CITY OF SOUTH ST. PAUL
MEETING AGENDA

WORK SESSION

Training Room
125 3rd Avenue North
South St. Paul, MN 55075

Monday, February 9, 2026
7:00 PM

1. CALL TO ORDER

2. DISCUSSION ITEMS

A. PFAS Treatment Feasibility Study

B. 400 Richmond Street Update

C. Villaume Avenue Property / Road Connection

D. Closed Session Pursuant to Minnesota Statutes § 13D.05 (c) (3), to consider offers to purchase real property at 316 Malden Street (No Attachment)

3. COUNCIL COMMENTS & QUESTIONS

4. ADJOURNMENT

WORK SESSION AGENDA REPORT

DATE:	February 9, 2026
DEPARTMENT:	Engineering
PREPARED BY:	Kelsey Gelhar
AGENDA ITEM NUMBER:	2.A.

MEETING TYPE
Regular Meeting

AGENDA ITEM
PFAS Treatment Feasibility Study

ACTION TO BE CONSIDERED OR DESIRED OUTCOME
Council discussion of the feasibility study and presentation of the study's findings

OVERVIEW
On April 10th, 2024, the EPA issued its final National Primary Drinking Water Regulation for several PFAS compounds. In September 2024, the City Council approved a proposal from AE2S to prepare a feasibility report for how to address PFAS in the water system. AE2S will present the findings of the feasibility report at the work session. The report and an executive summary are attached to this staff memo.

The goal of this meeting is to discuss the findings of the report, answer any questions from staff and Council, and better prepare for the presentation to the public at the February 17th City Council Meeting.

SOURCE OF FUNDS
Grant funding from Drinking Water Planning and Design Funds from the MPCA funded the preparation of the feasibility report.

ATTACHMENTS
1. SSP PFAS Feasibility Study_Executive Summary
2. SSP PFAS Feasibility Study_Report

City of
South St. Paul
Minnesota

CITY OF SOUTH ST. PAUL
PFAS FEASIBILITY STUDY

On April 10, 2024, the EPA issued its final National Primary Drinking Water Regulation for several PFAS compounds. In response to South St. Paul's strong commitment to public health and the approaching regulatory requirements, the City partnered with AE2S to conduct a feasibility study to evaluate potential PFAS treatment needs across the City's drinking water system. **Based on a comprehensive review of the City's water quality data, PFAS treatment at Well No. 4 is recommended to be installed by Spring 2029.**

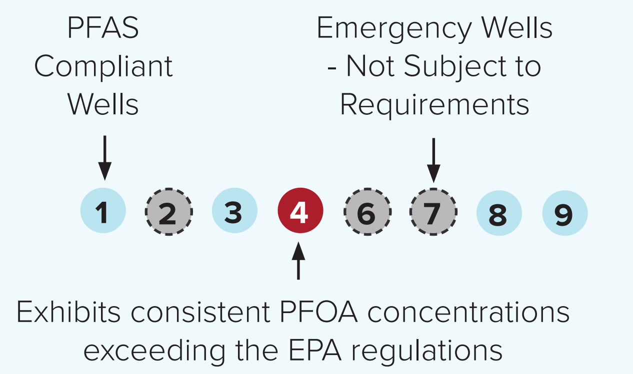
Water System Overview

The City owns and operates:

- **8 Groundwater Wells**
- **5 Storage Tanks**
- **Interconnections with Adjacent Water System**

This is critical infrastructure that manages water for daily demand and emergencies. The groundwater wells are defined as "entry points to the distribution system" and are obligated to follow EPA regulations.

GROUNDWATER WELLS



KEY STUDY COMPONENTS

- Overview of Existing Water System
- Water Treatment Regulatory Review
- Source Water Quality Review
- Review of Funding Availability
- Evaluation of PFAS Mitigation Options
- Planning Level PFAS Treatment Layout
- Operation and Maintenance Analysis
- Opinion of Probable Cost

PFAS Mitigation Strategies

Several PFAS mitigation strategies were evaluated, with an ultimate recommendation of:

Individual Treatment at Well No. 4

Other mitigation strategies evaluated included:

1. **Drill New Wells**
   No guarantee that new wells will produce PFAS free water
2. **Blend Wells**
   Very costly and would face operational challenges without removal of PFAS
3. **Connect to Nearby Systems** (including Inver Grove Heights and SPRWS)
   Requires capital expenditures and no control over future water rate increases
4. **Centralized Treatment**
   Significant costs beyond treating the impacted well
5. **Install Point of Use Treatment Systems**
   Would not address MDH or EPA compliance for PFAS due to contamination at compliance measurement points

RECOMMENDATIONS

After a full review of PFAS treatment alternatives, GAC media is expected to have the best performance for addressing project objectives and goals. GAC is recommended due to compatibility with water quality at Well No. 4, low relative cost when compared to other options, and ease of operations.

WHY GAC?

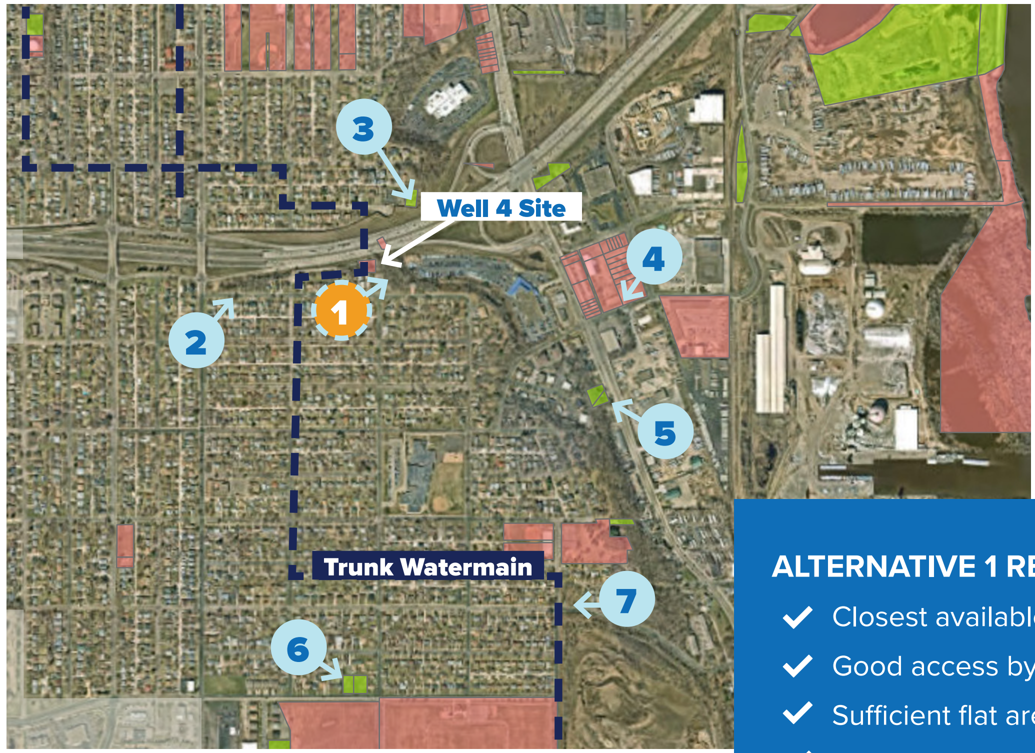
- Well-established and accepted PFAS removal process with well demonstrated performance.
- More cost effective than other technologies like Ion Exchange due a limited risk of premature breakthrough based on historical water quality data.
- Strong PFAS removal efficiencies shown by manufacturer and third party data.
- Ability to remove other compounds if necessary.

Preliminary Design Considerations:

- Relocate fluoride feed point from Wellhouse 4 to the proposed WTP
- Incorporate backwash tank to protect sewer system
- Maximize ease for operation and maintenance
- Minimize operational disruptions when GAC media change-outs are required

Treatment Location

On site treatment by the existing well house is not considered to be feasible due to the site topographic complexity, parcel size, unique road access, and spacing requirements for GAC treatment and operation. Therefore, seven remote sites, both city-owned and privately-owned, were studied to recommend a location for Well No. 4 PFAS treatment. These sites were selected for further analysis based on site access, ease of construction, and location with respect to the existing wellhouse.



Site Parameters

Site Access
Good access is integral to facility operations for construction and media exchange procedures

Proximity to Wellhouse and Major Distribution Trunklines
Piping to remote locations adds to project complexity and construction cost

Sites south of I-494 are preferred to avoid high costs of boring underneath the freeway

Site Slope Grade
Steep gradients generate additional expenses for excavation and backfilling.

ALTERNATIVE 1 RECOMMENDED

- ✔ Closest available site to Well No. 4
- ✔ Good access by street
- ✔ Sufficient flat area for building footprint
- ✔ Does not need to cross MnDOT roads or major City roads with pipelines
- ✔ Good access to nearby sewer lines

Treatment Technologies Assessed

- **Granular Activated Carbon (GAC)**
- **Ion Exchange (IX)**
- **Fluoro-sorb (FS)**
- **Membrane Filtration (Nanofiltration (NF) or Reverse Osmosis (RO)**

Other Considerations:

- ✔ Pretreatment Requirements
- ✔ Backwashing and Cleaning Requirements
- ✔ Operation & Maintenance Requirements
- ✔ Space Requirements
- ✔ Capital and Operational Costs

NEXT STEPS & IMPLEMENTATION

2026

February	Final Cost Estimate & Report Presentation to City Council
May	RSSCT Testing Procurement Sanitary Sewer Flow Monitoring
June	WTP Design Begins DWRF IUP Application
September	RSSCT Testing Results Obtained

2027

February	Design Completion
March	MDH/DLI Submission MN PFA Funding Application
April	Bid
July	Construction Begins

2028

2029

Spring 2029 = WTP Start-up

TIMELINE

This timeline allows the City of South St. Paul to construct the PFAS treatment facility at Well No. 4 before the current EPA compliance deadline in **(April 2029)** and continue to be engaged with the State of Minnesota and other funding agencies.

The EPA announced their intent to extend the compliance deadline to April 2031. However, the extension has yet to be officially proposed.

Anticipated Costs

The WTP construction costs cover building construction, installation of watermains, pumps, GAC systems, fluoride feed systems, and all necessary piping, equipment, and site work to operate the facility.

Construction	Costs
Civil and Site Utilities	$765,000
Building Construction and Site Concrete	$1,241,000
Process Pipe and Equipment	$3,196,000
HVAC and Plumbing	$137,000
Electrical	$308,000
Subtotal Construction Cost	**$5,647,000**
General Conditions (10%)	$564,700
Planning Level Construction Contingency (30%)	$1,694,000
Estimated Total Construction Cost	**$7,906,000**
Professional Services (engineering, legal, administrative, testing, and integration)	**$2,310,000**
Opinion of Probable Total Project Cost	**$10,216,000**

O&M Cost Category	Annual Cost	% of Cost
Operational Staff	$85,800	19.5%
Non-Treatment Processes	$6,000	1.4%
Treatment Equipment Maintenance	$21,000	4.8%
Treatment Equipment Power	$6,000	1.4%
Treatment Chemicals	$9,600	2.2%
GAC Media Changeout	$300,200	68.1%
Process Sewer Discharge	$12,100	2.7%
Pre-Contingency Subtotal	**$441,000**	
Planning Contingency (30%)	**$132,300**	
Annual O&M Cost	**$573,300**	

NOTE:

1. *Costs are planning level only. A planning level contingency of 30% has been applied.*
2. *O&M costs are expected to increase at an average inflation rate of 3%/year.*
3. *Operations staff and GAC media replacements account for almost 90% of O&M costs. If additional staff are not required and GAC media life is extended, O&M costs could decrease significantly.*
4. *Cost to purchase four SAC units included in process sewer discharge.*

SOUTH ST. PAUL PFAS FEASIBILITY STUDY

FOR

CITY OF SOUTH ST. PAUL, MN

Feasibility Study

January 22nd, 2026

Presented to:

City of South St. Paul
South St. Paul, Minnesota

Prepared By:

AE2S, LLC
P05491-2024-002

SOUTH ST. PAUL PFAS FEASIBILITY STUDY

For

January 2026

Professional Certification

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Name: Ursinio Puga, PE

Company: Advanced Engineering and Environmental Services, LLC (AE2S)

Date: January 22, 2026 Registration Number: 59303

Prepared By:

Advanced Engineering and Environmental Services, LLC (AE2S)

Water Tower Place Business Center
6901 E Fish Lake Road, Suite 184
Maple Grove, MN 55369

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Appendices

Chapter 1 Introduction and Background

The City of South St. Paul (City) partnered with Advanced Engineering and Environmental Services (AE2S) to explore PFAS mitigation options for the City's drinking water system. All eight (8) source water wells were considered, a number of treatment technologies were evaluated, and multiple alternative design options are provided in addition to the AE2S recommended treatment strategy.

1.1 Background

South St. Paul is located directly south of St. Paul, Minnesota and west of the Mississippi River. The City serves around 20,000 water customers. With eight (8) groundwater wells, the City provides steady water service and has emergency water flow capabilities. Starting in 2007, South St. Paul became aware of potential PFAS concentrations in their drinking water and has been monitoring supply wells at various frequencies. Though PFAS was detected in some wells, the City was in compliance with all PFAS-related state and federal regulations prior to April 10, 2024 (when new federal PFAS regulations were promulgated). In recent years, monitoring has been a higher priority for the City and in April 2024, the U.S. Environmental Protection Agency (USEPA) announced that all normally active drinking water wells are required to complete one year of quarterly monitoring and sampling for PFAS before 2027. This initial sampling is intended to determine if treatment is necessary to comply with the USEPA's new maximum contaminant levels (MCLs) for PFAS (also released in April 2024) and set a baseline for future monitoring. South St. Paul has generated a sufficient set of data to identify wells that may require PFAS treatment based on the recent USEPA rules regarding PFAS in drinking water.

The City owns and operates eight (8) groundwater wells, five (5) storage tanks, and four (4) interconnections with a nearby community. This is critical infrastructure that manages water for daily demand and emergencies. The groundwater wells are defined as "entry points to the distribution system" and are obligated to follow USEPA regulations.

1.2 Purpose of the Study

The purpose of this study is to explore PFAS treatment options for the City of South St. Paul. Through sampling, the City has found PFAS in five (5) of their eight (8) source water wells at various concentrations. Due to South St. Paul's concern for public health and the upcoming compliance deadlines for the new USEPA PFAS regulations, the City may require treatment of source water to continue to comply with upcoming drinking water regulations.

1.3 Project Sponsor and Contact Persons

The following City staff have been directly involved in the preparation of this study.

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(651) 554-3219
kgelhar@southstpaul.org

The South St. Paul PFAS Feasibility Study is being developed for the City of South St. Paul by AE2S. Questions about the contents of this Study should be directed toward:

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(763) 204-5303
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(605) 275-5620
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Chapter 2 Description of Water System

This chapter includes a high-level summary of the City's water system, which includes wells, storage, and a network of distribution system mains.

2.1 Water Supply

South St. Paul has eight (8) groundwater production wells that supply water to the municipal water system and provide emergency water flows. **Table 2-1** summarizes the City's well pumping capacity. Groundwater pumped by each well is treated with fluoride at the corresponding well house and sent into the distribution system. A filtration plant for radium, manganese, and iron removal was recently completed for Well No. 3. See **Figure 2-1** towards the end of this section for the location of the water supply wells within the City's water distribution system.

Table 2-1 Existing Water Supply

Well No.	Unique Well ID	Pressure Zone	Usage	Year Installed	Pumping Capacity	
					GPM	MGD
1	200674	High	Normal	1961	1,200	1.7
2	201153	High	Emergency	1972	1,200	1.7
3	200675	Low	Normal	1937	1,600	2.3
4	208347	Low	Normal	1946	2,000	2.9
6	200664	High	Emergency	1972	1,900	2.7
7	200676	Low	Emergency	1971	1,300	1.9
8	127251	High	High-Demand	1975	1,100	1.6
9	112201	Low	Normal	1975	300	0.4
Firm Pumping Capacity (with emergency wells)					**8,600**	**12.4**
Firm Pumping Capacity (without emergency wells)					**4,200**	**7.9**
Total Pumping Capacity					**10,600**	**15.3**

GPM – Gallons per Minute; GPD – Gallons per Day
No Existing Wells are located in the Oak Park Pressure Zone.
Firm pumping capacity is the capacity of the system with the largest contributed asset offline (Well No. 4 offline).

Well Nos. 1, 3, 4, and 9 are all used for normal operations, though Well Nos. 1, 4, and 9 are prioritized throughout the year and Well No. 3 is typically used as little as thirty (30) days a year to meet peak day summer demands. Well No. 8 is used as a back-up emergency well to meet peak day summer demands as needed and Well Nos. 2, 6 and 7 are used for emergency purposes only. Well No. 8 is used very rarely as it has only pumped approximately eight (8) million gallons of water in the past five (5) years in comparison with Well No. 4, which has pumped 2,725 million gallons of water during that same period. Well Nos. 2, 6, and 7 have not been used in the past ten (10) years to supply drinking water to the system.

2.2 Water Storage

Three (3) ground tanks and two (2) elevated water towers provide storage across the system, and all reside in the system's High Pressure Zone. A total of 3.15 million gallons (MG) of water can be stored by these five (5) tanks to provide reliability for system demands, emergency storage, fire flow protection, and assist in maintaining uniform pressure across the distribution system during peak hourly demands. Water storage volumes, materials and location are summarized in **Table 2-2**. See **Figure 2-1** towards the end of this section for the location of the water storage infrastructure within the City's water distribution system.

Table 2-2 Existing Storage Capacity

Storage Name	Type	Material	Zone Served	Year Installed	Storage Capacity (gallons)
9th Ave Tank	Ground	Steel	Low	1973	1,000,000
17th Ave Tank	Ground	Concrete	Low & Oak Park	2009	(2) 500,000 (two tanks)
18th Ave Tank	Elevated	Steel	High	1972	750,000
19th Ave Tank	Elevated	Steel	High	1960	400,000
				Total Elevated Storage	**1,150,000**
				Total Water Storage	**3,150,000**

2.3 Distribution Components

Three (3) pressure zones are used to maintain adequate water pressures across the system; High Zone, Low Zone, and the Oak Park Zone as shown in **Figure 2-1**. Distribution components include pump stations, pipes, valves, and hydrants across South St. Paul. 102 miles of watermains make up the existing water distribution system network and vary in size between 4-inch and 16-inch diameter pipes, with approximately 84 percent of the piping ranging in size from 6-inches to 8-inches. The water main material generally consists of cast iron pipe (CIP), ductile iron pipe (DIP), polyvinyl chloride (PVC) pipe, and high-density polyethylene (HDPE) pipe. **Figure 2-1** also shows the water main sizes and layout and **Table 2-3** summarizes the material types and quantities in South St. Paul.

South St. Paul has four (4) interconnections with the City of Inver Grove Heights for system resiliency. Three (3) of the connections are 6-inches in diameter and one (1) is an 8-inch connection. In addition, there is one (1) incomplete connection (6-inch) with the St. Paul Regional Water Services (SPRWS), though this was recently removed on the South St. Paul side of the meter vault. Due to this, there are no active connections that exist between South St. Paul and the SPRWS.

