Saint-Gobain McCaffrey Street Site (Site #: 442046)
Village of Hoosick Falls Water Supply Project
Basis of Design Report

Honeywell International Inc.
115 Tabor Road
Morris Plains, NJ 07950

Saint-Gobain Performance Plastics
14 McCaffrey Street
Hoosick Falls, NY 12090

Prepared by:

III Winners Circle
Albany, New York 12205
(518) 453-4500

Matthew B. Abatto, P.E.
Vice President, CHA Consulting, Inc.

WSP USA Environment & Infrastructure Inc.
300 Great Oaks Office Park – Suite 300
Albany, New York 12203

Client Ref. No.: 3617227571

CHA Project Ref. No.: 76850

Date:

October 2023

This document is intended only for the use of the individual or entity for which it was prepared and may contain information that is privileged, confidential and exempt from disclosure under applicable law. Any dissemination, distribution or copying of this document is strictly prohibited.

Version Control

Issue	Revision No	Date Issued	Page No	Description	Reviewed by
V1	1	May 25, 2023	All	Addressing Honeywell/Saint-Gobain Comments	MBA
V2	2	June 23, 2023	All	Addressing Village Comments	MBA
V3	3	October 20, 2023	All	Addressing DEC/DOH Comments	MBA

TABLE OF CONTENTS

TABLES

APPENDICES

LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
ANSI	American National Standards Institute
AWWA	American Water Works Association
BOD	Basis of Design
GPM	Gallons Per Minute
GAC	Granular Activated Carbon
GWUDI	Ground Water Under the Direct Influence (of Surface Water)
HDPE	High Density Polyethylene
MCL	Maximum Contaminant Level
MWS	Municipal Water Supply
MGD	Million Gallons per Day
mg/L	Milligrams per liter
MPA	Microscopic Particulate Analysis
ng/L	Nanograms per liter
NSF	National Sanitation Foundation
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
NYSHPO	New York State Historic Preservation Office
PE	Polyethylene
PFAS	Per- and polyfluoroalkyl Substances
PFBA	Perfluorobutanoic Acid
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
POET	Point-of-Entry Treatment
PLC	Programmable Logic Controller
ROW	Right-of-Way
ROD	Record of Decision
SCADA	Supervisory Control and Data Acquisition
USACE	United States Army Corps of Engineers
VFD	Variable Frequency Drive
WTP	Water Treatment Plant

1 INTRODUCTION

The Basis of Design (BOD) Report for Operable Unit 2 (OU-02) of the Saint-Gobain McCaffrey Street Site (Site) in the Village of Hoosick Falls (Village) was prepared pursuant to the OU-02 Record of Decision (ROD) issued in December 2021 by the New York State Department of Environmental Conservation (NYSDEC). The BOD Report is submitted pursuant to a NYSDEC Order On Consent and Settlement Agreement (Index No. CO 4-20160212-18) dated June 3, 2016, as amended May 11, 2023 and entered into with Honeywell International Inc. (Honeywell) and Saint-Gobain Performance Plastics Corporation (Saint-Gobain). Honeywell and Saint-Gobain are collectively referred to in this BOD Report as the Companies. CHA Consulting Inc. (CHA) was retained by WSP USA Environment & Infrastructure Inc. (WSP) and WSP was contracted by Honeywell to prepare the BOD Report.

OU-02, which is one of three operable units for the Site, includes the existing Municipal Water Supply (MWS) for the Village. The two other operable units that were defined for the Site are Operable Unit 1 (OU-01) and Operable Unit 3 (OU-03). OU-01 includes the 6.41–acre site, as well as groundwater contamination directly attributable to on-Site disposal of hazardous waste, and OU-03 encompasses the area associated with potential atmospheric deposition of Site-related contaminants or direct off-Site disposal of Site-related liquid and/or solid wastes.

As set forth in the ROD, the selected remedy for OU-02 includes the installation of a new waterline which will connect two new groundwater wells located west of the Hoosic River and south of the Village to the existing water treatment plant (WTP) located on Water Works Road. It is anticipated by the Companies and Village that the new groundwater supply wells and other associated hardware required by the ROD will all constitute improvements to the MWS and be dedicated to the Village upon completion of the MWS construction. Accordingly, the Companies entered into a voluntary agreement with the Village to review the design and construction of the improvements.

The objective of the BOD Report is, in general, to set forth design elements, plans, procedures and methods to implement the OU-02 remedial action. The BOD Report describes the proposed work which, in general, includes development of two new municipal groundwater wells, installation of a transmission main to the existing WTP, and construction of a well house with associated controls, equipment, and site improvements.

In accordance with the ROD, the new water supply wells are required to meet a maximum daily demand of 1.13 million gallons per day (MGD) or 785 gallons per minute (gpm) with full redundancy. Therefore, the two new water supply wells will provide 100% of the required demand for the Village, while Village Well 7 will serve as a backup well.

The BOD Report is organized into the following sections:

Section 2 - Provides a summary of the existing water supply infrastructure (WTP and distribution system), a description of the current source water characteristics, and a summary of existing and projected future water demand.

Section 3 – Contains a description of the primary components of the OU-02 design required to implement the remedy presented in the ROD, including: development of a new well field, stabilization of the bank of the Hoosic River adjacent to the new well field; design of a transmission main to convey water from the new well field to the existing water treatment plant; controls, instrumentation, and security measures required to operate and monitor

the new water supply infrastructure; and development of a long-term groundwater monitoring program to track potential migration of PFAS toward the new well field.

Section 4 - Presents the implementation plan for the project, including required regulatory permits and approvals, the project schedule, and opinion of probable construction costs.

The BOD Report is a component of the design submission to the NYSDEC and New York State Department of Health (NYSDOH) for permitting and approval of the Village's new MWS groundwater source. It is the expectation that the NYSDOH and the NYSDEC will review this BOD Report and associated design drawings and specifications, and provide comments for incorporation into the final design with the ultimate goal of receiving an approval letter from the NYSDOH to proceed with the project construction.

