FIRST FIVE-YEAR REVIEW REPORT FOR INTERNATIONAL MINERAL AND CHEMICAL CORPORATION (IMC) SUPERFUND SITE SPARTANBURG COUNTY, SOUTH CAROLINA

SEPTEMBER 2023

Prepared for

U.S. Environmental Protection Agency
Region 4
Atlanta, Georgia

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LIST OF ABBREVIATIONS & ACRONYMS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
bls	Below Land Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CWA	Clean Water Act
DCR	Declaration of Covenants and Restrictions
ESI	Expanded Site Inspection
EPA	United States Environmental Protection Agency
FFS	Focused Feasibility Study
FS	Feasibility Study
FYR	Five-Year Review
HDPE	High Density Polyethylene
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient
IC	Institutional Control
IMC	International Mineral and Chemical Corporation
LCR	Lead and Copper Rule
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
µg/L	Micrograms per Liter
mg/L	Milligrams per Liter
NCP	National Contingency Plan
NPK	Nitrogen-Phosphorus-Potassium
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
pH	Potential of hydrogen
PVC	Perforated Polyvinylchloride
PRP	Potentially Responsible Party
PSA	Preliminary Site Assessment
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RDWP	Remedial Design Work Plan
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional Screening Level
SCDHEC	South Carolina Department of Health and Environmental Control
SWMP	Site-Wide Monitoring Plan
SI	Site Inspection
s.u.	Standard pH Unit
UU/UE	Unlimited Use and Unrestricted Exposure

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 FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

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

This is the first FYR for the International Mineral and Chemical Corporation Superfund site (IMC Site, the Site). The triggering action for this policy review is the completion date of the Operable Unit 1 (OU1) remedial action (RA) for the Site of August 8, 2018. 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 (UU/UE).

The Site consists of one OU: OU1 addresses the groundwater remedial action. This FYR Report addresses the entire Site.

The South Carolina Department of Health and Environmental Control (SCDHEC) prepared this FYR at the International Mineral and Chemical Corporation Superfund site in Spartanburg, Spartanburg County, South Carolina. The SCDHEC personnel prepared this review from September 2022 to March 2023. The EPA is the lead agency for developing and implementing the remedy for the cleanup at the Site. The review began on September 8, 2022.

Site Background

A fertilizer manufacturing facility operated at the Site from 1910-1986; the facility has since been demolished. The Site is located in the Arkwright community (Figure G2), at 599 North Street, south of the City of Spartanburg in Spartanburg County, South Carolina. IMC Global, Inc., or related companies, including International Mineral and Chemical Corporation and IMC Fertilizer Group – Rainbow Division, owned or operated the facility from about 1910 until closure of the facility in 1986. Currently, the Site is owned by Vigindustries Inc., a subsidiary of The Mosaic Company. The facility operated as a nitrogen-phosphorus-potassium (NPK) fertilizer producer. Typical fertilizer manufacturing operations during the referenced timeframe included the use of phosphate rock to produce superphosphate, as well as the use of other types of raw materials, including fish scraps, bone meal, and cotton hulls, as sources of plant nutrients. Limited information is available regarding operations at the Site before 1947. As of 1947, there were three primary operations at the Site. Those site operations included the following:

- A sulfuric acid production process which was constructed in 1947 and operated until 1970.
- A superphosphate production process which continued operation until 1986.
- A fertilizer mixing operation that continued, with process modifications, until 1986.

The Site consists of 40.83 acres and is generally bounded on the north by undeveloped property and portions of Fairforest Creek, on the east by Fairforest Creek, to the south by the Arkwright Dump state Superfund site, and a few residential properties, and on the west by Seaboard Coast rail line. Other

industrial properties in the vicinity of the Site include a Mt. Vernon Mills facility to the immediate northwest, an active Solvay Chemical Corporation facility to the immediate southwest, and the inactive Arkwright Mills property to the north-northwest. The land uses in the vicinity of the Site include industrial, residential, and undeveloped properties. Currently, all residences and businesses are connected to City water and groundwater is not currently being used for a potable supply.

Although there is community interest in redevelopment, no projected land use changes were identified during this FYR. There are no immediate plans for the redevelopment of the Site.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: International Mineral and Chemical Corporation		
EPA ID: SCD003350493		
Region: 4	**State:** SC	**City/County:** Spartanburg/Spartanburg
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	**Has the site achieved construction completion?** Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name: Donovan Godbee (EPA) and Timothy Kadar (SCDHEC)		
Author affiliation: EPA and SCDHEC		
Review period: 9/8/2022 – 8/8/2023		
Date of site inspection:11/9/2022		
Type of review: Policy		
Review number: 1		
Triggering action date: 8/08/2018		
Due date (*five years after triggering action date*): 8/8/2023		

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The response action selected in the 2014 Record of Decision (ROD) was necessary to protect the public health or the welfare of the environment from actual releases of hazardous substances into the environment. A response action is generally warranted if one or more of the following conditions is met: 1) the cumulative excess carcinogenic risk to an individual exceeds 1E-4 (using reasonable maximum

exposure (RME) assumptions for either the current or reasonably anticipated future land use or current or potential beneficial use of ground/surface water); 2) the noncarcinogenic hazard index is greater than one (using RME assumptions for either the current or reasonably anticipated future land use or current or potential use of ground/surface water). The response action was warranted because:

- Groundwater contains contaminants above the Maximum Contaminant Level (MCLs) that contribute to an unacceptable risk. The groundwater exposure scenario had the highest excess cancer risks and non-carcinogenic risks of the exposure scenarios evaluated. Both current and future populations that may be exposed to groundwater contaminants cannot use potable supply wells and should be connected to the local City of Spartanburg water supply. Currently, all residences and businesses are connected to City water and groundwater is not currently being used for a potable supply.

Table 1 summarizes the contaminants of concern (COCs) identified in the Site's 2014 ROD.

Table 1: COCs by Media

COC	Media
Beryllium, Cadmium, Thallium, Lead, Fluoride, Nitrate, Benzene, 2,4-Dinitrotoluene (2,4-DNT)	Groundwater

Response Actions

The potentially responsible party (PRP) performed a Preliminary Site Assessment (PSA) for the Industrial Wastewater Division of SCDHEC in September 1991. Fluoride and lead were detected in unfiltered groundwater at concentrations exceeding their respective MCLs. Fluoride was also elevated in the unfiltered surface water sample. Three hydrogeologic assessments were conducted in December 1993, August 1994, and February 1995. Analyses of groundwater samples collected indicated the presence of metals exceeding primary and secondary MCLs. The EPA conducted a Site Inspection (SI) in September 1998. The SI reported that several inorganic constituents were present in groundwater samples above their MCLs and surface soils above background concentrations. The EPA conducted an Expanded Site Inspection (ESI) in 2000.

Semiannual groundwater and surface water sampling was conducted by Vigindustries under a permit with the Wastewater Division of SCDHEC. Groundwater and surface water samples were analyzed in the semiannual events for site-specific inorganic parameters. The semiannual groundwater monitoring program continued until December 2003 when it was suspended due to the Remedial Investigation/Feasibility Study (RI/FS) activities.

The Site was classified as a Superfund Alternative Site under Administrative Order on Consent (AOC) No. 01-3753-C issued by the EPA on July 10, 2001. Pursuant to that AOC, Vigindustries conducted a Remedial Investigation/Feasibility Study (RI/FS) and interim removal action. Vigindustries entered into a subsequent AOC to perform the removal actions for soil and fertilizer process residuals recommended in the RI/FS as a Non-Time Critical Removal Action (NTCRA). The NTCRA was completed in 2011 and a Focused Feasibility Study (FFS) was completed in 2014. In August 2014, the EPA issued a ROD identifying infiltration galleries as the selected remedy for the Site.

Remedial action objectives (RAOs) for the Site were developed in the Focused Feasibility Study (FFS) to identify and evaluate applicable remedial action (RA) alternatives in accordance with the

requirements of the NCP (40 CFR 300.430[e][2][i]). The NCP defines RAOs as a listing of the constituents and media of concern, potential exposure pathways, and remediation goals. Specific RAOs were developed based on the results of the RI and human health risk assessment along with a review of the applicable or relevant and appropriate requirements (ARARs). The RAOs established for the Site are presented in Table 2.

Table 2 - Remedial Action Objectives (2014 ROD)

Environmental Media	Remedial Action Objectives
Groundwater	For Human Health • Prevent future human exposure (dermal contact, ingestion, and inhalation) to groundwater with contaminants above levels that are protective of beneficial groundwater use. • To restore groundwater to beneficial use, if practicable, in a reasonable time frame. For Environmental Protection • To minimize migration of COCs from Site groundwater to surface water.

The selected remedy for the Site is infiltration galleries, groundwater monitoring and Institutional Controls (ICs) to achieve cleanup levels at the IMC Site. The components of the selected remedy as stated in the August 2014 ROD are:

- Installation of infiltration galleries in and downgradient of the former sulfuric acid area to address the low pH soil and groundwater.
- Periodic application of a neutralizing solution.
- Periodic sampling and analysis of monitoring wells.
- Institutional controls for site-wide groundwater use restrictions.

The goal of the remedial action is to restore groundwater to its beneficial use within a reasonable time frame. Until this goal is achieved, ICs have been implemented to prevent human exposure to contaminated groundwater. Public water is available in the area and is supplied from municipal wells.

Table 3: ROD Established Cleanup Levels

Groundwater		
COC	**Cleanup Level (µg/L)[a]**	**Basis**
Beryllium	4	Primary MCL[b]
Cadmium	5	Primary MCL
Thallium	2	Primary MCL
Lead	15	Federal Action Level[c]
Fluoride	4,000	Primary MCL
Nitrate	10,000	Primary MCL

Benzene	5	Primary MCL
2,4-DNT	10	Practical Quantitation Limit[d]

Notes:

a) µg/L – micrograms per liter

b) National Primary Drinking Water Regulations Maximum Contaminant Level - The highest level of a contaminant that is allowed in drinking water.

c) In 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR). The LCR includes "90th percentile" action level of 15 µg/L for lead (based on the 90th percentile sample level). Unlike the MCLG, which is based on what is safe for human health, the action level for lead is based on feasibility. Feasibility entails what is achievable using the best technology and treatment techniques while taking costs into account. Under the 1991 LCR, if samples contain lead concentrations less than 15 ppb, no action is required, despite EPA's assessment that any level of lead in drinking water is harmful to human health.

d) Practical Quantitation Limit means the lowest concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions.

Status of Implementation

The Remedial Design Work Plan (RDWP) was submitted on June 24, 2016, revised on July 19, 2016, and approved by EPA on July 27, 2016. The preliminary design was submitted to the EPA on September 23, 2016. Based on review comments, a pilot infiltration well and infiltration trench were constructed and operated in Infiltration Area 1 from January 10, 2017, to March 21, 2017. The Pre-final RD Report was submitted on April 21, 2017. The Final Remedial Design (RD) Report was submitted on July 21, 2017, and approved by the EPA on July 24, 2017.

The remedy addresses low pH source area soils, which are characterized by low vertical hydraulic conductivity, and low pH groundwater extending downgradient from the source area towards Fairforest Creek. Low pH condition enables several naturally occurring mineral constituents in native soil and bedrock to become soluble in the aquifer at concentrations above MCLs. The original concept for the infiltration areas presented in the ROD was a series of four trenches at three separate locations, totaling 12 trenches with 2-foot diameter pipe for buffer distribution. As a result of pilot testing performed in January 2017, the design was modified to include a 100-foot by 150-foot infiltration bed as Infiltration Area 1, infiltration wells as Infiltration Area 2, and an infiltration trench as Infiltration Area 3. Although the method of delivery was modified, the function of the infiltration remedy presented in the ROD remained the same. The remedial system includes three separate infiltration systems by which a buffer was applied to the low pH soil and groundwater. Low pH soil is associated with the former sulfuric acid plant area and is addressed by Infiltration Area 1. All three infiltration areas address low pH groundwater.

Because of low vertical permeability in Infiltration Area 1, an infiltration bed was designed to distribute the buffer laterally in the source soils using perforated polyvinylchloride (PVC) distribution pipes installed at a depth of approximately 6 feet bls. Infiltration Area 2, located immediately downgradient of Infiltration Area 1, consists of a row of 12 infiltration wells with screens that extend approximately 5 feet into the water table aquifer. A 36-inch diameter high density polyethylene (HDPE) solid wall pipe acts as a holding tank for the buffer solution and is connected to each infiltration well. Infiltration Area 3 was designed as a typical infiltration trench, approximately 200 feet long with two 24-inch diameter HDPE perforated pipes placed end-to-end immediately above the water table.

The selected buffer solution is 10 percent sodium carbonate, which was subjected to bench scale testing with samples of soil and groundwater from the Site. The bench tests showed that the buffer solution was effective in neutralizing acidity in both vadose soil and groundwater. Approximately 42,200 gallons of buffer solution was gravity-fed to the entire system during each quarterly infiltration event. Neutralizing the pH of the groundwater will allow metals currently dissolved in groundwater to drop out of solution within the groundwater and mitigate further dissolution of metals from the aquifer matrix. Neutralization of pH is expected to also have a positive effect on fluoride and nitrate concentrations in groundwater. Fluoride is anticipated to form a complex with existing aluminum and become less soluble in the aquifer as the pH increases to near neutral conditions. Nitrate is subject to denitrification under favorable geochemical conditions, one of which is a pH near neutral. Fluoride and nitrate are anticipated to attenuate in the affected groundwater area as the effects of the previous removal actions and neutral groundwater pH values become apparent over time.

Institutional Controls

The 2014 ROD called for the implementation of ICs to:

- Limit the use of the IMC Site to commercial, industrial, and/or recreational purposes, and
- restrict the future withdrawal of groundwater from the IMC Site.

At the time of drafting this FYR, the ICs were implemented and are maintained in the form of a Declaration of Covenants and Restrictions (DCR) recorded with the Spartanburg County Office of the Register of Deeds at Book 118-W, Pages 300-311. Figure 1 includes the parcel subject to the DCR. Table 3 summarizes the institutional controls implemented at the site. Appendix F includes the DCR.

Table 4: Implemented Institutional Controls

Media, Engineered Controls and Areas that Do not Support UU/UE Based on Current Conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)[a]	IC Objective	Instrument in Place
Groundwater	Yes	Yes	7-20-00-004.00	Restrict the future withdrawal of groundwater from the Site	Declaration of Covenants and Restrictions
Soil	Yes	Yes	7-20-00-004.00	Limit the use of the Site to commercial, industrial, and/or recreational purposes	Declaration of Covenants and Restrictions

SCDHEC makes no claim, explicit or implied, as to the accuracy of the information on this map. Any assumptions made from the use of this are done at the user's own risk. Imagery download from: https://maps.spartanburgcounty.org/arcgis/apps/webappviewer/index.html?id=6881d692298041bc91caeca0465f2efc on 11/15/2022.

Figure 1: IMC Superfund Site Institutional Control Map

III. PROGRESS SINCE THE LAST REVIEW

This report is the first FYR for the Site. Therefore, there are no protective statements or recommendations from a prior FYR.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

EPA issued an online news release on October 19, 2022, to announce that the FYR was underway. A copy of the news release is included in Appendix D. The results of the review and the completed FYR Report will be made available on EPA's site profile page: https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0403259

The FYR process included interviews with regulatory agencies involved in Site activities or aware of the Site. The purpose was to document the perceived status of the Site and any perceived problems or successes with the phases of the remedy implemented to date. All the interviews were conducted in person, via telephone, or completed by email after the Site inspection. The interviews are summarized below. Appendix E provides the complete interviews.

Chris Slocum is the SCDHEC Project Manager (PM) for the Site. Mr. Slocum is aware that the implementation of the remedy began five years ago, and this is the first Five-Year Review of the Site. Because of the relatively short time frame, the long-term effectiveness of the remedy remains to be seen. Mr. Slocum states that the buffer infiltration events appear to have had a positive influence on site-wide pH, while the influence on COC concentrations has varied across the Site. There appears to be some seasonal fluctuation in COC concentrations, and a long-term trend cannot yet be determined. The Site is maintained in good condition and appears to be secured from trespassers. Institutional controls are in place and are sufficient to protect human health and the environment.

Data Review

The purpose of this data review is to assess the effectiveness of the constructed remedy components. The June 2016 Site-Wide Monitoring Plan (SWMP) for the IMC Site specifies that after completion of eight quarterly infiltration events, Site-wide performance monitoring will be initiated. Performance monitoring consists of semiannual sampling of groundwater from 23 Site-wide monitoring wells and annual sampling of surface water at two stations on Fairforest Creek, upstream and downstream of the property. Monitoring wells and surface water stations included in the performance monitoring program are presented in Appendix I, Table I1, Appendix J, Table J1, Appendix K, Table K1, and the locations are shown in Appendix G, Figures G2 and G3.

The eighth and final quarterly infiltration event was completed in January 2020. The first semiannual performance monitoring event was completed three months later in April 2020 followed by the second event in October 2020. Semiannual monitoring was continued in April and October of 2021 and again in April and October of 2022 with annual surface water samples collected in October 2021 and October 2022.

Soil samples have not been collected as part of site operations and maintenance; however, on March 16, 2023, TRC Environmental Corporation submitted a Workplan to assist Viginindustries Inc. with acquiring additional data to evaluate the effectiveness of the remedy. The study plans to gather soil data from under the former fertilizer manufacturing building foundation as well as underneath Infiltration

Area 1. A groundwater assessment will also be conducted to further evaluate groundwater quality upgradient of Infiltration Area 1 and downgradient of Areas 1 and 2 towards MW-12/12A. This workplan was approved by the EPA on April 9, 2023.

Groundwater

Quarterly buffer infiltration events took place over a 2-year period from January 2018 to January 2020. Monitoring events were conducted 10 weeks after each infiltration events and included pH and specific conductivity. Increases in specific conductivity corresponded to the dispersal and distribution of the buffer solution within the groundwater. Increases in pH corresponded to the neutralization of acid within the groundwater and aquifer materials. Concentrations of COCs in groundwater monitoring wells within the treatment area began to demonstrate a response to the buffer infiltration events.

Increases in pH extending throughout the treatment area occur more slowly than specific conductivity increases because the buffering capacity of the infiltration solution becomes spent upon interaction with the aquifer. The downgradient flow of not-yet-treated groundwater continues between the infiltration events. The variable changes in both pH and specific conductivity over time in treated versus not-yet-treated groundwater is observable at monitoring locations MW-18 and MW-19. Appendix L, Figures L1 and L2 provide an example of the differences in time and effect of the buffer infiltrations over distance by comparing pH and conductivity between a monitoring well MW-18 located a relatively short distance downgradient of infiltration locations and at monitoring well MW-19 located further distance downgradient of the infiltration locations. A more attenuated effect can be seen at the further downgradient monitoring well MW-19.

Site-wide monitoring for COCs was conducted prior to infiltration events as a baseline (July 2016). A limited, interim monitoring event was performed in March 2019 following the first four infiltration events, and site-wide monitoring events were conducted in April and October of 2020 2021, and 2022. The 2022 groundwater monitoring events were conducted in April and October, which are 27 and 33 months following the final infiltration event in January 2020. Groundwater analytical results for constituents exceeding Cleanup Levels are available in Appendix G, Figure G2. Graphs illustrating pH, beryllium, cadmium (where detected), and fluoride versus time in monitoring wells within the affected groundwater area are presented in Appendix L.

From July 2016 to October 2022, no COCs were detected at concentrations exceeding cleanup levels in wells MW-02R, MW-03R, MW-06, and MW-10 located near the former process residual areas in the southern portion of the Site. Fluoride was the only constituent detected at concentrations exceeding cleanup levels at wells MW-09, MW-09A, and MW-16. Fluoride was not detected in well MW-09 above its cleanup level in the October 2022 monitoring event. Fluoride, 2,4-DNT, and beryllium are the only constituents exceeding cleanup levels in well MW-17. Remaining COCs have not been detected at concentrations exceeding cleanup levels in this area.

In the northeast portion of the Site (area addressed by the buffer infiltration areas), each COC was detected at a concentration exceeding its respective cleanup level in at least one monitoring well from July 2016 to October 2022. As illustrated in the graphs in Appendix L, concentrations of monitored constituents have decreased in many locations during the infiltration events. However, in most locations some level of concentration rebound is apparent. This is likely the result of untreated groundwater migrating into the monitoring well from upgradient. It has been observed that COCs in some monitoring wells, most notably those in the floodplain of Fairforest Creek, vary inversely with water table elevation.

These fluctuations are likely the result of dilution from infiltration of precipitation during the wetter spring season followed by relatively dryer periods during the summer and fall.

Isoconcentration maps for pH, beryllium, cadmium, and fluoride for July 2016 (baseline), April 2022, and October 2022 are presented in Appendix G, Figures G4, G5, G6, and G7 respectively. For pH (Appendix G, Figure G4), concentrations at monitoring well MW-18, immediately downgradient of Infiltration Area 2, were up during 2022 (5.4 standard pH units [s.u.] and 5.9 s.u.) compared to 2021. In the northeast portion of the Site, the pH at wells MW-12, MW-19, and MW-21 remains less than 4.0 s.u. However, in 2022, the pH at monitoring wells MW-7 and MW-20, located downgradient of Infiltration Area 3, continues to be greater than 4.0 s.u., indicating continued influence from Infiltration Area 3.

Beryllium: Beryllium concentrations in well MW-18, downgradient of Infiltration Area 2, are similar in 2022 to baseline concentrations measured in July 2016. However, many of the beryllium concentrations further to the northeast (MW-07, MW-08, MW-12, and MW-19) appear to be approaching baseline conditions. Beryllium concentrations in the vicinity of monitoring well MW-20 remained below the action level of 0.004 mg/L from July 2016 to April 2022, but were slightly higher than the action level in October 2022 indicating a limited area of continuing influence from the northern portion of Infiltration Area 3.

Wells nearest the buffer infiltration points clearly saw an increase in pH and decrease in beryllium concentrations during the application period. Following the completion of the buffer applications, pH began to drift downward and beryllium concentrations began to increase. Concurrent water level measurements show seasonality, which is also reflected to some extent in the beryllium concentrations.

Comparing the baseline distribution of beryllium to the most recent monitoring data, the maximum baseline concentration of 0.081 mg/L (MW-07) in the water table monitoring wells is currently a 0.078 mg/L (MW-07, October 2022). The average beryllium concentration in the treatment area water table monitoring wells (MW-07, MW-08, MW-11, MW-12, MW-18, MW-19, MW-20, and MW-21) decreased from 0.036 to 0.030 mg/L from the baseline event to current conditions.

Cadmium: Cadmium exceeded its cleanup level of 0.005 mg/L at each of the eight remedy-area water table monitoring locations during the baseline groundwater monitoring event, except at MW-19, in which cadmium was not detected during the baseline event. At the time this FYR report was prepared, cadmium concentrations were less than baseline conditions and are generally hovering slightly above or slightly below the cleanup level of 0.005 mg/L except in MW-12 (0.015 mg/L).

The maximum concentration of cadmium during the baseline groundwater monitoring event was 0.021 mg/L at MW-07, and the average concentration in the remedy area was 0.012 mg/L. During the October 2022 sampling event, cadmium concentrations at two of the remedy-area water table monitoring locations (MW-07 and MW-12) exceeded the cleanup level. The maximum concentration of 0.015 mg/L was observed at MW-12, and the average cadmium concentration in remedy area groundwater was reduced to 0.0066 mg/L.

Lead: Lead exceeded its cleanup level of 0.015 mg/L at remedy area water table monitoring location MW-11 (0.054 mg/L) during the 2016 baseline groundwater monitoring event. During the April 2022 sampling event, lead concentrations exceeded the cleanup level at MW-11 (0.019 mg/L) and MW-18 (0.022 mg/L), two remedy-area water table monitoring locations. During the October 2022 sampling

event, lead concentrations exceeded the cleanup level at a single remedy-area water table monitoring location, MW-11 (0.029 mg/L).

Thallium: Thallium exceeded its cleanup level of 0.002 mg/L at four (MW-12, MW-18, MW-19, and MW-20) of the remedy-area water table monitoring locations during the baseline groundwater monitoring event. The maximum detected concentration was 0.0072 mg/L at MW-20, and the average concentration in the remedy area was 0.0046 mg/L. Thallium concentrations have exceeded the cleanup level at MW-12 during each sampling event from July 2016 to October 2022. Thallium concentrations have exceeded the cleanup level at MW-18 during the sampling events of 2020, 2021, and April 2022. Thallium concentrations have not exceeded the cleanup level at MW-19 since October 2020.Thallium concentrations have exceeded the cleanup level at MW-20 during baseline sampling event, October 2021, and October 2022. The average thallium concentration in remedy area groundwater was at 0.0038 mg/L for the October 2022 sampling event.

Fluoride: Fluoride concentration exceeded its cleanup level of 4 mg/L at all eight (MW-07, MW-08, MW-11, MW-12, MW-18, MW-19, MW-20, and MW-21) remedy-area water table monitoring locations during the baseline groundwater monitoring event. The maximum detected concentration was 210 mg/L at MW-18, and the average concentration in the remedy area was 129 mg/L. Fluoride concentrations remained above the cleanup level for each sampling event from July 2016 to October 2022. During the October 2022 groundwater sampling event, the maximum fluoride concentration decreased to 96 mg/L at MW-18, and the average fluoride concentration in remedy area groundwater decreased to 76 mg/L. Fluoride concentrations continue to fluctuate seasonally.

Nitrate: Nitrate exceeded its cleanup level of 10 mg/L at all eight (MW-07, MW-08, MW-11, MW-12, MW-18, MW-19, MW-20, and MW-21) remedy-area water table monitoring locations during the baseline groundwater monitoring event. The maximum detected concentration was 110 mg/L at MW-07, and the average nitrate concentration in remedy area groundwater was 47 mg/L. During the October 2022 groundwater sampling event, nitrate concentrations remained above the cleanup level at five of the remedy-area water table monitoring locations. The maximum detected nitrate concentration was 81 mg/L at MW-07, and the average concentration in remedy area groundwater decreased to 31 mg/L.

