April 3, 2019

Interim Remedial Measure Work Plan

●

Groundwater Capture and Treatment

Saint-Gobain Performance Plastics Site
14 McCaffrey Street
Village of Hoosick Falls
Rensselaer County, New York
NYSDEC Site # 442046

SAINT-GOBAIN PERFORMANCE PLASTICS, CORP.
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I, Daniel P. Reilly, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

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EXECUTIVE SUMMARY

The objective of the proposed Interim Remedial Measure (IRM) is to capture and treat groundwater containing per- and polyfluoroalkyl substances (PFAS) at the McCaffrey Street Site (Site) that has the potential to migrate southeast from the Site. The IRM will pump groundwater from two existing extraction wells, treat the water with granular activated carbon (GAC), and discharge the treated water to the Hoosic River in accordance with approval from New York State Department of Environmental Conservation (NYSDEC). Capture and treatment of groundwater in the southeastern portion of the Site was selected to:

- Capture groundwater containing PFAS within the eastern and southern portions of the Site without significantly increasing the mobility of PFAS from higher concentration areas in shallower soils below the Site buildings;
- Not impact the ability of the Village of Hoosick Falls to provide water from the municipal well field; and
- Not compromise the structural integrity of the Site buildings.

Water pumped from the capture wells will be treated with GAC, a proven and accepted groundwater treatment process for removing PFAS from groundwater. Following treatment, the water will be discharged to the Hoosic River. The discharge will be monitored, and the monitoring results will be reported to NYSDEC in accordance with the requirements of a Discharge Permit Equivalent.

This Interim Remedial Measure Work Plan (IRM WP) describes the groundwater capture and treatment system, and the process for installing and implementing the system. An Interim Site Management Plan (ISMP) will be prepared to describe the installation, monitoring and operation of the IRM. It is anticipated that this groundwater capture and treatment system will be in operation within approximately three months following receipt of work plan approval from NYSDEC.

INTERIM REMEDIAL MEASURE WORK PLAN
14 MCCAFFREY STREET
VILLAGE OF HOOSICK FALLS, NEW YORK

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ABBREVIATIONS

ACT	accelerated column testing
bgs	below ground surface
CAMP	Community Air Monitoring Plan
CCR	Construction Completion Report
COC	Certificate of Completion
DUSRs	Data Usability Summary Reports
EBCT	empty-bed contact time
FEMA	Federal Emergency Management Agency
FER	Final Engineering Report
FS	Feasibility Study
GAC	granular activated carbon
gpm	gallons per minute
HASP	Health and Safety Plan
IEC	Institutional Control/Engineering Control
ISMP	Interim Site Management Plan
IRM	Interim Remedial Measure
NAVD88	North American Vertical Datum of 1988
NOI	Notice of Intent
NOT	Notice of Termination
NYCRR	New York Codes, Rules, and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation & Maintenance
PFAS	per and polyfluoroalkyl substances
PFDA	perfluorodecanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctane sulfonate
PLS	professional land surveyor
PTFE	polytetrafluoroethylene
RI	remedial investigation
SCG	standards, criteria, and guidance
SCO	soil cleanup objective
SOW	Scope of Work
SWPPP	Stormwater Pollution Prevention Plan
TOC	Total Organic Carbon 1.0

1.0 INTRODUCTION & PURPOSE

1.1 Introduction

This Interim Remedial Measure Work Plan (IRM WP) has been prepared in accordance with New York State Department of Environmental Conservation (NYSDEC) Order on Consent and Settlement Agreement (Index No. CO 4-20160212-18), dated June 3, 2016, and DER-10 – Technical Guidance for Site Investigation and Remediation (DER-10) in connection with the property at 14 McCaffrey Street, located in the Village of Hoosick Falls (Village), Rensselaer County, New York (the Site). A Site location map is presented as Figure 1 and a Site layout map is presented as Figure 2. Comments to the August 31, 2018 Draft IRM WP were received from NYSDEC on January 2, 2019. Comments to the February 15, 2019 revised IRM Work Plan were received from NYSDEC on March 27, 2019 and have been addressed in this document.

1.2 Purpose and Objective

The purpose of this IRM WP is to provide a plan for a non-emergency IRM. The objective of the IRM is to capture groundwater containing per and polyfluoroalkyl substances (PFAS) within the eastern and southern portions of the Site near areas with the highest concentrations on Site without significantly increasing the mobility of PFAS from shallower soils in those areas, without impacting the production capacity of the Village well field, and without compromising the structural integrity of the Site buildings.

The IRM will capture, extract, and treat shallow groundwater at the eastern and southern portions of the Site. The IRM will use two existing, onsite groundwater wells (PW04 and PW19; the capture zone of these wells is shown on Figure 3) and an above-ground water treatment structure (i.e., Conex storage container) housing a granular activated carbon (GAC) treatment system as shown on Figure 4. The IRM is a presumptive/proven remedial technology consistent with NYSDEC DER-15: Presumptive/Proven Remedial Technologies, which is applicable to New York State's Remedial Programs including the State Superfund Program. Groundwater in the unconsolidated deposits at the eastern and southern portions of the Site will be considered one treatment unit for the purposes of this IRM.

As required per DER-10 Section 6.1(b), an Interim Site Management Plan (ISMP) will be prepared for agency review, comment, and approval following construction of the IRM. The ISMP will be submitted in conjunction with the IRM Construction Completion Report (CCR). Per DER-10, the ISMP will include an Institutional Control/Engineering Control (IEC) Plan, a Monitoring Plan, and an Operation & Maintenance (O&M) Plan. As further described in Section 6 of this IRM WP, the intent of the Monitoring Plan will be to assess the performance and evaluate trends and effectiveness of the IRM. The O&M Plan will describe the steps necessary to operate and maintain the groundwater capture and treatment system.

2.0 REMEDIAL ACTION DESCRIPTION

2.1 Site Background and Physical Setting

The Site is located in the southwestern portion of the Village of Hoosick Falls as shown in Figure 1. It is approximately 6.5 acres with an approximate 60,000 square foot manufacturing building with associated entranceways, accessways, parking lots and loading areas. The Site building was reportedly first developed in 1961 for Dodge Fibers Corporation to produce extruded tapes and later circuit board laminates. The Site was acquired by Oak Materials Group (Oak Electronetics) in 1967 and then by AlliedSignal Fluorglas in 1987. The Site was then acquired by Furon in 1996 and Saint-Gobain in 1999.

Land use surrounding the Site includes residential areas to the north and east, undeveloped land to the south, and vacant Village property to the west, beyond which is the Hoosic River, which generally flows south to north past the Site. The closest water supply well in the Village well field is located approximately 900 feet southeast of the Site (Figure 2).

2.1.1 Geology and Hydrogeology

This section summarizes Site geology and hydrogeology as it relates to the proposed groundwater capture IRM. A conceptual geologic cross-section through the Site from the northwest to the southeast (see Figure 4 for cross-section location) is shown on Figure 5. Detailed descriptions of geology and hydrogeology will be included in subsequent reports that describe the ongoing remedial investigation work.

The Site is located on and adjacent to a terrace (erosional remnant) of glacial material elevated above the adjacent Hoosic River floodplain to the west, south, east, and north. This glacial material contains a dense silt-matrix till, which sits directly on bedrock on the western side of the terrace and extends to the east and south sides of the terrace where it was deposited on a basal outwash of silt, sand, and gravel. Due to erosion caused by an earlier course of the Hoosic River, this dense till layer has been partially eroded and replaced with alluvial material in the southern and eastern portions of the Site.

The top of bedrock is observed at depths of approximately 10 to 34 feet below ground surface (bgs) at the Site and increases to depths as great as 143 feet bgs within approximately 1,300 feet southeast of the Site and east of the Village well field.

Geophysical survey (seismic refraction) was used to evaluate the depth to bedrock between the Site building and adjacent properties, and is provided as Appendix A.

As shown in the conceptual cross-section in Figure 5, depth to shallow groundwater at the Site ranges from within a few feet of the ground surface at the facility buildings, where a perched groundwater zone exists, to approximately seven to ten feet below ground surface in the southeastern portion of the Site, where no perched groundwater zone exists. Available information indicates that groundwater flow in the shallower unconsolidated deposits is directed downward from the perched zones into the deeper unconsolidated deposits and radially from the Site. Regional topography suggests the Hoosic River is a regional discharge zone for groundwater from the unconsolidated deposits and bedrock.

2.2 Nature and Extent of PFAS

A remedial investigation of the Site has been ongoing since September 2016. Remedial investigation work has been conducted under the following approved work plans:

- Final Remedial Investigation/Feasibility Study Work Plan (RI/FS Work Plan), dated August 30, 2016, and
- Supplemental Scope of Work (Supplemental SOW), dated May 12, 2017.

Additional remedial investigation activities are currently ongoing in accordance with the Supplemental Scope of Work submitted on August 29, 2018, and approved by NYSDEC on December 7, 2018.

Analysis of the data collected to date during the Site remedial investigation is ongoing. The PFOA groundwater data presented in this IRM WP is intended to provide context for developing the proposed groundwater IRM.

The PFAS compounds perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS) are the primary compounds of interest at the Site. Remedial investigation data collected from September 2016 through December 2017 were provided to NYSDEC in the Data Summary Submittal, dated May 7, 2018.

Sampling conducted to date indicates that certain PFAS, with PFOA representing the highest concentrations, are present in groundwater in the unconsolidated deposits at and near the Site. Figures 6 and 7 present the relative magnitude of PFOA concentrations measured in monitoring wells screened in the shallow (perched) and deep unconsolidated deposits, respectively, during the January through early-April 2018 sampling event.

Generally, PFOA concentrations are higher in the onsite monitoring wells than the offsite monitoring wells, and higher in the shallow unconsolidated deposits than in the deep unconsolidated deposits (Figures 6 and 7). PFOA concentrations in bedrock monitoring wells on Site are significantly lower than in the unconsolidated deposits (Figure 8).

2.3 IRM Approach and Conceptual Design

The non-emergency IRM described in this document will capture, extract, and treat groundwater in the shallow and deep unconsolidated deposits (and to some extent the upper portions of bedrock) at and nearby the eastern and southern portions of the Site. It is anticipated that the IRM can be effectively operated to control offsite migration of groundwater toward the Village well field without reducing the capacity of the Village water supply wells located south-southeast of the Site (see Section 2.3.2).

Two existing groundwater wells (PW04 and PW19), which are installed in the unconsolidated materials to the top of bedrock and constructed specifically for groundwater extraction, will be used as capture wells. Well locations and estimated capture zone in the deep unconsolidated deposits are shown on Figure 3 (see Section 2.3.1.1 for details on the capture zone estimate). The IRM layout and location of a conceptual geologic cross-section of the Site from the northwest, through the facility buildings to the southeast is shown on Figure 4. The conceptual geologic cross-section and details on the groundwater capture wells are shown on Figure 5. A more detailed Site plan of the IRM groundwater treatment system is shown in Figure 9.

The main elements of the IRM are as follows:

- Installing a power source to operate the IRM.
- Minimal clearing and grubbing along the proposed treated water discharge pipe alignment.
- Installing groundwater pumps within existing wells PW04 and PW19 and discharge piping from the wells to water treatment equipment.
- Installing a water treatment structure, water treatment equipment, and associated controls.

- Installing treated water discharge piping to the Hoosic River.

The elements of the IRM are further detailed in Sections 2.3.2 and 2.3.3.

2.3.1 Pre-design Studies

The pre-design studies completed to inform IRM design included direct-push soil boring (Geoprobe) work in and near the facility building, accelerated column testing, a water treatment demonstration test, and multiple-well pumping tests consisting of a step-drawdown test and constant-rate pumping tests.

The Geoprobe investigation was performed within and adjacent to the building in 2017. The unconsolidated deposits under the building were found to typically have low transmissivity. Extraction of groundwater from these soils was determined to be impractical. See Section 2.3.1.1 for additional information on the anticipated effects of the IRM.

The accelerated column test and water treatment demonstration test were completed using groundwater drawn directly from the target aquifer at the project site to evaluate granular activated carbon (GAC) for PFAS removal and to support regulatory approvals related to water treatment (i.e., the development of the Discharge Permit Equivalent for the subject IRM). The multiple-well pumping tests were completed to determine the maximum pumping rate that is likely to be sustainable from two pumping wells (PW04 and PW19) and the potential capture zone.

Accelerated column testing, water treatment demonstration testing, and the multiple-well pumping tests were described in the August 28, 2017 IRM Concept Plan letter, approved by NYSDEC. The IRM Concept Plan letter is presented in Appendix G. The results of these tests are summarized below.

2.3.1.1 Groundwater Capture IRM Pre-Design Studies

Multiple-well pumping tests, including step-drawdown and constant-rate pumping tests, have been performed to assess the variability in aquifer properties in the unconsolidated deposits, evaluate the hydraulic connection between the unconsolidated deposits and the bedrock, and to provide information to assist in groundwater IRM design.

The two pumping wells (PW04 and PW19) were installed in the unconsolidated deposits and step-drawdown tests were completed in early November 2017 to determine the maximum pumping rate that is likely to be sustainable from the two pumping wells over a constant-rate pumping period. Water levels in surrounding wells, including bedrock monitoring well MW19, responded to pumping of wells PW04 and PW19. A step-drawdown test was also performed on monitoring well MW19.

The plan for the constant rate tests was to first pump well PW19 at a rate of 9 gpm, and then pump well PW04 at a rate of 6 gpm. Test pumping of well MW19 was considered as a contingency and discussed in the IRM Concept Plan letter; however, this testing was not necessary as water levels in well MW19 responded to pumping of well PW19 during the step-drawdown testing. Pumped groundwater was stored in tanks onsite until it could be treated through GAC vessels and discharged to a Village sanitary sewer manhole as described in Section 2.3.1.2. Also, as noted in Section 2.3.1.2, groundwater pumped from the target aquifer was successfully treated for PFAS to levels below the laboratory detection limit using a mobile GAC treatment system.

The constant rate tests were performed in April 2018. Well PW19 was pumped at 9 gpm for three days. Well PW04 was pumped at 6 gpm during the third day of the well PW19 test to maximize the stress on the aquifer system to the extent possible within a 15 gpm discharge constraint.

Early evaluation of drawdown at well PW04 indicated that the specific capacity of the well in April 2018 was much higher than in November 2017. Water levels had risen approximately 3 feet from November 2017 to April 2018 in the vicinity of wells PW04 and PW19. As a result, testing at well PW04 after the constant-rate phase included a step-drawdown test to determine the maximum sustainable rate with higher groundwater elevations. After pumping of well PW19 stopped, well PW04 was pumped at 12 gpm for the final two days of testing. A technical memorandum describing the pumping tests is included as Appendix B.

The estimated capture zone in the deep unconsolidated deposits shown on Figure 3 was defined as follows:

- Drawdowns in wells completed in the deep unconsolidated deposits were calculated at the time when the greatest stress had been placed on the aquifer system (after well PW19 had been pumped for three days and well PW04 had been pumped for one day).

- These drawdowns were then projected and subtracted from groundwater elevations measured in the deep unconsolidated deposits under non-pumping conditions to create an estimate of groundwater elevations under pumping conditions.
- The capture zone was estimated by inferring flow directions backward from the pumping wells and forward from the upgradient direction based on the estimated groundwater elevations under pumping conditions, and drawing a line around those flow paths that end at the wells.

The actual IRM capture zone estimated when the IRM is operating may differ from the estimate depicted in Figure 3 and is anticipated to vary according to hydrologic conditions. Plans to assess capture by the IRM will be included in the Monitoring Plan in the ISMP described in Section 6.1.

During operation of the IRM, water levels will be monitored to determine what influence, if any, the pumping has on groundwater elevations, groundwater flow, and solute transport rates from the shallower, perched zone beneath the buildings, where the highest concentrations of PFAS in groundwater have been detected (Figure 6). Drawdown in the deep unconsolidated deposits has the potential to increase the rate of downward vertical leakage from the perched zone, however, this potential effect is mitigated by the low vertical hydraulic conductivity of the base of the perched zone (which creates the perched zone). In addition, if the hydraulic head in the deeper unconsolidated deposits is drawn below the base of the perched unit, the rate of vertical leakage will not be affected by additional reduction in the deeper hydraulic heads. The perched condition is believed to be caused by water infiltrating downward from the ground surface, therefore, the drawing of hydraulic head in the deeper unconsolidated deposits below the base of the perched unit is not expected to reduce the resistance to vertical flow. Water level monitoring in wells completed in the perched unit will evaluate if the rate of downward leakage increases due to pumping of the capture wells. Monitoring of PFAS concentrations between the buildings and the groundwater capture wells will indicate whether notable increases in concentrations occur due to pumping of the wells. Note that any such developments would occur within the capture zone of the groundwater capture wells. Contingencies such as additional groundwater capture wells closer to the highest concentration locations may be evaluated if hydraulic conditions appear conducive. Such measures would not be favored if there is a potential to compromise the structural integrity of the Site buildings by causing soil compression.

2.3.1.2 Water Treatment Pre-Design Studies

Accelerated column testing (ACT), performed by Calgon from late October 2017 through November 2017, simulated the performance of a full-scale GAC water treatment system to remove PFAS from extracted groundwater from the Site. The ACT utilized virgin F400 activated carbon, which is made from select grades of bituminous coal through a process known as reagglomeration. An ACT is a test to estimate the carbon usage rate based on the adsorptive capacity of chemicals and kinetics of adsorption for a given application by scaling-down the conventional column testing hardware. Calgon developed a model of the column adsorption process to calculate the breakthrough curves for full-scale adsorption systems. The ACT simulated approximately 365 days of run time of a 50-gpm treatment system.

Results from the ACT include recommended empty-bed contact time (EBCT) for larger-scale GAC vessels; carbon use rate at the time of breakthrough of PFOA, other PFAS, and total organic carbon (TOC); and estimated mass transfer zone. Results of the ACT were used to size the GAC vessels and design other elements of the water treatment system.

A water treatment demonstration test using a mobile GAC treatment system to treat groundwater drawn directly from the target aquifer at the project site was completed in late November 2017 to verify the water treatment approach planned for the multiple-well pumping tests and for the full-scale IRM. The treatment system utilized virgin F400 activated carbon, consistent with the ACT test. The execution and results of the water treatment demonstration test were described in the Water Treatment Demonstration Test Results letter, dated December 6, 2017 (Appendix C). In summary, GAC treatment achieved PFAS removal to concentrations below the laboratory detection limit for all PFAS compounds except perfluorodecanoic acid (PFDA) and PFOA. All effluent results for PFDA and PFOA were below the limit of quantitation.

Water treatment for PFAS removal was further demonstrated during the multiple-well pumping tests described in Section 2.3.1.1. The same mobile GAC treatment system used during the water treatment demonstration test was used to treat water generated during the multiple-well pumping tests performed in April 2018, as well as additional investigation derived waste (IDW) liquids. All water treated by the mobile GAC treatment system was discharged to the Village sanitary sewer with approval from the Village wastewater treatment plant received via email to C.T. Male on April 19, 2018.

The results of water treatment during the multiple-well pumping tests are described in the memorandum in Appendix D. In summary, GAC treatment using the mobile water treatment system treated PFAS to below the laboratory detection limit for the analyzed compounds.

2.3.2 Groundwater Capture Wells

Two existing wells (PW04 and PW19), which are installed in the unconsolidated materials to the top of bedrock and used in the pumping tests described in Section 2.3.1.1, will be used as the IRM capture wells. Well locations and estimated capture zone in the deep unconsolidated deposits are shown on Figure 3 (see Section 2.3.1.1 for details on the capture zone estimate). The wells are six inches in diameter and are constructed with a steel casing and stainless steel screens. A submersible pump will be installed in the well to extract groundwater and pump it to the above-ground water treatment system. A typical groundwater interceptor well detail is shown on Figure 5. Information regarding the construction of these wells is presented in Appendix B.

2.3.2.1 Influence of the IRM on Village Water Supply Wells

The location of the IRM capture wells was selected, in part, to minimize the potential for interference with the Village water supply. The IRM is not expected to interfere with Village Well 7 (or other Village wells, such as Well 3, if used) based on the information presented in Appendix E and summarized as follows.

- The IRM is expected to draw groundwater down to an elevation no less than 408 feet North American Vertical Datum of 1988 (NAVD88). The screen of Village Well 3 extends from 388 to 376 ft. NAVD88. The screen of Village Well 7 extends from 365 to 350 ft. NAVD88. Given these relative elevations, the IRM cannot dewater Village Wells 3 or 7.
- The transmissivity of the deep unconsolidated aquifer in the vicinity of the IRM is much lower than near Village Wells 3 and 7 and elsewhere in the Village Well Field, limiting the productivity of the aquifer near the IRM.
- The April 2018 pumping test included simultaneous pumping of the proposed IRM capture wells PW04 and PW19 at a combined rate of 15 gpm. During this test, no drawdown was measured at well PZ05, which is located approximately 300

feet from well PW19, 840 feet from Village Well 3, and 640 feet from Village Well 7 (see Figure 2 of Appendix E). The IRM is not expected to produce water at rates that are substantially higher than was pumped during this testing.

- Groundwater elevations in well TW07, which is located within 10 feet of Village Well 7, were monitored for extended periods in the fall of 2017 and spring of 2018. During that time, while Village Well 7 was pumping, the groundwater elevation in well TW07 was no less than 40 feet above the top of the screen, and when Village Well 7 was not pumping, as much as 57 feet above the top of the screen. With this amount of additional drawdown available near Village Well 7, the operation of the proposed IRM is not expected to reduce the ability of Village Well 7 to provide water for the Village.

The groundwater capture wells are expected to first reduce the PFAS concentrations immediately downgradient of the IRM capture zone. Over time, PFAS concentrations are expected to decrease further downgradient from the edge of the capture zone into the Village well field. Concentration trends nearby and downgradient of the IRM, including in the Village well field and below the Site buildings, will be monitored and evaluated following initiation of IRM operation.