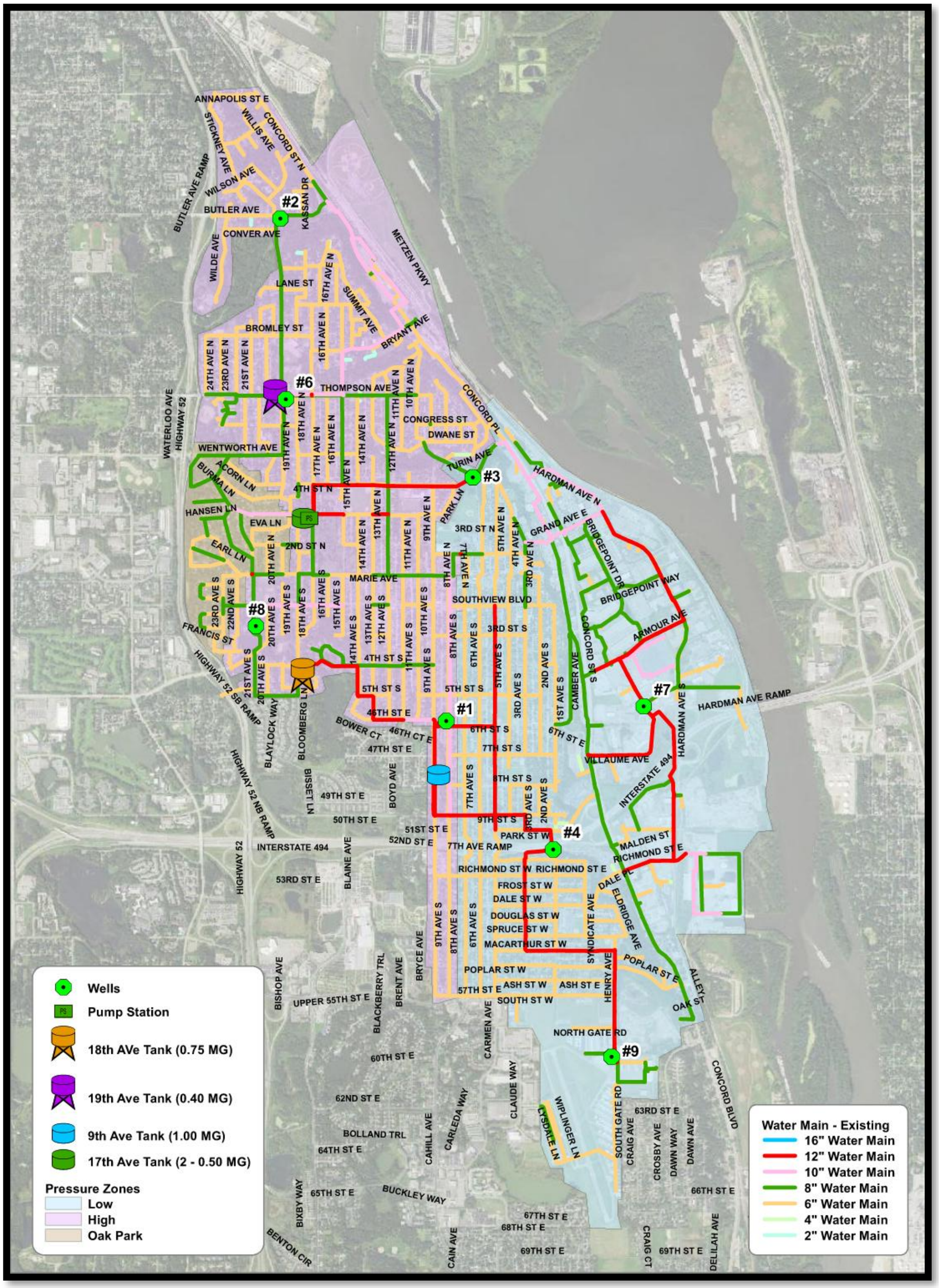


Figure 2-1 Water Assets in Service Area[1]

[1] Water System Planning Report for City of South St. Paul – August 2020 – AE2S, LLC

Table 2-3 Water Main Information

Pipe Size	Pipe Type				Total (feet)	Total (miles)
	CIP	DIP	PVC	HDPE		
4	1,982	643			2,625	0.5
6	232,473	50,544	3,547	849	287,413	54.4
8	29,694	45,947	13,944		89,585	17.0
10	11,175	13,126	1,627	1,480	28,097	5.3
12	12,555	31,169			45,351	8.6
14				425	425	0.1
16		342			342	0.1
Total (feet)	**287,879**	**141,771**	**8,311**	**848**	**453,838**	**86.0**
Total (miles)	**54.5**	**26.9**	**1.6**	**0.2**	**86.0**	

Isolation valves are common in the distribution system. About 1,150 gate valves isolate water flow from one pipe to another and minimize downtime impacts for various sections during required maintenance periods.

Fire hydrants are essential for providing adequate fire protection. Approximately 700 fire hydrants are located within City limits and provide water supply for firefighting.

2.4 Historical and Projected Water Demand

The population of South St. Paul has minimally increased from 20,167 to 20,400 over the past ten (10) years. Despite the minor increase in population, the total per capita water demand and per capita residential demand have trended downwards during this time. The 5-year average documented in the 2008 Water Plan was 163 gpcd for total water demand and 69 gpcd for residential demand. The 5-year average from the 2018 Water Plan was 126 gpcd for total water demand and 49 gpcd for residential water demand. Historical water demand is summarized in **Table 2-4** and projected water demand is shown in **Figure 2-2**.

Table 2-4 Historical Water Demand

Parameter	South St. Paul 2008 Water Supply Plan	South St. Paul 2018 Water Supply Plan
Average Day Demand (MGD)	2.7	2.6
Maximum Day Demand (MGD)	5.1	4.6
Residential Per Capita Demand (5 yr. avg.)	69 gpcd	49 gpcd
Total Per Capita Demand (5 yr. avg.)	163 gpcd	126 gpcd

GPCD – Gallons per Capita per Day
MGD – Million Gallons per Day

Projected water demand is not expected to significantly change, and increases in well productivity or quantity are not required to meet the City's water supply needs. In 2040, the projected average daily demand is 2.7 MGD and the projected maximum daily demand is 4.6 MGD. The total per capita demand is not expected to change from 126 gpcd.

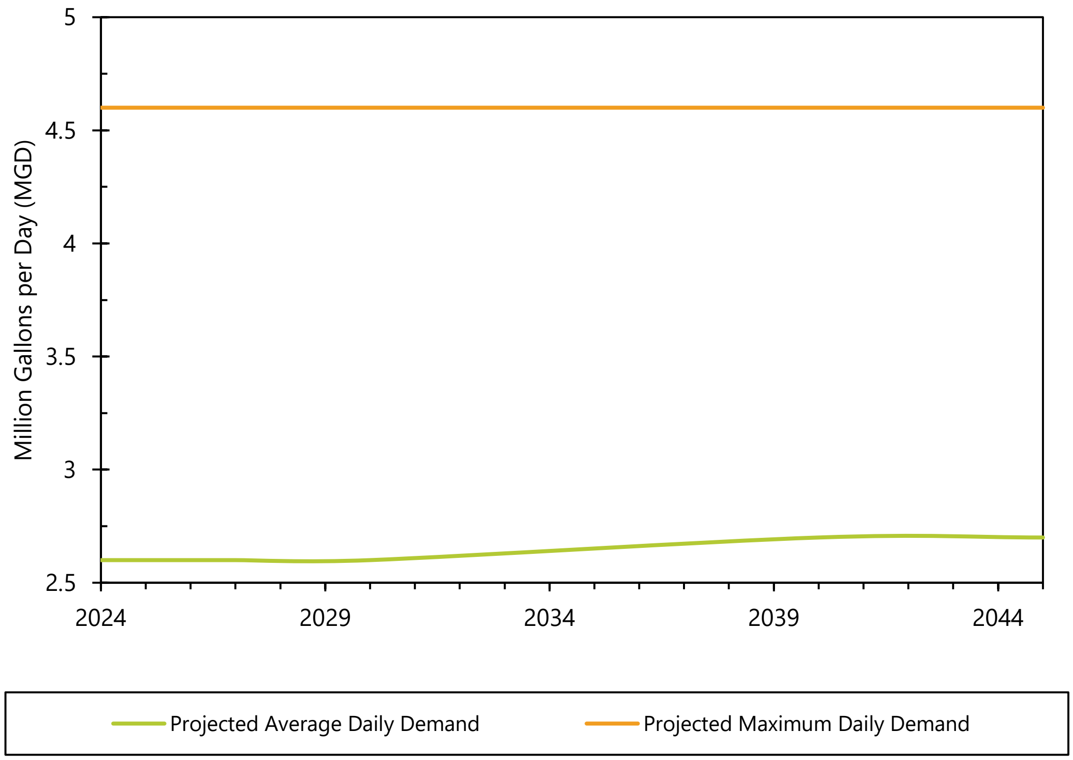


Figure 2-2 Projected Water Demand

Figure 2-2 is reflective of data generated from 2020 the Water System Planning Report[2]. No additional projections were made for this report outside of the 2020 report projections. The 2020 census provided a population of 20,759 and the 2024 projected population was 20,870. Population is fairly stagnant because the City is nearly built to the geographical limits. Increasing housing density and persons per home has been a driver for recent population increases. Despite the small increases in population, no significant change to average daily demand or maximum daily demand is expected.

2.4.1 Firm Pumping Capacity

Excluding the City's emergency wells, the firm pumping capacity is 4,200 gpm, or 6.0 MGD. This capacity is well above the projected maximum day demand. South St. Paul has plenty of water to self-supply for the extended future even with these emergency wells out of use.

[2] Water System Planning Report for City of South St. Paul – August 2020 – AE2S, LLC

Chapter 3 Water Treatment Regulatory Review

The water quality of South St. Paul's drinking water is evaluated against various Federal and State regulations by the Minnesota Department of Health (MDH) and the USEPA. This chapter describes State and Federal drinking water regulations, compliance requirements, and recent updates specific to PFAS in drinking water.

3.1 Drinking Water Regulations

A summary of the existing drinking water regulations (not associated with PFAS), including primary and secondary drinking water standards, other important water quality standards, and an overview of potential future regulations is summarized in **Appendix A**.

3.2 PFAS-Specific Regulations in the United States

Perfluoroalkyl substances (PFAS) are manmade contaminants prominent in manufacturing and are generally non-biodegradable in the environment. They are water-soluble and can be found in air, soil and source waters via industrial releases, discharges from wastewater treatment plants, street and stormwater runoff, and release from the use of aqueous film-forming foams.

Several companies in the United States began producing and using PFAS in the late 1940s due to their water, stain, grease, and heat-resistant properties. Over the years, PFAS have been used mainly in nonstick cookware, pizza boxes, stain resistant textiles, fire-fighting foam, and other everyday products. The toxicity and persistence of PFAS in the environment slowly became apparent throughout the 1980s and 1990s, and the EPA and others began researching the effects of PFAS in the late 1990s. Currently, exposure to PFAS has been linked to cancer, impacts to organs such as liver and heart, and immune and developmental damage to infants and children.

Because of this, PFAS producing companies announced the beginning of a phaseout plan for PFAS chemicals in the early 2000s. However, some PFAS chemicals are still manufactured today. The MDH began investigating PFAS in the environment and detected these contaminants in public and private drinking water sources in the East Twin Cities Metropolitan Area in the mid-2000s. In 2014, the EPA classified two (2) PFAS compounds as emerging contaminants, PFOA and PFOS, which are the most studied PFAS chemicals to date. In December 2019, the EPA started the process of establishing MCLs for PFOA and PFOS.

3.2.1 State of Minnesota PFAS Regulations

The MDH first developed Health Based Values (HBVs) for PFOS and PFOA in 2002, two (2) of the most prominent PFAS compounds. Since then, the MDH has continued to review available toxicological and more recently epidemiological information for many PFAS and develop new or revised values when needed. Currently, the MDH has HBVs for PFOS, PFOA, PFBS, PFBA, PFHxS, and PFHxA. HBVs for these six (6) PFAS compounds are summarized in **Table 3-1**.

Table 3-1 MDH Drinking Water HBVs for PFAS

PFAS Compound	Drinking Water Guidance Value (ppt or ng/L)
PFOA(1)	35
PFOS(1)	15
PFBA	7,000
PFBS	100
PFHxS(1)	47
PFHxA	200

(1) Guidance value subject to change per USEPA MLCs

The MDH has also established a combined Health or Hazard Index (HI) guidance level of 1.0 to evaluate the combined risk from the PFAS compounds by comparing the groundwater concentration to the HBVs. The MDH HI is calculated as shown below in **Equation 3-1**. The MDH HI is recommended to be maintained below 1.0.

Equation 3-1 MDH HI Calculation

$$MDH\ HI = \frac{[PFOA_{conc.}]}{35\ ppt} + \frac{[PFOS_{conc.}]}{15\ ppt} + \frac{[PFBA_{conc.}]}{7000\ ppt} + \frac{[PFBS_{conc.}]}{100\ ppt} + \frac{[PFHxS_{conc.}]}{47\ ppt} + \frac{[PFHxA_{conc.}]}{200\ ppt}$$

Since the MDH began monitoring PFAS in the mid-2000s, our understanding and ability to detect PFAS in the environment has evolved to the point where PFAS can now be detected at lower concentrations. Therefore, the MDH has indicated plans to revise the HBVs for PFOA and PFOS down to 0.0079 ppt and 2.3 ppt, respectively. However, this has not been made official as of the completion of this report. To this date, the HBVs in **Table 3-1** are still used in Minnesota.

Lastly, although the MDH has set HBVs for six (6) PFAS compounds and the HI calculation, these MDH guidance values have not been enforceable from a regulatory standpoint since the USEPA had not issued MCL values for PFAS until 2024. Up until now, when PFAS contamination in a water supply well exceeds a level of health concern, the MDH issued a well advisory to the water system. As part of that advisory, the water system is encouraged to provide communication to the public on the issue, but official enforcement actions were not taken by the MDH to require PFAS treatment or mitigation.

3.2.2 Federal PFAS Regulations

On April 10, 2024, the USEPA announced the final National Primary Drinking Water Regulation (NPDWR) for several PFAS compounds that are known to have significant negative effects on human health after long term exposure. Through this rule, the USEPA established legally enforceable levels, called Maximum Contaminant Levels (MCLs), for six (6) PFAS in drinking water: PFOA, PFOS, PFHxS, PFNA, and HFPO-DA as individual contaminants, and PFAS mixtures containing at least two (2) or more of PFHxS, PFNA, HFPO-DA, and PFBS using a Health Index (HI) MCL to account for combined levels of PFAS in the drinking water, similar to MDH's approach.

Under the rule requirements, public water systems must conduct initial and ongoing compliance monitoring for the regulated PFAS, implement solutions to reduce regulated PFAS in their drinking water if levels exceed the MCLs, and inform the public of the levels of regulated PFAS measured in their drinking water and if an MCL is exceeded. **Table 3-2** summarizes the USEPA PFAS regulations and the MCLs for each PFAS compound.

Table 3-2 EPA Regulation PFAS Summary

Contaminant	MCLG (ppt)	MCL (ppt)	HBWC (ppt)	PQL (ppt)
PFOS	0	4.0	-	4.0
PFOA	0	4.0	-	4.0
PFNA	10	10	10	4.0
PFHxS	10	10	10	3.0
HFPO-DA	10	10	10	5.0
PFBS(1)	-	-	2,000	3.0
USEPA HI	1 (unitless)	1 (unitless)	-	-

ppt: parts per trillion; HI: Hazard Index
(1) PFBS does not have an individual MCL, but it is included in the EPA HI calculation.

Important definitions to know for interpretation of the new USEPA PFAS regulations:

- **Maximum Contaminant Level Goal (MCLG):** Maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on the health of persons would occur, allowing an adequate margin of safety.
- **Maximum Contaminant Level (MCL):** Maximum level allowed of a contaminant in water which is delivered to any user of a public water system. This is the regulatory level.
- **Health Based Water Concentration (HBWC):** The level of a PFAS chemical in drinking water at which no health effects are expected.
- **Practical Quantitation Limit (PQL):** The lowest analyte concentration that can be reliably measured with a 95 percent confidence level.

Similar to the MDH HI formula, the USEPA HI formula is the summation of the tested concentration of the following chemicals: PFNA, PFHxS, HFPO-DA, and PFBS, each chemical divided by the associated health-based water concentration (HBWC) value, as shown in **Equation 3-2**. Hazard indexes greater than one (1) are results that exceed the MCL for these four (4) chemicals.

Equation 3-2 Federal HI Compliance Calculation

$$Hazard\ Index = \frac{[PFNA_{conc.}]}{10\ ppt} + \frac{[PFHxS_{conc.}]}{10\ ppt} + \frac{[HFPO-DA_{conc.}]}{10\ ppt} + \frac{[PFBS_{conc.}]}{2000\ ppt}$$

In addition to regulating PFAS concentrations in the drinking water, the USEPA final rule designate perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) as hazardous substances under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund, and will help ensure that polluters pay to clean up their contamination. This final action addresses PFOA and PFOS contamination by enabling investigation and cleanup of these harmful chemicals and ensuring that leaks, spills, and other releases are reported. USEPA issued a separate CERCLA enforcement discretion policy that makes clear that the USEPA will focus enforcement on parties who significantly contributed to the release of PFAS chemicals into the environment, including parties that have manufactured PFAS or used PFAS in the manufacturing process, Federal facilities, and other industrial entities.

Under the CERCLA extension of the rule, entities are required to immediately report releases of PFOA and PFOS that meet or exceed the reportable quantity of one (1) pound within a 24-hour period to the National Response Center, Tribal, and local emergency responders. The designation of PFOA and PFOS as hazardous substances under CERCLA enables the USEPA to use one of its strongest tools to compel polluters to pay for or conduct investigations and cleanup, rather than taxpayers. This designation is especially important as delay in addressing contamination allows PFOA and PFOS more time to migrate in water and soil, worsening the extent of contamination. The final rule also means that Federal entities that transfer or sell their property must provide notice about the storage, release, or disposal of PFOA or PFOS on the property and guarantee that contamination has been cleaned up or, if needed, that additional cleanup will occur in the future. It will also allow the Department of Transportation to list and regulate these substances as hazardous materials under the Hazardous Materials Transportation Act. This could have direct implications for communities that dispose of PFAS removal media for drinking water purposes.

3.2.3 PFAS Regulations Implementation Timeline

Summarized below are the important dates for compliance requirements:

- **April 2024:** Final PFAS Rule promulgated by the EPA.
- **April 2027:** Deadline to complete initial monitoring sample and begin compliance monitoring samples.
  - Initial monitoring sampling requirements vary by size of water system and type of source water (surface or groundwater) and are due by April 2027.
  - Beginning in April 2027, each system will have to submit quarterly compliance monitoring results unless approved for reduced monitoring by the regulatory agency.
- **April 2029:** Deadline for drinking water to show compliance with the PFAS Rule.
  - Results of initial monitoring must be included in Consumer Confidence Reports.
  - Regular monitoring for compliance must begin, and results of compliance monitoring must be included in Consumer Confidence Reports.
  - Required public notification for monitoring and testing violations.