2 EXISTING CONDITIONS

2.1 General

The Village of Hoosick Falls is located approximately 4 miles west from the Vermont border, in eastern Rensselaer County, New York. The Hoosic River cuts through the Village running south to north and is a tributary of the Hudson River. FEMA data for the Hoosic River indicates that water depths in the river can fluctuate from 5 to 20-feet deep, which result in areas along the Hoosic River (specifically within the Woods Brook watershed along NYS Route 22) being susceptible to flooding, including the existing Village well field.

The Village's municipal water system provides drinking water to approximately 4,500 residents within the Village limits and 113 users outside of the Village through 1,500 service connections. Water infrastructure within the Village consists of three groundwater wells, the Village WTP on Water Works Road, two water storage tanks, two small hydropneumatic pump stations, and a water distribution system consisting mostly of 6- and 8-inch piping.

2.2 Source Water Characteristics

The Village currently obtains its water supply from three groundwater wells (Wells 3, 6, and 7). Water quality testing for the existing groundwater supply wells has indicated that iron and manganese concentrations present in the aquifer exceed the maximum contaminant levels (MCLs) set by regulatory agencies. The most recent water quality testing data for Well 6 is from 2006, while Wells 3 and 7 were sampled and tested in 2019. Existing concentrations of iron and manganese in the existing groundwater supply wells are provided as Table 1.

Table 1 - Existing Iron and Manganese Concentrations

Groundwater Well	Iron Concentration (mg/L)	Manganese Concentration (mg/L)	Combined Iron and Manganese Concentration (mg/L)
Well 3	**0.33**[2]	**1.10**[3]	**1.43**[4]
Well 6[1]	**1.54**[1,2]	**0.66**[1,3]	**2.20**[1,4]
Well 7	**0.41**[2]	0.08	0.49

1. Water quality data for Well 6 reflects values from 2006.
2. Value exceeds the Fe MCL of 0.3 mg/L as indicated in NYS Sanitary Code Part 5, Subpart 5-1.
3. Value exceeds the Mn MCL of 0.3 mg/L as indicated in NYS Sanitary Code Part 5, Subpart 5-1.
4. Value exceeds the Combined MCL of 0.5 mg/L as indicated in NYS Sanitary Code Part 5, Subpart 5-1.

The water quality results show that the combined iron and manganese concentrations in Well 7 are just below the combined MCL of 0.5 mg/L, while the combined concentrations in Wells 3 and 6 are above the MCL. In addition, the iron and manganese concentrations for all three wells, except for Well 7's manganese concentration, exceeded the individual MCLs of 0.3 mg/L. All other water quality parameters that the wells were tested for were below regulatory limits with the exception of PFOA. The water quality data indicates that of the three existing supply wells, Well 6 has the highest concentrations of iron and manganese and is therefore maintained in reserve for emergency use only.

In the early 2000's, the Village wells were designated as Groundwater Under the Direct Influence of Surface Water (GWUDI) pursuant to NYSDOH regulations, requiring filtration. Upgrades at the Village WTP to treat PFAS are discussed in Section 2.4.

2.3 Existing and Projected Water Demands

Based on the Village's flow monitoring records from 2017 to 2021, the average daily and maximum day demands for the MWS are approximately 0.26 MGD and 0.596 MGD, respectively. The existing groundwater supply system has rated well capacities such that the maximum day demand could be achieved with the largest well out of service. Rated capacities and pumping test results for the MWS wells are provided in Table 2.

Table 2 - Existing Production Well Capacities

Well	Rated Pump Capacity	Pumping Test Data
Well 3	1,000 gpm	1,080 gpm (2018)
Well 6	300 gpm	431 gpm (2012)
Well 7	1,000 gpm	682 gpm (2012)
Total (All Wells)	**2,300 gpm**	**2,193 gpm**

According to projections from the Capital District Regional Planning Commission, the populations of the Village and Town are forecasted to remain relatively constant through 2050. Additionally, general trends indicate that water usage rates per capita are prone to diminish with time as water conservation measures become more mainstream and high-efficiency water fixtures are adopted into building regulations. Commercial and industrial users also tend to take steps to reduce their water usages over time. However, in contrast to these projections and trends, a conceptual expansion of the existing Village municipal water distribution system into surrounding areas of the Town of Hoosick has been discussed which would add new demand. The projected additional customers could result in projected average daily and maximum daily demands of 0.68 MGD (472 gpm) and 1.13 MGD (785 gpm), respectively. Considering these projections, the OU-02 ROD specifies a maximum day demand of 1.13 MGD (785 gpm). Therefore, for the purposes of this report, the target supply is 785 gpm such that the Village could still meet the maximum daily demand from the system with the largest well out of service.

2.4 Village of Hoosick Falls WTP

The WTP, located at Waterworks Road, was constructed in 2009 to comply with the Long Term 1 Enhanced Surface Water Treatment Rule requirements (67 FR 1812, 2002). The WTP is rated for 1.0 MGD and its original design incorporated the following processes: Pre-Treatment, Membrane Microfiltration, Disinfection, Post-Disinfection, and Corrosion Protection.

Water is pumped from active groundwater wells into a 12-inch ductile iron influent pipe into the WTP. Due to the presence of iron and manganese in the well supply, a pretreatment system is utilized for chemical oxidation of the

metals prior to the filtration system. The pretreatment system includes injection of liquid sodium hypochlorite and potassium permanganate into the raw water to oxidize the soluble iron and manganese into an insoluble form for removal through the filtration system.

After the pretreatment chemicals are injected, water flows into a 27-foot tall, 26,000-gallon pretreatment tank which provides additional time for chemical reactions to take place and allows iron and manganese particles to settle out of solution. From the pretreatment tank, water flows to two membrane filter skids. The membrane units are designed to filter out particulate material and microorganisms down to 3 microns.

In March 2016, in response to PFOA detections, a temporary granular activated carbon (GAC) treatment system was installed at the WTP downstream of the membrane filter units for the removal of organic contaminants and perfluorooctanoic acid (PFOA). The temporary GAC system consisted of two 10-foot diameter vessels each containing 20,000 pounds of GAC piped in a series configuration downstream of the existing microfiltration units. In conjunction with this, the Companies provided free bottled water to Village residents served by the MWS prior to the installation of the full capacity treatment system and to Town residents with private water supplies prior to the installation of individual Point-of-Entry Treatment (POET) systems.