The summaries of benzene and 2,4-dinitrotoluene include the wells in the groundwater remedy area plus the MW-5-series wells and MW-17.

Benzene: Benzene has been detected consistently in two monitoring wells at the Site (MW-05 and MW- 05S). Benzene was also detected at concentrations less than the ROD cleanup goal of 0.005 mg/L in MW-07 during the October 2020, October 2021, and October 2022 sampling events. At water table well MW-05S, the concentration of benzene has decreased from 0.14 mg/L to 0.047 mg/L, a drop to approximately one-third of the baseline concentration. At MW-05, the concentration of benzene has decreased from 0.012 mg/L to 0.004 mg/L, a drop of over half. These monitoring wells are outside the area of influence of the remediation system, and reductions in benzene concentrations are attributable to source removal and natural attenuation processes. The benzene concentrations at MW-05 have been at or below the ROD cleanup goal since October 2021.

2,4-Dinitrotoluene: From the baseline event through the most recent sampling event, 2,4-dinitrotoluene (2,4-DNT) has been detected in 11 Site wells, five of them intermittently. During the baseline event, the maximum 2,4-DNT concentration was 0.720 mg/L at MW-17 (located within an area where process

residuals were excavated during the non-time-critical removal action). The October 2022 concentration of 2,4-DNT at MW-17 was 0.120 mg/L, a drop to about a quarter of the baseline concentration.

The MW-05 well nest (located outside the groundwater remedy area), except water table well MW-05S, has experienced continuous 2,4-DNT detections. The concentration range of this area during the baseline sampling event ranged from 0.025 to 0.095 mg/L. The concentrations detected during subsequent sampling events have not shown a significant change during this timeframe.

Detected concentrations of 2,4-DNT within the groundwater remedy area during the baseline sampling event ranged from 0.0081 to 0.034 mg/L, and 2,4-DNT was not detected in four of the remedy-area wells in the October 2022 sampling event. The MW-05 area wells did not experience changes in 2,4-DNT during the treatment timeframe. Treatment area monitoring well MW-07 initially experienced a reduction in 2,4-DNT concentrations from July 2016 to April 2022 from 0.0210 mg/L to 0.0086 mg/L before rebounding back 0.0210 mg/L for the October 2022 sampling event. Treatment area monitoring well MW-18 experienced a reduction in 2,4-DNT concentrations to about half or less of the baseline concentration from 0.034 mg/L to 0.019 mg/L.

Buffer Application Estimate

Bench-scale neutralization tests had been conducted during the Remedial Design for soil and groundwater in the treatment area. These values have been used to calculate the buffer demand in the various parts of the treatment area in terms of milliequivalents. Likewise, the quantity of buffer infiltrated at each of the three infiltration areas was calculated in terms of milliequivalents. These calculations are presented in Appendix M. The table below presents the results of these calculations.

Table 5: Buffer Application Estimate

INFILTRATION AREA	BUFFERING CAPACITY NEEDED	BUFFERING CAPACITY APPLIED	DIFFERENCE
Area 1	1.8 to 2.4 x 10^5 equivalents	14 x 10^5 equivalents	11.6 to 12.2 x 10^5 equivalents
Area 2A[1]	8.6 x 10^5 equivalents	5.7 x 10^5 equivalents	(2.95 x 10^5 equivalents)
Area 2B[1]	6.6 x 10^5 equivalents	0	(6.6 x 10^5 equivalents)
Area 3	7.9 x 10^5 equivalents	6.0 x 10^5 equivalents	(1.9 x 10^5 equivalents)
TOTAL	24.9 to 25.7 x 10^5 equivalents	25.7 x 10^5 equivalents	0.2 to 0.8 x 10^5 equivalents

[1] Area 2A extends from Area 2 to MW-12; Area 2B extends from MW-12 to Area 3
[2] Based on range of water table elevations at Area 1 Differences in (parentheses) are negative values.

Based on the overall Site balance of buffer needed compared to buffer applied, it is expected that a sufficient amount of buffer has been applied at the groundwater treatment area, but the buffer has not been distributed throughout the treatment area.

Data at two specific monitoring wells, MW-12, and MW-18, suggest that the excess buffer introduced at Area 1 has not sufficiently been distributed to groundwater downgradient from that area.

Although ROD cleanup levels have not been met, a comparison of baseline groundwater quality and groundwater monitoring results indicates some limited progress has been made.

Surface Water

Surface water analytical results are summarized in Appendix K, Table K1. Benzene, 2,4-DNT, beryllium, cadmium, lead, and thallium were not detected in either upstream sample SW-02 or downstream sample SW-12. Nitrate was detected at both the upstream and downstream locations at similar concentrations in each sampling event from July 2016 to October 2022. Low concentrations of fluoride were detected at SW-02 for the first time in October 2022. Low concentrations of fluoride have been detected in downstream sample SW-12 from July 2016 to October 2022. Fluoride concentrations in downstream sample SW-12 were slightly higher than the concentration detected in the upstream samples collected at SW-02 in October 2022.

Site Inspection

The Site Inspection took place on 11/9/2022. In attendance were Dan Madison with TRC Companies Incorporated, Jeff Crowley and Donovan Godbee with the EPA, Chris Slocum, Sara MacDonald, Robert Kenis, Benjamin Bair, and Timothy Kadar with SCDHEC. The purpose of the Site Inspection was to assess the protectiveness of the remedy. For a full list of Site Inspection activities, see the Site Inspection Checklist in Appendix F.

Participants accessed the Site through a locked gate on North Street. The sign at the entrance of the Site was legible and contained contact information for Dan Madison at TRC.

Dan Madison provided a safety briefing and Site history with an update on the progress of groundwater remediation. The chain link fence and gate were found to be in good condition. Monitoring wells were properly secured and in good condition. Participants performed a drive-by survey of the neighborhood near the Site. Conditions remain similar to those that existed in 2016.

EPA transferred the local information repository to an online format, which allowed the EPA to make information available to the public more efficiently and conveniently.[1] SCDHEC staff visited the Spartanburg County Library located at 151 South Church Street, Spartanburg, SC 29306. The library no longer maintains a repository for site files; however, the library can provide access via the publicly available computers. The online information repository is at https://www.epa.gov/superfund/IMC.

V. TECHNICAL ASSESSMENT

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

Question A Summary:

A review of the remedial design, monitoring reports, decision documents, ARARs, risk assumptions, and the results of the Site Inspection does not provide enough data points to determine if the groundwater remedy is functioning as intended by the 2014 ROD. Analytical data shows the buffering injections are effective at increasing pH near the injection areas but are currently inconclusive regarding whether the buffering injections will effectively reduce contaminant mass in groundwater below cleanup levels in a reasonable timeframe. Long term trends cannot yet be established at this time until additional monitoring data is gathered. Institutional Controls are in place and limit the use of the IMC Site to commercial, industrial, and/or recreational purposes, and restrict the future withdrawal of groundwater from the IMC Site.

Although ROD cleanup levels are not met, a comparison of baseline groundwater quality and groundwater monitoring results indicates limited progress has been made.

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

[1] On March 18, 2013, the EPA promulgated a final rule to amend 40 C.F.R § 300.805(c) of the NCP "Location of the Administrative Record File" to acknowledge advancements in technologies used to manage and convey information to the public. This enabled the EPA to make Administrative Records available to the public via the internet.

Question B Summary:
The exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection are still valid. The RAOs were developed based on the results of the Human Health and Ecological Risk Assessment and based on ARARs. RAOs were not developed for soils, sediments, or surface water, as these three media do not pose elevated risk to human health, or the environment based on the results of the Risk Assessment. RAOs were developed for groundwater, which posed elevated risk through hypothetical future ingestion by residents residing on the IMC Property.

The IMC groundwater plume is defined as COC impacted groundwater in the underlying aquifer of the IMC Property. The RAOs for groundwater established in the 2014 ROD groundwater include:

- Prevent future human exposure (dermal contact, ingestion, and inhalation) to groundwater with contaminants above levels that are protective of beneficial groundwater use.
- To restore groundwater to beneficial use in a reasonable time frame.
- To minimize migration of COCs from site groundwater to surface water.

The exposure assumptions and RAO remain valid. The Site is currently vacant and secured by fencing with a locked gate. Institutional Controls are in place in the form of a Declaration of Covenants and Restrictions. The ICs prevent the use of the Site for recreational, residential, agricultural, child day care facilities, schools, or elderly care facilities. Further, groundwater is prohibited from all uses that could result in human exposure (without prior written approval from the EPA and SCDHEC). All residences and businesses in the area have access to City water and groundwater is not used as a drinking water resource near the Site.

Cleanup Levels for benzene, beryllium, cadmium, fluoride, nitrate, and thallium are the MCLs. The cleanup level for lead is the Federal Action Level. In 1991, the EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR). The LCR includes a "90th percentile" action level of 15 µg/L for lead (based on the 90th percentile sample level). Unlike the maximum contaminant level goal (MCLG), which is based on what is safe for human health, the action level for lead is based on feasibility. Feasibility entails what is achievable using the best technology and treatment techniques while taking costs into account. Under the 1991 LCR, if samples contain lead concentrations less than 15 ppb, no action is required, despite EPA's assessment that any level of lead in drinking water is harmful to human health. A comparison of the cleanup levels to the current MCLs as part of the ARARs review indicates that the cleanup levels remain valid. The cleanup level for 2,4-DNT is the laboratory practical quantitation limit, which is the lowest concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions.

This FYR conducted a toxicity assessment for lead and 2,4-DNT using the most current toxicity values (Appendix H, Table H4). Based on the screening-level risk evaluation, the 2014 ROD cleanup goals remain valid.

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

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

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
OU-1

OTHER FINDINGS

Two additional recommendations were identified during the FYR. These recommendations do not affect current or future protectiveness:

- Unidentified areas of impacted soil could be negatively affecting groundwater quality. Additional soil sampling in suspected areas, such as under the former manufacturing buildings, could delineate areas of previously unidentified impacted soils.
- Current data is inconclusive as to the effectiveness of the groundwater remedy. Additional groundwater sampling over time, and additional monitoring wells are needed to evaluate effectiveness of the groundwater remedy, including effectiveness of treating 2,4-DNT.

TRC Environmental Corporation submitted a Workplan to assist Viginindustries Inc. with acquiring additional data to evaluate the effectiveness of the remedy on March 16, 2023. The study plans to gather soil data from under the former fertilizer manufacturing building foundation as well as underneath Infiltration Area 1. A groundwater assessment will also be conducted to further evaluate groundwater quality upgradient of Infiltration Area 1 and downgradient of Areas 1 and 2 towards MW-12/12A. This workplan was approved by the EPA on April 9, 2023.

VII. PROTECTIVENESS STATEMENT

Sitewide Protectiveness Statement
Protectiveness Determination: Protective
Protectiveness Statement: The remedy at the International Mineral and Chemical Corporation Superfund site is protective of human health and the environment because a) contaminated soils were excavated and properly disposed off-site; b) buffering injections have raised groundwater pH near injection areas reducing some COCs in groundwater; c) institutional controls have been implemented to restrict land use and groundwater use.

VIII. NEXT REVIEW

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

APPENDIX A – REFERENCE LIST

TRC Environmental Corporation \ Vigindustries Incorporated. Focused Feasibility Study (FFS) for Groundwater, Former IMC Fertilizer Site, Spartanburg, South Carolina. July 2013.

TRC Environmental Corporation \ Vigindustries Incorporated. Focused Feasibility Study (FFS) for Groundwater, Former IMC Fertilizer Site, Spartanburg, South Carolina. July 2013, Revised March 2014, and May 2014.

U.S. EPA, Region IV. Record of Decision. International Mineral and Chemical Corporation (IMC) Fertilizer Superfund Site, Spartanburg, South Carolina. August 2014.

United States District Court, District of South Carolina, Spartanburg Division. United States of America, Plaintiff v. Vigindustries, Inc, Defendant – Remedial Design/Remedial Action Consent Decree. Civil Action No. 7:16-cv-00721-MGL. April 22, 2016.

TRC Environmental Corporation. Remedial Design Work Plan (RDWP), International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. Prepared for Vigindustries. June 2016, Revised July 2016.

TRC Environmental Corporation. Remedial Action (RA) Report, International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. July 2018.

TRC Environmental Corporation. September 2018 Interim Effectiveness Monitoring Data, International Mineral and Chemical (IMC) Fertilizer Superfund Site, Spartanburg, South Carolina, Civil Action No. 7:16-cv-00721-MGL. October 24, 2018.

TRC Environmental Corporation. Analytical Results for the March 2019 Interim Groundwater and Surface Water Monitoring Event, International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. May 30, 2019.

TRC Environmental Corporation. Analytical Results for the April and October 2020 Performance Monitoring Events, International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. January 7, 2021.

TRC Environmental Corporation. Analytical Results for the April and October 2021 Performance Monitoring Events, International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. January 13, 2022.

TRC Environmental Corporation. Analytical Results for the April and October 2022 Performance Monitoring Events, International Mineral and Chemical Fertilizer Superfund Site, Spartanburg, South Carolina. February 16, 2023.

APPENDIX B – CURRENT SITE STATUS

Environmental Indicators
- Current human exposures at the Site are under control. - Current groundwater migration is under control.

Are Necessary Institutional Controls in Place?
☒ All ☐ Some ☐ None

Has EPA Designated the Site as Sitewide Ready for Anticipated Use?
☐ Yes ☒ No

Has the Site Been Put into Reuse?
☐ Yes ☒ No

APPENDIX C – SITE CHRONOLOGY

Table C1: Site Chronology

Event	Date
IMC starts operations	1910
IMC ceases operations	1986
Site Inspection	1999
Expanded Site Inspection	2000
Remedial Investigation/Feasibility Study (RI/FS) Site Reconnaissance	2001
Focused Removal Action Activities	July to December 2002
Final Focused RI/FS Workplan	May to April 2004
Initial Feasibility Study	February 2008
Non-Time Critical Removal Action Workplan and Design Report	October 2009, Revised May 2010
Non-Time Critical Removal Action Activities	June 2010 to April 2011
Focused Feasibility Study	July 2013, Revised March 2014, and May 2014
Record of Decision	August 2014
Remedial Design/Remedial Action Consent Decree	April 2016
Remedial Design Work Plan	June 2016
Remedial Design Report	July 2017
Remedial Action (RA) Report	July 2018
Eight quarterly buffer solution injection events	2018 to 2020
Biannual Site-wide monitoring events	2020 to 2022

APPENDIX D – PRESS NOTICE

U.S. ENVIRONMENTAL PROTECTION AGENCY

NEWS RELEASE

EPA.GOV/NEWSROOM

EPA to Review Cleanups at 45 Southeast Superfund Sites this Year

Contact Information: region4press@epa.gov, 404-562-8400

ATLANTA (Oct. 19, 2022) – Today, the U.S. Environmental Protection Agency (EPA) announced that comprehensive reviews will be conducted of completed cleanup work at 45 National Priority List (NPL) Superfund sites in the Southeast.

The sites, located in Alabama, Florida, Georgia, Kentucky, Mississippi, 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.

"The Southeast Region will benefit tremendously from the full restoration of Superfund sites, which can become valuable parts of the community landscape," **said EPA Region 4 Administrator Daniel Blackmon**. "The Five-Year Review evaluations ensure that remedies put in place to protect public health remain effective over time."

The Superfund Sites where EPA will conduct Five-Year Reviews in 2022 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

Alabama Army Ammunition Plant https://www.epa.gov/superfund/alabama-army-ammunition-plant
Alabama Plating Company, Inc. https://www.epa.gov/superfund/alabama-plating-co
Mowbray Engineering Co. https://www.epa.gov/superfund/mowbray-engineering
US NASA Marshall Space Flight Center
US Army/NASA Redstone Arsenal https://www.epa.gov/superfund/redstone-aresenal

Florida

ALARIC Area GW Plume https://www.epa.gov/superfund/alaric-area-groundwater-plume
Beulah Landfill https://www.epa.gov/superfund/beulah-landfill
Chevron Chemical Co. (Ortho Division) https://www.epa.gov/superfund/chevron-chemical-company
Florida Petroleum Reprocessors https://www.epa.gov/superfund/florida-petroleum-reprocessors
Miami Drum Services https://www.epa.gov/superfund/miami-drum-services
Pensacola Naval Air Station https://www.epa.gov/superfund/naval-air-station-pensacola
Raleigh Street Dump https://www.epa.gov/superfund/raleigh-street-dump
Taylor Road Landfill https://www.epa.gov/superfund/taylor-road-landfill
Tower Chemical Co. https://www.epa.gov/superfund/tower-chemical-company

Georgia

Alternate Energy Resources Inc. https://www.epa.gov/superfund/alternate-energy-resources
Peach Orchard & Nutrition Co. Rd PCE Groundwater Plume Site https://www.epa.gov/superfund/peach-orchard-road-pce-plume
Powersville Site https://www.epa.gov/superfund/powersville-site
T.H. Agriculture & Nutrition Co (Albany Plant) https://www.epa.gov/superfund/t-h-agriculture

Kentucky

A.L. Taylor (Valley of the Drums) https://www.epa.gov/superfund/al-taylor-valley-of-drums
Brantley Landfill https://www.epa.gov/superfund/brantley-landfill
Distler Brickyard https://www.epa.gov/superfund/distler-brickyard
Distler Farm https://www.epa.gov/superfun https://www.epa.gov/superfund/lee-lane-landfilld/distler-farm
Lee's Lane Landfill https://www.epa.gov/superfund/lee-lane-landfill
National Electric Coil Co./Cooper Industries https://www.epa.gov/superfund/national-electric-coil-cooper-industries

Tri City Disposal Co. https://www.epa.gov/superfund/tri-city-disposal

North Carolina
ABC One Hour Cleaners https://www.epa.gov/superfund/abc-one-hour-cleaners
Aberdeen Pesticide Dumps https://www.epa.gov/superfund/aberdeen-contaminated-groundwater
Benfield Industries, Inc. https://www.epa.gov/superfund/benfield-industries
Cherry Point Marine Corps Air Station https://www.epa.gov/superfund/cherry-point-marine-corps
CTS of Ashville, Inc. https://www.epa.gov/superfund/cts-millsgap
GEIGY Chemical Corp (Aberdeen Plant) https://www.epa.gov/superfund/ciba-geigy-corporation
Gurley Pesticide Burial https://www.epa.gov/superfund/gurley-pesticide-burial
North Carolina State University (Lot 86, Farm Unit #1) https://www.epa.gov/superfund/north-carolina-state-university
Sigmon's Septic Tank Service https://www.epa.gov/superfund/sigmon-septic-tank

South Carolina
Admiral Home Appliances https://www.epa.gov/superfund/admiral-home-appliances
Beaunit Corp (Circular Knit & Dyeing Plant) https://www.epa.gov/superfund/beaunit
Carolawn Inc. https://www.epa.gov/superfund/carolawn
Elmore Waste Disposal https://www.epa.gov/superfund/elmore-waste-disposal
International Minerals and Chemicals (IMC) https://www.epa.gov/superfund/imc
Kalama Specialty Chemicals https://www.epa.gov/superfund/kalama-specialty-chemicals
Koppers Company, Inc. (Charleston Plant) https://www.epa.gov/superfund/koppers-charleston-plant
Savannah River Site (USDOE) https://www.epa.gov/superfund/savannah-river-site
SCRDI Bluff Road https://www.epa.gov/superfund/scrdi-bluff-road

Tennessee
Mallory Capacitor Co. https://www.epa.gov/superfund/mallory-capacitor
Memphis Defense Depot (DLA) https://www.epa.gov/superfund/memphis-defense-depot

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

APPENDIX E – SITE INSPECTION CHECKLIST/INTERVIEW FORMS

FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site Name: International Mineral and Chemical Corporation Superfund Site	**Date of Inspection:** 11/9/2022
Location and Region: Spartanburg, Spartanburg County, South Carolina/Region 4	**EPA ID:** SCD003350493
Agency, Office or Company Leading the Five-Year Review: EPA Region 4	**Weather/Temperature:** Sunny/60s

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls
- ☒ Other: Eight quarterly buffer solution injection events followed by biannual groundwater & surface water sampling to determine the overall effectiveness of the implemented remedy.

Attachments: ☒ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (check all that apply)

1. **O&M Site Manager** — Dan Madison (Name); CPG, PG, Consulting Hydrogeologist, TRC Companies (Title); 7/13/23 (Date)

Interviewed ☐ at site ☐ at office ☒ by email: _____

Problems, suggestions ☒ Report attached: See Attached at End of Site Inspection Checklist

2. **O&M Staff** — _____ (Name); _____ (Title); _____ (Date)

Interviewed ☐ at site ☐ at office ☐ by phone : _____

Problems/suggestions ☐ Report attached: _____

3. **Local Regulatory Authorities and Response Agencies** (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 SCDHEC
Contact Chris Slocum (Name) | Project Manager (Title) | 10/10/2022 (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 attacled: _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone No.
Problems/suggestions ☐ Report attacled: _____

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: EPA and SCDHEC retain O&M documents off site.

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: TRC retains safety documents off site. Documents are available onsite during any site visit.

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

Remarks: SCDHEC and TRC retains safety documents off site.

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits: _____	☐ Readily available	☐ Up to date	☒ N/A

Remarks: _____

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

7. **Groundwater Monitoring Records** ☒ Readily available ☒ Up to date ☐ N/A

Remarks: _____

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

9. **Discharge Compliance Records**

☐ Air ☐ Readily available ☐ Up to date ☒ N/A

☐ Water (effluent) ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A

Remarks: _____

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for state

☒ PRP in-house ☐ Contractor for PRP

☐ Federal facility in-house ☐ 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	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached
From: _____ Date	To: _____ Date	_____ Total cost	☐ Breakdown attached

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

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

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

Remarks: Fence is in good condition

B. Other Access Restrictions

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

Remarks: Locked gates and fencing prevent unauthorized access. Signage at gate.

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): Self-reporting

Frequency: Annual

Responsible party/agency: Vigindustries

Contact	Jim Brandt	Sr. Manager, Corporate EHS Legacy and Acquisitions	_____	_____
	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: None.

3. **Land Use Changes Off Site** ☐ N/A

Remarks: None.

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads Damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks: _____

B. Other Site Conditions

Remarks: _____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (low spots) ☐ Location shown on site map ☐ Settlement not evident

Arial extent: _____ Depth: _____

Remarks: _____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident

	Lengths: _____	Widths: _____	Depths: _____
	Remarks: _____		
3.	**Erosion**	☐ Location shown on site map	☐ Erosion not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
4.	**Holes**	☐ Location shown on site map	☐ Holes not evident
	Arial extent: _____		Depth: _____
	Remarks: _____		
5.	**Vegetative Cover**	☐ Grass	☐ Cover properly established
	☐ No signs of stress	☐ Trees/shrubs (indicate size and locations on a diagram)	
	Remarks:		
6.	**Alternative Cover** (e.g., armored rock, concrete)		☐ N/A
	Remarks: _____		
7.	**Bulges**	☐ Location shown on site map	☐ Bulges not evident
	Arial extent: _____		Height: _____
	Remarks: _____		
8.	**Wet Areas/Water Damage**	☐ Wet areas/water damage not evident	
	☐ Wet areas	☐ Location shown on site map	Arial extent: _____
	☐ Ponding	☐ Location shown on site map	Arial extent: _____
	☐ Seeps	☐ Location shown on site map	Arial extent: _____
	☐ Soft subgrade	☐ Location shown on site map	Arial extent: _____
	Remarks: _____		
9.	**Slope Instability**	☐ Slides	☐ Location shown on site map
	☐ 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.	**Flows Bypass Bench**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
2.	**Bench Breached**	☐ Location shown on site map	☐ N/A or okay
	Remarks: _____		
3.	**Bench Overtopped**	☐ Location shown on site map	☐ 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. **Settlement** (Low spots) ☐ Location shown on site map ☐ No evidence of settlement
   Arial extent: _____ Depth: _____
   Remarks: _____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
   Material type:_____ Arial extent: _____
   Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
   Arial extent: _____ Depth: _____
   Remarks: _____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
   Arial extent: _____ Depth: _____
   Remarks: _____

5. **Obstructions** Type: _____ ☐ No obstructions
   ☐ Location shown on site map Arial extent: _____
   Size: _____
   Remarks: _____

6. **Excessive Vegetative Growth** Type: _____
   ☐ No evidence of excessive growth
   ☐ Vegetation in channels does not obstruct flow
   ☐ Location shown on site map Arial extent: _____
   Remarks: _____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. **Gas Vents** ☐ Active ☐ Passive
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

2. **Gas Monitoring Probes**
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

3. **Monitoring Wells** (within surface area of landfill)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A
   Remarks: _____

4. **Extraction Wells Leachate**

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs maintenance ☐ N/A

Remarks: _____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks: _____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. **Gas Treatment Facilities**

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs maintenance

Remarks: _____

2. **Gas Collection Wells, Manifolds and Piping**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Gas Monitoring Facilities** (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs maintenance ☐ N/A

Remarks: _____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A

Remarks: _____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A

Remarks: _____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. **Siltation** Area extent: _____ Depth: _____ ☐ N/A

☐ Siltation not evident

Remarks: _____

2. **Erosion** Area extent: _____ Depth: _____

☐ Erosion not evident

Remarks: _____

3. **Outlet Works** ☐ Functioning ☐ N/A

Remarks: _____

4. **Dam** ☐ Functioning ☐ N/A

Remarks: _____

H. Retaining Walls ☐ Applicable ☐ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident

Horizontal displacement: _____ Vertical displacement: _____

Rotational displacement: _____

Remarks: _____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident

Remarks: _____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident

Area extent: _____ Depth: _____

Remarks:

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A

☐ Vegetation does not impede flow

Area extent: _____ Type: _____

Remarks: _____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident

Area extent: _____ Depth: _____

Remarks: _____

4. **Discharge Structure** ☐ Functioning ☐ N/A

Remarks: _____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident

Area extent: _____ Depth: _____

Remarks: _____

2. **Performance Monitoring** Type of monitoring:

☐ Performance not monitored

Frequency: ☐ Evidence of breaching

Head differential: _____

Remarks: _____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Pumps, Wellhead Plumbing and Electrical**

☐ Good condition ☐ All required wells properly operating ☐ Needs maintenance ☐ N/A

Remarks: _____

2. **Extraction System Pipelines, Valves, Valve Boxes and Other Appurtenances**

☐ Good condition ☐ Needs maintenance

Remarks: _____

3. **Spare Parts and Equipment**

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks: _____

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps and Electrical**

   ☐ Good condition ☐ Needs maintenance

   Remarks: _____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes and Other Appurtenances**

   ☐ Good condition ☐ 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 groundwater treated annually: _____

   ☐ Quantity of surface water treated annually: _____

   Remarks:

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:**

☒ Groundwater 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: _____

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).
Remedy implementation began five years ago and the long-term effectiveness of the remedy cannot yet be determined. The buffer infiltration events have had a positive influence on site-wide pH, while the influence on COC concentrations has varied across the site. There appears to be some seasonal fluctuation in COC concentrations, and a long-term trend cannot be determined at this time. The Site is in good condition and appears to be secured from trespassers. Institutional controls are in place at the Site and are sufficient to protect human health and the environment.