Initial monitoring for the six (6) regulated PFAS compounds will need to be completed by 2027. PFAS data must be collected from each entry point to the distribution system, analysis must be completed by a USEPA / State certified laboratory and analyzed by either Method 533 or 537.1. South St. Paul is classified as a large groundwater system serving more than 10,000 people so the initial monitoring must include four sampling events over a 12-month period. These four sampling events must occur two (2) to four (4) months apart.

3.2.4 Reporting PFAS Concentrations

The final rule utilizes rolling averages from quarterly compliance samples taken with approved USEPA methods. Current drinking water matrix focused methods include Method 533 and Method 537.1. There are known advantages and disadvantages with each method.

Compliance with the MCLs will be based on a Running Annual Average (RAA) during quarterly testing after the initial monitoring period is completed. This RAA is defined as the most recent four (4) quarters of data. If at any time more than one sample is taken during a quarter, all samples will be used in the RAA. Average values will be reported with the significant figures shown in **Table 3-2**.

Any individual PFAS result below the Practical Quantitation Levels (PQL) shown in **Table 3-2** will be reported as a value of zero (0) in the compliance calculation. The USEPA defines the PQL as the lowest level at which contaminants can be reliably quantified within specific limits of precision and accuracy during routine laboratory operating conditions using approved methods. The USEPA determines the PQL through interlaboratory studies and can be affected by the instrumentation used, sample preparation techniques, and the instrument operator. In setting the PQL, the USEPA must be assured that all laboratories certified to analyze for PFAS can meet the minimum requirements for precision and accuracy.

Based on these laboratory studies, the USEPA has set the PQL for each of the regulated PFAS in **Table 3-2**. It should be noted that the PQL for both PFOS and PFOA are set at the MCL. The other four (4) PFAS PQLs are set below the individual MCLs. The USEPA's protocol is to have water systems report the level of a contaminant detected in their drinking water at or below the PQL as zero (0) in their compliance calculations. This process can have a significant effect on the final compliance results that are reported to the regulatory agency.

During the initial monitoring phase (from April 2024 - April 2027), utilities are required to collect the following data defined in **Table 3-3**. After this phase, a 3-year long compliance sampling phase begins in which systems can continue monitoring every quarter (for applicable systems) or receive a reduced monitoring schedule. To be approved for a reduced monitoring schedule, systems must provide a RAA below all MCLs (including the HI MCL). Once in the reduced monitoring schedule, there is an option for systems to enter a further reduced monitoring schedule. To be approved for a further reduced monitoring schedule, systems must provide three (3) consecutive annual measurements underneath "trigger levels". These trigger levels are defined as one-half of the associated MCL for each PFAS compound. If a single sample result goes over the MCL during reduced monitoring, that system will be required to return to non-reduced monitoring. During reduced monitoring, samples between the trigger level and MCL will qualify a system to remain in the reduced monitoring category. If a single sample result goes over the trigger level during further reduced monitoring, that system will be required to return to non-reduced monitoring until they qualify for a less frequent sample schedule. There is no option to go from non-reduced monitoring to further reduced monitoring as systems are required to first show compliance with the reduced monitoring, if applicable. The nuances of the changing sample schedules are summarized in **Figure 3-1**. Sampling frequencies during the reduced monitoring and the further reduced monitoring stages may vary based on direction of the regulatory agency. Sampling frequencies shown in **Figure 3-1** summarize how systems can be approved for alternative sampling schedules in the future after initial monitoring.

Table 3-3 Initial Monitoring Sample Schedule

Initial System Monitoring Size	Source Water	Initial 12-Month Monitoring Period
>10,000	Surface	4 samples total, all 2-4 months apart
	Groundwater	
≤10,000	Surface	
	Groundwater	2 samples total, both 5-7 months apart

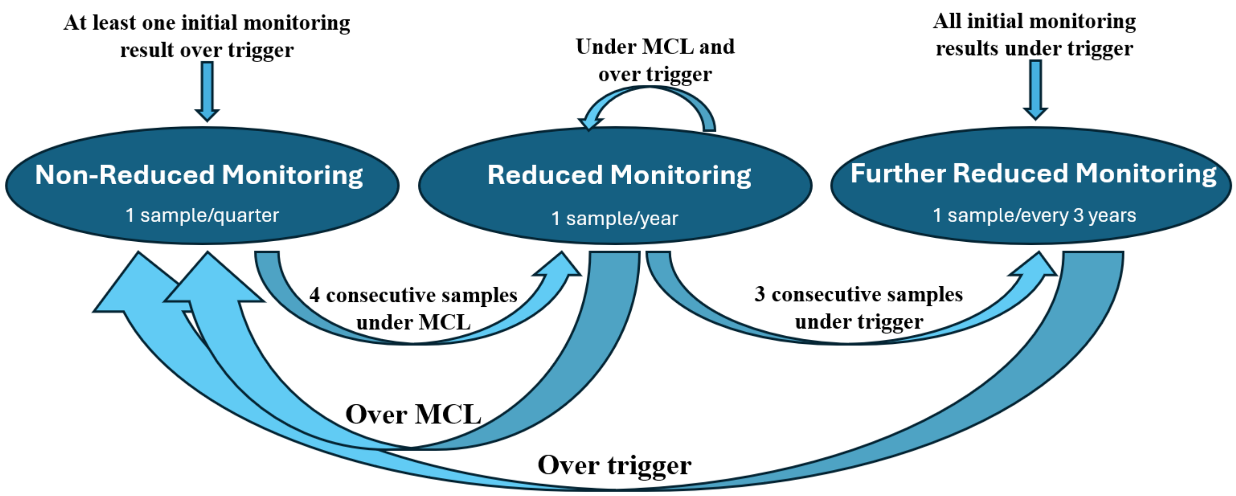


Figure 3-1 Compliance Monitoring Explanation

3.3 Legal Challenges to the USEPA PFAS Rule

Following the publication of the final PFAS ruling by the USEPA in June 2024, the American Water Works Association (AWWA) and Association of Metropolitan Water Agencies (AMWA) filed a petition in the United States Court of Appeals to challenge the PFAS MCLs in June 2024. AWWA and AMWA argue that USEPA did not follow the spirit of the Safe Drinking Water Act (SWDA) in determining the MCLs for the PFAS Final Rule. SWDA requires the use of sound, proven science in creating water regulations that protect public health.

The petition requests that a court verify the methods used by USEPA in determining the MCLs, proposes revised MCLs of 10 ppt for PFOA and PFOS – instead of the 4 ppt established by the USEPA, and suggests the removal of the HI MCL for compliance clarity. The details of this petition are available on AWWA's PFAS website page in the AWWA v EPA AMWA AWWA Opening Brief[1] filed on October 7th, 2024.

Although the fate of the PFAS Final Rule is expected to be determined in court at a later date, the full effects of the USEPA Final Rule remain in effect and the City of South St. Paul must plan accordingly. The PFAS mitigation analysis performed in this report conforms to the existing USEPA PFAS Final Rule.

3.4 Potential Changes to the USEPA PFAS Rules

In May of 2025, the USEPA announced plans to change the PFAS NPDWRs established in April of 2024.[2] According to a press release, the USEPA plans to rescind and reconsider the MCLs for PFHxS, PFNA, and HFPO-DA (Gen-X) individually as well as the Hazard Index for those three chemicals plus PFBS. The USEPA also announced plans to extend the PFAS compliance deadline for public water systems from April 2029 to April 2031. However, the announcement did not include an increase to the MCLs for PFOA and PFOS. According to the press release, the new rules would be officially proposed in Fall 2025, and the rules would be finalized in Spring of 2026. However, as of January 2026, the USEPA has yet to officially proposed changes to PFAS NPDWRs.

[1] Opening Brief: https://www.awwa.org/wp-content/uploads/AWWA-v-EPA-AMWA-AWWA-Opening-Brief.pdf

[2] USEPA Press Release: https://www.epa.gov/newsreleases/epa-announces-it-will-keep-maximum-contaminant-levels-pfoa-pfos

Chapter 4 Source Water Quality Review

South St. Paul's water was sampled and tested for PFAS and other compounds to study historical source water quality to aid in evaluating PFAS mitigation strategies as well as other treatment that may be needed to continue to comply with drinking water regulations. This chapter summarizes the historical PFAS data collected in South St. Paul, additional water quality data that was collected as part of this study, and the treatment goals recommended for the City based on the water quality results.

4.1 Historical PFAS Data

Table 4-1 below depicts the most recent four-quarter rolling averages for municipal supply wells with data from Method 533 or 537.1. The first detectable concentrations of PFAS in City-operated wells date back to 2007 (PFBA in Well No. 8). Looking at historical data, more PFAS constituents have been detected in South St. Paul as analytical techniques were improved. Not all municipal wells have detectable levels of PFAS, and only some wells have generated concentrations over the new USEPA MCLs.

Table 4-1 Most Recent Rolling Average PFAS Concentrations

Well No.	PFOA (ppt)	PFOS (ppt)	PFHxS (ppt)	PFNA (ppt)	PFBS (ppt)	HFPO-DA (ppt)	HI (1 or under)
MCL	**4.0**	**4.0**	**10.0**	**10.0**	**2000.0(1)**	**10.0**	**1**
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2(2)	16	0.0	0.0	0.0	0.0	0.0	0.0
3	1.7	0.0	1.2	0.0	1.0	0.0	0.1
4	7.5	1.1	5.5	0.0	4.7	0.0	0.6
6(2)	5.8	0.0	4.7	0.0	3.9	0.0	0.5
7(3)							
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	0.0	0.0

(1) Not an MCL by a Health-Based Water Concentration or Index. However, PFBS is used by the USEPA in the Federal HI calculation.
(2) Not enough 533 or 537.1 sample events for a true four-quarter rolling average. See further explanation below.
(3) No samples taken with method 533 or 537.1. See further explanation below.

Well Nos. 1, 3, 4, 8, and 9 have enough sampling events to complete the initial monitoring requirements due in April 2027. Well Nos. 2, 6, and 7 are emergency wells and are not subject to the rules and requirements of the initial monitoring rules. Important takeaways to note from the table above regarding historical PFAS concentrations:

- **Well No. 1:** Historical PFAS concentrations going back to 2007 show PFAS concentrations are below the PQL for all PFAS with MCLs. The City has completed quarterly sampling on Well No. 1 to assess compliance with the MCLs.

- **Well No. 2:** The City currently only has one sample for this well using Method 533. Although PFOA was detected on Well No. 2 at a concentration over the USEPA MCL on one occasion (January 2024), Well No. 2 is an emergency well that has not been used in the past ten (10) years. As such, this well does not need to comply with the USEPA MCLs due to its emergency status. This well also does not need a compliance agreement (CA) to show emergency status, because this well has been offline for years and was not placed offline *due to* PFAS concerns. Overall, Well No. 2 does not appear to pose concerns from a PFAS contamination standpoint as long as its emergency status remains in effect. In order to do so, Well No. 2 may not be used for more than 1 MG/yr and less than 33 hours/year. If this well is used for a true emergency situation, customer notification may be required by the MDH.
- **Well No. 3:** The City has a quarterly rolling average data for this well using Methods 533 or 537.1 to generate a quarterly rolling. Based on historical concentrations, Well No. 3 exceeded the MCL for PFOA on one occasion (October 2024), but this did not trigger a rolling annual average over the PFAS regulations. This well does not appear to pose concerns from a PFAS contamination standpoint at this time when compared to historical data both before and after the October 2024 sampling event.
- **Well No. 4:** This well has shown consistent PFOA concentrations over the USEPA MCL since 2022 when MDH began using Method 533 to test it. In addition, some PFOS concentrations have also been over the USEPA MCL, though the associated quarterly rolling averages for PFOS have remained below the USEPA MCL. It is likely that this well will need PFAS treatment considering it is heavily used by the City to supply water to the system and at least one (1) MCL is being exceeded.
- **Well No. 6:** The City currently only has one sample for this well using Method 533. Although PFOA was detected in Well No. 6 at a concentration over the USEPA MCL on one occasion (January 2024), Well No. 6 is an emergency well that has not been used in the past ten (10) years. As such, this well does not need to comply with the USEPA MCLs due to its emergency status. Well No. 6 does not appear to pose concerns from a PFAS contamination standpoint as long as its emergency status remains in effect. Similar usage restrictions apply as described for Well No. 2.
- **Well No. 7:** This well was only tested in 2007 and the City does not currently have data on Well No. 7 with Methods 533 or 537.1. Similar to Well Nos. 2 and 6, Well No. 7 is an emergency well that has not been used in the past ten (10) years. Therefore, the MCLs do not apply to this well as long as it maintains an emergency well status. Similar use restrictions apply.
- **Well No. 8:** The City has a quarterly rolling average data for this well using Methods 533 or 537.1 and historical PFAS concentrations going back to 2007 show data is below the PQL for all PFAS with MCLs. Although this well is used very seldomly, it does not qualify as an emergency well because it has pumped approximately eight (8) million gallons of water in the past five (5) years (limit is 1 MG/yr for emergency well status in Minnesota).
- **Well No. 9:** The MDH has been actively monitoring PFAS concentrations in Well No. 9 since 2022 using Method 533. Currently, eleven (11) tests have been completed on Well No. 9 and only one sampling event resulted in a PFAS concentration over the USEPA MCL

(PFOA in July 2023). Therefore, this well does not appear to pose concerns from a PFAS contamination standpoint at this time. Despite the breadth of historical tests, additional data is still needed to complete the initial monitoring requirements.

The Final PFAS Rule compliance is required starting in April 2029 for all water sources used for drinking water. At this time, Well No. 4 is the only well in which PFAS concentrations exceed the USEPA MCLs on a quarterly rolling average and is also actively used for drinking water supply in South St. Paul. **Table 4-2** below depicts the maximum historical concentration detected by Method 533 or 537.1 in parts per trillion (ppt). Note that a single high PFAS concentration does not trigger USEPA MCL exceedances nor violations. Exceedances can only be served through the quarterly running average calculation.

Table 4-2 Maximum Historical PFAS Concentrations

Well No.	PFOA	PFOS	PFHxS	PFNA	PFBS	HFPO-DA
MCL	**4.0**	**4.0**	**10.0**	**10.0**	**2000.0(1)**	**10.0**
1	0.0	0.0	0.0	0.0	0.0	0.0
2	16	2.4	2.6	0.0	2.1	0.0
3	6.6	3.4	4.7	0.0	4.0	0.0
4	7.9	4.5	6.2	0.0	5.3	0.0
6	5.8	3.5	4.7	0.0	3.9	0.0
7(2)						
8	0.0	0.0	0.0	0.0	0.0	0.0
9	4.2	2.5	4.2	0.0	1.1	0.0

(1) Not an MCL by a Health-Based Water Concentration or Index. However, PFBS is used by the USEPA in the Federal HI calculation.
(2) No samples taken with EPA Method 533 or 537.1.

PFAS concentrations in **Table 4-1** determine compliance with regulations, and concentrations in **Table 4-2** show the highest historical concentrations that indicate what future PFAS measurements may reflect. Well No. 3 is a unique case with detectable PFAS maximum concentrations but with low rolling averages. This is because the most recent sample event was the first to detect concentrations of any of the regulated PFAS compounds. Further data will be required to explore PFAS impacts on this well.

4.2 Other Water Quality Data

Since Well No. 4 appears to require PFAS treatment, the City of South St. Paul completed additional water quality testing on this well to aid in evaluating PFAS mitigation strategies as well as other treatment that may be needed to continue to comply with drinking water regulations. Well No. 4 was tested in December 2024. A summary of the results is shown below in **Table 4-3** (full data measurements in **Appendix B**).

Table 4-3 Well 4 Water Quality Summary

Parameter	Concentration	Units
Sulfate	31	mg/L
Chloride	110	mg/L
Sodium	38	mg/L
Magnesium	36	mg/L
Iron	0.015	mg/L
Manganese	0.012	mg/L
Nitrate as N	2.8	mg/L
Total Hardness as CaCO3	420	mg/L
Total Alkalinity as CaCO3	290	mg/L
pH	7.3	S.U.
Turbidity	0.15	NTU
Total Dissolved Solids (TDS)	580	mg/L
Total Organic Carbon (TOC)	0.623	mg/L
Dissolved Organic Carbon (DOC)	0.640	mg/L
Soluble and Volatile Organic Carbons (SOCs/VOCs)	0.0	mg/L
Combined Radium 226/228	0.420	pCi/L

Samples were collected 11/2024

The data presented in **Table 4-3** was used to explore the feasibility of PFAS removal treatment options described in **Section 6.2** . No constituents in addition to PFAS will require treatment to comply with current or proposed USEPA or MDH drinking water regulations.

4.3 Treatment Goals

The City of South St. Paul requires safe drinking water that conforms with all federal, state, and local regulations and aims to meet this goal through treatment that removes constituents of concerns to less than their MCL. South St. Paul also aims to minimize treatment costs to water users by treating only key water sources or using other mitigation strategies such as abandoning contaminated wells and utilizing new sources. At this time, Well No. 4 appears to be the only well within the system that requires PFAS mitigation to meet USEPA PFAS MCLs.

Chapter 5 Review of Funding Available

This section summarizes the City's position with available funding, both what has already been applied for and what else may be available. Both the State of Minnesota and large PFAS settlements are offering funding to municipalities to cover costs associated with compliance testing, piloting, design and construction of new PFAS removal facilities, and other PFAS related improvements.

5.1 Funding Applied For

Current funding applied for includes the State of Minnesota's Drinking Water Revolving Fund (DWRF), the Minnesota Pollution Control Agency's (MPCA) grant for Drinking Water Planning and Design Funds, and various settlements through the Aqueous Film-Forming Foam (AFFF) settlements.

Currently, the City of South St. Paul has secured $1,221,071 in the form of grant (complete loan-forgiveness) through the MPCA program. There is potential for obtaining additional grant funding through the DWRF and the AFFF settlements, but specific grant amounts are unclear at this point. Moving forward, unless additional opportunities arise for the City to submit for grant (complete loan-forgiveness) dollars, the Minnesota DWRF should be the go-to source for low-interest loans or grants for any upcoming PFAS-related projects.

5.1.1 Minnesota Drinking Water Revolving Fund

The Minnesota Public Facilities Authority (PFA), through the DWRF program, provides low interest loans to communities that meet a list of qualifications, such as contaminant exceedances in drinking water. In 2024, South St. Paul submitted an application to request that the PFA place a potential future water treatment PFAS removal project on the Project Priority List (PPL). For the projects that receive enough points and qualify for funding, the PFA requests that applicants submit an additional written application to place the project on the Intended Use Plan (IUP). By default, projects will remain on the PPL for up to five (5) years until completed, updated, or removed. Communities that decide not to take action to move a given project from the PPL to the IUP are removed from the PPL at no cost to the City. Projects that are needed to comply with emerging contaminant treatment may receive up to $3,000,000 in grant funding.