2.3.3 Groundwater Treatment System

The proposed IRM treatment system for groundwater pumped from capture wells PW04 and PW19 consists of cartridge filtration pretreatment for solids removal followed by GAC treatment in a lead-lag configuration for PFAS removal. Each vessel will contain approximately 25 cubic feet of GAC (50 cubic feet or approximately 1,400 pounds GAC total), and an inline oxygen injection device to increase the concentration of dissolved oxygen. The GAC utilized will be virgin F400 (or equivalent) activated carbon, which was shown to successfully remove PFAS during the ACT and demonstration tests using onsite groundwater. Additionally, a second, identical water treatment train (two-vessels-in-series configuration, each with 25 cubic feet of GAC) will be installed for redundancy and water treatment capacity during GAC change-out or maintenance. The spent GAC will be returned to and managed by the supplier in accordance with applicable regulatory requirements. Process equipment, with the exception of the two capture wells, will be assembled within a water treatment structure (i.e., Conex storage container). The second water treatment train will be kept in standby mode to provide an added factor of safety and contingency if for some reason the operating system is not able to meet the regulatory limit set in the Discharge Permit Equivalent. If an unexpected condition develops in which neither system is able to meet the regulatory limits for all parameters, the system will be shut down, NYSDEC will be notified, and an evaluation will be completed to determine the root cause.

A design flowrate of 25 gpm has been estimated based on the flow rates maintained during the constant-rate pumping tests that were part of the multiple-well pumping tests described in Section 2.3.1.1. The GAC vessels are sized to maintain an acceptable hydraulic loading rate with potential seasonal fluctuations in recovery rates, while still maintaining an EBCT consistent with the demonstration test. The GAC vessels are also of an appropriate size with a safety factor to treat the influent PFAS concentrations expected during full-scale operation, based on the concentrations observed during the multiple-well pumping test and ACT test (Appendices C and D). The influent concentration will be monitored as changes may affect the lead GAC vessel changeout rate.

Groundwater treatment system effluent will be discharged to the Hoosic River in accordance with approval from NYSDEC as described in Sections 2.4 and 2.5. The approximate discharge location (Outfall 001) and treated water discharge piping is shown on Figure 4. The treatment system will be monitoring in accordance with the Discharge Permit Equivalent described in Section 2.5. Monitoring will include monthly sampling with analysis for PFOA and PFOS at the system mid-point (lead vessel outlet). Changeout of the GAC in the lead vessel will be based on confirmed detection of PFOA or PFOS at the mid-point in accordance with the requirements of the Discharge Permit Equivalent, and will be fully described in the O&M Plan of the ISMP described in Section 6 of this IRM WP. Changeout of the lead vessel based on the first confirmed detection at the mid-point provides a factor of safety as the lag vessel remains in place to ensure PFOA and PFOS removal.

Upon startup of the treatment system, the GAC vessels will utilize virgin F400 GAC. The O&M Plan in the ISMP will describe potential future steps to assess the viability of recycling and reusing the spent GAC through thermal reactivation to restore its adsorptive capacity.

A detailed Site plan of the groundwater treatment system is shown in Figure 9, and a detailed process flow schematic and preliminary floor plan for the groundwater treatment system are in Figures 10 and 11, respectively.

2.4 Applicable NYS Standards, Criteria, and Guidance (SCGs)

Water treatment system effluent will be discharged to the Hoosic River in accordance with approval from NYSDEC. The discharge will be monitored and the results reported to NYSDEC in accordance with the permit. The applicable NYS SCGs will be met through water treatment system effluent water quality monitoring and reporting to NYSDEC.

2.5 Applicable Permits and Approvals

The following permits and approvals have or are anticipated to be required to construct and operate the IRM.

<u>New York State Permits and Approvals</u>

- Approval to discharge treated groundwater from NYSDEC. A final Discharge Permit Equivalent was issued by the NYSDEC Division of Water – Bureau of Permits on March 13, 2019 (see Appendix F).
    - 442046 – 2019-03-13 – SPDES Permit Equivalent – Effluent Limitations and Monitoring Requirements
    - 442046 – 2018-12-07 – SPDES Permit Equivalent – Statement of Basis for Surface Water Discharges

  The Discharge Permit Equivalent requires monthly monitoring, including laboratory analysis for PFOA and PFOS. If PFOA or PFOS is detected in the mid-point (i.e. lead vessel effluent) sample, the system will be retested and if the detection is confirmed the lead vessel GAC will be changed out.

- Access approval from the Village of Hoosick Falls for work being conducted on its property in relation to the IRM discharge and outfall.

A NYSDEC Water Withdrawal Permit or equivalent will not be required as it is not anticipated that the IRM will exceed the groundwater withdrawal threshold volume of 100,000 gallons per day.

3.0 TEMPORARY CONSTRUCTION FACILITIES

3.1 Site Security, Staging and Parking

3.1.1 Site Security

IRM construction activities will take place both on Site (property owned by Saint-Gobain) and off site (property owned by the Village). Site security expected to be implemented during construction of the IRM will include a designated entrance for personnel involved in the construction of the IRM.

Site security during operation of the IRM is expected to include locking caps for the two capture wells, a lockable exterior power disconnect panel, lockable doors on the water treatment structure (Conex storage container), and continued restricted and posted Site entrance.

3.1.2 Staging

Machinery, equipment, and materials for the construction and operation of the IRM will be staged within designated areas within the Site boundaries. The staging area locations will be determined prior to beginning construction of the IRM and may be adjusted throughout the operation of the IRM.

3.1.3 Parking

It is expected that the existing parking area in the southeastern portion of the Site will be used by personnel involved in the construction and operation of the IRM.

3.2 Site Clearing and Grubbing

Clearing and grubbing of trees and vegetation will be necessary in the southern portions of the Site during construction of the IRM. Cleared trees and vegetation will be chipped and disposed on Site; offsite trees and vegetation will be disposed off site. Grubbed tree and vegetation root systems will be vigorously shaken to remove soil and chipped for on-site landscaping purposes. Soil from the root systems will be removed and remain on the ground surface in the approximate area where the grubbing occurred.

3.3 Handling of Excess and Imported Soil/Fill

Fill and/or material to be reused on Site or anticipated to be imported onto the Site for construction of the IRM includes, but is not limited to, the following.

- Minimal excess soil/fill is expected to be generated during construction of the IRM. Soil excavated during underground piping installation will be re-used in place as backfill.
- Structural fill for the water treatment structure pad is expected to be imported.
- Topsoil for finish grading and areas to establish vegetative covers is expected to be imported.
- Crushed stone for parking and staging areas is expected to be imported.

See the following section for compliance of fill in accordance with 5.4(e)10 of NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (DER-10).

3.3.1 Imported/Reused Fill Testing

The sampling and analysis requirements for fill to be reused on Site or imported to the Site are set forth in DER-10. The following requirements must also be met:

- Materials proposed for import onto the Site will be approved by the certifying IRM engineer, and NYSDEC, and will be in compliance with provisions in 6 NYCRR Part 375 and DER-10 prior to delivery to the Site.

- Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

- Imported soils will meet the backfill quality standards established in 6 NYCRR 375-6.7(d). The imported fill quality standards will adhere to soil cleanup objectives (SCOs) for Industrial Use Sites as listed in Appendix 5 - Allowable Constituents Levels for Imported Fill or Soil, Subdivision 5.4(e) of DER-10. Soils that meet ‘exempt’ fill requirements under 6 NYCRR Part 360, but do not meet backfill objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

The source of imported fill and the analytical data will be provided to NYSDEC for review and approval prior to importing the fill to the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting solid covers. Imported soils stockpiled within the Site will be covered to prevent dust releases.

3.4 Cleaning of Movable Equipment

Movable equipment and other equipment that comes into contact with the Site's soil and groundwater will be cleaned prior to demobilization. The equipment will be cleaned in a specific area that is anticipated to be located within the southern portion of the Site. A pad will be constructed of reinforced polyethylene and bermed at its perimeter to deter the overflow of water beyond the pad. The floor of the pad will be sloped so that water collects in a low area of the pad and can be readily removed, as necessary. Water will be treated as described in Section 3.5. The equipment will be cleaned using shovels, brushes, brooms, and a high-pressure power washer.

3.5 IRM Derived Wastes

The IRM-derived wastes will be disposed of in accordance with applicable regulations and in consultation with NYSDEC.

3.6 Utilities

Necessary precautions will be taken to protect existing utilities located within the boundaries of the IRM.

Utilities expected to be required during construction and operation of the IRM include:

- Temporary bathroom and hand washing facilities; and
- Electricity during construction and operation of the IRM.

3.7 Surveying

Survey work performed in conjunction with the IRM will be certified by a New York State Professional Land Surveyor (PLS). The survey work will include surveying pre- and post-IRM Site conditions and locating the IRM components. The IRM components are expected to include the piping from the pumping wells to the water treatment structure, the water treatment structure including GAC vessels, the treated groundwater discharge pipe and outfall, and below and aboveground utilities.

4.0 SITE CONTROLS DURING REMEDIAL ACTION

4.1 Stormwater Management

In accordance with the New York Guidelines for Urban Erosion and Sediment Control and the New York State Stormwater Management Design Manual, erosion and sediment control measures, pollution prevention measures, and if applicable, post-construction water quality treatment, shall be designed and presented in the form of a Stormwater Pollution Prevention Plan (SWPPP).

The following forms will be completed and submitted to comply with the requirements of the General Permit for Stormwater Discharges from Construction Activity - GP-0-15-002:

- <u>Notice of Intent</u> (NOI) to NYSDEC to request coverage under the General Construction Stormwater Permit; and
- <u>Notice of Termination (NOT) to NYSDEC to </u>notify that the construction project is complete and has met the requirements of the construction permit.

A copy of the blank NOI and NOT forms are available through NYSDEC's website. The SWPPP and NOI will be provided to NYSDEC prior to commencing the IRM construction activities. The NOT will be provided to NYSDEC upon completion of the Site disturbance portion of the IRM project.

4.2 Community Air Monitoring Plan (CAMP)

A Community Air Monitoring Plan (CAMP) developed and approved for the remedial investigation will be implemented during this IRM construction.

4.3 Dust Control

Dust suppression techniques will be implemented, as necessary, to control fugitive dust to the extent practical during construction of the IRM. Such techniques must be employed, at a minimum, if the community air monitoring results indicate that particulate levels are above action levels. Reasonable attempts will be made to inhibit visible and/or fugitive dusts. The contractor may use one or more of the following techniques:

- Applying water to roads.
- Wetting equipment and excavation faces.
- Spraying water on excavation equipment during excavation and dumping.
- Hauling materials in containers or vehicles with solid tarp covers.
- Restricting vehicle speeds on Site.
- Covering excavated areas and materials after excavation immediately after activity ceases.

The IRM contractor will be required to perform dust control measure in a manner consistent with the applicable portions of the "New York Guidelines for Urban Erosion and Sediment Control" and the "New York State Stormwater Management Design Manual".

4.4 Construction Observation and Certification

C.T. Male will provide full-time observation during construction of the IRM (construction observer). Upon completion of the construction portion of the IRM and when CAMP monitoring is no longer required, C.T. Male will discontinue construction observation.

Periodic observation of the construction of the IRM will be made by a C.T. Male registered Professional Engineer to provide the required certification for the Construction Completion Report (CCR). The engineer will work with the construction observer to document that the project is implemented in accordance with the NYSDEC approved IRM WP. The project engineer will provide engineering review of IRM-related contractor submittals and field changes for the IRM construction work.

5.0 HEALTH AND SAFETY PLAN (HASP)

C.T. Male and any other construction observers will follow health and safety procedures in accordance with the existing Site-specific health and safety plan (HASP) that was developed for RI activities. Prior to implementing the field work, the existing Site-specific HASP will be amended as needed for any IRM tasks that are not addressed in the existing plan.

The contractor(s) for the Site IRM will be required to provide a Site-specific HASP certified by a Certified Industrial Hygienist or equivalent. The contractor's employees will be required to have read and understood their company's Site specific HASP prior to beginning work.

Site workers will also be required to successfully complete any training required by Saint-Gobain. Daily work permits will need to be prepared for review and signature by all contractors and Saint-Gobain personnel.

A copy of the health and safety plans will be available at the Site during the performance of IRMs to which they are applicable.

6.0 IRM MONITORING PROGRAM

As described above, an ISMP will be prepared for agency review, comment, and approval following submission of this IRM WP. Per DER-10, the ISMP will include an IEC Plan, a Monitoring Plan, and an Operation & Maintenance (O&M) Plan. These plans are further described below.

6.1 Interim Site Management Plan

As indicated in Section 1.2, an ISMP will be prepared to provide regular assessment of physical and chemical parameters to document that the IRM is performing as designed. Note that the ISMP will address the implementation and operation of the IRM only, and will not address other portions of the Site that are undergoing the RI/FS process. The ISMP will be provided for agency review, comment, and approval following submission of this IRM WP. Included in the ISMP will be the following components:

- An IEC Plan, as described in DER-10 6.2.1, which may include an excavation plan to manage soils excavated and/or imported as part of IRM construction, a construction dewatering plan if dewatering is necessary during IRM construction (i.e., trenching for underground piping installation), and/or updates to the HASP and CAMP.
- A Monitoring Plan, in accordance with DER-10 6.2.2, which will incorporate IRM effectiveness and performance monitoring and groundwater concentrations trends monitoring. The Monitoring Plan will include data collection to evaluate hydrogeological conditions at and nearby the Site. The Monitoring Plan will define a network of monitoring wells to be monitored, and the sampling/monitoring frequency and parameter list. Data collection from the well network and evaluations of the data may include, but not be limited to, the following: water level measurements, capture zone evaluation, well capacities, concentration trend analysis, assessing potential for capture well fouling, and to assess Site building structural support needs related to dewatering.
- An O&M Plan, in accordance with DER-10 6.2.3, which will describe the information necessary to operate and maintain the groundwater extraction and treatment system, and include data collection to evaluate the system performance. The O&M Plan will define sampling/monitoring frequency of the groundwater extraction treatment system and will include equipment information. Treatment system sampling and reporting will be completed in accordance with the

Discharge Permit Equivalent issued by NYSDEC. Additional data collection and evaluations of the data may include, but not be limited to, the following: recording the volume of water treated (totalizer readings), mass removal and removal efficiency, GAC usage rate, dissolved iron and manganese ranges to evaluate possible pre-treatment requirements, and ranges of dissolved oxygen during long-term pumping in order to evaluate aeration requirements.

The results of the IRM monitoring described in the Monitoring and O&M Plans will be evaluated and system adjustments and/or maintenance will be implemented to improve IRM performance or operation. Additional details and reporting schedule will be included in the ISMP. The planned schedule for submission of the ISMP and associated documents is shown on Figure 12.

6.2 Groundwater Treatment System Monitoring

Samples will be collected from the groundwater treatment system at system startup as described below. Details around the long-term operation, monitoring, and maintenance of the treatment system and groundwater capture wells will be addressed in the Monitoring and O&M Plans in the ISMP.

6.2.1 Water Treatment System Sampling

One round of samples will be collected during system start up from the GAC treatment system inlet, in between the lead/lag GAC vessels (midpoint), and at the discharge location (outlet) to demonstrate the system is operating as designed. The samples will be analyzed for those PFAS and other general chemistry parameters in accordance with the Discharge Permit Equivalent. Analytical data will be presented in ASP Category B data deliverable packages that will undergo EPA Level IIA data validation by an independent third party data validation firm. Results of the data validation will be presented in Data Usability Summary Reports (DUSRs). The results of the system startup samples will be reported to NYSDEC.

During long-term system operation, monitoring and reporting will be conducted in accordance with the Discharge Permit Equivalent issued by NYSDEC and as defined in the Monitoring and O&M Plans in the ISMP.

7.0 REMEDIAL STRUCTURES REMOVAL AND SITE RESTORATION PLANS

7.1 Remedial Structures Removal

Upon approval from the Department that the IRM is no longer required, aboveground and underground remedial system components (water treatment structure and equipment, piping, utilities, etc.) will be decommissioned.

7.2 Site Restoration

Upon decommission of the remedial components, the Site will be restored as necessary to pre-IRM conditions with respect to topography, hydrology, and vegetation, to the extent necessary and practicable. Wells no longer in use will be decommissioned with the Department's approval and in accordance with CP-43 Commissioner's Policy on Groundwater Monitoring Well Decommissioning.

8.0 REMEDIAL ACTION SCHEDULE AND PROGRESS REPORTS

8.1 Remedial Action Schedule

A preliminary schedule for implementing the IRM is presented on Figure 12. Project construction work on Site will begin within 60 days of formal approval from NYSDEC. NYSDEC will be provided with written notice a minimum of five business days prior to the initiation of IRM site work, as required under the Order.

8.2 IRM Progress Reports

Weekly progress reports will be submitted to the NYSDEC Project Manager via email during IRM construction. The progress report will briefly summarize the IRM activities completed for the previous week. The progress report will be submitted at the beginning of the following week. The format will be in a bulleted style, generally highlighting the major items accomplished during the previous week.

Relevant updates during IRM operations will be included in the ongoing monthly project progress reports submitted to NYSDEC describing remedial investigation activities. Additionally, quarterly progress reports on the operation of the IRM will be submitted to the NYSDEC Project Manager, the New York State Department of Health Project Manager, and pertinent personnel representing the remedial parties that will generally include the following information, where applicable:

- A tabulation of sample results received during the reporting period.
- A discussion of project progress and significant activities during the reporting period, including the status of requisite permits.
- A discussion of pending/planned significant project activities during the next two months, unless another time frame is authorized by NYSDEC.
- A discussion of problems encountered during operation of the IRM and proposed actions to correct the problems.
- Request for modifications to the IRM, and the status of previously-requested modifications.

A schedule and description of reporting the results of the performance monitoring described in Section 6 will be included in the Monitoring and O&M Plans in the ISMP.

8.3 Citizen Participation

Per 6 NYCRR Part 375-2.10(f), this IRM WP will be placed in the document repositories. A fact sheet summarizing the work to be performed and availability of the IRM WP will be prepared by NYSDEC and will be sent to the public via the NYSDEC listserv.

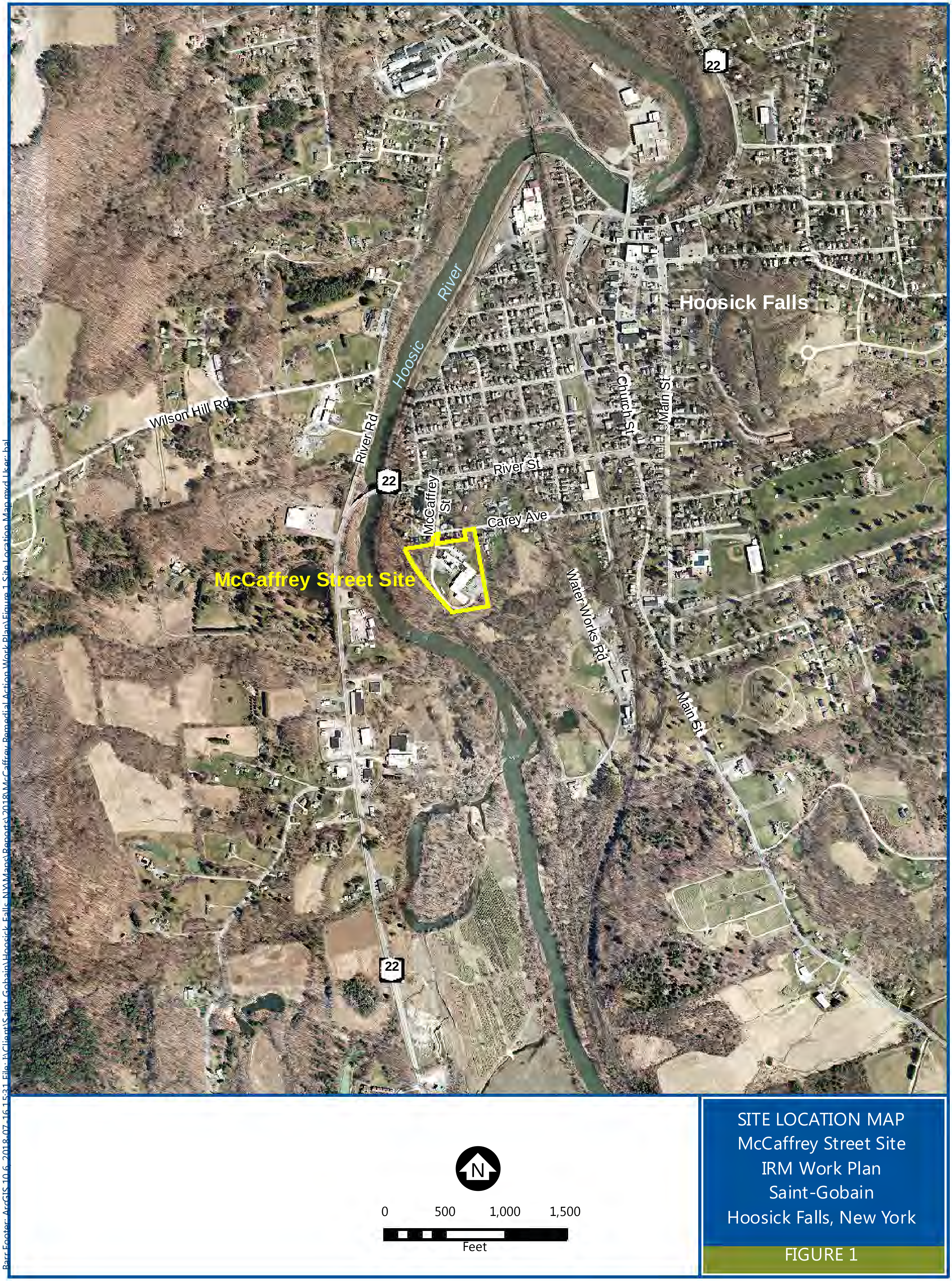
9.0 INSTITUTIONAL CONTROLS AND INTERIM SITE MANAGEMENT PLAN

As noted in Section 6 of this IRM WP, an ISMP will be prepared that describes procedures for operating and maintaining the groundwater treatment system and that requires periodic reports summarizing the effectiveness of the system. Institutional controls will be implemented, as appropriate for the IRM activity.

10.0 IRM CONSTRUCTION COMPLETION REPORT

The IRM will be documented in a Construction Completion Report (CCR) that will be incorporated into the final RI Report. The ISMP will be submitted concurrent with the CCR. The CCR will then be incorporated and/or referenced in the Final Engineering Report (FER). The FER is required for the Department's issuance of the Certificate of Completion (COC).