With approval from NYSDOH, the temporary GAC treatment system was replaced with a permanent GAC system in February 2017. The permanent GAC filtration system was installed after the membrane filter units for the removal of organic contaminants and PFOA. The GAC system consists of a 3,000-gallon balance tank, booster pumps, and two 12-foot diameter vessels containing 40,000 pounds of GAC. The GAC vessels are arranged to be operated in series and are regularly sampled and analyzed for 21 per- and polyfluoroalkyl substances (PFAS) at the influent, midpoint, and effluent of the system. The overall GAC system was designed to provide PFOA reduction below 20 nanograms per liter (ng/L) and has proven effective at removing PFOA from the Village water distribution system with PFOA concentrations in the carbon effluent reported as non-detect for the entire duration of the GAC system operation.

Following the GAC treatment system, sodium hypochlorite is injected into the filtered water and conveyed into a 171,000-gallon below grade concrete tank to achieve the necessary disinfection contact times. Finished water is then transferred into a 68,000-gallon clearwell at which point two vertical turbine pumps, each rated at 1.0 MGD, are used to convey the finished water to the Village's existing water storage tanks. Orthophosphates are also added into the discharge piping of the finished water pumps to provide corrosion control of the Village's water distribution system.

2.5 Water Distribution Infrastructure

The Village utilizes two existing storage tanks, located at Rogers Avenue and Rensselaer Street, to meet consumer demand, provide pressure regulation, and meet fire protection needs throughout the area served by the MWS. At both storage tank locations, there are underground hydropneumatic pump stations that provide water to customers immediately adjacent to the tanks. The Rogers Avenue Pump Station services approximately 18 homes on Ashley Drive and Rogers Avenue; the Rensselaer Street Pump Station services approximately 30 homes on

Parsons Avenue, Rensselaer Street, Congress Street, and Oak Street. A summary of the existing water storage tanks is provided as Table 3.

Table 3 - Village's Existing Water Storage Tanks

Location	Construction Type	Volume	Tank Installation Date
Rogers Avenue	Underground Concrete Tank	350,000 gal	Approx. 1950
Rensselaer Street	Aboveground Bolted Glass-fused-to-Steel	360,000 gal	2009

The oldest water distribution piping within the Village is from the early 20th century and was constructed of cast iron and asbestos-cement (i.e., Transite) piping. Newer, or recently replaced, sections of the water distribution system are composed of ductile iron. Pipe sizes within the distribution system range from ¾-inch to 16-inch, with most piping being 6- and 8-inch diameter.

3 OU-02 REMEDY DESIGN

3.1 Overview

The primary components of the OU-02 remedy design are as follows:

- Conversion of the LaCroix test wells into permanent supply wells with installation of submersible well pumps (including pitless adapters, variable frequency drives, and associated controls);
- Riverbank stabilization at the LaCroix property to protect permanent supply wells;
- Construction of a well house to protect controls, electrical equipment, and metering devices;
- Installation of a new transmission water main to convey groundwater from the proposed well field to the Village's WTP;
- General site improvements (including grading, fencing, access roads, security cameras, and stormwater infrastructure);
- Communication and controls integration into the Village's existing supervisory control and data acquisition (SCADA) system;
- Electrical improvements (including new electrical service and standby emergency diesel generator);
- Property Rights, Access, and Purchase Agreements;
- Existing well retrofitting and/or abandonment pertaining to a Groundwater Monitoring Network Plan; and
- Abandonment of Village Wells 3 and 6.

The primary design components are discussed in detail in the following subsections. Appendix A contains the complete design drawings for this project. The design drawings do not include the work related to implementation of the Groundwater Monitoring Plan (submitted to NYSDEC under a separate cover) and abandonment of existing Village wells; these items will be completed separately.

3.2 LaCroix Test Wells Conversion to Permanent Supply Wells

3.2.1 Applicable Regulations

The OU-02 remedy design includes obtaining permits for the new groundwater source for the MWS. Permitting requirements for new municipal water sources are defined in Title 10, NYSDOH, Chapter I, State Sanitary Code Part 5, Subpart 5-1. All work associated with the proposed water system will be completed in accordance with standards specified in the 2022 "Recommended Standards for Water Works" (Appendix 5-A of Part 5, Subpart 5-1), "Standards for Water Wells" (Appendix 5B), and "Special Requirements for Wells Serving Public Water Systems" (Appendix 5-D). Additionally, all wetted materials and components will be certified in accordance with National Sanitation Foundation/American National Standards Institute - 61 (NSF/ANSI-61), a standard that establishes minimum health-effect requirements for the chemical contaminants and impurities that are indirectly imparted to drinking water from products, components and materials used in drinking water systems.

3.2.2 LaCroix Groundwater Source Investigation

Several groundwater source investigations were conducted after 2016 to identify possible alternatives for the MWS. In 2019, the Companies investigated an aquifer on the LaCroix property as a potential location for groundwater source development. The deep sand and gravel aquifer beneath the LaCroix property is estimated to have a thickness of approximately 70-75 feet and is located beneath an approximately 20-foot-thick clay layer making it less likely to be impacted by surface contaminants.

As part of this investigation, a 10-inch test well was installed on the LaCroix property, hereinafter designated LaCroix Well 1, to estimate the potential yield of the aquifer. A 72-hour constant rate pumping test, at 450 gpm, was completed on this well in 2019 and a drawdown of approximately 6 feet was measured. Due to equipment limitations, the pumping test could not be completed at higher flow rates; however, these initial testing results indicated that the maximum sustainable yield from the LaCroix aquifer would be significantly greater than 450 gpm.

Based on the 2019 hydrogeological investigation and pumping test results at the LaCroix property, further field investigation was recommended to evaluate the yield of the LaCroix Well 1 relative to the maximum daily demand of 785 gpm and evaluate the feasibility, location, and potential yield of a second production well on the LaCroix property. In January 2023, the Companies submitted a Groundwater Source Investigation Work Plan to the NYSDEC to present a scope of additional aquifer testing at the LaCroix property, which was approved in February 2023 after addressing comments received from NYSDEC, NYSDOH, and the Village.