Although DWRF loans tend to have very low interest rates when compared to standard obligation loans, often projects funded through the DWRF program end up being more expensive as there are strict funding requirements such as complying with Build America, Buy America (BABA), American Iron and Steel (AIS), or prevailing wage requirements. However, given that the City's project would target PFAS removal in drinking water, which are considered emerging contaminants, South St. Paul may qualify for grant funding (complete loan-forgiveness) for a portion of the project(s).

The City's proposed project is currently ranked 154 out of 981 in the 2025 PPL. More details about grant funding opportunities through the DWRF will become available as the City decides to move the project from the PPL to the IUP.

5.1.2 Minnesota Drinking Water Planning and Design Funds

Early in 2024, the MPCA issued a new grant program ($20 million total) to provide grant funding for planning and design of PFAS treatment systems for communities operating drinking water supply systems in Minnesota. Eligible applicants include municipalities operating a drinking water supply system with a minimum of four (4) quarters rolling average results exceeding the USEPA PFAS MCLs at the entry point. The water must be tested using Methods 533 or 537.1. Eligible projects include proposals to plan and design for drinking water treatment systems to address PFAS contamination and the projects must be completed no later than June 30, 2027. Additionally, communities must not be part of the State of Minnesota 3M Settlement at the time of the application.

The City of South St. Paul submitted an application under this program for planning and design of PFAS treatment systems for Well No. 4 and a total of $1,221,071 were awarded via a grant (complete loan-forgiveness). Currently, Well No. 4 is the only well in the City that meets the grant requirements.

5.1.3 Aqueous Film-Forming Foam Settlements (AFFF)

Extensive funding is available through AFFF settlements with 3M, DuPont, Tyco, and BASF. The City has already applied major settlement claims for 3M, DuPont, Tyco, and BASF. These settlements only require the water system to have detectable PFAS concentrations as shown by EPA methods 533 or 537.1 certified testing. Allocation tables are provided so that communities can explore the allocation range of funds that they are expected to receive. Allocations are determined by water demand flows and maximum PFAS concentrations. The settlement totals are up to $12.5 billion, $1.2 billion, $0.75 billion, and $0.31 billion for 3M, DuPont, Tyco, and BASF, respectively. Currently, the City has submitted claims forms for the 3M, DuPont, Tyco, and BASF settlements. The funding amounts allocated through these settlements to the City of South St. Paul are unclear at this time.

5.2 Additional Funding Available

Additional funding is available through the Bipartisan Infrastructure Law (BIL) that funds public improvements projects. The Federal Emerging Contaminants Fund provides money for PFAS through State Revolving Fund (SRF) programs and is designated as grant money with complete loan-forgiveness. These funds are then distributed by individual states through their independent DWRF. Both PFOA and PFOS are designated as hazardous materials under CERCLA and an additional $1 billion is appropriated to treating at risk communities from these contaminants under the BIL. The AFFF PFAS Settlement website should also be continuously monitored in the event additional settlement agreements are added.

In addition to grant funding options, the Water Infrastructure Finance and Innovation Act (WIFIA) just announced is a federal funding source that provides loans to utilities for infrastructure improvements. This money is provided with low interest rates and often requires matching dollars. WIFIA recently announced $7.5 billion in available loan money, with $1 billion of that in the State Water Infrastructure Financing Authority (SWIFIA) to finance water infrastructure projects

Chapter 6 PFAS Mitigation Evaluation

PFAS requires advanced technology for removal due to unique characteristics that make it non-biodegradable and due to the wide variety of PFAS chemicals that exist and are regulated. Carbon-fluorine bonds are the strongest in nature and each PFAS chemical harbors at least one. Designating PFAS as long- or short-chain defines the relative length of carbon-carbon bonds and affects their removability due to varying molecular sizes and properties. Sourcing alternative water sources poses an option, though this process can be tricky to navigate with nearby aquifers also experiencing PFAS contamination.

6.1 PFAS Mitigation Options

Several PFAS mitigation strategies were evaluated as part of this study including drilling new wells and abandoning contaminating wells, blending contaminated wells with non-contaminated wells before the point of entry (POE), connecting to a nearby water system for water supply, providing centralized water treatment for all wells, providing individual wellhead treatment as needed to mitigate PFAS at each well, and install point of use treatment systems. Each option is analyzed in detail in subsequent sections.

6.1.1 Drill New Wells

One of the cheapest options to mitigate PFAS in South St. Paul is to abandon existing wells with high PFAS concentrations and drill new wells. Options for drilling new wells include drilling wells in the existing Jordan Aquifer or drilling deeper wells in the Mt. Simon-Hinckley Aquifer.

Drilling new wells into the Jordan Aquifer would not ensure PFAS-free water because existing wells in this aquifer show contamination. Additionally, Well No. 4 is the City's highest producing well and therefore the City may need to drill more than one well to supplement the capacity lost should Well No. 4 be abandoned.

Another option is drilling deeper wells in the Mt. Simon-Hinckley Aquifer as this aquifer is not known to have PFAS concentrations over the USEPA MCLs. The Mt. Simon-Aquifer is the deepest bedrock formation in the Twin Cities and is highly consolidated. In addition, this aquifer is known to contain high concentrations of natural Radium 226/228 that exceed the USEPA MCL. Therefore, this water source could likely require additional treatment processes to remove radium that would add both capital and operational cost to this option. Lastly, the State of Minnesota currently has a moratorium that restricts the use of this aquifer in the Twin Cities Metropolitan Area. Therefore, the Department of Natural Resources (DNR) does not issue new appropriation permits to pump groundwater from this aquifer when alternative water sources or interconnections with nearby public water systems exist. Variances to this moratorium are likely only to be provided to public water systems that have no other water supply option.

This option is not considered feasible at this time since there is a high likelihood that new wells in the Jordan Aquifer would have PFAS contamination resulting in the need to provide PFAS treatment in the future.

6.1.2 Blending Strategy for Active Wells

Municipal drinking water systems in the United States are regulated at each point of entry (POE) of where the water physically enters the distribution system. Therefore, systems such as South St. Paul with multiple wells and no centralized treatment, are regulated at each individual well. An option available to the City to lower PFAS concentrations in drinking water is to reduce the PFAS concentration at POEs by blending the active wells at a centralized location (without providing additional treatment) with the goal of lowering the PFAS concentrations to below the USEPA MCLs at the blended POE.

To proceed with this option, water pumped by the City's frequently active wells (Well Nos. 1, 3, 4, and 9, Well No. 8 is rarely used actively) would need to be conveyed to a centralized location and blended before entering the system. This would result in new trunk watermain infrastructure (likely ≥20-inch in diameter) of approximately 5 and 5.5 miles in length, with an estimated construction cost of over $12 million for the pipeline alone. Since Well No. 4 is the highest producing well in the City, and it also has the highest PFAS concentration, the City would likely need to blend this well with other non-contaminated wells ~50/50:

- Consistent operation of Well Nos. 1 and 3 to the centralized location to blend with Well 4
- Additional flows from Well No. 9 to address higher Well No. 4 flow conditions.

This option is not considered feasible at this time since it would result in a high capital cost that does not provide any PFAS removal from the City's drinking water. Additionally, the City may still find itself needing to provide PFAS treatment at the blended POE in the future given the potential for lowering MCLs as PFAS research continues.

6.1.3 Connect to Nearby Systems

Another option for the City is to purchase treated water from either the City of Inver Grove Heights or Saint Paul Regional Water Services (SPRWS) via new interconnected watermains. Currently, South St. Paul's water distribution system has four (4) complete interconnections with Inver Grove Heights to receive water during emergency situations. SPRWS reports having one (1) connection to South St. Paul on their side of the meter vault, though South St. Paul removed their side in recent years. Representatives of AE2S reached out to both water systems to discuss their willingness to provide drinking water to South St. Paul on a wholesale basis. Subsequent sections detail the specifics found with each water system.

Generally, for system reliability, South St. Paul would still be encouraged to maintain some active wells for high-demand usage and fire flow protections even if one of these systems provides drinking water to the City. Additionally, obtaining water solely from other municipalities leaves water users in South St. Paul subject to rate changes that may be out of their control. Lastly, extensive water modeling (water age and pressure testing) should be completed to explore the risks of reduced water quality, the effects of potential water chemistry changes, and/or the effects of pressure changes in the distribution network.

At this time, the City of South St. Paul has expressed interest in continuing to operate as an independent system. However, this section documents the willingness of the two (2) nearby systems to serve the City. For the reasons explained above and in subsequent sections, it is not recommended for the City to pursue these options at this time although this is a feasible alternative for the City to consider should PFAS treatment become extremely expensive to provide.

6.1.3.1 Connecting to Inver Grove Heights

Inver Grove Heights is open to future consideration, pending more discussion and understanding of future needs, of supplying drinking water to South St. Paul. The following items would need to be addressed to make this a feasible option:

- A detailed study would need to be completed to assess what additional infrastructure (supply, treatment, and storage) would be needed to allow Inver Grove Heights to produce, treat, and convey additional water for South St. Paul.
- At a minimum, one or more of the four existing interconnects between Inver Grove Heights and South St. Paul would require upgrading to larger diameter watermains to supply the appropriate amount of water.
- The City of Inver Grove Heights has noted that there are no nearby trunk watermains to these interconnections, so portions of piping in both communities may need to be upgraded/extended to supply the appropriate flows, the cost of which would likely need to be borne by the City of South St. Paul.
- Inver Grove Heights noted that trace amounts of PFAS have been detected in a few of their wells, though they do not expect these levels to trigger MCL violations in the near future based on current MDH and USEPA guidance. As time passes, this may change.

6.1.3.2 Connecting to SPRWS

SPRWS serves approximately 450,000 customers within the Twin Cities including the cities of St. Paul, Falcon Heights, Lauderdale, Maplewood, Mendota, Mendota Heights, West St. Paul, Roseville, Little Canada, and Arden Hills. Currently, the communities of Roseville, Little Canada, and Arden Hills are served on a wholesale basis while the other systems receive direct water supply from SPRWS. SPRWS expressed interest in assisting South St. Paul with supplying drinking water given its proximity through service to St. Paul and West St. Paul. Additionally, it appears SPRWS may have sufficient treatment capacity to provide water to South St. Paul, therefore reducing the need to pay for infrastructure expansion to serve the City. However, SPRWS noted that there are no current interconnections between the two systems. Therefore, new connections need to be made. Representatives of SPRWS provided a series of feasible locations to add interconnections which are depicted in **Table 6-1**.

Table 6-1 Possible Interconnections with SPRWS

Location	Watermain Diameter (inches)	Material	Requires Crossing Highway
Concord and Annapolis	12	Cast Iron	No
Annapolis – Concord to Stickney	6	Ductile Iron	No
Stickney & Annapolis	6	Cast Iron	No
Lewis and TH 52	6	Ductile Iron	Yes
Butler and Waterloo	6	Cast Iron	Yes
Rehnberg and Christiansen	6	Cast Iron	Yes
Thompson and Waterloo	6	HDPE	Yes
Wentworth and Waterloo (North ROW)	6	Cast Iron	Yes
Wentworth and Waterloo (South ROW)	8	Cast Iron	Yes
Marie and Christiansen	8	Ductile Iron	Yes
Mendota and TH 52	8	Ductile Iron	Yes

Each of the above options describes a location in the SPRWS system that borders South St. Paul's system. Connections made in these locations would be in the public right of way. Pipe upsizing may be needed based on how many connections are made. Additional interconnections beyond those summarized above may be needed depending on which pressure zones need to be connected. The cost of constructing new connections between the systems and associated infrastructure upgrades would likely fall to South St. Paul.

6.1.4 Provide Centralized Treatment

Centralized treatment across all system wells poses a number of financial and constructability constraints due to the geographical spread of wells across the City. Additionally, the nature of the City's water distribution system being divided into three (3) separate pressure zones makes centralized treatment challenging from an operational perspective. Lastly, given that only Well No. 4 has shown PFAS concentrations exceeding the USEPA MCLs on a quarterly rolling average basis, the City would spend a significant capital investment to provide PFAS treatment to wells that are not contaminated. As such, it is not recommended for the City to pursue this option at this time.

6.1.5 Provide Individual Wellhead Treatment

Providing individual wellhead treatment allows the City to strategically prioritize water quality for specific wells with the highest PFAS concentrations and prevent additional piping and energy costs associated with centralized treatment. There are two (2) potential wells that the City could consider providing PFAS treatment for due to their historical PFAS concentrations and pumping capacities (Well Nos. 3 and 4). Other wells that showed higher PFAS concentrations such as Well Nos. 2 and 6 do not require treatment due to their emergency status. Individual Wellhead

Treatment is considered to be the most feasible option to provide PFAS treatment in the City of South St. Paul.

6.1.5.1 Well No. 3

Well No. 3 is a high-demand well used occasionally each year during the summer. This Well produces 1,600 gpm and is currently under construction to implement a radium removal system. In September 2024, this well experienced a unique test result for PFAS and generated a single PFOA concentration result of 6.6 mg/L, with 4.7 mg/L for PFHxS and 4.0 mg/L for PFBS. Although these do not generate a MCL violation for PFOA, PFHxS or PFBS at this moment, it is essential that the City continues testing this well to understand what this test result means for the water source. In December 2024, PFAS concentrations for Well No. 3 returned to normal. If this well is used in place of Well No. 4, South St. Paul may need to look at impacts to the distribution system and water age changes due to its location and nearby pipe sizing. PFAS treatment at Well No. 3 is not required nor recommended at this time given the available data at the time this study was completed.

6.1.5.2 Well No. 4

Well No. 4 is the only normally active well with a four-quarter rolling average PFOA concentration consistently over the MCL. This well will require treatment to be in compliance with the USEPA MCLs by 2029 if the City wants to continue using it as a primary drinking water source. Well No. 4 serves the Low Pressure Zone and is conveniently located on a 12" water main line and is designed to provide large, consistent flows to the surrounding area. Because of its location, PFAS concentrations, and pumping capacity, providing PFAS treatment to Well No. 4 should be a priority for the City.

6.1.6 Install Point of Use Treatment Systems

Point of Use Treatment (POUT) systems are effective at treating contaminants right before reaching water customers, and they are most often used to remove unwanted contaminants from residential wells. These systems are small and are located inside individual properties. Small-scale reverse osmosis (RO) systems or carbon filter units are two (2) popular options for POUT systems.

Although this option has the potential for providing clean water for customers, the USEPA requires compliance with drinking water regulations at the POE to the water distribution system. As discussed in previous sections of this report, for South St. Paul, each individual well is a different POE. Therefore, the City would be in violation of the State and Federal drinking water regulations as soon as water with PFAS concentrations exceeding the USEPA MCLs entered the distribution system even if individual customers installed POUT systems at their properties. If desired, the City of South St. Paul can encourage individual property owners to use POUT systems at their own discretion to further reduce concentrations below what the distribution system provides. However, this option would not allow the City to comply with State and Federal drinking water regulations and therefore is not recommended at this time.

6.2 Treatment Technology Options

PFAS inlcude thousands of different chemicals, each expressing different removal characteristics due to associated chain lengths and functional head groups. Chain length describes the number of carbons attached to the functional group(s) that affects the size of the molecule and is correlated to the number of problematic carbon-fluorine bonds. Functional groups affect the physical properties of the compound and the overall molecular charge. Both chemical size and charge greatly affect how difficult a particular type of PFAS is to remove. Due to these complexities, numerous technologies are available to remove PFAS from drinking water with varying levels of effectiveness. **Figure 6-1** displays the molecular structure of PFOA, one of the most commonly studied PFAS compounds.

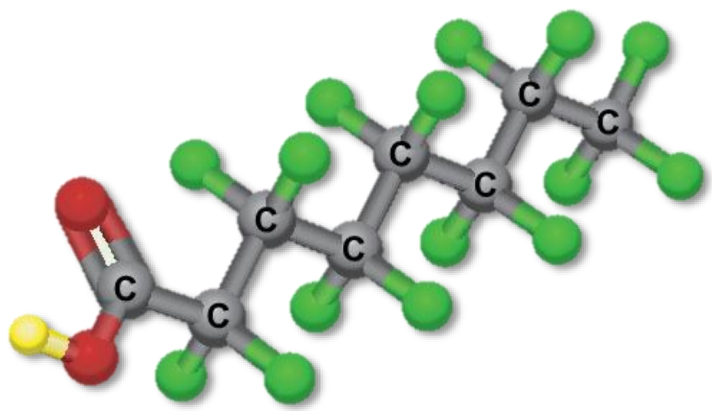


Figure 6-1 Molecular structure of PFOA

PFAS molecules of current regulatory interest include PFOA, PFOS, PFHxS, PFBS, PFNA and HFPO-DA (also known as GenX) and are included in the USEPA drinking water Methods 537.1 and 533. Depending on the number of individual carbon atoms present in a molecule chain, PFAS compounds can be categorized as either long or short-chain molecules:

- Long-chain PFAS molecules include those with six (6) or more carbon atoms, where the number of carbon atoms is greater than or equal to six ($n \geq 6$) for perfluoroalkyl sulfonic acids (C_nF_{2n+1}-SO_3H), and $n \geq 7$ for perfluoroalkyl carboxylic acids ($C_{n-1}F_{2n+1}$-COOH) forms. Thus, long-chain PFAS include PFOA, PFOS, PFNA, GenX and PFHxS.
- Short-chain PFAS molecules include those with less than six (6) or seven (7) carbon atoms, $n < 6$ and $n < 7$, for sulfonic and carboxylic types, respectively. Short-chain PFAS include PFBS.

Studies indicate that the types of PFAS present, relative to carbon chain length and chemical functional groups, and associated removal objectives are key factors that drive selection of an appropriate treatment process removal technology. Treatment process alternatives that are practiced on the full-scale include granular activated carbon (GAC), ion exchange (IX) and membrane separation via reverse osmosis (RO) or nanofiltration (NF). These technologies are also recognized as the best available technologies by the USEPA. Developing technologies that may be applicable for direct drinking water treatment or drinking water residual treatment are Dexsorb, surface modified clay, such as CETCO Fluoro-sorb (FS), and surface-active foam fractionation (SAFF). Subsequent sections describe each treatment technology in detail.

6.2.1 Granular Activated Carbon

Granular Activated Carbon (GAC) systems use adsorption to remove contaminants like PFAS as water passes through treatment vessel GAC media beds. GAC is widely used in water treatment for PFAS applications and to remove/adsorb organic molecules, such as taste and odor (T&O) compounds, disinfection byproduct (DBP) precursors, and volatile organic compounds (VOCs).

GAC media has a finite lifespan and contaminant adsorption capacity. The GAC media progressively approach saturation as compounds are adsorbed, and the capacity for further adsorption declines. Due to the adsorption nature of GAC and the need for pore adherence, short-chain PFAS (such as PFBA or PFBS) are less efficiently removed by GAC. GAC has historically been more effective at removing long-chain PFAS. The media bed is considered completely exhausted and consumed when contaminants targeted for removal are no longer effectively removed. The media bed is typically replaced well before this condition, which is typically when the target compound "breaks through" with concentrations above the defined treatment objective. The new media can be either virgin GAC or GAC that has been reactivated offsite. The waste media is removed by the GAC vendor and reactivated offsite to destroy the PFAS. At present, MDH is investigating if reactivated GAC can be reused for PFAS removal.