FIGURE 1
SITE LOCATION MAP



SITE LOCATION MAP
McCaffrey Street Site
IRM Work Plan
Saint-Gobain
Hoosick Falls, New York

FIGURE 1

FIGURE 2
SITE LAYOUT MAP

Note: The South/Southeast boundary of Wetland A defines the limit of the delineation and not the boundary of the wetland.

Imagery: State of New York 2017-04

SITE LAYOUT MAP
McCaffrey Street Site
IRM Work Plan
Saint-Gobain
Hoosick Falls, NY

Figure 2

FIGURE 3
ESTIMATED CAPTURE ZONE OF THE IRM

◎ Pumping Well

⊕ Village of Hoosick Falls Well

Approximate Saint-Gobain Property Boundary

Estimated IRM Capture Zone in Deep Unconsolidated Sediments for Spring 2018 Conditions (moderately wet)

☐ Boundary of Adjacent Parcel

Aerial Imagery: State of New York 2017

N

0 150 300
Feet

ESTIMATED CAPTURE ZONE
OF THE IRM
Saint-Gobain
Hoosick Falls, NY

FIGURE 3

FIGURE 4
CONCEPTUAL IRM LAYOUT AND CROSS-SECTION A-A′ LOCATION

● Pumping Well

● Monitoring Well

⬠ Piezometer

⊙ Boring Location

⬟ Proposed Treated Water Discharge Location

Proposed Buried Piping to/from Water Treatment Structure

Existing Natural Drainage

▭ Proposed Water Treatment Structure

▭ Proposed Water Treatment Structure Pad

Geologic Cross-section Alignment

Approximate Property Line

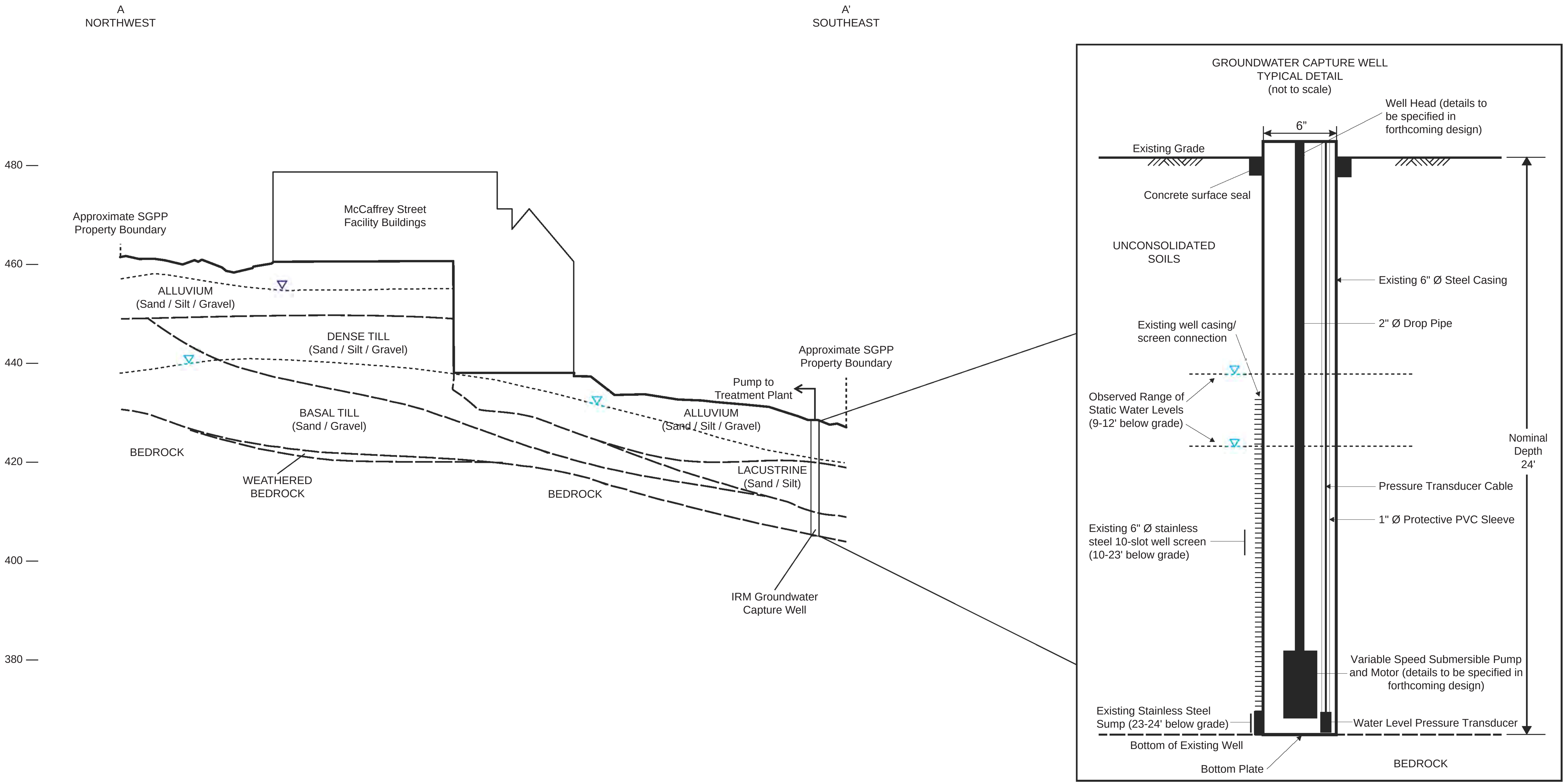
Imagery: State of New York 2017

CONCEPTUAL IRM LAYOUT AND CROSS-SECTION A-A' LOCATION
McCaffrey Street Site
IRM Work Plan
Saint-Gobain
Hoosick Falls, NY

Figure 4

FIGURE 5
CONCEPTUAL CROSS-SECTION A-A' WITH CAPTURE WELL TYPICAL DETAIL

"P:\Mpls\32 NY\42\32421002 SGPP Hoosick Falls\WorkFiles\1_MCCAFFREY\11_IRMs\Downgradient IRM\01_Work Plans\PW04 PW19 IRM\Remedial Action Work Plan\Figures\support\Figure 5 - McCaffrey_A-A'_20180205_KCM edits.ai"



NOTES

The depicted geology is based on the results of a three-dimentional model created using Earth Volumetric^{TM} (EVS) software. The geological results were simplified and locations and elevations are approximate. Groundwater elevations vary seasonally.

LEGEND

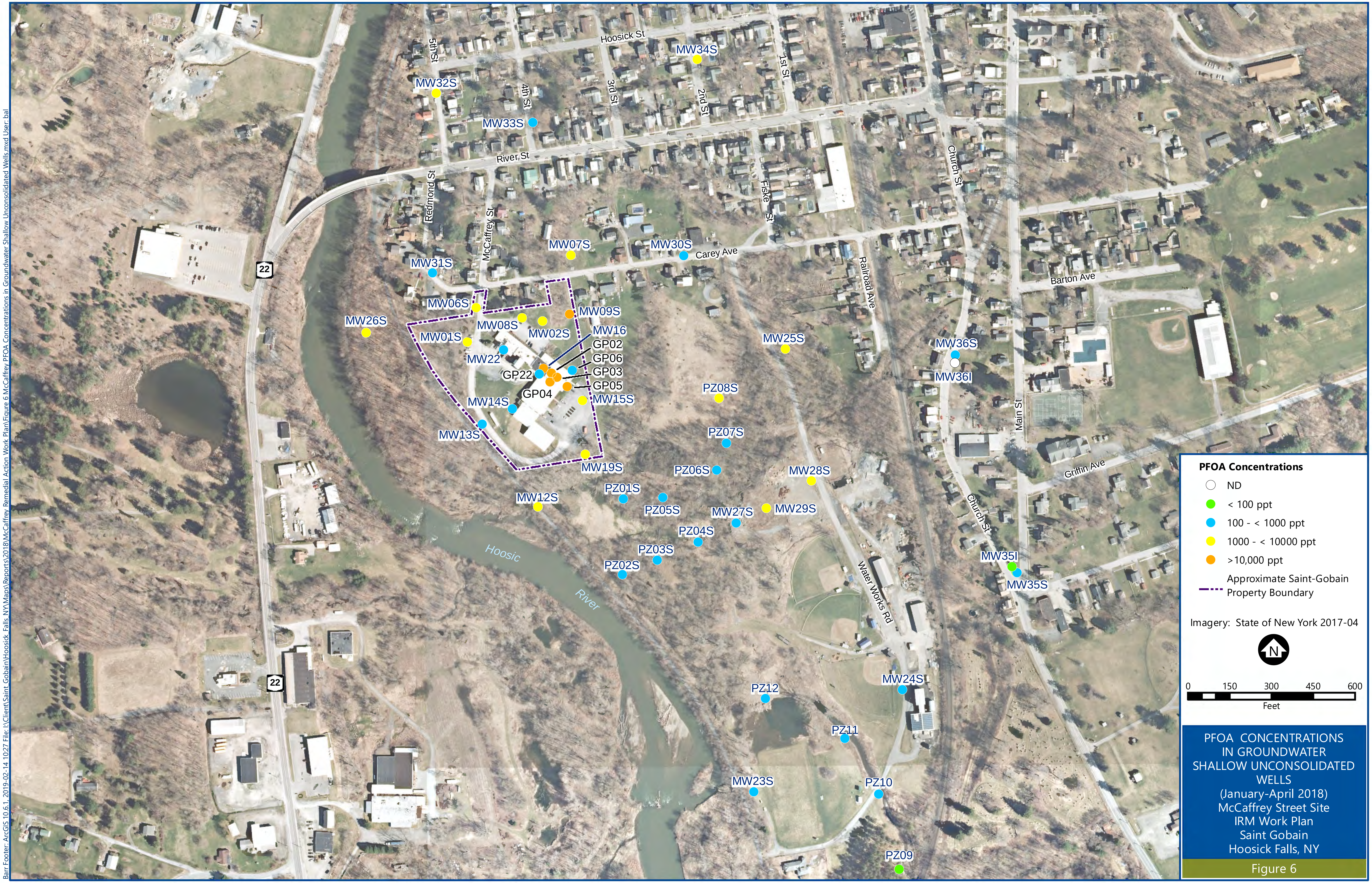
— — — —	Inferred Geologic Contact
---▽---	Approximate Perched Water Table
---▽---	Approximate Groundwater Elevation in the Deep Unconsolidated Deposits

0 100 150

Approximate Horizontal Scale in Feet
5x Vertical Exaggeration

FIGURE 5
CONCEPTUAL CROSS SECTION A-A'
WITH CAPTURE WELL TYPICAL DETAIL
MCCAFFREY STREET SITE
IRM WORK PLAN
SAINT-GOBAIN
HOOSICK FALLS, NY

FIGURE 6
PFOA CONCENTRATIONS IN GROUNDWATER, SHALLOW UNCONSOLIDATED WELLS
(JANUARY - APRIL 2018)



PFOA Concentrations

○ ND

● < 100 ppt

● 100 - < 1000 ppt

● 1000 - < 10000 ppt

● >10,000 ppt

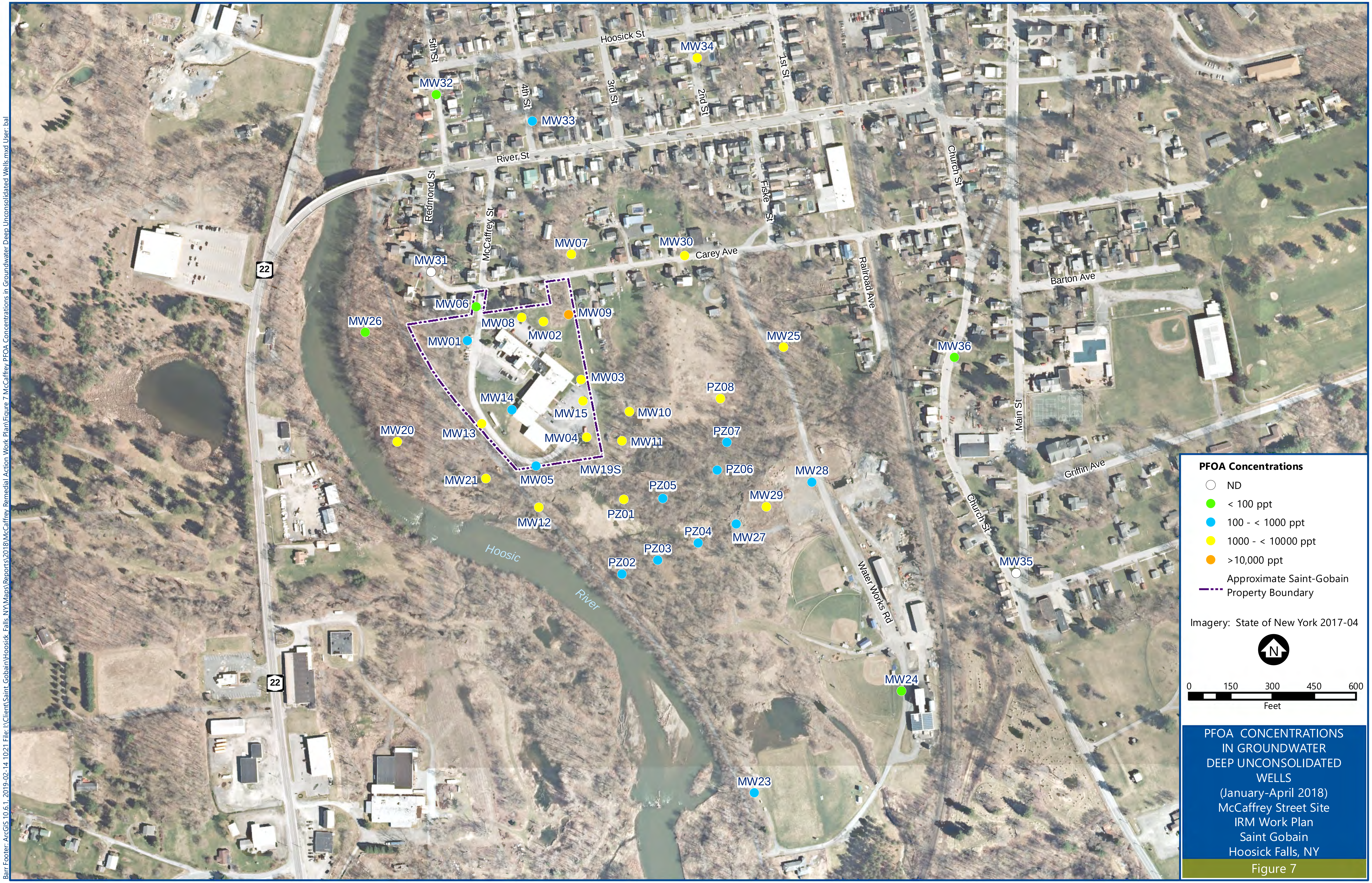
Approximate Saint-Gobain Property Boundary

Imagery: State of New York 2017-04

PFOA CONCENTRATIONS
IN GROUNDWATER
SHALLOW UNCONSOLIDATED
WELLS
(January-April 2018)
McCaffrey Street Site
IRM Work Plan
Saint Gobain
Hoosick Falls, NY

Figure 6

FIGURE 7
PFOA CONCENTRATIONS IN GROUNDWATER, DEEP UNCONSOLIDATED WELLS
(JANUARY – APRIL 2018)



PFOA CONCENTRATIONS
IN GROUNDWATER
DEEP UNCONSOLIDATED
WELLS
(January-April 2018)
McCaffrey Street Site
IRM Work Plan
Saint Gobain
Hoosick Falls, NY

Figure 7

Barr Footer: ArcGIS 10.6.1, 2019-02-14 10:21 File: I:\Client\Saint Gobain\Hoosick Falls NY\Maps\Reports\2018\McCaffrey Remedial Action Work Plan\Figure 7 McCaffrey PFOA Concentrations in Groundwater Deep Unconsolidated Wells.mxd User: bal

FIGURE 8
PFOA CONCENTRATIONS IN GROUNDWATER, BEDROCK WELLS
(JANUARY – APRIL 2018)

PFOA Concentrations

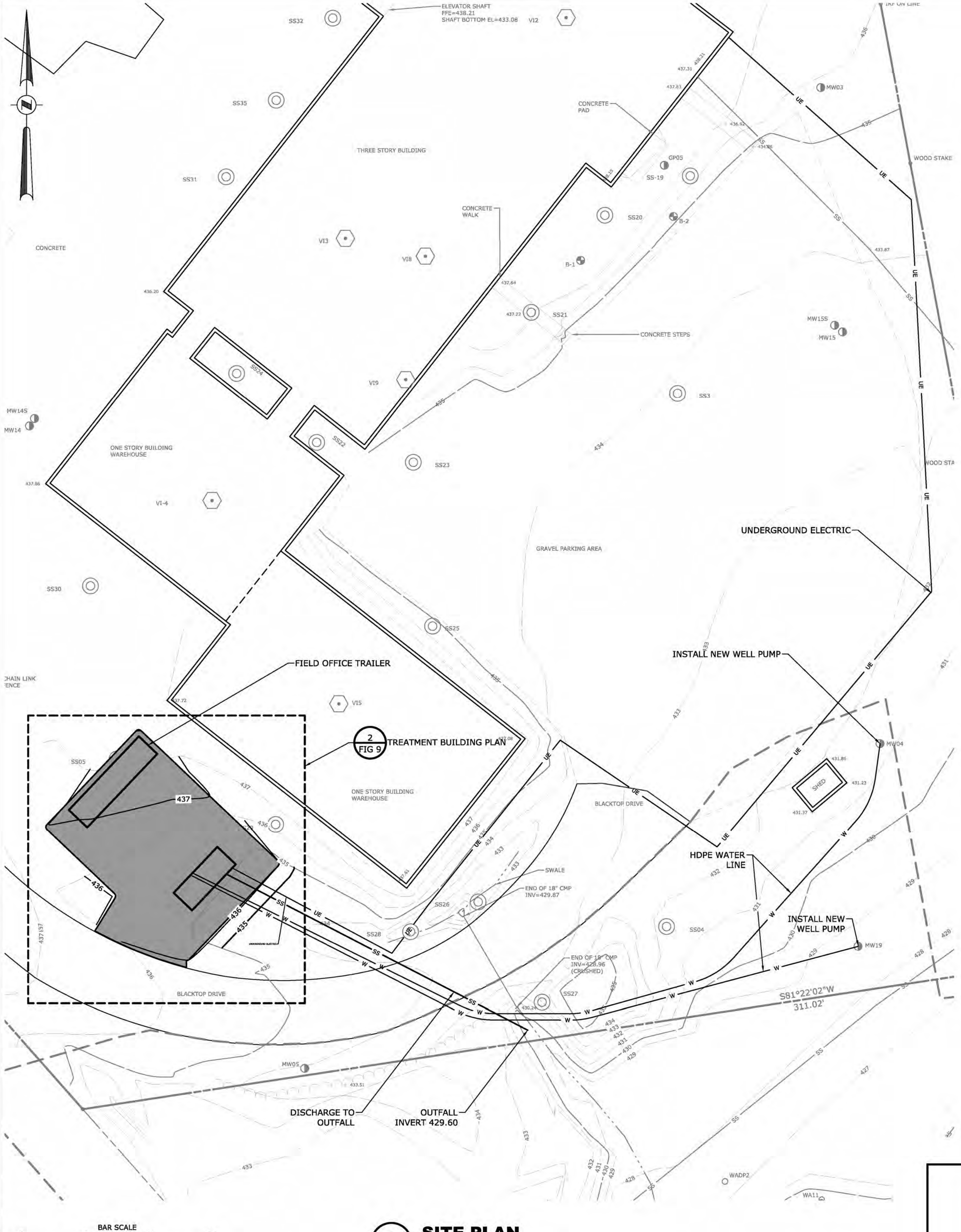
- ○ ND
- ● < 100 ppt
- ● 100 - < 1000 ppt
- ● 1000 - < 10000 ppt
- ● >10,000 ppt
- Approximate Saint-Gobain Property Boundary

Imagery: State of New York 2017-04

PFOA CONCENTRATIONS
IN GROUNDWATER
BEDROCK WELLS
(January-April 2018)
McCaffrey Street Site
IRM Work Plan
Saint Gobain
Hoosick Falls, NY

Figure 8

FIGURE 9
TREATMENT SYSTEM SITE PLAN, IRM GROUNDWATER TREATMENT SYSTEM



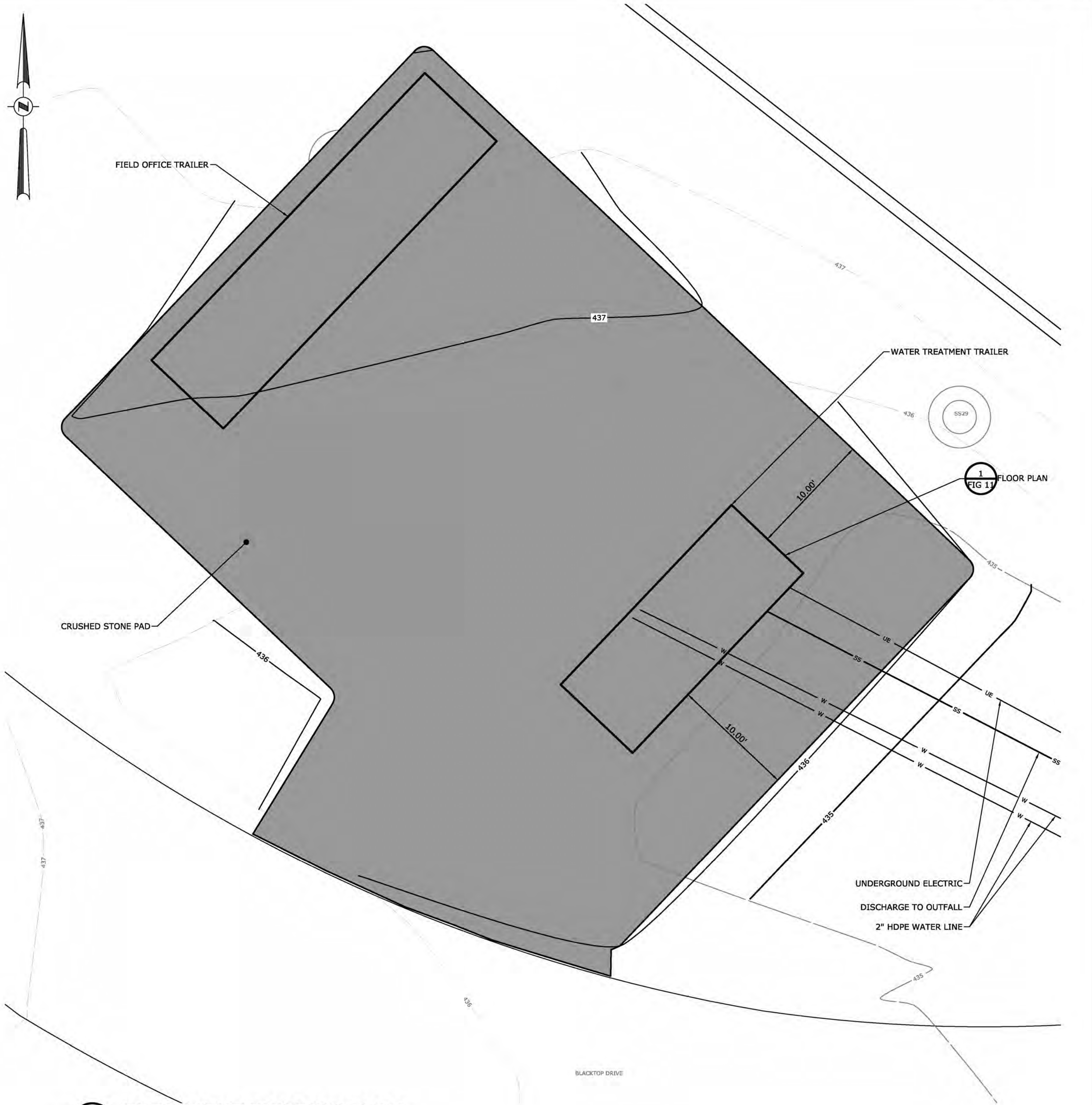
BAR SCALE
5 0 2.5 5 10
1 inch = 5 ft.

