethene	50.0	51.54		ug/L		103	70 - 130		1 30
cis-1,3-Dichloropropene	50.0	53.17		ug/L		106	70 - 130		2 20
Cyclohexane	50.0	47.95		ug/L		96	23 - 175		3 30
1,2-Dibromo-3-Chloropropane	50.0	44.60		ug/L		89	70 - 130		2 30
1,2-Dichlorobenzene	50.0	50.59		ug/L		101	70 - 130		1 30
1,3-Dichlorobenzene	50.0	51.15		ug/L		102	70 - 130		1 30
1,4-Dichlorobenzene	50.0	50.56		ug/L		101	70 - 130		1 30
Dichlorodifluoromethane	50.0	48.14		ug/L		96	70 - 130		2 40
1,1-Dichloroethane	50.0	50.56		ug/L		101	70 - 130		1 30
1,2-Dichloroethane	50.0	52.50		ug/L		105	70 - 130		1 50
1,1-Dichloroethene	50.0	51.65		ug/L		103	70 - 130		3 20
1,2-Dichloropropane	50.0	49.72		ug/L		99	70 - 130		2 20

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## QC Sample Results

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

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### Method: 8260D - Volatile Organic Compounds by GC/MS (Continued)

Lab Sample ID: LCSD 680-876567/6  
 Matrix: Water  
 Analysis Batch: 876567

Client Sample ID: Lab Control Sample Dup  
 Prep Type: Total/NA

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec Limits	RPD	RPD Limit
Ethylbenzene	50.0	51.34		ug/L		103	70 - 130	1	20
1,2-Dibromoethane	50.0	52.57		ug/L		105	70 - 130	1	30
2-Hexanone	250	224.1		ug/L		90	70 - 130	1	20
Isopropylbenzene	50.0	47.23		ug/L		94	70 - 130	2	30
Methyl acetate	100	81.34		ug/L		81	67 - 120	5	30
Methylcyclohexane	50.0	48.96		ug/L		98	70 - 130	5	30
Methylene Chloride	50.0	47.98		ug/L		96	70 - 130	2	30
4-Methyl-2-pentanone (MIBK)	250	229.2		ug/L		92	68 - 120	1	30
Methyl tert-butyl ether	50.0	48.08		ug/L		96	70 - 130	0	30
m-Xylene & p-Xylene	50.0	50.81		ug/L		102	70 - 130	2	30
o-Xylene	50.0	52.17		ug/L		104	70 - 130	2	30
Styrene	50.0	52.44		ug/L		105	70 - 130	1	30
1,1,2,2-Tetrachloroethane	50.0	53.79		ug/L		108	70 - 130	1	30
Tetrachloroethene	50.0	52.64		ug/L		105	70 - 130	3	30
Toluene	50.0	51.04		ug/L		102	70 - 130	2	30
trans-1,2-Dichloroethene	50.0	50.40		ug/L		101	70 - 130	0	30
trans-1,3-Dichloropropene	50.0	51.52		ug/L		103	70 - 130	0	30
1,2,4-Trichlorobenzene	50.0	49.22		ug/L		98	70 - 130	4	30
1,1,1-Trichloroethane	50.0	51.90		ug/L		104	70 - 130	2	30
1,1,2-Trichloroethane	50.0	49.99		ug/L		100	70 - 130	2	30
Trichloroethene	50.0	47.95		ug/L		96	70 - 130	2	30
Trichlorofluoromethane	50.0	52.05		ug/L		104	63 - 142	4	30
1,1,2-Trichloro-1,2,2-trifluoroethane	50.0	48.76		ug/L		98	63 - 141	4	30
Vinyl chloride	50.0	45.24		ug/L		90	66 - 129	3	30
Xylenes, Total	100	103.0		ug/L		103	70 - 130	2	30

Surrogate	LCSD %Recovery	LCSD Qualifier	Limits
4-Bromofluorobenzene (Surr)	95		70 - 130
Dibromofluoromethane (Surr)	106		70 - 130
1,2-Dichloroethane-d4 (Surr)	100		60 - 124
Toluene-d8 (Surr)	100		70 - 130

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## QC Association Summary

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

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### GC/MS VOA

#### Analysis Batch: 876433

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
752-29563-1	DPR-TB-2025	Total/NA	Water	8260D	
752-29563-2	MW-02-2025	Total/NA	Water	8260D	
752-29563-3	MW-15-2025	Total/NA	Water	8260D	
752-29563-4	MW-15Dup-2025	Total/NA	Water	8260D	
752-29563-5	MW-26-2025	Total/NA	Water	8260D	
MB 680-876433/9	Method Blank	Total/NA	Water	8260D	
LCS 680-876433/5	Lab Control Sample	Total/NA	Water	8260D	
LCSD 680-876433/6	Lab Control Sample Dup	Total/NA	Water	8260D	

#### Analysis Batch: 876567

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
752-29563-1	DPR-TB-2025	Total/NA	Water	8260D	
MB 680-876567/9	Method Blank	Total/NA	Water	8260D	
LCS 680-876567/5	Lab Control Sample	Total/NA	Water	8260D	
LCSD 680-876567/6	Lab Control Sample Dup	Total/NA	Water	8260D	

Eurofins Raleigh

## Lab Chronicle

Client: North Carolina Dept of Env Quality  
 Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
 TCE)

Job ID: 752-29563-1

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**Client Sample ID: DPR-TB-2025**

**Lab Sample ID: 752-29563-1**

Date Collected: 02/13/25 12:00

Matrix: Water

Date Received: 02/14/25 15:17

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260D		1	876567	P1C	EET SAV	02/21/25 13:08
Total/NA	Analysis	8260D		1	876433	P1C	EET SAV	02/20/25 13:44

**Client Sample ID: MW-02-2025**

**Lab Sample ID: 752-29563-2**

Date Collected: 02/13/25 14:13

Matrix: Water

Date Received: 02/14/25 15:17

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260D		1	876433	P1C	EET SAV	02/20/25 14:07

**Client Sample ID: MW-15-2025**

**Lab Sample ID: 752-29563-3**

Date Collected: 02/13/25 13:40

Matrix: Water

Date Received: 02/14/25 15:17

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260D		1	876433	P1C	EET SAV	02/20/25 14:29

**Client Sample ID: MW-15Dup-2025**

**Lab Sample ID: 752-29563-4**

Date Collected: 02/13/25 13:45

Matrix: Water

Date Received: 02/14/25 15:17

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260D		1	876433	P1C	EET SAV	02/20/25 14:52

**Client Sample ID: MW-26-2025**

**Lab Sample ID: 752-29563-5**

Date Collected: 02/13/25 14:36

Matrix: Water

Date Received: 02/14/25 15:17

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	8260D		1	876433	P1C	EET SAV	02/20/25 15:15

**Laboratory References:**

EET SAV = Eurofins Savannah, 5102 LaRoche Avenue, Savannah, GA 31404, TEL (912)354-7858

Eurofins Raleigh

## Accreditation/Certification Summary

Client: North Carolina Dept of Env Quality  
Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
TCE)

Job ID: 752-29563-1

### Laboratory: Eurofins Savannah

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
North Carolina (WW/SW)	State	269	12-31-25



## Method Summary

Client: North Carolina Dept of Env Quality  
Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
TCE)

Job ID: 752-29563-1

Method	Method Description	Protocol	Laboratory
8260D	Volatile Organic Compounds by GC/MS	SW846	EET SAV
5030C	Purge and Trap	SW846	EET SAV

**Protocol References:**

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

**Laboratory References:**

EET SAV = Eurofins Savannah, 5102 LaRoche Avenue, Savannah, GA 31404, TEL (912)354-7858



Eurofins Raleigh

## Sample Summary

Client: North Carolina Dept of Env Quality  
Project/Site: Site #: DPR- NCD 986 175 644 (Davis Park Road  
TCE)

Job ID: 752-29563-1

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Lab Sample ID	Client Sample ID	Matrix	Collected	Received
752-29563-1	DPR-TB-2025	Water	02/13/25 12:00	02/14/25 15:17
752-29563-2	MW-02-2025	Water	02/13/25 14:13	02/14/25 15:17
752-29563-3	MW-15-2025	Water	02/13/25 13:40	02/14/25 15:17
752-29563-4	MW-15Dup-2025	Water	02/13/25 13:45	02/14/25 15:17
752-29563-5	MW-26-2025	Water	02/13/25 14:36	02/14/25 15:17

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**Eurofins Raleigh**  
 104 Woodlands Industrial Court Suite A  
 Cary, NC 27511  
 Phone: 919-467-3090

**Chain of Custody Record**



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<b>Client Information (Sub Contract Lab)</b>		Sampler: N/A	Lab P#: Kuruganty, Nikita	Center Tracking No(s): N/A	COG No: 752-4938.1			
Client Contact:		Phone: N/A	E-Mail: INK@eurofins.com	State of Origin: North Carolina	Page: Page 1 of 1			
<b>Shipping/Receiving</b>		Company: Eurofins Environment Testing Southeast L			Accreditations Required (See Note): NELAP - Louisiana, State North Carolina (DW), State			
Address: 5102 LaRoche Avenue, Savannah GA, 31404		Due Date Requested: 3/5/2025	<b>Analysis Requested</b>		Job #: 752-29563-1			
City: Savannah		TAT Requested (days): N/A	Total Number of Containers:		Preservation Codes:			
State, Zip: GA, 31404		PO #: N/A						
Phone: 912-354-7858(Tel) 912-352-0185(Fax)		WC #: N/A						
Email: N/A		Project #: 75202528						
Project Name: Site #: DPR- NCD 985 175 644 (Davis Park Road TCE)		RSC/VM: N/A	Total Number of Containers:		Other: N/A			
Site: N/A								
<b>Sample Identification - Client ID (Lab ID)</b>		Sample Date	Sample Time	Sample Type (D/C Comp, Grab)	Matrix (Water, Sediment, Grab)	Preservation Code	Analysis Requested	Special Instructions/Notes
DPR-TB-2025 (752-29563-1)		2/13/25	12:00 Eastern	G	Water	X	X	
MW-02-2025 (752-29563-2)		2/13/25	14:13 Eastern	G	Water	X	X	
MW-15-2025 (752-29563-3)		2/13/25	13:45 Eastern	G	Water	X	X	
MW-15Dup-2025 (752-29563-4)		2/13/25	13:45 Eastern	G	Water	X	X	
MW-28-2025 (752-29563-5)		2/13/25	14:36 Eastern	G	Water	X	X	
Note: Since laboratory accreditations are subject to change, Eurofins Environment Testing Southeast, LLC places the ownership of method, analysis & accreditation certifications under our subcontracted laboratories. This sample shipment is forwarded under chain-of-custody. If the laboratory does not currently maintain accreditation in the State of Origin listed above for analysis/matrix being analyzed, the samples must be shipped back to the Eurofins Environment Testing Southeast, LLC laboratory or other instructions will be provided. Any changes to accreditation status should be brought to Eurofins Environment Testing Southeast, LLC attention immediately. If an requested accreditation are current to date, return the signed Chain of Custody attesting to said compliance to Eurofins Environment Testing Southeast, LLC.		<b>Possible Hazard Identification</b>		<b>Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)</b>				
Unconfirmed		Deliverable Requested: I, II, III, IV, Other (specify):		Primary Deliverable Rank: 2		<input type="checkbox"/> Return To Client <input type="checkbox"/> Disposal By Lab <input type="checkbox"/> Archive For _____ Months		
Empty Kit Relinquished by:		Date:	Time:	Method of Shipment:				
Relinquished by: <i>RG</i>		Date/Time: <i>2/17/25 16:00</i>	Company:	Received by: <i>[Signature]</i>	Date/Time: <i>2/18/25 10:08</i>	Company:		
Relinquished by:		Date/Time:	Company:	Received by:	Date/Time:	Company:		
Relinquished by:		Date/Time:	Company:	Received by:	Date/Time:	Company:		
Custody Seal Intact: <input type="checkbox"/> Yes <input type="checkbox"/> No		Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: <i>2.6 / 3.6</i>				

## Login Sample Receipt Checklist

Client: North Carolina Dept of Env Quality

Job Number: 752-29563-1

**Login Number: 29563**

**List Source: Eurofins Raleigh**

**List Number: 1**

**Creator: Ortiz, Daniel**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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## Login Sample Receipt Checklist

Client: North Carolina Dept of Env Quality

Job Number: 752-29563-1

**Login Number: 29563**  
**List Number: 2**  
**Creator: Lincoln, Alyssa**

**List Source: Eurofins Savannah**  
**List Creation: 02/18/25 02:14 PM**

Question	Answer	Comment
Radioactivity wasn't checked or is <math>\leq</math> background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	True	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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**APPENDIX I**

**15A NCAC Well Construction Standards**

## SUBCHAPTER 02C - WELL CONSTRUCTION STANDARDS

### SECTION .0100 - CRITERIA AND STANDARDS APPLICABLE TO WATER-SUPPLY AND

#### 15A NCAC 02C .0101 GENERAL PROVISIONS

(a) Authorization. The North Carolina Environmental Management Commission is required pursuant to G.S. 87-87 in the North Carolina Well Construction Act to adopt rules governing the location, construction, repair, and abandonment of wells, the operation of water wells or well systems with a designed capacity of 100,000 gallons per day or greater, and the installation and repair of pumps and pumping equipment.

(b) Purpose. Consistent with the duty to safeguard the public welfare, safety, health, and to protect and beneficially develop the groundwater resources of the State, it is declared to be the policy of this State to require that the location, construction, repair, and abandonment of wells, and the installation of pumps and pumping equipment conform to such reasonable standards and requirements as may be necessary to protect the public welfare, safety, health, and ground water resources.

*History Note:* Authority G.S. 87-87;  
Eff. February 1, 1976;  
Amended Eff. December 1, 1992; July 1, 1988;  
Readopted Eff. September 1, 2019.

#### 15A NCAC 02C .0102 DEFINITIONS

The terms used in this Subchapter shall be as defined in G.S. 87-85 and as follows:

- (1) "Abandon" means to discontinue the use of and to seal a well according to the requirements of 15A NCAC 02C .0113 of this Section.
- (2) "Access port" means an opening in a well casing or well head installed for the purpose of determining the position of the water level in the well or to facilitate disinfection.
- (3) "Agent" means any person who by agreement with a well owner has authority to act on his or her behalf in executing applications for permits. The agent may be either general agent or a limited agent authorized to do one particular act.
- (4) "Annular Space" means the space between the casing and the walls of a borehole or outer casing or the space between a liner pipe and well casing.
- (5) "Artesian flowing well" means a well in which groundwater flows above the land surface without the use of a pump and, under natural conditions, the static water level or hydraulic head elevation is greater than the land surface elevation.
- (6) "ASTM" means the American Society for Testing and Materials.
- (7) "Casing" means pipe or tubing constructed of materials and having dimensions and weights as specified in the rules of this Subchapter, that is installed in a borehole during or after completion of the borehole to support the side of the hole and thereby prevent caving, to allow completion of a well, to prevent formation material from entering the well, to prevent the loss of drilling fluids into permeable formations, and to prevent entry of contamination.
- (8) "Clay" means a substance comprised of natural, inorganic, fine-grained crystalline mineral fragments that, when mixed with water, forms a pasty, moldable mass that preserves its shape when air dried.
- (9) "Commission" means the North Carolina Environmental Management Commission.
- (10) "Consolidated rock" means rock that is firm and coherent, solidified or cemented, such as granite, gneiss, limestone, slate or sandstone, that has not been decomposed by weathering.
- (11) "Contaminate" or "Contamination" means the introduction of foreign materials of such nature, quality, and quantity into the groundwaters as to exceed the groundwater quality standards set forth in 15A NCAC 02L .0200.
- (12) "Department" is as defined in G.S. 87-85(5a).
- (13) "Designed capacity" means that capacity that is equal to the yield that is specified by the well owner or his or her agent prior to construction of the well.
- (14) "Director" means the Director of the Division of Water Resources or the Director's delegate.
- (15) "Division" means the Division of Water Resources.
- (16) "Domestic use" means water used for drinking, bathing or other household purposes, livestock, or gardens.

- (17) "Formation Material" means naturally occurring material generated during the drilling process that is composed of sands, silts, clays or fragments of rock and that is not in a dissolved state.
- (18) "GPM" and "GPD" mean gallons per minute and gallons per day, respectively.
- (19) "Grout" means a material approved in accordance with Rule .0107(e) of this Section for use in sealing the annular space of a well or liner or for sealing a well during abandonment.
- (20) "Lead Free" means materials containing not more than a weighted average of 0.25 percent lead per Section 1417 of the Safe Drinking Water Act amended January 4, 2014.
- (21) "Liner pipe" means pipe that is installed inside a completed and cased well for the purpose of preventing the entrance of contamination into the well or for repairing ruptured, corroded or punctured casing or screens.
- (22) "Monitoring well" means any well constructed for the primary purpose of obtaining information about the physical, chemical, radiological, or biological characteristics of groundwater or other liquids, or for the observation or measurement of groundwater levels. This definition excludes lysimeters, tensiometers, and other devices used to investigate the characteristics of the unsaturated zone but includes piezometers, a type of monitoring well constructed solely for the purpose of determining groundwater levels. This definition includes all monitoring well types, including temporary wells and wells using Geoprobe® or direct-push technology (DPT).
- (23) "Owner" means any person who holds the fee or other property rights in the well being constructed.
- (24) "Pitless adapters" or "pitless units" are devices manufactured to the standards specified under 15A NCAC 02C .0107(j)(5) for the purpose of allowing a subsurface lateral connection between a well and plumbing appurtenances.
- (25) "Public water system" means a water system as defined in 15A NCAC 18C, which is hereby incorporated by reference, including subsequent amendments.
- (26) "Recovery well" means any well constructed for the purpose of removing contaminated groundwater or other liquids from the subsurface.
- (27) "Saline" means having a chloride concentration of more than 250 milligrams per liter.
- (28) "Secretary" means the Secretary of the Department of Environmental Quality or the Secretary's delegate.
- (29) "Settleable solids" means the volume of solid particles in a well-mixed one liter sample that will settle out of suspension, in the bottom of an Imhoff Cone, after one hour.
- (30) "Sewer Lateral" means the sewer pipe connecting a structure to a wastewater treatment collection system or a municipal or commercial sewer main line.
- (31) "Site" means the land or water area where any facility, activity or situation is physically located, including adjacent or other land used in connection with the facility, activity or situation.
- (32) "Specific capacity" means the yield of the well expressed in gallons per minute per foot of draw-down of the water level (gpm/ft.-dd).
- (33) "Static water level" means the level at which the water stands in the well when the well is not being pumped and is expressed as the distance from a fixed reference point to the water level in the well.
- (34) "Suspended solids" means the weight of those solid particles in a sample that are retained by a standard glass microfiber filter, with pore openings of one and one-half microns, when dried at a temperature between 103 and 105 degrees Fahrenheit.
- (35) "Temporary well" means a well that is constructed to determine aquifer characteristics and that will be permanently abandoned or converted to a permanent well within 21 days (504 hours) of the completion of drilling of the borehole.
- (36) "Turbidity" means the cloudiness in water due to the presence of suspended particles such as clay or silt that may create laboratory analytical difficulties for determining contamination above 15A NCAC 02L.
- (37) "Vent" means a permanent opening in the well casing or well head, installed for the purpose of allowing changes in the water level in a well due to natural atmospheric changes or to pumping. A vent may also serve as an access port.
- (38) "Water-tight" means put or fit together so tightly that water cannot enter or pass through. For example, water-tight pipe may be filled with water and tested under pressure between three and five pounds per square inch (psi) for several minutes to detect leaks.
- (39) "Well" is as defined in G.S. 87-85(14).

- (40) "Well capacity" means the maximum quantity of water that a well will yield continuously as determined by methods outlined in 15A NCAC 02C .0110.
- (41) "Well head" means the upper terminal of the well including adapters, ports, valves, seals, and other attachments.
- (42) "Well system" means two or more wells connected to the same distribution or collection system or, if not connected to a distribution or collection system, two or more wells serving the same site.
- (43) "Yield" means the volume of water or other fluid per time that can be discharged from a well under a given set of circumstances.

*History Note:* Authority G.S. 87-85; 87-87; 143-215.3;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; July 1, 1988; March 1, 1985;  
 September 1, 1984;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0103 REGISTRATION**

*History Note:* Authority G.S. 87-87; 143-215.3(a)(1a); 143-355(e);  
 Eff. February 1, 1976;  
 Amended Eff. April 1, 2001; December 1, 1992; July 1, 1988; April 20, 1978;  
 Repealed Eff. September 1, 2009.

**15A NCAC 02C .0104 PUMP INSTALLATION REGISTRATION**

*History Note:* Authority G.S. 87-87;  
 Eff. February 1, 1976;  
 Repealed Eff. July 1, 1988.

**15A NCAC 02C .0105 PERMITS**

- (a) No person shall locate or construct any of the following wells until a permit has been issued by the Department:
  - (1) any water-well or well system with a designed capacity to pump 100,000 gallons per day (gpd) or more during one calendar year;
  - (2) any well added to an existing system if the total designed capacity of such existing well system and added well will equal or exceed 100,000 gpd;
  - (3) any temporary or permanent monitoring well or monitoring well system, including wells installed using direct-push technology (DPT) or Geoprobe® technology, designed to penetrate an aquifer to obtain groundwater data on property not owned by the well owner;
  - (4) any recovery well;
  - (5) any well with a design deviation from the standards specified under the rules of this Subchapter, including wells for which a variance is required.
- (b) The Department shall issue permits for wells used for geothermal heating and cooling, aquifer storage and recovery (ASR), or other injection purposes in accordance with 15A NCAC 02C .0200.
- (c) The Department shall issue permits for private drinking water wells in accordance with 15A NCAC 02C .0300, including private drinking water wells with a designed capacity greater than 100,000 gallons per day and private drinking water wells for which a variance is required.
- (d) An application for any well requiring a permit pursuant to Paragraph (a) of this Rule shall be submitted by the owner or his or her agent. In the event that the permit applicant is not the owner of the property where the well or well system is to be constructed, the permit application shall contain written approval from the property owner and a statement that the applicant assumes total responsibility for ensuring that the well(s) will be located, constructed, maintained and abandoned in accordance with the requirements of this Subchapter.
- (e) The application shall be submitted to the Department on forms furnished by the Department, which shall include the following:
  - (1) the owner's name;
  - (2) the owner's mailing address and proposed well site address;
  - (3) description of the well type and activity requiring a permit;
  - (4) site location (map);

- (5) a map of the site, to scale, showing the locations of:
    - (A) all property boundaries, at least one of which is referenced to a minimum of two landmarks such as identified roads, intersections, streams or lakes within 500 feet of proposed well or well system;
    - (B) all existing wells, identified by type of use, within 500 feet of proposed well or well system;
    - (C) the proposed well or well system;
    - (D) any test borings within 500 feet of proposed well or well system; and
    - (E) all sources of known or potential groundwater contamination, such as septic tank systems; pesticide, chemical or fuel storage areas; animal feedlots, as defined by G.S. 143-215.10B(5); landfills or other waste disposal areas within 500 feet of the proposed well.
  - (6) the well contractor's name and state certification number, if known; and
  - (7) a construction diagram of the proposed well(s) including specifications describing all materials to be used and methods of construction.
- (f) For water supply wells or well systems with a designed capacity of 100,000 gpd or greater, the application shall include, in addition to the information required in Paragraph (e) of this Rule:
- (1) the number, yield and location of existing wells in the system;
  - (2) the water system's name and reference number if already a public water supply system;
  - (3) the designed capacity of the proposed well(s);
  - (4) for wells to be screened in multiple zones or aquifers, representative data on the static water level and pH, specific conductance, and concentrations of sodium, potassium, calcium, magnesium, sulfate, chloride, and carbonates from each aquifer or zone from which water is proposed to be withdrawn. The data submitted shall demonstrate that construction of the proposed well will satisfy the requirements of 15A NCAC 02C .0107(h)(2);
  - (5) a copy of any water use permit required pursuant to G.S. 143-215.15; and
  - (6) any other well construction information or site specific information as requested by the Department to ensure compliance with G.S. 87-84.
- (g) For those monitoring wells with a design deviation from the specifications of 15A NCAC 02C .0108 of this Section, in addition to the information required in Paragraph (e) of this Rule, the application shall include:
- (1) a description of the subsurface conditions to evaluate the site. Data from test borings, wells, and pumping tests may be necessary;
  - (2) a description of the quantity, character and origin of the contamination;
  - (3) justification for the necessity of the design deviation; and
  - (4) any other well construction information or site specific information as requested by the Department to ensure compliance with G.S. 87-84.
- (h) For those recovery wells with a design deviation from the specifications in 15A NCAC 02C .0108 of this Section, in addition to the information required in Paragraphs (e) and (g) of this Rule, the application shall describe the disposition of any fluids recovered if the disposal of those fluids will have an impact on any existing wells other than those installed for the purpose of measuring the effectiveness of the recovery well(s).
- (i) In the event of an emergency, any well listed in Subparagraph (a)(1) through (a)(4) of this Rule may be constructed after verbal approval is provided by the Department. After-the-fact written applications shall be submitted by the person responsible for drilling or owner within 10 days after construction begins. The application shall include construction details of the well(s) and include the name of the person who gave verbal approval and the time and date that approval was given.
- (j) The well owner or his or her agent, and the North Carolina certified well contractor shall see that a permit is secured prior to the beginning of construction of any well for which a permit is required under the rules of this Subchapter.