Full-scale systems are usually configured in a lead-lag arrangement, so the lag bed can treat the PFAS that breaks through the lead bed. The lead and lag bed are then interchanged. Once PFAS breaks through the lead bed, the exhausted media must be removed and replaced with regenerated media or virgin media. The exhausted media can then either be appropriately disposed of and landfilled or can be thermally reactivated offsite to remove and destroy the adsorbed contaminants and restore its adsorption capacity such that it can then be reused if allowed by MDH. **Figure 6-2** below shows an example of a lead-lag arrangement of the pressure vessels for GAC. GAC treatment systems can also be configured as filters open to atmosphere, although it depends on the available head at the plant site. Minimum empty bed contact time (EBCT) of 10 minutes per vessel is typical for optimal PFAS removal. Surface loading rates (SLR) for GAC systems are in the range of 6-10 gpm/sf. Loading rates greater than 10 gpm/sf can escalate media exhaustion and pose increased risks of premature media breakthrough due to channelization of flow paths and reduced EBCTs.

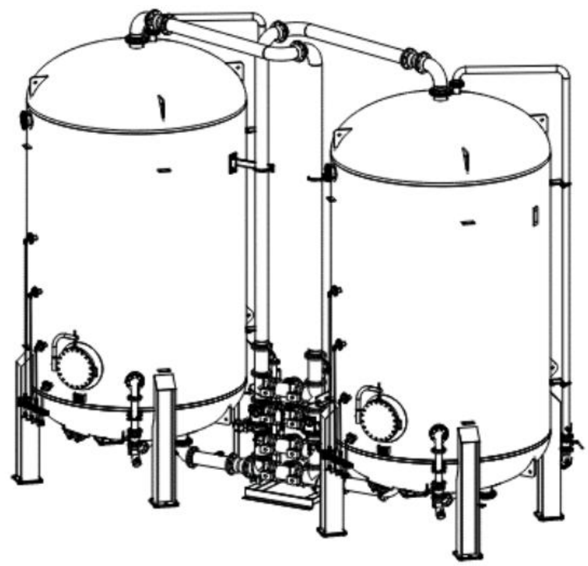


Figure 6-2 Typical Lead-Lad GAC Pressure Vessel Layout (based on Calgon Carbon Corporation's 1240 Model)

GAC can be derived from different sources including coconut shells, wood, lignite, and bituminous coal materials. Each pore structure excels in the removal of different constituents due to their differences in pore sizes and adsorption capacities. Macropores are greater than 50 nm across, mesopores are between 2-50 nm, and micropores are less than 2 nm across.[1] Due to the variances in structure and adsorption capacity, different types of GAC media may be better suited to removing certain contaminant compounds than others.

GAC types are summarized below:

- **Coal Based**
    - Bituminous Coal - Micropores, mesopores, and macropores present
    - Lignite Coal - Macroporous pore structure
- **Wood Based**
    - Macroporous pore structure
- **Peat Based**
    - Micropores, mesopores, and macropores present
- **Coconut Shell Based**
    - Microporous structure

Due to the variables that can influence GAC performance and treated water quality with respect to various PFAS compounds, GAC media adsorption characteristics and performance relative to specific treatment applications are best characterized through bench or pilot testing. One

[1] Xu, Yuqing & Lu, Zedong & Sun, Wenjun & Zhang, Xiaohui. (2021). Influence of pore structure on biologically activated carbon performance and biofilm microbial characteristics. Frontiers of Environmental Science & Engineering. 15. 10.1007/s11783-021-1419-1.

common testing method is to use a series of rapid small-scale column tests (RSSCT), where small volumes of GAC media are pilot tested against collected water samples to determine and predict how various carbon types may perform with actual source water and contaminant concentrations. RSSCT evaluations are an efficient and effective way to assess GAC performance characteristics and compare multiple products at one time. Such testing can also be completed via larger pilot scale analysis but requires on-site infrastructure and more time to complete.

Some GAC medias exhibit the potential for arsenic desorption when new. This can be safely managed by proper start-up procedures but requires forward washing a large volume of wash water sent to waste and additional downtime to commission. Media manufacturers make acid-washed media types that do not require lengthy start-up procedures to manage, though these media types can cost nearly 50% more.

In addition to forward washing, GAC requires a backwashing step as part of the new media installation. Although maintenance backwashes are also typically common for GAC, traditional backwashing is not allowed by MDH for PFAS removal applications due to the risk of washing off the adsorbed PFAS. Instead, some GAC facilities perform a low-rate “backfluffing” step that reduces some of the accumulated head loss within the GAC media. This process requires a slow backflow to help lift compacted media. Blackfluffing can help restore original head loss in the vessels without having high enough flow rates to fluidize the media and desorb PFAS constituents. Through backfluffing, these systems restore operations similar to the original head loss and continue strong PFAS removal until their respective adsorption capacity has been exhausted.

Managing competing constituents for GAC surface adsorption is essential for maximizing media lifetimes and reducing media changeouts. GAC is susceptible to lower overall performance in the presence of:

- Oxidants such as chlorine damage the oxidative coating on the surface of the media. Although this can slow surface removal kinetics, chlorine does not take significant pore space in the media and therefore is expected to minimally impact PFAS removal.
    - Based on the general water quality data provided in **Table 4-3**, iron and manganese concentrations are low and would not pose a risk to GAC.
    - Because oxidative damage occurs to just the media surface, this is a larger concern for iron and manganese removal applications where the oxidative coating is essential for removal.
- Natural Organic Matter (NOM) can compete for adsorption area which includes:
    - Total organic carbon (TOC)
    - Dissolved organic carbon (DOC)
    - Soluble organic carbon (SOC)
    - Volatile organic carbon (VOC).

  - The water quality of Well No. 4 indicated very low TOC and DOC measurements with non-detectable amounts of SOCs and VOCs, therefore not posing a risk to GAC media integrity.
- High water hardness can calcify the exterior of the media and pose challenges to the media exchange process.
  - Although caused by hard water conditions, these effects are mainly prevalent in high pH waters and Well No. 4 exhibits a neutral pH of 7.3.

GAC treatment systems are widely used in municipal water treatment. In the Twin Cities Metropolitan Area, the cities of Cottage Grove, Oakdale, St. Paul Park, and Woodbury have installed interim GAC WTPs to remove PFAS from the groundwater.

6.2.2 Ion Exchange

Ion exchange (IX) is a filtration technology that utilizes specialized charged resin beads with oppositely charged surface molecules. The benign surface molecules attached to the solid-phase resin beads are exchanged with contaminants present in the liquid-phase (groundwater) as water flows through the IX column to produce a clean water product. IX is common in water softening, deionization, and demineralization. The charged functional groups in PFAS make IX a strong removal technology, though piloting is important to find the appropriate resin and surface chemistry that maximizes PFAS removal. Treatment of PFAS via IX usually involves anion exchange of negatively charged particles, sometimes also abbreviated as AIX.

Similar to GAC media, IX media has a finite lifespan and contaminant exchange capacity. Exchange sites within the IX media progressively approach saturation as compounds are removed from the water, and the capacity for further exchange declines. The media bed is considered completely exhausted and consumed when contaminants targeted for removal are no longer effectively removed. However, unlike with GAC media, IX media cannot be recharged as the available IX resins for PFAS removal in drinking water applications are single-use resins. Therefore, the waste media is removed by the vendor and disposed of offsite.

Similar to GAC, IX treatment systems are typically configured with treatment vessels connected in series in a lead-lag arrangement. Given the observed faster uptake kinetics of PFAS on IX resin as compared to GAC, EBCTs for IX medias are lower (2 to 4 minutes per vessel is typical). Because of this, the surface loading rates of IX medias are typically higher than GAC media (12 to 14 gpm/sf). With a shorter EBCT compared to GAC, IX pressure vessels are usually smaller in height. **Figure 6-3** provides a typical lead-lag pressure vessel configuration for IX.

Similar to GAC media, IX performance selection is typically influenced by a variety of both source water and treatment process factors. IX is susceptible to NOM due to fouling risks and PFAS removal can be limited in the presence of other anions. Key details used to evaluate IX include:

- Specific resin media properties

- Water pH and temperature
- Flow rates and contact time
- Concentrations of organic and inorganic substances present
    - TDS
    - Dissolved Organics (TOC, DOC, SOC, VOC)
    - Sulfates, chlorides, nitrates, perchlorate, and other competing anions
    - Foulants and scalants (silica, ferric ions, calcium ions, chlorine, bacteria)
- Target effluent concentrations

Hence, for IX treatment applications, it becomes particularly important to understand the source water chemistry in detail, and to consider potential pretreatment process and associated desirable or undesirable effects on IX exchange efficiency. Because of the small and light nature of the IX resin particles, IX beds cannot be backwashed and only some IX media can even be backfluffed. Without the ability to backwash, pretreatment is almost always required to prevent media fouling. Once IX media is fouled or damaged, it must be replaced. Because IX media used for PFAS must be replaced upon breakthrough, it is important to understand if this type of fouling will accelerate media exhaustion.

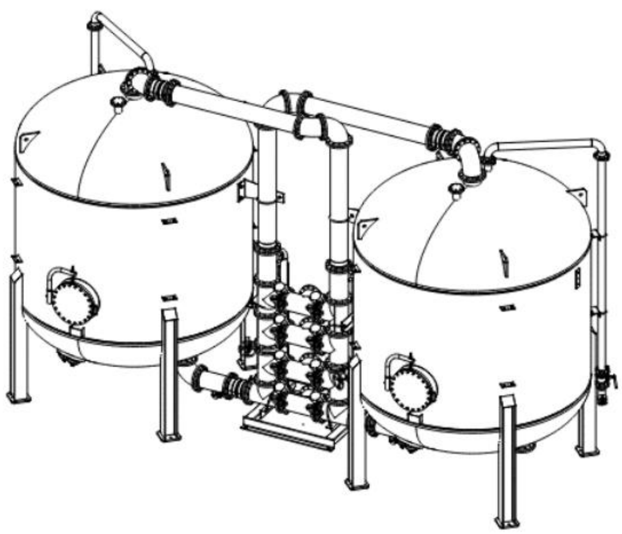


Figure 6-3 Typical Lead-Lag IX Pressure Vessel Layout
(based on Calgon Carbon Corporation's 1220 Model)

Ions present in the treatment water are susceptible to adsorption and exchange with resins if they are of the proper electrical charge. PFAS typically follows anionic exchange so the following anions (among others) will greatly affect PFAS removal capacities:

- Sulfates
- Chlorides
- Nitrates
- Other common ions present in water

As shown above, many PFAS selective resins use chloride as the benign ion, therefore the presence of additional chlorides in the groundwater may push kinetics to exchange less PFAS. The TDS and chloride found in the source water quality data for Well No. 4 would likely require pretreatment in some capacity. Options would be a lead-lag vessel configuration with GAC as the lead vessel to perform the pretreatment, though this can pose operational restrictions. In addition to the fouling from TDS, the water hardness measured at Well No. 4 indicates a substantial risk to media scaling which would reduce PFAS removal and damage the resin surface and greatly reduce PFAS removal.

IX media is roughly four to five times more expensive than GAC media, though it takes as little as 20% to 25% of the volume to get the same treatment. This is valuable for tight construction sites or utilities that experience higher flows. However, IX media tends to require pretreatment systems which increases the facility's overall footprint. Due to the raw water characteristics, <u>IX treatment is not recommended at this time</u>.

6.2.3 CETCO Fluoro-sorb

CETCO Fluoro-sorb 200 is a surface-modified organoclay media sourced from Wyoming bentonite. Modification involves introducing a surfactant to interlayer space. Fluoro-sorb is a stratified granular material like GAC that has been shown to be effective in removing PFAS to non-detect levels, including PFOA and PFOS. Fluoro-sorb has been found successful for two (2) to five (5) minute EBCTs and 6 gpm/sf to 14 gpm/sf surface loading rates. It also does not require dechlorination like IX. **Figure 6-4** provides an example of a CETCO Fluoro-sorb media often used for PFAS removal.

Figure 6-4 CETCO Fluorosorb 200 Adsorbent

Fluoro-sorb has shown promising results for short-chain PFAS that other filtration technologies struggle to capture and also have performed well with PFOA adsorption. Fluoro-sorb has a high adsorption capacity and can have a modified surface to be more selective with PFAS over NOM and other constituents, making it attractive for PFAS removal. This media also exhibits media exhaustion and breakthrough, similar to IX and GAC. Once exhausted, media cannot be reactivated and must be disposed of. Similar to GAC and IX, Fluoro-sorb can also be configured as lead-lag pressure vessels.

Fluoro-sorb treatment for PFOA and PFOS removal is typically designed for a minimum EBCT of 2 minutes and maximum surface loading rate of 10 gpm/sf per vessel. Therefore, the EBCT is similar to IX, but the surface loading rate is more aligned with GAC. Similar to GAC, Fluoro-sorb requires backwashing after replacing the media. Similar to IX, Fluoro-sorb requires less media and smaller vessels compared to GAC. The washing requirements for Fluoro-sorb are similar to that of GAC.

Although Fluoro-sorb has successful removal data, Fluoro-sorb has fewer installations and is less studied than GAC or IX media. This novel adsorbent would require extensive piloting to ensure performance for this application. Therefore, CETCO Fluoro-sorb is not recommended for South St. Paul at this time.

6.2.4 Dexsorb

Dexsorb is another novel adsorbent that provides similar treatment advantages to Fluoro-sorb. With consistently sized 0.78 nm pores, PFAS capture is selective and results in EBCTs around 3 minutes and smaller vessel sizes. Site constraints may drive the need for smaller vessels. Dexsorb is plant based and can be regenerated through a washing process instead of frequent media replacements like GAC and does not require dechlorination like IX. Similar to IX and Fluoro-sorb, media must be disposed of once exhausted and cannot be regenerated for use in the drinking water industry. A challenge associated with Dexsorb is its lack of installations and holds a smaller database of information regarding media performance and lifetime. As such, although Dexsorb is an available treatment technology, it is not recommended for South St. Paul at this time due to the lack of full-scale installations in the United States.

6.2.5 Membrane Filtration

Nanofiltration (NF) and Reverse Osmosis (RO) are separation processes that use a semipermeable membrane to remove impurities from water. The process relies on the principle of osmosis, which is the natural movement of solvent molecules (usually water) from an area of lower solute (impurity) concentration to an area of higher solute concentration through a semipermeable membrane. The direction of this natural osmotic flow is reversed by applying pressure to the side with higher solute concentration. This pressure, known as osmotic pressure, is applied to the water to force it through the semipermeable membrane, which allows only water molecules to pass through while blocking larger contaminants. Given that these membranes work on the molecular level, size (or molecular weight), and charge are important factors in the ability to prevent contaminants from passing through the semipermeable membrane, also known as the membrane’s rejection.

Although both membrane types are designed to remove dissolved constituents from water, the main differences between RO and NF membranes are pore size and selectivity. RO generally range from 10^{-3} to 10^{-4} microns. Whereas NF membranes can range from 10^{-3} to 10^{-2} microns. This difference in pore size affects selectivity, water flux, and pressure requirements. RO and potentially some NF membranes (e.g., tighter NF membranes) are selective and can be used to remove PFAS from drinking water. Selectivity also affects operating cost. RO membranes require more pressure and provide less water flux across the membrane, resulting in larger systems and pumps. Considering electrical usage consequences is essential in long term project cost estimates.

Membrane filtration techniques excel in high removal in standard applications. These advanced membranes are proven in PFAS removal and the removal of other constituents of concern. In addition to removing PFAS from the water, another great benefit of membrane technologies is that they can provide softening treatment. However, this can become problematic if only a few wells receive membrane treatment and most of the water entering the system from other wells is not softened. **Figure 6-5** shows a reverse osmosis system supplied by Pure Aqua that can handle 1 to 2 MGD.

Figure 6-5 Reverse Osmosis Systems (courtesy of Pure Aqua)

Proper cleaning procedures and antiscalant usage are required to maintain PFAS removal and membrane efficiency throughout the membrane lifetime. RO is a highly technical treatment method that requires pretreatment to minimize fouling risk on the membranes in addition to trained staff who are comfortable working with a wide range of chemistries for proper membrane cleaning procedures. Intense clean-in-place procedures are required every two (2) months to eight (8) months for properly functioning membranes. Chemicals required for membrane treatment technologies are listed below:

- Antiscalant – prevent membrane scaling
- Sodium Bisulfite – remove oxidants that can damage membranes
- Sulfuric Acid – pH adjuster for clean-in-place
- Citric Acid – Acid cleaner for clean-in-place
- Sodium Hydroxide – pH adjuster for clean-in-place

- High pH chemical – Base cleaner for clean-in-place

Although membrane technologies are very effective in removing PFAS and other contaminants, the largest drawback is that the 10- to 30-percent reject originated from this process will contain a high concentration of PFAS, which will require proper management in the form of treatment or disposal. Discussion with Metropolitan Council Environmental Services' (MCES) representatives would be required to assess disposal methods of the reject stream through the sanitary sewer system. The concentrated stream can be treated with any of the technologies introduced in this report (GAC, IX, etc.) for the removal of the PFAS. However, Surface Active Foam Fractionation (SAFF) treatment has gained popularity over the last couple of years for reducing brine volume.

6.2.5.1 Surface Active Foam Fractionation

SAFF uses air to generate fine bubbles, which then rise through a narrow water column. PFAS that accumulate at the top of the column as foam are vacuumed off for separate disposal. Disposal may include super-loading onto IX resin or Fluoro-sorb, or disposing directly as a liquid, depending on volume generated and disposal means available. Due to the surface-active nature of many PFAS compounds, SAFF can separate PFAS from bulk liquid solutions effectively and thus concentrate it in a lower volume stream. As such, SAFF is a powerful tool for remote sites that struggle with RO concentrate discharge and is especially useful for PFAS applications where hazardous discharge options are limited.

Although SAFF is an effective technology, site constraints at each well site can make SAFF an unattractive option due to the requirement of pretreatment through a membrane process that would precede SAFF, therefore larger facility footprints are needed. Additionally, residuals generated from the membrane and SAFF treatment processes can become cumbersome to dispose of. For these reasons, <u>the combination of membrane technologies and SAFF is not recommended as a feasible treatment technology for South St. Paul at this time</u>.

6.2.6 Treatment Technology Comparison

Each of the technologies discussed in this report have their unique set of requirements that may involve additional treatment, maintenance, space, or cost.

Table 6-2 provides a detailed summary of the different technologies with specific advantages and disadvantages, primarily related to treatability. Dexsorb is not included in this comparison due to the lack of installations and supporting evidence for strong, long-term PFAS removal. Additionally, SAFF is not included in this comparison because it does not directly remove PFAS from drinking water and is a supplemental technology for RO/NF treatment.