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.
Taken as a whole, COCs within the groundwater plume appear to be stable or, in general, decreasing. However, a long-term trend based on the data available cannot be determined. Further soil sampling might determine if there are potential source areas that have not been addressed. Evaluating the vertical buffer migration in Infiltration Area 1 via soil sampling and modeling could help improve the effectiveness of the remedy. Additional monitoring wells could be installed to better assess the buffer migration

	performance.
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.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. See B. Adequacy of O&M

Site Inspection Participants:

Jeffery Crowley, EPA Region 4, Remedial Project Manager
Donovan Godbee, EPA Region 4, Remedial Project Manager
Dan Madison, CPG, PG, Consulting Hydrogeologist, TRC Companies
Chris Slocum, Project Manager, SCDHEC
Sara MacDonald, Project Manager, SCDHEC
Evan Etheridge, SCDHEC
Benjamin Bair, SCDHEC
Timothy Kadar, SCDHEC

INTERVIEW FORM FOR FIVE-YEAR REVIEW

Site Name: IMC Corporation Superfund Site

Interviewer's Name: Timothy Kadar **Affiliation:** SCDHEC

Interviewee's Name: Chris Slocum **Affiliation:** SCDHEC, Federal Remediation Project Manager

Contact Info: SCDHEC
2600 Bull Street
Columbia, SC 29201
slocumcb@dhec.sc.gov

Type of Interview: Email
Date: November 10, 2022

1. What is your overall impression of the project, including cleanup, maintenance and reuse activities (as appropriate)?

Because implementation of the remedy began only five years ago and this is the first Five-Year Review of the Site, the long-term outcomes of the project remain to be seen. The buffer infiltration events appear to have had a positive influence on site-wide pH, while the influence on COC concentrations has varied across the site. There appears to be some seasonal fluctuation in COC concentrations, and a long- term trend cannot be determined at this time. The PRP and PRP contractor maintain the Site in good condition, and the Site appears to be secured from trespassers. Institutional controls are in place at the Site and appear to be sufficient to protect human health and the environment.

2. What is your assessment of the current performance of the remedy in place at the Site?

The buffer infiltration events appear to have had a positive influence on site-wide pH, while the influence on COC concentrations has varied across the site. There appears to be some seasonal fluctuation in COC concentrations, and a long-term trend cannot be determined at this time. The PRP contractor is planning to conduct a detailed evaluation of remedy effectiveness in early 2023, which will help in evaluating the performance of the remedy over the last five years.

3. Are you aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years?

I am not aware of any complaints or inquiries regarding site-related environmental issues or remedial activities from residents in the past five years.

4. Has your office conducted any site-related activities or communications in the past five years? If so, please describe the purpose and results of these activities.

DHEC has participated in multiple site visits, meetings, and conference calls with EPA, the PRP contractor, and the PRP. DHEC regularly reviews groundwater monitoring reports and other technical documents submitted by the PRP contractor and provides written comments as appropriate. The

purpose of DHEC's participation in site-related activities is to provide support to EPA. October 20, 2021: DHEC participated in a meeting with EPA, the PRP, and former South Carolina State Representative Harold Mitchell, Jr., about potential reuse of the Site by the company ReGenesis Institute as an aquaponics crop production operation. The purpose of the meeting was to confirm with DHEC and EPA that this proposed reuse of the Site would be acceptable and approvable. The PRP stated that they would not release control of the property without a firm commitment of no future liability. I am not aware of any further discussions between DHEC and the above-referenced parties regarding this matter.

5. Are you aware of any changes to state laws that might affect the protectiveness of the Site's remedy?

In May 2022, legislation (SC H.4999) was passed regarding the implementation of site-specific cleanup goals. The SCDHEC is currently working towards determining how best to implement that on affected sites. However, this change to state law is not anticipated to affect the protectiveness of the Site's chosen remedy in achieving the established remedial goals.

6. Are you comfortable with the status of the institutional controls at the Site? If not, what are the associated outstanding issues?

There are several institutional controls in place at the Site, including land use restrictions, prohibitions on any land use that would interfere with the remedy, restrictions on groundwater use and well installation, as well as others. The institutional controls are being maintained as required by the Consent Decree and appear to be protective of human health and the environment.

7. Are you aware of any changes in projected land use(s) at the Site?

As discussed in the response to Question 4, DHEC received an inquiry about potential reuse of the Site in October 2021. However, DHEC has not participated in any additional discussions regarding this, and I am not aware of any changes in projected land use at the Site.

8. Do you have any comments, suggestions or recommendations regarding the management or operation of the Site's remedy?

Once the PRP contractor has completed the detailed evaluation of the remedy, it may be appropriate to discuss the effectiveness of the remedy between DHEC, EPA, the PRP, and the PRP contractor.

Interview Form for the IMC Superfund Site Five-Year Review 2023

Site Name: International Minerals & Chemical (IMC) EPA ID No.:
Interviewer Name: LTonya Spencer Harvey via email Affiliation: USEPA Reg4
Name: Michelle Hays Affiliation: TRC Environmental Corporation
Subject's Contact Information: mhays@trccompanies.com, (864) 608-1836
Time: 10:00 AM Date: July 13, 2023
Type of Interview (Circle one): In Person Phone E-Mail Other_____
Location of Interview: E-Mail

O&M Contractor/PRP Representative

1. What is your overall impression of the project?

   Construction and implementation of the remedy were conducted in accordance with the remedial design and the ROD. Performance monitoring data suggests that groundwater quality is responding slower than anticipated; therefore, TRC, on behalf of the PRP, is currently conducting field activities to further evaluate remedy effectiveness. In the event the remedy effectiveness evaluation warrants additional treatment, future buffer applications may be recommended.

2. Have any problems been encountered which required, or will require, changes to this remedial design or this ROD?

   None at this time. The remedy was implemented in accordance with the remedial design and the ROD. Presently, field activities are being conducted to further evaluate remedy effectiveness. In the event this evaluation warrants additional treatment, future buffer applications may be recommended, which does not require modifications to the remedial design or the ROD.

3. Have any problems or difficulties been encountered which have impacted construction progress or implementability?

   No problems or difficulties have been encountered. The remedy was implemented in accordance with the remedial design and the ROD.

4. Do you feel well informed about the site's activities and progress?

   Yes. TRC implemented the remedy and performs site activities; therefore, TRC is informed on activities and progress.

5. Do you have any comments, suggestions, or recommendations regarding the site's management or operation?

   None at this time.

APPENDIX F – INSTITUTIONAL CONTROLS

May 2, 2022

Mr. Jeff Crowley
Remedial Project Manager
EPA Project Coordinator
United States Environmental Protection Agency, Region 4
61 Forsyth Street
Atlanta, Georgia 30303-8960

Re: 2022 Annual Proprietary Controls Report
Consent Decree, Section VIII.20.g Proprietary Requirements Civil Action No. 7:16-cv-00721-MGL
International Mineral and Chemical Fertilizer Superfund Site Spartanburg, South Carolina

Dear Mr. Crowley,

Section VIII.20.g of the Consent Decree (CD) for the International Mineral and Chemical (IMC) Fertilizer Superfund Site (Site) specifies the Settling Defendant shall monitor, maintain, enforce, and annually report on all Proprietary Controls required under the CD. Proprietary Controls are established in the Declaration of Covenants and Restrictions ("Declaration") recorded with the Spartanburg County Office of the Register of Deeds at Book 118-W, Pages 300-311. The Declaration also requires that Declarant and any future owners of the Property submit to the SC DHEC and the EPA a statement of maintenance of the covenants and restrictions annually by May 31st of each year. The Proprietary Controls in place include the following:

1. The Property shall not be used for the following purposes without prior written approval from SC DHEC: residential, agricultural, child day care facilities, schools, or elderly care facilities;

2. The Property shall not be used for recreational purposes without written approval from the EPA and the SC DHEC;

3. Groundwater from the Property that exceeds Maximum Contaminant Levels (MCLs) is prohibited from all uses that could result in human exposure without prior written approval from the EPA and the SC DHEC;

4. The Property shall not be used in a manner that would interfere with the groundwater remediation system without prior written approval from the

EPA and the SC DHEC;

5. No groundwater wells shall be drilled or otherwise constructed on the Property without prior written approval from the EPA and the SC DHEC;

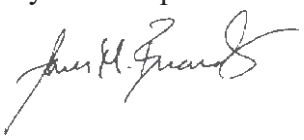
6. Without prior written approval from the EPA and the SC DHEC, no excavations or soil disturbance shall occur at or within the portions of the Property, legally described on Exhibit B to the Declaration and highlighted on the survey attached as Exhibit C to the Declaration;

7. The EPA, the SC DHEC, and all other parties performing response actions under the EPA's and the SC DHEC's oversight, shall be provided access to oversee the response action and for: i) inspecting the Property; ii) monitoring; iii) verifying information; iv) sampling; v) assessing the need for additional response or quality control practices; vi) assessing Declarant's compliance with the CD; vii) assessing compliance with land use restrictions required by the CD; viii) taking samples as necessary to enforce the CD; ix) implementing the work required under the CD; and x) inspecting and copying records.

Annual Report of Proprietary Controls

The covenants and restrictions applicable to this Property are being properly maintained, and no development or use which is inconsistent with the Declaration of Covenants and Restrictions has occurred since the date of the last annual report.

If you have questions or comments, please call me at 306.523.2859. Sincerely,



Jim Brandt
Sr. Manager, Corporate EHS Legacy and Acquisitions

cc: Randall Chaffins, EPA
Chris Slocum, SC DHEC
Joel Padgett, SC DHEC
Sara Schultz, Vigindustries
Sarah J. Sorenson, The Mosaic Company
Dan Madison, TRC
Michelle Hays, TRC

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VERIFIED
SCANNED
12-4-17

VIG INDUSTRIES

Vigindustries Inc.
1700-2010 12th Ave
Regina, SK S4P 0M3
www.vigindustries.com

Tel (306) 523-2903
Fax (306) 523-2870
E-mail: sara.schultz@vigindustries.com

November 27, 2017

Sarah MacDonald & Joel Padgett
Federal Remediation Section, Division of Site Assessment, Remediation & Revitalization
South Carolina Department of Health & Environmental Control
2600 Bull St
Columbia, SC 29201

RECEIVED
DEC 01 2017
SITE ASSESSMENT
REMEDIATION &
REVITALIZATION

Re: Declaration of Covenants and Restriction
Civil Action No. 7:16-cv-00721-MGL
International Mineral and Chemical Fertilizer Superfund Site
Spartanburg, South Carolina

Dear Ms. MacDonald & Mr. Padgett:

Further to the above referenced requirement, please find enclosed the Declaration of Covenants and Restrictions signed by Vigindustries. Once signed by an officer of your company, please forward this document to Franklin Hill at the address below with a request to return the signed document to Vigindustries. Upon return of the executed document, Vigindustries will record the restrictions and secure the necessary title insurance policy.

Franklin Hill
Director, Superfund Division
U.S. Environmental Protection Agency
Region 4
61 Forsyth St
Atlanta, GA 30303

If additional clarification is required with respect to this information, please let me know.

Sincerely,

Sara Schultz
EHS Legacy Project Coordinator

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STATE OF SOUTH CAROLINA	)	**DECLARATION OF COVENANTS**
	)	
COUNTY OF SPARTANBURG	)	**AND RESTRICTIONS**

THIS DECLARATION OF COVENANTS AND RESTRICTIONS ("Declaration") is made and entered as of this 21st day of November, 2017, by Vigindustries Inc., a Delaware corporation ("Declarant"), and the South Carolina Department of Health and Environmental Control (the "Department").

RECITALS

WHEREAS, this Declaration is entered into pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA"), 42 U.S.C. §§ 9601, et seq. and the South Carolina Hazardous Waste Management Act, S.C. Code Ann. § 44-56-200; and

WHEREAS, Declarant is the owner of certain real property in Spartanburg County, South Carolina, known as the International Mineral and Chemical Corporation ("IMC") Fertilizer Superfund Site, more particularly described in **Exhibit A** attached hereto and incorporated herein by reference (the "Property"); and

WHEREAS, hazardous substances in excess of allowable concentrations for unrestricted use remain at the Property; and

WHEREAS, the Property is the subject of a remediation action, pursuant to a Consent Decree (CD), dated April 22, 2016, entered into by the United States Environmental Protection Agency ("USEPA") and Declarant under CERCLA; and

WHEREAS, the USEPA issued a Record of Decision ("ROD") dated August 25, 2014 for the Property in which the USEPA selected remedial activities to be conducted at the Property, including the implementation of institutional controls to protect groundwater as set forth in this Declaration; and

WHEREAS, Declarant is undertaking a groundwater remediation action to address hazardous constituents remaining in the subsurface soils and groundwater; and

WHEREAS, the Property may be used for industrial or commercial purposes without further remediation in accordance with the provisions of the ROD and this Declaration, provided prior written notice is given to the Department and the USEPA, and written pre-approval is obtained from the Department and the USEPA, as required and further explained below in this Declaration, and provided that the proposed industrial or commercial purpose is not otherwise prohibited by other applicable federal, state or local laws, regulations, or ordinances; and

WHEREAS, Declarant has agreed to impose certain restrictions on the manner in which the Property may be used in the future; and

WHEREAS, it is the intention of all parties that the USEPA is a third party beneficiary of such restrictions and such restrictions shall be enforceable by the USEPA, the Department, and their successor agencies.

NOW, THEREFORE, KNOW ALL PERSONS BY THESE PRESENTS that Declarant hereby declares and covenants on behalf of itself and its successors and assigns that the Property described in **Exhibit A** shall be held, mortgaged, transferred, sold, conveyed, leased, occupied, and used subject to the following covenants and restrictions, which shall touch and concern and run with the title to the Property.

1. Declarant covenants for itself, its successors and assigns that the Property shall not be used for the following purposes without prior written approval from the Department or its successor agency: residential; agricultural; child day care facilities; schools; or elder care facilities.

2. Declarant covenants for itself, its successors and assigns that the Property shall not be used for recreational purposes without written approval from the USEPA and the Department or its successor agency;

3. Declarant covenants for itself, its successors and assigns that groundwater from the Property that exceeds Maximum Contaminant Levels is prohibited from all uses that could result in human exposure without prior written approval from the USEPA and the Department or its successor agency.

4. Declarant covenants for itself, its successors and assigns that the Property shall not be used in a manner that would interfere with the groundwater remediation system without prior written approval from the USEPA and the Department or its successor agency.

5. Declarant covenants for itself, its successors and assigns that no groundwater wells shall be drilled or otherwise constructed on the Property without prior written approval from the USEPA and the Department or its successor agency.

6. Without prior written approval from the USEPA and the Department or its successor agency, Declarant covenants for itself, its successors and assigns that no excavations or soil disturbance shall occur at or within the portions of the Property, legally described on **Exhibit B** and highlighted on the attached survey set forth on **Exhibit C**, which has been prepared by Stantec, dated September 25, 2017, and entitled "Mapping Exhibit for Restrictive Properties of Vigindustries Inc.".

7. Declarant covenants for itself, its successors and assigns that the USEPA, the Department, their successor agencies, and all other parties performing response actions under the USEPA's and the Department's oversight, shall be provided access to oversee the response action and for: i) inspecting the Property; ii) monitoring; iii) verifying information; iv) sampling; v) assessing the need for additional response or quality control practices; vi) assessing Declarant's compliance with the CD; vii) assessing compliance with land use restrictions required by the CD; viii) taking samples as necessary to enforce the CD; ix)

implementing the work required under the CD; and x) inspecting and copying records. So long as Declarant is owner of the Property, USEPA, the Department, their successor agencies and all other parties performing response actions under the USEPA and the Department's oversight shall be accompanied by Declarant or Declarant's designee while at the Property. However, nothing in the preceding sentence limits any authority of the USEPA, the Department, or their successor agencies to take all appropriate action to protect human health and the environment or to prevent, abate, respond to, or minimize an actual or threatened release of hazardous substances at the Property, or to direct or order such action, or seek an order from a court, to protect human health and the environment or to prevent, respond to, or minimize an actual or threatened release of hazardous substances on, at, or from the Property.

8. The covenants and restrictions set forth herein shall run with the title to the Property and shall be binding upon Declarant, its successors and assigns and any future owners of the Property. Declarant, its successors and assigns, and any future owners of the Property, shall include the following notice on all deeds, mortgages, plats, or any legal instruments used to convey any interest in the Property (failure to comply with this paragraph does not impair the validity or enforceability of these covenants):

> NOTICE: This Property is Subject to Declaration of Covenants and Restrictions recorded on the _____ day of _____ 201_, at Book _____ Page _____, Officer of the Register of Deeds, and any subsequent Amendments Recorded thereto.

9. Declarant shall file this Declaration with the Deed for the Property and the Map in a timely fashion in the Office of Register of Deeds of Spartanburg County, South Carolina, and shall re-record it at any time the Department may require to preserve its rights. Declarant shall pay all recording costs and taxes necessary to record this document in the public records. Declarant shall provide a filed, stamped copy of same to the USEPA and the Department within sixty (60) days of recordation. The copy shall show the date and Book and Page number where the Declaration has been recorded. The contact person for the USEPA is Director, Superfund Division, USEPA Region 4, 61 Forsyth Street SW, Atlanta, GA 30303-8960. The contact person for the Department is Director, Division of Site Assessment, Remediation, and Revitalization, SCDHEC, 2600 Bull Street, Columbia, SC 29201.

10. This Declaration shall remain in place until such time as the USEPA and the Department have made a written determination that the covenants and restrictions set forth herein are no longer necessary. This Declaration shall not be amended without the written consent of the USEPA or the Department or their successor agencies. The Department shall not consent to any amendment or termination of the Declaration without the consent of the USEPA.

11. Declarant, its successors and assigns, and any future owners of the Property, shall submit to the Department and the USEPA a statement of maintenance of the covenants and restrictions as set forth herein annually by May 31st of every year. This reporting requirement is the obligation of each owner of the Property, or a portion of the Property, as of May 31st

of each year. Once title to all or a portion of the Property has been conveyed by Declarant or any subsequent owner, such predecessor in title shall no longer have any responsibility for submission of the Report with respect to the Property it previously owned. Declarant, its successors and assigns, and any future owners of the Property, shall provide the following notice in each Report:

> "The covenants and restrictions applicable to this Property are being properly maintained, and no development or use which is inconsistent with the Declaration of Covenants and Restrictions has occurred since the date of the last annual report."

12. It is expressly agreed that the USEPA is not the recipient of a real property interest but is a third party beneficiary of the Declaration of Covenants and Restrictions and, as such, has the rights of enforcement.

13. This Declaration only applies to the Property expressly identified in Exhibit A and does not impair the USEPA or the Department's authority with respect to the Property or other real property under the control of Declarant.

(Signature page following on next page.)

IN WITNESS WHEREOF, Declarant has caused this instrument to be executed as of the date first above written.

Vigindustries Inc.,

A STATE OF DELAWARE CORPORATION

WITNESSES:

Denise Clarke

Denise Clarke

Brenda Sweeney

Brenda Sweeney

By: P. V. der V.

Patrick van der Voorn

Vice President

STATE OF Minnesota

COUNTY OF Hennepin

I, Elizabeth Paskey (Notary Public), do hereby certify that, Patrick van der Voorn, an authorized representative of Vigindustries Inc., personally appeared before me this day and acknowledged the due execution of the foregoing instrument, on behalf of the Corporation.

Witness my hand and official seal this 21st day of November, 2017.

Elizabeth Paskey

ELIZABETH PASKEY
Notary Public
My Commission Expires 01/31/2022

Notary Public for Minnesota

My Commission Expires: 1/31/22

IN WITNESS WHEREOF, the Agency has caused this instrument to be executed as of the date first above written.

WITNESSES:

South Carolina Department of Health and Environmental Control

By: Daphne D Neel

Daphne G. Neel, Chief
Bureau of Land and Waste Management
Environmental Quality Control

STATE OF South Carolina

COUNTY OF Richland

I, Lavinia K. Hiott (Notary Public), do hereby certify that, _____, Daphne G. Neel, Chief of the Bureau Land and Waste Management in the South Carolina Department of Health and Environmental Control, personally appeared before me this day and acknowledged the due execution of the foregoing instrument.

Witness my hand and official seal this 5th day of December, 2017.

Lavinia K. Hiott

Notary Public for South Carolina

My Commission Expires: 2/28/2026

This Declaration is hereby approved by the United States Environmental Protection Agency as a third party beneficiary this 7th day of February, 2018.

United States Environmental Protection Agency

By:
Franklin E. Hill
Director, Superfund Division
U.S. Environmental Protection
Agency Region 4

Exhibit A

Legal Description

Real property in the City of Spartanburg, County of Spartanburg, State of South Carolina, described as follows:

All those certain pieces, parcels or lots of land, situate, lying and being in the County of Spartanburg, State of South Carolina, being shown and designated as Lots 1, 2, 3, 4, 5, 6, 7, 8 and 9 on plat and survey prepared for VIG Industries, Inc. by Freeland & Associates, Inc. dated May 3, 1999, revised May 14, 1999, recorded in the ROD Office in Plat Book 144, at Page 780, and having such metes and bounds as appears through, incorporated herein by reference.

Less, however, all that certain piece, parcel or lot of land, containing 5-one hundredths (5/100) acre, more or less, located, lying and being adjoining the present property of the International Agricultural Corporation, near Arkwright Mills, County of Spartanburg, State of South Carolina, and being more particularly described as follows: Beginning at an iron pin (new) near the gate across the road leading into the plant of International Agricultural Corporation, and running thence N. 66-10 E. 118.5 feet (along driveway) to a fence post; thence S. 30-05 E. 32.08 feet to an iron pin (new); thence S 81-00 W. 125.8 feet to an iron pin, the beginning corner, all of which will more fully appear by reference to a plat thereof made by H. Stribling, C.E., August 4, 1931. This being a part of the same property conveyed to George Murphy by H. E. Ravenel and Ravadson Trust Company, by deed dated December 1, 1916, Deed Book ?R, at Page 184, RMC Office for Spartanburg County. This being all the property conveyed to International Agricultural Corporation by Deed of George Murphy dated August 5, 1931, Deed Book 7-Z, at Page 340.

Also, Less and Except that real property consisting of approximately 6.285 acres which was conveyed by Deed of VigIndustries Inc. to City of Spartanburg, by Deed dated August 26, 2011 and recorded in the Office of the Register of Deeds for Spartanburg County on August 29, 2011, where it appears in Deed Book 99B, at Page 854.

APN: 7-20-00-004.00

Exhibit B

Restrictive Property

AS-D

Being the parcel labeled "AS-D", as shown on plat entitled "Mapping Exhibit for Restrictive Properties of Vigindustries Inc.", and being more particularly described as the following:

Commencing at a NGS Monument "EC2875", having published South Carolina Grid Coordinates of N: 1,126,844.61 feet & E: 1,720,230.43 feet, thence heading S42°30'13"E, 3,228.69 feet to the POINT OF BEGINNING; thence N68°45'50"E, 30.35 feet to a point; thence S17°10'22"E, 33.26 feet to a point; thence S74°21'15"W, 30.00 feet to a point; thence N17°41'42"W, 30.31 feet to the POINT OF BEGINNING, containing 957.9 square feet, more or less.

PR-1

Being the parcel labeled "PR-1", as shown on plat entitled "Mapping Exhibit for Restrictive Properties of Vigindustries Inc.", and being more particularly described as the following:

Commencing at a NGS Monument "EC2875", having published South Carolina Grid Coordinates of N: 1,126,844.61 feet & E: 1,720,230.43 feet, thence heading S46°13'06"E, 3,713.23 feet to the POINT OF BEGINNING; thence N40°36'08"E, 6.30 feet to a point; thence N49°55'35"E, 14.06 feet to a point; thence N63°26'03"E, 37.81 feet to a point; thence N61°05'57"E, 18.73 feet to a point; thence N51°16'44"E, 25.40 feet to a point; thence S39°48'20"E, 14.68 feet to a point; thence S49°05'03"W, 20.34 feet to a point; thence S59°41'01"W, 23.35 feet to a point; thence S65°22'34"W, 22.55 feet to a point; thence S60°15'16"W, 19.28 feet to a point; thence S47°07'24"W, 6.53 feet to a point; thence S40°58'20"W, 8.60 feet to a point; thence N46°21'07"W, 15.34 feet to the POINT OF BEGINNING, containing 1,494.4 square feet, more or less.