BAR SCALE
20 0 10 20 40
1 inch = 20 ft.

1
FIG 9

SITE PLAN

SCALE: 1" = 20"
CROSS REFERENCE: NONE



2
FIG 9

TREATMENT BUILDING PLAN

SCALE: 1" = 5'
CROSS REFERENCE: NONE

FOR REGULATORY REVIEW ONLY

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
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DESIGNED: JRG
DRAFTED : JRG
CHECKED : CRK
PROJ. NO : 14.4756
SCALE : AS NOTED
DATE : AUGUST 2018

FIGURE 9 - TREATMENT SYSTEM SITE PLAN

SAINT GOBAIN PERFORMANCE PLASTICS
IRM GROUNDWATER TREATMENT SYSTEM

VILLAGE OF HOOSICK FALLS
RENSSELAER COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 518.786.7400
COBLESKILL, NY • GLENS FALLS, NY • HIGHLAND, NY • JOHNSTOWN, NY
LITTLE FALLS, NY • RED HOOK, NY • SYRACUSE, NY

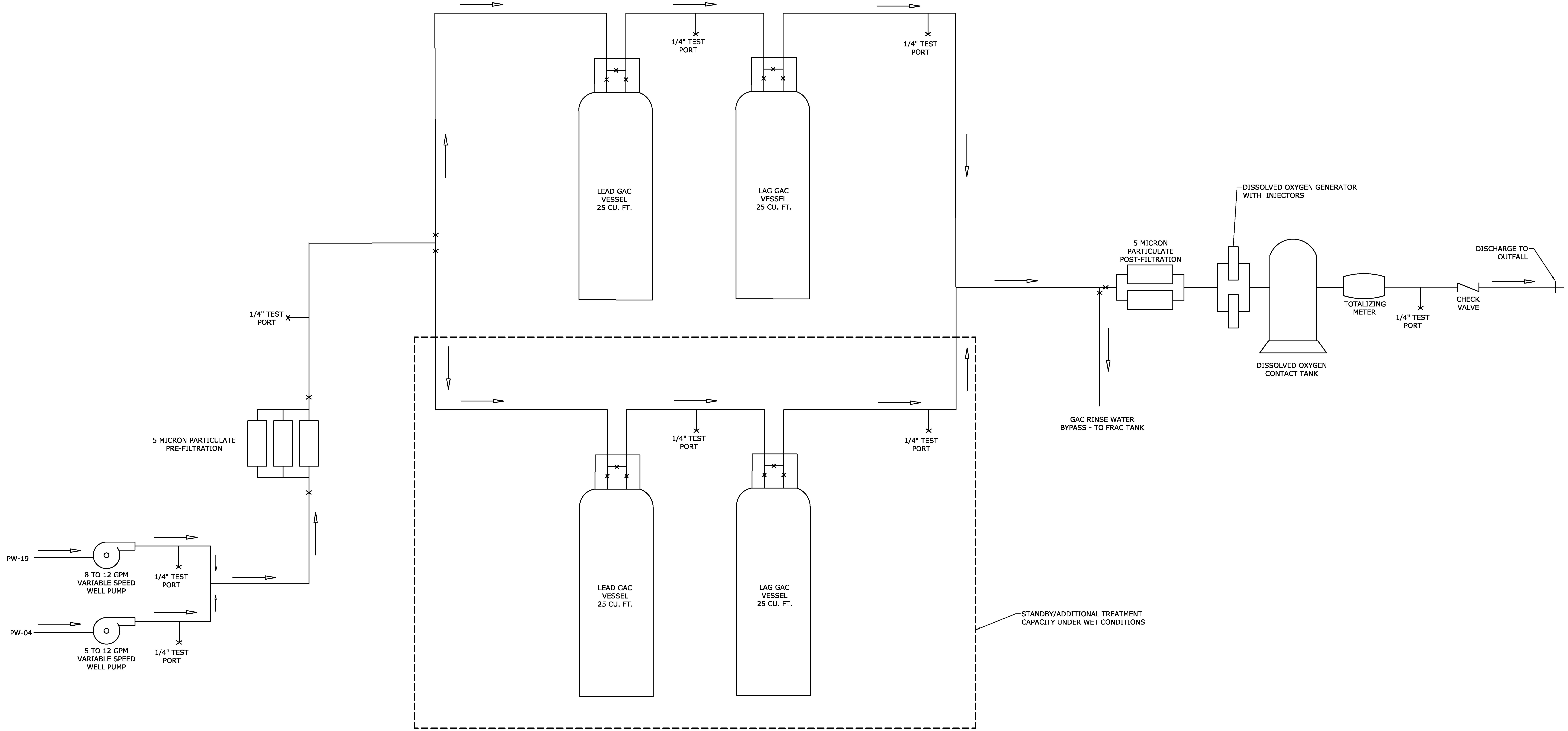
FIG 9
SHEET 1 OF 1
DWG. NO: XX-XXXX

CAD DWG. FILE NAME: K:\Projects\144756\Civil\Drawings and Maps\Temporary IRM Groundwater Treatment Process\Fig 9.dwg
DRAWING PRINTED DATE: August 20, 2018

FIGURE 10
PROCESS SCHEMATIC, IRM GROUNDWATER TREATMENT SYSTEM

XREFS: NONE

PROJECT NUMBER: 14.4756



NOTES:
1. ALL CONNECTING PIPING TO BE 1-1/2" PEX
2. SUPPORT PIPING AND EQUIPMENT AS NECESSARY

FOR REGULATORY REVIEW ONLY

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
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DESIGNED: JRG
DRAFTED : JRG
CHECKED : CRK
PROJ. NO : 14.4756
SCALE : AS NOTED
DATE : AUGUST 2018

FIGURE 10 - PROCESS SCHEMATIC

SAINT GOBAIN PERFORMANCE PLASTICS
IRM GROUNDWATER TREATMENT SYSTEM

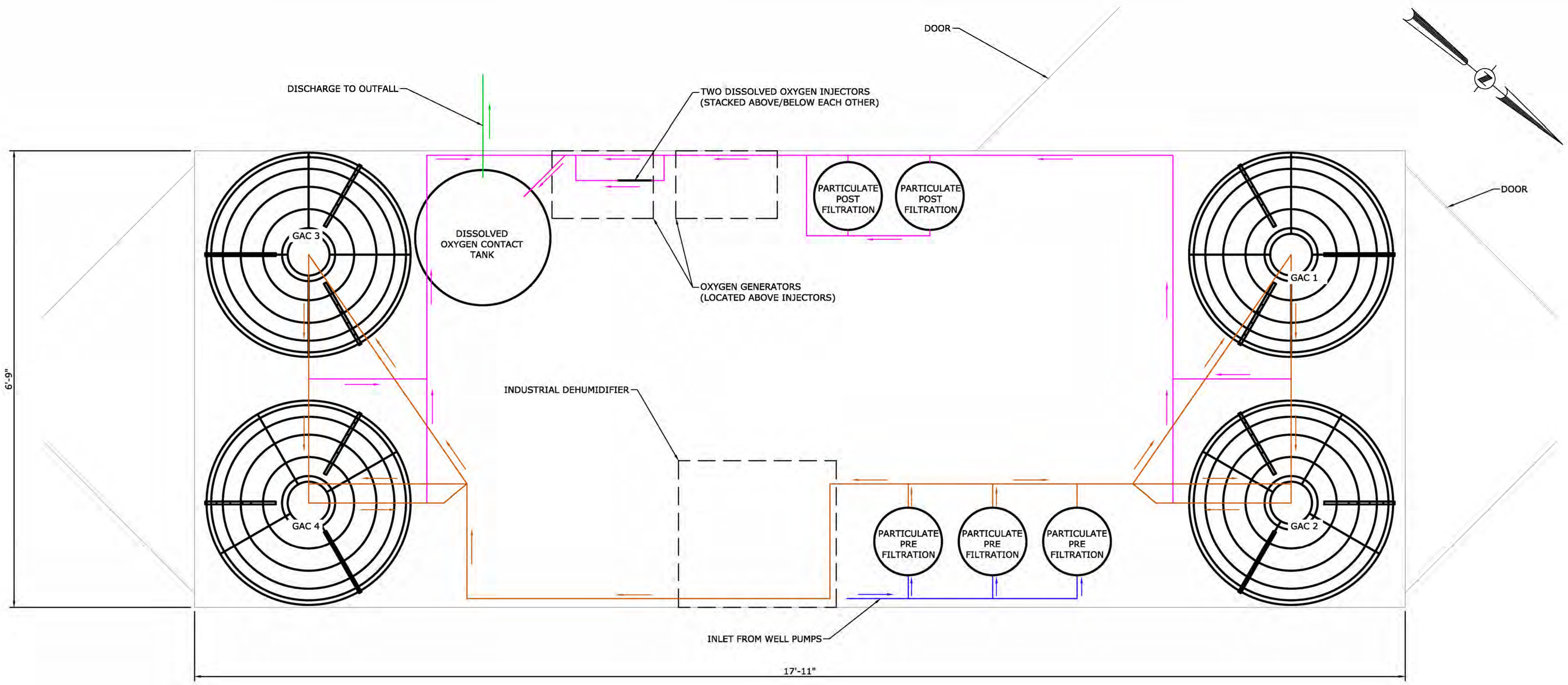
VILLAGE OF HOOSICK FALLS
RENSSELAER COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 518.786.7400
COBLESKILL, NY · GLENS FALLS, NY · HIGHLAND, NY · JOHNSTOWN, NY
LITTLE FALLS, NY · RED HOOK, NY · SYRACUSE, NY

FIG 10
SHEET 1 OF 1
DWG. NO: XX-XXXX

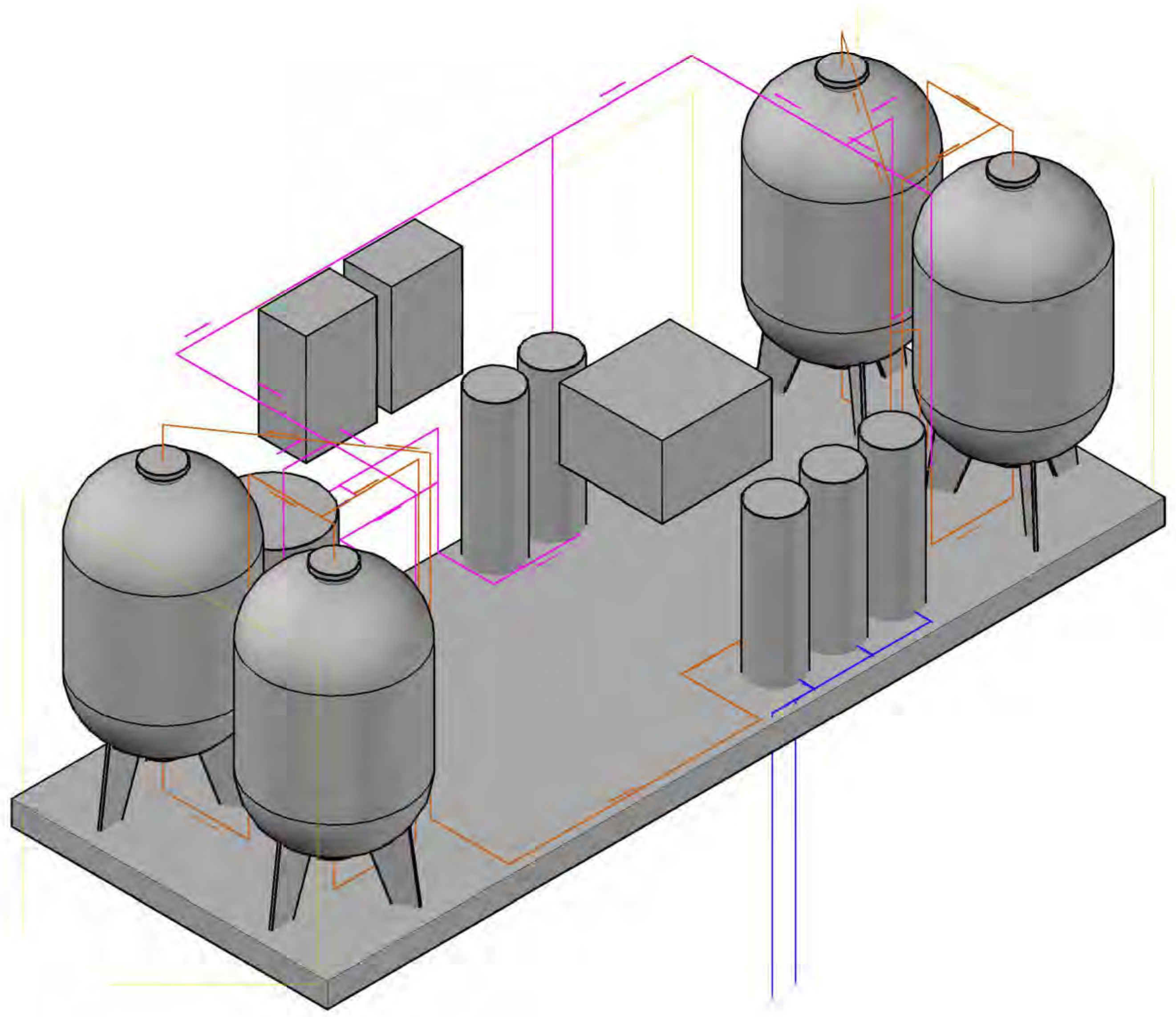
CAD DWG. FILE NAME: K:\Projects\144756\Civil\Drawings and Maps\Temporary IRM Groundwater Treatment Process\Fig 10 and 11.dwg
DRAWING PRINTED DATE: August 20, 2018

FIGURE 11
PRELIMINARY FLOOR PLAN, IRM GROUNDWATER TREATMENT SYSTEM



1 FIG 11 **FLOOR PLAN**

SCALE: 1" = 1'-0"
CROSS REFERENCE: NONE



🟦	INLET FROM WELLS
🟧	PROCESS LINES: PRE-FILTERS THROUGH GAC VESSELS
🟪	PROCESS LINES: GAC THROUGH OXYGEN ADDITION
🟩	DISCHARGE TO OUTFALL

FOR REGULATORY REVIEW ONLY

DATE		REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.
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DESIGNED: JRG
DRAFTED : JRG
CHECKED : CRK
PROJ. NO : 14.4756
SCALE : AS NOTED
DATE : AUGUST 2018

FIGURE 11 - PRELIMINARY FLOOR PLAN

SAINT GOBAIN PERFORMANCE PLASTICS IRM GROUNDWATER TREATMENT SYSTEM

VILLAGE OF HOOSICK FALLS
RENSSELAER COUNTY, NEW YORK

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NY 518.786.7400
COBLESKILL, NY · GLENS FALLS, NY · HIGHLAND, NY · JOHNSTOWN, NY
LITTLE FALLS, NY · RED HOOK, NY · SYRACUSE, NY

FIG 11
SHEET 1 OF 1
DWG. NO: XX-XXXX

CAD DWG. FILE NAME: K:\Projects\144756\Civil\Drawings and Maps\Temporary IRM Groundwater Treatment Process\Fig 10 and 11.dwg
DRAWING PRINTED DATE: August 20, 2018

FIGURE 12
PRELIMINARY PROJECT SCHEDULE

Figure 12 - Project Schedule - IRM Groundwater Capture and Treatment

Saint Gobain Performance Plastics

McCaffrey Street, Hoosick Falls, NY

TASK	2018	JANUARY 2019				FEBRUARY 2019				MARCH 2019					APRIL 2019				MAY 2019					JUNE 2019				JULY 2019				AUGUST 2019					SEPTEMBER 2019				OCTOBER 2019				NOVEMBER 2019					DECEMBER 2019			
		4	11	18	25	1	8	15	22	1	8	15	22	29	5	12	19	26	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29	6	13	20	27
Submit draft IRM work plan to NYSDEC	🟦 8/31/2018																																																				
Comments from NYSDEC on draft work plan		🟦 1/2/2019																																																			
NYSDEC Discharge Permit Equivalent issued	🟦 12/7/2018, re-issued 3/13/19																																																				
Prepare and Submit revised IRM work plan to NYSDEC			🟦	🟦	🟦	🟦	🟦	🟦 2/15/2019																																													
NYSDEC review of revised work plan									🟦	🟦	🟦	🟦	🟦 3/27/2019																																								
Address comments to revised work plan														🟦	🟦																																						
IRM work plan approval from NYSDEC															🟥	🟥																																					
Approvals from Village of Hoosick Falls for project															🟦	🟦	🟦																																				
Design finalization / contracting															🟦	🟦																																					
Power feed installation for GAC treatment system from McCaffrey facility																				🟦	🟦	🟦																															
Construction of GAC treatment system (off-site) in trailer fitted with power, insulation, lights, heater, etc.																	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																										
Fabricate instrumentation and controls for wells and treatment system																	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦																										
Onsite prep work for IRM treatment trailer placement																										🟦	🟦																										
Install piping from wells to GAC treatment system																											🟦																										
Setting pumps in wells & pitless adapters																											🟦																										
Delivery of trailer with GAC treatment system																												🟦																									
Connection of power supply to treatment trailer and piping from wells																												🟦																									
GAC treatment system start-up & operational																													🟦	🟦	🟦																						
Prepare Interim Site Management Plan (ISMP) and Operations, Maintenance and Monitoring (OM&M) Plan, submit to NYSDEC																															🟦	🟦	🟦	🟦	🟦	🟦	🟦																
Prepare and Submit CCR for IRM																																🟦	🟦	🟦	🟦																		
Monitoring of GAC treatment system																															🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦									

🟥 red = milestone

🟦 light blue= Main task

NOTES:

Task - 'Monitoring of GAC treatment system' -- Duration of GAC treatment system operation and monitoring to be determined.

APPENDIX A
GEOPHYSICAL REFRACTION SURVEY
Prepared by Hager-Richter Geoscience, Inc.

APPENDIX A has been removed from this edition of the IRM Work Plan to reduce file size for Web Viewing.

The full IRM Work Plan is available for review in the following Document Repositories:

Village of Hoosick Falls Library
73 Classic Street
Hoosick Falls, NY 12090
(518) 686-9401

Village of Hoosick Falls Offices
24 Main Street
Hoosick Falls, NY 12090
(518) 686-7072

An elecronic copy of the full IRM Work Plan is also available directly from the NYSDEC Project Manager, William Shaw, upon request by telephone using 518-402-9676 or by email using William.Shaw@dec.ny.gov.

APPENDIX B
DATA COLLECTION IN SUPPORT OF A GROUNDWATER CAPTURE IRM DESIGN, TECHNICAL MEMORANDUM

APPENDIX B has been removed from this edition of the IRM Work Plan to reduce file size for Web Viewing.

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APPENDIX C
WATER TREATMENT DEMONSTRATION TEST RESULTS, C.T. MALE ASSOCIATES, December 6, 2017

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
50 Century Hill Drive, Latham, NY 12110
518.786.7400 FAX 518.786.7299 www.ctmale.com

December 6, 2017

Mr. William Shaw *Via Email*
NYSDEC
Division of Environmental Remediation
625 Broadway, 11th Floor
Albany, New York 12233-7013

Re: *Water Treatment Demonstration Test Results*
14 McCaffrey Street Site
Hoosick Falls, NY
Site No. 442046

Dear Mr. Shaw:

The purpose of this letter is to provide a summary of the recent water treatment activities completed at the Saint-Gobain Performance Plastics (SGPP) McCaffrey Street facility in Hoosick Falls, New York (the Site) for groundwater generated as part of ongoing investigative work and tests associated with interim remedial measures (IRM) design at the Site. This letter will also support the permitting process for a State Pollutant Discharge Elimination System (SPDES) equivalency permit discharge of treated groundwater at the Site.

Water generated from ongoing investigative work and IRM development that was treated and stored in frac tanks at the Site between November 20th and 22nd, 2017 includes:

1. Groundwater generated during pumping well development and step-drawdown testing (PW-04 and PW-19), frac tank DEV-1.
2. Investigative-derived waste (IDW) liquids, frac tanks IDW-1 and IDW-2.