This field investigation was completed in parallel with preparation of the OU-02 remedy design. In June 2023, two monitoring wells (GWI-10 and GWI-11) were installed approximately 71 and 180 feet, respectively, away from LaCroix Well 1. Based on the boring logs and the soil sample geotechnical analyses, the closer monitoring well (GWI-10) indicated more favorable hydrogeological conditions for siting the second well. A step drawdown and another 72-hour constant rate pumping test were successfully completed in May 2023 on LaCroix Well 1. The 2023 72-hour constant rate pumping test was performed at a flow rate of 800 gpm and a maximum drawdown of approximately 15.7 feet was measured during this test. The pumping test results indicate that LaCroix Well 1 has sufficient capacity to provide a maximum daily demand of 785 gpm.

The Companies recommended to NYSDEC and NYSDOH siting of the second LaCroix well, hereinafter designated LaCroix Well 2, near monitoring well GWI-10 based on the results of the LaCroix Well 1 pumping tests. LaCroix Well 2 was installed approximately 10 feet away from GWI-10 with a maximum finished depth of 105 feet below existing grade. The well was constructed of welded sections of 10-inch diameter carbon steel casing to a depth of 80 feet connected to a telescoping 10-inch diameter, continuous-wrap, stainless steel well screen that extends to the bottom of the well.

A step drawdown and a 72-hour constant rate pumping test were completed to verify pumping capacity for LaCroix Well 2. The 72-hour constant rate pumping test at LaCroix Well 2 was performed at a flow rate of 800 gpm and a maximum drawdown of approximately 13.4 feet was measured during this test. The pumping test results indicate that LaCroix Well 2 has sufficient capacity to provide a maximum daily demand of 785 gpm.

The results of the groundwater source investigation at the LaCroix property indicate that each of the two wells (LaCroix Wells 1 and 2) are capable of sustaining a yield of 800 gpm, which is greater than the Village's future maximum daily demand of 785 gpm, with the largest well out of service. In addition to LaCroix Wells 1 and 2, the Village MWS well configuration will also include Village Well 7 to serve as a backup well. As such, Village Wells 3 and 6 will not be needed going forward and will be abandoned in accordance with NYSDEC Water Well Decommissioning Procedures.

Water quality testing at LaCroix Wells 1 and 2 was completed in May 2019 and August 2023, respectively. The results from the water quality testing are provided as Table 4.

Table 4 – Water Quality Data for LaCroix Well 1 and LaCroix Well 2

Parameter	LaCroix Well 1	LaCroix Well 2	NYSDOH MCL Concentrations
Iron (mg/L)	0.027	0.019	0.3
Manganese (mg/L)	**0.36**	**0.32**	0.3
Combined Iron & Manganese (mg/L)	0.39	0.34	0.5
Sodium (mg/L)	**29.9**	**28.0**	No Designated Limit[1]
Barium (µg/L)	236	210	2,000
Copper (µg/L)	0.58	-	No Designated Limit
Nickel (µg/L)	1.4	-	No Designated Limit
Uranium-238 (µg/L)	4.6	4.9	30
Chloride (as Cl) (mg/L)	56	46	250
Fluoride (mg/L)	0.065	0.07	2.2
Sulfate (mg/L)	26	23	250
Turbidity (NTU)	0.14	0.25	1.0
PFBA (ng/L)	NA[2]	2.5 / ND[4]	No Designated Limit
PFOA (ng/L)	ND[3]	ND[3] / 2.2[5]	10

1. There is no NYSDOH MCL for sodium; however, water containing more than 20 mg/L of sodium should not be used for drinking by people on severely restricted sodium diet.
2. NA = Not Analyzed
3. ND = Not Detected
4. 2.5 ng/L via Method 533; ND (with a reporting limit of 8 ng/L) via Method 1633
5. ND (with reporting limit of 2 ng/L) via Method 533; 2.2 ng/L via Method 1633

The analytical results for LaCroix Wells 1 and 2 are very similar with only manganese exceeding the MCL. There is no MCL for sodium, but the sodium concentration does exceed the guidance value for individuals on a low sodium diet. No volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, herbicides, haloacetic acids (HAAs), or polychlorinated biphenyls (PCBs) were detected. All other water quality parameters were below their respective MCLs.

Of the PFAS analyzed by EPA Method 533, only perfluorobutanoic acid (PFBA) was detected. Perfluorooctanoic acid (PFOA) was detected at a concentration of 2.2 ng/L via EPA Method 1633, but was not detected via Method 533.

In addition to evaluating water quality, Microscopic Particulate Analysis (MPA) tests were performed at LaCroix Wells 1 and 2 to evaluate the potential for groundwater under direct influence of surface water in the source aquifer. Results from both tests indicated that no biological organisms of significance were observed. According

to the MPA report and the proposed EPA risk factors associated with bio-indicators, there is a low risk of surface water influence. The report on the sample obtained from LaCroix Well 2 also noted that the water sample was "an exceptionally clean sample, especially considering the high volume sampled."

The water quality test data suggest that the LaCroix Well Field will provide water quality that is equal to or better than the water that is currently being provided by the WTP's existing well field.

Water at the LaCroix Well Field has lower concentrations of iron and manganese than the Village's existing well field, which can both be removed through the Village's existing WTP pretreatment system. As such, no changes to the existing WTP system or process are recommended/needed prior to using groundwater from the LaCroix Well Field.

A Pumping Test Report for LaCroix Wells 1 and 2 (CHA, 2023), which summarizes evaluations performed at the LaCroix Well Field, has been submitted to NYSDEC and NYSDOH as part of the Water Withdrawal Permit Application.