PR-2

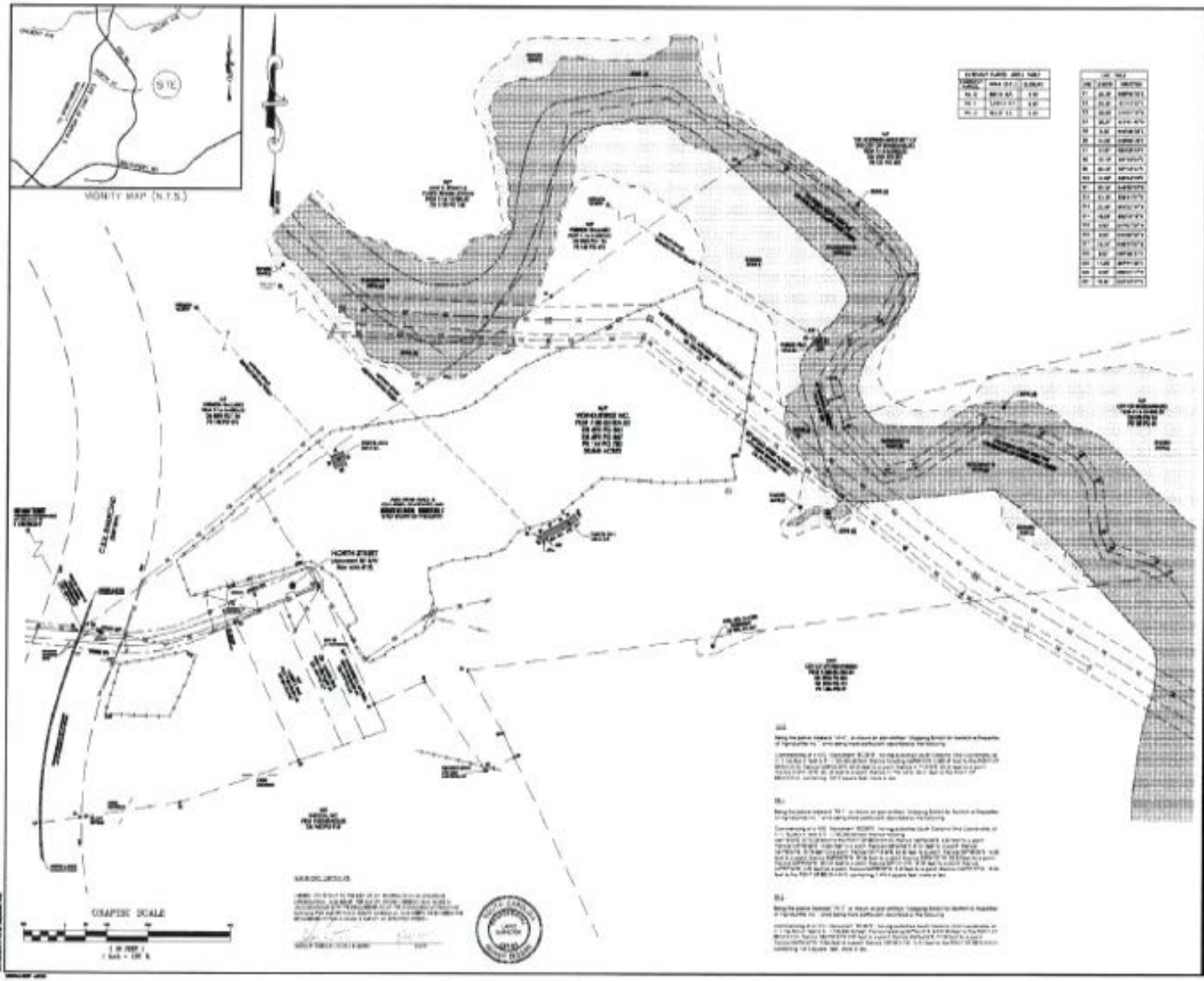
Being the parcel labeled "PR-2", as shown on plat entitled "Mapping Exhibit for ResrictiveProperties of Vigindustries Inc.", and being more particularly described as the following:

Commencing at a NGS Monument "EC2875", having published South Carolina Grid Coordinates of N: 1,126,844.61 feet & E: 1,720,230.43 feet, thence heading S57°56'49"E, 3,949.33 feet to the POINT OF BEGINNING; thence N84°29'27"E, 9.57 feet to a point; thence S04°44'06"E, 17.08 feet to a point; thence S86°04'47"W, 9.86 feet to a point; thence N03°45'41"W, 16.81 feet to the POINT OF BEGINNING, containing 164.6 square feet, more or less.

Exhibit C

Mapping Exhibit for Restrictive Properties of Vigindustries Inc.

(See attached)



Stantec

Copyright Reserved

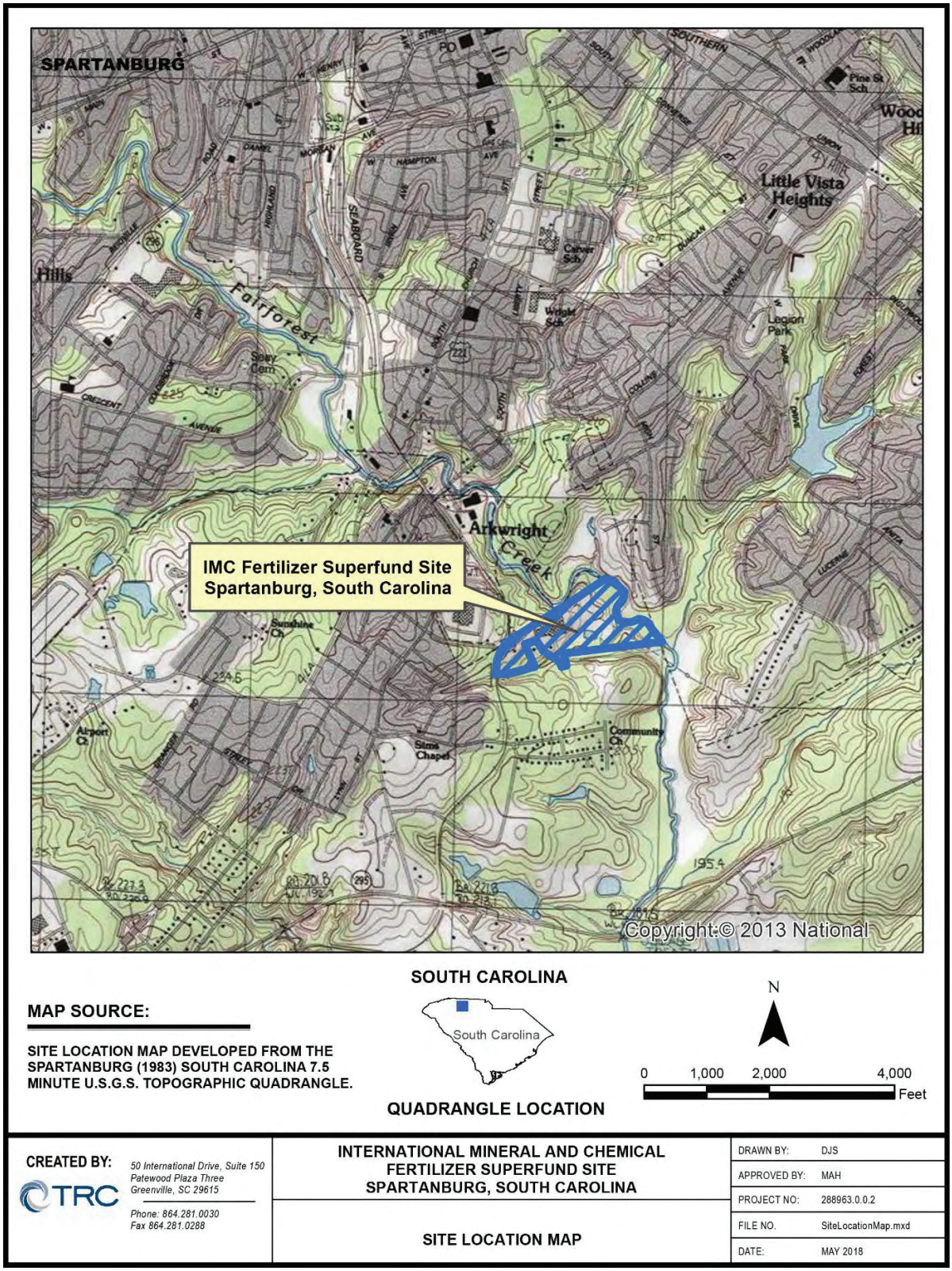
Client
THE MOSAIC COMPANY
3033 CAMPUS DRIVE, SUITE E490
PLYMOUTH, MN 55441

MAPPING EXHIBIT FOR RESTRICTIVE PROPERTIES OF VIGINDUSTRIES INC.

PARCEL # 7-20-00-004.00
MSMG 38.848 ACRES TOTAL
LOCATED IN SPARTANBURG COUNTY
STATE OF SOUTH CAROLINA

Project No.	Scale	Date
178660100	1"=100'	09.20.2017
Drawing No.	Sheet	Revision
M100-00001	1 of 1	0

APPENDIX G – MAPS AND FIGURES



Disclaimer: This map and any boundary lines within the map are approximate and subject to change. The map is not a survey. The map is for informational purposes only regarding the EPA's response actions at the Site.

Figure G1: Site Location Map

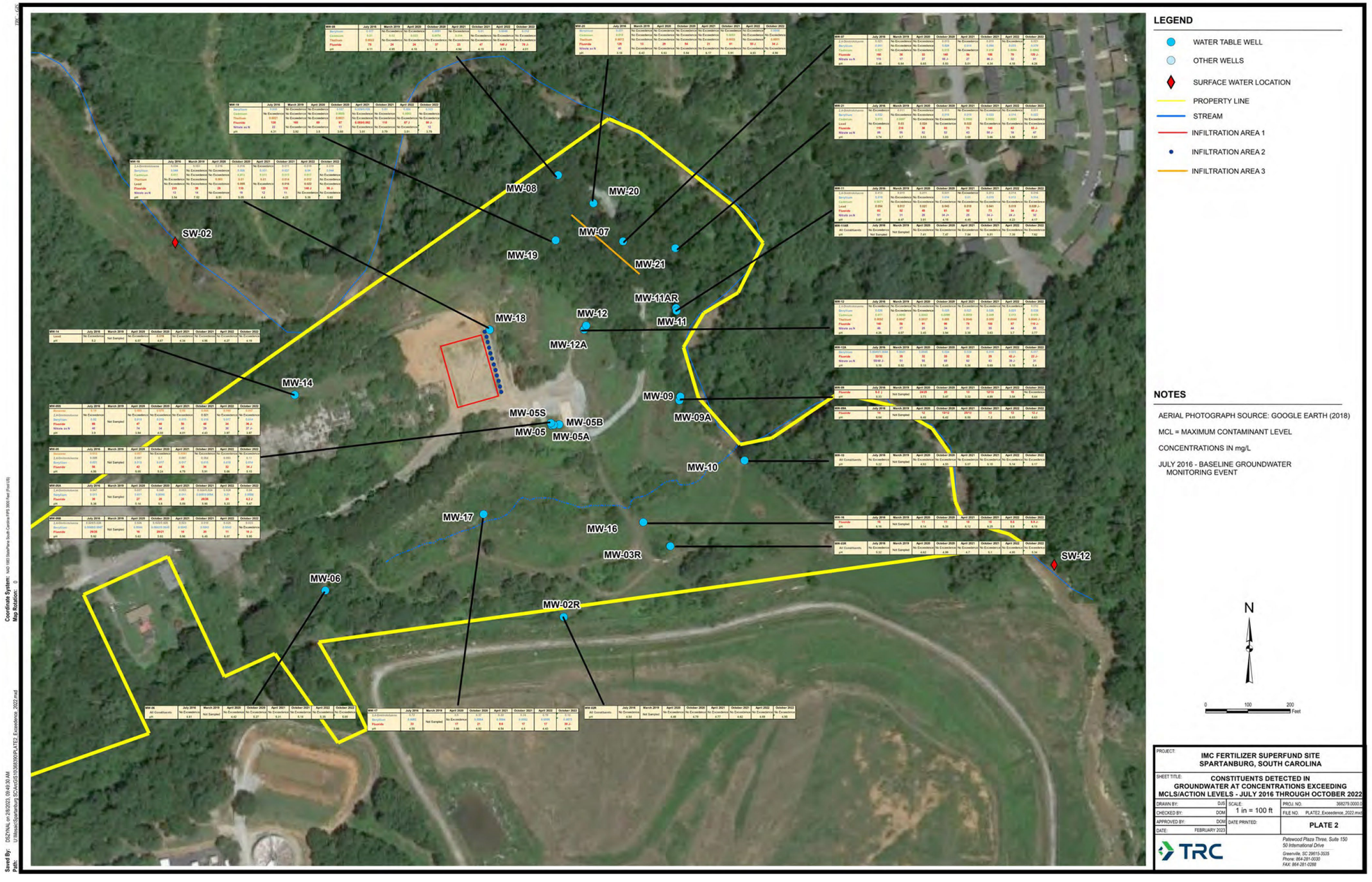


Figure G2: COCs in Groundwater Exceeding MCLs/Cleanup Levels – July 2016 Through October 2022

Figure G3: Groundwater Level Map

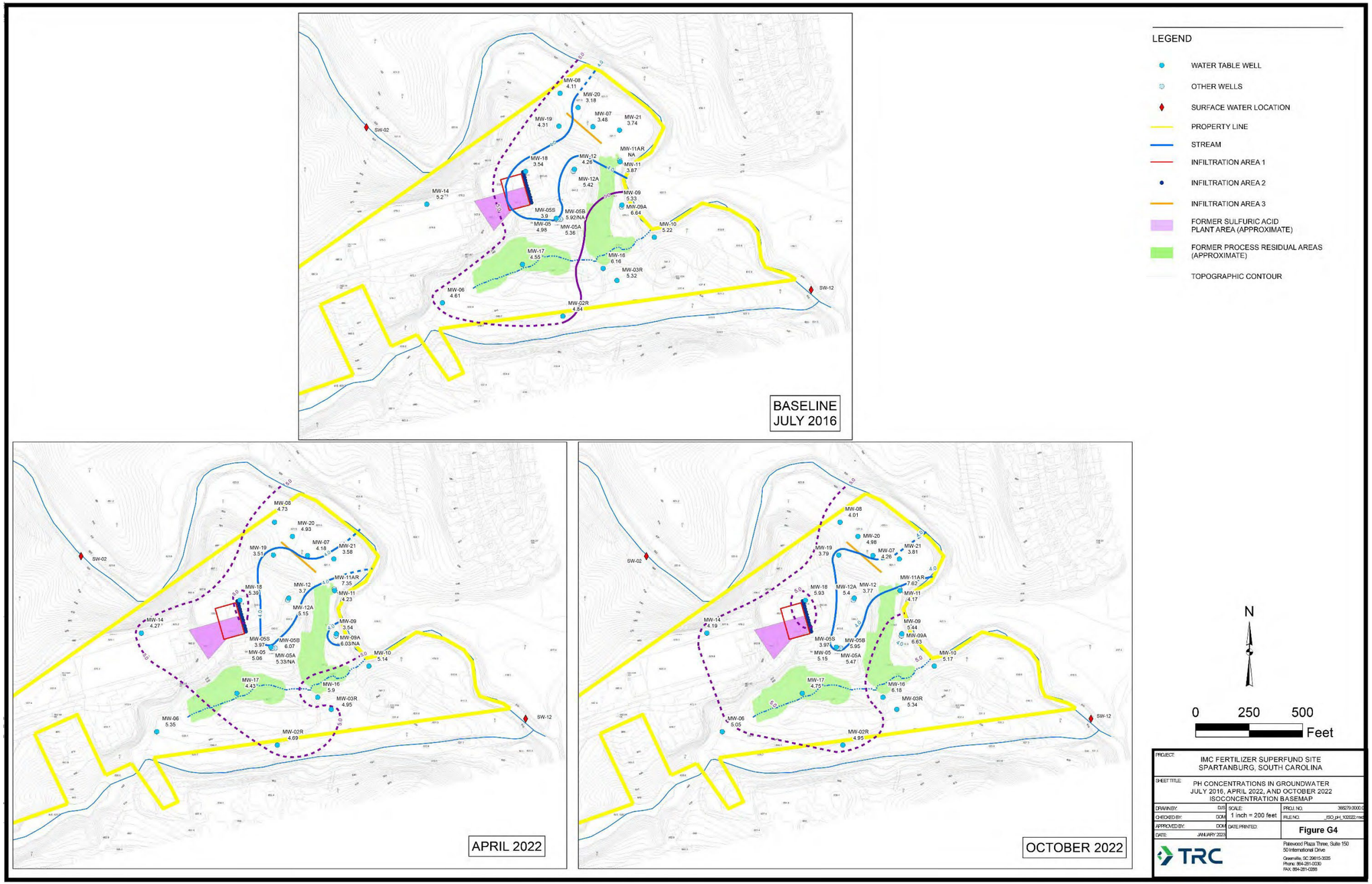


Figure G4: pH Concentrations in Groundwater July 2016, April 2022, and October 2022 Isoconcentration Map

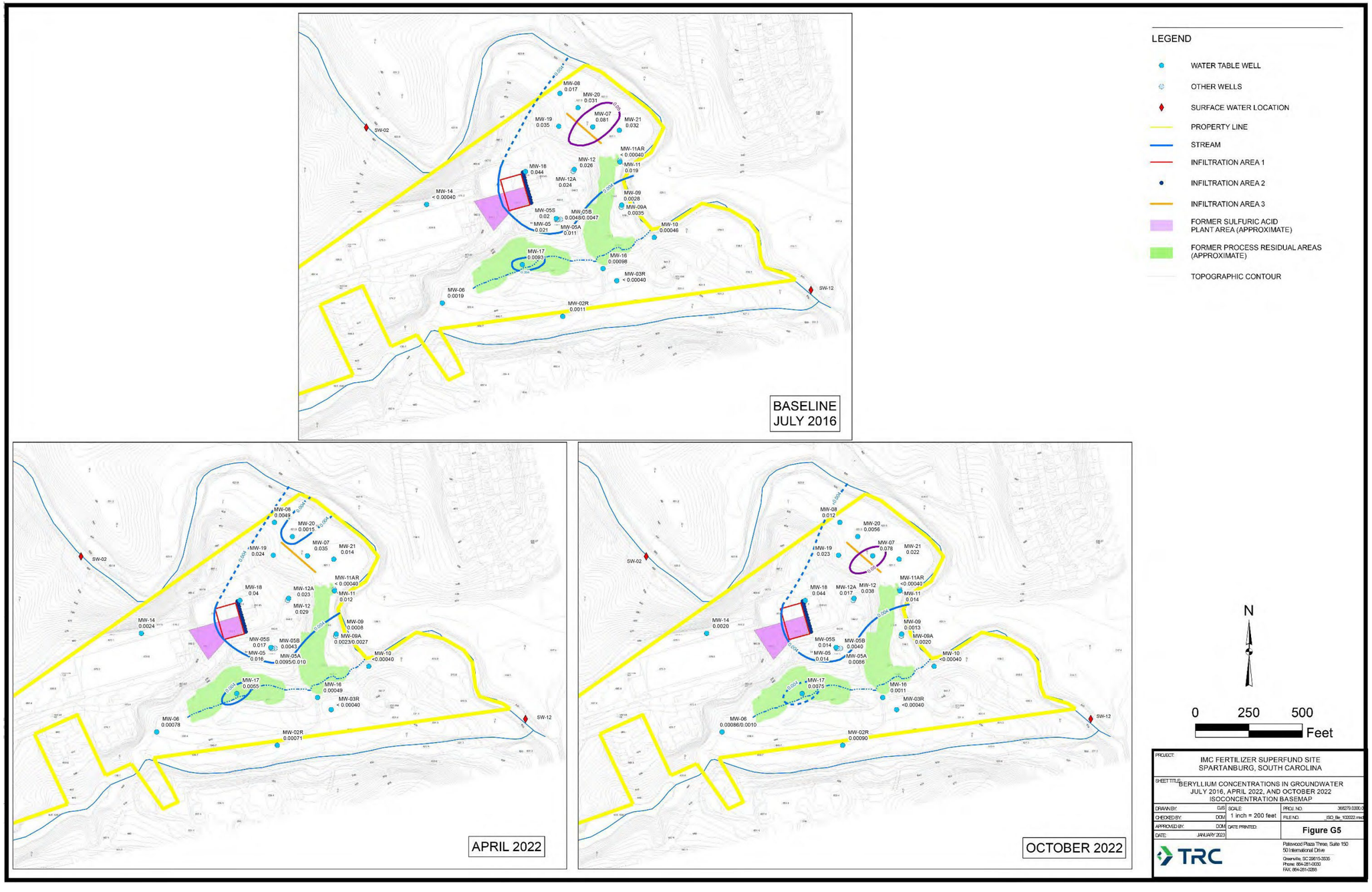


Figure G5: Beryllium Concentrations in Groundwater July 2016, April 2022, and October 2022 Isoconcentration Map

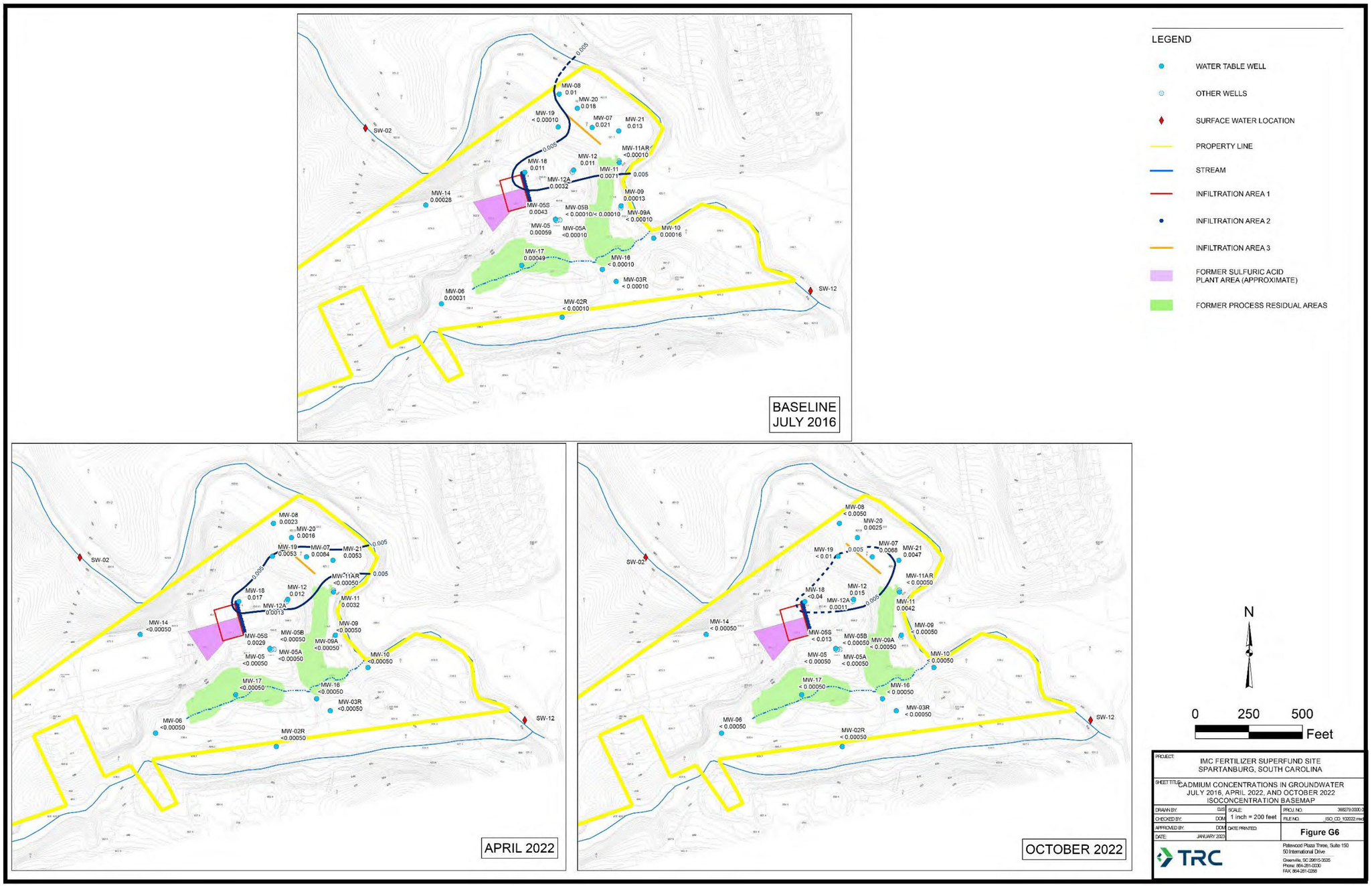


Figure G6: Cadmium Concentrations in Groundwater July 2016, April 2022, and October 2022 Isoconcentration Map

Figure G7: Fluoride Concentrations in Groundwater July 2016, April 2022, And October 2022 Isoconcentration Map

APPENDIX H – DETAILED ARARs REVIEW

Appendix H includes a review of relevant, site-related documents including the RODs, remedial action reports and recent monitoring data. CERCLA Section 121(d)(1) requires that Superfund remedial actions attain "a degree of cleanup of hazardous substance, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment." The remedial action must achieve a level of cleanup that at least attains those requirements that are legally applicable or relevant and appropriate. In performing the FYR for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

- Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, remedial action, location, or other circumstance found at a CERCLA site.
- Relevant and appropriate requirements are those standards that, while not "applicable," address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site. Only those state standards that are more stringent than federal requirements may be applicable or relevant and appropriate.
- To-Be-Considered (TBC) criteria are non-promulgated advisories and guidance that are not legally binding but should be considered in determining the necessary remedial action. For example, TBCs may be particularly useful in determining health-based levels where no ARARs exist or in developing the appropriate method for conducting a remedial action.