*History Note: Authority G.S. 87-87; 143-215.1;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; March 1, 1985; September 1, 1984; April 20, 1978;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0106 WATER USE PERMIT**

*History Note: Authority G.S. 143-215.14; 143-215.15;  
 Eff. February 1, 1976;  
 Repealed Eff. April 20, 1978.*

**15A NCAC 02C .0107 STANDARDS OF CONSTRUCTION: WATER SUPPLY WELLS**

(a) Location.

- (1) A water supply well shall not be located in any area where surface water or runoff will accumulate around the well due to depressions, drainage ways, and other landscapes that will concentrate water around the well.
- (2) The horizontal separation between a water supply well and potential sources of groundwater contamination that exist at the time the well is constructed shall be no less than as follows unless otherwise specified in Subparagraph (a)(3) of this Rule:
  - (A) Single-family dwelling with septic tank and drainfield, including the drainfield repair area 50 feet
  - (B) Single-family dwelling with septic tank and drainfield, including the drainfield repair area in sapolite system as described in 15A NCAC 18A .1956 100 feet
  - (C) All other facilities with septic tank and drainfield, including drainfield repair area 100 feet
  - (D) Other subsurface ground absorption waste disposal system 100 feet
  - (E) Industrial or municipal residuals disposal or wastewater-irrigation sites 100 feet
  - (F) Industrial or municipal sewage or liquid-waste collection or sewer main, constructed to water main standards in the American Water Works Association (AWWA) Standards C600 and/or C900, which can be obtained from AWWA at American Water Works Association, 6666 West Quincy Avenue, Denver, CO 80235, at a cost of one hundred and four dollars (\$104.00) 50 feet
  - (G) Water-tight sewer lateral line from a residence or other non-public system to a sewer main or other wastewater disposal system 25 feet
  - (H) Other sewage and liquid-waste collection or transfer facility 100 feet
  - (I) Cesspools and privies 100 feet
  - (J) Animal feedlots, as defined by G.S. 143-215 10B(5), or manure or litter piles 100 feet
  - (K) Fertilizer, pesticide, herbicide, or other chemical storage areas 100 feet
  - (L) Non-hazardous waste storage, treatment, or disposal lagoons 100 feet
  - (M) Sanitary landfills, municipal solid waste landfill facilities, incinerators, construction and demolition (C&D) landfills, and other disposal sites except Land Clearing and Inert Debris landfills 500 feet
  - (N) Land Clearing and Inert Debris (LCID) landfills 100 feet
  - (O) Animal barns 100 feet
  - (P) Building perimeters, including any attached structures that need a building permit, such as garages, patios, or decks, regardless of foundation construction type 25 feet
  - (Q) Surface water bodies that act as sources of groundwater recharge, such as ponds, lakes, and reservoirs 50 feet
  - (R) All other surface water bodies, such as brooks, creeks, streams, rivers, sounds, bays, and tidal estuaries 25 feet
  - (S) Chemical or petroleum fuel underground storage tank systems regulated under 15A NCAC 02N:
    - (i) with secondary containment 50 feet
    - (ii) without secondary containment 100 feet
  - (T) Above ground or underground storage tanks that contain petroleum fuels used for heating equipment, boilers, or furnaces, with the exception of tanks used solely for storage of propane, natural gas, or liquefied petroleum gas 50 feet
  - (U) All other petroleum or chemical storage tank systems 100 feet
  - (V) Gravesites 50 feet
  - (W) Coal ash landfills or impoundments 200 feet

- (X) All other potential sources of groundwater contamination 50 feet
- (3) For a water supply well as defined in G.S. 87-85(13) on a lot serving a single-family dwelling and intended for domestic use, where lot size or other fixed conditions preclude the separation distances specified in Subparagraph (a)(2) of this Rule, the required horizontal separation distances shall be the maximum possible but shall in no case be less than the following:
  - (A) Industrial or municipal sewage or liquid-waste collection or sewer main, constructed to water main standards as stated in the AWWA Standards C600 and/or C900 25 feet
  - (B) Animal barns 50 feet
- (4) In addition to the separation distances specified in Subparagraph (a)(2) of this Rule, a well or well system with a designed capacity of 100,000 gallons per day (GPD) or greater shall be located a sufficient distance from known or anticipated sources of groundwater contamination so as to prevent a violation of groundwater quality standards specified in 15A NCAC 02L .0202 resulting from the movement of contaminants in response to the operation of the well or well system at the proposed rate and schedule of pumping.
- (5) Wells drilled for public water supply systems regulated by the Public Water Supply Section of the Division of Water Resources shall meet the requirements of 15A NCAC 18C.
- (b) Source of water.
  - (1) The source of water for any water supply well shall not be from a water bearing zone or aquifer that is contaminated;
  - (2) In designated areas described in 15A NCAC 02C .0117 of this Section, the source shall be greater than 43 feet below land surface;
  - (3) In designated areas described in 15A NCAC 02C .0116 of this Section, the source may be less than 20 feet below land surface, but in no case less than 10 feet below land surface;
  - (4) For wells constructed with separation distances less than those specified in Subparagraph (a)(2) of this Rule based on lot size or other fixed conditions as specified in Subparagraph (a)(3) of this Rule, the source shall be greater than 43 feet below land surface except in areas described in Rule .0116 of this Section; and
  - (5) In all other areas the source shall be at least 20 feet below land surface.
- (c) Drilling Fluids. Drilling Fluids shall not contain organic or toxic substances or include water obtained from surface water bodies or water from a non-potable supply and shall be comprised only of:
  - (1) The formational material encountered during drilling; or
  - (2) Materials manufactured specifically for the purpose of borehole conditioning or water well construction.
- (d) Casing.
  - (1) If steel casing is used:
    - (A) The casing shall be new, seamless, or electric-resistance welded galvanized or black steel pipe. Galvanizing shall be done in accordance with requirements of ASTM A53/A53M-07, which is hereby incorporated by reference, including subsequent amendments and editions and can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C 700, West Conshohocken, PA, 19428-2959 at a cost of eighty dollars and forty cents (\$80.40);
    - (B) The casing, threads and couplings shall meet or exceed the specifications of ASTM A53/A53M-07 or A589/589M-06, which is hereby incorporated by reference, including subsequent amendments and editions, and can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C 700, West Conshohocken, PA, 19428-2959 at a cost of eighty dollars and forty cents (\$80.40), and fifty-two dollars (\$52.00), respectively;
    - (C) The wall thickness for a given diameter shall equal or exceed that specified in Table 1;

TABLE 1: MINIMUM WALL THICKNESS FOR STEEL CASING:

Nominal Diameter	Wall Thickness
(inches)	(inches)
For 3.5 inch or smaller pipe, Schedule 40 is required	

4	0.142
5	0.156
5.5	0.164
6	0.185
8	0.250
10	0.279
12	0.330
14 and larger	0.375

- (D) Stainless steel casing, threads, and couplings shall conform in specifications to the general requirements in ASTM A530/A530M-04a, which is hereby incorporated by reference, including subsequent amendments and editions and can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C 700, West Conshohocken, PA, 19428-2959 at a cost of forty-six dollars (\$46.00), and also shall conform to the specific requirements in the ASTM standard that best describes the chemical makeup of the stainless steel casing that is intended for use in the construction of the well;
  - (E) Stainless steel casing shall have a minimum wall thickness that is equivalent to standard Schedule number 10S;
  - (F) Steel casing shall be equipped with a drive shoe if the casing is driven in a consolidated rock formation. The drive shoe shall be made of forged, high carbon, tempered seamless steel and shall have a beveled, hardened cutting edge; and
  - (G) Any materials containing lead shall meet NSF 61 standards, which can be obtained from NSF International at a cost of three hundred and twenty-five dollars (\$325.00), or NSF 372 standards, which can be obtained at a cost of fifty-five dollars (\$55.00). Both standards can be obtained from NSF International, P.O. Box 130140, 789 N. Dixboro Road, Ann Arbor, MI 48105.
- (2) If thermoplastic casing is used:
- (A) The casing shall be new and manufactured in compliance with standards of ASTM F480-14, which is hereby incorporated by reference including subsequent amendments and editions, and can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C 700, West Conshohocken, PA, 19428-2959 at a cost of sixty-seven dollars (\$67.00);
  - (B) The casing and joints shall meet or exceed all the specifications of ASTM F480-06b, except that the outside diameters shall not be restricted to those listed in ASTM F480-06b, which is hereby incorporated by reference, including subsequent amendments and editions and can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C 700, West Conshohocken, PA, 19428-2959 at a cost of eighty dollars and forty cents (\$80.40);
  - (C) The depth of installation for a given Standard Dimension Ratio (SDR) or Schedule number thickness shall not exceed that listed in Table 2 unless the Department is

provided written documentation from the manufacturer of the casing stating that the casing may safely be used at the depth at which it is to be installed is provided.

TABLE 2: Maximum allowable depths (in feet) of Installation of Thermoplastic Water Well Casing. Dimensional standards for PVC pipe are specified in ASTM F 480-14.

Nominal Diameter (inches)	Maximum Depth (in feet) for Schedule 40	Maximum Depth (in feet) for Schedule 80
2	485	1460
3	415	1170
3.5	315	920
4	253	755
5	180	550
6	130	495
8	85	340
10	65	290
12	65	270
14	50	265
16	50	255

	Maximum Depth (in feet) for SDR 21	Maximum Depth (in feet) for SDR 17	Maximum Depth (in feet) for SDR 13.5
All Diameters	185	355	735

- (D) Thermoplastic casing with wall thickness less than that corresponding to SDR 21 or Schedule 40 shall not be used;
  - (E) For wells in which the casing will extend into consolidated rock, thermoplastic casing shall be equipped with a coupling or other device approved by the manufacturer of the casing as sufficient to protect the physical integrity of the thermoplastic casing during the processes of seating and grouting the casing and subsequent drilling operations;
  - (F) Thermoplastic casing shall not be driven by impact, but may be pushed;
  - (G) PVC well casing joints shall meet the requirements of ASTM F 480-14; and
  - (H) Screws or similar mechanical fasteners shall not be used for joining PVC well casing.
- (3) In constructing any well, all water-bearing zones that contain contaminated, saline, or other non-potable water shall be cased and grouted so that contamination of overlying and underlying groundwater zones will not occur.
- (4) Every well shall be cased so that the bottom of the casing extends to the following depths:
- (A) Wells located within the area described in Rule .0117 of this Section shall be cased from land surface to a depth of at least 43 feet.

- (B) Wells located within the area described in Rule .0116 of this Section shall be cased from land surface to a depth of at least 10 feet.
  - (C) Wells constructed with separation distances less than those specified in Subparagraph (a)(2) of this Rule based on lot size or other fixed conditions as specified in Subparagraph (a)(3) of this Rule shall be cased from land surface to a depth of at least 43 feet except in areas described in Rule .0116 of this Section.
  - (D) Wells located in any other area shall be cased from land surface to a depth of at least 20 feet.
  - (5) The top of the casing shall be terminated at least 12 inches above land surface, regardless of the method of well construction and type of pump to be installed.
  - (6) The casing in wells constructed to obtain water from a consolidated rock formation shall meet the requirements of Subparagraphs (d)(1) through (d)(5) of this Rule and shall:
    - (A) prevent any formational material from entering the well in excess of the levels specified in Paragraph (h) of this Rule; and
    - (B) firmly be seated at least five feet into the rock.
  - (7) The casing in wells constructed to obtain water from an unconsolidated rock formation (such as gravel, sand, or shells) shall extend at least one foot into the top of the water-bearing formation.
  - (8) Upon completion of the well, the well shall be sufficiently free of obstacles including formation material as necessary to allow for the installation and proper operation of pumps and associated equipment.
  - (9) Prior to removing equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85(16), to preclude the entrance of contaminants into the well.
- (e) Allowable Grouts.
- (1) One of the following grouts shall be used wherever grout is required by a rule of this Section. Where a particular type of grout is specified by a rule of this Section, no other type of grout shall be used.
    - (A) Neat cement grout shall consist of a mixture of not more than six gallons of clear, potable water to one 94 pound bag of Portland cement. Up to five percent, by weight, of untreated Wyoming sodium bentonite may be used to improve flow and reduce shrinkage. The Wyoming sodium bentonite shall be 200 mesh with a yield rating of 90 barrels per ton. If bentonite is used, additional water may be added at a rate not to exceed 0.6 gallons of water for each pound of untreated Wyoming sodium bentonite.
    - (B) Sand cement grout shall consist of a mixture of not more than two parts sand and one part cement and not more than six gallons of clear, potable water per 94 pound bag of Portland cement.
    - (C) Concrete grout shall consist of a mixture of not more than two parts gravel or rock cuttings to one part cement and not more than six gallons of clear, potable water per 94 pound bag of Portland cement. One hundred percent of the gravel or rock cuttings must be able to pass through a one-half inch mesh screen.
    - (D) Bentonite slurry grout shall consist of a mixture of not more than 24 gallons of clear, potable water to one 50 pound bag of commercial granular Wyoming sodium bentonite. Non-organic, non-toxic substances may be added to bentonite slurry grout mixtures to improve particle distribution and pumpability. Bentonite slurry grout may only be used in accordance with the manufacturer's written instructions.
    - (E) Bentonite chips or pellets shall consist of pre-screened Wyoming sodium bentonite chips or compressed sodium bentonite pellets with largest dimension of at least one-fourth inch but not greater than one-fifth of the width of the annular space into which they are to be placed. Bentonite chips or pellets shall be hydrated in place. Bentonite chips or pellets shall only be used in accordance with the manufacturer's written instructions.
    - (F) Specialty grout shall consist of a mixture of non-organic, non-toxic materials with characteristics of expansion, chemical-resistance, rate or heat of hydration, viscosity, density, or temperature-sensitivity applicable to specific grouting requirements. Specialty grouts shall not be used without prior approval by the Director. A request for approval of a specialty grout shall be submitted to the Director and shall include the following information:

- (i) a demonstration of non-toxicity, such as American National Standard Institute (ANSI) or National Sanitation Foundation, Inc. (NSF) Standard 60 certification, which is hereby incorporated by reference including subsequent amendments and editions, and can be obtained from NSF International, P.O. Box 130140, 789 North Dixboro Road, Ann Arbor, MI 48105 at a cost of three hundred and twenty-five dollars (\$325.00);
  - (ii) the results of an independent laboratory that demonstrate the finished product has a permeability of less than  $1 \times 10^{-6}$  centimeters per second and, if the product is used in areas of brackish or saline groundwater, the grout will not degrade over the lifetime of the well;
  - (iii) a general procedure for mixing and emplacing the grout;
  - (iv) the types of wells the request would apply to; and
  - (v) any other additional information the Department needs to ensure compliance with G.S. 87-84 as requested by the Department.
- (2) With the exception of bentonite chips or pellets, the liquid and solid components of all grout mixtures shall be blended prior to emplacement below land surface.
  - (3) No fly ash, other coal combustion byproducts, or other wastes shall be used in any grout.
- (f) Grout emplacement.
- (1) Casing shall be grouted to a minimum depth of twenty feet below land surface except that in those areas designated in Rule .0116 of this Section, grout shall extend to a depth of two feet above the screen or, for open end wells, to the bottom of the casing, but in no case less than 10 feet.
  - (2) In addition to the grouting required by Subparagraph (f)(1) of this Rule, the casing shall be grouted as necessary to seal off all aquifers or zones that contain contaminated, saline, or other non-potable water so that contamination of overlying and underlying aquifers or zones shall not occur.
  - (3) Bentonite slurry grout may be used in that portion of the borehole that is at least three feet below land surface. That portion of the borehole from land surface to at least three feet below land surface shall be filled with a concrete or cement-type grout or bentonite chips or pellets that are hydrated in place.
  - (4) Grout shall be placed around the casing by one of the following methods:
    - (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the annular space around the casing and overflows at the surface;
    - (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the annular space that can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application; or
    - (C) Other. Grout may be emplaced in the annular space by gravity flow to ensure complete filling of the space. Gravity flow shall not be used if water or any visible obstruction is present in the annular space within the applicable minimum grout depth specified in Subparagraph (f)(1) of this Rule at the time of grouting, with the exception that bentonite chips or pellets may be used if water is present and if designed for that purpose.
  - (5) If a rule of this Section requires grouting of the casing to a depth greater than 20 feet below land surface, the pumping or pressure method shall be used to grout that portion of the borehole deeper than 20 feet below land surface, with the exception of bentonite chips and pellets used in accordance with Part (f)(4)(C) of this Rule.
  - (6) If an outer casing is installed, it shall be grouted by either the pumping or pressure method.
  - (7) Bentonite chips or pellets shall be used in compliance with all manufacturer's instructions including pre-screening the material to eliminate fine-grained particles, installation rates, hydration methods, tamping, and other measures to prevent bridging.
  - (8) Bentonite grout shall not be used to seal zones of water with a chloride concentration of 1,500 milligrams per liter or greater. For wells installed on the barrier island from the Virginia state line south to Ocracoke Inlet, chloride concentrations shall be documented and reported as required by 15A NCAC 02C .0114(1)(E).
  - (9) The well shall be grouted within seven days after the casing is set. If the well penetrates any water-bearing zone that contains saline water, the well shall be grouted within one day after the casing is set.

- (10) No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.
  - (11) If grouting is required by the provisions of this Section, the grout shall extend outward in all directions from the casing wall to a minimum thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater.
  - (12) In no case shall a well be required to have an annular grout seal thickness greater than four inches.
  - (13) For wells constructed in locations where flowing artesian conditions are encountered the well shall be grouted to protect the artesian aquifer, prevent erosion of overlying material, and confine the flow within the casing.
- (g) Well Screens.
- (1) The well, if constructed to obtain water from an unconsolidated rock formation, shall be equipped with a screen that will prevent the entrance of formation material into the well after the well has been developed and completed.
  - (2) The well screen shall be of a design to permit the optimum development of the aquifer with minimum head loss consistent with the intended use of the well. The openings shall be designed to prevent clogging and shall be free of rough edges, irregularities, or other defects that may accelerate or contribute to corrosion or clogging.
  - (3) Multi-screen wells shall not connect aquifers or zones that have differences in water quality or potentiometric surfaces that would result in contamination of any aquifer or zone.
- (h) Gravel and Sand-Packed Wells.
- (1) In constructing a gravel-or sand-packed well:
    - (A) The packing material shall be composed of quartz, granite, or similar mineral or rock material and shall be of uniform size, water-washed, and free from clay, silt, and toxic materials.
    - (B) The size of the packing material shall be determined from a grain size analysis of the formation material and shall be of a size sufficient to prohibit the entrance of formation material into the well in concentrations above those permitted by Paragraph (i) of this Rule.
    - (C) The packing material shall be placed in the annular space around the screens and casing by a fluid circulation method to ensure accurate placement and avoid bridging.
    - (D) The packing material shall be disinfected.
  - (2) The packing material shall not connect aquifers or zones that have differences in water quality that would result in contamination of any aquifer or zone.
- (i) All water supply wells shall be developed by the well contractor. Development shall include removal of formation materials, mud, drilling fluids, and additives, such that the water contains no more than:
- (1) Five milliliters per liter of settleable solids; and
  - (2) Ten NTUs of turbidity as suspended solids.
- Development does not require efforts to reduce or eliminate the presence of dissolved constituents that are indigenous to the ground water quality in that area.
- (j) Well Head Completion.
- (1) Access Port. Every water supply well shall be equipped with a usable access port or air line, except for the following: a multi-pipe deep well with jet pump or adapter mounted on the well casing or well head; and wells with casing two inches or less in diameter if a suction pipe is connected to a suction lift pump. The access port shall be at least one half inch inside the diameter opening so that the position of the water level can be determined. The port shall be installed and maintained in such manner as to prevent entrance of water or foreign material.
  - (2) Well Contractor Identification Plate.
    - (A) An identification plate, showing the well contractor and certification number and the information specified in Part (j)(2)(E) of this Rule, shall be installed on the well within 72 hours after completion of the drilling.
    - (B) The identification plate shall be constructed of a durable weatherproof, rustproof metal or other material approved by the Department as equivalent.
    - (C) The identification plate shall be permanently attached to either the aboveground portion of the well casing, surface grout pad, or enclosure floor around the casing where it is visible and in a manner that does not obscure the information on the identification plate.
    - (D) The identification plate shall not be removed.

- (E) The identification plate shall be stamped to show the following:
  - (i) the total depth of well;
  - (ii) the casing depth (feet) and inside diameter (inches);
  - (iii) the screened intervals of screened wells;
  - (iv) the packing interval of gravel-packed or sand-packed wells;
  - (v) the yield, in gallons per minute (gpm) or specific capacity in gallons per minute per foot of drawdown (gpm/ft. of drawdown);
  - (vi) the static water level and the date it was measured;
  - (vii) the date the well was completed.
- (3) Pump Installation Information Plate.
  - (A) An information plate, showing the well contractor and certification number of the person installing the pump and the information specified in Part (j)(3)(D) of this Rule, shall be permanently attached to either the aboveground portion of the well casing, the surface grout pad, or the enclosure floor, if present, where it is visible and in a manner that does not obscure the information on the identification plate, within 72 hours after completion of the pump installation;
  - (B) The information plate shall be constructed of a durable, waterproof, rustproof metal or other material approved by the Department;
  - (C) The information plate shall not be removed; and
  - (D) The information plate shall be stamped or engraved to show the following:
    - (i) the date the pump was installed;
    - (ii) the depth of the pump intake; and
    - (iii) the horsepower rating of the pump.
- (4) Controlled flow. Every artesian flowing well shall be constructed, equipped, and operated to prevent the uncontrolled discharge of groundwater. Flow discharge control shall be provided to conserve the groundwater resource and prevent or reduce the loss of artesian hydraulic head. Flow control may consist of valved pipe connections, watertight pump connections, receiving tank, flowing well pitless adapter, packer, or other methods approved by the Department to prevent the loss of artesian hydraulic head and stop the flow of water as referenced in G.S. 87-88(d). Well owners shall be responsible for the operation and maintenance of the valve.
- (5) Pitless adapters or pitless units shall be allowed as a method of well head completion under the following conditions:
  - (A) Design, installation, and performance standards are those specified in PAS-97(04), which is hereby incorporated by reference including subsequent amendments and editions and can be obtained from the Water System Council National Programs Office, 1101 30<sup>th</sup> Street, N.W., Suite 500, Washington, DC 20007 at no cost;
  - (B) The pitless device is compatible with the well casing;
  - (C) The top of the pitless unit extends at least 12 inches above land surface;
  - (D) The excavation surrounding the casing and pitless device is filled with grout from the top of the casing grout to the land surface; and
  - (E) The pitless device has an access port.
- (6) All openings for piping, wiring, and vents shall enter into the well at least 12 inches above land surface, except where pitless adapters or pitless units are used, and shall be sealed to preclude the entrance of contaminants into the well. The final land surface grade adjacent to the well head shall be such that surface water is diverted away from the well.