3.2.3 Proposed LaCroix Production Well Design

LaCroix Well 1 consists of a 10-inch diameter steel casing that extends from 4-feet above grade to approximately 105-feet below the ground surface. A 16-inch diameter cement bentonite cap encompasses the 10-inch casing and extends 27-feet below the ground surface. A slotted, stainless steel, continuous wire wrap screen is installed in the lower 30-feet of the well casing (approximately 75 to 105 feet below ground surface) and was designed to ensure a maximum entrance velocity of no more than 0.1 feet per second. The construction of LaCroix Well 2 was similar to LaCroix Well 1. The screen openings for LaCroix Well 2 were designed to be slightly larger based on the grain size of the surrounding formation, and the well was screened from 80 to 105 feet below grade.

Hydrogeological investigations performed at the LaCroix Well Field identified the static groundwater level at approximately 15 feet below the ground surface. A well pump in each LaCroix well will be mounted such that the suction inlet is approximately 70-feet below the ground surface to ensure that pump submergence requirements are maintained during the maximum drawdown conditions.

A 16 by 16-feet area around the well heads will be protected using an 8-foot-tall chain link fence with barbed wire. The chain-link fencing will provide physical protection for the well heads and prevent any tampering or vandalism to the Village's water supply infrastructure. Access into the fenced area will be provided by a lockable 16-foot double swing gate, which will allow the Village to back a truck to the well casings for maintenance operations of the proposed wells. The fenced area of each well head will also include a prefabricated, aluminum platform with handrails and concrete foundation that will be used for mounting the electrical components (i.e., safety disconnects, electrical pull boxes, receptacles, etc.) that will be installed adjacent to the water supply wells. The platforms will have a working surface above the FEMA 100-year flood elevation (elev. 436 feet) to ensure electrical equipment would be above the 100-year flood elevation during storm events. A site plan for the LaCroix property is included on Drawing C-201 in Appendix A.

As part of converting the test wells into permanent supply wells, a submersible vertical turbine well pump will be installed within each of the existing 10-inch steel casings. Each submersible well pump will be designed to operate at 800 gpm which will meet the Village's maximum day demand (785 gpm) with the other well serving as a redundant supply. As previously discussed, it is also planned to retain the existing Village Well 7 to serve as a backup. Details of the pumps that will be installed in LaCroix Wells 1 and 2 are provided in Table 5 and product data sheets for the pumps are provided as Appendix B.

Table 5 - Proposed LaCroix Well Pump Specifications

Pump Type	Submersible Vertical Turbine
Manufacturer/Model	Goulds Water Technology, Model C07THC030A66B
Design Point	800 gpm @ 130 feet total dynamic head (TDH)
Shutoff Head	215 feet
Pump Efficiency	75% at the Design Point
Nominal Speed	3,450 RPM
Number of Stages	Two
Motor Horsepower	30 HP
Electrical Requirements	3 Phase, 460 V, 60 Hz
Bowl Diameter	7-1/2 inches with cable guard
Discharge Connection	6-inch NPT
Certifications	NSF/ANSI-61 Certified

A 6-inch check valve, Sch. 40 steel riser pipe, and pitless adapter with "lift-out" mechanism will be provided on the discharge of the submersible pump within the well casing. The steel riser pipe will be fitted with spacers to center the piping and well pump within the casing, and any electrical cables for the pump motor and level transmitters will be firmly attached to the riser pipe at 10-foot intervals. The proposed pitless adapter will be a Monitor Division Model 10PS1012WBWE06M8EPX, as manufactured by Baker Water Systems, and will connect to the 6-inch steel riser pipe from the well pump. The pitless adapter will be constructed to allow for removal of the well pump for disinfection of the well and for the installation of level sensing equipment and wiring. Additional features of the pitless adapter include an integral swing check valve and a 6-inch mechanical joint discharge connection. Product data sheets for the pitless adapter are provided as Appendix C.

Installation of the pitless adapter will include excavating the area around the pumping wells and cutting the existing steel casing pipe to approximately 5-feet below grade. The pitless adapter will then be welded on to the casing such that the discharge from the pitless adapter is below frost depth to provide protection from freezing temperatures and frost heaving. The two LaCroix wells will be located within the 100-year flood plain of the Hoosic River; therefore, the pitless adapters will be fitted with an extension that terminates 3-feet above the FEMA 100-year flood elevation (elev. 436 ft) to prevent contamination of the groundwater wells with surface water during flooding events. At the top of each pitless adapter, a watertight, locking, vented well cap will be installed. The vent piping shall be a minimum of 1-1/2-inch diameter and shall terminate in a downturned position with a 24-mesh

corrosion resistant screen. The pumping well and the pitless adapter design is provided as Drawing D-101 in Appendix A.

Separate runs of 6-inch ductile iron piping will be installed from each well to the well house for redundancy, and will also incorporate a 6-inch bypass valve installed between the piping runs prior to entering the well house for operational flexibility. Discharge piping from the wells will be provided with shutoff valves and hydrants adjacent to the fenced in area to allow for isolation of the pumps and well testing. Well pumps will be tested by diverting flows through the hydrants using hoses or diffusers to prevent damage to the ground surface and flows will be monitored using temporarily installed flow meters. Dechlorinator attachments will be utilized if chlorinated water is being flushed from the water system.

3.3 LaCroix Property Riverbank Stabilization

Due to natural meandering of the Hoosic River, the riverbank at the LaCroix property is subject to erosion, and stabilization of the riverbank is needed to protect the two new municipal wells pursuant to the ROD. The riverbank erosion was observed at the LaCroix property during the initial investigation in February 2019. Since that time, the river has shifted approximately 20 feet westward toward the LaCroix test well installed in 2019. To protect the new water supply wells and other critical infrastructure (i.e., controls, generators, access roads, etc.), stream bank stabilization measures along the Hoosic River riverbank adjacent the LaCroix property have been completed in October 2023. This work was implemented as a separate project under a Permit issued by the United States Army Corps of Engineers (USACE) and NYSDEC prior to construction of the proposed water supply improvements described in this report.

3.4 Prefabricated Well House

The proposed building enclosure will be a factory-built, modular steel building approximately 24 feet long and 12 feet wide with an 8-foot interior height. The building will be shipped completely assembled, as a single modular unit. Footers and frost walls will be installed to support the structure. The structure will be fastened to the concrete with anchor bolts. Building roof and walls are designed to withstand anticipated wind and snow loads for the site location and design conforms to all applicable building codes and regulatory requirements. A building floor plan and sections for the proposed well house are included as Drawing C-202 in Appendix A.