Chemical-specific ARARs are health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish an acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment. Examples of chemical specific ARARs include Maximum Contaminant Levels (MCLs) under the federal Safe Drinking Water Act and ambient water quality criteria enumerated under the federal Clean Water Act (CWA).

Action-specific ARARs are technology- or activity-based requirements or limits on actions taken with respect to a particular hazardous substance. These requirements are triggered by a remedial activity, such as discharge of contaminated groundwater or in-situ remediation.

Location-specific ARARs are restrictions on hazardous substances, or the conduct of the response activities solely based on their location in a special geographic area. Examples include restrictions on activities in wetlands, sensitive habitats, and historic places.

Remedial actions are required to comply with the chemical specific ARARs identified in the ROD. In performing the five-year review for compliance with ARARs, only those ARARs that address the protectiveness of the remedy are reviewed.

Table H1: Chemical Specific ARARs

Chemical Specific ARARs for IMC Fertilizer Superfund Site			
Action/Media	**Requirements**	**Prerequisite**	**Citation(s)**
Classification of Groundwater	All South Carolina groundwater is classified Class GB under SCDHEC R. 61-68H.9. which meets the definition of underground sources of drinking water.	Groundwater, except within mixing zones, within the state of South Carolina - **applicable**	SCDHEC Reg. 61-68H.2
Restoration of groundwater as a potential drinking water source	All inorganic and organic contaminants in underground sources of drinking water may not exceed Maximum Contaminant levels (MCLs) as set forth in R.61-58, State Primary Drinking Water Regulations. <u>Site Contaminants of Concern:</u> Beryllium 4 µg/L Cadmium 5 µg/L Thallium 2 µg/L Lead 15 µg/L Fluoride 4000 µg/L Nitrate 10000 µg/L Benzene 5 µg/L Note: µg/L – micrograms per liter	Groundwater classified as underground source of drinking water (USDW) as (defined in SCDHEC Reg. 61-68B.62) - **relevant and appropriate**	SCDHEC Reg. 61-68H.9.b 40 CFR Part 141 Subpart G *(National Primary Drinking Water Regulations)*
	The requirements of this Subpart I constitute the national primary drinking water regulations for lead. The lead action level is exceeded if the concentration of lead is greater than 0.015 mg/L.	Groundwater classified as underground source of drinking water - **relevant and appropriate**	40 CFR 141.80(a) 40 CFR 141.80(c)(1)

Chemical Specific ARARs for IMC Fertilizer Superfund Site			
Action/Media	**Requirements**	**Prerequisite**	**Citation(s)**
	Shall not exceed concentrations or amounts such as to interfere with use, actual or intended, as determined by SCDHEC.	Presence of waste, pesticides, other synthetic organic compounds, deleterious substances, or constituents thereof not specified in SCDHEC R. 61-68H.9a or b. in Class GB groundwater - **relevant and appropriate**	SCDHEC R. 61-68H.9.C

Table H2: Action Specific ARARs

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Monitoring Well Installation, Operation, and Abandonment			
Installation of Permanent and Temporary Monitoring Wells	All monitoring wells shall be drilled, constructed, maintained, operated, and/or abandoned to ensure that underground sources of drinking water are not contaminated.	Construction of permanent and temporary monitoring wells, as defined in R. 61-71B - **applicable**	SCDHEC R. 61-71H.1(b)
Installation of Permanent Conventionally Installed or Direct Push Monitoring Wells	Wells shall be grouted from the top of the bentonite seal to the land surface. Grout is to be composed of neat cement, a bentonite cement mixture, or high solids sodium bentonite grout.	Construction of permanent conventionally installed or direct push monitoring wells, as defined in R. 61-71B - **applicable**	SCDHEC R. 61-71H.2.a.(1),(2) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(1),(2) *[direct push wells]*

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	The diameter of the annular space shall be large enough to allow for forced injection of grout through a tremie pipe. All grouting shall be accomplished using forced injection to emplace the grout. When emplacing the grouting material, the tremie pipe shall be lowered to the bottom of the zone to be grouted. The tremie pipe shall be kept full continuously from start to finish of the grouting procedure, with the discharge end of the tremie pipe being continuously submerged in the grout until the zone to be grouted is completely filled.		SCDHEC R. 61-71H.2.a.(3),(4) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(3),(4) *[direct push wells]*
	A cement or aggregate reinforced concrete pad at the ground surface of appropriate durability and strength, considering the setting and location of each well, that extends six inches beyond the borehole diameter and six inches below ground surface is required. The pad shall be capable of preventing infiltration between the surface casing and the borehole to the subsurface.		SCDHEC R. 61-71H.2.a.(5) *[conventionally installed wells]* SCDHEC R. 61-71H.3.b.(5) *[direct push wells]*
Installation of Permanent Conventionally Installed or Direct Push Monitoring Wells (cont'd)	Well Construction and Materials Standards - 1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be composed of material	Construction of permanent conventionally installed or direct push monitoring wells, as defined in R. 61- 71B - **applicable**	SCDHEC R. 61 - 71H.2.b. *[conventionally installed wells]* SCDHEC R. 61 - 71H.3.c *[direct push wells]*

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	so as to minimally affect water quality analyses. 2) Casing shall have a sufficient diameter to provide access for sampling equipment. 3) A properly hydrated bentonite seal with a minimum thickness of twelve inches directly above the filler pack shall be used, if the well has a filter pack. 4) The monitoring well Intake or screen design shall minimize formational materials from entering the well. The filter pack 17 shall be utilized opposite the well screen as appropriate in so that parameter analyses will be minimally affected. 5) A locking cap or other security devices to prevent damage and/or vandalism shall be used. 6) Monitoring wells completed below grade shall be in a watertight vault with a well cap to prevent infiltration of surface water into the well.		
Additional Requirements for Installation of Direct Push Monitoring Wells	Direct push wells cannot be installed below a confining layer unless it can be demonstrated to the satisfaction of the Department that cross-contamination of the aquifer systems can be prevented.	Construction of direct push monitoring wells, as defined in R. 61-71B-**applicable**	R. 61-71H.3.a.

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Installation of Temporary Monitoring Wells	Construction and Materials - (1) Casing shall be of sufficient strength to withstand normal forces encountered during and after well installation and be 20 composed of material so as to minimally affect water quality analyses. (2) Casing shall have a sufficient diameter to provide access for sampling equipment. (3) The monitoring well intake or screen design shall minimize formational materials from entering the well. The filter pack or intake shall be utilized opposite the well screen as appropriate so that parameter analyses will be minimally affected.	Construction of temporary monitoring wells, as defined in R. 61-718- **applicable**	SCDHEC R. 61- 71H.4.a.
	All temporary monitoring wells shaft be sealed with a watertight cap or seal until abandoned. Temporary monitoring wells shall be maintained such that they are not a source or channel of contamination before they are abandoned.	Operation and maintenance of temporary monitoring wells, as defined in R. 61-71B - **applicable**	SCOHEC R. 61- 71H.4.b.
Abandonment of Permanent Conventionally Installed Monitoring Wells	Abandonment of permanent conventionally Installed monitoring wells shall be by forced Injection of grout or pouring through a tremie pipe starting at the bottom of the well and proceeding to the surface In one continuous operation. The well shall be filled with either with neat cement, bentonite-cement, or 20% high solids sodium bentonite grout, from the bottom of the well to the land surface.	Abandonment of permanent conventionally Installed monitoring wells **- applicable**	SCDHEC R. 61- 71H.2.e.

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Abandonment of Permanent Direct Push Monitoring Wells	(1) Permanent direct push wells that do not penetrate a confining layer shall be abandoned by removing all casing from the subsurface and be grouted by forced injection through a tremie pipe from the total depth to the land surface, or by forced injection or pouring of neat cement, bentonite-cement or 20% high solids sodium bentonite grout through a tremie pipe starting at the bottom of the well and proceeding to the surface. (2) Direct push wells that penetrate a confining layer shall be abandoned by forced Injection or pouring of neat cement, bentonite-cement, or 20% high solids sodium bentonite grout through a tremie pipe starting at the bottom of the well and proceeding to the surface in one continuous operation.	Abandonment of permanent direct push monitoring wells, as defined In R.61- 71B- **applicable**	SCDHEC R. 61- 71H.2.f.
Underground Infiltration Galleries - Installation, Operation, and Abandonment			
Injection of reagents through Underground infiltration galleries	An injection activity cannot allow the movement of fluid containing any contaminant into USDWs, if the presence of that contaminant may cause a violation or the primary drinking water standards under 40 CFR part 141, other health-based standards, or may otherwise adversely affect the health of persons. This prohibition applies to well construction, operation, maintenance, conversion, plugging, closure, or any other injection activity.	Class V wells [as defined in 40 CFR 144.6(e)) used to inject reagents - **applicable**	40 CFR 144.82(a)(1)

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	The movement of fluids containing wastes or contaminants into underground sources of drinking water as a result of injection is prohibited if the presence of the waste or contaminant: • May cause a violation of any drinking water standard under R61-58.5; or, • May otherwise adversely affect the health of persons.	Operation of wells, including subsurface fluid distribution systems, as defined In R. 61-87.2(2), for underground injection of any fluids into the subsurface or ground waters of the State of South Carolina - **applicable**	SCDHEC R.61-87.5
	No person shall construct, use, or operate a Class V.A. well for injection in violation of R61-87.5.	Class V.A. injection wells [as classed in R.61-87.11(E)(1)(g)), including subsurface fluid distribution system [as defined in 87.2(2)] for use in experimental technologies - **applicable**	SCDHEC R.61-87.11(E)(2)(b)
Operation of underground infiltration galleries	At a minimum, the following information concerning the injection formation shall be determined or calculated: (1) Fluid pressure: (2) Estimated fracture pressure: (3) Physical and chemical characteristics of the injection zone. Note: Depending upon how the chemical reagent is introduced to the infiltration galleries this requirement may be considered.	Operation of Class V.A. wells, including subsurface fluid distribution systems, as defined in R. 61-87.2(2). for underground injection of any fluids into the subsurface or ground waters of the State of South Carolina - **applicable**	SCDHEC R.61- 87.14(D)

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Shall at all times proper1y operate and maintain all facilities and systems of treatment and controls which are installed or used.		SCDHEC R.61- 87.13(X)
	Shall report malfunction of injection system which may cause fluid migration into or between underground sources of drinking water; shall immediately stop injection upon determination that the injection system has malfunctioned and could cause fluid migration Into or between underground sources or drinking water; shall not restart the injection system until the malfunction has been corrected.		SCDHEC R.61-87.13(EE)
Monitoring of underground infiltration galleries	An appropriate number of monitoring wells shall be completed into the injection zone and into any underground sources of drinking water which could be affected by the injection operation. These wells shall be located in such a fashion as to detect any excursion of injection fluids, process by-products, or formation fluids outside the injection area or zone. If the operation may be affected by subsidence or catastrophic collapse the monitoring wells shalt be located so that they will not be physically affected.	Monitoring of Class V.A. wells, including a subsurface fluid distribution system, as defined In R. 61-87.2(Z). used for underground injection of any fluids into the subsurface or groundwaters of the State of South Carolina - **applicable**	SCDHEC R.61-87.14(G)(1)

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	In determining the number, location, construction, and frequency of monitoring of the monitoring wells the following criteria shall be considered: (a) The population relying on the USDW affected or potentially affected by the injection operation; (b) The proximity of the injection operation to points of withdrawal of drinking water; (c) The local geology and hydrogeology; (d) The operating pressures and whether a negative pressure gradient Is being maintained; (e) The nature and volume of the Injected fluid, the formation water, and the process by-products; and (f) The Injection well density.		SCDHEC R.61-87.14(G)(2)
	Monitoring requirements shall, at a minimum, specify: • Monitoring of the nature of injected fluids with sufficient frequency to yield representative data on its characteristics; • Monitoring of Injection pressure and either flow rate or volume semi-monthly. or metering and dally recording of injected and produced fluid volumes as appropriate • Monitoring of the fluid level in the		SCDHEC R.61-87.14(G)(3)(a),(b),(d)

Action Specific ARARs for IMC Fertilizer Superfund Site			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	injection zone semi• monthly, where appropriate and monitoring of the parameters chosen to measure water quality in the monitoring wells semi-monthly. Note: Monitoring of injections and monitoring wells will be conducted pursuant to an EPA-approved monitoring plan documented in appropriate CERCLA RD/RA document		
Plugging and abandonment of infiltration galleries	The well to be abandoned shall be in a state of static equilibrium with the mud weight equalized top to bottom, by a method prescribed by the Department prior to the placement of the cement plug(s).	Abandonment of Class V.A wells, including subsurface fluid distribution systems, as defined In R. 81-87.2(2), for underground injection of any fluids into the subsurface or ground waters of the State of South Carolina - **applicable.**	SCOHEC R.87.15(B)
	The well must be plugged in such a manner which will not allow the movement of fluids either into or between underground sources of drinking water.		SCDHEC R.87.15(C)
	Wells must be closed in a manner that complies with prohibition of fluid movement in 40 CFR 144.82(a). Also, any soil, gravel, sludge, liquids, or other materials removed from or adjacent to the well must be disposed or otherwise managed in accordance with substantive applicable Federal, State, and local regulations and requirements.	Class V wells [as defined In 40 CFR 144.6(e)] used to inject reagents – **applicable.**	40 CFR 144.82(b)

ARAR	applicable or relevant and appropriate requirement
CFR	Code of Federal Regulations
CWA	Clean Water Act of 1972
OEACT	deactivation
EPA	U.S. Environmental Protection Agency
NPDES	National Pollutant Discharge Elimination System
RCRA	Resource Conservation and Recovery Act of 1976
SCDHEC	South Carolina Department of Health and Environmental Control
TCLP	Toxicity Characteristic Leaching Procedure

Groundwater Chemical Specific ARARs

The cleanup levels for groundwater at the Site are based on primary MCLs (40 CFR Part 141-143) for groundwater, the Federal Action Level for lead, and the practical quantitation limit for 2,4-dinitrotoluene. This FYR compared groundwater ARARs in the 2014 ROD against the current values of these ARARs. None of the ARARs have changed since 2014. In addition, no new MCLs has been established for 2,4-Dinitrotoluene (2,4-DNT). The practical quantitation limit for 2,4-DNT has not changed.

Table H3 presents the 2014 ROD list of COCs and their cleanup levels and compares them to the current applicable ARARs. This FYR did not identify any changes to the assumptions applied to the site-specific, risk-based cleanup level calculations at the time of the 2014 ROD that affects current or future protectiveness of the site.

Table H3: Summary of Groundwater ARAR Changes

Contaminant	2014 ROD Cleanup Levels[a] (µg/L)[b]	Current ARARs[c] (µg/L)	ARARs More or Less Stringent than Cleanup Levels?
Beryllium	4	4	No changes
Cadmium	5	5	No changes
Thallium	2	2	No changes
Lead	15[d]	15[d]	No changes
Fluoride	4,000	4,000	No changes
Nitrate	10,000	10,000	No changes
Benzene	5	5	No changes
2,4-DNT	10[e]	10[e]	No changes

Notes:

a) Source: 2014 ROD;.

b) µg/L – micrograms per liter.

c) Current ARARs are based on Federal (40 CFR 141 -143) and South Carolina Department of Health and Environmental Control State Primary Drinking Water Regulations (South Carolina Code of Regulations Chapter 61-58) and are the same. Federal standards are based on National Primary Drinking Water Maximum Contamination Levels and state standards are based on South Carolina R.61-58.5 Maximum Contaminant Levels in Drinking Water. Listed values are MCLs from https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants, accessed 1/23/23.

d) Federal Action Level - In 1991, EPA published a regulation to control lead and copper in drinking water. This regulation is known as the Lead and Copper Rule (also referred to as the LCR). The LCR includes "90th percentile" action level of 15 µg/L for lead (based on the 90th percentile sample level). Unlike the MCLG, which is based on what is safe for human health, the action level for lead is based on feasibility. Feasibility entails what is achievable using the best technology and treatment techniques while taking costs into account. Under the 1991 LCR, if samples contain lead concentrations less than 15 ppb, no action is required, despite EPA's assessment that any level of lead in drinking water is harmful to human health.

e) Practical Quantitation Limit (PQL) means the lowest concentration of an analyte that can be measured within specified limits of precision and accuracy during routine laboratory operating conditions.

No new exposure pathways were identified. No new methodologies to determine risk more accurately were identified during this Five-Year Review. Groundwater cleanup levels are based on federal and state drinking water standards and are not addressed further.

APPENDIX I – WATER LEVEL ELEVATION TABLE

Table I1: Groundwater Elevations
IMC Fertilizer Superfund Site, Spartanburg, South Carolina

Well ID	Date	Measuring Point Elevation (ft)	Depth to Water (ft)	Water Level Elevation (ft)
MW-02R	7/5/2016	636.09	9.59	626.50
	3/18/2019		7.59	628.50
	4/1/2020		8.05	628.04
	10/5/2020		8.79	627.30
	4/2/2021		7.25	628.84
	10/4/2021		9.59	626.5
	4/4/2022		8.59	627.50
	10/3/2022		10.66	625.43
MW-03R	7/5/2016	628.38	8.01	620.37
	3/18/2019		5.63	622.75
	4/1/2020		6.06	622.32
	10/5/2020		6.99	621.39
	4/2/2021		5.31	623.07
	10/4/2021		7.96	620.42
	4/4/2022		6.58	621.80
	10/3/2022		8.87	619.51
MW-05S	7/5/2016	642.56	21.2	621.36
	3/18/2019		18.85	623.71
	4/1/2020		19.45	623.11
	10/5/2020		20.79	621.77
	4/2/2021		19.09	623.47
	10/4/2021		21.55	621.01
	4/4/2022		20.12	622.44
	10/3/2022		22.26	620.30
MW-05	7/5/2016	641.53	20.06	621.47
	3/18/2019		17.73	623.80
	4/1/2020		18.35	623.18
	10/5/2020		19.65	621.88
	4/2/2021		17.95	623.58
	10/4/2021		20.41	621.12
	4/4/2022		19.01	622.52
	10/3/2022		21.16	620.37
MW-05A	7/5/2016	641.18	19.67	621.51
	3/18/2019		17.33	623.85
	4/1/2020		17.93	623.25
	10/5/2020		19.27	621.91
	4/2/2021		17.53	623.65
	10/4/2021		20.01	621.17
	4/4/2022		18.61	622.57
	10/3/2022		20.77	620.41
MW-05B	7/5/2016	643.95	22.46	621.49
	3/18/2019		20.09	623.86
	4/1/2020		20.69	623.26
	10/5/2020		22.11	621.84
	4/2/2021		20.31	623.64
	10/4/2021		22.81	621.14
	4/4/2022		21.38	622.57
	10/3/2022		23.56	620.39
MW-06	7/5/2016	641.16	8.1	633.06
	3/18/2019		5.27	635.89
	4/1/2020		6.31	634.85
	10/5/2020		7.66	633.50
	4/2/2021		5.61	635.55
	10/4/2021		8.35	632.81
	4/4/2022		7.34	633.82
	10/3/2022		9.34	631.82

Table I1 Continued: Groundwater Elevations
IMC Fertilizer Superfund Site, Spartanburg, South Carolina

Well ID	Date	Measuring Point Elevation (ft)	Depth to Water (ft)	Water Level Elevation (ft)
MW-07	7/5/2016	623.00	9.3	613.70
	3/18/2019		6.59	616.41
	4/1/2020		6.99	616.01
	10/5/2020		9.05	613.95
	4/2/2021		6.15	616.85
	10/4/2021		9.75	613.25
	4/4/2022		7.99	615.01
	10/3/2022		10.18	612.82
MW-08	7/5/2016	623.85	10.7	613.15
	3/18/2019		8.33	615.52
	4/1/2020		8.77	615.08
	10/5/2020		10.5	613.35
	4/2/2021		7.99	615.86
	10/4/2021		10.88	612.97
	4/4/2022		9.7	614.15
	10/3/2022		11.08	612.77
MW-09	7/5/2016	623.59	10.3	613.29
	3/18/2019		9.15	614.44
	4/1/2020		10	613.59
	10/5/2020		10.7	612.89
	4/2/2021		9.75	613.84
	10/4/2021		10.63	612.96
	4/4/2022		10.57	613.02
	10/3/2022		11.46	612.13
MW-09A	7/5/2016	623.11	8.9	614.21
	3/18/2019		7.69	615.42
	4/1/2020		8.47	614.64
	10/5/2020		9.22	613.89
	4/2/2021		8.17	614.94
	10/4/2021		9.09	614.02
	4/4/2022		8.91	614.20
	10/3/2022		9.91	613.20
MW-10	7/5/2016	623.54	11.53	612.01
	3/18/2019		10.27	613.27
	4/1/2020		10.59	612.95
	10/5/2020		11.15	612.39
	4/2/2021		10.35	613.19
	10/4/2021		11.11	612.43
	4/4/2022		11.05	612.49
	10/3/2022		11.81	611.73
MW-11	7/5/2016	623.86	10.15	613.71
	3/18/2019		8.35	615.51
	4/1/2020		8.69	615.17
	10/5/2020		10.12	613.74
	4/2/2021		8.29	615.57
	10/4/2021		10.58	613.28
	4/4/2022		9.89	613.97
	10/3/2022		11.29	612.57
MW-11AR	7/5/2016	623.89	6.6	617.29
	3/18/2019		4.79	620.10
	4/1/2020		5.41	619.48
	10/5/2020		6.49	618.40
	4/2/2021		5.01	618.88
	10/4/2021		6.99	616.90
	4/4/2022		5.34	619.55
	10/3/2022		7.56	616.33

Table I1 Continued: Groundwater Elevations
IMC Fertilizer Superfund Site, Spartanburg, South Carolina

Well ID	Date	Measuring Point Elevation (ft)	Depth to Water (ft)	Water Level Elevation (ft)
MW-12	7/5/2016	643.41	24.04	619.37
	3/18/2019		21.27	622.14
	4/1/2020		21.83	621.58
	10/5/2020		23.63	619.78
	4/2/2021		21.51	621.90
	10/4/2021		24.42	618.99
	4/4/2022		22.62	620.79
	10/3/2022		25.08	618.33
MW-12A	7/5/2016	643.81	24.32	619.49
	3/18/2019		21.67	622.14
	4/1/2020		22.27	621.54
	10/5/2020		23.95	619.86
	4/2/2021		21.93	621.88
	10/4/2021		24.75	619.06
	4/4/2022		23.03	620.78
	10/3/2022		25.37	618.44
MW-14	7/5/2016	681.48	42.42	639.06
	3/18/2019		35.57	645.91
	4/1/2020		39.01	642.47
	10/5/2020		42.79	638.69
	4/2/2021		38.99	642.49
	10/4/2021		44.03	637.45
	4/4/2022		42.85	638.63
	10/3/2022		45.04	636.44
MW-16	7/5/2016	626.28	8.01	618.27
	3/18/2019		6.37	619.91
	4/1/2020		6.25	620.03
	10/5/2020		7.32	618.96
	4/2/2021		6.05	620.23
	10/4/2021		7.81	618.47
	4/4/2022		6.94	619.34
	10/3/2022		8.67	617.61
MW-17	7/5/2016	628.16	2.3	625.86
	3/18/2019		0.91	627.25
	4/1/2020		1.47	626.69
	10/5/2020		1.44	626.72
	4/2/2021		1.19	626.97
	10/4/2021		1.96	626.20
	4/4/2022		1.45	626.71
	10/3/2022		2.34	625.82
MW-18	7/5/2016	653.74	30.66	623.08
	3/18/2019		24.57	629.17
	4/1/2020		27.05	626.69
	10/5/2020		30.23	623.51
	4/2/2021		26.23	627.51
	10/4/2021		31.45	622.29
	4/4/2022		28.97	624.77
	10/3/2022		32.22	621.52
MW-19	7/5/2016	627.87	13.05	614.82
	3/18/2019		9.41	618.46
	4/1/2020		10.17	617.70
	10/5/2020		12.65	615.22
	4/2/2021		9.23	618.64
	10/4/2021		13.45	614.42
	4/4/2022		11.53	616.34
	10/3/2022		13.91	613.96

Table I1 Continued: Groundwater Elevations
IMC Fertilizer Superfund Site, Spartanburg, South Carolina

Well ID	Date	Measuring Point Elevation (ft)	Depth to Water (ft)	Water Level Elevation (ft)
MW-20	7/5/2016	624.93	11.41	613.52
	3/18/2019		8.71	616.22
	4/1/2020		9.09	615.84
	10/5/2020		11.11	613.82
	4/2/2021		8.21	616.72
	10/4/2021		11.96	612.97
	4/4/2022		10.13	614.80
	10/3/2022		12.06	612.87
MW-21	7/5/2016	624.36	11.31	613.05
	3/18/2019		9.73	614.63
	4/1/2020		10.05	614.31
	10/5/2020		11.43	612.93
	4/2/2021		9.51	614.85
	10/4/2021		11.89	612.47
	4/4/2022		10.69	613.67
	10/3/2022		12.24	612.12