*History Note: Authority G.S. 87-87; 87-88; S.L. 2018-65; Eff. February 1, 1976; Amended Eff. May 14, 2001; December 1, 1992; March 1, 1985; September 1, 1984; April 20, 1978; Temporary Amendment Eff. August 3, 2001; Amended Eff. September 1, 2009; August 1, 2002; Readopted Eff. June 15, 2020.*

**15A NCAC 02C .0108 STANDARDS OF CONSTRUCTION: WELLS OTHER THAN WATER SUPPLY**

- (a) No well shall be located, constructed, operated, or repaired in any manner that may adversely impact the quality of groundwater.
  - (b) Injection wells shall conform to the standards set forth in Section .0200 of this Subchapter.
  - (c) Monitoring wells and recovery wells shall be located, designed, constructed, operated, and abandoned with materials and by methods that are compatible with the chemical and physical properties of the contaminants involved, specific site conditions, and specific subsurface conditions.
  - (d) Monitoring well and recovery well boreholes shall not penetrate to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered. Any portion of the borehole that extends to a depth greater than the depth to be monitored or the depth from which contaminants are to be recovered shall be grouted completely to prevent vertical migration of contaminants.
  - (e) The well shall not hydraulically connect:
    - (1) separate aquifers; or
    - (2) those portions of a single aquifer where contamination occurs in separate and definable layers within the aquifer.
  - (f) The well construction materials used shall be structurally stable, corrosion resistant, and non-reactive based upon the depth of the well and any contaminants to be monitored or recovered.
  - (g) The well shall be constructed in such a manner that water or contaminants from the land surface cannot migrate along the borehole annulus into any packing material or well screen area.
  - (h) In non-water supply wells, packing material placed around the screen shall extend one foot or greater above the top of the screen and a one foot or greater thick seal, comprised of chip or pellet bentonite or other material approved by the Department as equivalent, shall be emplaced directly above and in contact with the packing material. If shallow groundwater is observed within five feet or less of land surface during well construction, the packing material and seal shall comply with Paragraph (j) of this Rule.
  - (i) In non-water supply wells, grout shall be placed in the annular space between the outermost casing and the borehole wall from the land surface to the top of the bentonite seal above any well screen or to the bottom of the casing for open end wells. The grout shall comply with Paragraph (e) of Rule .0107 of this Section.
  - (j) For non-water supply wells in which the stabilized water table is visible within five feet of land surface during well installation or field investigation activities, well construction shall meet each of the following requirements:
    - (1) Packing material placed in the annular space around the well screen shall extend six inches or greater above the top of the screen;
    - (2) A six-inch or greater thick seal comprised of chip or pellet bentonite shall be placed in the annular space above and in direct contact with the packing material;
    - (3) A one-foot or greater seal of concrete or cement grout shall be installed in the annular space from land surface to the top of the bentonite seal (upper one foot of well horizon); and
    - (4) Shallow wells of this class shall be equipped with a two-foot or greater concrete pad around the well, flush with the land surface to prevent surface water infiltration.
- If a well is installed under this Paragraph, the existence of a shallow water table shall be verified by a NC certified well contractor, licensed professional engineer, geologist, or soil scientist and noted on all documents or reporting forms submitted.
- (k) All wells shall be grouted within seven days after the casing is set. If the well penetrates any water-bearing zone that contains contaminated or saline water, the well shall be grouted within one day after the casing is set.
  - (l) All non-water supply wells, including temporary wells, shall be secured with a locking well cap to ensure against unauthorized access and use.
  - (m) All non-water supply wells shall be equipped with a steel outer well casing or flush-mount cover, set in concrete, and other measures to protect the well from damage by normal site activities.
  - (n) Any well that would flow under natural artesian conditions shall be valved so that the flow can be regulated.
  - (o) In non-water supply wells, the well casing shall be terminated no less than 12 inches above land surface unless all of the following conditions are met:
    - (1) site-specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; and
    - (2) the well head is completed in such a manner so as to preclude surficial contaminants from entering the well.
  - (p) Each non-water supply well shall have permanently affixed an identification plate. The identification plate shall be constructed of a durable, waterproof, or rustproof material and shall contain the following information:
    - (1) well contractor's name and certification number;
    - (2) the date the well was completed;

- (3) the total depth of the well;
  - (4) a warning that the well is not for water supply and that the groundwater may contain hazardous materials;
  - (5) the depth to the top and bottom of each screen; and
  - (6) the well identification number or name assigned by the well owner.
- (q) Each non-water supply well shall be developed such that the level of turbidity or settleable solids does not preclude accurate chemical analyses of any fluid samples collected or adversely affect the operation of any pumps or pumping equipment.
- (r) Wells constructed for the purpose of monitoring or testing for the presence of liquids associated with tanks regulated under 15A NCAC 02N shall be constructed in accordance with 15A NCAC 02N .0504.
- (s) Wells constructed for the purpose of monitoring for the presence of vapors associated with tanks regulated under 15A NCAC 02N shall:
- (1) be constructed in such a manner as to prevent the entrance of surficial contaminants or water into or alongside the well casing; and
  - (2) be provided with a locking well cap to ensure against unauthorized access and use.
- (t) Temporary wells and all other non-water supply wells shall be constructed in such a manner as to preclude the vertical migration of contaminants within and along the borehole channel.
- (u) Geotechnical borings advanced for building activities, such as foundation testing and road bed strength evaluations shall not be considered wells as defined in G.S. 87-85(14) if they are immediately abandoned after use pursuant to Rule .0113(d)(1) of this Section. These borings shall not require submittal of a well construction or abandonment record pursuant to Rule .0114 of this Section.
- (v) Soil borings advanced for such activities as collecting soil samples for contamination assessment or characterization soil profiles shall not be considered wells as defined in G.S. 87-85(14) if they are not intended to penetrate the water table and are abandoned after samples are collected pursuant to Rule .0113(d)(1) of this Section. These borings shall not require submittal of a well construction or well abandonment records pursuant to Rule .0114 of this Section.

*History Note: Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0109 PUMPS AND PUMPING EQUIPMENT**

- (a) The pumping capacity of the pump shall be consistent with the intended use and yield characteristics of the well.
  - (b) The pump and related equipment for the well shall be located to permit easy access and removal for repair and maintenance.
  - (c) The base plate of a pump placed directly over the well shall be designed to form a watertight seal with the well casing or pump foundation.
  - (d) In installations where the pump is not located directly over the well, the annular space between the casing and pump intake or discharge piping shall be closed with a watertight seal.
  - (e) The well head shall be equipped with a screened vent to allow for the pressure changes within the well unless a suction lift pump or single-pipe jet pump is used or artesian flowing well conditions are encountered.
  - (f) The person installing the pump in any water supply well shall install a threadless sampling tap at the wellhead for obtaining water samples except:
    - (1) In the case of suction pump or offset jet pump installations the threadless sampling tap shall be installed on the return (pressure) side of the pump piping; and
    - (2) In the case of pitless adapter installations, the threadless sampling tap shall be located upstream of the water storage tank.
- The threadless sampling tap shall be turned downward, located a minimum of 12 inches above land surface, floor, or well pad, and positioned such that a water sample can be obtained without interference from any part of the wellhead. If the wellhead is also equipped with a threaded hose bibb in addition to the threadless sampling tap, the hose bibb shall be fitted with a backflow preventer or vacuum breaker.
- (g) A priming tee shall be installed at the well head in conjunction with offset jet pump installations.
  - (h) Joints of any suction line installed underground between the well and pump shall be tight under system pressure.

- (i) The drop piping and electrical wiring used in connection with the pump shall meet all applicable underwriters specifications.
- (j) Only potable water shall be used for priming the pump.
- (k) Any materials containing lead shall meet NSF 61 standards.

*History Note: Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009, December 1, 1992; April 20, 1978;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0110 WELL TESTS FOR YIELD**

(a) Every domestic well shall be tested for capacity by one of the following methods:

- (1) Pump Method
  - (A) select a permanent measuring point, such as the top of the casing;
  - (B) measure and record the static water level below or above the measuring point prior to starting the pump;
  - (C) measure and record the discharge rate at intervals of 10 minutes or less;
  - (D) measure and record water levels using a steel or electric tape at intervals of 10 minutes or less;
  - (E) continue the test for a period of at least one hour; and
  - (F) make measurements within an accuracy of plus or minus one inch.
- (2) Bailer Method
  - (A) select a permanent measuring point, such as the top of the casing;
  - (B) measure and record the static water level below or above the measuring point prior to starting the bailing procedure;
  - (C) bail the water out of the well for a period of one hour or longer;
  - (D) determine and record the bailing rate in gallons per minute at the end of the bailing period; and
  - (E) measure and record the water level after stopping bailing process.
- (3) Air Rotary Drill Method
  - (A) measure and record the amount of water being injected into the well during drilling operations;
  - (B) measure and record the discharge rate in gallons per minute at intervals of one hour or less during drilling operations;
  - (C) after completion of the drilling, continue to blow the water out of the well for 30 minutes or longer and measure and record the discharge rate in gallons per minute at intervals of 10 minutes or less during the period; and
  - (D) measure and record the water level after discharge ceases.
- (4) Air Lift Method. Measurements shall be made through a pipe placed in the well. The pipe shall have an inside diameter of at least five-tenths of an inch or greater and shall extend from top of the well head to a point inside the well that is below the bottom of the air line.
  - (A) Measure and record the static water level prior to starting the air compressor;
  - (B) Measure and record the discharge rate at intervals of 10 minutes or less;
  - (C) Measure and record the pumping level using a steel or electric tape at intervals of 10 minutes or less; and
  - (D) Continue the test for a period of one hour or longer.

(b) Public, Industrial, and Irrigation Wells. Every industrial or irrigation well and, if required by rule adopted by the Commission for Public Health, every well serving a public water supply system upon completion shall be tested for capacity by the following or equivalent method:

- (1) The water level in the well to be pumped and in all observation wells shall be measured and recorded prior to starting the test.
- (2) The well shall be tested by a pump of sufficient size and lift capacity to test the yield of the well, consistent with the well diameter and purpose.
- (3) The pump shall be equipped with throttling devices to reduce the discharge rate to approximately 25 percent of the maximum capacity of the pump.

- (4) The test shall be conducted for a period of 24 hours or longer without interruption and, except for wells constructed in Coastal Plain aquifers, shall be continued for a period of four hours or longer after the pumping water level stabilizes.
- (5) The pump discharge shall be set at a constant rate or rates that can be maintained throughout the testing period. If the well is tested at two or more pumping rates (a step-drawdown test), pumping at each pumping rate shall continue to the point that the pumping water level declines no more than 0.1 feet per hour for a period of four hours or more for each pumping rate, except for wells constructed to Coastal Plain aquifers. In wells constructed in Coastal Plain aquifers, pumping at each pumping rate shall continue for four hours or longer.
- (6) The pump discharge rate shall be measured by an orifice meter, flowmeter, weir, or equivalent metering device. The metering device used shall have a calibration accuracy within plus or minus five percent of a known standard.
- (7) The discharge rate of the pump and time shall be measured and recorded at intervals of 10 minutes or less during the first two hours of the pumping period for each pumping rate. If the pumping rate is constant after the first two hours of pumping, discharge measurements and recording may be made at longer time intervals not to exceed one hour.
- (8) The water level in each well and time shall be measured and recorded at intervals of five minutes or less during the first hour of pumping and at intervals of 10 minutes or less during the second hour of pumping. After the second hour of pumping, the water level in each well shall be measured at such intervals that the lowering of the pumping water level does not exceed three inches between measurements.
- (9) A reference point for water level measurements shall be selected and recorded for the pumping well and each observation well to be measured during the test. All water level measurements shall be made from the selected reference points, which shall be permanently marked.
- (10) All water level measurements shall be made with a steel or electric tape or equivalent measuring device.
- (11) All water level measurements shall be made within an accuracy of plus or minus one inch or to 0.1 foot.
- (12) After the completion of the pumping period, measurements of the water level recovery rate in the pumped well shall be made in the same manner as the drawdown for a period of two hours or greater.

*History Note:* Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009, April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0111 DISINFECTION OF WATER SUPPLY WELLS**

- (a) Any person constructing, repairing, testing, or performing maintenance or installing a pump in a water supply well shall disinfect the well upon completion of construction, repairs, testing, maintenance, or pump installation.
- (b) Any person disinfecting a well shall perform disinfection in accordance with the following procedures:
  - (1) Chlorination.
    - (A) Hypochlorite shall be placed in the well in sufficient quantities to produce a chlorine residual of at least 100 parts per million (ppm) in the well. Stabilized chlorine tablets or hypochlorite products containing fungicides, algacides, or other disinfectants shall not be used. Chlorine test strips or other quantitative test methods shall be used to confirm the concentration of the chlorine residual.
    - (B) The hypochlorite shall be placed in the well by one of the following or equivalent methods:
      - (i) Granular hypochlorite may be dropped in the top of the well and allowed to settle to the bottom; or
      - (ii) Hypochlorite solutions shall be placed in the bottom of the well by using a bailer or by pouring the solution through the drill rod, hose, or pipe placed in the bottom of the well. The solution shall be flushed out of the drill rod, hose, or pipe by using water or air.

- (C) The water in the well shall be agitated or circulated to ensure thorough dispersion of the chlorine.
  - (D) The well casing, pump column, and any other equipment above the water level in the well shall be rinsed with the chlorine solution as a part of the disinfecting process.
  - (E) The chlorine solution shall stand in the well for a period of 24 hours or more.
  - (F) The well shall be pumped until there is no detectable total chlorine residual in water pumped from the well before the well is placed in use.
- (2) Other alternate materials and methods of disinfection, at least as effective as those set forth in Subparagraph (b)(1) of this Rule, may be used upon prior approval by the Department. A written request for approval of alternate disinfection methods or materials shall be submitted to the Director and will be approved or denied on a case-by-case basis following a review of the information submitted in this Subparagraph. The written request shall include the following information:
- (A) a demonstration that the method of disinfection will be at least as effective as chlorination as described under in Subparagraph (b)(1) of this Rule;
  - (B) a demonstration of non-toxicity, such as ANSI or NSF Standard certification or EPA studies;
  - (C) the general procedures for the disinfection and emplacement, including the amount of product to be used per unit volume of the well;
  - (D) a demonstration that, after disinfection is completed, the water within the well will meet 15A NCAC 02L groundwater standards; and
  - (E) any other information requested by the Department to ensure compliance with G.S. 87-84.

*History Note:* Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; July 1, 1988; September 1, 1984;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0112 WELL MAINTENANCE: REPAIR: GROUNDWATER RESOURCES**

- (a) A well that is not maintained by the owner to conserve and protect the groundwater resources or that constitutes a source or channel of contamination to the water supply or any aquifer shall be permanently abandoned in accordance with Rule .0113(b) of this Section.
- (b) Wells that are used for dewatering shall be permanently abandoned in accordance with Rule .0113(b) of this Section within 30 days of completion of the dewatering activity.
- (c) All materials used in the maintenance, replacement, or repair of any well shall be in accordance with Rules .0107 and .0108 of this Section.
- (d) Broken, punctured, or otherwise defective or unserviceable casing, screens, fixtures, seals, or any part of the well head shall be repaired or replaced, or the well shall be permanently abandoned in accordance with Rule .0113(b) of this Section.
- (e) NSF International approved PVC pipe rated at 160 PSI may be used for liner pipe. The annular space around the liner casing shall be five-eighths inches or greater and shall be completely filled with neat-cement grout or sand cement grout. The well liner shall be completely grouted within 10 working days after collection of water samples or completion of other testing to confirm proper placement of the liner or within 10 working days after the liner has been installed if no sampling or testing is performed.
- (f) No well shall be repaired or altered such that the well head is completed less than 12 inches above land surface. Any grout excavated or removed as a result of the well repair shall be replaced in accordance with Rule .0107(f) of this Section.
- (g) Well rehabilitation by noncontinuous chemical treatment shall be conducted using methods and materials approved by the Department based on a demonstration that the materials and methods used will not create a violation of groundwater standards in 15A NCAC 02L, including rendering the groundwater unsuitable for its intended best use after completion of the rehabilitation. A written request for approval of a noncontinuous chemical treatment shall be submitted to the Director and shall include the following information:
  - (1) a demonstration of non-toxicity, such as ANSI or NSF Standard certification or EPA studies;

- (2) the general procedures for the rehabilitation, including the amount of product to be used per unit volume of the well;
- (3) a demonstration that, after rehabilitation is completed, the water within the well will meet 15A NCAC 02L groundwater standards;
- (4) a description of the dosing frequency; and
- (5) after submittal of request, any other information necessary for the Department to ensure compliance with G.S. 87-84.

*History Note: Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009, August 1, 2002; April 1, 2001; December 1, 1992; September 1, 1984;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0113 ABANDONMENT OF WELLS**

(a) A well that is temporarily removed from service shall be temporarily abandoned in accordance with the following procedures:

- (1) The well shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85(16), compatible with the casing and installed so that it cannot be removed without the use of hand tools or power tools.
- (2) The well shall be maintained whereby it is not a source or channel of contamination during temporary abandonment.

(b) Permanent abandonment of water supply wells other than bored or hand dug wells shall be performed in accordance with the following procedures:

- (1) All casing and screen materials may be removed prior to initiation of abandonment procedures if such removal will not cause or contribute to contamination of the groundwaters.
- (2) The entire depth of the well shall be sounded before it is sealed to ensure freedom from obstructions that may interfere with sealing operations.
- (3) Except in the case of temporary wells and monitoring wells, the well shall be disinfected in accordance with Rule .0111(b)(1)(A) through .0111(b)(1)(C) of this Section.
- (4) In the case of gravel-packed wells in which the casing and screens have not been removed, neat-cement or bentonite slurry grout shall be injected into the well, completely filling it from the bottom of the casing to the top.
- (5) Wells constructed in unconsolidated formations shall be completely filled with grout by introducing it through a pipe extending to the bottom of the well that can be raised as the well is filled.
- (6) Wells constructed in consolidated rock formations or that penetrate zones of consolidated rock may be filled with grout, sand, gravel or drill cuttings within the zones of consolidated rock. The top of any sand, gravel or cutting fill shall terminate at least 10 feet below the top of the consolidated rock or five feet below the bottom of casing. Grout shall be placed beginning 10 feet below the top of the consolidated rock or five feet below the bottom of casing in a manner to ensure complete filling of the casing, and extend up to the land surface. For any well in which the depth of casing or the depth of the bedrock is not known or cannot be confirmed, the entire length of the well shall be filled with grout up to the land surface.

(c) For bored wells or hand dug water supply wells constructed into unconsolidated material:

- (1) The well shall be disinfected in accordance with Rule .0111(b)(1)(A) through .0111(b)(1)(C) of this Section.
- (2) All plumbing or piping in the well and any other obstructions inside the well shall be removed from the well.
- (3) The uppermost three feet of well casing shall be removed from the well.
- (4) All soil or other subsurface material present down to the top of the remaining well casing shall be removed, including the material extending 12 inches or greater outside of the well casing.
- (5) The well shall be filled to the top of the remaining casing with grout, dry clay, or material excavated during construction of the well. If dry clay or material excavated during construction of the well is used, it shall be emplaced in lifts no more than five feet thick, each compacted in place prior to emplacement of the next lift.

- (6) A six-inch thick concrete grout plug shall be placed on top of the remaining casing such that it covers the entire excavated area above the top of the casing, including the area extending 12 inches or greater outside the well casing.
- (7) The remainder of the well above the concrete plug shall be filled with grout or soil.
- (d) All wells other than water supply wells, including temporary wells, monitoring wells, or test borings:
  - (1) less than 20 feet in depth that do not penetrate the water table shall be abandoned by filling the entire well up to land surface with grout, dry clay, or material excavated during drilling of the well and then compacted in place;
  - (2) greater than 20 feet in depth or that penetrate the water table shall be abandoned by completely filling with a bentonite or cement - type grout; and
  - (3) constructed in consolidated rock formations or that penetrate zones of consolidated rock may be filled with grout, sand, gravel, or drill cuttings within the zones of consolidated rock. The top of any sand, gravel or cutting fill shall terminate 10 feet or greater below the top of the consolidated rock or five feet below the bottom of the casing. Grout shall be placed beginning 10 feet below the top of the consolidated rock or five feet below the bottom of the casing in a manner to ensure complete filling of the casing and shall extend up to the land surface. For any well in which the depth of the casing or the depth of the bedrock is not known or cannot be confirmed, the entire length of the well shall be filled with grout up to the land surface.
- (e) Any well that acts as a source or channel of contamination shall be repaired or permanently abandoned within 30 days of receipt of notice from the Department.
- (f) All wells shall be permanently abandoned in which the casing has not been installed or from which the casing has been removed, prior to removing drilling equipment from the site.
- (g) The well owner is responsible for permanent abandonment of a well except that:
  - (1) the well contractor is responsible for well abandonment if abandonment is required because the well contractor improperly locates, constructs, repairs or completes the well;
  - (2) the person who installs, repairs or removes the well pump is responsible for well abandonment if that abandonment is required because of improper well pump installation, repair or removal; or
  - (3) the well contractor (or individual) who conducts a test boring is responsible for its abandonment at the time the test boring is completed.

*History Note: Authority G.S. 87-87; 87-88;  
 Eff. February 1, 1976;  
 Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0114 DATA AND RECORDS REQUIRED**

**Reports.**

- (1) A person completing or abandoning a well, including wells installed using direct push technology (DPT)(e.g., Geoprobe®), shall submit to the Division a record of the construction, on form GW-1, or abandonment, on form GW-30. For water supply wells, a copy of each completion or abandonment record shall also be submitted to the health department responsible for the county in which the well is located. The record shall be on forms provided by the Division and shall include:
  - (A) a certification that construction or abandonment was completed as required by this Section;
  - (B) the owner's name and address;
  - (C) the latitude and longitude of the well with a position accuracy of 100 feet or less;
  - (D) the diameter, depth, and yield of the well;
  - (E) the chloride concentration for wells installed in the area delineated in Rule .0107(f)(8) of this Section; and
  - (F) after submittal of form, any other information necessary as requested by the Department to ensure compliance with G.S. 87-84.
- (2) The certified record of completion or abandonment shall be submitted within a period of thirty days after completion or abandonment. For multiple DPT/Geoprobe® wells having the same construction, only one GW-1 or GW-30 is required to be submitted if the total number of wells is indicated on the form.

- (3) Furnishing of records to any person or agency other than the Division shall not constitute compliance with the reporting requirement and shall not relieve the well contractor of his or her reporting requirement to the Division.

*History Note:* Authority G.S. 87-87; 87-88;  
Eff. February 1, 1976;  
Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; September 1, 1984; April 20, 1978;  
Readopted Eff. September 1, 2019.

#### **15A NCAC 02C .0115 DIAGRAMS AND FORMS**

*History Note:* Authority G.S. 87-87;  
Eff. February 1, 1976;  
Amended Eff. April 20, 1978;  
Repealed Eff. September 1, 1984.

#### **15A NCAC 02C .0116 DESIGNATED AREAS: WATER SUPPLY WELLS CASED TO LESS THAN 20 FEET**

- (a) If the best or only source of potable water exists between 10 and 20 feet below the surface of the land, water supply wells may be cased to a depth less than 20 feet in the following areas:
  - (1) in Currituck County in an area between the sound and a line beginning at the end of SR 1130 near Currituck Sound, thence north to the end of SR 1133, thence north to the end of NC 136 at the intersection with the sound;
  - (2) on the barrier island from the Virginia state line, south to Ocracoke Inlet;
  - (3) all areas lying between the Intracoastal Waterway and the ocean from New River Inlet south to New Topsail Inlet; and
  - (4) all areas lying between the Intracoastal Waterway and the ocean from the Cape Fear River south to the South Carolina line.
- (b) Pursuant to Rule .0118 of this Section, water supply wells may be cased to a depth less than 20 feet, if:
  - (1) the only or best source of drinking water in the area exists between a depth of 10 and 20 feet below the surface of the land; and
  - (2) using this source of water in the area is in the best interest of the public.
- (c) In all other areas, the source of water shall be at least 20 feet below land surface. However, when adequate quantities of potable water cannot be obtained below a depth of 20 feet, the source of water may be obtained from unconsolidated rock formations at depths less than 20 feet provided that:
  - (1) adequate quantities of water of acceptable quality for the intended use is not available to a minimum depth of 50 feet can be shown to exist;
  - (2) the proposed source of water is the maximum feasible depth above 20 feet, but in no case less than 10 feet; and
  - (3) the regional office of the Department is notified prior to the construction of a well obtaining water from a depth between 10 and 20 feet below land surface.

*History Note:* Authority G.S. 87-87;  
Eff. April 20, 1978;  
Amended Eff. September 1, 2009; December 1, 1992; July 1, 1988; September 1, 1984;  
Readopted Eff. September 1, 2019.

#### **15A NCAC 02C .0117 DESIGNATED AREAS: WATER SUPPLY WELLS CASED TO MINIMUM DEPTH OF 43 FEET**

Water supply wells constructed in the following areas or within 400 feet of the following areas shall be cased to a minimum depth of 43 feet and grouted to a depth of 20 feet:

- (1) Anson County generally west of a line beginning at the intersection of the runs of the Pee Dee River and Buffalo Creek, thence generally northeast to SR 1627, thence generally south along SR 1627 to the intersection with SR 1632, thence generally west along SR 1632 to the intersection with US 52, thence generally south along US 52 to the intersection with SR 1418, thence generally

- southwest along SR 1418 to the intersection of NC 218, thence south along NC 218 to the intersection with US 74, thence generally west along US 74 to the intersection of SR 1251, thence generally southwest along SR 1251 to the intersection with SR 1240, thence generally southeast along SR 1240 to the intersection with SR 1252, thence generally south along SR 1252 to the intersection with SR 1003, thence generally west along SR 1003 to the Union County line;
- (2) Cabarrus County generally east of a line beginning at the intersection of SR 1113 and the Union County line, thence generally northeast along SR 1113 to the intersection with SR 1114, thence generally east along SR 1114 to the Stanly County line, thence generally northeast along the county line to the intersection with SR 1100, thence generally northeast along SR 1100 to the intersection of with SR 2622, thence generally southeast along SR 2622 to the intersection with SR 2617, thence generally northeast along SR 2617 to the intersection with SR 2611, thence generally north along SR 2611 to the intersection with NC 73, thence generally east along NC 73 to the intersection with SR 2453, thence generally northeast along SR 2453 to the intersection with SR 2444, thence generally northeast along SR 2444 to the Rowan County line;
  - (3) Davidson County generally east of a line starting at the intersection of the runs of Abbots Creek and the Yadkin River in High Rock Lake, thence generally north along Abbots Creek to NC 8 bridge, thence generally north along NC 8 to the intersection with Interstate 85, thence generally northeast along Interstate 85 to the intersection with US 64, thence generally southeast along US 64 to the Randolph County line;
  - (4) Montgomery County generally west of a line beginning at the intersection of SR 1134 with the Randolph County line, thence generally south along SR 1134 to the intersection with SR 1303, thence generally south along SR 1303 to the intersection with NC 109, thence generally southeast along NC 109 to the intersection with SR 1150, thence generally south along SR 1150 to the intersection with NC 73, thence generally southeast along NC 73 to the intersection with SR 1227, thence generally east along SR 1227 to the intersection with SR 1130, thence generally northeast along SR 1130 to the intersection with SR 1132, thence generally southeast along SR 1132 to the intersection with SR 1174, thence generally east along SR 1174 to the intersection with NC 109, thence generally north along NC 109 to the intersection with SR 1546, generally southeast along SR 1546 to the intersection of SR 1543, thence generally south along SR 1543 to the intersection with NC 731, thence generally west along NC 731 to the intersection with SR 1118, thence generally southwest along SR 1118 to the intersection with SR 1116, thence generally west along SR 1116 to the intersection with NC 109, thence generally south along NC 109 to the intersection with the Richmond County line;
  - (5) Randolph County generally west of a line beginning at the intersection of US 64 with the Davidson County line, thence generally east along US 64 to the intersection with NC 49, thence generally southwest along NC 49 to the intersection with SR 1107, thence generally south along SR 1107 to the intersection with SR 1105, thence southeast along SR 1105 to the intersection with the Montgomery County line;
  - (6) Rowan County generally east of a line beginning at the intersection of SR 2352 with the Cabarrus County line, thence generally northeast along SR 2352 to the intersection with SR 2353, thence generally north along SR 2353 to the intersection with SR 2259, thence generally northeast along SR 2259 to the intersection with SR 2142, thence north along SR 2142 to the intersection with SR 2162, thence generally northeast along SR 2162 to the intersection with the run of the Yadkin River in High Rock Lake;
  - (7) Union County generally east of a line beginning at the intersection of SR 1117 with the South Carolina-North Carolina State line, thence generally north along SR 1117 to the intersection with SR 1111, thence generally northwest along SR 1111 to the intersection with NC 75, thence generally northwest along NC 75 to the intersection with NC 16, thence generally north along NC 16 to the intersection with SR 1008, thence generally northeast along SR 1008 to the intersection with SR 1520, thence generally northeast along SR 1520 to the intersection with NC 218, thence generally east along NC 218 to the intersection with US 601, thence generally north along US 601 to the intersection with SR 1600, thence generally northeast along SR 1600 to the intersection with the Cabarrus County line; and
  - (8) Stanly County -- all.