All electrical panels, telemetry equipment, variable frequency drives (VFDs), pump controls and monitoring equipment will be housed within the prefabricated building. Lighting, heating, ventilation, and piping within the building will be factory assembled and shipped as integral parts of the building sections. Interior lights will consist of ceiling mounted LED light fixtures, and exterior photocell light fixtures will be provided at each entrance into the building and on each exterior wall. Wall-mounted electric unit heaters will be used to prevent internal piping and equipment from freezing during winter months. HVAC units and dehumidifiers will be provided for climate control inside the building. Building control panels, light switches, receptacles, and thermostats will be factory-installed and will comply with building code requirements.

The 6-inch ductile iron piping from each LaCroix well will be routed to the southern side of the well house and

enter through floor penetrations where the piping will transition to epoxy coated Schedule 40 steel pipe. Piping runs for each well within the building will include isolation valves, check valves, flow meters, sample taps, pressure gauges, and pressure transmitters. The 6-inch water mains from each well will combine into a 12-inch header downstream of the flow and pressure monitoring equipment. A combination air release valve will also be installed on the discharge header to enable purging of any accumulated air within the piping. The 12-inch steel piping will then transition to DR 11 high-density polyethylene (HDPE) 12-inch piping immediately downstream of the building.

Concrete equipment maintenance pads and pipe supports will be installed as needed within the building structure. Spacing of all piping, equipment, and supports will be installed per manufacturer recommendations and will allow for ease of maintenance and possible future upgrades. The building will also include exterior non-freeze hose bibbs and a floor drain that will discharge to daylight.

In the event of a power interruption, the well house and proposed wells will be powered by an emergency diesel backup generator, manufactured by Milton CAT. The generator will be installed on a slab-on-grade foundation adjacent to the proposed well house. An automatic transfer switch will be installed within the building that connects the building control panel and the generator. The automatic transfer switch will changeover the building power supply to the generator in the event of a power failure and will enable continuous operation of the well pumps. The generator was designed based on the electrical loads required to operate one well pump, instrumentation, controls, building lighting, ventilation, and heating system for a period of 24 hours.

3.5 Water Transmission Main

Approximately 6,800 linear feet of 12-inch diameter DR 11 HDPE piping will be installed as a transmission main to convey groundwater from the well field on the LaCroix property to the 12-inch ductile iron piping that feeds into the Village's existing WTP on Water Works Road. HDPE water main pipe sections and fittings will be connected using butt-fusion techniques or electrofusion couplings. Water distribution valves will be composed of ductile iron with mechanical joint ends. HDPE to ductile iron transitions will be made using HDPE flange adapters and restrained couplings. All pipe and fittings will be installed with a minimum of 5 feet of cover to prevent freezing and will be installed in accordance with AWWA C-906-15 Polyethylene (PE) Pressure Pipe and Fittings, and AWWA M55 PE Pipe – Design and Installation. A minimum of 10 feet of horizontal separation and 18-inch vertical separation will be maintained where water mains are installed parallel to, or crossing, existing sanitary and storm sewer infrastructure.

The proposed transmission main will convey untreated groundwater directly to the Village's existing WTP and is not suitable to provide direct service connections or fire protection for residents along its routing. As such, the transmission main will not have any water service taps or fire hydrants installed. Additionally, because the proposed transmission main is not servicing any customers, the system design pressure can be lowered below the typical working pressure of 60-80 pounds per square inch (psi) for distribution systems; the pumps will be sized to achieve a target discharge pressure of approximately 40-50 psi. The static head condition within the water transmission main will be controlled by the water level in the existing pre-treatment tank located outside of the WTP building. Pumping and head loss calculations for the proposed transmission main are provided as Appendix D.

3.5.1 Proposed Water Main Routing

Routing for the water main will begin at the well house on the LaCroix property and end at the connection to the 12-inch ductile iron influent pipe into the Village's WTP. From the well house the water main will travel west to NYS Route 22, turn north, and proceed along the eastern Right-of-Way (ROW) boundary of NYS Route 22. Approximately 200 feet south of Bovie Hill Road, the water main will angle to the northeast and follow the paved driveway behind the Falls Diner restaurant for approximately 330 feet through the following parcels: 37.-2-11, 37.-2-10, and 37.-2-6.2. At that point, the water main will turn eastward and proceed to the Hoosic River.

Approximately 630 linear feet of the water main will be installed via horizontal directional drilling (HDD) to cross beneath the Hoosic River. The section of water main installed via HDD will be designed to have a minimum of 20 feet of separation from the river bottom to account for any unknown soil conditions. Additionally, watertight joints, permanent sampling taps, and isolation valves will be provided on both ends of the river crossing in accordance with Ten State Standards. A total of 1,470 linear feet of water main will also be installed via HDD to cross under existing storm culverts and intermittent streams located along Route 22 and Water Works Road. Locations of the HDD drilling and receiving pits, including entry and exit angles, have been designed in accordance with current industry standards and understanding of equipment limitations.

After crossing the Hoosic River, the proposed water main will proceed eastward to Water Works Road and turn northward along the eastern side of Water Works Road to the proposed connection point located on the existing 12-inch ductile iron piping entering the Village's WTP. The proposed connection to the Village's existing water piping will be completed using a 12-inch ductile iron tee and 12-inch restrained couplings. The final connection would require a temporary disruption to the Village's water supply, which will be coordinated with the Village and completed during a period of low demand. Plans and profiles for the proposed alignment are included as drawings C-101 thru C-111 in Appendix A.

The majority of the water main will be installed in grassed areas within the public ROW alongside paved roadways using open trench methods. Impacts to existing roadways will be minimized and traffic control and maintenance measures will be implemented for all work along NYS Route 22 and Water Works Road. Details for trenching, water main installation, and pavement restoration are included in the design specifications.