APPENDIX J - ANALYTICAL RESULTS FOR GROUNDWATER MONITORING WELLS

Table J1: Groundwater Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
CLEANUP LEVEL[2]		0.005	0.01	0.004	0.005	0.015	0.002	4.0	10.0	--	--	--	--	--
MW-02R	7/8/2016	<0.0050	< 0.0080	**0.0011**	< 0.00010	< 0.0010	< 0.00050	**0.26**	**0.89**	< 1.0	4.84	25.3	93	0
	4/7/2020	< 0.0010	< 0.0080	**0.00082**	< 0.00050	< 0.0010	< 0.00050	**0.13**	**0.75**	< 1.7	4.48	14.34	46	0
	10/12/2020	< 0.0010	< 0.0080	**0.00097**	< 0.00050	< 0.0010	< 0.00050	**0.16**	**0.36 J+**	< 1.7	4.79	20.08	57	0
	4/8/2021	< 0.0010	< 0.0080	**0.0011**	< 0.00050	< 0.0010	< 0.00050	**0.15**	**0.59**	< 2.5	4.77	15.23	79	0
	10/7/2021	< 0.0010	< 0.0080	**0.0009**	< 0.00050	< 0.0010	< 0.00050	**0.15**	**0.51 J-**	< 2.5	4.62	20.18	56	0
	4/5/2022	< 0.0010	< 0.0080	**0.00071**	< 0.00050	< 0.0010	< 0.00050	**0.2**	**0.75 J-**	<2.5	4.69	14.83	90	0.43
	10/6/2022	< 0.0010	< 0.0080	**0.00090**	< 0.00050	< 0.0010	< 0.00050	**0.18 J-**	**0.72**	< 2.5	4.95	20.39	90	1.97
MW-03R	7/6/2016	<0.0050	< 0.0080	< 0.00040	< 0.00010	< 0.0010	< 0.00050	**0.63**	**1.6**	< 1.0	5.32	18.54	197	2.38
	4/8/2020	< 0.0010	< 0.0080	**0.00046**	< 0.00050	< 0.0010	< 0.00050	**0.46**	**0.98**	**2.7**	4.62	17.23	137	0
	10/12/2020	< 0.0010	< 0.0080	**0.00041**	< 0.00050	< 0.0010	< 0.00050	**0.3**	**0.85 J+**	< 1.7	4.99	18.96	169	4.4
	4/9/2021	< 0.0010	< 0.0080	**0.00046**	< 0.00050	< 0.0010	< 0.00050	**0.38**	**0.97**	< 2.5	4.7	17.38	209	8.05
	10/7/2021	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.25**	**1.3 J-**	< 2.5	5.1	18.44	143	0
	4/8/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.46**	**1**	<2.5	4.95	15.12	200	0.06
	10/6/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.26 J-**	**1.3**	< 2.5	5.34	18.91	180	0.93
MW-05S	7/7/2016	**0.14**	< 0.0080	**0.02**	**0.0043**	**0.0024**	< 0.00050	**66**	**48**	< 1.0	3.9	19.35	3500	0
	4/2/2020	**0.068**	< 0.0080	**0.019**	**0.0029**	**0.0016**	< 0.00050	**47**	**74**	< 1.7	3.94	17.09	2810	0.16
	10/7/2020	**0.078**	< 0.0080	**0.018**	**0.0031**	**0.0022**	< 0.00050	**48**	**34**	< 1.7	4.08	20.26	2710	0
	4/5/2021	**0.05**	< 0.0080	**0.018**	**0.0026**	< 0.0010	< 0.00050	**50**	**43**	< 2.5	4.01	21.97	2570	1.81
	10/5/2021	**0.064**	**0.021**	**0.016**	**0.0024**	**0.0016**	< 0.00050	**48**	**29**	< 2.5	4.43	18.25	2560	1.3
	4/4/2022	**0.048**	< 0.0080	**0.017**	**0.0029**	**0.0014**	< 0.00050	**34**	**38**	<2.5	3.97	18.12	2530	0.01
	10/11/2022	**0.047**	< 0.0080	**0.014**	< 0.013	< 0.025	< 0.013	**36 J-**	**37 J-**	**3.0**	3.97	19.1	2510	2.51
MW-05	7/7/2016	**0.012**	**0.095**	**0.021**	**0.00059**	< 0.0010	< 0.00050	**56**	**6.8**	< 1.0	4.98	20.98	708	0
	4/2/2020	**0.007**	**0.097**	**0.018**	< 0.00050	< 0.0010	< 0.00050	**42**	**5.6**	< 1.7	5.05	18.99	311	7.25
	10/7/2020	**0.0047**	**0.1**	**0.017**	< 0.00050	< 0.0010	< 0.00050	**44**	**5.8**	< 1.7	5.24	18.95	358	0.1
	4/5/2021	**0.0061**	**0.097**	**0.017**	< 0.00050	< 0.0010	< 0.00050	**38**	**5.9**	< 2.5	4.79	17.52	458	2.58
	10/5/2021	**0.0034**	**0.064**	**0.015**	< 0.00050	< 0.0010	< 0.00050	**36**	**4.4**	**2.6**	5.91	19.22	366	1.3
	4/4/2022	**0.005**	**0.093**	**0.016**	< 0.00050	< 0.0010	< 0.00050	**32**	**5.8**	<2.5	5.06	17.44	500	0.55
	10/5/2022	**0.0040**	**0.11**	**0.014**	< 0.00050	< 0.0010	< 0.00050	**34 J**	**5.4 J-**	**3.0 J**	5.15	18.84	460	1.5
MW-05A	7/7/2016	<0.0050	**0.047**	**0.011**	< 0.00010	< 0.0010	< 0.00050	**36**	**4.9**	< 1.0	5.36	21.69	324	0
	4/2/2020	< 0.0010	**0.037**	**0.011**	< 0.00050	< 0.0010	< 0.00050	**27**	**4**	< 1.0	5.14	16.88	187	1
	10/7/2020	< 0.0010	**0.045**	**0.0098**	< 0.00050	< 0.0010	< 0.00050	**28**	**4.1**	< 1.7	5.6	19.6	188	0.5
	4/5/2021	< 0.0010	**0.053**	**0.011**	< 0.00050	< 0.0010	< 0.00050	**28**	**5**	< 2.5	5.09	17.31	250	0.19
	10/5/2021	< 0.0010	**0.024**	**0.009**	< 0.00050	< 0.0010	< 0.00050	**26**	**4**	< 2.5	5.98	19.06	177	0
	10/5/2021 (dup)	< 0.0010	**0.024**	**0.0094**	< 0.00050	< 0.0010	< 0.00050	**26**	**4.1**	< 2.5	NA	NA	NA	NA
	4/4/2022	< 0.0010	**0.039**	**0.0095**	< 0.00050	< 0.0010	< 0.00050	**24**	**3.7**	<2.5	5.33	17.37	260	0.07
	4/4/2022 (dup)	< 0.0010	**0.038**	**0.01**	< 0.00050	< 0.0010	< 0.00050	**23**	**3.9**	<2.5	NA	NA	NA	NA
	10/5/2022	< 0.0010	**0.04**	**0.0086**	< 0.00050	< 0.0010	< 0.00050	**4.2 J**	**3.9 J-**	< 2.5	5.47	18.97	240	1.32

Table J1 Continued: Groundwater Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
CLEANUP LEVEL[2]		0.005	0.01	0.004	0.005	0.015	0.002	4.0	10.0	--	--	--	--	--
MW-05B	7/7/2016	<0.0050	**0.025**	**0.0048**	< 0.00010	< 0.0010	< 0.00050	**26**	**7.4**	< 1.0	5.92	19.6	450	0.26
	7/7/2016 (dup)	< 0.0050	**0.028**	**0.0047**	< 0.00010	< 0.0010	< 0.00050	**25**	**7.5**	< 1.0	NA	NA	NA	NA
	4/2/2020	< 0.0010	**0.026**	**0.0044**	< 0.00050	< 0.0010	< 0.00050	**16**	**6.3**	< 1.7	5.63	16.75	271	0
	10/7/2020	< 0.0010	**0.025**	**0.0042**	< 0.00050	< 0.0010	< 0.00050	**20**	**5.8**	< 1.7	5.92	19.63	348	0
	10/7/2020 (dup)	< 0.0010	**0.026**	**0.0045**	< 0.00050	< 0.0010	< 0.00050	**21**	**5.8**	< 17	NA	NA	NA	NA
	4/5/2021	< 0.0010	**0.023**	**0.0042**	< 0.00050	< 0.0010	< 0.00050	**16**	**8.4**	< 2.5	5.98	19.08	436	5.13
	10/12/2021	< 0.0010	**0.018**	**0.0043**	< 0.00050	< 0.0010	< 0.00050	**20**	**6.7**	< 2.5	6.48	18.39	284	0
	4/5/2022	< 0.0010	**0.025**	**0.0043**	< 0.00050	< 0.0010	< 0.00050	**11**	**4.9 J-**	<2.5	6.07	17.01	350	0.35
	10/11/2022	< 0.0010	**0.023**	**0.0040**	< 0.00050	< 0.0010	< 0.00050	**18 J-**	**5.8 J-**	< 2.5	5.95	19.1	350	0.47
MW-06	7/8/2016	<0.0050	< 0.0080	**0.0019**	**0.00031**	**0.0022**	< 0.00050	**0.46 j+**	**6.9**	< 1.0	4.61	18.19	196	0.55
	4/7/2020	< 0.0010	< 0.0080	**0.00094**	< 0.00050	< 0.0010	< 0.00050	**0.5**	**4.7**	**4.1**	4.42	14.85	125	0
	10/13/2020	< 0.0010	< 0.0080	**0.00067**	< 0.00050	< 0.0010	< 0.00050	**0.54**	**5**	< 1.0	5.27	19.71	182	0
	4/8/2021	< 0.0010	< 0.0080	**0.0006**	< 0.00050	< 0.0010	< 0.00050	**0.61**	**3.8**	**2.8**	5.31	14.98	212	0
	10/7/2021	< 0.0010	< 0.0080	**0.0014**	< 0.00050	< 0.0010	< 0.00050	**0.66**	**6.6 J-**	< 2.5	5.18	19.3	197	0
	4/8/2022	< 0.0010	< 0.0080	**0.00078**	< 0.00050	< 0.0010	< 0.00050	**0.86**	**5.7 J-**	**5.8**	5.35	15.21	230	2.53
	10/6/2022	< 0.0010	< 0.0080	**0.00086**	< 0.00050	< 0.0010	< 0.00050	**0.29 J-**	**6.1**	< 2.5	5.05	19.79	230	1.73
	10/6/2022 (dup)	< 0.0010	< 0.0080	**0.0010**	< 0.00050	< 0.0010	< 0.00050	**0.32 J-**	**6.5**	< 2.5	NA	NA	NA	NA
MW-07	7/11/2016	<0.0050	**0.021**	**0.081**	**0.021**	< 0.050	< 0.025	**160**	**110**	**1.2**	3.48	18.43	4420	0
	3/21/2019	<0.0050	< 0.0080	**0.00072**	**0.0007**	< 0.0010	< 0.00050	**38**	**17**	**6.6**	6.84	9.13	5430	0
	4/6/2020	< 0.0050	< 0.0080	**0.00082**	**0.00081**	< 0.0010	**0.00058**	**33**	**27**	**20**	6.65	15.32	5600	7.49
	10/6/2020	**0.0032**	**0.013**	**0.029**	**0.015**	**0.0014**	**0.0014**	**140**	**85 J-**	**24**	5.83	19.24	4380	2
	4/6/2021	< 0.0010	< 0.0080	**0.014**	**0.0035**	**0.0029**	**0.00054**	**56**	**27**	**25**	5.01	15.85	1440	23.3
	10/6/2021	**0.0033**	**0.015**	**0.088**	**0.016**	< 0.0010	**0.0015**	**150**	**86 J-**	**3.8**	4.34	20.02	4120	0.4
	4/6/2022	<0.0010	**0.0086**	**0.035**	**0.0084**	**0.0014**	**0.0014**	**78**	**32**	**4.5 J**	4.18	16.69	1970	7.57
	10/7/2022	**0.0023**	**0.021**	**0.078**	**0.0068**	< 0.01	< 0.0050	**120 J-**	**81**	< 2.5	4.26	19.18	3580	0.83
MW-08	7/11/2016	<0.0050	< 0.0080	**0.017**	**0.01**	**0.0011**	**0.0022**	**78**	**5.3**	**2.4**	4.11	18.71	3540	0
	3/20/2019	<0.0050	< 0.0080	**0.00043**	**0.02**	< 0.0010	< 0.00050	**24**	**2.8**	< 1.7	4.95	10.16	308	0.6
	4/13/2020	< 0.0010	< 0.0080	**0.00075**	**0.023**	< 0.0010	**0.00072**	**24**	**2.5**	< 1.7	4.18	14.96	649	1.01
	10/8/2020	< 0.0010	< 0.0080	**0.0091**	**0.0074**	**0.0014**	**0.0012**	**37**	**3.9**	**1.9**	4	18.6	3500	1.6
	4/6/2021	< 0.0010	< 0.0080	**0.001**	**0.014**	**0.002**	< 0.00050	**23**	**2.8**	< 2.5	4.94	16.17	383	9.02
	10/6/2021	< 0.0010	< 0.0080	**0.01**	**0.005**	< 0.0010	**0.0014**	**47**	**4.0 J-**	< 2.5	4.15	19.37	3400	0
	4/7/2022	< 0.0010	< 0.0080	**0.0049**	**0.0023**	< 0.0010	**0.0006**	**140 J**	**4.6**	<2.5 UJ	4.73	15.44	2640	1.86
	10/10/2022	< 0.0010	< 0.0080	**0.012**	< 0.0050	< 0.01	< 0.0050	**76 J-**	**5.0**	**1.5**	4.01	17.82	4160	2.21
MW-09	7/11/2016	<0.0050	< 0.0080	**0.0028**	**0.00013**	< 0.0010	< 0.00050	**6.2 j**	**0.50**	< 1.0	5.33	18.01	519	0
	4/6/2020	< 0.0010	< 0.0080	**0.002**	< 0.00050	< 0.0010	< 0.00050	**24**	**2.2**	< 1.7	3.73	14.08	549	0.19
	4/6/2020 (dup)	< 0.0010	< 0.0080	**0.0019**	< 0.00050	< 0.0010	< 0.00050	**25**	**2.1**	< 1.7	NA	NA	NA	NA
	10/13/2020	< 0.0010	**0.0099**	**0.002**	**0.00057**	< 0.0010	< 0.00050	**25**	**2.8**	< 1.7	3.47	20.14	714	0
	4/8/2021	< 0.0010	< 0.0080	**0.0027**	< 0.00050	< 0.0010	< 0.00050	**13**	< 0.020	< 2.5	3.32	16.9	789	0
	10/11/2021	< 0.0010	< 0.0080	**0.0027**	< 0.00050	< 0.0010	< 0.00050	**12**	**0.40 J**	< 2.5	4.99	19.34	365	0
	10/11/2021 (dup)	< 0.0010	< 0.0080	**0.0024**	< 0.00050	< 0.0010	< 0.00050	**13**	**0.15 J**	< 2.5	NA	NA	NA	NA
	4/6/2022	< 0.0010	< 0.0080	**0.0008**	< 0.00050	< 0.0010	< 0.00050	**19**	**4.3 J-**	<2.5 UJ	3.54	16.74	800	1.5
	10/5/2022	< 0.0010	< 0.0080	**0.0013**	< 0.00050	< 0.0010	< 0.00050	**3.9 J**	**0.40 J-**	< 2.5	5.44	18.61	270	2.69

Table J1 Continued: Groundwater Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
CLEANUP LEVEL[2]		0.005	0.01	0.004	0.005	0.015	0.002	4.0	10.0	--	--	--	--	--
MW-09A	7/11/2016	<0.0050	< 0.0080	**0.0035**	< 0.00010	< 0.0010	< 0.00050	**14**	< 0.20	**1.6**	6.64	18.36	908	1.48
	4/6/2020	< 0.0010	< 0.0080	**0.0025**	< 0.00050	< 0.0010	< 0.00050	**12**	< 0.020	< 1.7	6.48	16.64	480	8.3
	10/13/2020	< 0.0010	< 0.0080	**0.0025**	< 0.00050	< 0.0010	< 0.00050	**13**	**0.099**	< 1.7	6.42	17.51	662	0
	10/13/2020 (dup)	< 0.0010	< 0.0080	**0.0024**	< 0.00050	< 0.0010	< 0.00050	**12**	**0.093**	< 1.7	NA	NA	NA	NA
	4/8/2021	< 0.0010	< 0.0080	**0.0014**	**0.0005**	< 0.0010	< 0.00050	**25**	**1.2**	< 2.5	6.58	17.55	738	0
	4/8/2021 (dup)	< 0.0010	< 0.0080	**0.0029**	< 0.00050	< 0.0010	< 0.00050	**13**	< 0.020	< 2.5	NA	NA	NA	NA
	10/11/2021	< 0.0010	< 0.0080	**0.0025**	< 0.00050	< 0.0010	< 0.00050	**13**	< 0.020 UJ	< 2.5	7.2	17.77	511	9.4
	4/6/2022	< 0.0010	< 0.0080	**0.0023**	< 0.00050	< 0.0010	< 0.00050	**12**	<0.020 UJ	**7.3 J**	6.03	16.66	690	5.9
	4/6/2022 (dup)	< 0.0010	< 0.0080	**0.0027**	< 0.00050	< 0.0010	< 0.00050	**13**	<0.020 UJ	< 2.5 UJ	NA	NA	NA	NA
	10/5/2022	< 0.0010	< 0.0080	**0.0020**	< 0.00050	< 0.0010	< 0.00050	**12 J**	**R**	**3.1 J**	6.63	17.09	660	4.51
MW-10	7/6/2016	<0.0050	< 0.0080	**0.00046**	**0.00016**	< 0.0010	< 0.00050	**2.2**	**2.4**	< 1.0	5.22	19.38	270	0.53
	4/14/2020	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**1.2**	**2**	< 1.7	4.93	15.41	119	0
	10/14/2020	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**1**	**1.4**	< 1.7	4.53	18.81	193	0
	4/9/2021	< 0.0010	< 0.0080	**0.00044**	< 0.00050	< 0.0010	< 0.00050	**1.2**	**1.6**	< 2.5	5.07	16.84	196	0
	10/12/2021	< 0.0010	< 0.0080	**0.0004**	< 0.00050	< 0.0010	< 0.00050	**1.1**	**9.4**	< 2.5	5.15	17.3	163	0
	4/8/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**1.1**	**1.5**	<2.5	5.14	15.18	200	0.63
	10/6/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.97 J-**	**1.5**	< 1.0	5.17	17.37	220	1.57
MW-11	7/11/2016	<0.0050	**0.013**	**0.019**	**0.0071**	**0.054**	< 0.00050	**82**	**51**	**2.1**	3.87	18.72	3020	0.24
	3/20/2019	<0.0050	**0.015**	**0.0032**	**0.0032**	**0.017**	< 0.00050	**52**	**31**	< 1.7	4.47	16.95	1650	0
	4/14/2020	< 0.0010	**0.011**	**0.0031**	**0.0032**	**0.021**	< 0.00050	**49**	**28**	< 1.7	3.91	13.98	1720	0
	10/12/2020	< 0.0010	**0.031**	**0.016**	**0.002**	**0.043**	< 0.00050	**61**	**34 J+**	< 1.7	4.15	20.84	2340	0
	4/7/2021	< 0.0010	**0.0092**	**0.01**	**0.0027**	**0.018**	< 0.00050	**52**	**25**	< 2.5	4.45	17.2	1920	0
	10/7/2021	< 0.0010	**0.013**	**0.015**	**0.004**	**0.041**	< 0.00050	**73**	**34 J-**	< 2.5	3.9	20.46	2070	0
	4/5/2022	< 0.0010	**0.014**	**0.012**	**0.0032**	**0.019**	< 0.00050	**34**	**24 J-**	<2.5	4.23	13.9	1790	0.25
	10/4/2022	< 0.0010	**0.016**	**0.014**	**0.0042**	**0.029 J-**	< 0.00050 UJ	**48 J-**	**32**	< 2.5	4.17	20.95	2040	2.1
MW-11AR	7/12/2016	<0.0050	< 0.0080	< 0.00040	< 0.00010	**0.0019**	< 0.00050	**1.8**	< 0.20	**18**	NA	NA	NA	NA
	4/14/2020	< 0.0010	< 0.0080	< 0.00040 uj	< 0.00050	**0.0027**	< 0.00050	**1.9**	**0.072**	**20**	7.41	16.1	508	29.8
	10/13/2020	< 0.0010	< 0.0080	< 0.00040	< 0.00050	**0.0063**	< 0.00050	**1.9**	**0.13**	**90 J**	7.47	18.48	622	8.1
	4/7/2021	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**2.8**	< 0.020	**20**	7.84	17.57	978	4.3
	10/7/2021	< 0.0010	< 0.0080	< 0.00040	< 0.00050	**0.0038**	< 0.00050	**2**	**R**	**190**	8.51	17.55	686	0
	4/6/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**2**	<0.020 UJ	**21 J**	7.35	16.02	960	4.98
	10/4/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.64 J**	**R**	**35 J**	7.62	18.17	0.934	6.31
	10/5/2022 (dup)	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**2.3 J**	**R**	**120 J**	NA	NA	NA	NA
MW-12	7/11/2016	<0.0050	**0.0081**	**0.026**	**0.011**	< 0.050	**0.0052**	**140**	**46**	**3.4**	4.26	25.65	2830	9.79
	3/19/2019	<0.0050	**0.0087**	**0.002**	**0.0055**	< 0.0010	**0.0047**	**58**	**17**	< 1.7	4.07	14.34	1550	0
	4/13/2020	< 0.0010	< 0.0080	**0.0025**	**0.0083**	< 0.0010	**0.0037**	**91**	**25**	< 1.3	3.45	20.36	1990	0
	10/6/2020	< 0.0010	< 0.0080	**0.025**	**0.0099**	**0.0016**	**0.005**	**96**	**34**	< 1.7	3.94	18.69	2630	4.2
	4/5/2021	< 0.0010	< 0.0080	**0.021**	**0.0058**	< 0.0010	**0.0046**	**78**	**31**	< 2.5	3.38	17.76	2070	6.66
	10/12/2021	< 0.0010	< 0.0080	**0.026**	**0.009**	**0.0011**	**0.005**	**100**	**35**	< 2.5	3.63	18.91	2320	0
	4/4/2022	< 0.0010	< 0.0080	**0.029**	**0.012**	**0.0011**	**0.0044**	**97**	**44**	<2.5	3.7	17.77	2770	0.93
	10/4/2022	< 0.0010	**0.012**	**0.038**	**0.015**	< 0.0010 UJ	**0.0040 J-**	**110 J-**	**55**	< 2.5	3.77	21.66	3560	3.73

Table J1 Continued: Groundwater Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
CLEANUP LEVEL[2]		0.005	0.01	0.004	0.005	0.015	0.002	4.0	10.0	--	--	--	--	--
MW-12A	7/6/2016	<0.0050	< 0.0080	**0.024**	**0.0032**	< 0.0010	< 0.00050	**50**	**100**	< 1.0	5.42	21.99	3050	7.25
	3/19/2019	<0.0050	< 0.0080	**0.0041**	**0.0017**	< 0.0010	< 0.00050	**35**	**51**	< 1.7	5.52	15.16	1840	2.4
	4/13/2020	< 0.0010	< 0.0080	**0.0045**	**0.0019**	< 0.0010	< 0.00050	**32**	**55**	< 1.7	5.18	17.27	1020	0
	4/13/2020 (dup)	< 0.0010	< 0.0080	**0.0044**	**0.0018**	< 0.0010	< 0.00050	**32**	**48 J-**	< 1.7	NA	NA	NA	NA
	10/6/2020	< 0.0010	< 0.0080	**0.024**	**0.0019**	< 0.0010	< 0.00050	**35**	**69**	< 1.7	5.43	18.14	1560	0
	4/5/2021	< 0.0010	< 0.0080	**0.024**	**0.0016**	< 0.0010	< 0.00050	**32**	**62**	< 2.5	5.36	18.46	2070	0.2
	10/12/2021	< 0.0010	< 0.0080	**0.018**	**0.0015**	< 0.0010	< 0.00050	**29**	**43**	< 2.5	5.69	17.47	1440	0
	4/6/2022	< 0.0010	< 0.0080	**0.023**	**0.0013**	< 0.0010	< 0.00050	**42 J-**	**39 J-**	<2.5 UJ	5.15	17.89	1510	0.26
	10/4/2022	< 0.0010	< 0.0080	**0.017**	**0.0011**	< 0.0010 UJ	< 0.00050 UJ	**23 J-**	**31**	< 2.5	5.4	18.03	1260	0.99
MW-14	7/11/2016	<0.0050	< 0.0080	< 0.00040	**0.00028**	**0.0023**	< 0.00050	< 3.0	**4.5**	**24**	5.2	21.58	2610	95.1
	4/8/2020	< 0.0010	< 0.0080	< 0.00040	< 0.00050	**0.0079**	< 0.00050	< 0.10	**5**	**33**	6.07	18.48	1970	139
	10/13/2020	< 0.0010	< 0.0080	**0.0039**	< 0.00050	**0.019**	< 0.00050	**0.18**	**4.3**	**40**	4.87	22.83	2030	247
	4/9/2021	< 0.0010	< 0.0080	**0.0022**	< 0.00050	**0.01**	< 0.00050	< 0.10	**5.7**	**48**	4.34	21.36	2340	36.4
	10/5/2021	< 0.0010	< 0.0080	**0.0022**	< 0.00050	**0.0098**	< 0.00050	**0.15**	**2.7 J-**	**29**	4.96	19.81	2020	38.5
	4/7/2022	<0.0010	<0.0080	**0.0024**	<0.00050	**0.013**	<0.00050	**0.19**	**0.12**	**4.4 J**	4.27	18.77	2400	29.2
	10/5/2022	< 0.0010	< 0.0080	**0.0020**	< 0.00050	**0.011**	< 0.00050	**0.11 J**	**0.051 J-**	**7.8 J**	4.19	20.36	2330	14.9
MW-16	7/6/2016	<0.0050	< 0.0080	**0.00098**	< 0.00010	< 0.0010	< 0.00050	**16**	**0.079**	**73**	6.16	20.41	1470	4.47
	4/8/2020	< 0.0010	< 0.0080	**0.00067**	< 0.00050	< 0.0010	< 0.00050	**11**	**0.052**	**44**	6.14	14.86	452	2.26
	10/14/2020	< 0.0010	< 0.0080	**0.00074**	< 0.00050	< 0.0010	< 0.00050	**11**	**0.049**	**56**	6.38	21.6	608	0
	4/8/2021	< 0.0010	< 0.0080	**0.00069**	< 0.00050	< 0.0010	< 0.00050	**18**	< 0.020	< 2.5	6.12	15.44	674	1.87
	10/6/2021	< 0.0010	< 0.0080	**0.00089**	< 0.00050	< 0.0010	< 0.00050	**16**	**R**	**62**	6.25	21.87	692	9.8
	4/5/2022	< 0.0010	< 0.0080	**0.00049**	< 0.00050	< 0.0010	< 0.00050	**9.6**	**0.11 J-**	**46**	5.9	14.49	720	1.92
	10/10/2022	< 0.0010	< 0.0080	**0.0011**	< 0.00050	< 0.0010	< 0.00050	**9.9 J-**	**0.17**	**19**	6.18	20.75	1040	4.64
MW-17	7/8/2016	<0.0050	**0.72**	**0.0093**	**0.00049**	< 0.0010	< 0.00050	**33**	< 0.020	**2.0**	4.55	20.53	1040	0
	4/8/2020	< 0.0010	**0.5**	**0.0015**	< 0.00050	< 0.0010	< 0.00050	**17**	< 0.020	**1.7**	3.66	18.41	223	0
	10/13/2020	< 0.0010	**0.37**	**0.0064**	< 0.00050	< 0.0010	< 0.00050	**21**	**0.054**	**2.6**	4.92	29.63	221	0
	4/8/2021	< 0.0010	**0.22**	**0.0064**	< 0.00050	< 0.0010	< 0.00050	**9.6**	**0.073**	**67**	4.54	19.22	314	0.07
	10/7/2021	< 0.0010	**0.24**	**0.0062**	< 0.00050	< 0.0010	< 0.00050	**17**	**R**	< 2.5	4.6	19.78	220	0
	4/8/2022	< 0.0010	**0.19**	**0.0055**	< 0.00050	< 0.0010	< 0.00050	**17**	**0.03 J-**	**5.3**	4.43	14.98	330	0.86
	10/6/2022	< 0.0010	**0.12**	**0.0075**	< 0.00050	< 0.0010	< 0.00050	**30 J-**	**0.081**	**6.2**	4.75	19.76	400	0.90
MW-18	7/6/2016	<0.0050	**0.034**	**0.044**	**0.011**	< 0.025	< 0.013	**210**	**13**	**9.4**	3.54	22.16	5110	9.54
	3/21/2019	<0.0050	**0.051**	< 0.00040	< 0.00050	< 0.0010	**0.002**	**39**	**14**	**140**	7.52	13.6	13700	>500
	4/8/2020	< 0.0010	**0.016**	**0.0026**	**0.0034**	< 0.0010	**0.003**	**29**	**9.7**	**150**	6.51	19.71	6750	115
	10/7/2020	< 0.0010	**0.016**	**0.026**	**0.013**	**0.055**	**0.01**	**110**	**19**	**1300**	5.05	20.71	6260	>1000
	4/7/2021	< 0.0010	**0.0098**	**0.031**	**0.011**	< 0.01	**0.01**	**120**	**12**	**120**	4.4	19.78	7390	65.6
	10/12/2021	< 0.0010	**0.011**	**0.037**	**0.013**	**0.016**	**0.014**	**110**	**11**	**1000**	4.23	20.2	10300	1000
	4/7/2022	< 0.0010	**0.019**	**0.04**	**0.017**	**0.022**	**0.012**	**140 J**	**7.5**	**1100 J**	5.39	17.55	10330	>1000
	10/6/2022	< 0.0010 UJ	**0.019**	**0.044**	< 0.04	< 0.08	< 0.04	**96 J-**	**7.5**	**540**	5.93	20.6	11650	1161