Table 6-2 Treatment Technology Comparison

Treatment Technology	Advantages	Disadvantages
GAC	• Well established and accepted PFAS removal process with well demonstrated performance. • Strong long-chain PFAS removal efficiencies. • Spent media can be thermally reactivated and reused. • Can remove other compounds if necessary. • No constituent concentrations in Well No. 4 water quality data are expected to jeopardize PFAS removal or accelerate media exhaustion.	• Spent media must be replaced with new media while old media is reactivated or disposed of by a third-party vendor. • Other contaminants can compete with PFAS for adsorption capacity on the GAC media potentially reducing PFAS removal performance based on raw water conditions. • Water hardness can pose challenges for media exchange. • Less effective removing short-chain PFAS removal. • Requires larger vessel footprint and EBCT than other media types.
IX	• Strong removal efficiency of long-chain PFAS with some IX resins focused more on short-chain PFAS removal, but actual performance depends on site-specific water chemistry. • Operational costs are similar, and sometimes can be lower, when compared to GAC. • Less media requirements and vessel footprint when compared to GAC due to shorter EBCTs. • Fairly selective media for PFAS is available.	• Spent media must be replaced and disposed of. Regeneration is not currently commercially viable, which makes this media less sustainable in terms of disposal when compared to GAC. • Unlike with GAC, IX usually requires pretreatment as fouling can cause irreversible media damage. • TDS, chloride, sulfate, and hardness accelerate media breakthrough • IX resins are typically proprietary, which can limit supplier availability and increase resin costs. • Cannot be backwashed and fouled IX media needs to be replaced.
Fluoro-sorb	• Influent TOC does not greatly affect PFAS removals unlike with other treatment methods. • Proven effective to remove regulated and other target PFAS. • Vessel footprint is smaller than GAC systems.	• Limited full-scale installations in the United States to date. • Spent media must be replaced and disposed of. Regeneration is not yet commercially viable. • Media is proprietary and can limit supplier availability and impact costs. • Vessel footprint larger than IX systems.
RO/NF	• Effective for removing all target PFAS types. • Can be used for multi-contaminant control. • Highly-automated options available for remote operation. • Can provide softening.	• High capital and operating cost when compared to other options. • Produces large volumes of reject water that requires special disposal or further treatment to remove PFAS. Reject water may present disposal challenges. • Pretreatment required to avoid membrane fouling. • Numerous high strength acids, bases, and proprietary chemicals required for operation and maintenance. • Highly trained operators with strong water chemistry background.

6.2.6.1 Pretreatment Requirements

IX, NF, and RO all require pretreatment in the majority of cases. Pretreatment can come in the form of conventional filtration, coagulation and flocculation, or something more unique such as cartridge filtration. The water source quality at each individual facility will drive what type of pretreatment is required.

For Well No. 4, IX, NF, and RO would all require pretreatment. The ion concentrations such as chloride, sulfate, and nitrate present would greatly limit the PFAS removal via IX due to acting as competing ions for resin surface adsorption. The high TDS and hardness exhibited at the site would greatly contribute to fouling and scaling of IX resins and NF/RO membranes. Membrane scaling results in major increases in head loss across process units and dramatically reduces equipment runtimes allowed between clean-in-place procedures. GAC and Fluoro-sorb generally do not generally require pretreatment, and no water quality results for Well No. 4 generated any concerns that would require pretreatment. **Table 6-3** summarizes the pretreatment needs for each treatment technology.

Table 6-3 Pretreatment Requirements Comparison Matrix

Technology	Pretreatment Requirements
GAC	Low
IX	High
Fluoro-sorb	Low
NF/RO	Highest

6.2.6.2 Washing and Cleaning Requirements

GAC and Fluoro-sorb both require washing after new media has been installed, though MDH does not allow traditional backwashing after operations have begun. IX cannot be backwashed because of the risk of media loss due to the lightweight nature of the resin. Instead, GAC, Fluoro-sorb, and IX can be backfluffed with MDH approval on a case-by-case basis for PFAS removal applications. Special care during backfluffing of IX resins must be taken to prevent media damage and media loss. NF and RO membranes require regular cleaning. This process is energy and chemical intensive. **Table 6-4** summarizes the backwashing needs for each treatment technology.

Table 6-4 Washing and Cleaning Requirements Comparison Matrix

Technology	Washing/Cleaning Required for Start Up	Washing/Cleaning Required for Operation
GAC	Yes	Optional, with MDH approval
IX	No	No – not recommended
Fluoro-sorb	Yes	Optional, with MDH approval
NF/RO	Yes	Yes

6.2.6.3 Operation & Maintenance Requirements

Maintenance can be a subjective descriptor of technology reliability and heavily relies on the experience/training of facility operators and staffing. Membrane technologies require the most chemical addition and labor-intensive cleaning processes. Clean-in-place procedures can be elaborate and require numerous chemicals and knowledge to run smoothly. Obtaining these chemicals can be costly and are at risk of low availability at times. Membranes generate clean-in-place waste that needs to be chemically neutralized and properly disposed.

GAC, Fluoro-sorb, and IX all require media change out once "breakthrough" of the desired contaminant effluent occurs above desired levels. However, media changeouts can be managed by media suppliers thus reducing the operation's staff involvement. A few studies suggest that Fluoro-sorb has a higher PFAS adsorption capacity than GAC and may require less frequent changeouts due to achieving a higher number of treated bed volumes before exhaustion.[1] **Table 6-5** summarizes the operation and maintenance requirement levels for each treatment technology.

Table 6-5 Operation and Maintenance Requirement Levels Comparison Matrix

Technology	Operation & Maintenance Requirements
GAC	Low
IX	Moderate (depends on pretreatment needs)
Fluoro-sorb	Low
NF/RO	High

6.2.6.4 Space Requirements

Treatment technologies with pretreatment requirements will likely require the most space due to additional treatment areas/basins. In most applications, options such as GAC and Fluoro-sorb only require infrastructure for the filter vessels and a storage/equalization basin, which can be installed below the building, if required.

Although IX likely requires pretreatment, roughly 1/5 of the media volume for IX is required in comparison to GAC. Therefore, IX facilities often require less footprint to treat the same amount of water when compared to GAC. Fluoro-sorb may require less filter media than GAC, though Fluoro-sorb is not as space-efficient as IX.

For flows above 1,500 gpm, it is likely that RO could require three (3) to five (5) treatment trains. RO skids tend to have a horizontal layout resulting in a large footprint. In addition, membrane systems require pretreatment and ample space for chemical rooms to allow for safe chemical

[1] Najm, I., Gallagher, B., Vishwanath, N., Blute, N., Gorzalski, A., Feffer, A., & Richardson, S. (2021). Per- and polyfluoroalkyl substances removal with granular activated carbon and a specialty adsorbent: A case study. *AWWA Water Science*, e1245. https://doi.org/10.1002/aws2.1245

storage of dissimilar and incompatible chemicals. **Table 6-6** summarizes the space requirements for each treatment technology, including any pretreatment footprint that must be considered.

Table 6-6 Space Requirements Comparison Matrix

Technology	Space Requirements
GAC	Moderate
IX	Moderate
Fluoro-sorb	Low
NF/RO	High

6.2.6.5 Capital and Operational Costs

For smaller facilities under 2 MGD, GAC typically has the lowest capital cost due to the lack of pretreatment and lack of chemical addition, though IX can become more attractive above this flow capacity since it tends to have a lower ongoing operational cost. Medias such as GAC and Fluoro-sorb have a more frequent replacement schedule and add a great amount of operational costs, but are priced closer to $150 to $250 per cubic foot for media, whereas IX can cost around $600 per cubic foot. Therefore, understanding media replacement requirements and timeline can impact long-term overall life-cycle cost for each treatment technology. NF and RO membranes have the highest capital and operational cost. **Table 6-7** summarizes the budgetary comparison for each treatment technology.

Table 6-7 Budgetary Comparison Matrix

Technology	Capital Cost	Operational Cost
GAC	Low	Moderate
IX	Moderate	Low to Moderate
Fluoro-sorb	Low	Moderate
NF/RO	High	High

Chapter 7 PFAS Removal Recommendation

7.1 Mitigation Approach and Technology

South St. Paul will require PFAS mitigation of active wells with measured PFAS rolling averages above the USEPA MCLs. Below is a summary of each mitigation approach discussed in **Chapter 6** and the recommendation to proceed with individual treatment at Well No. 4.

- **Drill New Wells**
  - No guarantee that new wells will produce PFAS free water.
- **Blend Wells**
  - Although compliance could be achieved, this option is very costly for no removal of PFAS.
  - Operational challenges would exist and require fine tuning to ensure proper blending to ensure compliance.
  - Firm capacity of the system would be decreased due to the reliance of numerous wells in flow production.
- **Connect to Nearby Systems**
  - The City would no longer have control over water quality or rates in the system due to needing to purchase water from another entity.
  - Some nearby systems would require significant capital expenditures to provide drinking water to South St. Paul. It would be expected for South St. Paul to cover some, or all, of these costs.
- **Centralized Treatment**
  - This alternative would incur significant costs from piping each well to a centralized location. This approach would provide treatment to non-impacted wells that do not require treatment, which will become costly.
- **Individual Treatment**
  - Treatment of Well No. 4 is recommended due to high pumping capacity, usage, and consistent PFAS concentrations above the MCLs.
- **Install Point of Use Treatment Systems**
  - Compliance is measured at distribution point entry and these systems would not address PFAS contamination at compliance measurement points monitored by MDH or the USEPA. The City would receive reoccurring violations.
  - These systems cannot be efficiently monitored for treatment quality or maintenance by City staff.

Considerations for each treatment option discussed in **Chapter 6** are summarized below. Granular activated carbon (GAC) is the recommended treatment technology for Well No. 4 at this time. Non-treatment mitigation techniques were eliminated for limiting South St. Paul operationally or not guaranteeing compliance in the future.

- **Granular Activated Carbon (GAC)**
    - GAC is recommended due to compatibility with the water quality at Well No. 4, low relative cost compared to other treatment approaches, and ease of operations.
- **Ion Exchange (IX)**
    - Well No. 4's water quality poses numerous scaling and fouling concerns for the integrity of IX media, causing shorter run times and more expensive media replacement costs over time. Pretreatment would be required for this technology, incurring more maintenance, costs, and spatial footprint.
- **Fluoro-sorb (FS)**
    - Although promising preliminary data suggests FS can selectively remove PFAS, few installations exist and long-term removal via FS is not well understood.
- **Membrane Technologies - Nanofiltration or Reverse Osmosis (NF/RO)**
    - Membranes exhibit both high capital and operational costs.
    - Pretreatment would require more footprint, staffing, and costs.
    - Membranes require constant attention and elaborate operational procedures.
    - There is potential for discharging PFAS-concentrated water into the MCES sewer system.

7.2 Preliminary Design Recommendations

This Section defines site feasibility and outlines the recommended treatment process, treatment location, site layout, building layout, and other design appurtenances considered to generate a planning level cost and operations and maintenance (O&M) estimate.

7.2.1 Process Flow Diagram and Operation

The preliminary process flow diagram (PFD) for the proposed facility indicating water flow through the facility (see **Figure 7-1**). **Appendix C** includes a more detailed version of this PFD. Based on the flow data provided by the City of South St. Paul for Well No. 4, two (2) large GAC skids (each with two (2) filter vessels) will be required for operation. Each skid will be capable of treating a maximum of ~990 gpm of flow. Internal piping to the facility will be designed such that flexibility is provided to bypass 100% of the flow (emergency operation) or partial bypass (for day-to-day operational needs).

Depending on the time of the year, Well No. 4 varies its flow from 1.4 MGD (or 972 gpm) to 2.7 MGD (or 1,900 gpm). Considering that each vessel will be able to treat approximately 990 gpm, City staff could strategically adjust operation of Well No. 4 to only run a single GAC skid during most of winter months and off-peak water demand months. Preliminary calculations indicate that the bypass flow must be kept to below 500 gpm while one skid is operating at 990 gpm to meet USEPA MCLs. Operating in this manner could extend the media life while maintaining compliance with the USEPA MCLs. SCADA will be utilized to program the facility so that bypassing occurs automatically based on Well No. 4 pumping rate. Representatives from the MDH have preliminarily approved this proposed approach for treatment pending further refinement.

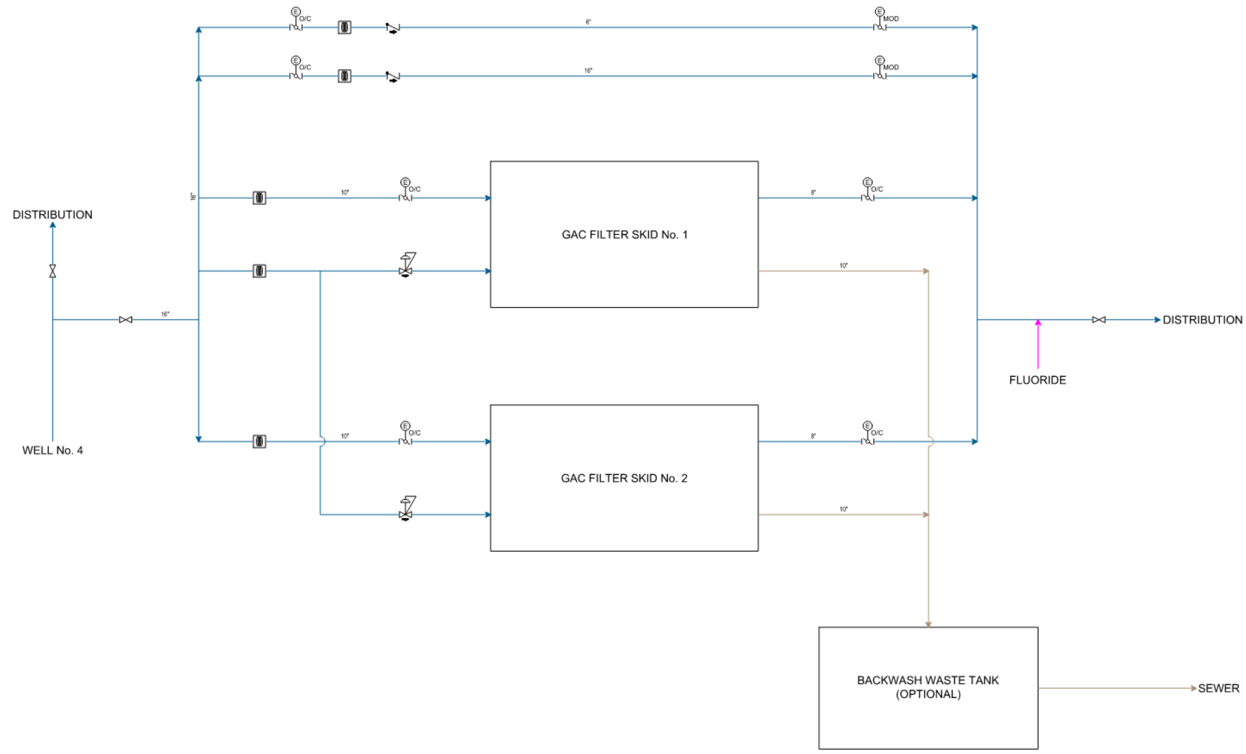


Figure 7-1: PFAS Facility Process Flow Diagram

During preliminary design of the facility, the option to reduce the two (2) bypasses to a single bypass will be studied in an effort for simplifying operation and reducing capital costs. Additionally, the PFD shows raw water being used for backwashing. During preliminary design, a decision will be made whether raw water, or finished water, is used for backwashing GAC media during the media commissioning step (backwashing is not expected regularly for this application).

Table 7-1 below includes a preliminary list of the valves and appurtenances required to operate the plant.

Table 7-1 Preliminary Improvements Schedule

Valve Type	Quantity	Location(s)
Gate Valves	3	Yard piping for facility bypass and rerouting to new distribution system point of entry location
Control Valves	2	Around filter skids to regulate pressure/flow during backwash

Valve Type	Quantity	Location(s)
Butterfly Valves	8	Two on each of the four flow paths to manage active/inactive flow paths
Check Valves	3	Prevent backflow on bypass lines due to pressures induced from distribution system and filter skid effluents, and on backwash tank effluent
Plug Valves	1	Isolation of backwash tank effluent
Air Release Valves	1	Air release at highest part of backwash tank effluent line
Flow Meters	4	One for each flow path

7.2.2 Filtration Technology

After a full review of PFAS treatment alternatives, GAC media is expected to have the best performance for addressing project objectives and goals. The water quality of Well No. 4 analyzed in **Section 4.2** of this report highlighted analytes that would influence both GAC and IX performance. The TDS concentration (580 mg/L), water hardness (420 mg/L as CaCO3), and chloride concentration (110 mg/L) would all contribute to premature fouling and breakthrough of IX media, leading to more frequent media replacements and higher operational costs for the City. Premature breakthrough of IX media must be avoided because it is roughly four (4) times more expensive per cubic foot than GAC. Additional testing in the form of RSSCT (rapid small-scale column testing) studies is recommended to identify the single most effective GAC media to further optimize PFAS removal and minimize media replacements.

As required by MDH, a lead-lag filter configuration is recommended for the proposed upgrades to maximize EBCT and effectively treat PFAS. With a 12-foot diameter vessel, flows through a single filter skid have a capacity of ~990 gpm to maintain the 10-minute EBCT required by MDH in each filter vessel. With two skids in operation, 1,980 gpm can be treated, with any additional flows being routed through the small bypass line for a blended effluent. Note Well No. 4 can pump a maximum of 2,000 gpm.

Redundancy is accounted for with the bypass line and the second filter skid flow path. If a single skid is offline, the second skid can accommodate 990 gpm flows and the bypass can allow for a higher effluent flow. Bypass capacity will be further defined in final design, though will be dependent on the removal of PFAS provided by the vessels and the media exhaustion percentage at a given point in time. Bypass flow will need to be monitored during operation to ensure the PFAS concentration in the blended water is below the USEPA MCLs.

7.2.3 Pump Hydraulics

The increased head loss generated by the proposed facility was inputted into the hydraulic model for South St. Paul and assessed through a 5-day extended period simulation with peak water demands. The hydraulic model used for this simulation had the WTP relatively located near Wellhouse 4, but not in an exact location (see **Section 7.2.6**). Further refinement of the modeling effort will be completed during design. However, at this time, the modeling completed is sufficient for this planning effort. The analysis demonstrated that the current well pump can handle the additional dynamic head loss produced by the WTP's GAC filters, piping, valves, and fittings. The system was generally able to maintain pressures above 90 psi (desired) at the control points, with very few instances below 85 psi. As such, the desired system pressure was maintained while ensuring proper water levels in the water storage tanks.

Although system pressure can be maintained with the proposed upgrades, the capacity of Well No. 4 is expected to drop from about 2,000 gpm to nearly 1,800 gpm due to the additional head loss. Recent flow data indicates that the well does not often run above 1,800 gpm. If greater than 1,800 gpm is required to maintain pressure, the emergency facility bypass line could be utilized to raise pressure to about 2,000 gpm, allowing for a blended entry point into the distribution system.

Backwashing procedures could be driven by the Well No. 4 pump directly or driven by the distribution system pressure. If backwash flow is provided by the distribution system, Well No. 4 will need to run and provide water to the system via the other filter train.

This hydraulic analysis was done prior to the completion of upgrades to Well No. 3. Further analysis of the hydraulic system may be required once the hydraulic model has been updated with the impacts that the new WTP on Well No. 3 may have on its pumping capacity.