3.5.2 Valves and Appurtenances

Resilient wedge gate valves, Model A-2361 as manufactured by Mueller Company, will be installed at 1,000-feet intervals along the new transmission main for maintenance purposes. As there will be no water service connections along the water main, the 1,000-feet interval between valves is appropriate and meets the requirements of Ten State Standards. Valves will be rated for a minimum working pressure of 250 psi, NSF/ANSI-61 certified, and will be provided with a 2-inch square operating nut.

Gate valves will also be provided at both ends of the proposed HDD section of water main beneath the Hoosic River. These valves will allow isolation of the water main section for any future maintenance. Permanent taps will also be provided on the HDD section to allow metering, leakage testing, or water sample collection as required by regulatory standards.

Hydrants will be provided adjacent to the proposed wells to be utilized for well testing and flushing purposes. The proposed hydrants will not be utilized for potable water or fire protection purposes and will be color coded and marked as such. Hydrants will be Super Centurion 250 A-423, as manufactured by Mueller Company.

Manual blowoff/flushing hydrants will be provided at high points and low points along the water main route to allow air purging and flushing of the transmission main. Blowoffs will be installed above grade and located in grassed areas at the back of the ROW. Units will be Model Mainguard #77, as manufactured by Kupferle Foundry, and shall be designed to be self-draining, non-freezing, and will be provided with a 2-1/2-inch NST outlet. Flushing hydrants will not be utilized for potable water or fire protection purposes and will be color coded and marked as such. Product data information for the proposed gate valves, hydrants, and blowoffs are provided as Appendix E.

3.6 General Site Improvements

Access to the well house will be provided by a 15-foot-wide asphalt driveway extending from NYS Route 22 to the well house that includes a parking area for three vehicles. The driveway will also be extended along the length of the well house to allow equipment deliveries through the exterior doors on the northern side of the building.

Security features for the well house will include an 8-foot-high chain-link perimeter fence with barbed wire, two stationary web-based cameras, exterior door intrusion alarms, and motion-activated flood lights on the building corners. One security camera will be mounted for observing the paved driveway and door entrances along the north side of the building, and the second camera will be mounted on the southern side of the building facing the well field.

Per the existing site topography, stormwater is planned to discharge from the improvements on the LaCroix property in the easterly direction towards the Hoosic River. The final site grading and stormwater design meets the applicable water quality volume criteria, runoff reduction volume criteria and peak flow mitigation criteria specified by the NYSDEC. Stormwater best management practices have been designed and implemented per the New York State Stormwater Management Design Manual and the New York State Standards and Specifications for Erosion and Sediment Control to meet NYSDEC stormwater quality and runoff requirements prior to site stormwater discharging to the existing open areas adjacent to the Hoosic River.

3.7 Instrumentation and Controls

Submersible pressure transmitters, Model Vegawell 52 as manufactured by Vega Americas, Inc., will be installed within the well casings to monitor groundwater levels during pumping operations. Proposed transmitters will be provided with ceramic measuring cells capable of providing continuous level measurement within the wells. Transmitters will be capable of recording changes in groundwater level (up to a minimum of 100 feet) and will have sufficient cabling for the sensor from its mounted location within the well casing to the control panel located in the well house. Sensors will also be provided with a local disconnect fitting and electrical pull box adjacent to their respective well to allow for ease of maintenance. Level readings from the transmitters will be displayed and integrated into the proposed programmable logic controller (PLC) within the new well house. Manufacturer information for the submersible well level transmitters is included in Appendix F.

Pumps will be equipped with VFDs, located within the new well house, and will adjust pump speed to match the Village's water system demand. In general, the well pumps will be designed to ramp up and down to maintain an operator-specified water level within the pretreatment tank at the WTP. Each well will be capable of providing the maximum day demand for the Village; therefore, only one pump will be operated at a time with the second pump serving as a backup. The controls will be programmed such that the pumps will cycle in operation and distribute even wear of the pump components.

The well house piping will include two 6-inch diameter flow meters, one for each well pump. The flow meters will be installed to ensure the piping always remains flooded with a streamlined flow pattern for accurate measurements per manufacturer recommendations. Flow meters will consist of a 6-inch, Model Promag 400W magnetic flow meter, manufactured by Endress Hauser. The flow meters will be supplied with local displays and will have 4-20 mA signal outputs to the PLC for continuous flow and totalized volume. Manufacturer information for the meter is included in Appendix G.

Additionally, pressure gauges and transmitters will be installed on each of the 6-inch lines to monitor pressures throughout the transmission main. 4-20 mA output signals from the pressure transmitters will be connected into the PLC within the building. Pressure transmitters will be Model 3051 as manufactured by Rosemount, and will be provided with remote wall-mounted displays. To protect the transmission main and equipment from possible high pressures or pressure surges, the proposed pumps will be programmed such that they will deenergize if pressures, as recorded by the pressure transmitters, reach levels greater than a user-specified value. This condition will also initiate and relay a high-pressure alarm to the Village. Manufacturer information for the pressure transmitters is included in Appendix H.

A control panel equipped with a PLC with ethernet/IP networking communications protocol and an ethernet switch will be provided at the well house. The VFDs, generator and security cameras will also be equipped with ethernet/IP networking communication protocol and networked to the ethernet switch. This well house network will communicate to the Village's SCADA network for monitoring the well house operations including the following:

- Flow and Pressure readings
- Well pump VFDs
- Well level readings
- Generator monitoring
- ATS monitoring
- All setpoint monitoring
- Intrusion detection
- Alarm monitoring
- Security camera monitoring
- Modems/firewall for communication system

The Village's SCADA system will be able to monitor the process parameters, record related pumping data, and activate alarms. Operators will have the ability to adjust pumping set points and operating levels to meet the changing needs of the water system. The communication for the monitoring and control will be based on

broadband (primary) and cellular (secondary) connections between the proposed well house and the Village's SCADA system (Time Warner/Spectrum as the primary and Verizon as the secondary).