Treatment of well development water, frac tank DEV-1, represented the “water treatment demonstration test”, and treatment of IDW liquids thereafter represented “batch water treatment”. Table 1 enclosed with this letter provides a summary of the sources of water that were treated as part of the water treatment demonstration test and batch treatment and additional details regarding sample collection. The water treatment is consistent with the information submitted to the New York State Department of Environmental Conservation (NYSDEC) on October 10, 2017 (and later revised on November 7, 2017).

Water Treatment Results

Table 2 enclosed with this letter provides a summary of the samples collected prior to the water treatment demonstration test, during the demonstration test, and during batch treatment of IDW liquids. Table 3 enclosed provides the analytical results associated with the samples collected. Note that the analytical data provided is in the process of being validated. Validation was not complete at the time this letter was prepared.

The mobile water treatment system used for the demonstration test and batch treatment of IDW liquids was able to treat PFAS compounds to concentrations below the detection limit for most compounds, with the exception of perfluorodecanoic acid (PFDA) and perfluorooctanoic acid (PFOA). GAC treatment was able to treat PFOA to 2 ng/L or less and PFDA to 1 ng/L or less. The final concentrations measured in the treated water frac tanks, DEMO-1 and DEMO-2, at the completion of the treatment (sample IDs SG1-B-DEMO-1 and SG1-B-DEMO-2, collected on November 27) were non-detect for all PFAS with the exception of J-flagged (less than the limit of quantitation) detections of PFOA.

Summary

The water treatment approach selected has been demonstrated effective in treating PFAS in both well development water and IDW liquids during the water treatment demonstration test and subsequent batch treatment. SGPP would like to proceed with the multiple-well pumping tests, starting as soon as December 11, 2017, with continuous discharge of treated water using the same water treatment approach to discharge location SD001 (with eventual discharge to the Hoosic River) during the tests.

Please let us know if you have questions or comments.

Sincerely,

C.T. MALE ASSOCIATES

Kirk Moline
Managing Geologist, P.G.

Attachment: Tables 1, 2 and 3

c: Christopher Angier, P.E., SGPP
Edward Canning, SGPP
James Moras, P.E.
Ray Wuolo, P.E., P.G.
Daniel Reilly, P.E., C.T. Male
Brian Angerman, P.E.
Sara Ramsden, P.E.

Table 1
SGPP McCaffrey Site - Water Treatment Demonstration Test/Batch Water Treatment Summary

Source water description	Frac tank name	Source	Approximate volume treated	Discharge location requested for approval	Date of water treatment	Water treatment process description	Sampling completed[1]	Additional Details
Groundwater generated during pumping well development (PW-04 and PW-19)	DEV-1	PW-04/PW-19 (pumping wells)	13,000	SD001 (overland flow to Hoosic River)	11/20/2017	• Pre-filter skid (Dual Gradient 5-micron) • Lead GAC vessel (filled with to 2,000 lbs of Calgon F400 GAC) • Lag GAC vessel (filled with to 2,000 lbs of Calgon F400 GAC) • Influent, Midpoint, and Effluent Water Sampling Ports	• Source batch composite • Treated batch composite • Between lead/lag vessels (once/day)	Treated water was discharged to an empty, clean 21,000-gallon frac tank (DEMO-1).
Investigative-derived waste (IDW)	IDW-1 and IDW-2	New monitoring wells, recovery well, and pumping wells installation and development, new and existing monitoring wells purging, drilling tool and testing equipment decontamination water, accelerated column test (ACT) residuals	8,000	SD001 (overland flow to Hoosic River)	11/21/2017 through 11/22/2017		• Source batch composite • Treated effluent (once/day) • Between lead/lag vessels (once/day) • Treated water frac tanks (both) after batch water treatment completion	The first, partially-full frac tank of IDW (IDW-1) was treated and discharged to partially-full frac tank DEMO-1. The second partially-full frac tank (IDW-2) was treated and discharged to an empty, clean 8,500 gallon frac tank (DEMO-2).

Notes

[1] See Table 2 for sampling summary.

Table 2

SGPP McCaffrey Site - Water Treatment Demonstration Test/Batch Water Treatment Sampling Summary

Sample Name[1]	Date Collected	Sample Description
IDW-1	11/3/2017	Sample collected from frac tank IDW-1 after no additional IDW liquids were being added to the tank.
IDW-2	11/3/2017	Sample collected from frac tank IDW-2 after no additional IDW liquids were being added to the tank.
DEV-1	11/15/2017	Sample collected from frac tank DEV-1 after PW-04 and PW-19 development and step-testing was complete and no additional groundwater was being added to the tank.
SG1-FRAC-RB01	11/15/2017	Rinse water collected from frac tank DEMO-2 (8,500 gallon tank). PFAS-free water was rinsed into the tank and a sample collected to determine if any PFAS contamination was present in the empty tank.
SG1-FRAC-RB02	11/17/2017	Rinse water collected from frac tank DEMO-1 (21,000 gallon tank). PFAS-free water was rinsed into the tank and a sample collected to determine if any PFAS contamination was present in the empty tank.
SG1-D-MIDEFF	11/20/2017	Sample collected between lead/lag GAC vessels mid-way through treatment of DEV-1 groundwater.
SG1-D-DEMO-1	11/20/2017	Sample collected from DEMO-1 treated water composite at the end of treatment of DEV-1 groundwater/end of the water treament demonstration test.
SG1-B-MIDEFF	11/21/2017	Sample collected between lead/lag GAC vessels mid-way through treatment of IDW-1 contents.
SG1-B-EFF	11/21/2017	Sample collected from GAC system effluent mid-way through treatment of IDW-1 contents.
SG1-B-MIDEFF	11/22/2017	Sample collected between lead/lag GAC vessels mid-way through treatment of IDW-2 contents.
SG1-B-EFF	11/22/2017	Sample collected from GAC system effluent mid-way through treatment of IDW-2 contents.
SG1-B-DEMO-1	11/27/2017	Sample collected from DEMO-1 treated water composite at the end of batch treatment. No additional treated water was added to DEMO-1 after collection.
SG1-B-DEMO-2	11/27/2017	Sample collected from DEMO-2 treated water composite at the end of batch treatment. No additional treated water was added to DEMO-1 after collection.

Notes

[1] See Table 3 for analytical results.

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

		Location	SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
		Date	11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
		Sample Type	N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
		Data Status	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
		LAB_SDG	SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													
General Parameters															
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	**72.3**	**39.7**	**145**	--	--	--	**147**	--	--	--	--	**142**	**116**
Alkalinity, carbonate, as CaCO3	NA	mg/l	**34.0**	**97.0**	< 1.7 U	--	--	--	< 1.7 U	--	--	--	--	< 1.7 U	< 1.7 U
Alkalinity, total, as CaCO3	NA	mg/l	**106**	**137**	**145**	--	--	--	**147**	--	--	--	--	**142**	**116**
Carbon, total organic	NA	mg/l	**3.1**	**5.0**	< 0.50 U	--	--	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U	< 0.50 U
Chloride	NA	mg/l	**66.9**	**49.7**	**68.6**	--	--	--	**76.1**	--	--	--	--	**77.1**	**131**
Cyanide	NA	mg/l	**0.014**	**0.012**	< 0.0050 U	--	--	--	< 0.0050 U	--	--	--	--	< 0.0050 U	< 0.0050 U
Hardness, as CaCO3	NA	mg/l	**69.3**	**107**	**194**	--	--	--	**183**	--	--	--	--	**169**	**88.0**
Nitrogen, ammonia, as N	NA	mg/l	< 0.050 U	< 0.050 U	< 0.050 U	--	--	--	**0.057 J**	--	--	--	--	< 0.050 U	< 0.050 U
pH	NA	pH units	**9.2**	**9.8**	**7.7**	--	--	**7.9**	**8.1**	**8.1**	**8.1**	--	--	**8.1**	**7.9**
Solids, total dissolved	NA	mg/l	**342**	**297**	**295**	--	--	--	**311**	--	--	--	--	**317**	**314**
Solids, total suspended	NA	mg/l	**33.8**	< 1.00 U	**1.50 J**	--	--	--	< 1.00 U	--	--	--	--	< 1.00 U	**7.50**
Specific conductance @ 25 ºC	NA	umhos/cm	**571**	**470**	**565**	--	--	--	**554**	--	--	--	--	**554**	**517**
Sulfate, as SO4	NA	mg/l	**65.1**	**36.9**	**24.9**	--	--	--	**43.1**	--	--	--	--	**41.9**	**42.8**
Temperature	NA	deg C	**22.0**	**22.6**	**22.6**	--	--	**21.3**	**22.6**	**21.3**	**21.4**	--	--	**22.5**	**22.7**
Turbidity	NA	NTU	**0.30 J**	**1.8**	**1.6**	--	--	--	**1.1**	--	--	--	--	**3.3**	**17**
Metals															
Aluminum	Total	mg/l	< 0.0894 U	**0.104 J**	**0.201 J**	--	--	--	**0.179 J**	--	--	--	--	**0.321 J**	**0.974**
Antimony	Total	mg/l	**0.0019 J**	**0.00068 J**	< 0.00045 U	--	--	--	**0.0017 J**	--	--	--	--	**0.0018 J**	**0.0018 J**
Arsenic	Total	mg/l	**0.0137**	**0.0038 J**	< 0.00072 U	--	--	--	**0.0060**	--	--	--	--	**0.0062**	**0.0036 J**
Barium	Total	mg/l	**0.0475**	**0.0209**	**0.0410**	--	--	--	**0.0765**	--	--	--	--	**0.0701**	**0.0674**
Beryllium	Total	mg/l	< 0.000071 U	< 0.000071 U	< 0.000071 U	--	--	--	< 0.000071 U	--	--	--	--	< 0.000071 U	< 0.000071 U
Cadmium	Total	mg/l	< 0.00015 U	< 0.00015 U	< 0.00015 U	--	--	--	< 0.00015 U	--	--	--	--	< 0.00015 U	< 0.00015 U
Calcium	Total	mg/l	**26.5**	**38.9**	**58.5**	--	--	--	**51.9**	--	--	--	--	**48.4**	**28.1**
Chromium	Total	mg/l	< 0.00087 U	**0.0450**	< 0.00087 U	--	--	--	< 0.00087 U	--	--	--	--	< 0.00087 U	**0.0013 J**
Cobalt	Total	mg/l	**0.00019 J**	**0.00038 J**	**0.00020 J**	--	--	--	< 0.00016 U	--	--	--	--	< 0.00016 U	**0.00034 J**
Copper	Total	mg/l	**0.0037 J**	**0.00088 J**	**0.00081 J**	--	--	--	**0.0034 J**	--	--	--	--	**0.0024 J**	**0.0047**
Iron	Total	mg/l	< 0.0805 U	< 0.0805 U	**0.156 J**	--	--	--	< 0.0805 U	--	--	--	--	**0.111 J**	**0.538**
Lead	Total	mg/l	**0.00036 J**	< 0.00011 U	**0.00017 J**	--	--	--	**0.00016 J**	--	--	--	--	**0.00028 J**	**0.00046 J**
Magnesium	Total	mg/l	**0.758**	**2.36**	**11.5**	--	--	--	**13.0**	--	--	--	--	**11.7**	**4.35**
Manganese	Total	mg/l	**0.0019 J**	**0.0038 J**	**0.0804**	--	--	--	**0.0193**	--	--	--	--	**0.0193**	**0.0304**
Mercury	Total	mg/l	< 0.000050 U	< 0.000050 U	**0.000071 J**	--	--	--	< 0.000050 U	--	--	--	--	< 0.000050 U	< 0.000050 U
Nickel	Total	mg/l	**0.0021 J**	< 0.0010 U	**0.0020 J**	--	--	--	< 0.0010 U	--	--	--	--	< 0.0010 U	< 0.0010 U
Potassium	Total	mg/l	**9.55**	**6.91**	**1.57**	--	--	--	**2.47**	--	--	--	--	**3.70**	**7.72**
Selenium	Total	mg/l	**0.0014 J**	**0.00073 J**	< 0.00050 U	--	--	--	**0.0016 J**	--	--	--	--	**0.0016 J**	**0.0014 J**
Silver	Total	mg/l	< 0.00015 U	< 0.00015 U	< 0.00015 U	--	--	--	< 0.00015 U	--	--	--	--	< 0.00015 U	< 0.00015 U
Sodium	Total	mg/l	**87.3**	**60.5**	**35.5**	--	--	--	**38.6**	--	--	--	--	**48.6**	**68.6**
Thallium	Total	mg/l	< 0.00012 U	< 0.00012 U	< 0.00012 U	--	--	--	< 0.00012 U	--	--	--	--	< 0.00012 U	< 0.00012 U
Vanadium	Total	mg/l	**0.0263**	**0.0086**	**0.00034 J**	--	--	--	**0.00095 J**	--	--	--	--	**0.0011**	**0.0018**
Zinc	Total	mg/l	< 0.0065 U	**0.0077 J**	**0.0090 J**	--	--	--	< 0.0065 U	--	--	--	--	< 0.0065 U	< 0.0065 U
SVOCs															
1,2,4,5-Tetrachlorobenzene	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
1,4-Dioxane	NA	ug/l	< 1.0 U	< 1.0 U	< 1.0 U	--	--	--	< 1.0 U	--	--	--	--	< 1.0 U	< 1.0 U
2,2'-oxybis (1-chloropropane)	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

		Location	SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
		Date	11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
		Sample Type	N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
		Data Status	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
		LAB_SDG	SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													
2,3,4,6-Tetrachlorophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2,4,5-Trichlorophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2,4,6-Trichlorophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2,4-Dichlorophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2,4-Dimethylphenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2,4-Dinitrophenol	NA	ug/l	< 10 U	< 10 U	< 10 U	--	--	--	< 10 U	--	--	--	--	< 10 U	< 10 U
2,4-Dinitrotoluene	NA	ug/l	< 1.0 U	< 1.0 U	< 1.0 U	--	--	--	< 1.0 U	--	--	--	--	< 1.0 U	< 1.0 U
2,6-Dinitrotoluene	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2-Chloronaphthalene	NA	ug/l	< 0.40 U	< 0.41 U	< 0.42 U	--	--	--	< 0.40 U	--	--	--	--	< 0.40 U	< 0.41 U
2-Chlorophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2-Methyl-4,6-dinitrophenol	NA	ug/l	< 5.0 U	< 5.1 U	< 5.2 U	--	--	--	< 5.0 U	--	--	--	--	< 5.0 U	< 5.1 U
2-Methylnaphthalene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
2-Methylphenol (o-cresol)	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2-Nitroaniline	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
2-Nitrophenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
3,3`-Dichlorobenzidine	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
3-Nitroaniline	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Bromophenyl phenyl ether	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Chloro-3-methylphenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Chloroaniline	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
4-Chlorophenyl phenyl ether	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Methylphenol (p-cresol)	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Nitroaniline	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
4-Nitrophenol	NA	ug/l	< 10 U	< 10 U	< 10 U	--	--	--	< 10 U	--	--	--	--	< 10 U	< 10 U
Acenaphthene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Acenaphthylene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Acetophenone	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Anthracene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Atrazine	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Benz(a)anthracene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Benzaldehyde	NA	ug/l	< 1.0 U	< 1.0 U	< 1.0 U	--	--	--	< 1.0 U	--	--	--	--	< 1.0 U	< 1.0 U
Benzo(a)pyrene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Benzo(b)fluoranthene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Benzo(g,h,i)perylene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Benzo(k)fluoranthene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Biphenyl	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Bis(2-chloroethoxy)methane	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Bis(2-chloroethyl)ether	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Bis(2-ethylhexyl)phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Butyl benzyl phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Caprolactam	NA	ug/l	< 5.0 U	< 5.1 U	< 5.2 U	--	--	--	< 5.0 U	--	--	--	--	< 5.0 U	< 5.1 U
Carbazole	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Chrysene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Dibenz(a,h)anthracene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

		Location	SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
		Date	11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
		Sample Type	N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
		Data Status	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
		LAB_SDG	SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													
Dibenzofuran	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Diethyl phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Dimethyl phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Di-n-butyl phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Di-n-octyl phthalate	NA	ug/l	< 2.0 U	< 2.0 U	< 2.1 U	--	--	--	< 2.0 U	--	--	--	--	< 2.0 U	< 2.1 U
Fluoranthene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Fluorene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Hexachlorobenzene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Hexachlorobutadiene	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Hexachlorocyclopentadiene	NA	ug/l	< 5.0 U	< 5.1 U	< 5.2 U	--	--	--	< 5.0 U	--	--	--	--	< 5.0 U	< 5.1 U
Hexachloroethane	NA	ug/l	< 1.0 U	< 1.0 U	< 1.0 U	--	--	--	< 1.0 U	--	--	--	--	< 1.0 U	< 1.0 U
Indeno(1,2,3-cd)pyrene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Isophorone	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Naphthalene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Nitrobenzene	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
n-Nitrosodi-n-propylamine	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
n-Nitrosodiphenylamine	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Pentachlorophenol	NA	ug/l	< 1.0 U	< 1.0 U	< 1.0 U	--	--	--	< 1.0 U	--	--	--	--	< 1.0 U	< 1.0 U
Phenanthrene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
Phenol	NA	ug/l	< 0.50 U	< 0.51 U	< 0.52 U	--	--	--	< 0.50 U	--	--	--	--	< 0.50 U	< 0.51 U
Pyrene	NA	ug/l	< 0.10 U	< 0.10 U	< 0.10 U	--	--	--	< 0.10 U	--	--	--	--	< 0.10 U	< 0.10 U
VOCs															
1,1,1-Trichloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,1,2,2-Tetrachloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,1,2-Trichloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,1-Dichloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,1-Dichloroethylene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,2,3-Trichlorobenzene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
1,2,4-Trichlorobenzene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
1,2-Dibromo-3-chloropropane (DBCP)	NA	ug/l	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	--	< 2 U	--	--	--	--	< 2 U	< 2 U
1,2-Dibromoethane (EDB)	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,2-Dichlorobenzene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
1,2-Dichloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,2-Dichloroethylene, cis	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,2-Dichloroethylene, trans	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,2-Dichloropropane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,3-Dichlorobenzene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
1,3-Dichloropropene, cis	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,3-Dichloropropene, trans	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
1,4-Dichlorobenzene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
2-Hexanone	NA	ug/l	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	--	< 3 U	--	--	--	--	< 3 U	< 3 U
Acetone	NA	ug/l	< 6 U	< 6 U	< 6 U	< 6 U	< 6 U	--	< 6 U	--	--	--	--	< 6 U	< 6 U
Benzene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Bromochloromethane	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

		Location	SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
		Date	11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
		Sample Type	N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
		Data Status	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
		LAB_SDG	SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													
Bromodichloromethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Bromoform	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Bromomethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Carbon disulfide	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
Carbon tetrachloride	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Chlorobenzene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Chlorodibromomethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Chloroethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Chloroform	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Chloromethane	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Cumene (isopropyl benzene)	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
Cyclohexane	NA	ug/l	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	--	< 2 U	--	--	--	--	< 2 U	< 2 U
Dichlorodifluoromethane (Freon-12)	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Ethyl benzene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Methyl acetate	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
Methyl ethyl ketone (2-butanone)	NA	ug/l	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	--	< 3 U	--	--	--	--	< 3 U	< 3 U
Methyl isobutyl ketone (MIBK)	NA	ug/l	< 3 U	< 3 U	< 3 U	< 3 U	< 3 U	--	< 3 U	--	--	--	--	< 3 U	< 3 U
Methyl tertiary butyl ether (MTBE)	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Methylcyclohexane	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
Methylene chloride	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Styrene	NA	ug/l	< 1 U	< 1 U	< 1 U	< 1 U	< 1 U	--	< 1 U	--	--	--	--	< 1 U	< 1 U
Tetrachloroethylene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Toluene	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Trichloroethylene (TCE)	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Trichlorofluoromethane (Freon-11)	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Trichlorotrifluoroethane (Freon 113)	NA	ug/l	< 2 U	< 2 U	< 2 U	< 2 U	< 2 U	--	< 2 U	--	--	--	--	< 2 U	< 2 U
Vinyl chloride	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Xylene, m & p	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Xylene, o	NA	ug/l	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	< 0.5 U	--	< 0.5 U	--	--	--	--	< 0.5 U	< 0.5 U
Pesticides															
4,4'-DDD	NA	ug/l	< 0.0042 UD1	< 0.0043 UD1	< 0.0040 UD2	--	--	--	< 0.0040 UD1	--	--	--	--	< 0.0040 UD1	< 0.0042 UD1
4,4'-DDE	NA	ug/l	< 0.0042 UD2	< 0.0043 UD1	< 0.0040 UD2	--	--	--	< 0.0040 UD1	--	--	--	--	< 0.0040 UD1	< 0.0042 UD1
4,4'-DDT	NA	ug/l	< 0.0044 UD1	< 0.0044 UD1	< 0.0042 UD2	--	--	--	< 0.0042 UD1	--	--	--	--	< 0.0042 UD1	< 0.0043 UD1
a-BHC	NA	ug/l	< 0.0025 UD1	< 0.0026 UD1	< 0.0024 UD1	--	--	--	< 0.0024 UD1	--	--	--	--	< 0.0024 UD2	< 0.0025 UD1
Aldrin	NA	ug/l	< 0.0017 UD1	< 0.0017 UD1	< 0.0016 UD1	--	--	--	< 0.0016 UD2	--	--	--	--	< 0.0016 UD2	< 0.0017 UD2
b-BHC	NA	ug/l	< 0.0028 UD2	< 0.0029 UD2	< 0.0027 UD2	--	--	--	< 0.0027 UD2	--	--	--	--	< 0.0050 UVD2	**0.0042 JBPD2**
Chlordane, cis (alpha)	NA	ug/l	< 0.0025 UD2	< 0.0026 UD1	< 0.0024 UD1	--	--	--	< 0.0024 UD2	--	--	--	--	< 0.0024 UD2	< 0.0025 UD2
Chlordane, trans (gamma)	NA	ug/l	< 0.0059 UD1	< 0.0060 UD2	**0.0076 JPD2**	--	--	--	< 0.0056 UD1	--	--	--	--	< 0.0056 UD1	< 0.0058 UD1
d-BHC	NA	ug/l	< 0.0028 UD1	< 0.0029 UD1	< 0.0027 UD2	--	--	--	< 0.0027 UD1	--	--	--	--	< 0.0027 UD1	< 0.0028 UD1
Dieldrin	NA	ug/l	**0.0069 JPD2**	< 0.0045 UD1	< 0.0043 UD2	--	--	--	< 0.0043 UD1	--	--	--	--	< 0.0043 UD2	< 0.0044 UD1
Endosulfan I	NA	ug/l	**0.048 D1**	< 0.0037 UD2	< 0.0035 UD2	--	--	--	< 0.0035 UD1	--	--	--	--	< 0.0035 UD2	< 0.0036 UD1
Endosulfan II	NA	ug/l	< 0.013 UD1	< 0.013 UD1	< 0.012 UD2	--	--	--	< 0.012 UD2	--	--	--	--	< 0.012 UD1	< 0.013 UD1
Endosulfan sulfate	NA	ug/l	< 0.0049 UD1	< 0.0050 UD1	< 0.0047 UD1	--	--	--	< 0.0047 UD2	--	--	--	--	< 0.0047 UD2	< 0.0048 UD2
Endrin	NA	ug/l	< 0.0068 UD2	< 0.0069 UD1	< 0.0065 UD1	--	--	--	< 0.0065 UD1	--	--	--	--	< 0.0065 UD2	< 0.0068 UD1