*History Note: Authority G.S. 87-87; S.L. 2018-65*

*Eff. April 20, 1978;*  
*Amended Eff. September 1, 2009, April 1, 2001;*  
*Readopted Eff. June 15, 2020.*

**15A NCAC 02C .0118 VARIANCE**

(a) The Secretary may grant a variance from any construction standard under the rules of this Section, as set forth in Rule .0119 of this Section. Any variance request shall be submitted using the official form approved the Division as set forth in Paragraph (b) of this Rule and may be granted by the Secretary to the person responsible for the construction of the well for which the variance is sought, if:

- (1) the use of the well will not endanger human health and welfare or the groundwaters; and
- (2) construction in accordance with the standards is not technically feasible in such a manner as to afford a reasonable water supply at a reasonable cost.

(b) The variance request application form shall be submitted to the Division and shall include the following:

- (1) the owner's name, mailing address, and Email address;
- (2) the owner's telephone number(s);
- (3) the physical location of the well site;
- (4) the well contractor's name and State certification number;
- (5) the well contractor's mailing address and Email address;
- (6) the well contractor's telephone number(s);
- (7) a map of the site, to scale, showing the locations of all existing and proposed well(s) in relation to:
  - (A) road names and property boundaries;
  - (B) buildings and structures;
  - (C) other wells;
  - (D) surface water bodies; and
  - (E) known sources of contamination;
- (8) the reason for the variance request;
- (9) a construction diagram of the proposed well(s) including specifications describing all atypical materials or methods to be used and means for assuring the integrity and quality of the finished well(s);
- (10) a copy of the local well application and permit, if applicable;
- (11) the signatures of the well contractor and well owner(s); and
- (12) after submittal of form, any other information necessary as requested by the Department to ensure compliance with G.S. 87-84.

(c) The Secretary may impose such conditions on a variance or the use of a well for which a variance is granted and is necessary to ensure compliance with G.S. 87-84. The facts supporting any variance under this Rule shall be in writing and made part of the variance.

(d) The Secretary shall respond in writing to a request for a variance within 30 days after the receipt of the variance request.

(e) A variance applicant who is dissatisfied with the decision of the Secretary may commence a contested case by filing a petition under G.S. 150B-23 within 60 days after receipt of the decision.

*History Note: Authority G.S. 87-84; 87-87; 87-88; 143-215.3(a)(4);*  
*Eff. April 20, 1978;*  
*Amended Eff. September 1, 2009; April 1, 2001; December 1, 1992; September 1, 1988;*  
*September 1, 1984;*  
*Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0119 DELEGATION**

(a) The Secretary is delegated the authority to grant permission for well construction under G.S. 87-87.

(b) The Secretary is delegated the authority to give notices and sign orders for violations under G.S. 87-91.

(c) The Secretary may grant a variance from any construction standard, or the approval of alternate construction methods or materials, specified under Rule .0118 of this Section.

*History Note: Authority G.S. 143-215.3(a)(4);*  
*Eff. March 1, 1985;*  
*Amended Eff. October 1, 2009; December 1, 1992;*  
*Readopted Eff. September 1, 2019.*

## SECTION .0200 - CRITERIA AND STANDARDS APPLICABLE TO INJECTION WELLS

### 15A NCAC 02C .0201 PURPOSE

The rules in this Section establish classes of injection wells and set forth requirements and procedures for permitting, constructing, operating, monitoring, reporting, and abandoning approved types of injection wells. They also establish standards for abandoning, monitoring, and reporting non-permitted wells used for the injection of wastes or any substance of a composition and concentration such that, if it were discharged to the land or waters of the State, would adversely affect human health or would otherwise render those waters unsuitable for their best intended usage. Except as provided for in G.S. 143-215.1A, the discharge of any wastes to the subsurface by means of wells is prohibited by G.S. 143-214.2(b).

*History Note:* Authority G.S. 87-84; 87-87; 87-88; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. August 1, 1982; Amended Eff. May 1, 2012; September 1, 1996; Readopted Eff. September 1, 2019.

### 15A NCAC 02C .0202 SCOPE

The rules in this Section apply to all construction, operation, use, modification, alteration, repair, and abandonment activities of all injection wells as defined herein. These Rules do not apply to subsurface distribution systems associated with sewage treatment and disposal permits issued in accordance with G.S. 130A.

*History Note:* Authority G.S. 87-86; 87-87; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. August 1, 1982; Amended Eff. May 1, 2012; September 1, 1996; Readopted Eff. September 1, 2019.

### 15A NCAC 02C .0203 CONFLICT WITH OTHER LAWS, RULES, AND REGULATIONS

The provisions of any federal, county, or municipal laws, rules, or regulations establishing injection well standards affording greater protection to the public welfare, safety, and health and to the groundwater resources shall prevail, within the jurisdiction of such agency or municipality, over standards established by the rules in this Section.

*History Note:* Authority G.S. 87-87; 87-96; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. August 1, 1982; Amended Eff. September 1, 1996; Readopted Eff. September 1, 2019.

### 15A NCAC 02C .0204 DEFINITIONS

In addition to the terms defined in Rule .0102 of this Subchapter, the following terms and phrases apply:

- (1) "Abandonment or Plugging Record" means a listing of permanent or temporary abandonment of a well and may contain a well log or description of amounts and types of abandonment material used, the method employed for abandonment, a description of formation location, formation thickness, and location of abandonment structures.
- (2) "Aquifer Storage and Recovery Well (ASR)" means a well that is used to inject potable water for the purposes of subsurface storage and for later recovery of the injected water.
- (3) "Area of Review" means the area around an injection well as specified in each applicable rule.
- (4) "Best intended usage" means best usage as used in 15A NCAC 02L .0201 for each groundwater classification.
- (5) "Catastrophic Collapse" means the collapse of overlying strata caused by removal of underlying materials.
- (6) "Closed-Loop Geothermal Well System" means a system of continuous piping, part of which is installed in the subsurface via vertical or angled borings, through which moves a fluid that does not exit the piping, but is used to transfer heat energy between the subsurface and the fluid in

association with a heating and cooling system. A variation of this type of system consists of the continuous piping emplaced into a water supply well such that the standing column of groundwater serves as the heat transfer medium.

- (7) "Closed-Loop Groundwater Remediation System" is as defined in G.S. 143-215.1A.
- (8) "Cluster" means two or more geothermal injection wells connected to the same manifold or header of a geothermal heating and cooling system.
- (9) "Confined or Enclosed Space" means any space that has a restricted means of entry and exit and is subject to the accumulation of toxic or flammable contaminants or has an oxygen deficient atmosphere.
- (10) "Confining Zone" means a geological formation, group of formations, or part of a formation that is capable of limiting movement of groundwater.
- (11) "Contaminant" is as defined in 15A NCAC 02L .0102.
- (12) "Flow Rate" means the volume per unit time of a fluid moving past a fixed reference point.
- (13) "Fluid" means a material or substance which is capable of flowing whether in a semisolid, liquid, sludge, gas, or other form or state.
- (14) "Formation Fluid" means fluid present in a formation under natural conditions. This shall not include introduced fluids, such as drilling mud and grout, used to facilitate the construction or development of a well.
- (15) "Generator" means any person, identified by site location, whose act or process produces hazardous waste.
- (16) "Groundwaters" mean those waters occurring in the subsurface under saturated conditions.
- (17) "Hazardous Waste" means any solid, semisolid, liquid, or contained gaseous waste or combination thereof that, because of its quantity, concentration, or physical, chemical or infectious characteristic, may:
  - (a) cause or contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or
  - (b) pose a present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.
- (18) "Hazardous Waste Management Facility" means all contiguous land and structures and other appurtenances and improvements on the land used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (for example, one or more landfills, surface impoundments, or combination of them).
- (19) "Hose Bibb or Tap" means a fluid sampling port located on or appurtenant to a well.
- (20) "Hydraulic Conductivity" means the volume of water at the existing kinematic viscosity that will move in a porous medium in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow.
- (21) "Hydraulic or Pneumatic Fracturing" means the intentional act of injecting potable water, ambient air, or other approved fluids, which may carry a proppant, for the purpose of forming new fractures or propagating existing fractures in a geologic formation or portion thereof with the intent of increasing the formation's permeability.
- (22) "Hydrostratigraphic Unit" means a body of rock or unconsolidated sediment distinguished and characterized by observable hydraulic properties that relate to its ability to receive, store, transmit, and yield water.
- (23) "Infiltration gallery" means a subsurface ground absorption system designed for the introduction of treated wastewater into the subsurface environment.
- (24) "Injectant" means a solid or fluid that is emplaced in the subsurface by means of an injection well.
- (25) "Injection" means emplacement or discharge into the subsurface of a solid or fluid substance or material. This definition shall exclude drilling fluids, grout used in association with well construction or abandonment, and fluids used in connection with well development, disinfection, rehabilitation, or stimulation.
- (26) "Injection Well" means any well as defined in G.S. 87-85 whose depth is greater than its largest surface dimension and that is used, or intended to be used, for the injection of fluids or solids into the subsurface or groundwaters.
- (27) "Injection Zone" means a geological formation, group of formations, or part of a formation receiving solids or fluids through an injection well.

- (28) "In-situ Thermal (IST) Well Systems" means a well or wells that are used to apply heat in a targeted subsurface zone to promote remediation, such as electrical resistance heating (ERH), thermal conductive heating (TCH), or steam enhanced extraction (SEE).
- (29) "Lithology" means the description of rocks or sediments on the basis of their physical and chemical characteristics.
- (30) "Lithostratigraphic Unit" means a body of rock or unconsolidated sediment that is distinguished and characterized by observable lithologic features or its position relative to other bodies of rock or unconsolidated sediment.
- (31) "Mechanical Integrity" means:
- (a) an absence of a leak in the casing, tubing, or packer of an injection well; and
  - (b) an absence of fluid movement through vertical channels adjacent to the injection well bore.
- (32) "Operation" means any injection well or system
- (33) "Oversight agency" means the state or local agency with jurisdiction over a contamination incident.
- (34) "Permit" means an authorization, license, or equivalent control document issued by the Director to implement the requirements of the rules of this Section.
- (35) "Permitted by Rule" means that the injection activity is authorized by the rules of this Section and does not require the issuance of an individual permit when injection wells are constructed and operated in accordance with the rules of this Section.
- (36) "Plug" means the act or process of stopping the flow of fluids into or out of a formation through a borehole or well penetrating that formation.
- (37) "Potable Water" means those waters of the State that are suitable for drinking, culinary, or food processing purposes.
- (38) "Pressure" means the total load or force per unit area acting on a surface.
- (39) "Proppant" means a granular substance such as quartz sand or other material approved by the Department of Health and Human Services' Division of Public Health that is used to hold open cracks formed in the subsurface as a result of hydraulic or pneumatic fracturing.
- (40) "Receptor" means any human, plant, animal, or structure that is, or has the potential to be, affected by the release or migration of contaminants. Any well constructed for the purpose of monitoring groundwater and contaminant concentrations shall not be considered a receptor.
- (41) "Subsidence" means the lowering of the natural land surface in response to earth movements; reduction of formation fluid pressure; removal of underlying supporting material by mining or solution of solids, either artificially or from natural causes; compaction due to wetting (hydrocompaction); oxidation of organic matter in soils; or added load on the land surface.
- (42) "Subsurface Distribution System" means an assemblage of perforated pipes, drain tiles, or other similar mechanisms intended to distribute fluids or solids below the surface of the ground.
- (43) "Transmissivity" means the rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of an aquifer under a unit hydraulic gradient. It equals the hydraulic conductivity multiplied by the aquifer thickness.
- (44) "Thermally Enhanced Grout" is a grout that is used to seal or grout water well annular spaces and geothermal ground source heat loops. It is engineered to provide efficient heat transfer and to create a low permeability seal.
- (45) "Underground Sources of Drinking Water" means all underground waters of the State classified as existing or potential water supplies in 15A NCAC 02L.
- (46) "Waste" is as defined in G.S. 143-213(18).
- (47) "Waters" or "Waters of the State" is as defined in G.S. 143-212.
- (48) "Water table" is as defined in 15A NCAC 02L .0102.

*History Note: Authority G.S. 87-85; 87-87; 143-213; 143-215.1A;  
 Eff. August 1, 1982;  
 Amended Eff. May 1, 2012; September 1, 1996; July 1, 1988; March 1, 1984;  
 Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0205 AREA OF REVIEW**

*History Note:* Authority G.S. 87-87; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. August 1, 1982;  
Amended Eff. September 1, 1996;  
Repealed Eff. May 1, 2012.

**15A NCAC 02C .0206 CORRECTIVE ACTION**

(a) Injection wells not constructed in compliance with these Rules shall be brought into compliance with the rules in this Section or abandoned by the person responsible for the construction of the wells within 30 calendar days of becoming aware of any noncompliance.

(b) If operation of any injection facility is not in compliance with the requirements of the rules in this Section, or if continued operation of the injection facility threatens any water quality standard or classification established under the authority of G.S. 143-214.1, the owner of the injection facility shall:

- (1) stop all injection activities;
- (2) notify the Division orally by the close of the next business day and in writing within five calendar days of becoming aware of any noncompliance;
- (3) perform a site assessment and submit the site assessment to the Division within 30 calendar days of notifying the Division. The Director may approve an alternate time period greater than 30 calendar days based on the severity and extent of noncompliance. The site assessment report shall include a description of:
  - (A) the source and cause of contamination;
  - (B) any imminent hazards to public health and safety and actions taken to mitigate them;
  - (C) all receptors and exposure pathways;
  - (D) the horizontal and vertical extent of soil and groundwater contamination and all factors affecting the contaminant transport; and
  - (E) any geological and hydrogeological features influencing the movement or chemical or physical character of the contaminants; and
- (4) submit a corrective action plan and a proposed schedule for implementation of the corrective action to the Director for approval. In reviewing the proposed plan and schedule, the Director shall consider the compliance history of the well owner, the severity and extent of noncompliance, and any other criteria necessary for the protection of human health and the environment. The corrective action plan shall include:
  - (A) a description of the proposed corrective action and the reasons for its selection;
  - (B) specific plans, including engineering details where applicable, for restoring the groundwater quality and for restoring the integrity of the injection facility if the injection activity is to continue;
  - (C) a schedule for the implementation and operation of the proposed plan; and
  - (D) a monitoring plan for evaluating the effectiveness of the proposed corrective action.

*History Note:* Authority G.S. 87-87; 87-88; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. August 1, 1982;  
Amended Eff. May 1, 2012; September 1, 1996; March 1, 1984;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0207 MECHANICAL INTEGRITY**

(a) An injection well has internal mechanical integrity, meaning there is no leak in the casing, tubing, or packer, as demonstrated by one of the following methods:

- (1) monitoring of the tubing-casing annulus pressure, following an initial pressure test, with sufficient frequency to be representative. This test shall be performed at the well head while maintaining an annulus pressure different from atmospheric pressure;
- (2) pressure testing with liquid or gas; or
- (3) any other method proposed by the permittee and approved by the Director as equally effective.

(b) An injection well has external mechanical integrity, meaning there is no fluid movement into groundwaters through vertical channels adjacent to the injection well bore, as determined by one of the following methods:

- (1) the results of a temperature or noise log;
- (2) grouting records plus predictive calculations demonstrating that the injection pressures will not exceed the strength of the grout; or

- (3) any other method proposed by the permittee and approved by the Director as equally effective.
- (c) In conducting and evaluating the tests enumerated in this Section or other tests allowed by the Director, the owner or operator shall apply methods and standards generally accepted in the industry. When the well owner or operator reports the results of mechanical integrity tests, a description of the tests and the methods used shall be included.
- (d) The Director may require additional or alternative tests if the results presented by the owner or operator under Paragraph (c) of this Rule do not demonstrate that an injection well has mechanical integrity.
- (e) If an injection well fails to demonstrate mechanical integrity, the well owner or operator shall take corrective action as specified in Rule .0206 of this Section.

*History Note: Authority G.S. 87-87; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. August 1, 1982; Amended Eff. May 1, 2012; September 1, 1996; March 1, 1984; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0208 FINANCIAL RESPONSIBILITY**

When required by the rules of this Section, the permittee shall maintain and demonstrate financial responsibility and resources in the form of performance bonds, trust funds, surety bonds, letters of credit, financial tests, insurance or corporate guarantees, or other forms of financial assurances approved by the Director as equivalent to close, plug, and abandon the injection operation.

*History Note: Authority G.S. 87-87; 87-88; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c); 40 C.F.R. 144.52(a)(7); 40 C.F.R. 145.11(a)(20); Eff. August 1, 1982; Amended Eff. May 1, 2012; September 1, 1996; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0209 CLASSIFICATION OF INJECTION WELLS**

Injection Wells are classified as follows:

- (1) Class 1. No person shall construct, use, or operate an injection well of this class. This class applies to industrial, municipal, and nuclear disposal wells that are used to inject wastes beneath the lowermost formation containing underground sources of drinking water. A description of the primary function for wells of this class is as follows:
  - (a) Hazardous Waste Disposal Well. These wells are used by generators of hazardous wastes or owners of hazardous waste management facilities to inject hazardous waste.
  - (b) Industrial Disposal Well. These wells are used to inject non-hazardous industrial waste.
  - (c) Municipal Disposal Well. These wells are used to inject non-hazardous waste.
  - (d) Nuclear Disposal Well. These wells are used to inject nuclear waste.
- (2) Class 2. No person shall construct, use, or operate an injection well of this class. This class applies to oil and gas production and storage related injection wells and includes wells that are used to inject fluids:
  - (a) that are brought to the surface in connection with natural gas storage operations or conventional oil or natural gas production;
  - (b) for enhanced recovery of oil or natural gas; and
  - (c) for storage of hydrocarbons that are liquid at standard temperature and pressure.
- (3) Class 3. No person shall construct, use, or operate an injection well of this class. This class applies to wells that are used for the purpose of extraction of minerals or energy. A description of the primary function for wells of this class is as follows:
  - (a) In Situ Production of Uranium or Other Metals. This category includes only in-situ production from ore bodies that have not been conventionally mined. Solution mining of conventional mines such as stopes leaching is included in Class 5.
  - (b) Solution Mining Well. These wells are used in the solution mining of salts or potash.
  - (c) Sulfur Mining Well. These wells are used in the mining of sulfur by the Frasch process.
- (4) Class 4. No person shall construct, use, or operate an injection well of this class. This class applies to injection wells that are used to inject hazardous wastes into or above a formation containing an underground source of drinking water and includes wells used by:

- (a) generators of hazardous wastes or radioactive wastes; and
  - (b) owners of hazardous waste management facilities, or radioactive waste disposal sites.
- (5) Class 5. This class applies to all injection wells not included in Class 1, 2, 3, 4, or 6.
- (a) The construction, use, or operation of the following Class 5 injection well types is prohibited. A description of the primary function for these prohibited Class 5 wells is as follows:
    - (i) Agricultural Drainage Well. These wells receive irrigation tailwaters, other field drainage, animal yard, feedlot, or dairy runoff;
    - (ii) Air Scrubber Waste Disposal Well. These wells are used to inject wastes from air scrubbers;
    - (iii) Gaseous Hydrocarbon Storage Well. These wells are used for the storage of hydrocarbons that are gases at standard temperature and pressure;
    - (iv) Groundwater Aquaculture Return Flow Well. These wells inject groundwater or surface water that has been used to support aquaculture;
    - (v) In-situ Fossil Fuel Recovery Well. These wells are used for the in-situ recovery of coal, lignite, oil shale, and tar sands;
    - (vi) Mining, Sand, or Other Backfill Well. These wells are used to inject a mixture of fluid and sand, mill tailings, and other solids into mined out portions of subsurface mines, whether the injectant is a radioactive waste or not. This also includes wells used to control mine fires and acid mine drainage wells;
    - (vii) Motor Vehicle Waste Disposal Well. These wells receive wastes from motor vehicle facilities and include autobody repair shops, new and used car dealerships, specialty repair shops, such as transmission, muffler, and radiator repair shops and any facility that steam cleans or otherwise washes undercarriages or engine parts or does any vehicular repair work;
    - (viii) Sewage or Wastewater Disposal Well. These wells are used to inject sewage or wastewater from any source to the groundwaters of the State. This includes cesspools and abandoned drinking water wells;
    - (ix) Solution Mining Well. These wells are used in solution mining in conventional mines, such as stopes leaching;
    - (x) Special Drainage Well. These wells are used for disposing of water from sources other than direct precipitation. Examples of this well type include: landslide control drainage wells, water tank overflow drainage wells, swimming pool drainage wells, and lake control drainage wells; and
    - (xi) Water Softener Regeneration Brine Disposal Well. These wells are used to inject regeneration wastes from water softeners.
  - (b) The construction, use, or operation by an individual of the following Class 5 injection well types may be approved by the Director provided that the injected material does not contain any waste or any substance of a composition and concentration such that, if it were discharged to the land or waters of the State, would adversely affect human health or would otherwise render those waters unsuitable for their best intended usage:
    - (i) Aquifer Recharge Wells specified in Rule .0218 of this Section;
    - (ii) Aquifer Storage and Recovery Wells specified in Rule .0219 of this Section;
    - (iii) Aquifer Test Wells specified in Rule .0220 of this Section;
    - (iv) Experimental Technology Wells specified in Rule .0221 of this Section;
    - (v) Geothermal Aqueous Closed-Loop Wells specified in Rule .0222 of this Section;
    - (vi) Geothermal Direct Expansion Closed-Loop Wells specified in Rule .0223 of this Section;
    - (vii) Geothermal Heating/Cooling Water Return Wells specified in Rule .0224 of this Section;
    - (viii) Groundwater Remediation Wells specified in Rule .0225 of this Section;
    - (ix) Salinity Barrier Wells specified in Rule .0226 of this Section;
    - (x) Stormwater Drainage Wells specified in Rule .0227 of this Section;
    - (xi) Subsidence Control Wells specified in Rule .0228 of this Section;
    - (xii) Tracer Wells specified in Rule .0229 of this Section; and

- (xiii) Other Wells specified in Rule .0230 of this Section;
- (6) Class 6. No person shall construct, use, or operate an injection well of this class. This class applies to wells that are used for containment of a gaseous, liquid, or supercritical carbon dioxide stream in subsurface geologic formations.

*History Note:* Authority G.S. 87-87; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. August 1, 1982;  
Amended Eff. May 1, 2012; September 1, 1996; March 1, 1984;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0210 REQUIREMENTS: WELLS USED TO INJECT WASTE OR CONTAMINANTS**

The owner of any well that has been used to inject wastes or contaminants, with the exception of wells permitted in accordance with this Section, shall take corrective action as specified in Rule .0206(b) of this Section

*History Note:* Authority G.S. 87-87; 87-88; 143-214.2; 143-215.1A;  
Eff. August 1, 1982;  
Amended Eff. September 1, 1996; March 1, 1984;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0211 GENERAL PERMITTING REQUIREMENTS APPLICABLE TO ALL INJECTION WELL TYPES**

- (a) A permit shall be obtained from the Director prior to constructing, operating, or using any well for injection unless the well is deemed permitted in accordance with the rules of this Section. No permit shall be granted for the injection of wastes or any substance of a composition and concentration such that, if it were discharged to the land or waters of the state, it would adversely affect human health or would otherwise render those waters unsuitable for their best intended usage unless specifically provided for by statute or by the rules in this Section.
- (b) No person shall construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of fluid containing any contaminant into underground sources of drinking water if the presence of that contaminant would cause a violation of any applicable groundwater quality standard specified in Subchapter 02L or would otherwise adversely affect human health.
- (c) If at any time the Director learns that any injection well may cause a violation of any applicable groundwater quality standard specified in 15A NCAC 02I, that is not authorized by the rules of this Section, the Director shall do one of the following:
- (1) require an individual permit for injection wells that are otherwise permitted by rule;
  - (2) require such actions as may be necessary to prevent the violation, including corrective action as required in Rule .0206 of this Section; or
  - (3) take enforcement action as provided for in G.S. 87-91, G.S. 87-94, or G.S. 87-95.
- (d) All permit applications shall be signed as follows:
- (1) For a corporation: by a responsible corporate officer. For the purposes of this Section, a "responsible corporate officer" means a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation;
  - (2) For a partnership or sole proprietorship: by a general partner or the proprietor, respectively;
  - (3) For a municipality, State, federal, or other public agency: by either a principal executive officer or ranking elected official; and
  - (4) For all other persons: by the well owner, or his or her agent.
- (e) The person signing the permit application shall certify that the data furnished on the application is accurate and that the injection well will be operated in accordance with the approved specifications and conditions of the permit.
- (f) All reports shall be signed by a person described in Paragraph (d) of this Rule. All records, reports, and information required to be submitted to the Director and all public comment on these records, reports, or information shall be disclosed to the public unless the person submitting the information can show that such information, if made public, would disclose methods or processes entitled to protection as trade secrets as defined in G.S. 66-152. The Director shall determine which information is entitled to confidential treatment. If the Director determines that such information is entitled to be treated as confidential information as defined in G.S. 132-1.2, the Director shall take steps to protect such information from disclosure.