3.8 Electrical Service, Power Distribution and Lighting

A new electrical utility primary below grade service will be routed from the overhead three phase utility service at the street to a pad mounted utility transformer adjacent to the well house. The utility transformer's secondary will be 480/277V, three phase, four wire. A CT/PT cabinet and utility meter will be wall mounted on the building's exterior. The building will be equipped with a 200 Amp Service Entrance Rated Automatic Transfer Switch feeding a 480/277V 200 Amp Power Distribution Panel. This panel will be equipped with a surge protection device and will feed all the 480V/3PH loads including the building HVAC loads, VFDs for the 30HP well pumps, and a 30KVA 480V-208/120V transformer feeding a 100AMP 208/120V Panelboard for lighting, convenience, and control power loads. A pad mounted diesel backup generator in a weatherproof sound attenuating enclosure will also be mounted adjacent to the well house. The prefabricated well house will be equipped with all the power distribution components, pump VFDs, HVAC unit, convenience receptacles, interior LED lighting, and exterior LED wall packs equipped with photocells adjacent to doors and on each exterior wall for security. From the VFDs in the well house, 480V/3PH motor feeders will be routed below grade to power the well pumps via a local disconnect installed on the prefabricated electrical platform adjacent to the wells. Because of the distance, these motor feeders will need to be XLPE insulated VFD cable. The safety disconnects will be elevated out of the flood plain and they will be equipped with an auxiliary contact interlocked to the VFD enable such that the VFD is disabled when the disconnect is opened. Six feet of open wall space will be designated in the well house for a control panel and telemetry components.

3.9 Property Rights, Access, and Agreements

Two new groundwater supply wells, including all yard piping, well house structure, and site work will be located on the LaCroix property, which will require a section of the property to be acquired prior to construction. Based on requirements of NYCRR, Title 10, Part 5, a 100-foot and 200-foot radius around each well will be required to be owned and controlled by the Village, respectively. To meet this requirement, a portion of the LaCroix property will be acquired, by the Village, to include the area required for access driveway, well house, site work, and 100-foot radius around each new well. There will also be a recorded agreement with the property owner to control activities in the area within a 200-foot radius around each new well, in accordance with NYCRR, Title 10, Part 5, Subpart 5-1.

Other property agreements (i.e., permanent and temporary easements) are required where the transmission main crosses private properties to allow for installation and maintenance of the water main. Permanent easements will generally be 30 feet wide and centered on the proposed water main. Approximately 1,400 linear feet of the proposed transmission main, extending eastward from NYS Route 22 (south of Bovie Hill Road) to Water Works Road, will be located on privately owned properties and therefore requires permanent easements. Specific properties that will require 30-foot-wide permanent easements include parcels 37.-2-10, 37.-2-11, and 37.-2-6.2.

Negotiations with the specific property owners are in the process of being finalized and property acquisition agreements and terms will be in place prior to construction of the project. A 15 feet wide temporary easement will also be obtained, adjacent to the permanent easements for use during construction of the proposed transmission main.

3.10 Development of a Groundwater Monitoring Network

As required by the ROD, long-term groundwater monitoring will be performed to track potential migration of PFAS toward the LaCroix Well Field. The OU-02 Groundwater Monitoring Plan has been prepared and submitted to the NYSDEC under separate cover. Existing monitoring wells that will not be included in the groundwater monitoring network will be decommissioned in accordance with regulatory standards. Monitoring well installation, monitoring well abandonment, and monitoring well retrofitting for the purpose of long-term groundwater monitoring will be implemented under a contract separate from the remainder of the OU-02 Water Supply Project construction.

4 IMPLEMENTATION PLAN

This section of the report presents the implementation plan for the project, including listing of required regulatory permits and approvals, the project schedule, and opinion of probable construction costs.

4.1 Regulatory Permits and Approvals

The OU-02 Water Supply project is being conducted under the State Superfund Program requirements and, therefore, some permits are not required to be issued as long as the proposed work meets the substantive requirements of the permit. The project is anticipated to require federal, state, and local permits listed in Table 6.

Table 6 - Anticipated Federal, State, and Local Permits

Permit/Approval	Lead Agency	Comments
Project Approval	NYSDOH	Required for construction of Municipal Water Supply
Water Withdrawal Permit	NYSDEC	Permit application includes the Pumping Test Report for LaCroix Wells 1 and 2; the permit application has been prepared.
Highway Work Permit	NYSDOT	CHA has discussed the project scope with NYSDOT and the selected Contractor will need to obtain NYSDOT's permit. Construction Inspectors must be DOT certified
SPDES General Permit for Construction Activities	NYSDEC	The selected Contractor will be responsible for filing a Notice of Intent. Project will impact approximately 4.5 acres.
Wetlands Permit	USACE	Identified temporary wetland impacts of approximately 0.39 acres and 0.04 acres, and permanent wetland impact of 0.07 acres. Joint Permit Application has been prepared and submitted.
T&E Species	U.S. Fish and Wildlife Service	Potential for Long-eared bat. Implement tree cutting window of 11/1 to 3/31 following approval of JPA.
Historic/Cultural Resources	NY State Historic Preservation Office (NYSHPO)	Required as part of NOI for SPDES Permit and JPA. Cultural survey has been completed and a report was provided to NYSHPO. Letter of No Effect Issued.
Subdivision Plan	Town of Hoosick	Required to subdivide project area from remainder of LaCroix Property. A draft Subdivision Plan has been shared with the Town.
Site Plan Approval	Town of Hoosick	Approval will be obtained following subdivision of property.
Building Permit	Town of Hoosick	General Contractor will obtain the permit.

4.2 Project Schedule

The anticipated project schedule is listed in Table 7.

Table 7 - Anticipated Project Schedule

Task	Completion Date
Design Completion	May – December 2023
Regulatory Permitting, Review, and Approval	October – December 2023
Project Bidding and Award	November 2023 – January 2024
Start Construction (weather dependent)	April 2024
Final Completion (weather dependent)	December 2024
Start-up/Shake-down	Early 2025

4.3 Engineer's Opinion of Probable Construction Cost

An engineer's opinion of probable construction cost was prepared for the work presented in this report. A construction contingency of 10% was added to the subtotal of construction costs to capture unknown expenses that may exist at the Design Phase. The engineer's opinion of probable construction cost for this project is $5,523,000, a breakdown of which is provided as Appendix I.

APPENDIX A
DESIGN DRAWINGS