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

		Location	SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
		Date	11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
		Sample Type	N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
		Data Status	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
		LAB_SDG	SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													
Endrin aldehyde	NA	ug/l	< 0.017 UD1	< 0.017 UD1	< 0.016 UD2	--	--	--	< 0.016 UD1	--	--	--	--	< 0.016 UD1	< 0.017 UD1
Endrin ketone	NA	ug/l	< 0.0042 UD2	< 0.0043 UD2	< 0.0040 UD2	--	--	--	< 0.0040 UD1	--	--	--	--	< 0.0040 UD1	< 0.0042 UD1
g-BHC (Lindane)	NA	ug/l	< 0.0017 UD1	< 0.0017 UD1	< 0.0016 UD1	--	--	--	< 0.0016 UD1	--	--	--	--	< 0.0016 UD1	< 0.0017 UD1
Heptachlor	NA	ug/l	< 0.0017 UD2	< 0.0017 UD2	< 0.0016 UD1	--	--	--	< 0.0016 UD2	--	--	--	--	< 0.0016 UD2	< 0.0017 UD2
Heptachlor epoxide	NA	ug/l	< 0.0019 UD1	< 0.0020 UD1	< 0.0018 UD1	--	--	--	< 0.0018 UD1	--	--	--	--	< 0.0018 UD1	< 0.0019 UD1
Methoxychlor	NA	ug/l	< 0.025 UD1	< 0.026 UD1	< 0.024 UD2	--	--	--	< 0.024 UD2	--	--	--	--	< 0.024 UD2	< 0.025 UD2
Toxaphene	NA	ug/l	< 0.25 UD1	< 0.26 UD1	< 0.24 UD1	--	--	--	< 0.24 UD2	--	--	--	--	< 0.24 UD1	< 0.25 UD1
PCBs															
Aroclor 1016	NA	ug/l	< 0.084 UD1	< 0.085 UD1	< 0.080 UD1	--	--	--	< 0.080 UD1	--	--	--	--	< 0.080 UD1	< 0.083 UD1
Aroclor 1221	NA	ug/l	< 0.084 UD1	< 0.085 UD1	< 0.080 UD1	--	--	--	< 0.080 UD1	--	--	--	--	< 0.080 UD1	< 0.083 UD1
Aroclor 1232	NA	ug/l	< 0.17 UD1	< 0.17 UD1	< 0.16 UD1	--	--	--	< 0.16 UD1	--	--	--	--	< 0.16 UD1	< 0.17 UD1
Aroclor 1242	NA	ug/l	< 0.084 UD1	< 0.085 UD1	< 0.080 UD1	--	--	--	< 0.080 UD1	--	--	--	--	< 0.080 UD1	< 0.083 UD1
Aroclor 1248	NA	ug/l	< 0.084 UD1	< 0.085 UD1	< 0.080 UD1	--	--	--	< 0.080 UD1	--	--	--	--	< 0.080 UD1	< 0.083 UD1
Aroclor 1254	NA	ug/l	< 0.084 UD1	< 0.085 UD1	< 0.080 UD1	--	--	--	< 0.080 UD1	--	--	--	--	< 0.080 UD1	< 0.083 UD1
Aroclor 1260	NA	ug/l	< 0.13 UD1	< 0.13 UD1	< 0.12 UD1	--	--	--	< 0.12 UD1	--	--	--	--	< 0.12 UD1	< 0.13 UD1
Aroclor 1262	NA	ug/l	< 0.17 UD1	< 0.17 UD1	< 0.16 UD1	--	--	--	< 0.16 UD1	--	--	--	--	< 0.16 UD1	< 0.17 UD1
Aroclor 1268	NA	ug/l	< 0.13 UD1	< 0.14 UD1	< 0.13 UD1	--	--	--	< 0.13 UD1	--	--	--	--	< 0.13 UD1	< 0.13 UD1
Per- and Polyfluoroalkyl Substances															
n-Ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	NA	ng/l	< 1 U	< 0.4 U	< 0.4 U	--	--	< 0.4 U	< 0.4 U	< 0.7 U	< 0.7 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U
n-Methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA)	NA	ng/l	< 1 U	< 0.4 U	< 0.4 U	--	--	< 0.4 U	< 0.4 U	< 0.7 U	< 0.7 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.7 U	< 0.3 U	**0.5 J**	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorobutanoic acid (PFBA)	NA	ng/l	**38**	**4 J**	**8**	--	--	< 2 U	< 2 U	< 3 U	< 3 U	< 2 U	< 2 U	< 2 U	< 2 U
Perfluorodecanoic acid (PFDA)	NA	ng/l	**14 B**	**0.6 J**	**0.5 J**	**1 J**	**10**	< 0.4 U	**0.4 J**	< 0.7 U	**1 J**	**0.6 J**	**0.6 J**	< 0.4 U	< 0.4 U
Perfluorododecanoic acid (PFDoA / PFDoDA)	NA	ng/l	**1 J**	< 0.3 U	< 0.3 U	**0.5 J**	**0.4 J**	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	**120**	**11**	**23**	**0.6 J**	**2**	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 1 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.7 U	< 0.7 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U
Perfluorohexanoic acid (PFHxA)	NA	ng/l	**170**	**11**	**21**	**2**	**1**	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorononanoic acid (PFNA)	NA	ng/l	**15**	**0.9 J**	**1**	**0.5 J**	**6**	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorooctane sulfonate (PFOS)	NA	ng/l	**20**	**2 J**	**1 J**	**2 J**	**13**	< 0.7 U	< 0.7 U	< 1 U	< 1 U	< 0.7 U	< 0.7 U	< 0.7 U	< 0.7 U
Perfluorooctanesulfonamide (PFOSA / FOSA)	NA	ng/l	**1 J**	< 0.3 U	< 0.3 U	--	--	**0.3 J**	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorooctanoic acid (PFOA)	NA	ng/l	**9800 B**	**360**	**1000**	**2**	**10**	< 0.3 U	**1**	**2**	**2 J**	**1**	**2**	**0.5 J**	**0.4 J**
Perfluoropentanoic acid (PFPeA)	NA	ng/l	**110**	**5**	**11**	--	--	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorotetradecanoic acid (PFTA / PFTeDA / PFTeA)	NA	ng/l	< 0.7 U	< 0.3 U	< 0.3 U	**0.3 J**	< 0.3 U	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluorotridecanoic acid (PFTrDA / PFTriA)	NA	ng/l	< 0.7 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.5 U	< 0.5 U	< 0.3 U	< 0.3 U	< 0.3 U	< 0.3 U
Perfluoroundecanoic acid (PFUnA / PFUnDA)	NA	ng/l	**3 J**	< 0.4 U	< 0.4 U	< 0.4 U	**1 J**	< 0.4 U	< 0.4 U	< 0.7 U	< 0.7 U	< 0.4 U	< 0.4 U	< 0.4 U	< 0.4 U

-- Not analyzed.

N: Normal Sample.

B: Lancaster lab qualifier - Indicates that the analyte was detected in the blank.

D1: Lancaster lab qualifier - Indicates for the dual column analyses that the result is reported from column 1.

D2: Lancaster lab qualifier - Indicates for the dual column analyses that the result is

Table 3
SGPP McCaffrey Site
Water Treatment Demonstration Test/Batch Water Treatment Analytical Results

Location			SG1-IDW-1	SG1-IDW-2	SG1-DEV-1	SG1-FRAC-RB01	SG1-FRAC-RB02	SG1-D-MIDEFF	SG1-D-DEMO-1	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-MIDEFF	SG1-B-EFF	SG1-B-DEMO-1	SG1-B-DEMO-2
Date			11/03/2017	11/03/2017	11/15/2017	11/15/2017	11/17/2017	11/20/2017	11/20/2017	11/21/2017	11/21/2017	11/22/2017	11/22/2017	11/27/2017	11/27/2017
Sample Type			N	N	N	Rinse Blank	Rinse Blank	N	N	N	N	N	N	N	N
Data Status			Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced	Not Verified/Qced
LAB_SDG			SMC05	SMC05	SMC17	SMC16	SMC20	SMC21	SMC21	SMC21	SMC21	SMC22	SMC22	SMC23	SMC23
Parameter	Total or Dissolved	Units													

reported from column 2.

J: Lancaster lab qualifier - Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL).

P: Lancaster lab qualifier - Concentration difference between the primary and confirmation column >40%. The lower result is reported.

U: Lancaster lab qualifier - Analyte was not detected at the value indicated.

V: Lancaster lab qualifier - Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference.

APPENDIX D
AQUIFER TEST WATER TREATMENT RESULTS MEMORANDUM EVALUATION

Memorandum

To: Kirk Moline, CT Male
From: Katie Wolohan, Brian Angerman, Sara Ramsden, Katrina Marini, Barr Engineering
Subject: Aquifer Test Water Treatment Results – McCaffrey Street Site
Date: June 6, 2018
Project: 32421001.02
c: Dan Reilly, CT Male

The purpose of this memorandum is to provide a summary of the recent water treatment activities completed at the Saint-Gobain Performance Plastics (SGPP) McCaffrey Street facility in Hoosick Falls, New York (the Site) for groundwater generated during multiple-well aquifer tests associated with interim remedial measure (IRM) design at the Site.

Water Treatment Activities

Multiple-well aquifer tests were conducted at pumping wells PW-19 and PW-04 between April 23rd and April 28th, 2018. The maximum pumping rate measured during the tests was 16.5 gallons per minute (gpm). Groundwater from the tests was treated and stored in frac tanks at the Site between April 23rd and May 1st, 2018.

Water treatment was consistent with the work plan information submitted to the New York State Department of Environmental Conservation (NYSDEC) on November 7th, 2017 (C.T. Male, 2017) and updated April 3rd, 2018 (C.T. Male, 2018). Groundwater produced during the multiple-well aquifer tests was temporarily stored in frac tanks at the Site, then treated through cartridge filters (for removal of any solids) and a lead/lag granular activated carbon (GAC) mobile treatment system at approximately 45 gpm. The treated water was temporarily stored in clean frac tanks prior to discharge to the Village of Hoosick Falls (Village) sanitary sewer, through permission received from the Village wastewater treatment plant via email on April 19, 2018 (Village WWTP, 2018). All treated water was discharged to the Village sanitary sewer at approximately 15 gpm. The total volume of groundwater produced, treated, and discharged during the multiple-well aquifer tests at the Site was 84,095 gallons.

Water Treatment Results

Table 1 enclosed with this letter provides a summary of the samples collected at different stages of the treatment process. Table 2 enclosed provides the analytical results associated with the samples collected. Note that the analytical data provided is not validated.

The mobile water treatment system treated PFAS compounds to below the laboratory detection limit for all compounds.

Summary

The water treatment approach selected was demonstrated effective in treating PFAS from the groundwater generated during the multiple-well aquifer tests.

Attachments

Table 1 – Aquifer Test Water Treatment Sampling Summary
Table 2 – Aquifer Test Water Treatment Analytical Results

References

C.T. Male Associates, 2017. IRM Investigative Work – Water Treatment Approach, Groundwater Interception Design Saint-Gobain, McCaffrey Street Site, 14 McCaffrey Street, Village of Hoosick Falls, Rensselaer County, DEC Site No,: 442046. Prepared for Saint-Gobain Performance Plastics Corp. Email submittal from Kirk Moline of C.T. Male to James Moras of NYSDEC, November 7, 2017.

C.T. Male Associates, 2018. Pending 72 Pumping Test- McCaffrey Street Site. Email from Kirk Moline of C.T. Male to William Shaw and Susan Edwards of NYSDEC, April 3, 2018.

Village of Hoosick Falls Wastewater Treatment Plant (Village WWTP), 2018. RE: Hoosick Falls WWTP & 72-Hour Pump Test of 2 Wells. Email from Ken Holbrook of Village WWTP to Dan Reilly of C.T. Male, April 19, 2018.

Table 1: Aquifer Test Water Treatment Sampling Summary

McCaffrey Street Site
Hoosick Falls, New York

Sample Name[1]	Date Collected	Sample Description
SG1-PT-GAC-MIDEFF	4/24/2018	Sample collected between lead/lag GAC vessels on first day of treatment of water from PW-19.
SG1-PT-GAC-EFF	4/24/2018	Sample collected from GAC system effluent on first day of treatment of water from PW-19.
SG1-PT-PW19-GAC-INF	4/25/2018	Sample collected from PW-19 tap.
SG1-PT-GAC-EFF	4/25/2018	Sample collected from GAC system effluent on second day of treatment of water from PW-19.
SG1-PT-GAC-EFF	4/26/2018	Sample collected from GAC system effluent on first day of treatment of composite water from PW-19 and PW-04.
SG1-PT-GAC-EFF	4/27/2018	Sample collected from GAC system effluent on first day of treatment of water from PW-04 alone.
SG1-PT-PW04-GAC-INF	4/27/2018	Sampled collected from PW-04 tap.
SG1-PT-GAC-EFF	4/30/2018	Sample collected from GAC system effluent on final day of treatment of water from PW-04.
SG1-PT-GAC-MIDEFF	4/30/2018	Sampled collected between lead/lag GAC vessels on final day of treatment of water from PW-04.

Notes

[1] See Table 2 for analytical results.

Table 2: Aquifer Test Water Treatment Analytical Results

McCaffrey Street Site

Hoosick Falls, New York

		Location	**PT-GAC-MIDEFF**	**PT-GAC-EFF**	**PT-PW19-GAC-INF**	**PT-GAC-EFF**	**PT-GAC-EFF**	**PT-PW04-GAC-INF**	**PT-GAC-EFF**	**PT-GAC-EFF**	**PT-GAC-MIDEFF**
		Date	**4/24/2018**	**4/24/2018**	**4/25/2018**	**4/25/2018**	**4/26/2018**	**4/27/2018**	**4/27/2018**	**4/30/2018**	**4/30/2018**
		Sample Type	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**	**N**
		Data Status	**No QC**	**No QC**	**No QC**	**No QC**	**No QC**	**No QC**	**No QC**	**No QC**	**No QC**
		LAB_SDG	**SMC55**	**SMC55**	**SMC56**	**SMC56**	**SMC57**	**SMC58**	**SMC58**	**SMC59**	**SMC59**
Parameter	Total or Dissolved	Units									
General Parameters											
Alkalinity, bicarbonate, as CaCO3	NA	mg/l	--	**195**	**195**	**197**	**221**	**223**	**234**	**230**	**223**
Alkalinity, carbonate, as CaCO3	NA	mg/l	--	< 1.7 U	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7	< 1.7 U	< 1.7 U
Alkalinity, total, as CaCO3	NA	mg/l	--	**195**	**195**	**197**	**221**	**223**	**234**	**230**	**223**
Carbon, total organic	NA	mg/l	--	< 0.50 U	**0.74 J**	< 0.50	**0.55 J**	**0.67 J**	< 0.50	< 0.50 U	< 0.50 U
Chloride	NA	mg/l	--	**45.7**	**54.8**	**54.4**	**105**	**160**	**136**	**173**	**160**
Cyanide	NA	mg/l	--	< 0.0050 U	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050 U	< 0.0050 U
Hardness, as CaCO3	NA	mg/l	--	**269**	**248**	**275**	**288**	**330**	**331**	**313**	**298**
Nitrogen, ammonia, as N	NA	mg/l	--	< 0.050 U	< 0.050	< 0.050	< 0.050	**0.054 J**	**0.051 J**	< 0.050 U	< 0.050 U
pH	NA	pH units	--	**8.0**	**8.0**	**7.9**	**8.0**	**7.5**	**7.9**	**7.7**	**7.7**
Solids, total dissolved	NA	mg/l	--	**317**	**358**	**368**	**471**	**624**	**606**	**618**	**593**
Solids, total suspended	NA	mg/l	--	< 1.00 U	**1.04 J**	< 1.00	< 1.00	< 1.00	< 1.00	< 1.00 U	< 1.00 U
Specific conductance @ 25 ºC	NA	umhos/cm	--	**617**	**602**	**634**	**832**	**1050**	**1020**	**1020**	**1020**
Sulfate, as SO4	NA	mg/l	--	**35.7**	**21.2**	**23.1**	**29.4**	**30.6**	**30.0**	**31.4**	**32.2**
Temperature	NA	deg C	--	**22.8**	**22.2**	**22.0**	**22.3**	**22.3**	**22.3**	**23.0**	**23.0**
Turbidity	NA	NTU	--	**0.20 J**	**0.25 J**	**0.25 J**	**0.30 J**	**1.0**	**0.20 J**	**0.35 J**	**0.55 J**
Metals											
Aluminum	Total	mg/l	--	< 0.0894 U	< 0.0894	< 0.0894	< 0.0894	< 0.0894	< 0.0894	< 0.0894 U	< 0.0894 U
Antimony	Total	mg/l	--	< 0.00045 U	< 0.00045	< 0.00045	< 0.00045	< 0.00045	< 0.00045	**0.00045 U**	**0.00045 U**
Arsenic	Total	mg/l	--	< 0.00072 U	< 0.00072	< 0.00072	< 0.00072	< 0.00072	< 0.00072	< 0.00072 U	< 0.00072 U
Barium	Total	mg/l	--	**0.0822**	**0.0556**	**0.0790**	**0.104**	**0.0489**	**0.0946**	**0.0887**	**0.0697**
Beryllium	Total	mg/l	--	< 0.000071 U	< 0.000071	< 0.000071	< 0.000071	< 0.000071	< 0.000071	< 0.000071 U	< 0.000071 U
Cadmium	Total	mg/l	--	< 0.00015 U	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	**0.00015 U**	**0.00015 U**
Calcium	Total	mg/l	--	**76.8**	**70.7**	**70.9**	**86.0**	**98.5**	**100**	**101**	**98.6**
Chromium	Total	mg/l	--	< 0.00087 U	< 0.00087	< 0.00087	< 0.00087	< 0.00087	< 0.00087	< 0.00087 U	< 0.00087 U
Cobalt	Total	mg/l	--	**0.00041 J**	**0.00021 J**	< 0.00016	**0.00027 J**	< 0.00016	**0.00050 J**	**0.00037 J**	**0.00036 J**
Copper	Total	mg/l	--	**0.0066**	**0.00069 J**	**0.0054**	**0.0061**	**0.0167**	**0.0077**	**0.0079**	**0.0130**
Iron	Total	mg/l	--	< 0.0805 U	< 0.0805	< 0.0805	< 0.0805	< 0.0805	< 0.0805	< 0.0805 U	< 0.0805 U
Lead	Total	mg/l	--	< 0.00011 U	< 0.00011	< 0.00011	< 0.00011	**0.0013 J**	< 0.00011	< 0.00011 U	< 0.00011 U
Magnesium	Total	mg/l	--	**13.9**	**13.6**	**13.4**	**15.3**	**16.0**	**16.2**	**16.3**	**16.0**
Manganese	Total	mg/l	--	**0.227**	**0.103**	**0.0993**	**0.132**	**0.0858**	**0.274**	**0.236**	**0.169**
Mercury	Total	mg/l	--	< 0.000050 U	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050	< 0.000050 U	< 0.000050 U
Nickel	Total	mg/l	--	< 0.0010 U	< 0.0010	< 0.0010	< 0.0010	< 0.0010	**0.0016 J**	**0.0015 J**	**0.0018 J**
Potassium	Total	mg/l	--	**1.85**	**1.37**	**1.38**	**1.60**	**1.28**	**1.42**	**1.34**	**1.28**
Selenium	Total	mg/l	--	**0.0014 J**	**0.00061 J**	**0.0013 J**	**0.0015 J**	**0.00062 J**	**0.0013 J**	**0.0012 J**	**0.00088 J**
Silver	Total	mg/l	--	< 0.00015 U	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015	< 0.00015 U	< 0.00015 U
Sodium	Total	mg/l	--	**38.1**	**38.9**	**42.2**	**65.3**	**96.6**	**88.6**	**98.8**	**98.0**
Thallium	Total	mg/l	--	< 0.00012 U	< 0.00012	< 0.00012	< 0.00012	< 0.00012	< 0.00012	< 0.00012 U	< 0.00012 U
Vanadium	Total	mg/l	--	**0.00085 J**	< 0.00021	**0.00069 J**	**0.0010**	< 0.00021	**0.00069 J**	**0.00058 J**	**0.00049 J**
Zinc	Total	mg/l	--	**0.0109 J**	< 0.0065	**0.0065 J**	< 0.0065	**0.0557**	< 0.0065	**0.0075 J**	**0.0215 J**
Per- and Polyfluoroalkyl Substances											
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	ng/l	< 2.7 U	< 2.7 U	< 0.92	< 0.93	< 0.93	< 0.92	< 0.92	< 0.92 U	< 0.92 U
8:2 Fluorotelomer sulfonate (8:2 FTS)	NA	ng/l	< 1.8 U	< 1.8 U	< 1.8	< 1.9	< 1.9	< 1.8	< 1.8	< 1.8 U	< 1.8 U
n-Ethyl perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	NA	ng/l	< 0.92 U	< 0.92 U	< 0.92	< 0.93	< 0.93	< 0.92	< 0.92	< 0.92 U	< 0.92 U
n-Methyl perfluorooctanesulfonamidoacetic acid (MeFOSAA)	NA	ng/l	< 0.92 U	< 0.92 U	< 0.92	< 0.93	< 0.93	< 0.92	< 0.92	< 0.92 U	< 0.92 U
Perfluorobutane sulfonate (PFBS)	NA	ng/l	< 0.27 U	< 0.27 U	**0.64 J**	< 0.28	< 0.28	**1.1**	< 0.28	< 0.28 U	< 0.27 U
Perfluorobutanoic acid (PFBA)	NA	ng/l	< 1.8 U	< 1.8 U	**7.5**	< 1.9	< 1.9	**18**	< 1.8	< 1.8 U	< 1.8 U
Perfluorodecane sulfonate (PFDS)	NA	ng/l	< 0.55 U	< 0.55 U	< 0.55	< 0.56	< 0.56	< 0.55	< 0.55	< 0.55 U	< 0.55 U
Perfluorodecanoic acid (PFDA)	NA	ng/l	< 0.92 U	< 0.92 U	< 0.92	< 0.93	< 0.93	**2.0**	< 0.92	< 0.92 U	< 0.92 U
Perfluorododecanoic acid (PFDoA / PFDoDA)	NA	ng/l	< 0.27 U	< 0.27 U	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28 U	< 0.27 U
Perfluoroheptane sulfonate (PFHpS)	NA	ng/l	< 0.37 U	< 0.37 U	< 0.37	< 0.37	< 0.37	< 0.37	< 0.37	< 0.37 U	< 0.37 U
Perfluoroheptanoic acid (PFHpA)	NA	ng/l	< 0.27 U	< 0.27 U	**23**	< 0.28	< 0.28	**47**	< 0.28	< 0.28 U	< 0.27 U
Perfluorohexane sulfonate (PFHxS)	NA	ng/l	< 0.37 U	< 0.37 U	**0.47 J**	< 0.37	< 0.37	**0.64 J**	< 0.37	< 0.37 U	< 0.37 U
Perfluorohexanoic acid (PFHxA)	NA	ng/l	< 0.37 U	< 0.37 U	**22**	< 0.37	< 0.37	**45**	< 0.37	< 0.37 U	< 0.37 U
Perfluorononanoic acid (PFNA)	NA	ng/l	< 0.37 U	< 0.37 U	**2.1**	< 0.37	< 0.37	**3.6**	< 0.37	< 0.37 U	< 0.37 U
Perfluorooctanesulfonamide (PFOSA / FOSA)	NA	ng/l	< 0.92 U	< 0.92 U	< 0.92	< 0.93	< 0.93	< 0.92	< 0.92	< 0.92 U	< 0.92 U
Perfluorooctanesulfonate (PFOS)	NA	ng/l	< 0.37 U	< 0.37 U	**1.5 J**	< 0.37	< 0.37	**5.1**	< 0.37	< 0.37 U	< 0.37 U
Perfluorooctanoic acid (PFOA)	NA	ng/l	< 0.27 U	< 0.27 U	**1100**	< 0.28	< 0.28	**2200**	< 0.28	< 0.28 U	< 0.27 U
Perfluoropentanoic acid (PFPeA)	NA	ng/l	< 1.8 U	< 1.8 U	**10**	< 1.9	< 1.9	**26**	< 1.8	< 1.8 U	< 1.8 U
Perfluorotetradecanoic acid (PFTA / PFTeDA / PFTeA)	NA	ng/l	< 0.27 U	< 0.27 U	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28 U	< 0.27 U
Perfluorotridecanoic acid (PFTrDA / PFTriA)	NA	ng/l	< 0.27 U	< 0.27 U	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28	< 0.28 U	< 0.27 U
Perfluoroundecanoic acid (PFUnA / PFUnDA)	NA	ng/l	< 0.37 U	< 0.37 U	< 0.37	< 0.37	< 0.37	< 0.37	< 0.37	< 0.37 U	< 0.37 U