- (g) The Director shall consider the cumulative effects of drilling and construction of multiple wells and operation of all proposed wells during evaluation of permit applications.
- (h) All permits shall be issued for a period not to exceed five years from the date of issuance. Permits shall be deemed active until all permit requirements have been met and documentation has been received indicating that the wells meet one of the following conditions:
- (1) the wells are temporarily or permanently abandoned in accordance with Rule .0240 of this Section;
  - (2) the wells have been converted to some other use; or
  - (3) the wells are permitted under another permit issued by the appropriate permitting authority for that activity.
- (i) All facilities shall be operated and maintained to comply with the rules of this Section.
- (j) The permittee shall allow the Director or an authorized representative, upon their presentation of credentials and other documents as may be required by law, to:
- (1) enter upon the permittee's premises where a regulated facility or activity is located or conducted or where records are required to be kept under the conditions of the permit;
  - (2) have access to and copy, during normal business hours of the establishment, any records that are required to be kept under the conditions of the permit;
  - (3) inspect any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under the permit; and
  - (4) sample or monitor for the purposes of assuring permit compliances or as otherwise authorized, any substances or parameters.
- (k) The permit may be modified, revoked and reissued, or terminated by the Director in whole or part for actions that would adversely affect human health or the environment. Such actions may include:
- (1) violation of any terms or conditions of the permit;
  - (2) obtaining a permit by misrepresentation or failure to disclose fully all relevant facts; or
  - (3) refusal of the permittee to allow authorized employees of the Division upon proper presentation of credentials to:
    - (A) enter upon permittee's premises on which a system is located where any records are required to be kept under terms and conditions of the permit;
    - (B) have access to and copy any records required to be kept under terms and conditions of the permit;
    - (C) inspect any monitoring equipment or method required in the permit; or
    - (D) collect any sample from the injection facility.
- (l) The filing of an application by the permittee for a permit modification, revocation and reissuance, termination, or a notification of planned changes or anticipated noncompliance shall not stay any permit condition.
- (m) The permittee shall furnish to the Director any information that the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit or to determine compliance with the permit. The permittee shall also furnish to the Director, upon request, copies of records required by the permit to be kept.
- (n) The permittee shall retain records of all monitoring information, including all calibration and maintenance records, all original strip chart recordings for continuous monitoring instrumentation, and copies of all reports required by the permit for a period of at least three years from the date of the sample, measurement, report, or application. Records of monitoring information shall include the:
- (1) date, place, and time of sampling or measurements;
  - (2) individuals who performed the sampling or measurements;
  - (3) dates analyses were performed;
  - (4) individuals who performed the analyses;
  - (5) analytical techniques or methods used;
  - (6) results of any such sampling, measurements, and analyses; and
  - (7) description and date of any maintenance activities performed, including the name and contact information of the individuals performing such activities.
- (o) The permit shall not be transferred to any person without the approval of the Director. A permit ownership or name change request shall be submitted to the Director.
- (p) The permittee shall report any monitoring or other information that indicates:
- (1) noncompliance with a specific permit condition;

- (2) a contaminant may cause a violation of applicable groundwater quality standards specified in 15A NCAC 02L; and
- (3) a malfunction of the injection system may cause the injected fluids to migrate outside the approved injection zone or area.

The information shall be provided to the Director orally within 24 hours of the permittee becoming aware of the occurrence and as a written submission within five days of the occurrence. The written submission shall contain a description of the noncompliance and its cause, the period of noncompliance including dates and times, the anticipated time it is expected to continue if the noncompliance has not been corrected, and all steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); 40 CFR 144.52(a)(7); 40 CFR 145.11(a)(20);  
Eff. August 1, 1982;  
Amended Eff. May 1, 2012; February 1, 1997; October 1, 1996; March 1, 1984;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0212 ADDITIONAL CRITERIA AND STANDARDS: CLASS II: CLASS III**

*History Note:* Authority G.S. 87-87; 87-88; 143-211; 143-214.2; 143-215.3(a)(1); 143-215.3(c);  
Eff. August 1, 1982;  
Repealed Eff. March 1, 1984.

**15A NCAC 02C .0213 ADDITIONAL CRITERIA AND STANDARDS APPLICABLE TO CLASS 5 WELLS**

**15A NCAC 02C .0214 ABANDONMENT AND CHANGE-OF-STATUS**

*History Note:* Authority G.S. 87-87; 87-88; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. August 1, 1982;  
Amended Eff. February 1, 1997; October 1, 1996; March 1, 1984;  
Repealed Eff. May 1, 2012.

**15A NCAC 02C .0215 VARIANCE**

**15A NCAC 02C .0216 DELEGATION**

*History Note:* Authority G.S. 87-87(4); 87-88; 143-215.1A; 143-215.3(a)(1); 143-215.3(a)(4); 150B-23;  
Eff. September 1, 1996;  
Repealed Eff. May 1, 2012.

**15A NCAC 02C .0217 PERMITTING BY RULE**

(a) The following injection well systems shall be deemed to be permitted by the rules of this Section pursuant to G.S. 87-88(a) and it shall not be necessary for the Division to issue an individual permit for the construction or operation of the following injection well systems provided that the system does not result in the violation of any assigned surface water, groundwater, or air quality standard; there is no groundwater discharge of the injectant into surface waters; and all criteria for the specific systems are met:

- (1) Aquifer Test Wells specified in Rule .0220 of this Section;
- (2) Geothermal Aqueous Closed Loop Wells specified in Rule .0222 of this Section;
- (3) Geothermal Direct Expansion Closed Loop Wells specified in Rule .0223 of this Section;
- (4) Groundwater Remediation Wells specified in Rule .0225 of this Section; and
- (5) Stormwater Drainage Wells specified in Rule .0227 of this Section.

(b) Any violation of groundwater standards not authorized by the rules of this Section shall be treated in accordance with Rule .0206 of this Section.

(c) An injection well system permitted by rule under the rules of this Section shall remain permitted by rule until such time as the Director determines that it shall not be deemed to be permitted. This determination shall be made based on compliance with the provisions of the rules of this Section.

(d) If the Director determines that an injection well system shall not be permitted by rule, the Director shall require the owner of the injection well system to obtain an individual permit.

*History Note:* Authority G.S. 87-87; 87-88(a);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.

#### **15A NCAC 02C .0218 AQUIFER RECHARGE WELLS**

Aquifer Recharge Wells, which recharge depleted aquifers and inject uncontaminated water of equal or better quality than the aquifer being recharged, shall meet the requirements of Rule .0219 of this Section. However, the Director may impose additional requirements to ensure compliance with G.S. 87-84.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A;  
143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.

#### **15A NCAC 02C .0219 AQUIFER STORAGE AND RECOVERY WELLS**

(a) A permit shall be obtained from the Director prior to constructing, operating, or using an Aquifer Storage and Recovery Well. "Aquifer Storage and Recovery Well" means a well that is used to inject potable water for the purposes of subsurface storage and for later recovery of the injected water.

(b) Permit Applications. In addition to the permit requirements set forth in Rule .0211 of this Section, an application shall be submitted, in duplicate, to the Director on forms furnished by the Director and shall include the following:

- (1) A site description that includes:
  - (A) the name of the well owner or person otherwise legally responsible for the injection well, his or her mailing address and telephone number, and whether the owner is a federal, state, private, public, or other entity;
  - (B) the name of the property owner, if different from the well owner, and his or her physical address, mailing address, and telephone number;
  - (C) the name, mailing address, telephone number, and geographic coordinates of the facility for which the application is submitted; and
  - (D) a list of all other injection permits associated with the subject facility.
- (2) Project Description. A description of what problem the project is intended to solve or what objective the project is intended to achieve and shall include the following:
  - (A) the history and scope of the problem or objective;
  - (B) what is currently being done to solve the problem or achieve the objective;
  - (C) why existing practices are insufficient to solve the problem or achieve the objective;
  - (D) what other alternatives were considered to solve the problem or achieve the objective; and
  - (E) how this option was determined to be the most effective or desirable to solve the problem or achieve the objective.
- (3) Demonstration of Financial Responsibility as required in Rule .0208 of this Section.
- (4) Injection Zone Determination. The applicant shall specify the horizontal and vertical portion of the injection zone within which the proposed injection activity will occur based on the hydraulic properties of that portion of the injection zone specified. No violation of groundwater quality standards specified in Subchapter 02L resulting from the injection shall occur outside the specified portion of the injection zone, as detected by a monitoring plan approved by the Director.
- (5) Hydrogeologic Evaluation. If required by G.S. 89E, G.S. 89C, or G.S. 89F, a licensed geologist, professional engineer, or licensed soil scientist shall prepare a hydrogeologic evaluation of the facility to a depth that includes the injection zone determined in accordance with Subparagraph (4) of this Paragraph. A description of the hydrogeologic evaluation shall include all of the following:
  - (A) regional and local geology and hydrogeology;
  - (B) changes in lithology underlying the facility;
  - (C) depth to the mean seasonal high water table;

- (D) hydraulic conductivity, transmissivity, and storativity of the injection zone based on tests of site-specific material, including a description of the tests used to determine these parameters;
  - (E) rate and direction of groundwater flow as determined by predictive calculations or computer modeling; and
  - (F) lithostratigraphic and hydrostratigraphic logs of test and injection wells.
- (6) Area of Review. The area of review shall be calculated using the procedure for determining the zone of endangering influence specified in 40 CFR 146.6(a), which is hereby incorporated by reference, including subsequent amendments and editions, and can be obtained electronically from the website of the Federal Register at <https://www.ecfr.gov/cgi-bin/ECFR>. The applicant shall identify all wells within the area of review that penetrate the injection or confining zone and repair or permanently abandon all wells that are improperly constructed or abandoned.
- (7) Analyses of the injection zones including:
- (A) test results of the native groundwater and the proposed recharge water for the parameters listed in Subparagraph (h)(4) of this Rule;
  - (B) geochemical analyses of representative samples of the aquifer matrix to determine the type and quantity of reactive minerals; and
  - (C) evaluation of the chemical compatibility of the native groundwater, injected water, and the aquifer matrix using site-specific geochemical data and hydraulic properties of the injection zones, and the results of any geochemical or hydrogeologic modeling. The chemical compatibility evaluation shall identify potential changes in groundwater quality resulting from the injection activities within the area of review specified in Subparagraph (6) of this Paragraph.
- (8) Injection Procedure. The applicant shall submit a description of the proposed injection procedure that includes the following:
- (A) the proposed average and maximum daily rate and quantity of injectant;
  - (B) the average maximum injection pressure expressed in units of pounds per square inch (psi);
  - (C) calculation of fracture pressures of confining units expressed in units of psi; and
  - (D) the total or estimated volume to be injected.
- (9) Injection well construction details including:
- (A) the number and depth of injection wells;
  - (B) an indication of whether the injection wells are existing or proposed;
  - (C) the depth and type of casing;
  - (D) the depth and type of screen material;
  - (E) the depth and type of grout; and
  - (F) the plans and specifications of the surface and subsurface construction of each injection well or well system.
- (10) Monitoring Wells. Monitoring wells shall be located so as to detect any movement of injection fluids, process byproducts, or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (4) of this Paragraph. The monitoring schedule shall be consistent with the proposed injection schedule, pace of the anticipated reactions, and rate of transport of the injected fluid. The applicant shall submit a monitoring plan that includes the following:
- (A) a list of monitoring parameters and analytical methods to be used;
  - (B) other parameters that may serve to indicate the progress of the intended reactions;
  - (C) a list of existing and proposed monitoring wells to be used; and
  - (D) a sampling schedule for monitoring the proposed injection.
- (11) Well Data Tabulation. A tabulation of data on all existing or abandoned wells within the area of review of the injection wells that penetrate the proposed injection zone, including water supply wells, monitoring wells, and wells proposed for use as injection or monitoring wells. The data shall include a description of each well's type, depth, and record of abandonment or completion.
- (12) Plan of Action. A proposed plan of action to be taken if the proposed injection operation causes fracturing of confining units, results in adverse geochemical reactions, or otherwise threatens groundwater quality.

- (13) Maps and Cross-Sections. Scaled, site-specific site plans or maps depicting the location, orientation, and relationship of facility components including the following:
  - (A) area map based on the most recent USGS 7.5' topographic map of the area, at a scale of 1:24,000, and showing the location of the proposed injection site;
  - (B) topographic contour intervals showing all facility related structures, property boundaries, streams, springs, lakes, ponds, and other surface drainage features;
  - (C) all existing or abandoned wells within the area of review of the injection wells listed in the tabulation required in Subparagraph (11) of this Paragraph that penetrate the proposed injection zone, including water supply wells, monitoring wells, and wells proposed for use as injection wells;
  - (D) potentiometric surface maps of each hydrostratigraphic unit in the injection zone(s) that show the direction of groundwater movement, and all existing and proposed wells;
  - (E) cross-sections that show the horizontal and vertical extent of the injection zones, lithostratigraphic units, hydrostratigraphic units, and all existing and proposed wells, complete with casing and screen intervals; and
  - (F) all existing sources of potential or known groundwater contamination, including waste storage, treatment, or disposal systems within the area of review of the injection well or well system.
- (14) Any other information necessary for the Director to ensure compliance with G.S. 87-84.
- (c) Injection Volumes. The Director may establish maximum injection volumes and pressures necessary to assure that:
  - (1) fractures are not initiated in the confining zones;
  - (2) injected fluids do not migrate outside the injection zone or area;
  - (3) injected fluids do not cause or contribute to the migration of contamination into uncontaminated areas; and
  - (4) there is compliance with operating requirements.
- (d) Injection.
  - (1) Injection may not commence until construction is complete, the permittee has submitted notice of completion of construction to the Director, and the Director has inspected or reviewed the injection well and finds it in compliance with the permit conditions. If the permittee has not received notice from the Director of intent to inspect or otherwise review the injection well within 10 days after the Director receives the notice, the permittee may commence injection
  - (2) Prior to granting approval for the operation, the Director shall consider the following information:
    - (A) all available logging and testing data on the well;
    - (B) a demonstration of mechanical integrity pursuant to Rule .0207 of this Section;
    - (C) the proposed operating procedures;
    - (D) the results of the formation testing program; and
    - (E) the status of corrective action on defective wells in the area of review.
- (e) Well Construction.
  - (1) Wells shall not be located:
    - (A) where surface water or runoff will accumulate around the well due to depressions, drainage ways, or other landscapes that will concentrate water around the well;
    - (B) if a person would be required to enter confined spaces to perform sampling and inspection activities; or
    - (C) if injectants or formation fluids would migrate outside the approved injection zone as determined by the applicant in accordance with Subparagraph (b)(4) of this Rule.
  - (2) The methods and materials used in construction shall not threaten the physical or mechanical integrity of the well during its lifetime and shall be compatible with the proposed injection activities.
  - (3) The well shall be constructed in such a manner that surface water or contaminants from the land surface cannot migrate along the borehole annulus either during or after construction.
  - (4) The borehole shall not penetrate to a depth greater than the depth at which injection will occur unless the purpose of the borehole is the investigation of the geophysical and geochemical characteristics of an aquifer. Following completion of the investigation, the borehole beneath the zone of injection shall be completely grouted to prevent the migration of any contaminants.

- (5) Drilling fluids and additives shall contain only potable water and may be comprised of one or more of the following:
  - (A) the formation material encountered during drilling;
  - (B) materials manufactured specifically for the purpose of borehole conditioning or well construction; or
  - (C) materials approved by the Director, based on a demonstration of not adversely affecting human health or groundwater quality.
- (6) Only grouts listed under Rule .0107 of this Subchapter shall be used with the exception that bentonite grout shall not be used:
  - (A) to seal zones of water with a chloride concentration of 1,500 milligrams per liter or greater as determined by tests conducted at the time of construction; or
  - (B) in areas of the State subject to saltwater intrusion that may expose the grout to water with a chloride concentration of 1,500 milligrams per liter or greater at any time during the life of the well.
- (7) The annular space between the borehole and casing shall be grouted:
  - (A) with a grout that is non-reactive with the casing or screen materials, the formation, or the injectant;
  - (B) from land surface to the top of the gravel pack and in such a way that there is no interconnection of aquifers or zones having differences in water quality that would result in degradation of groundwater quality in any aquifer or zone; and
  - (C) so that the grout extends outward from the casing wall to a thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater, but in no case shall a well be required to have an annular grout seal thickness greater than four inches.
- (8) Grout shall be emplaced around the casing by one of the following methods:
  - (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the annular space around the casing and overflows at the surface;
  - (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the annular space that can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application; or
  - (C) Other. Grout may be emplaced in the annular space by gravity flow to ensure complete filling of the space. Gravity flow shall not be used if water or any visible obstruction is present in the annular space at the time of grouting.
- (9) All grout mixtures shall be prepared prior to emplacement per the manufacturer's directions with the exception that bentonite chips or pellets may be emplaced by gravity flow if water is present or the chips or pellets are otherwise hydrated in place.
- (10) If an outer casing is installed, it shall be grouted by either the pumping or pressure method.
- (11) The well shall be grouted within seven days after the casing is set or before the drilling equipment leaves the site, whichever occurs first. If the well penetrates any water-bearing zone that contains saline water, the well shall be grouted within one day after the casing is set.
- (12) No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.
- (13) A casing shall be installed that extends from at least 12 inches above land surface to the top of the injection zone.
- (14) Wells with casing extending less than 12 inches above land surface shall be approved by the Director only when one of the following conditions is met:
  - (A) site specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; or
  - (B) it is not operationally feasible for the well head to be completed 12 inches above land surface due to the engineering design requirements of the system.
- (15) Multi-screened wells shall not connect aquifers or zones having differences in water quality that would result in a degradation of groundwater quality in any aquifer or zone.
- (16) Prior to removing the equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85, to preclude contaminants from entering the well.
- (17) Packing materials for gravel-and sand-packed wells shall be:
  - (A) composed of quartz, granite, or other hard, non-reactive rock material;

- (B) of uniform size, water-washed and free from clay, silt, and toxic materials;
  - (C) disinfected prior to subsurface emplacement;
  - (D) emplaced such that it will not connect aquifers or zones having differences in water quality that would result in the deterioration of groundwater quality in any aquifer or zone;
  - (E) evenly distributed around the screen and shall extend to a depth at least one foot above the top of the screen. A one-foot or greater thick seal, comprised of bentonite clay, shall be emplaced directly above and in contact with the packing material.
- (18) Each injection well shall have a well identification plate that meets the criteria specified in Rule .0107 of this Subchapter.
  - (19) A hose bibb, sampling tap, or other collection equipment shall be installed on the line entering the injection well such that a sample of the injectant can be obtained prior to its entering the injection well
  - (20) If applicable, all piping, wiring, and vents shall enter the well through the top of the casing unless it is based on a design demonstrated to preclude surficial contaminants from entering the well.
  - (21) The well head shall be completed in such a manner as to preclude surficial contaminants from entering the well, and well head protection shall include:
    - (A) an accessible external sanitary seal installed around the casing and grouting; and
    - (B) a water-tight cap or seal compatible with the casing and installed so that it cannot be removed without the use of hand or power tools.
- (f) Testing.
- (1) Well logs and other tests conducted during the drilling and construction of the wells shall be submitted to the Director after completion of well construction. A descriptive report interpreting the results of such logs and tests shall be prepared by a log analyst and submitted to the Director after completion of the tests. The accuracy and usefulness of the logs and tests shall be determined by the Director based on the intended function, depth, construction, and other characteristics of the well, and availability of similar data in the area of the drilling site. Such logs and tests shall include:
    - (A) lithostratigraphic logs of the entire borehole;
    - (B) hydrostratigraphic logs of the entire borehole; and
    - (C) deviation checks conducted on all holes where pilot holes and reaming are used at sufficiently frequent intervals to assure that vertical avenues for fluid migration through diverging holes are not created during drilling.
  - (2) When the injection zone is a water-bearing formation, the following information concerning the injection zone as determined by the applicant in accordance with Subparagraph (b)(4) of this Rule shall be submitted to the Director:
    - (A) fluid pressure;
    - (B) fluid temperature;
    - (C) fracture pressure;
    - (D) other physical and chemical characteristics of the injection zone;
    - (E) physical and chemical characteristics of the formation fluids; and
    - (F) compatibility of injected fluids with formation fluids.
  - (3) When the injection formation is not a water bearing formation, only the fracture pressure and other physical and chemical characteristics of the injection zone shall be determined or calculated and submitted to the Director after completion of the determinations.
  - (4) Tests for mechanical integrity shall be conducted prior to operation and every 10 years thereafter in accordance with Rule .0207 of this Section. The Director may require more frequent mechanical integrity testing as set out in Rule .0207 of this Section.
- (g) Operation and Maintenance.
- (1) Pressure at the well head shall be limited to a maximum that will ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area.
  - (2) There shall be no injection between the outermost casing and the well borehole.
  - (3) Monitoring of the operating processes at the well head and protection against damage of the well head during construction and use shall be provided for by the well owner.

(h) Monitoring.