7.2.4 Chemical Addition

Fluoride is currently the only chemical used at Well No. 4. In addition to removing PFAS, GAC media also removes fluoride from the water. Therefore, the fluoride feed point at Well No. 4 will need to be moved to post-GAC treatment. As such, space needs to be allocated in the PFAS removal facility to allow the City to store and feed fluoride.

Chlorine addition is a potential future requirement for the City to supply at entry points to the distribution system and an unfurnished room will be provided in the building to accommodate these anticipated changes to regulations. Similar to fluoride, chlorine would need to be added post-GAC treatment.

Preliminary design includes chemical furnishings in the fluoride room including a 120-gallon bulk fluoride tank with secondary containment, two transfer pumps (one duty, one spare), a break tank, a day tank, and two feed pumps (one duty, one spare). Tubing to the injection sites will be encased in Sch 80 PVC where needed. Pump shelves and an eyewash station will also be furnished.

7.2.5 Backwash Tank

Including a below ground backwash tank to the overall design would assist in equalizing the flows going to the sewer during backwash procedures. Flows during a GAC filter backwash protocol can reach up to 1,300 gpm (75°F water temperature, or 1,000 gpm at 55°F water temperature) and it is estimated that the residual capacities of the sewer lines near the PFAS removal facility can accept a maximum of 900 gpm based on the as-built information provided by the City. To be conservative, the backwash tank size assumed that the PFAS treatment facility will discharge wastewater to the sewer at a rate of 500 gpm during backwashes. This results in needing a 31,000-gallon tank and two (2) 300-gpm pumps on site to equalize the flow during backwash and start-up procedures. Full start-up procedures are described in **Section 7.4** of this report.

After coordinating with GAC media suppliers, there is flexibility to the standard initial backwashing procedure that may assist in lowering backwash waste flows to 900 gpm and lower and strategically plan backwashes when water temperatures are at or below 55°F. Because understanding existing sewer capacity is critical to the operation of the PFAS facility, <u>it is recommended to proceed with sanitary sewer flow monitoring prior to final design to confirm existing residual capacities.</u> This monitoring will provide a value engineering opportunity to either optimize the backwash tank size or omit the backwash tank completely from the final design if the nearby sewer is able to handle either the standard or alternative backwash flows provided by the media manufacturers.

7.2.6 Treatment Location

On site treatment by the existing well house is not considered to be feasible due to the site topographic complexity, parcel size, unique road access, and spacing requirements for GAC treatment and operation. Therefore, a total of eight (8) remote sites, both city-owned and privately-owned parcels, were studied to recommend a site for Well No. 4 PFAS treatment. The eight (8) sites were selected for further analysis based on ownership status (prioritizing city-owned parcels) and location with respect to both Wellhouse 4 and the existing 12-inch trunk watermain distribution line. It should be noted that building a new treatment building on any of eight (8) sites would require MnDOT permits and easements due to the proximity to I-494. Permitting and easements from MnDOT are required regardless of the site chosen since the existing 12-inch trunk watermain leaving the wellhouse will need to be upsized to 16-inch or a new 16-inch watermain will need to be installed nearby.

Major parameters considered during the site selection process included:

- **Site access**
  - Good access is integral to facility operations for construction and media exchange procedures.
- **Proximity to wellhouse and major distribution trunklines**
  - Piping to remote locations adds to project complexity and construction cost
  - Sites south of Highway 494 are preferred to avoid boring under 494 due to cost.
- **Site slope grade**
  - Steep gradients generate additional expenses for excavation and backfilling.

Figure 7-2 below depicts the locations studied. Red parcels indicate non-vacant City-owned sites while green parcels are vacant City-owned sites. The blue dashed line represents the approximate location of the 12-inch trunk watermain.

Figure 7-2 Building Location Alternatives

Table 7-2 below summarizes the advantages and disadvantages associated with each alternative site shown in **Figure 7-2**. Alternatives 1 and 2 were deemed to be the most appropriate for South St. Paul considering access, construction costs, and proximity to both the distribution system trunklines and Wellhouse 4.

Table 7-2 Building Location Alternatives Comparison

Alternate	Advantages of Location	Disadvantages of Location
1 Parcel ID: 364510001010	* Vacant parcel * Close to well house and trunkline * Good access by street * Corner of the site is flat for building * Does not need to cross MNDOT roads or major City roads with pipelines	* Site is positioned up a fairly large hill from well house
2 Parcel ID: 366582003300	* Close to well house and trunkline * Good access by street * Sufficient flat area for building * Does not need to cross MNDOT roads or major City roads with pipelines	* Not city owned (need to buy or obtain a permit from MNDOT) * Site is long and narrow so building would have to accommodate shape of site * Site slopes down dramatically across a large portion of site (north half and west half mainly)

Alternate	Advantages of Location	Disadvantages of Location
3 Parcel ID: 366582009320	* City owned and vacant * Distribution trunk line is close for connecting treated water	* Tight access for construction and maintenance but could be managed * Would need MNDOT easement south of the apartment complex for additional access. * Pipe encasement required for boring under 494 * Sloped site will increase construction costs
4 Parcel ID: 367150011160 & 367150018350	* City owned and mostly vacant * Good access and flat site * Relatively close to well house * Close to existing Public Works facility	* Site may be used seasonally for storage * Far from trunkline and may require additional pumping and trunk watermain improvements
5 Parcel ID: 367150021181 & 367150022010	* City owned, vacant, and has good access * Does not need to cross MNDOT roads or major City roads with pipelines	* Far from trunkline and may require additional pumping and trunk watermain improvements * Bluffline and MRRCA rules restrict development of the site
6 Parcel ID: 368330004180 & 368330004190	* City owned, vacant, and good access * Does not need to cross MNDOT roads or major City roads with pipelines *Close to Well No. 9 so centralized treatment would be a feasible option to pursue	* Far from trunkline and may require additional pumping and trunk watermain improvements * Surrounded by residential property * Proximity to South St. Paul airport and flight path restricts development of the site
7 Parcel ID: 364530001260	* Flat site and good access from road * Proximity to trunk line for effluent water	* Not city owned (Owner has not been contacted) * Far from well and may need additional pumping
8 Parcel ID: 366582006150 & 366582006110	* At well site, see “Well 4 Site” on Figure above * No need for trunk improvements	* Poor access difficult for media exchanges * Costly construction due to complex site, small size, and steep site slope gradients * New WTP would limit access to the well house for maintenance

A meeting was held with City staff on March 3rd, 2025, to discuss the alternative locations. Upon further discussion with City staff, it was decided that Alternative locations 1 and 2 were the preferred locations to proceed with siting PFAS treatment for Well No. 4. After discussing property purchasing with the Owners of both Alternative 1 and Alternative 2, Alternative 1 was ultimately selected and a purchase agreement was approved in November 2025. The owner of Alternative 2, the Minnesota Department of Transportation (MnDOT), ultimately would not have been able to transfer enough land of Alternative 2 to the City for Well 4 treatment. As a result, Alternative 1 was used as the basis of design for the preliminary design detailed in this chapter.

7.2.7 Site Layout

Alternative 1, located northeast of the intersection between 1st Avenue S and Warburton Street E, allows for great street access and enough flat space for the desired PFAS facility equipment. It is proposed that the building will be located on the west end of the site. An optional 30-foot-wide driveway, that can also serve as off-street parking for City vehicles when servicing the facility, can be located on the west side of the building to maximize access to the PFAS facility. Northeast of the PFAS facility, there is space for an optional 31,000-gallon tank used for equalization of water produced during backwashing, forward washing, and backfluffing. Submersible sump pumps will convey water from the tank to the nearby sewer lines on 1st Avenue S. In addition to backwashing procedures, media commissioning will also generate a significant amount of water that will need to be discharged to the City's sanitary sewer system. An approximate layout of the site is shown in **Figure 7-3**. It should be noted that the hydraulic analysis in **Section 7.2.3** was completed under the assumption that the PFAS WTP would be located near Wellhouse 4. Additional modeling should be completed during the early stages of the design phase to confirm the well will continue to operate appropriately.

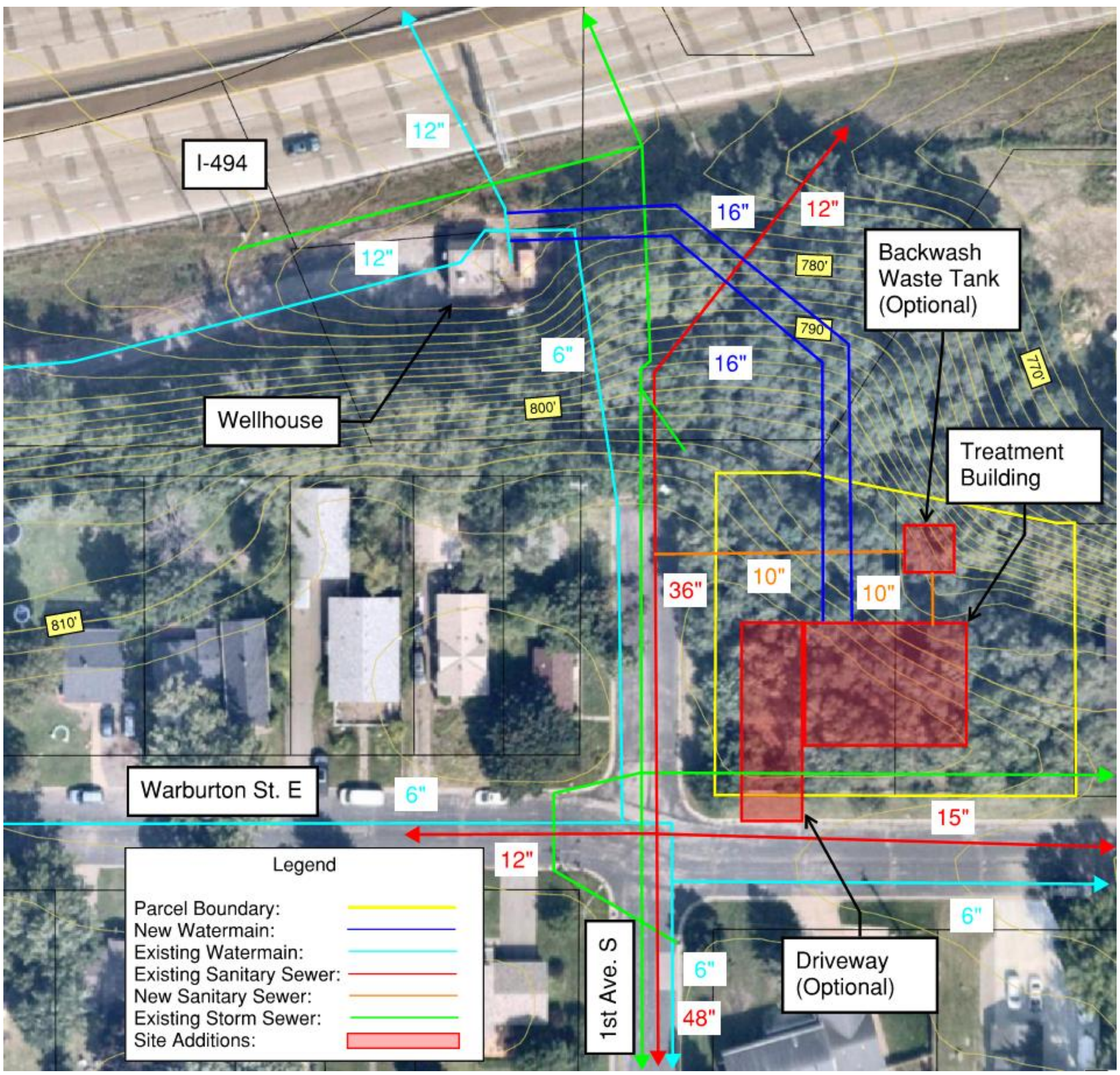


Figure 7-3: Proposed Site Layout for Alternative 1 (locations are approximate)

It is anticipated that media commissioning procedures could require anywhere between 200,000 and 700,000 gallons of water to clean acid-washed media or nonacid-washed media, respectively, before the GAC vessels can produce drinking water of sufficient quality for public supply. Much of this flow is expected to be rinsing procedures operated around 500 gpm which are expected to be allowable by the nearby existing sewer lines, however, <u>it is recommended to proceed with sanitary sewer flow monitoring prior to proceeding with final design to confirm existing residual capacities</u>. As highlighted above, acid-washed GAC media can significantly lower the volume of water required for commissioning, though it is more expensive when compared to non-acid washed media.

7.2.7.2 Related Site Upgrades

Piping between the wellhouse and the facility is essential for maintaining operational flexibility for discharge water and allowing flow bypass when needed. **Figure 7-3** also shows a tentative site piping plan, based on the approximate location of utilities, that would provide all necessary flow paths needed by South St. Paul while minimizing installation costs.

It is anticipated that two new 16-inch watermains will be required to convey water from Wellhouse 4 to the PFAS facility. The preliminary layout has two watermains that run parallel from Wellhouse 4, up the hill, and to the treatment building. Due to the short distance of the installation, trenching is recommended for the new watermains instead of directional drilling. In this layout, both watermains need to cross under storm and sanitary sewers. Construction of this layout would require installing pipe across MnDOT property, requiring a permit and permanent easement. Construction of this layout would also require caution with respect to the above ground powerline that runs along the west side of 1st Avenue S and connects to Wellhouse 4. Trenching of the proposed water mains would also require clearing the trees surrounding the new water mains' path. Despite these anticipated challenges, the proposed path for the new watermains is the most cost-effective option and would cause the least local disturbance since the alternative path would require tying into the existing 6″ watermain on 1st Avenue S and then upsizing the entire 6″ watermain between the tie-in and the 12″ trunk watermain on 3rd Avenue S. This proposed approach to the site piping layout was discussed with two local contractors. Both contractors agreed that this plan would be cheaper to construct than if the pipelines were to be routed along the Wellhouse's existing driveway and Warburton Street E.

Full treatment bypass will be possible with the included valving and a smaller bypass within the facility will allow for treated and non-treated water blending to meet both PFAS requirements and water demands. Backwash waste will be routed to and from the backwash waste tank with 10-inch pipe.

7.2.7.3 Building Layout

A preliminary building layout for Alternative 1 is shown in **Appendix C**. Two (2) granular activated carbon (GAC) filter skid systems (total of four filter vessels) will handle ~1,980 gpm of flow with excess flows directed to an internal building bypass line and resulting in a blended effluent before leaving the facility. The vessels are limited to 1,980 gpm because of the EBCT required by MDH for PFAS treatment, and PFAS is expected to be sufficiently removed once this time as elapsed. The internal bypass line will also play a role in lower flow scenarios when the facility requires only one set of vessels to be operating, with excess flows bypassing the system and generating a blended effluent to meet target effluent flows.

Three (3) rooms on the east side of the facility provide divided spaces for fluoride addition (acid room), sodium hypochlorite addition (chlorine room), and electrical equipment. Secondary containment, pump shelves, and eyewash stations will be included in both chemical rooms. The electrical room will have HVAC for temperature stabilization and consistent air turnover to help maintain equipment and minimize humidity.

Process piping will be routed to the edges of the building and utilize floor penetrations before routing outside the area of the building foundation. Adequate space will be provided to allow for the back vessels to be removed with either one or no additional vessels requiring removal to access. A garage door can be installed for easier access to the vessels. Additionally, knock-out panels on the western wall may be provided for ease of removal of the GAC vessels if needed in the future.

7.3 Opinion of Probable Cost

The estimated cost to design and construct the WTP is summarized in **Table 7-3.** The estimated capital cost includes the cost of the optional driveway and backwash waste tank. Capital costs include a 30-percent construction contingency and an 18-percent indirect cost contingency. Other costs necessary for construction such as materials testing, geotechnical evaluations, and SCADA programming are also included. Lastly, an estimate to complete RSSTC testing via a third-party consultant is also provided. Costs related to the Metropolitan Council Environmental Services' (MCES) sewer availability charges (SAC) are included in the **Operation and Maintenance Analysis**.

Table 7-3 Anticipated Capital Costs

Division Name	Unit	Installed Cost
Construction		
Civil and Site Utilities	LS	$765,000
Building Construction and Site Concrete	LS	$1,241,000
Process Pipe and Equipment	LS	$3,196,000
HVAC and Plumbing	LS	$137,000
Electrical	LS	$308,000
Subtotal Construction Cost		**$5,647,000**
Construction General Conditions & Miscellaneous		
General Conditions	10.0%	$564,700
Construction Contingencies		
Planning Level Construction Contingency	30.0%	$1,694,000
Estimated Total Construction Cost		**$7,906,000**
Anticipated Professional Services		
Indirect Costs (Engineering, Admin, and Legal)	25.0%	$1,976,500
Design Phase Geotechnical Evaluations	LS	$30,000
Construction Testing	LS	$45,000
RSSCT Analysis (Optional)	LS	$100,000
SCADA Integration Programming	2.0%	$158,120
Opinion of Probable Total Project Cost		**$10,216,000**

7.4 Operation and Maintenance Analysis

Along with the costs of designing and constructing the new WTP, the City will incur operations and maintenance (O&M) costs. This report provides a planning-level analysis of the O&M costs for the new WTP over a 20-year planning period starting from the expected first year of operation (2029 to 2049). The seven (7) O&M cost categories anticipated for the WTP are operations staff, non-treatment processes, treatment equipment maintenance, treatment equipment power, treatment chemicals, GAC media changeout, and process sewer discharge. Several assumptions went into completing this analysis. Each individual O&M cost category along with assumptions are summarized in the paragraphs below. This analysis assumes that Well No. 4's usage remains constant throughout the planning period, so all seven (7) O&M cost categories remain the same except for inflationary increases (3-percent per year). Additionally, O&M cost estimates include a 30-percent planning contingency.

- **Operations Staff/Labor:** The WTP is not expected to require a full-time operator; however, it is likely that South St. Paul will need to hire an additional public works staff member to oversee the WTP on a part-time basis. This individual would also assist with other municipal duties as needed. An hourly wage of $40.18/hour was used to estimate this cost. Wage data was obtained from the 2023 Minneapolis-St. Paul Bureau of Labor Statistics and adjusted for inflation to the first year of plant operation (2029).