-- Not analyzed.

N: Normal Sample.

J: Lancaster lab qualifier - Estimated value >= the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL).

U: Lancaster lab qualifier - Analyte was not detected at the value indicated.

APPENDIX E
EVALUATION OF POTENTIAL IRM IMPACT TO VILLAGE WELL 7

Potential for adverse interference of proposed the proposed IRM with the operation of Village Well 7

The objective of the IRM is to intercept the migration of PFOA in groundwater from the McCaffrey Street Site within the capture zone of the Village wells, such that over time, the mass of PFOA migrating to the Village wells is decreased, and influent concentrations in raw water entering the Village WTP are reduced. The IRM location was selected, in part, to minimize the potential for interference with the Village Water Supply. The proposed IRM consists of two vertical wells.

The potential for the IRM to interfere with Village Wells 3 and 7 is judged to be negligible based on the information presented below.

1). Figure 1, adapted from DeSimone (2017a, 2017b, 2018), shows the relative elevations of the IRM interception well screens and the screens of Village Wells 3 and 7. Selected slides from DeSimone, 2018 are included in Attachment A. The IRM is expected to draw water down to an elevation now lower than approximately 408 to 410 feet NAVD88. The screen of Village Well 3 extends from 388 to 376 ft NAVD88. The screen of Village Well 7 extends from 365 to 350 ft NAVD88. Given these relative elevations, the IRM cannot physically dewater either Village Well 3 or Village Well 7.

2). As quantified below, the transmissivity of the deep unconsolidated aquifer in the vicinity of the IRM is much lower than in the vicinity of Village Wells 3 and 7. This means that the drawdown caused by operation of the IRM will not be widespread and that Village Wells 3 and 7 produces the majority of their water from the much more transmissive portions of the aquifer near the wells.

Driscoll (1986, p. 1021) provides the following equation to estimate the specific capacity of a well in a confined aquifer.

$$\frac{Q}{s} = \frac{T}{2000}$$

where:

Q is the pumping rate of the well in gpm,

s is the drawdown in the pumped well in feet, and

T is the transmissivity of the aquifer in gal/day/ft.

This equation can be used to estimate the transmissivity of an aquifer based on the specific capacity of a well completed in it. Well 7 had a specific capacity of 27 gpm/ft when pumped at 1000 gpm for 3 days (C.T. Male, 2002). The proposed IRM interception wells (PW04 and PW19) were pumped in April 2018 and had specific capacities of 2 gpm/ft after pumping for 2 days at 12 gpm (PW04) and 1 gpm/ft when pumping for 2 days at 9 gpm (PW19). Using the average specific capacity value in the vicinity of the IRM, the transmissivity of the deep unconsolidated aquifer in that area is approximately 3,000 gal/day/ft, whereas the transmissivity in the vicinity of Village Well 7 is approximately 54,000 gal/day/ft. This is a factor of 18 higher than in the vicinity of the IRM and is a further indication that operation of the IRM will have a negligible effect on the ability to utilize Village Well 7 for municipal source water. This transmissivity estimate for Village Well 7 is consistent with other estimates in the well field such as 92,000 gal/day/ft based on testing of Village Well 3 (Dunn, 1983).

3). The April 2018 pumping test included operating IRM test wells PW04 and PW19 simultaneously at a combined rate of 15 gpm. No drawdown was measured during the testing at well PZ05, located approximately 300 feet from PW19, between the IRM test wells and Village Wells 3 and 7 (Figure 2). PZ05 is 840 feet from Village Well 3 and 640 feet from Village Well 7. The IRM is expected to produce more water under wetter conditions, when groundwater elevations will also be higher in the Village well field, but is not expected to produce water at rates that are substantially higher than was pumped during this testing.

4). Groundwater elevations in well TW07, located within 10 feet of Village Well 7, were monitored for extended periods in the fall of 2017 and spring of 2018. During that time, the groundwater elevation while Village Well 7 was pumping was no less than 40 feet above the top of the screen and as much as 57 feet above the top of the screen when Village Well 7 was not pumping. With this amount of additional drawdown available near Village Well 7, the operation of the proposed IRM is expected to have negligible influence on the ability of Village Well 7 to produce raw water for the Village.

Similar information is not available at Village Well 3, but Village Well 3 is further from the proposed IRM and closer to the Hoosic River, which is believed to recharge the aquifer system in which the Village wells are screened.

References

C.T. Male, 2002. Pumping test data for Village Well 7.

DeSimone, D.J., 2018. Surficial Geology of Hoosick Falls, NY with Surficial Geologic Map at 1:12,000 and Interpretive Cross Section through the Village Well Field. Slides presented at the 2018 GSA Northeast Section Meeting, Burlington, VT.

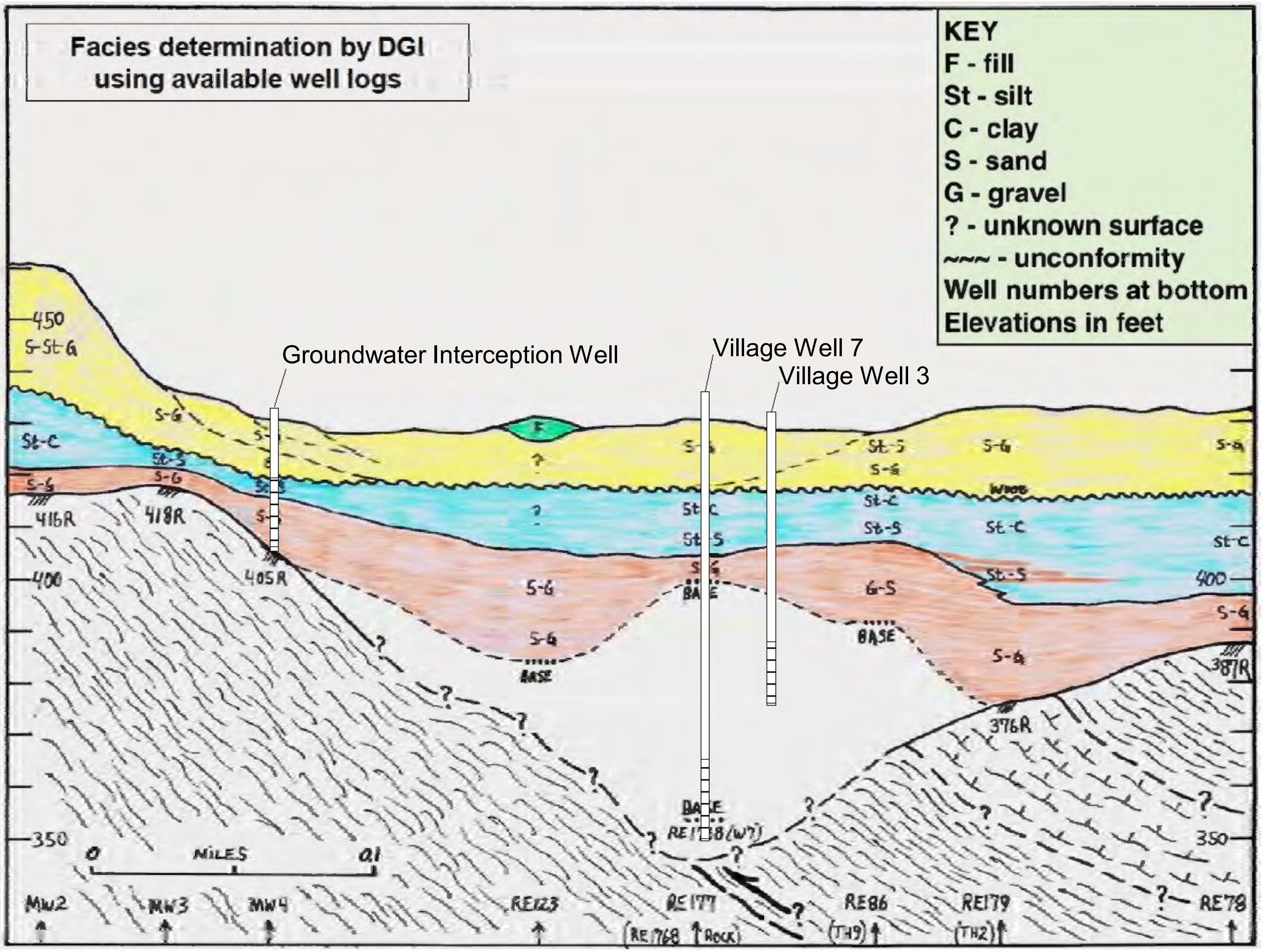
DeSimone, D.J., 2017a. Surficial Geology of Hoosick Falls, NY with Surficial Geologic Map at 1:12,000 and Interpretive Cross Section through the Village Well Field.

DeSimone, D.J., 2017b. Surficial Geology of Hoosick Falls, NY with Implications for Hydrogeology of Village Aquifer. A Report to Accompany Surficial Geologic Map and Cross Sections. Prepared under contract to Hoosick Falls Central School District. January 2017.

Driscoll, F.G., 1986. Groundwater and Wells, 2nd edition. Johnson Filtration Systems, Inc., St. Paul, MN, 1089 p.

Dunn Geoscience Corp, 1983, Hydrogeologic evaluation of the Hoosick Falls aquifer, Phase II: Latham, N.Y., Dunn Geoscience Corp., project 191-1-2005.

Figures



After DeSimone, D.J., 2018, 2017a, and 2017b

Figure 1. Illustration of the relative elevations of the proposed IRM Interception Well screens and the screens of Village Wells 3 and 7.

Locations With Response to Pumping

- ▲ RuggedTroll 100
- ● LevelTroll 700

Locations With No Response to Pumping

- ▲ RuggedTroll 100
- ● LevelTroll 700
- ◎ Manual Measurement
- Approximate Saint-Gobain Property Boundary
- ⊕ Village Well

PW-19 pumped at 9 gpm from 4/23 – 4/26/2018

PW-04 pumped at 6 gpm 4/25 – 4/26/2018

PW-04 pumped at 12 gpm 4/26 – 4/28/2018

Aerial Imagery: State of New York 2017

N

0 170 340

Feet

MAP OF THE 2018 MCCAFFREY IRM PUMPING TESTS SHOWING LOCATIONS OF WELLS IN WHICH MEASURABLE RESPONSES TO PUMPING WERE RECORDED

Saint-Gobain

Hoosick Falls, NY

FIGURE 2

Bara Footer: ArcGIS 10.6, 2018-07-20 13:18 File: I:\Client\Saint_Gobain\Hoosick_Falls_NY\Maps\Reports\2018\McCaffrey Pumping Test\Figure 2 Measurable Responses to Pumping.mxd User: EMA

Attachment 1

Selected Slides from DeSimone, 2018

Surficial Geology of Hoosick Falls, NY with Surficial Geologic Map at 1:12,000 and Interpretive Cross Section through the Village Well Field

David J DeSimone, PhD

DeSimone Geoscience Investigations (DGI)

hawkeye272david@yahoo.com

prepared under contract to
Hoosick Falls Central School District
January 2017

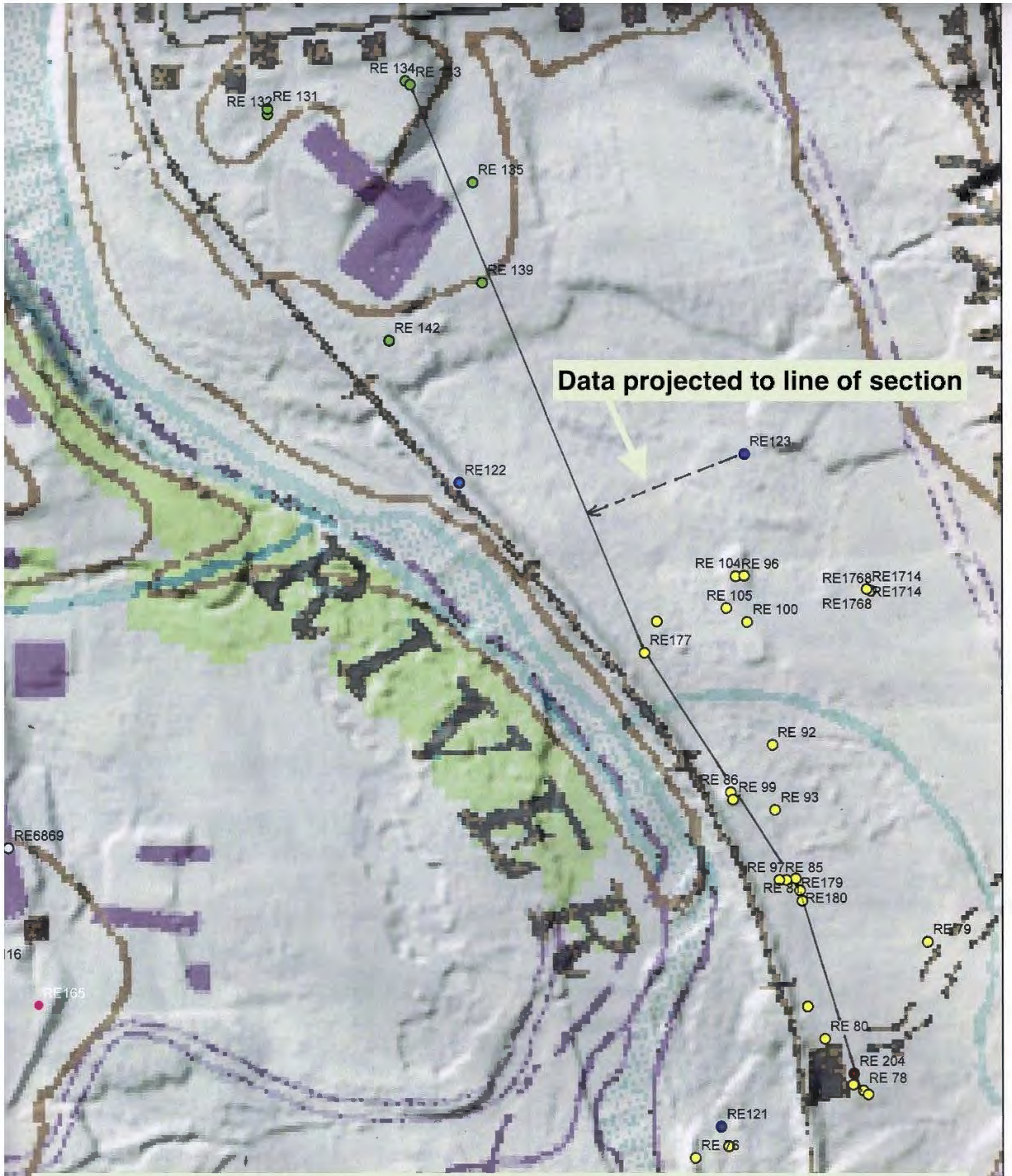
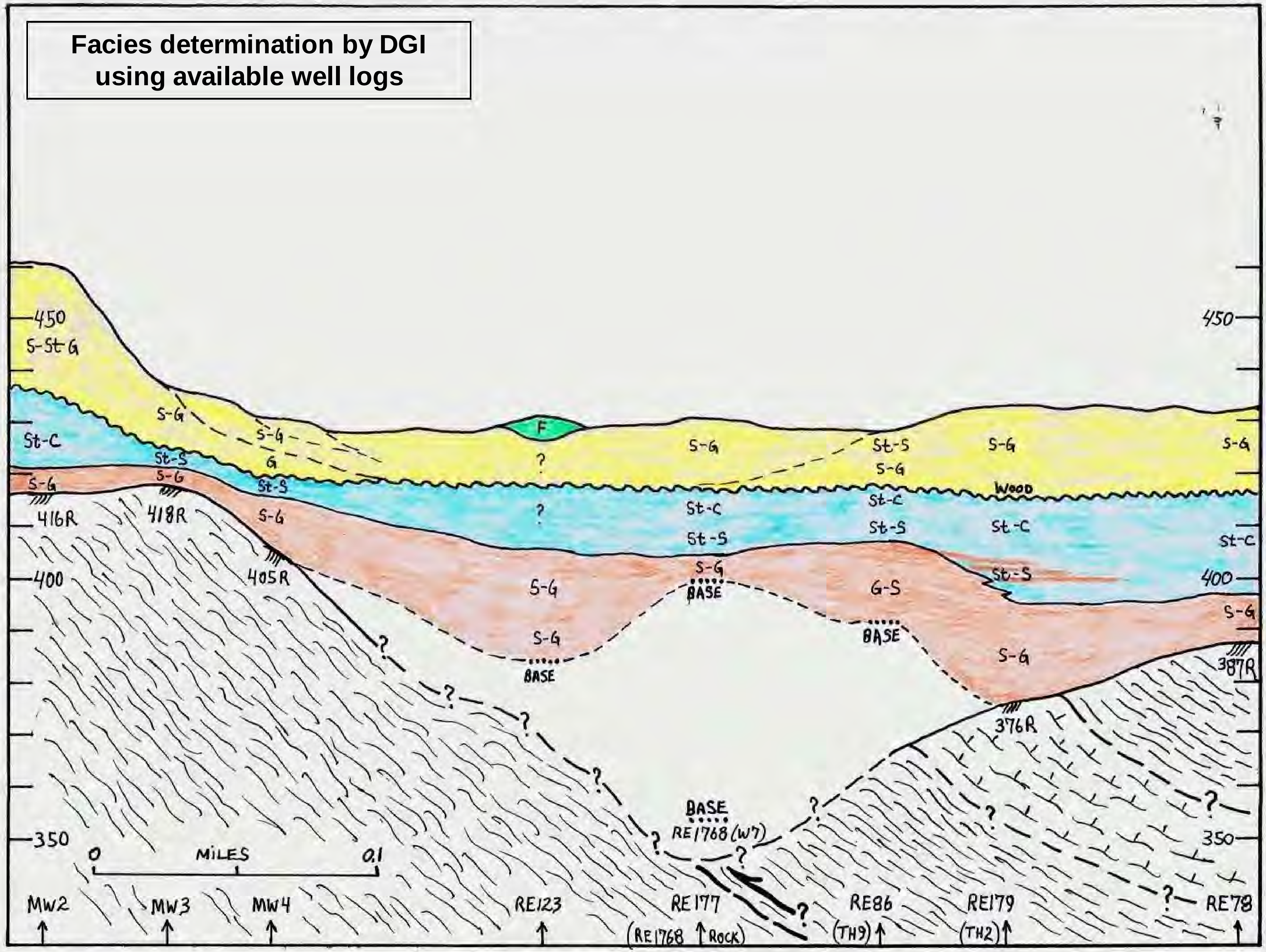