- (1) Monitoring of the groundwater quality by the permittee shall be required by the Director to demonstrate protection of the groundwaters of the State.
- (2) In determining the type, density, frequency, and scope of monitoring, the Director shall consider the following:
  - (A) physical and chemical characteristics of the injection zone;
  - (B) physical and chemical characteristics of the injected fluids;
  - (C) volume and rate of discharge of the injected fluids;
  - (D) compatibility of the injected fluids with the formation fluids;
  - (E) the number, type, and location of all wells, mines, surface bodies of water, and structures within the area of review;
  - (F) proposed injection procedures;
  - (G) expected changes in pressure, formation fluid displacement, and direction of movement of injected fluid;
  - (H) proposals of corrective action to be taken in the event of a failure in any phase of injection operations that renders the groundwaters unsuitable for their best intended usage as defined in Rule .0204 of this Section; and
  - (I) the life expectancy of the injection operations.
- (3) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
- (4) The following analytical parameters shall be included:
  - (A) disinfectants and disinfection byproducts;
  - (B) radium, radionuclides, and gross alpha radiation;
  - (C) Reduction Potential (Eh), pH, Total Dissolved Solids (TDS), Biological Oxygen Demand (BOD), Total Oxygen Demand (TOD), Chemical Oxygen Demand (COD), temperature, conductivity, and dissolved oxygen;
  - (D) coliform, Escherichia coli (E. Coli), Giardia, and Cryptosporidium;
  - (E) parameters based on the source water, injection zone formation materials, native groundwater, and any other parameters necessary for the Department to ensure compliance with G.S. 87-84; and
  - (F) other parameters for which National Primary and Secondary Drinking Water Standards have been established.
- (5) Analysis of the physical, chemical, biological, or radiological characteristics of the injected fluid shall be made monthly or more frequently, as necessary in order to provide representative data for characterization of the injectant.
- (6) Continuous recording devices to monitor the injection pressure, flow, rate, and volume of injected fluid shall be installed.
- (7) Monitoring wells associated with the injection site shall be monitored quarterly or on a schedule determined by the Director to detect any migration of injected fluids from the injection zone to ensure compliance with G.S. 87-84.
- (8) Monitoring wells completed in the injection zone and adjacent to the injection zone may be affected by the injection operations. If affected, the Director may require additional monitor wells be installed outside the injection zone to detect any movement of injection fluids, process byproducts, or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (b)(4) of this Rule. If the operation is affected by subsidence or catastrophic collapse, additional monitoring wells shall be located so that they will not be physically affected and shall be of an adequate number to detect movement of injected fluids, process byproducts, or formation fluids outside the injection zone or area. In determining the number, location, and spacing of monitoring wells, the following criteria shall be considered by the Director:
  - (A) the population relying on the groundwater resource affected, or potentially affected, by the injection operation;
  - (B) the proximity of the injection operation to points of withdrawal of groundwater;
  - (C) the local geology and hydrology;
  - (D) the operating pressures;

- (E) the chemical characteristics and volume of the injected fluid, formation water, and process by products; and
  - (F) the number of existing injection wells.
- (i) Reporting.
- (1) A record of the construction, abandonment, or repairs of the injection well shall be submitted to the Director within 30 days of completion of the specified activities.
  - (2) All sampling results shall be reported to the Division quarterly or at another frequency determined by the Director based on the reaction rates, injection rates, likelihood of secondary impacts, and site-specific hydrogeologic information.
  - (3) The results of each test required in Paragraph (f) of this Rule shall be submitted to the Director within 30 days of the completion of the test.
- (j) Public Notice. Public notice of intent to issue permits for applications submitted pursuant to this Rule shall be given prior to permit issuance.
- (1) Such notice shall:
    - (A) be posted on the Division website and given in press releases via media outlets having coverage within the area of review;
    - (B) provide 30 days for public comments to be submitted to the Director; and
    - (C) include a description of details of the project, such as the permit applicant, the location, number, and depth of injection wells; and the injectant type, source, and volume.
  - (2) After the public comment period has ended the Director shall:
    - (A) consider the comments submitted and determine if a public hearing is warranted;
    - (B) determine if the draft permit shall be issued, modified, or denied; and
    - (C) post notice on the Division website as of the final permitting action, which shall include the issued permit or the reason for denial if the permit was denied.
  - (3) In determining if a public hearing is warranted, the Director's consideration shall include the following:
    - (A) requests by property owners within the area of review;
    - (B) potential harm to the public by not having a public hearing;
    - (C) potential harm to the applicant due to the delay in having a public hearing; and
    - (D) the likelihood of obtaining new information regarding the proposed injection.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
 Eff. May 1, 2012;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0220 AQUIFER TEST WELLS**

- (a) "Aquifer Test Wells" means wells used to inject uncontaminated fluid into an aquifer to determine the aquifer characteristics.
- (b) Injection wells of this type shall be permitted by rule when constructed and operated in accordance with this Rule.
- (c) Only potable water shall be injected through this type of injection well.
- (d) Tests for mechanical integrity shall be conducted in accordance with Rule .0207 of this Section.
- (e) Injection wells of this type shall be constructed in accordance with the well construction standards applicable to monitoring wells specified in Rule .0108 of this Subchapter;
- (f) The operation of the aquifer test well shall not cause contaminated groundwater to migrate into an area not contaminated prior to initiation of injection activities or cause a violation of applicable groundwater quality standards as specified in 15A NCAC 02L.
- (g) Within 30 days of a change of status of the well, the owner/operator shall provide the following information:
  - (1) facility name, address, and location indicated by either:
    - (A) latitude and longitude with reference datum, position accuracy, and method of collection;
    - or
    - (B) a facility site map with property boundaries;

- (2) name, telephone number, and mailing address of person responsible for installation or operation of the well;
  - (3) ownership of facility as a private individual or organization or a federal, State, county, or other public entity;
  - (4) number of injection wells and their construction details; and
  - (5) well status as proposed, active, inactive, temporarily abandoned, or permanently abandoned.
- (h) A record of the construction, abandonment, or repairs of the injection well shall be submitted to the Director within 30 days of completion of the specified activities.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0221 EXPERIMENTAL TECHNOLOGY WELLS**

"Experimental Technology Wells" means wells used in experimental or unproven technologies whose operation complies with all applicable rules and statutes. Experimental Technology Wells shall comply with the rules governing the injection well types in Rule .0209(5)(b) of this Section that most closely resembles the Experimental Technology Well's hydrogeologic complexity and potential to adversely affect groundwater quality.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0222 GEOTHERMAL AQUEOUS CLOSED-LOOP WELLS**

(a) "Geothermal Aqueous Closed-Loop Wells" means wells that house a subsurface system of closed-loop pipe that circulates potable water only or a mixture of potable water and performance-enhancing additives such as antifreeze, corrosion inhibitors, or scale inhibitors for heating and cooling purposes. Only additives that the Department of Health and Human Services' Division of Public Health determines not to adversely affect human health in compliance with G.S. 130A-5 shall be used.

(b) Permitted by Rule. Aqueous Closed-Loop Geothermal Wells are permitted by rule when constructed and operated in accordance with the rules of this Section.

(c) Individual Permits. If an individual permit is required pursuant to Rule .0217 of this Section, then an application for permit renewal shall be made at least 120 days prior to the expiration date of the permit.

(d) Notification. In addition to the requirements set forth in Rule .0211 of this Section, notification for systems designed to serve a single family residence shall be submitted two or more business days prior to construction and at least 30 days for all other installations. The notification shall be submitted to the Director and to the county health department. The notification shall be made using one form per facility supplied by the Director and shall include:

- (1) the well owner's name, address, telephone number, email address (if available), and whether the owner is a federal, State, private, public, or other entity. If the well operator is different from the owner then the same information shall be provided for the well operator;
- (2) the physical location of the well facility;
- (3) a description of the proposed injection activities;
- (4) a scaled, site-specific map showing the following:
  - (A) any water supply well and surface water body; septic system including drainfield, waste application area, and repair area; and any other potential sources of contamination listed in Subparagraph (e)(5) of this Rule within 250 feet of the proposed injection wells;
  - (B) property boundaries within 250 feet of the parcel where the proposed wells are located; and
  - (C) an arrow orienting the site to one of the cardinal directions;
- (5) the types and concentrations of additives, if any, to be used in the closed-loop geothermal well system. Only additives approved by the Department of Health and Human Services shall be used in any closed loop geothermal well system;

- (6) plans and specifications of the surface and subsurface construction details of the system;
  - (7) the heating and cooling system installation contractor's name and certification number, address, email address (if available), and telephone number;
  - (8) a description of how the items identified in Part (d)(4)(A) of this Rule will be protected during well construction; and
  - (9) any other information necessary for the Department to ensure compliance with G.S. 87-84.
- (e) Well Construction.
- (1) Only tubing that meets the specifications in Chapter 12 of the North Carolina Mechanical Code shall be used, which is hereby incorporated by reference, including subsequent amendments and editions, and can be accessed at no cost at <http://www.ncdoi.com/osfm/>.
  - (2) Drilling fluids and water produced during well construction shall be managed to prevent direct discharges to surface waters as well as violations of groundwater and surface water quality standards. Plans for such preventive measures shall be retained onsite throughout the construction process.
  - (3) The well shall be constructed in a manner that surface water or contaminants from the land surface cannot migrate along the borehole annulus at any time during or after construction.
  - (4) The well shall be located such that:
    - (A) the injection well is not in an area where surface water or runoff will accumulate around the well due to depressions, drainage ways, or other landscape features that will concentrate water around the well; and
    - (B) the injection well is not in an area that requires a person to enter confined spaces to perform sampling and inspection activities.
  - (5) The horizontal separation between the geothermal aqueous closed-loop well and potential sources of groundwater contamination that exist at the time the wells are constructed shall be no less than as follows:
    - (A) Building perimeters, including any attached structures for which a building permit is required, such as garages, patios, or decks, regardless of foundation construction type 15 feet
    - (B) Septic systems, including drainfield, waste application area, and repair area 50 feet
    - (C) Industrial or municipal sewage or liquid waste collection or transmission sewer mains constructed to water main standards as stated in the American Water Works Association (AWWA) Standards C600 and/or C900 15 feet
    - (D) Water-tight sewer lateral lines from a residence or other non-public system to a sewer main or other wastewater disposal system 15 feet
    - (E) Other industrial or municipal sewage or liquid waste collection or transmission sewer mains 25 feet
    - (F) Chemical or petroleum fuel underground storage tank systems regulated under 15A NCAC 02N with secondary containment 50 feet
    - (G) Chemical or petroleum fuel underground storage tank systems regulated under 15A NCAC 02N without secondary containment 100 feet
    - (H) Above ground or underground storage tanks that contain petroleum fuels used for heating equipment, boilers, or furnaces, except for tanks used solely for storage of propane, natural gas, or liquefied petroleum gas 50 feet
    - (I) Land-based or subsurface waste storage or disposal systems 50 feet
    - (J) Gravesites 50 feet
    - (K) Any other potential sources of contamination 50 feet
  - (6) The methods and materials used in construction shall not threaten the physical and mechanical integrity of the well and any tubing during its lifetime and shall be compatible with the proposed injection activities.
  - (7) Drilling fluids shall contain only potable water and may be comprised of one or more of the following:
    - (A) the formation material encountered during drilling; and
    - (B) materials manufactured specifically for the purpose of borehole conditioning or well construction.

- (8) Thermally enhanced bentonite slurry grout shall be used. This grout shall consist of a mixture of not more than 22 gallons of potable water, one 50-pound bag of thermally enhanced commercial Wyoming sodium bentonite, and up to 400 pounds of clean dry 50-70 mesh silica sand. The amount of silica sand may be varied to achieve the thermal conductivity desired of the grout. The thermally enhanced grout slurry shall only be used in accordance with the manufacturers written instructions and shall meet permeability standards in accordance with Rule .0107 of this Subchapter.
  - (9) Bentonite grout shall not be used:
    - (A) to seal zones of water with a chloride concentration of 1,500 milligrams per liter or greater as determined by tests conducted at the time of construction; or
    - (B) in areas of the State subject to saltwater intrusion that may expose the grout to water with a chloride concentration of 1,500 milligrams per liter or greater at any time during the life of the well
  - (10) No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.
  - (11) Grout shall be placed the entire length of the well boring from the bottom of the boring to land surface or, if completed below land surface, to the well header or manifold connection.
  - (12) The grout shall be emplaced by one of the following methods:
    - (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the borehole or annular space around the casing and overflows at the surface, or
    - (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the borehole or annular space which can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application.
  - (13) If temporary outer casing is installed, it shall be removed during grouting of the borehole in a way that maintains the integrity of the borehole and uniform grout coverage around the geothermal tubing.
  - (14) If a permanent outer casing is installed:
    - (A) The space between the interior wall of the casing and the geothermal tubing shall be grouted the entire length of the well boring from the bottom of the boring to land surface or, if completed below land surface, to the well header or manifold connection;
    - (B) The annular space between the casing and the borehole shall be grouted with a grout that is non-reactive with the casing or the formation;
    - (C) Grout shall extend outward in all directions from the casing wall to borehole wall and have a thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater; and
    - (D) In no case shall a well be required to have an annular grout seal thickness greater than four inches.
  - (15) Grout emplacement shall not threaten the physical or mechanical integrity of the well.
  - (16) The well shall be grouted within seven days after drilling is complete or before the drilling equipment leaves the site, whichever occurs first. If the well penetrates any water-bearing zone that contains contaminated or saline water, the well shall be grouted within one day after the casing is set.
  - (17) Prior to removing the equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85, to preclude contaminants from entering the well.
  - (18) Well head completion shall be conducted in a manner so as to preclude surficial contaminants from entering the well.
- (f) Well Location. The location of each well boring and appurtenant underground piping leading to all heat exchangers shall be identifiable such that they may be located, repaired, and abandoned as necessary after construction.
- (1) The as-built locations of each well boring, header pit, and appurtenant underground piping shall be recorded on a scaled site-specific facility map, which shall be retained onsite and distributed as specified in Subparagraph (i)(1) of this Rule.
  - (2) Each well boring and header pit shall be located by a North Carolina registered land surveyor, a GPS receiver, or by triangulation from at least two permanent features on the site, such as building foundation corners or property boundary iron pins.

- (3) Well boring and appurtenant underground piping locations shall be identifiable in the field by tracer wire and warning tape, concrete monuments, or any other method approved by the Director upon a demonstration that such a method provides a reliable and accurate method of detection.
  - (4) If tracer wire and warning tape are used, then tracer wire consisting of copper wire of at least 14 gauge shall be placed adjacent to all horizontal piping during pipe installation, and warning tape shall be installed directly above the horizontal piping approximately 12 inches below final grade.
  - (5) If concrete monuments are used, then each monument shall be located directly above each individual well, at the perimeter corners of each well field, or in the center of each well cluster. Each concrete monument shall be permanently affixed with an identification plate constructed of durable, weatherproof, rustproof metal or other material approved by the Director as equivalent, which shall be stamped with the following information:
    - (A) well contractor name and certification number;
    - (B) number and depth of the borings;
    - (C) grout depth interval;
    - (D) well construction completion date; and
    - (E) identification as a geothermal well or well field.
- (g) Testing.
- (1) Closed loop tubing shall pass a pressure test on-site prior to installation into the borehole. Any closed loop tubing that fails the pressure test shall either not be used or shall pass a subsequent pressure test prior to installation and after all leaks have been located and repaired.
  - (2) The closed loop well system shall pass a pressure test after installation and prior to operation. Any pressure fluctuation other than that due to thermal expansion and contraction of the testing medium shall be considered a failed test. Any leaks shall be located and repaired prior to operating the system.
- (h) Operation.
- (1) The well shall be protected against damage during construction and use.
  - (2) The well shall be operated and maintained in accordance with the manufacturer's specifications throughout its operating life.
- (i) Monitoring and Reporting.
- (1) The well owner shall submit the as-built well locations as documented in accordance with Paragraph (f) of this Rule to the Director and the appropriate county health department. The well owner shall also record these documents with the register of deeds of the county in which the facility is located.
  - (2) Upon sale or transfer of the property, the owner shall give a copy of these records to the new property owner or owners.
  - (3) The Director may require any monitoring necessary to ensure compliance with G.S. 87-84.
  - (4) The permittee shall report any leaks to the Division during the lifetime of the well.
  - (5) A record of the construction, abandonment, or repairs of the injection well shall be submitted to the Director within 30 days of completion of the specified activities.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0223 GEOTHERMAL DIRECT EXPANSION CLOSED-LOOP WELLS**

- (a) "Geothermal Direct Expansion Closed-Loop Wells" means wells used to house a subsurface system of closed-loop pipe that circulates refrigerant gas for heating and cooling purposes. Only gasses that the Department of Health and Human Services' Division of Public Health determines not to adversely affect human health in compliance with G.S. 130A-5 shall be used.
- (b) Permitted by Rule. Direct Expansion Closed-Loop Geothermal Wells are permitted by rule when constructed and operated in accordance with the rules of this Section.
- (c) Individual Permits. If an individual permit is required pursuant to Rule .0217 of this Section, then an application for permit renewal shall be made at least 120 days prior to the expiration date of the permit.
- (d) Notification. In addition to the requirements set forth in Rule .0211 of this Section, notification for systems designed to serve a single family residence shall be submitted two or more business days prior to construction and

30 days or more for all other installations. The notification shall be submitted to the Director and to the county health department. The notification shall be made using one form per operation supplied by the Director and shall include:

- (1) the well owner's name, address, telephone number, email address (if available), and whether the owner is a federal, State, private, public, or other entity. If the well operator is different from the owner then the same information shall be provided for the well operator;
  - (2) the physical location of the well;
  - (3) a description of the proposed injection activities;
  - (4) a scaled, site specific map showing the following:
    - (A) any water supply well and surface water body; septic system including drainfield, waste application area, and repair area; and any other potential sources of contamination listed in Subparagraph (e)(6) of this Rule within 250 feet of the proposed injection wells;
    - (B) property boundaries within 250 feet of the parcel where the proposed wells are located; and
    - (C) an arrow orienting the site to one of the cardinal directions;
  - (5) the type of gas to be used in the closed-loop geothermal well system. Only approved gases shall be used in any closed loop geothermal well system;
  - (6) plans and specifications of the surface and subsurface construction details of the system;
  - (7) the heating and cooling system installation contractor's name and certification number, address, email address (if available), and telephone number;
  - (8) a description of how the items identified in Part (d)(4)(A) of this Rule will be protected during well construction; and
  - (9) any other information necessary for the Department to ensure compliance with G.S. 87-84.
- (e) Well Construction.
- (1) Only tubing that meets the specifications in Chapter 12 of the North Carolina Mechanical Code shall be used.
  - (2) All systems shall be constructed with cathodic protection unless testing conducted in accordance with Paragraph (g) of this Rule indicates that all pH test results are within the range of 5.5 to 11.0 standard units.
  - (3) Drilling fluids and water produced during well construction shall be managed to prevent direct discharges to surface waters and violations of groundwater and surface water quality standards. Plans for such preventive measures shall be retained onsite throughout the construction process.
  - (4) The well shall be constructed in a manner that surface water or contaminants from the land surface cannot migrate along the borehole annulus at any time during or after construction.
  - (5) The well shall be located such that:
    - (A) the injection well is not in an area where surface water or runoff will accumulate around the well due to depressions, drainage ways, or other landscape features that will concentrate water around the well; and
    - (B) the injection well is not in an area that requires a person to enter confined spaces to perform sampling and inspection activities.
  - (6) The horizontal separation between the geothermal direct expansion closed-loop well and potential sources of groundwater contamination that exist at the time the wells are constructed shall be no less than as follows:
 

(A) Building perimeters, including any attached structures for which a building permit is required, such as garages, patios, or decks, regardless of foundation construction type	15 feet
(B) Septic systems, including drainfield, waste application area, and repair area	50 feet
(C) Industrial or municipal sewage or liquid waste collection or transmission sewer mains constructed to water main standards as stated in the American Water Works Association (AWWA) Standards C600 and/or C900	15 feet
(D) Water-tight sewer lateral lines from a residence or other non-public system to a sewer main or other wastewater disposal system	15 feet
(E) Other industrial or municipal sewage or liquid waste collection or transmission sewer mains	25 feet

- (F) Chemical or petroleum fuel underground storage tank systems regulated under 15A NCAC 02N with secondary containment  
50 feet
- (G) Chemical or petroleum fuel underground storage tank systems regulated under 15A NCAC 02N without secondary containment  
100 feet
- (H) Above ground or underground storage tanks that contain petroleum fuels used for heating equipment, boilers, or furnaces, except for tanks used solely for storage of propane, natural gas, or liquefied petroleum gas  
50 feet
- (I) Land-based or subsurface waste storage or disposal systems  
50 feet
- (J) Gravesites  
50 feet
- (K) Any other potential sources of contamination  
50 feet
- (7) Angled boreholes shall not be drilled in the direction of underground petroleum or chemical storage tanks unless it can be demonstrated to the satisfaction of the Director that doing so will not adversely affect human health or cause a violation of a groundwater quality standard as specified in Subchapter 02L.
- (8) The methods and materials used in construction shall not threaten the physical and mechanical integrity of the well during its lifetime and shall be compatible with the proposed injection activities.
- (9) Drilling fluids shall contain only potable water and may be comprised of one or more of the following:
  - (A) the formation material encountered during drilling; and
  - (B) materials manufactured specifically for the purpose of borehole conditioning or well construction.
- (10) Thermally enhanced bentonite slurry grout shall be used. This grout shall consist of a mixture of not more than 22 gallons of potable water, one 50-pound bag of thermally enhanced commercial Wyoming sodium bentonite, and up to 400 pounds of clean dry 50-70 mesh silica sand. The amount of silica sand may be varied to achieve the thermal conductivity desired of the grout. The thermally enhanced grout slurry shall only be used in accordance with the manufacturers written instructions.
- (11) Bentonite grout shall not be used:
  - (A) to seal zones of water with a chloride concentration of 1,500 milligrams per liter or greater as determined by tests conducted at the time of construction; or
  - (B) in areas of the State subject to saltwater intrusion that may expose the grout to water with a chloride concentration of 1,500 milligrams per liter or greater at any time during the life of the well.
- (12) No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.
- (13) Grout shall be placed the entire length of the well boring from the bottom of the boring to land surface or, if completed below land surface, to the well header or manifold connection.
- (14) The grout shall be emplaced by one of the following methods:
  - (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the borehole or annular area space the casing and overflows at the surface; or
  - (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the borehole or annular space which can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application.
- (15) If temporary outer casing is installed, it shall be removed during grouting of the borehole in a way that maintains the integrity of the borehole and uniform grout coverage around the geothermal tubing.
- (16) If a permanent outer casing is installed:
  - (A) The space between the interior wall of the casing and the geothermal tubing shall be grouted the entire length of the well boring from the bottom of the boring to land surface or, if completed below land surface, to the well header or manifold connection.
  - (B) The annular space between the casing and the borehole shall be grouted with a grout that is non-reactive with the casing or the formation.

- (C) Grout shall extend outward in all directions from the casing wall to borehole wall and have a thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater; and
  - (D) In no case shall a well be required to have an annular grout seal thickness greater than four inches.
- (17) Grout emplacement shall not threaten the physical or mechanical integrity of the well.
  - (18) The well shall be grouted within seven days after drilling is complete or before the drilling equipment leaves the site, whichever occurs first. If the well penetrates any water-bearing zone that contains contaminated or saline water, the well shall be grouted within one day after the casing is set.
  - (19) Prior to removing the equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85, to preclude contaminants from entering the well.
  - (20) Well head completion shall be conducted in a manner so as to preclude surficial contaminants from entering the well.
- (f) Well Location. The location of each well boring and appurtenant underground piping leading to all heat exchangers shall be identifiable such that they may be located, repaired, and abandoned as necessary after construction.
- (1) The as-built locations of each well boring, header pit, and appurtenant underground piping shall be recorded on a scaled site-specific facility map, which shall be retained onsite and distributed as specified in Subparagraph (i)(1) of this Rule.
  - (2) Each well boring and header pit shall be located by a North Carolina registered land surveyor, a GPS receiver, or by triangulation from at least two permanent features on the site, such as building foundation corners or property boundary iron pins.
  - (3) Well boring and appurtenant underground piping locations shall be identifiable in the field by tracer wire and warning tape, concrete monuments, or any other method approved by the Director upon a demonstration that such a method provides a reliable and accurate method of detection.
  - (4) If tracer wire and warning tape are used, then tracer wire consisting of copper wire of at least 14 gauge shall be placed adjacent to all horizontal piping during pipe installation, and warning tape shall be installed directly above the horizontal piping approximately 12 inches below final grade.
  - (5) If concrete monuments are used, then each monument shall be located directly above each individual well, at the perimeter corners of each well field, or in the center of each well cluster. Each concrete monument shall be permanently affixed with an identification plate constructed of durable, weatherproof, rustproof metal or other material approved by the Director as equivalent, which shall be stamped with the following information:
    - (A) well contractor name and certification number;
    - (B) number and depth of the borings;
    - (C) grout depth interval;
    - (D) well construction completion date; and
    - (E) identification as a geothermal well or well field.
- (g) Testing.
- (1) Closed loop tubing shall pass a pressure test on-site prior to installation into the borehole. Any closed loop tubing that fails the pressure test shall either not be used or shall pass a subsequent pressure test prior to installation and after all leaks have been located and repaired.
  - (2) The closed loop well system shall pass a pressure test after installation and prior to operation. Any pressure fluctuation other than that due to thermal expansion and contraction of the testing medium shall be considered a failed test. Any leaks shall be located and repaired prior to operating the system.
  - (3) When not providing cathodic protection as specified in Subparagraph (e)(2) of this Rule drilling cuttings shall be tested for pH at a frequency of at least every 10 feet of boring length using a pH meter that has been calibrated prior to use according to the manufacturer's instructions.
- (h) Operation.
- (1) The well shall be protected against damage during construction and use.
  - (2) The well shall be operated and maintained in accordance with the manufacturer's specifications throughout its operating life. Cathodic protection, if required, shall be maintained at all times in accordance with the manufacturer's specifications throughout the operating life of the wells.
- (i) Monitoring and Reporting.

- (1) The well owner shall submit the as-built well locations as documented in accordance with Paragraph (f) of this Rule to the Director and the appropriate county health department. The well owner shall also record these documents with the register of deeds of the county in which the facility is located.
- (2) Upon sale or transfer of the property, the owner shall give a copy of these records to the new property owner or owners.
- (3) The Director may require any monitoring necessary to ensure compliance with G.S. 87-84.
- (4) The permittee shall report any leaks to the Division during the lifetime of the well.
- (5) A record of the construction, abandonment, or repairs of the injection well shall be submitted to the Director within 30 days of completion of the specified activities.

*History Note:* Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.

**15A NCAC 02C .0224 GEOTHERMAL HEATING AND COOLING WATER RETURN WELLS**

(a) "Geothermal Heating and Cooling Water Return Wells" means wells that reinject groundwater used to provide heating or cooling for structures. These wells shall not be approved by the Director unless the temperature of the injection fluid does not exceed 30 degrees Fahrenheit above or below the naturally occurring temperature of the receiving groundwater, including wells using a geothermal fluid source. No Geothermal Heating and Cooling Water Return Well shall be constructed, repaired, or operated without a permit.

(b) Permit Applications. In addition to the permit requirements set forth in Rule .0211 of this Section, an application shall be submitted, in duplicate, to the Director made using one form per operation supplied by the Director and shall include the following:

- (1) the well owner's name, address, telephone number, email address (if available), and whether the owner is a federal, State, private, public, or other entity. If the well operator is different from the owner, then the same information shall be provided for the well operator;
- (2) the physical address of the location of the well site if different than the well owner's mailing address;
- (3) a description of the injection activities proposed by the applicant;
- (4) a scaled, site-specific map showing at a minimum, the following:
  - (A) any water supply well and surface water body; septic system including drainfield, waste application area, and repair area; and any other potential sources of contamination listed under Rule .0107 of this Subchapter within 250 feet of the proposed injection wells;
  - (B) property boundaries within 250 feet of the parcel on which the proposed wells are located; and
  - (C) an arrow orienting the site to one of the cardinal directions;
- (5) the proposed average and maximum daily injection rate, volume, pressure, temperature, and quantity of fluid to be injected;
- (6) plans and specifications of the surface and subsurface construction details of the system including a schematic of the injection and source wells construction;
- (7) the heating and cooling system installation contractor's name, address, email address (if available), and telephone number; and
- (8) any other information necessary for the Department to ensure compliance with G.S. 87-84.

(c) Permit Renewals. Application for permit renewal shall be made at least 120 days prior to the expiration date of the permit.

(d) Well Construction.