Table J1 Continued: Groundwater Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
CLEANUP LEVEL[2]		0.005	0.01	0.004	0.005	0.015	0.002	4.0	10.0	--	--	--	--	--
MW-19	7/11/2016	<0.0050	< 0.0080	**0.035**	< 0.00010	**0.011**	**0.0021**	**130**	**22**	**9**	4.31	20.01	4470	10.3
	3/21/2019	<0.0050	< 0.0080	**0.0028**	**0.0047**	**0.0033**	**0.0014**	**160**	**8.5**	**2.5**	3.92	11.32	3510	0
	4/13/2020	< 0.0010	< 0.0080	**0.0027 j-**	**0.0044**	**0.0032**	**0.0017**	**69**	**7.9**	**5**	3.5	16.48	3000	1.7
	10/8/2020	< 0.0010	< 0.0080	**0.027**	**0.0055**	**0.0055**	**0.0021**	**87**	**11**	**6.1**	3.68	17.75	3290	9.4
	4/6/2021	< 0.0010	< 0.0080	**0.028**	**0.0048**	**0.0048**	**0.002**	**83**	**7.6**	< 2.5	3.81	17.72	3670	1.16
	4/6/2021 (dup)	< 0.0010	< 0.0080	**0.028**	**0.0048**	**0.0048**	**0.0019**	**82**	**7.9**	< 2.5	NA	NA	NA	NA
	10/6/2021	< 0.0010	< 0.0080	**0.03**	**0.005**	**0.0049**	**0.002**	**110**	**10 J-**	**3.4**	3.79	19.73	3620	0.9
	4/7/2022	< 0.0010	< 0.0080	**0.024**	**0.0053**	**0.0041**	**0.0019**	**87 J**	**7.4**	<2.5 UJ	3.51	17.78	3090	2.66
	10/10/2022	< 0.0010	< 0.0080	**0.023**	< 0.01	< 0.02	< 0.01	**80 J-**	**12**	**3.3**	3.79	17.57	3400	7.5
MW-20	7/11/2016	<0.0050	< 0.0080	**0.031**	**0.018**	< 0.0010	**0.0072**	**120**	**40**	**3.2**	3.18	16.69	3790	2.2
	3/20/2019	<0.0050	< 0.0080	< 0.0020	< 0.0025	**0.0051**	< 0.0025	**13**	**0.035**	**3.3**	6.43	8.74	2510	0
	4/6/2020	< 0.0050	< 0.0080	< 0.00040	**0.00078**	**0.008**	**0.00086**	**29**	**0.25**	**7.1**	6.63	16.45	3390	3.9
	10/6/2020	< 0.0010	< 0.0080	**0.0015**	**0.00093**	< 0.0010	**0.0019**	**54**	**7.2 J-**	**2.2**	5.84	19.68	2550	1.8
	4/6/2021	< 0.0010	< 0.0080	< 0.00040	**0.00068**	**0.0026**	< 0.00050	**21**	**0.19**	**5**	6.17	15.76	1170	14.7
	10/6/2021	< 0.0010	< 0.0080	**0.0022**	**0.0053**	< 0.0010	**0.0033**	**81**	**5.6 J-**	**48**	5.91	19.92	2880	0
	4/7/2022	< 0.0010	< 0.0080	**0.0015**	**0.0016**	< 0.0010	**0.0001**	**53 J**	**7.3**	<2.5 UJ	4.93	16.72	1390	1.27
	10/10/2022	< 0.0010	< 0.0080	**0.0056**	**0.0025**	< 0.0010	**0.0031**	**34 J-**	**7.1**	**32**	4.98	18.41	2890	3.93
MW-21	7/11/2016	<0.0050	< 0.0080	**0.032**	**0.013**	**0.0043**	**0.0018**	**110**	**86**	**2.9**	3.74	19.23	3600	1.2
	3/21/2019	<0.0050	**0.011**	**0.0034**	**0.0087**	**0.03**	**0.00065**	**210**	**55**	< 1.7	3.7	12.38	2990	0
	4/14/2020	< 0.0010	< 0.0080	**0.0027**	**0.0021**	**0.024**	**0.00072**	**36**	**52**	**12**	3.53	17.25	2370	0
	10/13/2020	< 0.0010	**0.013**	**0.015**	**0.0033**	**0.0056**	**0.0009**	**83**	**53**	< 1.7	3.83	19.65	2690	0
	4/9/2021	< 0.0010	< 0.0080	**0.015**	**0.0066**	**0.022**	**0.00067**	**73**	**43**	< 2.5	3.69	19.04	2410	8.4
	10/6/2021	< 0.0010	< 0.0080	**0.023**	**0.0092**	< 0.0010	**0.0013**	**140**	**50 J-**	< 2.5	3.66	20.27	3040	0
	4/6/2022	<0.0010	<0.0080	**0.014**	**0.0053**	**0.0089**	**0.00055**	**62**	**16**	**3.3 J**	3.58	16.64	2010	4.33
	10/7/2022	< 0.0010	**0.011**	**0.022**	**0.0047**	< 0.0050	< 0.0025	**85 J-**	**47**	**2.8**	3.81	19.08	2880	0.15

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted.
[2] Cleanup level defined by the Record of Decision (EPA, August 2014).
VOC - Volatile Organic Compound.
SVOC - Semivolatile Organic Compound.
TSS - Total Suspended Solids.
ORP - Oxidation-Reduction Potential.
s.u. - standard units.
°C - degrees Celsius.
µmhos/cm @ 25°C - micromhos per centimeter at 25 degrees Celsius.
mg/L - milligrams per liter
ntu - nephelometric turbidity units.
NA - Not analyzed.
< - Concentration less than the Quantitation Limit.
J+ - Concentration considered an estimate biased high based on data validation.
J - Concentration considered an estimate based on data validation.
J- - Concentration considered an estimate biased low based on data validation.
R - Rejected; Unusable data.
UJ - Not detected based on data validation; quantitation limit may be inaccurate or imprecise.
Bolding indicates constituent detection.
Shading indicates concentration exceeds Remediation Goal.

APPENDIX K - ANALYTICAL RESULTS FOR SURFACE WATER

Table K1: Surface Water Analytical Results - IMC Fertilizer, Spartanburg, South Carolina

SAMPLE LOCATION	DATE	PARAMETER[1]												
		VOC	SVOC	METALS				WET CHEMISTRY			FIELD PARAMETERS			
		BENZENE	2,4-DINITROTOLUENE	BERYLLIUM	CADMIUM	LEAD	THALLIUM	FLUORIDE	NITRATE as N	TSS	pH (s.u.)	TEMPERATURE (°C)	SPECIFIC CONDUCTANCE (µmhos/cm @ 25°C)	TURBIDITY (ntu)
SW-02	7/5/2016	< 0.0050	< 0.0080	< 0.00040	< 0.00010	< 0.0010	< 0.00050	< 0.10	**0.76**	**4.6**	7.30	30.83	126	4.69
	3/20/2019	< 0.0050	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	< 0.10	**1.1**	**1.7**	7.1	10.97	77	2.8
	4/9/2020	< 0.001	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	< 0.10	**0.77 J-**	**2.7**	5.52	19.87	59	0
	10/8/2020	< 0.001	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	< 0.10	**0.87 J+**	**2.4**	5.81	19.04	90	0
	10/11/2021	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	< 0.10	**0.73 J**	**4.7**	6.04	19.99	67	0
	10/6/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.14 J-**	**0.78 J-**	**3.5**	6.44	17.01	110	4.75
SW-12	7/11/2016	< 0.0050	< 0.0080	< 0.00040	< 0.00010	< 0.0010	< 0.00050	**0.44**	**0.86**	**2.8**	6.85	30.23	207	3.35
	3/20/2019	< 0.0050	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.29 J**	**1.2**	**2.3**	6.89	10.39	81	3.5
	4/9/2020	<0.001	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.22**	**0.84**	**3.3**	5.45	18.97	67	0
	10/8/2020	<0.001	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.28**	**0.92 J+**	**3.3**	6.21	19.92	97	0
	10/11/2021	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.16**	**0.74 J**	**5.4**	5.27	19.95	70	0
	10/6/2022	< 0.0010	< 0.0080	< 0.00040	< 0.00050	< 0.0010	< 0.00050	**0.34 J-**	**0.76 J-**	**3.0**	6.06	17.44	110	5.42

[1] Analytical results are reported in milligrams per liter (mg/L) unless otherwise noted. VOC - Volatile Organic Compound.
SVOC - Semi-Volatile Organic Compound.
TSS - Total Suspended Solids.
s.u. - standard units.
°C - degrees Celsius.
µmhos/cm @ 25°C - micromhos per centimeter at 25 degrees Celsius. ntu - nephelometric turbidity units.
< - Concentration less than the Quantitation Limit.
J+ - Concentration considered an estimated biased high based on data validation. J- - Concentration considered an estimated biased low based on data validation.
J - Concentration considered an estimate based on data validation. Bolding indicates constituent detection.

APPENDIX L TIME VERSUS CONCENTRATION GRAPHS (PH, SPECIFIC CONDUCTIVITY, BERYLLIUM, CADMIUM, AND FLUORIDE)