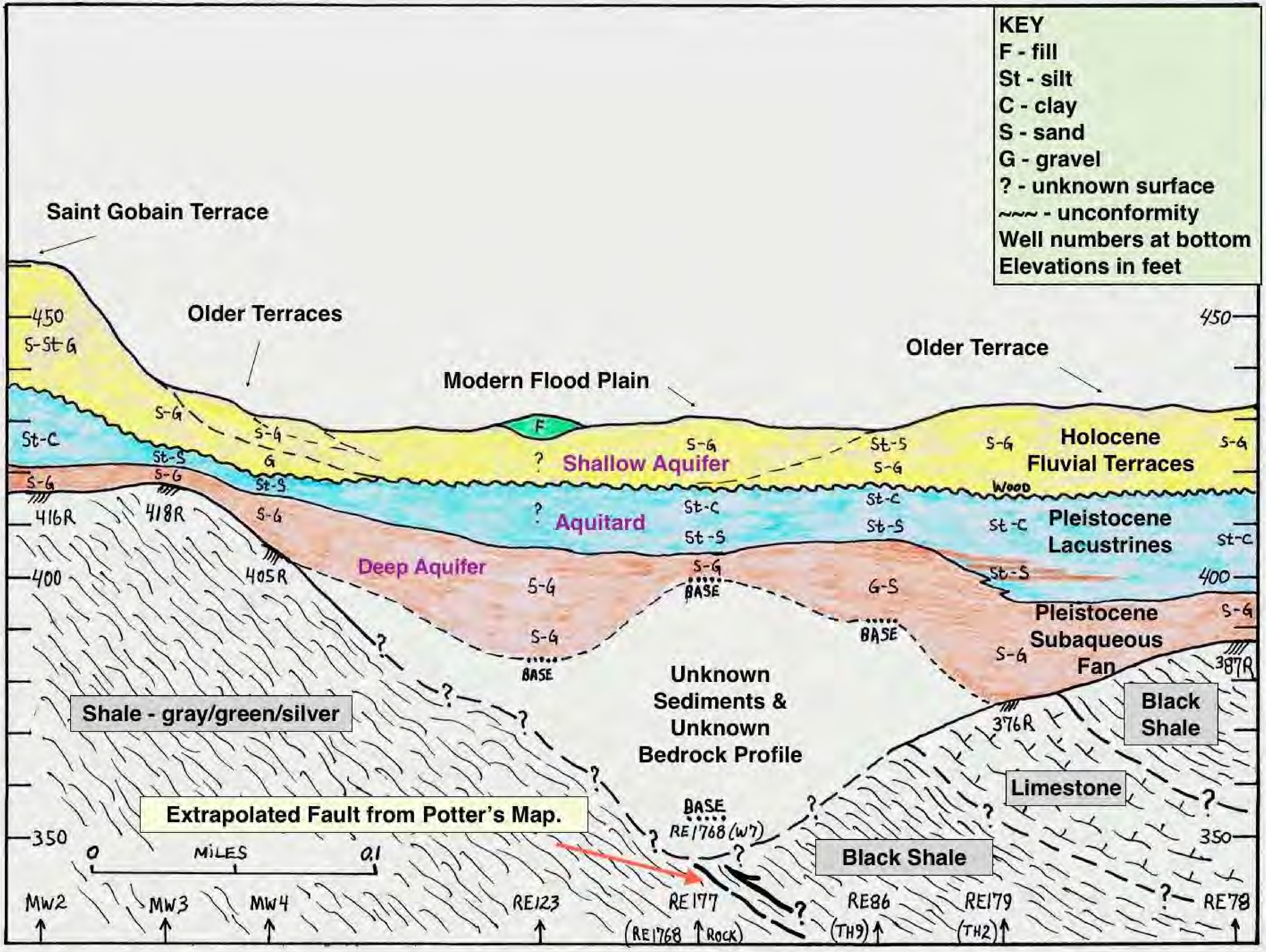
Figure 1: Line of cross section shown on map of well locations

Map courtesy of USGS



Facies determination by DGI using available well logs

Data from 8 logs used to construct simplified depiction of sediments and bedrock profile



Origins & Hydrogeologic Classification of Sediments

APPENDIX F

442046 – 2019-03-13 – DISCHARGE PERMIT EQUIVALENT – EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS – FINAL

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water, Bureau of Permits
625 Broadway, Albany, New York 12233-3505
P: (518) 402-8111 | F: (518) 402-9029
www.dec.ny.gov

MEMORANDUM

TO: William Shaw, DER
FROM: Erik Posner, DOW EP
SUBJECT: Saint-Gobain Performance Plastics, McCaffrey Street Facility
DRAINAGE BASIN: 11-02 (Hoosick River)
DATE: March 13, 2019

Please find effluent limitations and monitoring requirements for the above noted remediation dewatering discharge.

The DOW does not have any regulatory authority over a discharge from a State, PRP, or Federal Superfund Site. DER will be responsible for ensuring compliance with the attached effluent limitations and monitoring requirements, and approval of all engineering submissions. All effluent results, engineering submissions, and modification requests must be sent to the DER Project Manager identified in Footnote 1. The Regional Water Engineer should be kept appraised of the status of this discharge and, in accordance with the attached criteria, receive a copy of the effluent results for informational purposes.

If you have any questions, please contact me at (518) 402-8259.

Attachment (Effluent Limitations and Monitoring Requirements)

ec: Derek Thorsland, Regional Water Engineer (w/attach)
Donald Canestrari, BWP Section Chief, DOW (w/attach)

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

During the period beginning **January 1, 2019** and lasting until **December 31, 2023** the discharges from the wastewater treatment facility (consisting of filtration, metering and carbon adsorption) to the Hoosick River, water index number H-264, Class C(T) shall be limited and monitored by the operator as specified below:

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Monthly Avg.	Daily Max.		Measurement Frequency	Sample Type
Outfall 001 - Treated Remediation Discharge:					
Flow Rate	Monitor	72000	GPD	Continuous	Recorder
pH (range)	6.0-9.0 (Range)		S.U.	1/month	Grab
Total Suspended Solids	Monitor	50	mg/L	1/month	Grab
Settleable Solids	Monitor	0.1	mL/L	1/month	Grab
Total Dissolved Solids	Monitor	Monitor	mg/L	1/month	Grab
Oil & Grease	Monitor	15	mg/L	1/month	Grab
Dissolved Oxygen	Monitor	6.0 (Min)	mg/L	1/month	Grab

Outfall Number and Parameter	Discharge Limitations		Units	Minimum Monitoring Requirements	
	Monthly Avg.	Action Level		Measurement Frequency	Sample Type
Outfall 01A – ¼” Test Port between Lead GAC and Lag GAC					
Perfluorooctanoic acid (PFOA)	Monitor	* (See footnote 1)	ng/L	1/month	Grab
Perfluorooctanesulfonic acid (PFOS)	Monitor	* (See footnote 1)	ng/L	1/month	Grab

(1) Monitoring for PFOS and PFOA shall use EPA Method 537, Version 1.1 and shall occur after the first of two granular activated carbon (GAC) filters in series. Upon receipt of analytical results for PFOS or PFOA with detectable levels at or above the Lowest Concentration Minimum Reporting Level (LCMRL), a confirmatory sample shall immediately be collected from the same location and analyzed to verify exceedance of the LCMRL action level.

If the confirmatory sample yields results for PFOS or PFOA at or above the EPA Method 537, Version 1.1 LCMRL, the lead GAC filter shall be replaced within 30 days of receipt of the confirmatory results, using the following step-wise procedure: the lead GAC filter shall be removed, the lag GAC filter shall become the lead filter, and a new GAC filter shall be installed in the lag position. If the lead GAC filter that had exceeded the action limit for PFOS or PFOA in the confirmatory sample is not changed out within 30 days of receipt of the sample results, discharge shall be temporarily ceased until GAC filter change out as noted above occurs.

If the confirmatory sample results are below the EPA Method 537, Version 1.1 LCMRL for PFOS and PFOA, sampling frequency will continue 1/month as indicated in the table above.

Additional Conditions:

1. Discharge is not authorized until such time as an engineering submission showing the method of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. All monitoring data, engineering submissions and modification requests must be submitted to:

William Shaw, P.G.
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233-7013
(518) 402-9554

With a copy sent to:

Derek Thorsland, P.E.
Regional Water Engineer, Region 4
1130 North Wescott Road
Schenectady, NY 12306-2014
(518) 357-2219

2. Only site generated wastewater is authorized for treatment and discharge.

3. Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received six (6) months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

4. Both concentration (mg/L, µg/L, or ng/L) and mass loadings (lbs/day) must be reported to the Department for all parameters except flow and pH.

5. Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

6. This discharge and administration of this discharge must comply with the substantive requirements of 6NYCRR Part 750.

APPENDIX G
IRM CONCEPT PLAN LETTER, August 28, 2017

C.T. MALE ASSOCIATES
Engineering, Surveying, Architecture & Landscape Architecture, D.P.C.
50 Century Hill Drive, Latham, NY 12110
518.786.7400 FAX 518.786.7299 www.ctmale.com

August 28, 2017 ***Via Email***

Mr. James Moras, P.E.
Section Chief
Section C, Remedial Bureau B
New York State Department of Environmental Conservation
Division of Environmental Remediation
625 Broadway
Albany, NY 12233-7015
james.moras@dec.ny.gov

RE: IRM Concept Plan
Groundwater Interception Design
Saint-Gobain, McCaffrey Street Site
14 McCaffrey Street
Village of Hoosick Falls, Rensselaer County
DEC Site No.: 442046

Dear Mr. Moras:

The purpose of this letter is to outline the proposed next steps in evaluating fate and transport and potential interim remedial measures (IRMs) at the Saint-Gobain Performance Plastics (SGPP) McCaffrey Street facility in Hoosick Falls, New York (the Site). As previously discussed with the Department, IRMs would be considered once sufficient site data had been developed as necessary to screen and evaluate such efforts. Based on the work completed to date, we believe that an IRM can be considered at this time.

The groundwater interception IRM under evaluation may consist of a series of recovery wells or a drain, depending on the resolution of property access issues and the results of the scope of work described below. In order to gather sufficient data for design of these IRMs to capture, contain and treat groundwater and to foster regulatory approval, the following initial tests are proposed:

1. **Accelerated Column Test**
2. **Water Treatment Demonstration Test**
3. **Multiple-Well Pumping Tests**

The tests described in this letter are conceptual. Detailed interim remedial action work plans will be developed for both the water treatment demonstration test and the multiple-well pumping tests upon concept approval by the New York State Department of Environmental Conservation (NYSDEC).

Accelerated Column Test

Accelerated column testing (ACT) will be performed by Calgon to simulate the performance of a full-scale granular activated carbon (GAC) water treatment system to remove PFAS from extracted groundwater. An ACT is a test to estimate the carbon usage rate based on the adsorptive capacity of materials and kinetics of adsorption for a given application by scaling-down the conventional column testing hardware. Calgon recommends that the groundwater sent for testing be as representative as possible of the groundwater that will be extracted and treated as part of the full-scale system, including the same potential upstream pretreatment that would be completed in the field, to the extent possible. Since the carbon particles used in ACT are ground to a fine mesh, they will not exhibit the same filtration properties as the full-scale system or the pressure drop that would occur. Therefore, Calgon recommends that the groundwater sent for testing be free of any suspended solids.

Calgon has developed an accurate model of the column adsorption process that is used to calculate the breakthrough curves for full-scale adsorption systems. ACT simulates 1-2 years of run time over approximately one month of testing. Results will inform:

- Recommended empty-bed contact time (EBCT) for larger-scale vessels
- Rate of carbon adsorption
- Estimate of carbon replacement frequency
- Estimates of the carbon use rate at breakthrough and when anticipated breakthrough would occur

Approximately 55 gallons of groundwater are required to complete the ACT. Groundwater will be collected from an existing monitoring well or combination of wells pending further recommendation from Calgon on suitable PFAS concentration for the ACT to be representative considering the wide range of observed PFAS concentrations at the site. Groundwater collection from MW-10 and other wells located on the southeastern portion of the Site is preliminarily being considered.

Water Treatment Demonstration Test

The demonstration test will consist of a small-scale GAC treatment test to supplement the ACT completed by Calgon. The purpose of the demonstration test will be to verify the results of the ACT and the water treatment approach planned for the multiple-well pumping tests described in the next section. The demonstration test will utilize water from the two newly-developed pumping wells (PW-04 and PW-19) described in the next section. Water will be pumped from the new pumping wells, into a frac tank for storage (and incidental aeration and settling of solids) prior to treatment. At this time, it is anticipated that the demonstration test treatment will incorporate Calgon F400AW carbon, however, the exact volume of groundwater to be treated and GAC to be utilized is still under design consideration. The treated discharge will be routed to a second frac tank to allow for sampling and analysis prior to discharge to the Hoosic River, discharge to the Village of Hoosick Falls publicly owned treatment works, or offsite disposal, whichever is deemed appropriate based on analytical testing and results, and regulatory approval. Both discharge and offsite disposal options will be evaluated.

If the demonstration test is effective at treating groundwater from PW-04 and PW-19 to appropriate discharge limits, the multiple-well pumping tests will follow using a larger-scale treatment system that can accommodate the anticipated flow, without storage of the pumped water. Analytical results from the demonstration test combined with the ACT will be used to obtain regulatory approval and necessary permits for discharge or disposal of groundwater generated during the multiple-well pumping test and for discharge of groundwater generated as part of full-scale interim remedial measures (IRMs). A detailed demonstration test plan will be prepared that includes test methods and recommended analytical sampling. If accepted by the regulators, a mobile laboratory may be brought onsite to shorten the turn-around time for analytical results.

Multiple-Well Pumping Tests

Two or three pumping tests will be performed to assess the variability in aquifer properties in the unconsolidated deposits, to assess the hydraulic connection between the unconsolidated deposits and bedrock, and to provide information for designing the groundwater interception IRM using a groundwater flow model. Pumping wells will be installed near existing monitoring wells MW-04, which is completed at the base of the unconsolidated deposits, and MW-19, which is completed in the bedrock. The testing plan outlined below is subject to change based on field conditions. For example, if it is determined that there would be significant advantage to pumping the two proposed wells simultaneously, the test may proceed in that manner.

The new pumping wells are shown as PW-04 and PW-19 on Figure 1. The pumping wells will be installed approximately 15 feet away from the existing monitoring wells, offset as indicated in Figure 1 to maximize the chances these wells can be retained if a remedial drain is eventually installed. In addition, a new observation well in the unconsolidated materials will be installed as close as practical to the bedrock monitoring well MW-19.

The new pumping wells will be 6-inch diameter wells that will be installed in unconsolidated materials above the bedrock with 15-foot long, stainless steel wire-wrapped screens with a slot size determined by materials encountered in the field and a total depth as close to the top of bedrock as possible. All well materials will be evaluated to be free of perfluorinated compounds per existing standard procedures. The screens of these wells will penetrate most or all of the saturated thickness of the unconsolidated materials at these locations. The new observation well near MW-19 will be installed in a manner similar to existing wells at the Site. The new pumping wells may also serve as permanent recovery wells if they are not removed for construction of other IRMs.

Each pumping test will include a step-drawdown test up to 8 hours in duration to determine the maximum pumping rate that is likely to be sustainable from each pumping well over a constant-rate pumping period, followed by an aquifer recovery period of equal or greater length or until 95% recovery has been achieved, followed by a constant-rate pumping test of up to 72 hours in duration. As noted above, the second unconsolidated aquifer pumping test may be staged to overlap the first test in order to maximize the stress on the aquifer system. In addition, if a measureable response to pumping of PW-19 does not occur in MW-19, a step-drawdown test and up to 24-hour constant-rate pumping test will also be considered for the bedrock monitoring well (MW-19). MW-19 will have more available drawdown than PW-19 and slug testing results at MW-19 indicate a hydraulic conductivity of 2.3 ft/day.

During the pumping tests, it is anticipated that all groundwater will be pumped through a mobile water treatment system that includes GAC vessels (filled with Calgon F400 carbon) for PFAS removal prior to discharge, if the ACT and demonstration test described in the previous sections indicates this is acceptable and the necessary approvals are received.

A pumping test of similar scope may be performed between the Site and the Village well field if it is determined that the groundwater interception IRM must include vertical wells to capture and treat groundwater between the Site and the Village well field. The location and specifications for this testing would be based on information gathered during the supplemental field investigation in this area.

Summary and Next Steps

Accelerated Column Testing

Calgon has been engaged to determine lab availability and to schedule the ACT. Calgon is planning to complete an ACT that simulates one year of full-scale operation of the lead bed in a lead-lag treatment system. The test will last approximately one month, and samples will be collected frequently to capture breakthrough of PFAS compounds and total organic carbon (TOC). ACT results will be used to design GAC water treatment and pretreatment for the multiple-well pumping tests and the full-scale IRM water treatment system.

Water Treatment Demonstration Test

The water treatment demonstration test will be conducted prior to the multiple-well pumping test, using water from newly-developed pumping wells PW-04 and PW-19, to assist with design considerations for the water treatment system that will be used during the multiple-well pumping tests and potentially for water generated as part of the IRMs.

Multiple-Well Pumping Tests

The yield of the proposed pumping well for the aquifer test is currently hard to predict based on the highly variable hydraulic conductivity measurements estimated from slug testing of monitoring wells onsite and the limited saturated thickness of unconsolidated material in the area of interest. If a pumping test is completed using a well with low yield, the pumping test will provide information on a small portion of the aquifer through which the interim measure would be installed. For this reason, two pumping test locations have been identified to provide information on variability of aquifer properties. Aquifer testing features will be designed and located such that they also have utility as recovery wells or long-term IRM monitoring points. A groundwater interception remedial design plan will be developed and executed based on the results of the pumping tests and resolution of property access issues.

Once the Department has reviewed this plan, we would be pleased to schedule and attend a meeting to further discuss the plan and address any questions or comments you may have. If you have any questions in the meantime, please feel free to contact me at your convenience.

Respectfully submitted,

C.T. MALE ASSOCIATES

Daniel Reilly, P.E.
Division Manager, Environmental Services

Attachment: Figure 1

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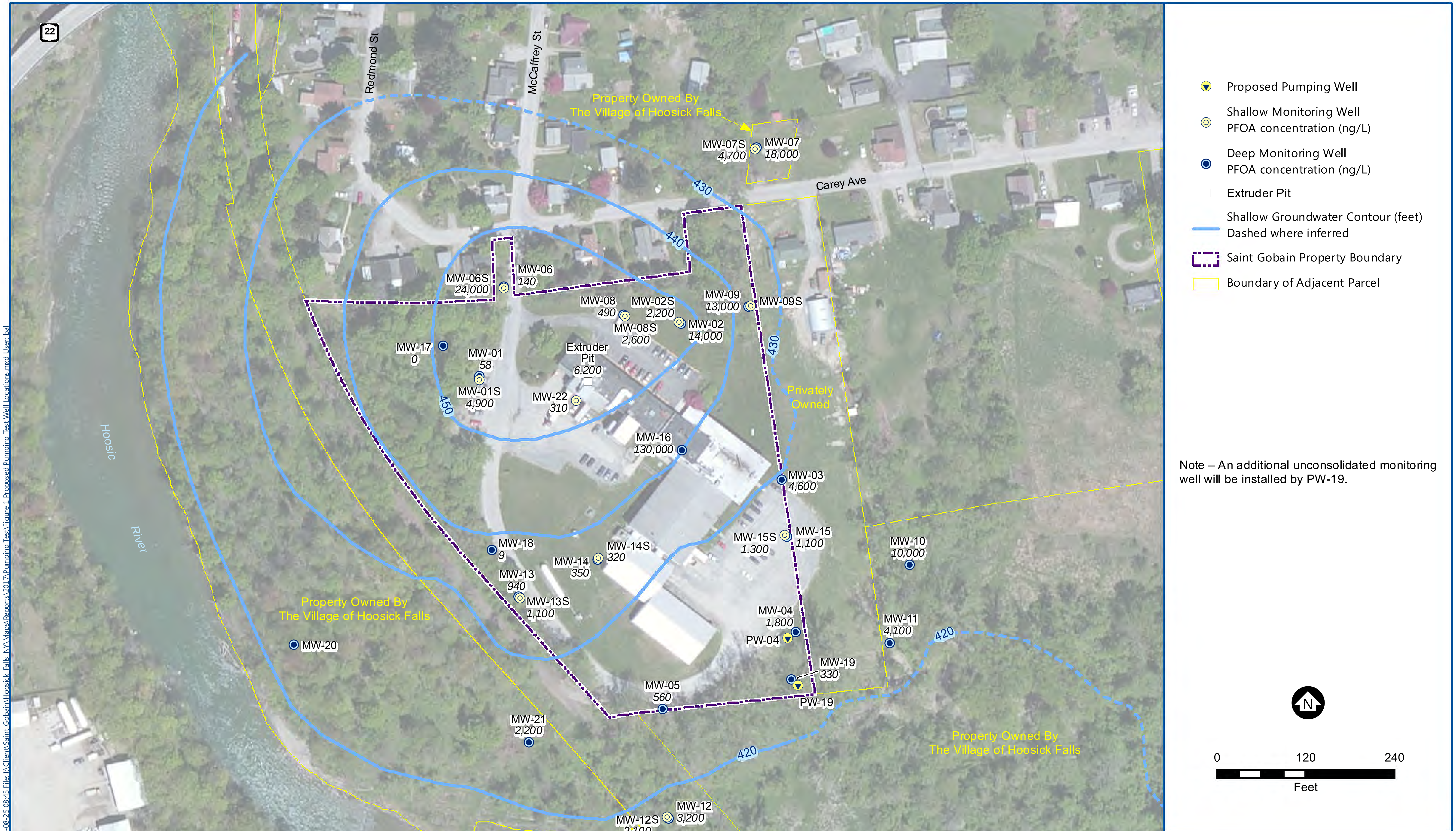

Note – An additional unconsolidated monitoring well will be installed by PW-19.

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PROPOSED PUMPING TEST
WELL LOCATIONS
Saint-Gobain
Hoosick Falls, NY

FIGURE 1