- (1) A water supply well providing water for a separate geothermal heating and cooling injection well shall be constructed in accordance with the requirements of Rule .0107 of this Subchapter.
- (2) A geothermal heating and cooling water return injection well constructed with a well screen shall also be constructed in accordance with the requirements of Rule .0107 of this Subchapter except that the entire length of the casing shall be grouted from the top of the sand or gravel pack to the land surface in such a way that there is no interconnection of aquifers or zones having differences in water quality that would result in the degradation of groundwater quality of any aquifer or zone.

- (3) For open-end geothermal heating and cooling water return wells (also referred to as open-hole wells), the casing shall be grouted from the bottom of the casing to the land surface in such a way that there is no interconnection of aquifers or zones having differences in water quality that would result in degradation groundwater quality of any aquifer or zone.
  - (4) The injection well system shall be constructed such that sampling taps or other collection equipment approved by the Director provides a functional source of water when the system is operational. Such equipment shall provide the means to collect a water sample after emerging from the water supply well (influent sample), and immediately prior to injection into the return well (effluent sample).
- (e) Operation and Maintenance.
- (1) Pressure at the well head shall be limited to ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area.
  - (2) Injection between the outermost casing and the well borehole shall be prohibited.
  - (3) The well owner shall monitor the operating processes and protect the well against damage during construction and use.
- (f) Monitoring and Reporting.
- (1) Monitoring of any well may be required by the Director as necessary to ensure compliance with G.S. 87-84.
  - (2) The well owner shall retain copies of records of site maps showing the location of the injection wells and any testing, calibration, or monitoring information done on-site. Upon sale or transfer of the property, the owner shall give a copy of these records to the new property owner or owners.
  - (3) The permittee shall record the number and location of the wells with the register of deeds in the county in which the facility is located.
  - (4) A record of the construction, abandonment, or repairs of the injection well shall be submitted to the Director within 30 days of completion of the specified activities.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0225 GROUNDWATER REMEDIATION WELLS AND SYSTEMS**

- (a) "Groundwater Remediation Wells" means wells that are used to inject additives, treated groundwater, or ambient air for the treatment of contaminated soil or groundwater. Only additives that the Department of Health and Human Services' Division of Public Health determines not to adversely affect human health in compliance with G.S. 130A-5 shall be approved for injection.
- (b) "Groundwater Remediation Systems" include infiltration galleries and injection wells. When on-site contaminated groundwater is used, the groundwater remediation injection wells shall be permitted in accordance with G.S. 143-215.1A.
- (c) Permitted by Rule. The following are permitted by rule pursuant to Rule .0217 of this Section if constructed and operated in accordance with the rules of this Section, all criteria for the specific injection system are met, hydraulic or pneumatic fracturing are not conducted, and the injection wells or injection activities do not result in the violation of any groundwater or surface water standard outside the injection zone:
  - (1) Passive Injection Systems that use in-well delivery systems to diffuse injectants into the subsurface;
  - (2) Small-scale Injection Operations used to inject tracers or other additives to remediate contaminant plumes located within a land surface area not to exceed 10,000 square feet;
  - (3) Pilot Tests conducted to evaluate the technical feasibility of a remediation strategy in order to develop a full scale remediation plan for future implementation, if the surface area of the injection zone wells are located within an area that does not exceed five percent of the land surface above the known extent of groundwater contamination. A pilot test may involve multiple injection wells, injection events, and injectants within the specified area. An individual permit shall be required to conduct more than one pilot test on any separate groundwater contaminant plume;

- (4) Air Injection Wells used to inject ambient air to enhance in-situ treatment of groundwater and that meet the following requirements:
    - (A) The air to be injected shall not exceed the ambient air quality standards set forth in 15A NCAC 02D .0400 and shall not contain petroleum or any other constituent that would cause a violation of groundwater standards specified in Subchapter 02L; and
    - (B) Injection wells of this type shall be constructed in accordance with the well construction standards applicable to monitoring wells specified in Rule .0108 of this Subchapter.
  - (5) In-situ thermal (IST) well systems shall meet the following requirements:
    - (A) Any IST systems used shall not contain petroleum or any other constituent that would cause a violation of groundwater standards specified in Subchapter 02L; and
    - (B) Injection wells of this type shall be constructed in accordance with the well construction standards applicable to monitoring wells specified in Rule .0108 of this Subchapter.
- (d) Notification for Groundwater Remediation Wells described in Subparagraphs (c)(1) through (c)(3), and (c)(5) of this Rule shall be submitted to the Director two weeks prior to injection made using one form per facility supplied by the Director. Such notification shall include the following:
- (1) the name and contact information of the well owner;
  - (2) the name and contact information of the person who can answer technical questions about the proposed injection system, if different from the well owner;
  - (3) geographic coordinates of the injection well or well field;
  - (4) maps of the injection zone indicating the known extent of contamination such as:
    - (A) contaminant plume maps with isoconcentration lines that show the horizontal extent of the contaminant plume in soil and groundwater, existing and proposed monitoring wells, and existing and proposed injection wells; and
    - (B) cross-sections to the known or projected depth of contamination that show the horizontal and vertical extent of the contaminant plume in soil and groundwater, changes in lithology, existing and proposed monitoring wells, and existing and proposed injection wells;
  - (5) the purpose, scope, and goals of the proposed injection activity;
  - (6) the name, volume, concentration, and Material Safety Data Sheet of each injectant;
  - (7) a schedule of injection well construction and injection activities;
  - (8) the plans and specifications of each injection well or well system, which include:
    - (A) the number and depth of injection wells;
    - (B) information on whether the injection wells are existing or proposed;
    - (C) the well contractor name and certification number; and
    - (D) information on whether the injection wells are permanent wells, "direct push" temporary injection wells, or are subsurface distribution systems; and
  - (9) a description of a monitoring plan capable of determining if violations of groundwater quality standards specified in Subchapter 02L result from the injection activity.
- (e) Notification for Air Injection Wells described in Subparagraph (c)(4) of this Rule shall be submitted to the Director two weeks prior to injection on forms supplied by the Director. Such notification shall include the following:
- (1) the facility name, address, and location indicated by either:
    - (A) the latitude and longitude with reference datum, position accuracy, and method of collection; or
    - (B) a facility site map with property boundaries;
  - (2) the name, telephone number, and mailing address of the person responsible for installation or operation of the wells;
  - (3) the ownership of facility as a private individual or organization or a federal, State, county, or other public entity;
  - (4) the number of injection wells and their construction details; and
  - (5) the operating status as proposed, active, inactive, temporarily abandoned, or permanently abandoned.
- (f) Permit Applications for all Groundwater Remediation Wells not Permitted by Rule. In addition to the permit requirements set forth in Rule .0211 of this Section, an application for all groundwater remediation wells not permitted by rule shall be submitted in duplicate to the Director made using one form per facility furnished by the Director and shall include the following:

- (1) Site Description and Incident Information. The site description and incident information shall include the following:
  - (A) the name of the well owner or person otherwise responsible for the installation or operation of injection wells, mailing address, telephone number, and whether the owner is a federal, State, private, public, or other entity;
  - (B) the name of the property owner, if different from the well owner, physical address, mailing address, and telephone number;
  - (C) the name, mailing address, telephone number, geographic coordinates of the facility for which the application is submitted, a brief description of the nature of the business, and the status of the facility such as closed, still operating, or under construction;
  - (D) a description of the contamination incident including the source, type, cause, and release dates of the contamination; a list of all contaminants in the affected soil or groundwater; the presence and thickness of free product; and the maximum contaminant concentrations detected in the affected soil and groundwater;
  - (E) the State agency responsible for management of the contamination incident, including the incident tracking number, and the incident manager's name and telephone number; and
  - (F) a list of all permits issued for the facility or contamination incident, including Hazardous Waste Management program permits or approval under the Resource Conservation and Recovery Act (RCRA), waste disposal permits issued in accordance with G.S. 143-215.1, Sewage Treatment and Disposal Permits issued in accordance with G.S. 130A, and any other environmental permits required by State or federal law.
- (2) Soils Evaluation (For Systems Treating On-Site Contaminated Groundwater Only). For systems with proposed discharge within seven feet of land surface and above the seasonal high water table, a soil evaluation of the disposal site shall be provided to the Division by the applicant. If required by G.S. 89F, a soil scientist shall submit this evaluation. If this evaluation is submitted, it shall include the following information:
 

[Note: The North Carolina Board for Licensing of Soil Scientists has determined, via letter dated December 1, 2005, that preparation of soils reports pursuant to this Paragraph constitutes practicing soil science under G.S. 89F.]

  - (A) Field description of soil profile. Based on examinations of excavation pits or auger borings, the following parameters shall be described by individual horizons to a depth of seven feet below land surface or to bedrock: thickness of the horizon; texture; color and other diagnostic features; structure; internal drainage; depth, thickness, and type of restrictive horizons; pH; cation exchange capacity; and presence or absence of evidence of any seasonal high water table. Applicants shall dig pits when necessary for evaluation of the soils at the site.
  - (B) Recommendations concerning annual and instantaneous loading rates of liquids, solids, other wastewater constituents, and amendments. Annual hydraulic loading rates shall be based on in-situ measurement of saturated hydraulic conductivity in the most restrictive horizon.
- (3) Injection Zone Determination. The applicant shall specify the horizontal and vertical portion of the injection zone within which the proposed injection activity shall occur based on the hydraulic properties of that portion of the injection zone specified. No violation of groundwater quality standards specified in Subchapter 02L resulting from the injection shall occur outside the specified portion of the injection zone as detected by a monitoring plan approved by the Division. For systems treating on-site contaminated groundwater, computer modeling or predictive calculations based on site-specific conditions shall be provided to demonstrate that operation of the system shall not cause or contribute to the migration of contaminants into previously uncontaminated areas. This prescribed injection zone shall replace the compliance boundary as defined in 15A NCAC 2L .0107.
- (4) A hydrogeologic evaluation of the disposal site to a depth that includes the injection zone determined in accordance with Subparagraph (3) of this Paragraph. If required by G.S. 89E, G.S. 89C, or G.S. 89F, a licensed geologist, professional engineer, or licensed soil scientist shall prepare a hydrogeologic evaluation of the facility. The hydrogeologic evaluation shall include all of the following:
  - (A) the regional and local geology and hydrogeology;

- (B) the changes in lithology underlying the facility;
  - (C) the depth to bedrock;
  - (D) the depth to the mean seasonal high water table;
  - (E) the hydraulic conductivity, transmissivity, and storativity of the injection zone based on tests of site-specific material, including a description of the tests used to determine these parameters;
  - (F) the rate and direction of groundwater flow as determined by predictive calculations or computer modeling; and
  - (G) the lithostratigraphic and hydrostratigraphic logs of test and injection wells.
- (5) Area of Review. The area of review shall be calculated using the procedure for determining the zone of endangering influence specified in 40 CFR 146.6(a). The applicant shall identify all wells within the area of review that penetrate the injection or confining zone and repair or permanently abandon all wells that are improperly constructed or abandoned
- (6) Injectant Information. The applicant shall submit the following information for each proposed injectant:
- (A) the injectant name and manufacturer, concentration at the point of injection, and percentage if present in a mixture with other injectants;
  - (B) the chemical, physical, biological, or radiological characteristics necessary to evaluate the potential to adversely affect human health or groundwater quality;
  - (C) the source of fluids used to dilute, carry, or otherwise distribute the injectant throughout the injection zone as determined in accordance with Subparagraph (f)(3) of this Rule. If any well within the area of review of the injection facility is to be used as the fluid source, then the following information shall be submitted: location or ID number, depth of source, formation, rock or sediment type, and a chemical analysis of the water from the source well, including analyses for all contaminants suspected or historically recognized in soil or groundwater on the site;
  - (D) a description of the rationale for selecting the injectants and concentrations proposed for injection, including an explanation or calculations of how the proposed injectant volumes and concentrations were determined;
  - (E) a description of the reactions between the injectants and the contaminants present, including specific breakdown products or intermediate compounds that may be formed by the injection;
  - (F) a summary of results if modeling or testing was performed to investigate the injectant's potential or susceptibility for biological, chemical, or physical change in the subsurface; and
  - (G) an evaluation concerning the development of byproducts of the injection process, including increases in the concentrations of naturally occurring substances. Such an evaluation shall include the identification of the specific byproducts of the injection process, projected concentrations of byproducts, and areas of migration as determined through modeling or other predictive calculations.
- (7) Injection Procedure. The applicant shall submit a description of the proposed injection procedure that includes the following:
- (A) the proposed average and maximum daily rate and quantity of injectant;
  - (B) the average maximum injection pressure expressed in units of pounds per square inch (psi); and
  - (C) the total or estimated total volume to be injected.
- (8) Engineering Planning Documents (For Systems Treating On-Site Contaminated Groundwater Only). If required by G.S. 89C, a professional engineer shall prepare these documents. The following documents shall be provided to the Division by the applicant:  
 [Note: The North Carolina Board of Examiners for Engineers and Surveyors has determined, via letter dated December 1, 2005, that preparation of engineering design documents pursuant to this Paragraph constitutes practicing engineering under G.S. 89C.]
- (A) engineering plans for the entire system, including treatment, storage, application, and disposal facilities and equipment, except those previously permitted unless they are directly tied into the new units or are critical to the understanding of the complete process;

- (B) specifications describing materials to be used, methods of construction, and means for ensuring quality and integrity of the entire groundwater remediation system;
  - (C) plans that include construction details of recovery, injection, and monitoring wells and infiltration galleries;
  - (D) operating plans that include:
    - (i) the operating schedule including any periodic shut-down times;
    - (ii) required maintenance activities for all structural and mechanical elements;
    - (iii) a list of all consumable and waste materials with their intended source and disposal locations;
    - (iv) restrictions on access to the site and equipment; and
    - (v) provisions to ensure the quality of the treated effluent and hydraulic control of the system at all times when any portion of the system ceases to function, such as standby power capability, complete system-off status, or duplicity of system components.
- (9) Fracturing Plan. If hydraulic or pneumatic fracturing is proposed, then the applicant shall submit a detailed description of the fracturing plan that includes the following:
- (A) Material Safety Data Sheets of fracturing media including information on any proppants used;
  - (B) a map of fracturing well locations indicating the known extent of groundwater contamination and all buildings, wells, septic systems, underground storage tanks, and underground utilities located within the area of review as described in Subparagraph (5) of this Paragraph;
  - (C) a demonstration that the fracturing process shall not result in the fracturing of any confining units or otherwise cause or contribute to the migration of contamination into uncontaminated areas, or otherwise cause damage to buildings, wells, septic systems, underground storage tanks, and underground utilities;
  - (D) the injection rate and volume;
  - (E) the orientation of bedding planes, joints, and fracture sets of the fracture zone;
  - (F) a performance monitoring plan for determining the fracture well radius of influence; and
  - (G) if conducted, the results of geophysical testing or a pilot demonstration of fracture behavior conducted in an uncontaminated area of the site.
- (10) Injection well construction details including:
- (A) the number and depth of injection wells;
  - (B) the number and depth of borings if using multi-level or "nested" well systems;
  - (C) information on whether the injection wells are existing or proposed;
  - (D) the depth and type of casing;
  - (E) the depth and type of screen material;
  - (F) the depth and type of grout;
  - (G) information on whether the injection wells are permanent or temporary "direct push" points; and
  - (H) the plans and specifications of the surface and subsurface construction details of each injection well or well system.
- (11) Monitoring Wells. Monitoring wells shall be of sufficient quantity and location to detect any movement of injection fluids, injection process byproducts, or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (f)(3) of this Paragraph. The monitoring schedule shall be consistent with the proposed injection schedule, the pace of the anticipated reactions, and the rate of transport of the injectants and contaminants. The applicant shall submit a monitoring plan that includes the following:
- (A) the target contaminants and the secondary or intermediate contaminants that may result from the injection;
  - (B) the other parameters that may serve to indicate the progress of the intended reactions;
  - (C) a list of existing and proposed monitoring wells to be used; and
  - (D) a sampling schedule for monitoring the proposed injection.
- (12) Well Data Tabulation. A tabulation of data on all existing or abandoned wells within the area of review of the injection wells that penetrate the proposed injection zone, including monitoring wells and wells proposed for use as injection wells. Such data shall include a description of each

- well's type, depth, record of abandonment or completion, and any additional information the Director may require to ensure compliance with G.S. 87-84.
- (13) Maps and Cross-Sections. Scaled, site-specific site plans or maps depicting the location, orientation, and relationship of facility components including the following:
- (A) an area map based on the most recent USGS 7.5' topographic map of the area, at a scale of 1:24,000 and showing the location of the proposed injection site;
  - (B) topographic contour intervals showing all facility related structures, property boundaries, streams, springs, lakes, ponds, and other surface drainage features;
  - (C) all existing or abandoned wells within the area of review of the injection wells listed in the tabulation required in Subparagraph (12) of this Paragraph that penetrate the proposed injection zone, including water supply wells, monitoring wells, and wells proposed for use as injection wells;
  - (D) potentiometric surface maps that show the direction of groundwater movement and existing and proposed wells;
  - (E) contaminant plume maps with isoconcentration lines that show the horizontal extent of the contaminant plume in soil and groundwater and existing and proposed wells;
  - (F) cross-sections to the known or projected depth of contamination that show the horizontal and vertical extent of the contaminant plume in soil and groundwater, major changes in lithology, and existing and proposed wells; and
  - (G) any existing sources of potential or known groundwater contamination, including waste storage, treatment, or disposal systems, within the area of review of the injection well or well system.
- (14) Any other information necessary for the Department to ensure compliance with G.S. 87-84.
- (g) Injection Volumes. The Director may establish maximum injection volumes and pressures necessary to ensure compliance with G.S. 87-84 and that:
- (1) fractures are not initiated in the confining zone of the injection zone determined in accordance with Subparagraph (f)(3) of this Rule;
  - (2) injected fluids do not migrate outside the injection zone or area; and
  - (3) injected fluids and fractures do not cause or contribute to the migration of contamination into uncontaminated areas.
- (h) Well Construction.
- (1) Wells shall not be located where:
    - (A) surface water or runoff will accumulate around the well due to depressions, drainage ways, or other landscapes that will divert water to the well;
    - (B) a person would be required to enter confined spaces to perform sampling and inspection activities; and
    - (C) injectants or formation fluids would migrate outside the approved injection zone as determined by the applicant in accordance with Subparagraph (f)(3) of this Rule.
  - (2) Wells used for hydraulic or pneumatic fracturing shall be located within the boundary of known groundwater contamination but no closer than 75 feet to this boundary unless it can be demonstrated that a lesser separation distance will not adversely affect human health or cause a violation of a groundwater quality standard as specified in Subchapter 02L, such as through the use of directional fracturing.
  - (3) The methods and materials used in construction shall not threaten the physical and mechanical integrity of the well during its lifetime.
  - (4) The well shall be constructed in a manner that surface water or contaminants from the land surface cannot migrate along the borehole annulus either during or after construction.
  - (5) The borehole shall not penetrate to a depth greater than the depth at which injection will occur unless the purpose of the borehole is the investigation, of the geophysical and geochemical characteristics of an aquifer. Following completion of the investigation the borehole beneath the zone of injection shall be grouted completely to prevent the migration of any contaminants.
  - (6) For "direct-push" temporary injection wells constructed without permanent or temporary casing, injection and well abandonment activities shall be conducted within the same working day as when the borehole is constructed.
  - (7) Drilling fluids shall contain only potable water and may be comprised of one or more of the following:

- (A) the formation material encountered during drilling; and
  - (B) materials manufactured specifically for the purpose of borehole conditioning or well construction.
- (8) Only allowable grout listed under Rule .0107 of this Subchapter shall be used; however, bentonite grout shall not be used:
- (A) to seal zones of water with a chloride concentration of 1,500 milligrams per liter or greater as determined by tests conducted at the time of construction; or
  - (B) in areas of the State subject to saltwater intrusion that may expose the grout to water with a chloride concentration of 1,500 milligrams per liter or greater at any time during the life of the well.
- (9) The annular space between the borehole and casing shall be grouted:
- (A) with a grout that is non-reactive with the casing or screen materials, the formation, or the injectant;
  - (B) from the top of the gravel pack to land surface and in a way that there is no interconnection of aquifers or zones having differences in water quality that would result in the degradation of the groundwater quality of any aquifer or zone; and
  - (C) so that the grout extends outward from the casing wall to a thickness equal to either one-third of the diameter of the outside dimension of the casing or two inches, whichever is greater. In no case shall a well be required to have an annular grout seal thickness greater than four inches.
- (10) Grout shall be emplaced around the casing by one of the following methods:
- (A) Pressure. Grout shall be pumped or forced under pressure through the bottom of the casing until it fills the annular space around the casing and overflows at the surface;
  - (B) Pumping. Grout shall be pumped into place through a hose or pipe extended to the bottom of the annular space that can be raised as the grout is applied. The grout hose or pipe shall remain submerged in grout during the entire application; or
  - (C) Other. Grout may be emplaced in the annular space by gravity flow in a way to ensure complete filling of the space. Gravity flow shall not be used if water or any visible obstruction is present in the annular space at the time of grouting.
- (11) All grout mixtures shall be prepared prior to emplacement per the manufacturer's directions with the exception that bentonite chips or pellets may be emplaced by gravity flow if water is present or otherwise hydrated in place.
- (12) If an outer casing is installed, it shall be grouted by either the pumping or pressure method.
- (13) The well shall be grouted within seven days after the casing is set or before the drilling equipment leaves the site, whichever occurs first. If the well penetrates any water-bearing zone that contains contaminated or saline water, the well shall be grouted within one day after the casing is set.
- (14) No additives that will accelerate the process of hydration shall be used in grout for thermoplastic well casing.
- (15) A casing shall be installed that extends from at least 12 inches above land surface to the top of the injection zone.
- (16) Wells with casing extending less than 12 inches above land surface and wells without casing shall be approved by the Director only when one of the following conditions is met:
- (A) site specific conditions directly related to business activities, such as vehicle traffic, would endanger the physical integrity of the well; or
  - (B) it is not operationally feasible for the well head to be completed 12 inches above land surface due to the engineering design requirements of the system.
- (17) Multi-screened wells shall not connect aquifers or zones having differences in water quality that would result in a degradation of the groundwater quality of any aquifer or zone.
- (18) Prior to removing the equipment from the site, the top of the casing shall be sealed with a water-tight cap or well seal, as defined in G.S. 87-85, to preclude contaminants from entering the well.
- (19) Packing materials for gravel and sand packed wells shall be:
- (A) composed of quartz, granite, or other hard, non-reactive rock material;
  - (B) of uniform size, water-washed and free from clay, silt, and toxic materials;
  - (C) disinfected prior to subsurface emplacement;

- (D) emplaced such that it will not connect aquifers or zones having differences in water quality that would result in the deterioration of the water quality in any aquifer or zone; and
- (E) evenly distributed around the screen and shall extend to a depth at least one foot above the top of the screen. A one foot thick or greater seal comprised of bentonite clay, shall be emplaced directly above and in contact with the packing material.
- (20) All permanent injection wells shall have a well identification plate that meets the criteria specified in Rule .0107 of this Subchapter.
- (21) A hose bibb, sampling tap, or other collection equipment shall be installed on the line entering the injection well such that a sample of the injectant can be obtained prior to its entering the injection well.
- (22) If applicable, all piping, wiring, and vents shall enter the well through the top of the casing unless it is based on a design demonstrated to preclude surficial contaminants from entering the well.
- (23) The well head shall be completed in a manner to preclude surficial contaminants from entering the well, and well head protection shall include:
  - (A) an accessible external sanitary seal installed around the casing and grouting; and
  - (B) a water-tight cap or well seal compatible with the casing and installed so that it cannot be removed without the use of hand or power tools.
- (i) Mechanical Integrity. All permanent injection wells shall be tested for mechanical integrity, which shall be conducted in accordance with Rule .0207 of this Section.
- (j) Operation and Maintenance.
  - (1) Unless permitted by this Rule, pressure at the well head shall be limited to a maximum that will ensure that the pressure in the injection zone does not initiate new fractures or propagate existing fractures in the injection zone, initiate fractures in the confining zone, or cause the migration of injected or formation fluids outside the injection zone or area.
  - (2) Injection between the outermost casing and the well borehole is prohibited.
  - (3) The well owner shall monitor the operating processes at the well head and shall protect the well head against damage during construction and use.
- (k) Monitoring.
  - (1) Monitoring of the injection well shall be required by the Director to protect groundwaters of the State.
    - (A) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.
    - (B) Analysis of the physical, chemical, biological, or radiological characteristics of the injectant shall be made monthly or more frequently, as approved by the Director, in order to provide representative data for characterization of the injectant.
    - (C) Monitoring of injection pressure, flow rate, and cumulative volume shall occur according to a schedule determined necessary by the Director.
    - (D) Monitoring wells associated with the injection site shall be monitored quarterly or on a schedule determined by the Director to detect any migration of injected fluids from the injection zone.
  - (2) In determining the type, density, frequency, and scope of monitoring, the Director shall consider the following:
    - (A) physical and chemical characteristics of the injection zone;
    - (B) physical and chemical characteristics of the injected fluids;
    - (C) volume and rate of discharge of the injected fluids;
    - (D) compatibility of the injected fluids with the formation fluids;
    - (E) the number, type, and location of all wells, mines, surface bodies of water, and structures within the area of review;
    - (F) proposed injection procedures;
    - (G) expected changes in pressure, formation fluid displacement, and direction of movement of injected fluid;
    - (H) proposals of corrective action to be taken in the event that a failure in any phase of injection operations renders the groundwaters unsuitable for their best intended usage as defined 15A NCAC 02L; and
    - (I) the life expectancy of the injection operations.