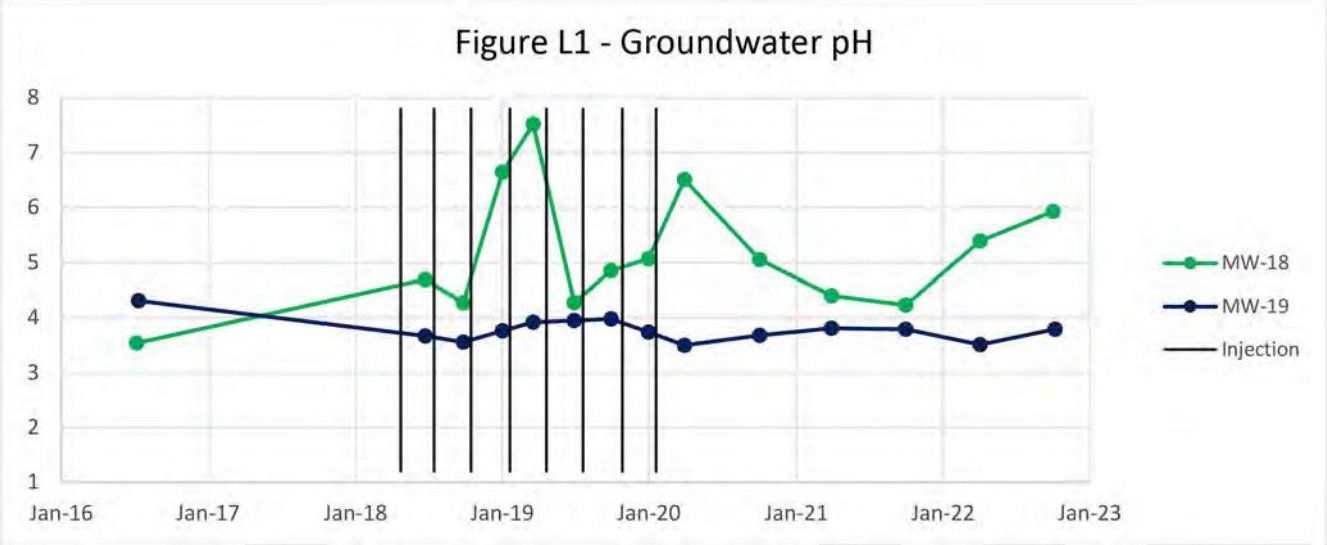


Figure L1: Groundwater pH

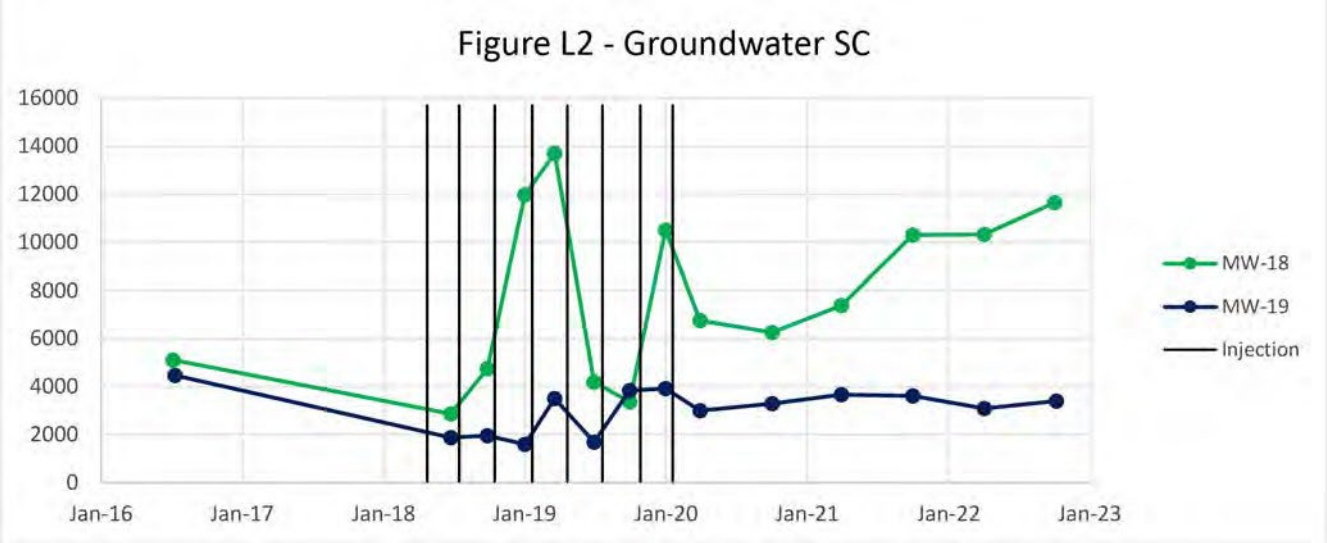


Figure L2: Groundwater SC

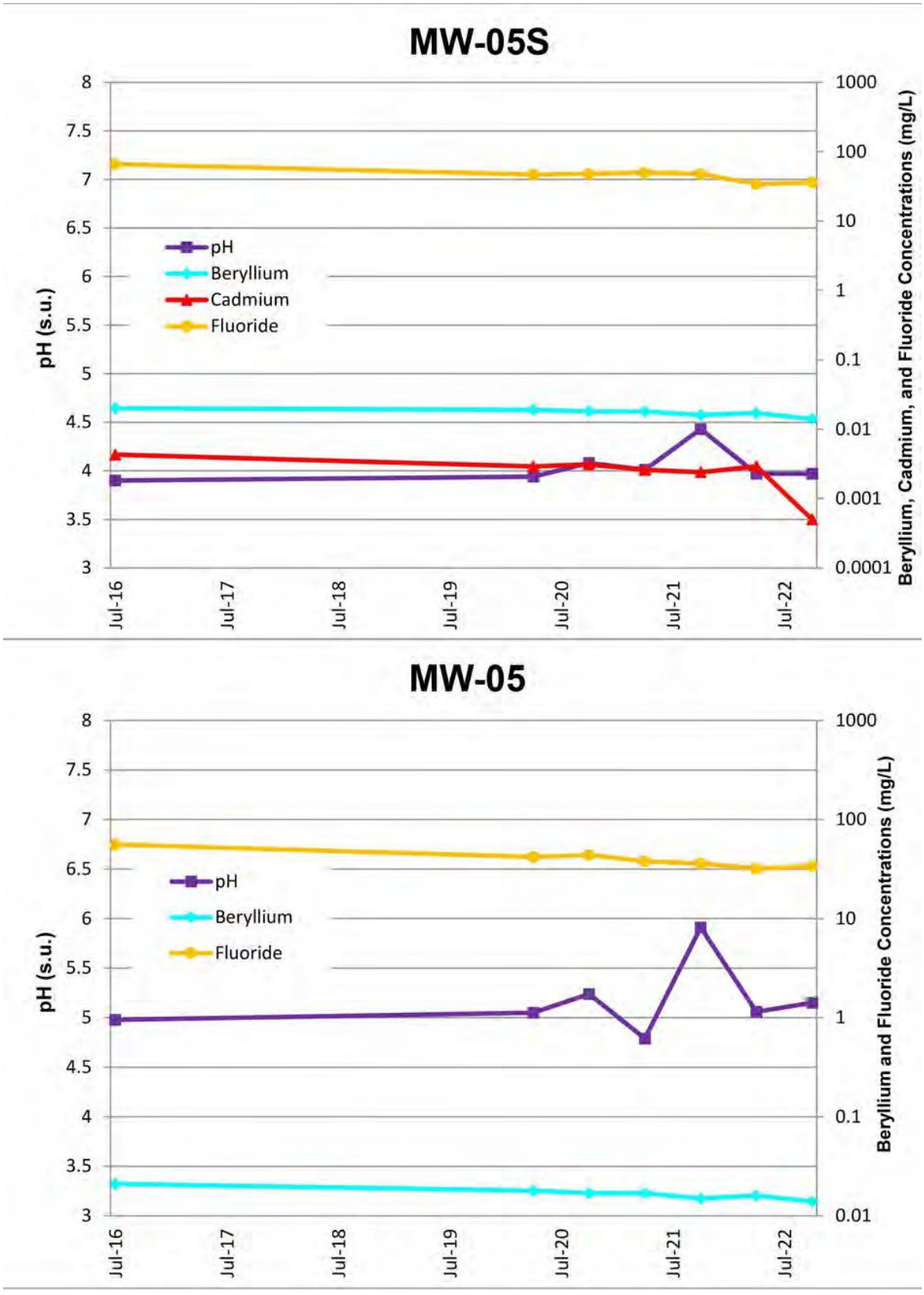


Figure L3: MW-05S and MW-05

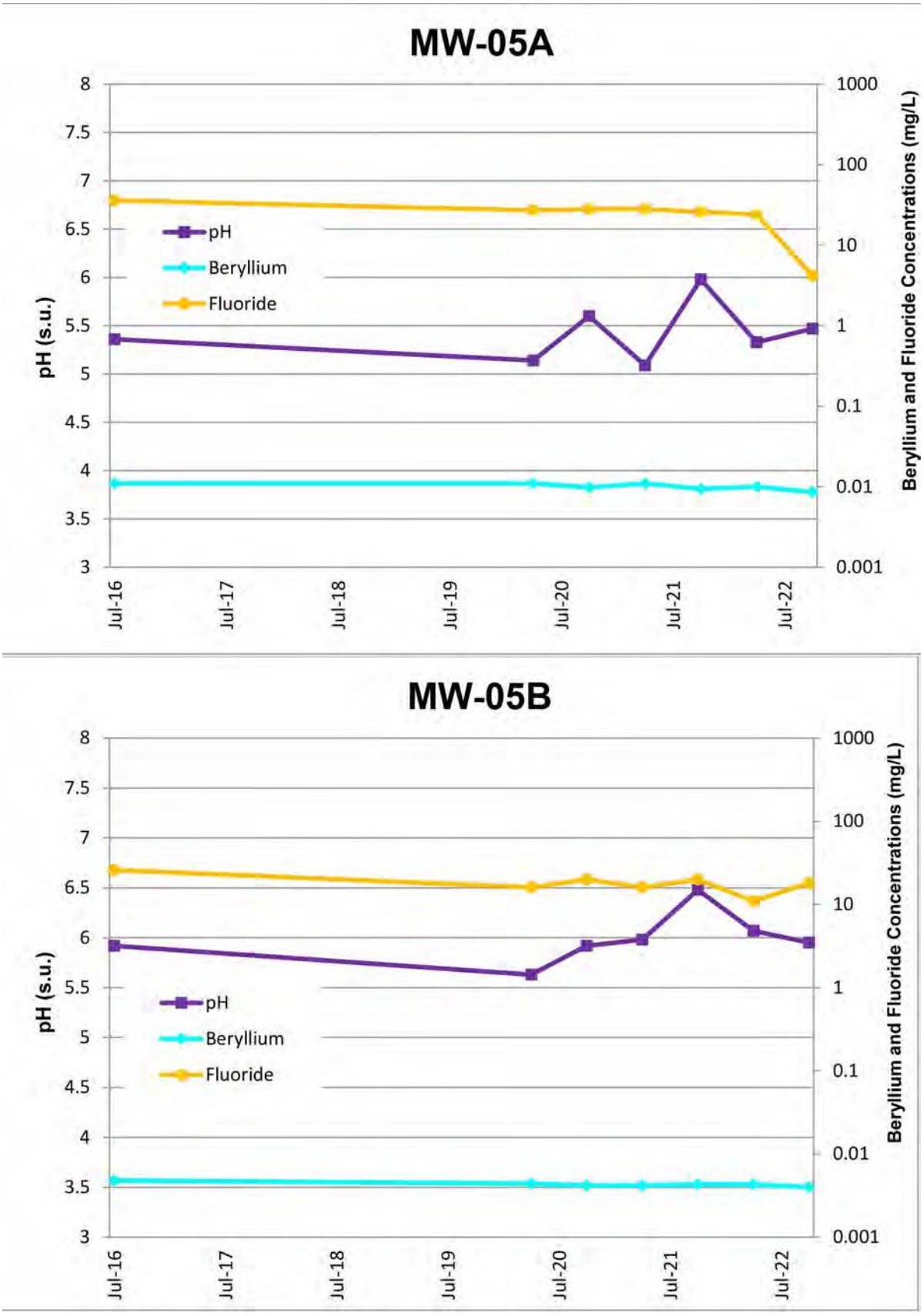


Figure L4: MW-05A and MW-05B

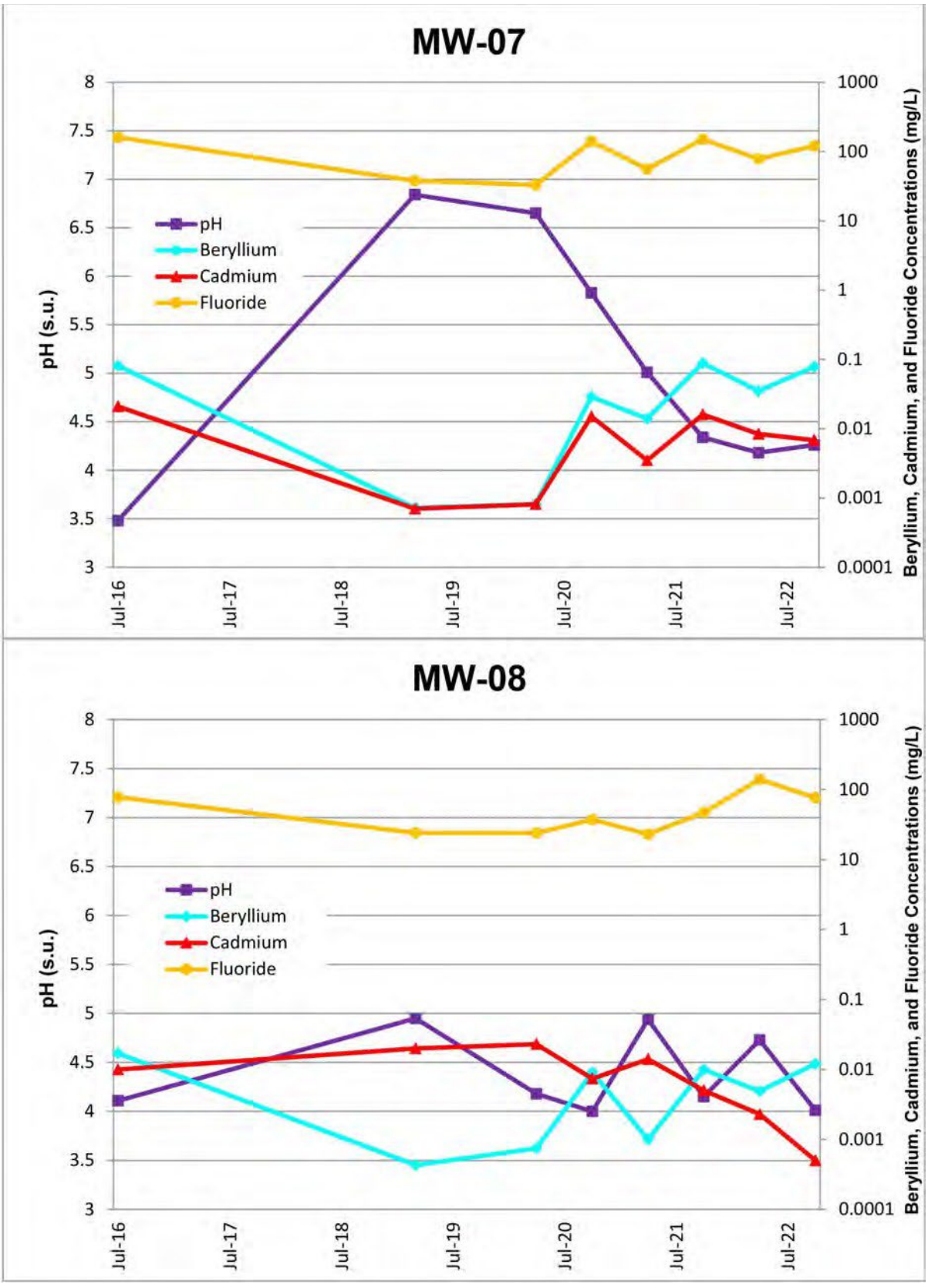


Figure L5: MW-07 and MW-08

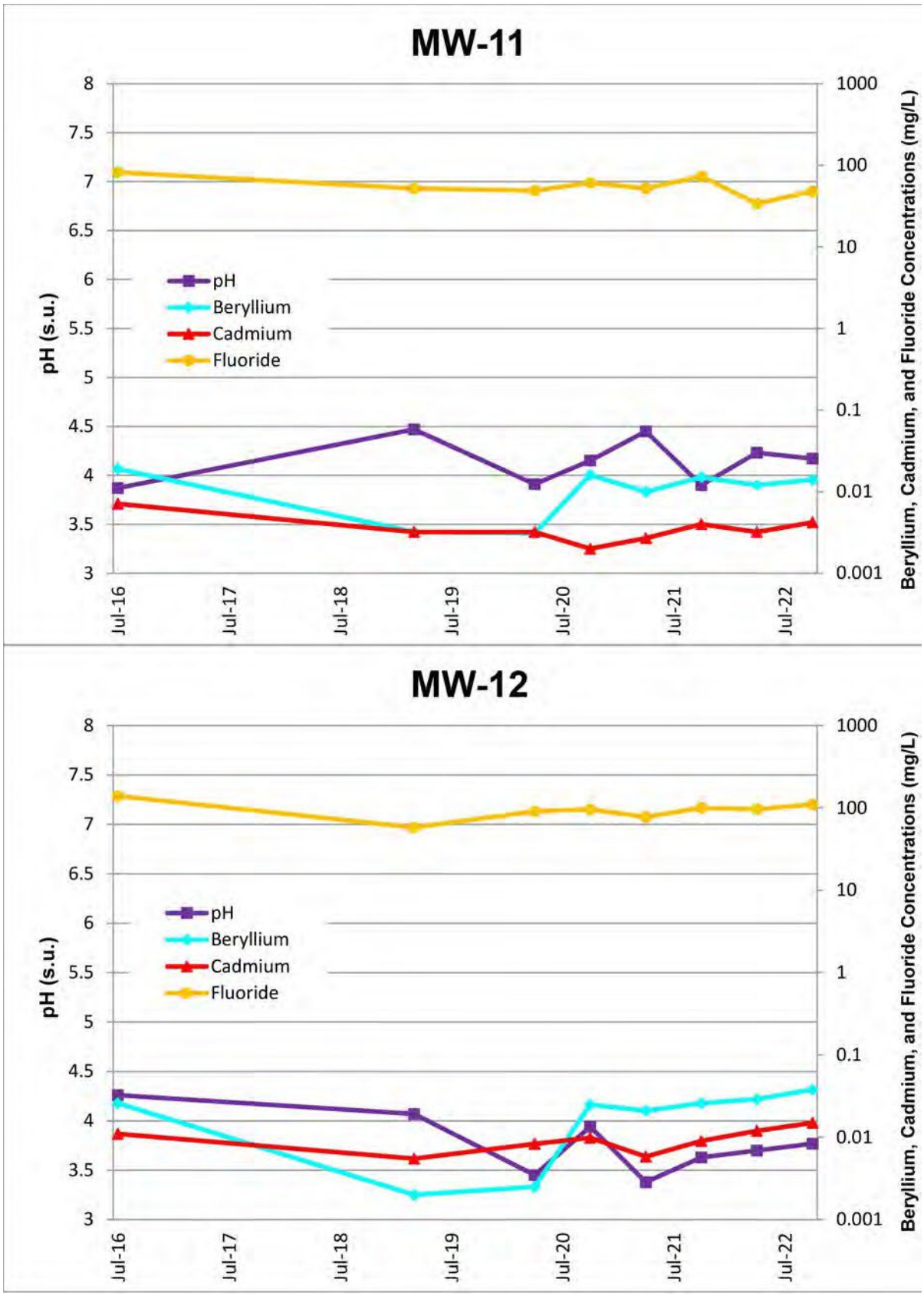


Figure L6: MW-11 and MW-12

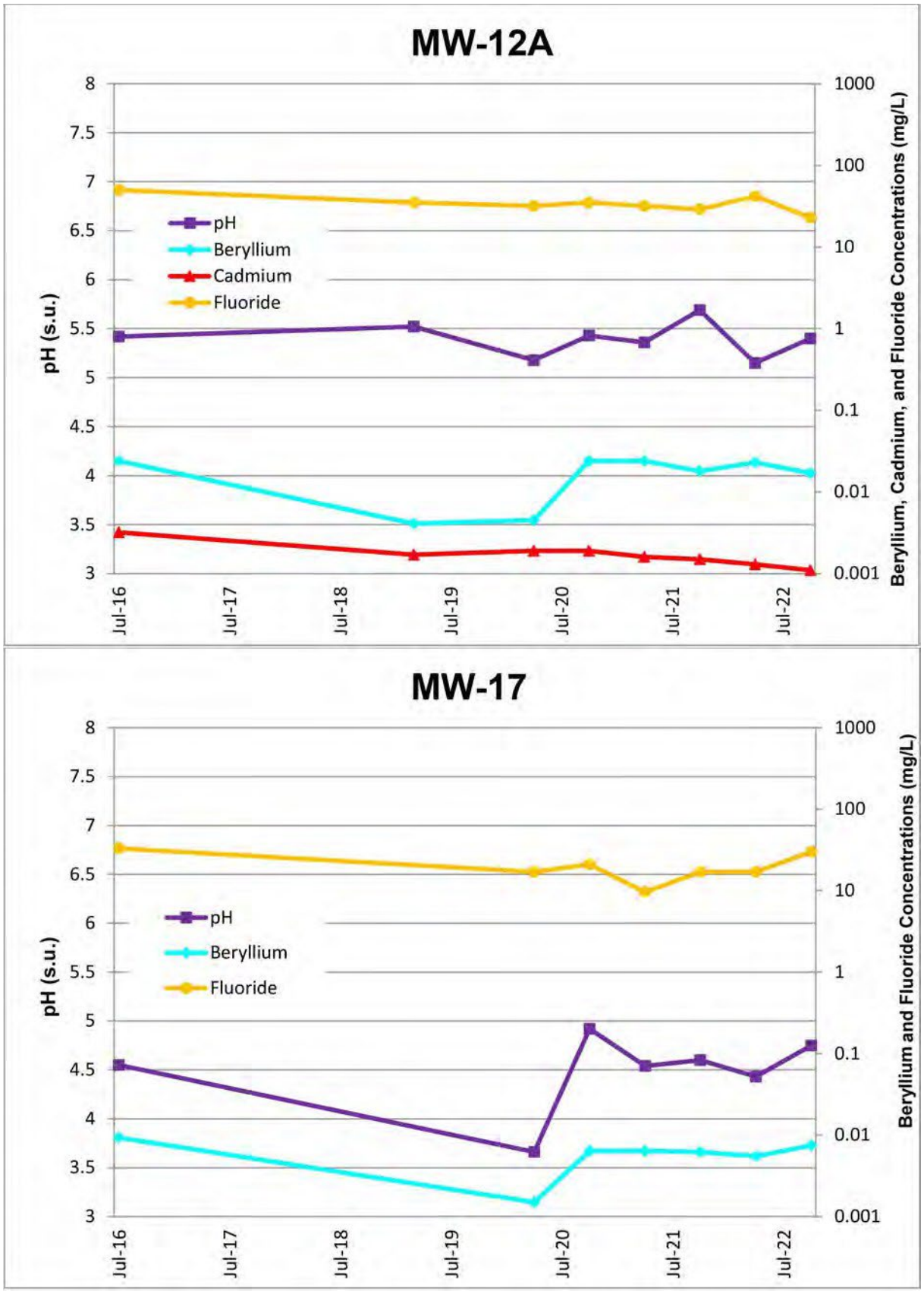


Figure L7: MW-12A and MW-17

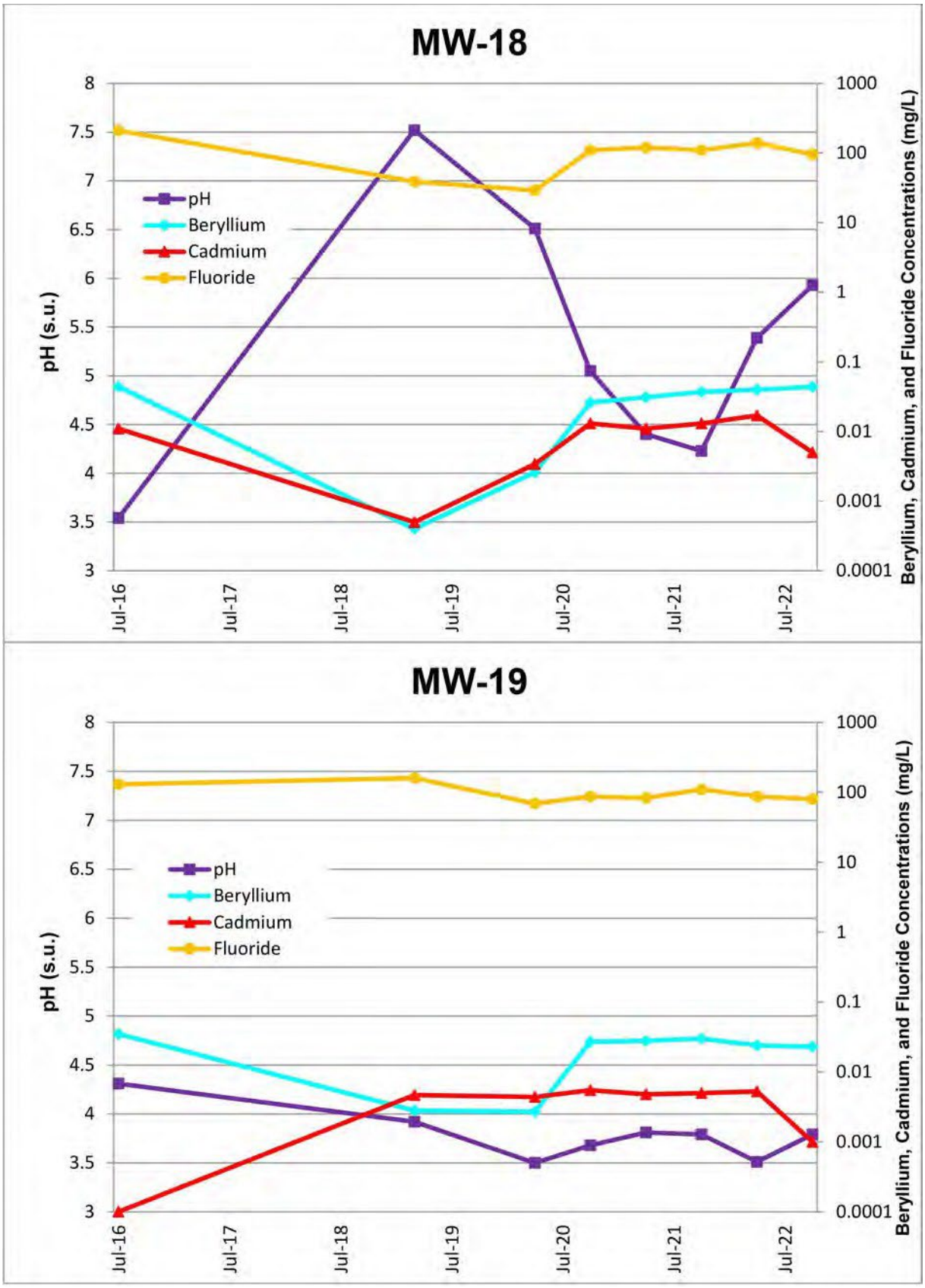


Figure L8: MW-18 and MW-19

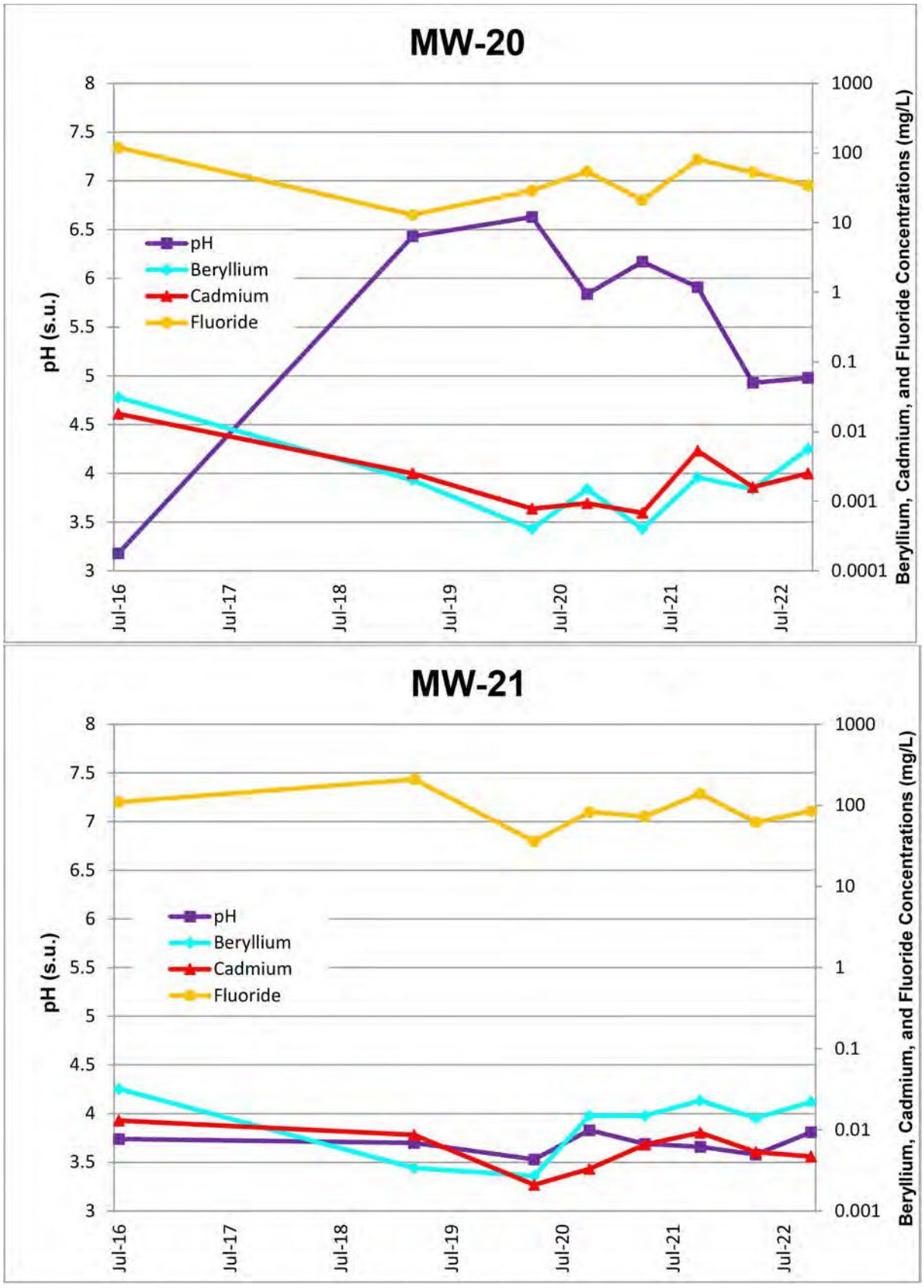


Figure L9: MW-20 and MW-21

APPENDIX M – ESTIMATE OF NEUTRALIZATION CAPACITY VERSUS DEMAND

Estimates of Neutralization Capacity and Demand

This attachment presents estimations of buffer demand in the soil and aquifer at the infiltration areas compared to the amount of buffer added to date. Two important assumptions are incorporated into these neutralization calculations:

- First, based on the bench tests conducted on soil and groundwater samples collected at the site, the soil contains five times more acidity than the water. The soil acidity was measured on soil from the source area, and thus may overestimate the amount present in the saturated zone downgradient of the source area. However, the pH of the soil from the source area is similar to that of the groundwater, and thus the soil may reasonably be expected to contain a similar level of acidity. Acidic water will convert the soil constituents in contact with the water to an acidic form, and the extent of the conversion will depend on the pH of the water.
- The second assumption is that the calcium carbonate buffer will treat the whole depth of the aquifer. The assumption is being used in the infiltration zones (*i.e.*, calcium carbonate buffer added to the top of the aquifer will infiltrate throughout the aquifer). This assumption is a simplification that may not be valid.

Area 1

Area 1 is a 100- by 150-foot area where the buffer solution was infiltrated through between 16 and 22 feet of acidic soil in the source area based on the range of water level elevations at MW-18 during the infiltration events. Thus, the calcium carbonate buffer injected in Area 1 needs to neutralize a volume of 240,000 to 330,000 ft^3 or 6.8 to 9.3 x 10^6 L.

Bench tests of source area soil established a calcium carbonate requirement of 0.1 percent by weight for neutralization. If we assume a bulk soil density of 1.3 kg/L, this means that there are 8.83 to 12.15 x 10^6 kg of soil in Area 1. The dosage for neutralization for the soil is then 8,830 to 12,150 kg calcium carbonate. At 50 kg $CaCO_3$/kequiv, this equates to 1.8 to 2.4 x 10^5 equivalents of base.

A total of 184,000 gallons of treatment solution were added in Area 1. Calculating the amount of calcium carbonate buffer added goes as follows:

184,000 gal x 3.8 kg/gal = 699,200 kg buffer solution

infiltrated 699,200 kg x 0.10 kg $CaCO_3$/kg solution = 69,920 kg

$CaCO_3$ applied

69,920 kg $CaCO_3$ / 50 kg/kequiv = 1.4 x 10^3 kequiv of base added (14 x 10^5 equivalents)

The amount of neutralization demand met by the buffer infiltration is 69,920 kg $CaCO_3$ / 8,830 to 12,150 kg $CaCO_3$ = 560 to 790 percent. Excess buffering capacity applied at Area 1 was anticipated to infiltrate into the aquifer and continue neutralization beneath and downgradient of Area 1.

Area 2

The Area 2 injection area is 180 ft in length, with an aquifer depth of 25 ft and a distance between the injection wells and MW-12 of 220 ft. Thus, the calcium carbonate buffer injected in Area 2 needs to neutralize a volume of 990,000 ft^3 or 28,000 m^3 (or 28 x 10^6 L).

If we assume a porosity of 25%, and a bulk soil density of 1.3 kg/L, this means that there are 7 x 10^6 L of pore water and 36 x 10^6 kg of soil in the area between the injection wells and MW12. The total acidity requiring treatment for the soil and water is as follows:

Water: 7 x 10^6 L x 20 mequiv/L = 1.4 x 10^5 equivalents

of base Soil: 36 x 10^6 kg x 20 mequiv/kg = 7.2x 10^5

equivalents of base Total: 8.6 x 10^5 equivalents of base

needed

A total of 74,400 gallons of treatment solution were added in Area 2. Calculating the amount of calcium carbonate buffer added goes as follows:

74,400 gal x 3.8 kg/gal = 283,000 kg injected

283,000 kg x 0.10 kg $CaCO_3$/kg solution = 28,300 kg $CaCO_3$

28,300 kg $CaCO_3$/ 50 kequiv/kg = 565 kequiv base (or 5.65 x 10^5 equivalents of base added)

The amount of base added at Area 2 under these assumptions is about 2/3 of the total acidity present in the area between the injection wells and MW-12. The aquifer between MW-12 and the Area 3 infiltration trench would present additional buffer demand. Using the same procedure to estimate buffer demand between MW- 12 and Area 3, the volume of aquifer to be treated is approximately 180 feet x 165 feet x 25 feet, or 742,500 ft^3 or 21,025 m^3 (or 21 x 10^6 L).

Making the same assumptions for the downgradient portion of Area 2 as for the portion of Area 2 upgradient of MW-12, the total acidity requiring treatment for the soil and water in Area 3 is as follows:

Water: 5.25 x 10^6 L x 20 mequiv/L = 1.1 x 10^5 equivalents of base

Soil: 27 x 10^6 kg x 20 mequiv/kg = 5.5 x 10^5

equivalents of base Total: 6.6 x 10^5 equivalents of base

needed

Area 3

The Area 3 infiltration area is 200 ft in length, with an aquifer depth of 17 ft and a distance between the infiltration trench and Fairforest Creek 265 ft. The amount of buffer added at Area 3 needs to

neutralize a volume of 901,000 ft^3 or 25,513 m^3 (or 25.5 x 10^6 L).

Making the same assumptions for Area 3 as for Area 2, the total acidity requiring treatment for the soil and water in Area 3 is as follows:

Water: 6.38 x 10^6 L x 20 mequiv/L = 1.3 x 10^5 equivalents of base

Soil: 33 x 10^6 kg x 20 mequiv/kg = 6.6 x 10^5

equivalents of base Total: 7.9 x 10^5 equivalents of base needed

A total of 79,200 gallons of treatment solution were added in Area 3. Calculating the amount of calcium carbonate buffer added goes as follows:

79,200 gal x 3.8 kg/gal = 300,960 kg injected

300,960 kg x 0.10 kg $CaCO_3$/kg solution = 30,100 kg $CaCO_3$

30,100 kg $CaCO_3$/ 50 kequiv/kg = 602 kequiv base (or 6.02 x 10^5 equivalents of base added)

The amount of base added at Area 3 under these assumptions is about 3/4 of the total acidity estimated to be present in the area between the infiltration trench and Fairforest Creek.

Buffer Demand - Buffer Applied Balance

The following table summarizes the buffering capacity applied and the buffering capacity needed for the site.

INFILTRATION AREA	BUFFERING CAPACITY NEEDED	BUFFERING CAPACITY APPLIED	DIFFERENCE
Area 1	1.8 to 2.4 x 10^5 equivalents	14 x 10^5 equivalents	11.6 to 12.2 x 10^5 equivalents
Area 2A[1]	8.6 x 10^5 equivalents	5.7 x 10^5 equivalents	(2.95 x 10^5 equivalents)
Area 2B[1]	6.6 x 10^5 equivalents	0	(6.6 x 10^5 equivalents)
Area 3	7.9 x 10^5 equivalents	6.0 x 10^5 equivalents	(1.9 x 10^5 equivalents)
TOTAL	24.9 to 25.7 x 10^5 equivalents	25.7 x 10^5 equivalents	0.2 to 0.8 x 10^5 equivalents

[1] Area 2A extends from Area 2 to MW-12; Area 2B extends from MW-12 to Area 3
[2] Based on range of water table elevations at Area 1
Differences in (parentheses) are negative values

Based on the overall site balance of buffer needed compared to buffer applied, a sufficient amount of buffer has been applied at the groundwater treatment area, but the buffer has not distributed throughout the treatment area.

APPENDIX N – SITE PHOTOGRAPHS

Site Photograph N1 - Gate at entrance to the IMC Superfund Site, Spartanburg, South Carolina

Site Photograph N2 – Foundations for Former Process Buildings

Site Photograph N3 - Foundations for Former Process Buildings from East Looking West

Site Photograph N4 - Infiltration Area 2 Injection Wells

Site Photograph N5 - Rock Check Dam (East of Infiltration Area 2)

Site Photograph N6 - MW-5, MW-5A, MW-5S

Site Photograph N7 - Infiltration Area 3 (Looking from South to North)