- (3) Monitoring wells completed in the injection zone and any of those zones adjacent to the injection zone may be affected by the injection operations. If affected, the Director may require additional monitor wells located to detect any movement of injection fluids, injection process byproducts, or formation fluids outside the injection zone as determined by the applicant in accordance with Subparagraph (f)(3) of this Rule. If the operation is affected by subsidence or catastrophic collapse, any other required monitoring wells shall be located so that they will not be physically affected and shall be of an adequate number to detect movement of injected fluids, process byproducts, or formation fluids outside the injection zone or area. In determining the number, location and spacing of monitoring wells, the following criteria shall be considered by the Director:
    - (A) the population relying on the groundwater resource affected, or potentially affected, by the injection operation;
    - (B) the proximity of the injection operation to points of withdrawal of groundwater;
    - (C) the local geology and hydrology;
    - (D) the operating pressures;
    - (E) the chemical characteristics and volume of the injected fluid, formation water, and process byproducts; and
    - (F) the number of existing injection wells.
- (l) Reporting.
- (1) For all injection wells, the well owner shall be responsible for submitting to the Director on forms furnished by the Director the following:
    - (A) a record of the construction (form GW-1), abandonment (form GW-30), or repairs of the injection well within 30 days of completion of the specified activities; and
    - (B) the Injection Event Record within 30 days of completing each injection.
  - (2) For injection wells requiring an individual permit, the following shall apply:
    - (A) The well owner shall be responsible for submitting to the Director hydraulic or pneumatic fracturing performance monitoring results;
    - (B) All sampling results shall be reported to the Division annually or at another frequency determined by the Director based on the reaction rates, injection rates, likelihood of secondary impacts, and site-specific hydrogeologic information;
    - (C) A final project evaluation report shall be submitted within nine months after completing all injection-related activities associated with the permit or submit a project interim evaluation before submitting a renewal application for the permit. This document shall assess the injection projects findings in a written summary. The final project evaluation shall also contain monitoring well sampling data, contaminant plume maps, and potentiometric surface maps; and
    - (D) For groundwater remediation injection permits, each monitoring report shall include a summary identifying any detectable contaminant degradation breakdown products, and a table with historical laboratory analytical results. The table shall indicate any exceedances of groundwater standards per 15A NCAC 02L .0202, and shall distinguish data collected prior to injection from data collected after injection.
- (m) Application and Annual Fees (For Systems Treating On-Site Contaminated Groundwater Only)
- (1) Application Fee. For every application for a new or major modification of a permit under this Rule, a nonrefundable application processing fee in the amount provided in G.S. 143-215.3D shall be submitted to the Division by the applicant at the time of application. Modification fees shall be based on the annual fee for the facility.
  - (2) Annual Fees. An annual fee for administering and compliance monitoring shall be charged in each year of the term of every renewable permit per the schedule in G.S. 143-215.3D(a). Annual fees shall be paid for any facility operating on an expired permit that has not been rescinded or revoked by the Division. Permittees shall be billed annually by the Division. A change in the facility, which changes the annual fee, shall result in the revised annual fee being billed effective with the next anniversary date.
  - (3) Failure to pay an annual fee within 30 days after being billed may be cause for the Division to revoke the permit upon 60 days notice.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0226 SALINITY BARRIER WELLS**

Salinity Barrier Wells, which inject uncontaminated water into an aquifer to prevent the intrusion of salt water into the fresh water, shall meet the requirements of Rule .0219 of this Section, except that the Director may impose additional requirements to ensure compliance with G.S. 87-84.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0227 STORMWATER DRAINAGE WELLS SYSTEMS**

(a) Stormwater Drainage Wells Systems means well systems that receive the flow of water that occurs during rainfall or a snowmelt event.

(b) The following Stormwater Drainage Wells Systems shall be permitted by rule pursuant to Rule .0217 of this Section:

- (1) systems designed in accordance with stormwater controls required by federal laws and regulations, State statutes and rules, or local controls; and
- (2) infiltration systems, which receive stormwater from roof tops.

(c) Nothing in this Rule shall be construed as to allow untreated stormwater to be injected directly into any aquifer or to otherwise result in the violation of any groundwater quality standard as specified in 15A NCAC 02L.

(d) Reporting. Within 30 days of a change of status of the well drainage system, the owner or operator shall submit the following information to the Division:

- (1) the facility name, address, and location indicated by either:
  - (A) latitude and longitude with reference datum, position accuracy, and method of collection; or
  - (B) a facility site map indicating property boundaries;
- (2) the name, telephone number, and mailing address of owner or operator;
- (3) the ownership of facility as a private individual or organization, or a federal, State, county, or other public entity;
- (4) the number of injection wells drainage and collection systems; and
- (5) the well injection system status as proposed, active, inactive, temporarily abandoned, or permanently abandoned.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0228 SUBSIDENCE CONTROL WELLS**

Subsidence Control Wells, which are used to inject uncontaminated fluids to reduce or eliminate subsidence associated with overdraft of fresh water or other activities not related to oil or natural gas production, shall meet the requirements of Rule .0219 of this Section, except that the Director may impose additional requirements to ensure compliance with G.S. 87-84.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c); Eff. May 1, 2012; Readopted Eff. September 1, 2019.*

**15A NCAC 02C .0229 TRACER WELLS**

Tracer Wells, which are used to inject substances for determining hydrogeologic properties of aquifers, shall meet the requirements of Rule .0225 of this Section, except that the Director may impose additional requirements to ensure compliance with G.S. 87-84.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.*

#### **15A NCAC 02C .0230 OTHER WELLS**

Other Wells shall meet the requirements of that injection well type described in Rule .0209(5)(b) of this Section that most closely resembles the proposed Other Well's hydrogeologic complexity and potential to adversely affect groundwater quality. The Director may impose additional requirements to ensure compliance with G.S. 87-84.

*History Note: Authority G.S. 87-87; 87-88; 87-90; 87-94; 87-95; 143-211; 143-214.2(b); 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.*

#### **15A NCAC 02C .0240 ABANDONMENT AND CHANGE-OF-STATUS OF INJECTION WELLS AND SYSTEMS**

(a) Injection wells and injection well systems shall be abandoned by the well owner in accordance with one of the following procedures or other alternatives approved by the Director that ensures compliance with G.S. 87-84:

- (1) Wells other than closed-loop geothermal wells shall be temporarily or permanently abandoned as required by Rule .0113 of this Subchapter.
- (2) Closed-loop geothermal wells that are temporarily abandoned shall be maintained so that they are not a source or channel of contamination during the period of abandonment.
- (3) Closed-loop geothermal wells shall be permanently abandoned as follows:
  - (A) all casing, tubing, or piping and associated materials shall be removed prior to abandonment if that removal will not cause or contribute to contamination of groundwater;
  - (B) the boring shall be filled from bottom to top with grout through a hose or pipe that extends to the bottom of the well and is raised as the well is filled;
  - (C) for tubing with an inner diameter of one-half inch or greater, the entire vertical length of the inner tubing shall be grouted;
  - (D) for tubing with an inner diameter less than one-half inch that cannot feasibly be grouted, the tubing shall be refilled with potable water and capped or sealed at a depth not less than two feet below land surface; and
  - (E) any protective or surface casing not grouted in accordance with the requirements set forth in this Section shall be removed and the well shall be grouted in accordance with the requirements set forth in this Section.
- (4) If a subsurface cavity has been created as a result of the injection operations, the well shall be abandoned in a manner that will prevent the movement of fluids into or between aquifers and in accordance with the terms and conditions of the permit.

(b) An injection well that acts as a source or channel of contamination shall be brought into compliance with the standards and criteria of these Rules, repaired, or permanently abandoned. Repair or permanent abandonment shall be completed within 15 days of the discovery of the noncompliance.

(c) Exploratory or test wells, constructed for the purposes of obtaining information regarding an injection well site, shall be permanently abandoned in accordance with Rule .0113 of this Subchapter within two days after drilling or two days after testing is complete, whichever is later. However, if a test well is being converted to a permanent injection well, this conversion shall be completed within 30 days after drilling.

(d) An injection well shall be permanently abandoned by the drilling contractor before removing his or her equipment from the site if the well casing has not been installed or has been removed from the well bore.

(e) The well owner shall be responsible for permanent abandonment of a well except that:

- (1) the well contractor shall be responsible for well abandonment if abandonment is required because the well contractor improperly locates, constructs, repairs or completes the well;
  - (2) the person who installs, repairs or removes the well pump shall be responsible for well abandonment if that abandonment is required because of improper well pump installation, repair or removal; or
  - (3) the well contractor (or individual) who conducts a test boring shall be responsible for its abandonment at the time the test boring is completed.
- (f) Groundwater remediation systems that include infiltration galleries shall be abandoned as follows:
- (1) 30 days prior to initiation of closure of a groundwater remediation system, the permittee shall submit the following documentation to the Division:
    - (A) the reasons for closure;
    - (B) a letter from the oversight agency authorizing closure of the system; and
    - (C) a description of the proposed closure procedure.
  - (2) The infiltration gallery shall be closed such that it:
    - (A) will be rendered permanently unusable for the disposal of fluids; and
    - (B) will not serve as a source or channel of contamination.
  - (3) Within 30 days following upon completion of the closure, the permittee shall submit the following documentation to the Division:
    - (A) a description of the completed closure procedure;
    - (B) the dates of all actions taken for the procedure; and
    - (C) a written certification a by North Carolina licensed engineer or geologist that the closure has been accomplished, and that the information submitted is complete, factual, and accurate.

*History Note:* Authority G.S. 87-87; 87-88; 143-211; 143-215.1A; 143-215.3(a)(1); 143-215.3(c);  
 Eff. May 1, 2012;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0241 VARIANCE**

- (a) The Secretary, through the Director, may grant a variance from any construction or operation standards under the rules of this Section. Any request for a variance shall be made using the form set forth in Rule .0118(b) of the Subchapter by the person responsible for construction of the well for which the variance is sought pursuant to Rule .0118(b) of this Subchapter. The Director shall grant the variance if:
- (1) the use of the well will not endanger human health and welfare or the groundwater; and
  - (2) construction or operation in accordance with the standards is not technically feasible or the proposed construction provides equal or better protection of the groundwater.
- (b) The Secretary, through the Director, may require the variance applicant to submit such information necessary to make a decision to grant or deny the variance. The Director may impose such conditions on a variance or the use of a well for which a variance is granted and is necessary to ensure compliance with G.S. 87-84. The facts supporting any variance under this Rule shall be in writing and made part of the variance.
- (c) The Secretary, through the Director, shall respond in writing to a request for a variance within 30 days after receipt of the variance request.
- (d) For variances requested as a part of a permit application, the Director may include approval as a permit condition.
- (e) A variance applicant who is dissatisfied with the decision of the Director may commence a contested case by filing a petition under G.S. 150B-23 within 60 days after receipt of the decision.

*History Note:* Authority G.S. 87-87(4); 87-88; 143-215.1A; 143-215.3(a)(4);  
 Eff. May 1, 2012;  
 Readopted Eff. September 1, 2019.

**15A NCAC 02C .0242 DELEGATION**

- (a) The Secretary is delegated the authority to grant permission for well construction under G.S. 87-87.
- (b) The Secretary is delegated the authority to give notices and sign orders for violations under G.S. 87-91.
- (c) The Secretary may grant a variance from any construction standard, or the approval of alternate construction methods or materials, as specified under the rules of this Section.

*History Note: Authority G.S. 87-87(4); 143-215.1A; 143-215.3(a)(1); 143-215.3(a)(4);  
Eff. May 1, 2012;  
Readopted Eff. September 1, 2019.*

#### **SECTION .0300 - PERMITTING AND INSPECTION OF PRIVATE DRINKING WATER WELLS**

##### **15A NCAC 02C .0301 SCOPE AND PURPOSE**

(a) The purpose of the rules of this Section is to set out standards for permitting and inspection of private drinking water wells as defined in G.S. 87-85 by local health departments pursuant to G.S. 87-97.

(b) The rules of 15A NCAC 02C .0100 apply to private drinking water wells, as well as the following:

- (1) Potential sources of groundwater contamination shall not be located closer to the well than the separation distances specified in 15A NCAC 02C .0107(a)(2) or .0107(a)(3), as applicable;
- (2) In addition to the provisions in 15A NCAC 02C .0109, the builder, well contractor, pump installer, or homeowner, as applicable, shall provide assistance when necessary to gain access for inspection of the well, pumps, and pumping equipment; and
- (3) In addition to the requirements of 15A NCAC 02C .0113, any well that acts as a source or channel of contamination shall be repaired or permanently abandoned within 30 days of receipt of notice from the local health department.

*History Note: Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.*

##### **15A NCAC 02C .0302 DEFINITIONS**

The definitions in G.S. 87-85 and 15A NCAC 02C .0102 apply throughout this Section. In addition, the following definitions apply throughout this Section:

- (1) "Abandonment Permit" means a well abandonment permit issued by the local health department authorizing or allowing the permanent abandonment of any private drinking water well as defined in the rules of this Section.
- (2) "Certificate of Completion" means a certification by the local health department that a private drinking water well has been constructed or repaired in compliance with the construction permit or repair permit.
- (3) "Construction of wells" means the term as defined in G.S. 87-85.
- (4) "Construction permit" means a well construction permit issued by the local health department authorizing or allowing the construction of any private drinking water well as defined in the rules of this Section.
- (5) "Known source of release of contamination" means a location where any of the following activities, facilities, or conditions have been documented by the Department of Environmental Quality or a local health department:
  - (a) Groundwater contamination incidents arising from agricultural operations, including application of agricultural chemicals pursuant to 15A NCAC 02L;
  - (b) Groundwater contamination associated with the construction or operation of injection, monitoring, and other wells subject to permitting under the Well Construction Act and this Subchapter;
  - (c) Groundwater contamination associated with the operation of non- discharge, discharge (NPDES) facilities, land application of animal waste, and other activities subject to permitting under G.S. 143-215.1;
  - (d) Releases of hazardous waste or constituents that currently exceed the Groundwater Quality Standards listed in 15A NCAC 02L at facilities governed under G.S. 130A-294;
  - (e) Dry-Cleaning Solvent Cleanup sites regulated under G.S. 143-215.104(A);
  - (f) Pre-regulatory landfills and Inactive hazardous substance or waste disposal sites governed under the Inactive Hazardous Sites Act of 1987, G.S. 130A-310;
  - (g) Solid waste facilities subject to 15A NCAC 13B that have monitoring wells with exceedances of the Groundwater Protection Standards as defined in 15A NCAC 13B .1634(g) and (h);

- (h) Releases of petroleum and hazardous substances subject to G.S. 143-215.75 through 215.98;
  - (i) Sites that fall within the authority of the Brownfields Property Reuse Act as defined by G.S. 130A, Article 9 Part 5;
  - (j) Contamination associated with pollution sources in soils or other sites known or suspected to have exceeded the Groundwater Quality Standards listed in 15A NCAC 02L; or
  - (k) Contamination known to the local health department through experience with the property, surrounding properties, or information provided by the applicant.
- (7) "Local Health Department" means the authorized agent of the county or district health department or its successor.
  - (8) "Person" means the term as defined in G.S. 87-85.
  - (9) "Plat" means a property survey prepared by a registered land surveyor, drawn to a scale of one inch equals no more than 60 feet, that includes: the specific location of all structures and proposed structures and appurtenances, including decks, porches, pools, driveways, out buildings, existing and proposed wastewater systems, existing and proposed wells, springs, water lines, surface waters or designated wetlands, easements, including utility easements, and existing or proposed chemical or petroleum storage tanks above or below ground. "Plat" also means, for subdivision lots approved by the local planning authority and recorded with the county register of deeds, a copy of the recorded subdivisions plat that is accompanied by a site plan that is drawn to scale.
  - (10) "Pumps" and "pumping equipment" means the terms as defined in G.S. 87-85.
  - (11) "Repair" means the term as defined in G.S. 87-85.
  - (12) "Repair permit" means a well repair permit issued by the local health department authorizing or allowing the repair of any private drinking water well as defined in the rules of this Section.
  - (13) "Site plan" means a drawing not necessarily drawn to scale that shows the existing and proposed property lines with dimensions, and the specific location of all structures and proposed structures and appurtenances, including decks, porches, pools, driveways, out buildings, existing and proposed wastewater systems, existing and proposed wells, springs, water lines, surface waters or designated wetlands, easements, including utility easements, and existing or proposed chemical or petroleum storage tanks above or below ground.
  - (14) "Water supply system" means pump and pipe used in connection with or pertaining to the operation of a private drinking water well including pumps, distribution service piping, pressure tanks, and fittings.
  - (15) "Well contractor activity" has the same meaning as in G.S. 87-98.2(6).
  - (16) "Well seal" means the term as defined in G.S. 87-85.

*History Note: Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.*

**15A NCAC 02C .0303 APPLICATION FOR PERMIT**

A property owner or the property owner's agent shall submit an application for a permit to construct, repair, or abandon a private drinking water well to the local health department for the county where the well is located or will be located. The application shall include:

- (1) The name, the address, and the phone number of the proposed well property owner or agent;
- (2) The signature of owner or agent;
- (3) The address and the parcel identification number of the property where the proposed well is to be located;
- (4) A plat or site plan;
- (5) The intended use(s) of the property;
- (6) Other information deemed necessary by the local health department to determine the location of the property and any site characteristics, such as existing or permitted sewage disposal systems, easements or rights of way, existing wells or springs, surface water or designated wetlands, chemical or petroleum storage tanks, landfills, waste storage, known source of release of contamination, and any other characteristics or activities on the property or adjacent properties that could impact groundwater quality or suitability of the site for well construction;

- (7) Any current or pending restrictions regarding groundwater use as specified in G.S. 87-88(a); and
- (8) Any variances regarding well construction or location issued under 15A NCAC 02C .0118.

*History Note:* Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

#### **15A NCAC 02C .0304 PERMITTING**

(a) No person shall construct a private drinking water well without first obtaining a well construction permit from the local health department. No person shall repair a private drinking water well without first obtaining a well repair permit, except a well repair permit is not required for maintenance or pump repair or replacement. Disinfection in accordance with 15A NCAC 02C .0111 is a maintenance activity that does not require a repair permit. No person shall permanently abandon a private drinking water well without first obtaining a well abandonment permit from the local health department.

(b) Before issuing a well construction permit, the local health department shall conduct a field investigation to evaluate the topography, landscape position, available space, and potential sources of groundwater contamination on or around the site where a private drinking water well is to be located. Furthermore, the Department shall conduct a search of DEQ's published inventories to determine whether the proposed well site is located within 1,000 feet of a known source of release of contamination. The local health department shall issue a private water well construction permit after determining the site can be permitted for a well meeting the rules of this Section. The local health department shall not issue a construction permit for a well in violation of restrictions regarding groundwater use established pursuant to G.S. 87-88(a). The construction permit shall include a site plan showing the location of potential sources of contamination and area(s) suitable for well construction. The construction permit shall reference documentation from DEQ's published inventories of known releases of contamination within 1,000 feet of the proposed well site, and any known risk of constructing the well related to those findings. The local health department shall issue a written notice of denial of a construction permit if it determines a private drinking water well cannot be constructed in compliance with the rules of this Section. The notice of denial shall include reference to specific laws or rules that cannot be met and shall be provided to the applicant.

(c) Any well permit shall be valid for a period of five years; however, the local health department may revoke a permit at any time if it determines that there has been a material change in any fact or circumstance upon which the permit shall not be issued. The validity of a well construction permit or a well repair permit is not affected by a change in ownership of the site where a private drinking water well is proposed to be located if the proposed well can still be constructed or repaired in the permitted area and in accordance with this Section and 15A NCAC 02C .0100. The local health department may suspend or revoke any permits issued upon a determination that the rules of this Section have been violated.

(d) If there is an improperly abandoned well(s) on the site, the construction permit shall be conditioned upon repair or abandonment of those improperly abandoned well(s) in accordance with the rules of 15A NCAC 02C .0100.

*History Note:* Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

#### **15A NCAC 02C .0305 GROUT INSPECTION AND CERTIFICATION**

(a) The well contractor shall contact the local health department to schedule a grout inspection before grouting a private drinking water well and include the location, permit number, and anticipated time for grouting each private drinking water well. The local health department shall schedule the appointment by the end of the business day before the grouting is to occur except where the local health department has made provisions for scheduling inspections at night or on the same day of the inspection.

(b) Upon completion of a grout inspection, the local health department shall provide a written certification on the well permit that a grout inspection was completed and that the grouting is in compliance with the rules of 15A NCAC 02C .0100. When a local health department is unable to conduct a grout inspection within one hour of the scheduled time, the well contractor may grout a well without a grout inspection by the local health department. The well contractor shall provide a written certification to the local health department that the well has been grouted in compliance with the rules of 15A NCAC 02C .0100. A completed Well Construction Record form GW-1 stating the well was grouted in compliance with the rules of this Section shall serve as the well contractor's grout certification.

For purposes of issuing a Certificate of Completion, the well contractor's grout certification shall be accepted by the local health department as evidence the grout complies with the rules of this Section if the local health department:

- (1) was contacted by the well contractor to schedule a grout inspection;
- (2) was unable to inspect the grouting of the well within one hour following the scheduled time; and
- (3) upon final inspection, finds no evidence to indicate the well grout does not comply with the rules of this Section.

*History Note:* Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

#### **15A NCAC 02C .0306 WELL COMPLETION AND CERTIFICATION**

(a) After receiving a permit to construct a private drinking water well, the property owner or agent shall notify the health department prior to well construction if any of the following occur:

- (1) The separation criteria specified in 15A NCAC 02C .0107 cannot be met;
- (2) The residence or other structure is located other than indicated on the permit;
- (3) The use of the structure is changed from the use specified on the permit;
- (4) The septic system needs to be changed from the location indicated on the permit;
- (5) Landscaping changes have been made that may affect the integrity of the well;
- (6) There are current or pending restrictions regarding groundwater use as specified in G.S. 87-88(a);
- (7) The water source for any well intended for domestic use is adjacent to any water-bearing zone suspected or known to be contaminated; or
- (8) Any other changes occur in the information provided in the application for the well permit.

(b) The well contractor shall maintain a copy of the well construction permit, repair permit, or abandonment permit on the job site at all times during the construction, repair, or abandonment of the well. The well contractor shall meet all the conditions of the permit.

(c) The well contractor shall submit a copy of Well Construction Record (GW-1) to the local health department. Upon completion of construction or repair of a private drinking water well for which a permit is required, the local health department shall inspect the well and issue a Certificate of Completion that includes an "as built" drawing. Prior to the issuance of a Certificate of Completion, the local health department shall verify that the well was constructed in the designated area and according to the well construction permit and the rules of this Subchapter. The local health department shall inspect the grout around the casing for any settling, inspect the well head after the well seal is in place, and verify that a Well Construction Record has been received from the certified well contractor. No person shall place a private drinking water well into service without first having obtained a Certificate of Completion.

*History Note:* Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

#### **15A NCAC 02C .0307 WELL DATA AND RECORDS**

(a) Any person completing, abandoning, or repairing any well shall submit a record of the construction, abandonment, or repair to the local health department and the Division of Water Resources within 30 days of completion of construction, abandonment, or repair. The record shall be on a form provided by the Department of Environmental Quality.

(b) The local health department shall maintain a registry of all permitted private drinking water wells, specifying the well location and the water quality test results until the well is permanently abandoned in accordance with this Subchapter.

*History Note:* Authority G.S. 87-87; 87-97;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

#### **15A NCAC 02C .0308 APPEAL PROCEDURE**

Appeals concerning permit decisions or actions by the local health department to enforce the rules of this Section shall be conducted according to the procedures established in G.S. 150B, the Administrative Procedure Act.

*History Note:* Authority G.S. 87-87;  
Eff. July 1, 2008;  
Readopted Eff. July 1, 2019.

**15A NCAC 02C .0309 WELL ABANDONMENT AND CERTIFICATION**

- (a) The applicant or well contractor shall contact the local health department to provide notification of intent to permanently abandon a private drinking water well, and include the location, permit number, and anticipated time for abandonment of each private drinking water well. If it is conducting an inspection, the local health department shall schedule the appointment by the end of the business day before the abandonment is to occur except where the local health department has made provisions for scheduling inspections at night or on the same day as the inspection.
- (b) Upon notification from the well contractor, the local health department may opt to inspect the well abandonment process. The local health department shall inform the well contractor of its availability and intention to inspect the well abandonment after notification pursuant to Paragraph (a) of this Rule. When a local health department is unable to conduct the abandonment inspection within one hour of the scheduled time, the well contractor may abandon the well without an inspection by the local health department.
- (c) Upon completion of a permanent well abandonment, the local health department shall provide a written certification on the well abandonment permit, or other local health department form, that a well abandonment inspection was completed and that the abandonment is in compliance with the rules of 15A NCAC 02C .0100. When the local health department opts to not inspect the permanent abandonment process, the well contractor shall provide written certification to the local health department that the well has been abandoned in compliance with the rules of 15A NCAC 02C .0100. A completed Well Abandonment Record form GW-30 stating the well was abandoned in compliance with the rules of this Section shall serve as the well contractor's abandonment certification.

*History Note:* Authority G.S. 87-87;  
Eff. July 1, 2019.