- **Non-Treatment Processes:** There are four (4) non-treatment processes required for the operation of the WTP: general building maintenance, non-treatment power, backwash tank cleaning, and sewer discharge.
    - The building maintenance accounts for all costs related to care and upkeep of the WTP's structure and building hardware. Building maintenance costs were estimated based on the WTP's total square footage and an industry standard rate of $0.069/sqft as recommended by the Buildings Owners and Managers Association.
    - Non-treatment power is the required power consumed by equipment not directly related to treatment. This cost includes the power consumed for lighting, plumbing, and HVAC. Non-treatment power costs were estimated based on the WTP's total square footage and an industry standard rate of $0.083/sqft as recommended by the Buildings Owners and Managers Association.
    - Backwash tank cleaning assumes that South St. Paul will need to clean sediment accumulated in the tank once per year at a cost of $5,000. This cost is only applicable if the backwash tank is required during final design.
    - Other costs in this category include sewer discharge. However, it is not anticipated that this facility will be equipped with a bathroom, locker room, etc., and therefore sewer discharges should be minimal unless a GAC media commissioning or backwash related sewer discharges take place. Those expenses are calculated under a separate O&M cost category.
- **Treatment Equipment Maintenance:** Treatment equipment within the WTP requires specialized maintenance to ensure proper operation. The WTP's treatment equipment includes pumps, valves, filter vessels, and chemical feed systems directly related to operation as well as equipment indirectly related to treatment including plumbing, HVAC, electrical equipment, and process controls. For planning purposes, the cost of treatment equipment maintenance was estimated as one (1) percent per year of the WTP's equipment's capital cost for said equipment.
- **Treatment Equipment Power:** In addition to the non-treatment power required to operate lights, etc., treatment processes such as pumping are also expected to require power. Most of the treatment power consumption is expected to come from the increased energy required for Well No. 4 to pump water through the GAC media due to the additional head loss and the power to operate the backwash waste pumps.
- **Treatment Chemicals:** The WTP is expected to include chemical addition of fluorosilicic acid to supply fluoride to the water. In the future, sodium hypochlorite (chlorine) may also be added for disinfection purposes. However, this O&M analysis assumes only fluoride is needed based on current operation. The cost of chemicals is estimated to be the cost of bulk fluorosilicic acid required to reach a dose of 0.75 mg/L. A cost of $0.56/bulk pound of fluorosilicic acid was used. Note that this cost is not new for South St. Paul as fluorosilicic acid is currently being fed at Well No. 4.

- **GAC Media Changeout:** GAC media replacement is by far the most significant contributor to the WTP's O&M costs, as it will need to be replaced to maintain adequate PFAS removal. Media changeout is required once the GAC reaches its adsorptive capacity and breakthrough occurs in the lead vessel. Typically, only the lead vessel of each skid is replaced at a time, as it experiences breakthrough first. Operational strategies can be implemented to stagger changeouts between skids, reducing the likelihood that both lead vessels require replacement simultaneously. This analysis conservatively assumes an annual replacement of the lead vessels on both skids. However, actual changeout frequency can reasonably range from one to three years, depending on PFAS concentrations, system usage, and media performance. To better refine this estimate and manage long-term O&M costs, it is recommended that RSSCTs be conducted. Based on supplier quotes, the GAC media is projected to cost approximately $3.60 per pound during the first year of operation (2029). Each lead vessel contains approximately 40,000 pounds of media.
- **Process Sewer Discharge:** The WTP's process sewer discharge refers to the wastewater produced by the treatment process. The wastewater must be discharged to the City's sewer system to be treated by MCES. There may be non-process sewer discharge from the WTP, however, this discharge is assumed to be negligible and thus will not impact O&M costs significantly. The process sewer discharge can be broken into two (2) categories: changeout washing and backfluffing. Changeout washing requires two steps: backwashing to remove fines from the GAC media and forward-washing to confirm the quality of the GAC vessel effluent as acceptable. Backwashing and forward flushing occur with every media changeout. Backfluffing is performed to maintain head loss across the vessels in between media changeouts. This analysis assumes that backfluffing occurs every six (6) months. The actual flow rates, operational times, and frequency for backwashing, forward flushing, and backfluffing will vary depending on the specific GAC product chosen and MDH guidance. For example, acid-washed GAC has a higher capital cost per pound than non-acid washed but requires significantly less wash water during the commissioning procedures. The costs for discharges treated by MCES include sewer availability charges (SAC units), industrial waste capacity charges (ICC), and industrial waste temporary capacity charges (ITCC). SAC units are a one-time purchase to establish a baseline flow and are purchased when a facility starts up. ICC are rates applied to regular discharges that exceed the baseline flow established by the purchased SAC units. ITCC are rates applied to temporary discharges. For the recommended WTP, MCES is expected to require the City to purchase a minimum of 4 SAC units. The cost to purchase the SAC units was applied to the first year of operation only. Since GAC media changeout occurs infrequently, the associated backwashing and forward-flushing discharges are expected to be subject to ITCC. However, since backfluffing is anticipated to occur more regularly, discharges related to backfluffing are expected to be subject to ICC. It should be noted that the City has the option to purchase more SAC units when the WTP starts up and later in the WTP's lifetime.

Table 7-4 below summarizes the estimated cost for each O&M cost category for Year 1 of operation (2029) and Year 20 (2049). An inflation rate of 3-percent and a 30-percent planning contingency were applied to this O&M estimate. The initial SAC unit charges are assessed only in the first year of operation and include a 3% yearly inflation from 2025. Note that additional labor requirements and GAC media changeouts comprise almost 90-percent of the O&M costs. Therefore, O&M costs could decrease significantly if additional labor is not needed or if the GAC media changeout frequency is less than once per year. Results from an RSSCT study would aid in refining the O&M cost projections as they would provide a better estimate for expected media life and changeout frequency.

Table 7-4 O&M Cost Estimate

O&M Cost Category	Year 1 (2029)	Year 20 (2049)	Cumulative 20-Year	% of Cumulative Cost
Operational Staff	$85,800	$155,300	$2,459,000	20.0%
Non-Treatment Processes	$6,000	$10,900	$172,000	1.4%
Treatment Equipment Maintenance	$21,000	$38,000	$602,000	4.9%
Treatment Equipment Power	$6,000	$10,900	$172,000	1.4%
Treatment Chemicals	$9,600	$17,100	$271,000	2.2%
GAC Media Changeout	$300,200	$539,200	$8,569,000	69.8%
Process Sewer Discharge	$12,100	$1,600	$36,000	0.3%
Pre-Contingency Subtotal	**$441,000**	**$773,000**	**$12,281,000**	
Planning Contingency (30%)	**$132,300**	**$231,900**	**$3,684,000**	
Total O&M Cost	**$573,300**	**$1,004,900**	**$15,965,000**	

7.5 Next Steps and Implementation Timeline

Table 7-5 summarizes a recommended project schedule that would allow the City of South St. Paul to construct the PFAS facility before the current USEPA compliance deadline in (April 2029) and continue to be engaged with the State of Minnesota and other funding agencies. Critical next steps include:

- Completing RSSCT studies to 1) identify top performing GAC medias for installation and 2) better understand replacement timeline to further refine O&M cost estimate projections. Additional piloting is not recommended due to the significant cost required to complete a long enough pilot study that could accurately provide information on media changeout.
- Completing sanitary sewer flow monitoring at key locations throughout the trunk sewers downstream of the proposed WTP to better assess the allowable wastewater discharge pumping rate for the WTP. Increasing the pumping rate could reduce the size of the backwash tank and therefore reduce construction costs.
- Continue coordination with MnDOT regarding project site easements.
- Meet the design deadline of June 2026 to comply with the DWRF funding requirements.

Table 7-5 Project Schedule

Milestone	Date
Final Cost Estimate & Report	January 2026
Presentation to City Council	February 2026
RSSCT Testing Procurement	May 2026
Sanitary Sewer Flow Monitoring	May 2026
WTP Design Begins	June 2026
DWRF IUP Application	June 2026
RSSCT Testing Results Obtained	September 2026
Design Completion	February 2027
MDH/DLI Submission	March 2027
MN PFA Funding Application	March 2027
Bid	April 2027
Construction Begins	July 2027
WTP Start-Up	Spring 2029

Appendix A: Review of Primary and Secondary Drinking Water Standards in the United States

The Safe Drinking Water Act (SDWA) was passed by Congress in 1974. Its purpose was to establish a uniform set of regulations and water quality standards for public water systems (PWSs) across the United States. The SDWA focused on identifying substances present in drinking water that have adverse public health effects. Within the State of Minnesota, the primacy agency in charge of enforcing these rules and regulations is the MDH.

To strengthen the SDWA, especially the regulation setting process, most of the 1974 SDWA was amended in 1986. Under the 1986 SDWA Amendments, the number of regulated contaminants increased from 23 to 89. Each standard consisted of a sampling frequency requirement and a maximum contaminant level (MCL). The U.S. Environmental Protection Agency (USEPA) was originally mandated by Congress to establish MCLs for 25 new parameters every three (3) years under the amended 1986 SDWA. Amendments to the SDWA in 1986 included a host of regulations.

A Reauthorization of the SDWA was signed into law (Public Law 104-182) on August 6, 1996. The law repealed the original mandate established by Congress for the USEPA to regulate 25 new contaminants every three (3) years and replaced it with a new standard-setting process to identify contaminants for future regulation based on their occurrence, the health risk they pose and cost-benefit evaluations. The 1996 SDWA Reauthorization made several additional important changes including: 1) establishing new requirements for selecting contaminants for regulation, 2) mandating the use of sound science, 3) allowing analyses of health risk reductions, costs, and benefits, 4) establishing an occurrence database, and 5) permitting competing risks to be evaluated.

Under the Reauthorization, the USEPA selects at least five (5) new contaminants to consider for regulation every five (5) years with regulations geared toward those imposing the highest health risk. Currently under the SDWA, there are 91 regulated contaminants. Although surface water treatment facilities have been the primary focus of heightened regulations due to the concerns regarding microbiological contaminants and DBPs, ground water treatment plants have also been impacted, but to a lesser degree. The Reauthorization of the SDWA has provided a review of the original and amended SDWA and a better understanding of the significance of providing regulations that emphasize the importance of maintaining proper disinfection while controlling the formation of DBPs.

The goal of providing high-quality water is achieved by complying with the primary drinking water regulations, satisfying select secondary drinking water regulations, and addressing water quality issues not specifically addressed by primary or secondary regulations. Primary drinking water regulations control or will control filtration, turbidity, filter backwash, disinfection, DBPs, disinfectant residuals, total coliform bacteria, lead and copper, and a long list of additional contaminants in the water through MCLs. These primary regulations are designed to protect public health. The secondary drinking water regulations are established to help provide quality water that is both aesthetically and cosmetically pleasing, as well as to address technical effects, a term coined by the SDWA Advisor that addresses issues such as corrosivity and scaling. Another water quality standard that is not currently regulated as primary or secondary drinking water regulations and an anticipated future regulation that may impact the finished water quality is also considered below.

- Volatile Organic Carbons (VOCs)
    - The VOCs Rule became effective under the SDWA Phase II/V Rules on January 9, 1989. The VOCs Rule established MCLs for twenty-one VOCs such as styrene, toluene, xylenes, etc. that are suspected human carcinogens through ingestion.

Primary Drinking Water Standards

The primary drinking water standards are legally enforceable standards that apply to public water supply systems. Primary drinking water standards regulate microbial contaminants, disinfectants and DBPs, inorganic and organic compounds, radionuclides, and other advisory objectives and parameters. Primary standards protect public health by limiting the levels of contaminants in drinking water by establishing maximum residual disinfectant levels (MRDLs), MCLs, and treatment techniques (TT) for different contaminants.

Total Coliform Rule (TCR)

The TCR became effective under the SDWA on December 31, 1990 replacing the microbiological monitoring rule. This rule established microbiological standards and monitoring requirements that apply to all PWSs. The purpose of the TCR is to prevent outbreaks of waterborne microbial diseases by regulating a group of organisms that include fecal coliform and Escherichia coli (E.coli). The potential health effects of these organisms include gastroenteric and Legionnaires' disease. The presence or absence of total coliform is the general indication used to measure the level of pathogenic contamination within the water. The maximum contaminant level goal (MCLG) for total coliform is zero, and the MCL is based on the population served by the treatment facility. For all PWSs that collect 40 or more samples per month, no more than 5-percent of the samples may be positive for total coliform, and for those that collect fewer than 40 samples, no more than one (1) sample may be positive for total coliform under the routine monitoring requirements of the TCR. If any routine sample tests positive for total coliform, repeat samples are required. These repeat samples must be analyzed for fecal coliform, and no positive fecal coliform samples are allowed.

Groundwater Rule (GWR)

Although ground water has historically been thought to be free of microbial contamination, recent research indicates that some ground waters are a source of waterborne disease. Most cases of waterborne disease are characterized by gastrointestinal symptoms such as diarrhea, vomiting, etc. These symptoms are much more serious and can be fatal for persons in sensitive subpopulations such as young children, the elderly, and persons with compromised immune systems. In addition, research indicates that some viral pathogens found in ground water are linked to long-term health effects such as adult-onset diabetes and myocarditis (inflammation of the middle muscular layer of the heart wall).

The 1996 amendments to the SDWA required EPA to develop regulations that require disinfection of ground water systems "as necessary" to protect public health. The GWR establishes multiple barriers to protect against bacteria and viruses in drinking water from ground water sources and establishes a targeted strategy to identify ground water systems at high risk for fecal contamination. The GWR was issued as a final regulation in 2006. This rule applies to public ground water systems (systems that have at least 15 service connections or regularly serve at least 25 individuals daily at least 60 days out of the year). Implementation of this rule began in January, 2010. The requirements of this rule include:

- System sanitary surveys conducted by the State which are intended to identify significant deficiencies;
- Hydrogeologic sensitivity assessments for non-disinfected systems;
- Source water microbial monitoring by systems that do not disinfect and draw from hydrogeologically sensitive aquifers or have detected fecal indicators within the system's distribution system;
- Corrective action by any system with significant deficiencies or positive microbial samples indicating fecal contamination; and
- Compliance monitoring for systems which disinfect to ensure that they reliably achieve 4-log (99.99 percent) inactivation or removal of viruses.

A positive total coliform result from the TCR routine sampling triggers source water monitoring. Source water monitoring requires the system to collect a sample from the well(s) for further microbial analysis. If the sample is positive, then the system must take corrective action as directed by the state. A ground water system's best action to maintain compliance with the GWR is to maintain chlorine residuals in the distribution system sufficient to prevent positive coliform results in their TCR samples.

<u>Stage 1 Disinfectants-Disinfection By-Products (DBP) Rule (Stage 1 D/DBPR)</u>

Some DBPs are listed as probable human carcinogens by the National Cancer Institute, and some have also been linked to adverse effects on the liver, kidneys, nervous system and reproductive system. For this reason, the Stage 1 D/DBPR established MCLs for eleven (11) DBPs, categorized into two (2) groups of organic by-products (four (4) trihalomethanes (THMs) and five (5) haloacetic acids (HAA5s)) and two (2) inorganic by-products (chlorite and bromate). The Stage 1 D/DBPR also established maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for three (3) disinfectants: chlorine, chloramines and chlorine dioxide. Compliance was required by January 2002 for all community water systems (CWSs) serving more than 10,000 people. A CWS is defined as a PWS that has 15 or more service connections or serves 25 or more people on a year-round basis.

<u>Stage 2 Disinfectants-Disinfection By-Products Rule (Stage 2 D/DBPR)</u>

The USEPA published a Pre-Proposal Draft for the Stage 2 D/DBPR on October 17, 2001, and officially proposed the Stage 2 D/DBPR on August 18, 2003. The rule was finalized and published on January 5, 2006. The Stage 2 D/DBPR is intended to reduce potential cancer and reproductive and developmental health risks from DBPs in drinking water. Under the Stage 2 D/DBPR, systems were required to conduct an evaluation of their distribution systems, known as an Initial Distribution System Evaluation (IDSE), to identify the locations that are more likely to have high DBP concentrations. Based on the results of the IDSE, Stage 2 D/DBPR compliance monitoring sites were chosen. Compliance with the MCLs for two (2) groups of DBPs (TTHM and HAA5) would be calculated for each monitoring location in the distribution system. This approach, referred to as the locational running annual average (LRAA), differed from Stage 1 D/DBPR, which determined compliance by calculating the RAAs of samples from all monitoring locations across the system.

The Stage 2 DBPR also requires each system to determine if it has exceeded an operational evaluation level, which is identified using compliance monitoring results. The operational evaluation level provides an early warning of possible future MCL violations, which allows the system to take proactive steps to remain in compliance. A system that exceeds an operational evaluation level is required to review its operational practices and submit a report to the state primacy agency that identifies actions that may be taken to mitigate future high DBP concentrations, particularly those that may jeopardize compliance with the DBP MCLs.

Several factors including pH, presence of organic precursors typically measured as total organic carbon (TOC), chlorine residual concentration and type, temperature, and contact time have a significant impact on the formation of DBPs. Considering the above factors, pH control, total organic carbon (TOC) removal and utilizing chloramine disinfection are typically optimized to control DBPs in water treatment facilities.

<u>Phase II/IIb and Phase V Rules</u>

The Phase II and Phase IIb Rules became effective on July 1, 1991 and January 1, 1993 respectively. The Phase II/IIb Rules set standards for thirty-eight (38) synthetic organic chemicals (SOCs) and inorganic chemicals (IOCs). Thirty-six (36) of the contaminants are regulated by MCLs and two contaminants, acrylamide and epichlorohydrin, are controlled by limiting their use in drinking water treatment chemicals.

Although a large number of Phase II/IIb chemicals result from human activity, others occur naturally in water. These contaminants have been shown to either be, or are suspected to be, carcinogenic through ingestion. Some of the other effects of these contaminants include damage to numerous organs in the body, circulatory system damage, bone damage, nervous system damage and disorders, thyroid damage, and decreased body weight.

PWSs are required to ensure the water they supply meets the MCL for each Phase II/IIb chemical. A plan for synchronizing compliance monitoring across several existing and upcoming rules was introduced under Phase II/IIb. Monitoring frequencies for most source-related contaminants were coordinated with compliance periods of three years each. Phase II/IIb monitoring requirements also established: (1) sampling locations for surface and ground water systems, (2) the initial sampling frequency that is specific for a contaminant or contaminant group, (3) lower repeat sampling frequencies for water systems that do not detect a specific contaminant or contaminant group during the initial monitoring, (4) increased monitoring frequencies for water systems that do detect initial contaminant, (5) monitoring waivers for reducing or eliminating the sampling frequencies, and (6) one-time monitoring requirements for 30 other unregulated contaminants.

The Phase V Rule, effective on January 17, 1994, set standards for 23 additional contaminants. Contaminants monitored under Phase V included four inorganic contaminants, cyanide, three volatile organics, and 15 pesticides or synthetic organics. The USEPA set different monitoring schedules for different contaminants, depending on the routes by which each contaminant enters the water supply. In general, ground water systems could take samples less frequently than surface water systems because the source water is subject to less external influences. Systems that prove over several years that they are not susceptible to contamination can apply for a variance to reduce monitoring frequency.

Inorganic Contaminants (IOCs)

The IOCs regulation under the Phase II Rule became effective in 1992. Some IOCs in finished water can alter consumer's acceptability by effecting taste, color, and scale decomposition on pipes and fittings. In addition, IOCs such as arsenic and lead have demonstrated adverse consequences on human health. The purpose of the IOC regulation is to protect public health and reduce the potential risk of cancer or other adverse health effects. Lead and copper and arsenic are discussed individually since USEPA has established the Lead and Copper Rule and the Arsenic Rule.

Lead and Copper Rule (LCR)

The 1986 Amendments to the SDWA required USEPA to promulgate drinking water standards for contaminants that impose potential adverse health risks. Lead and copper were specifically listed in the 1986 amendments for mandatory development of a National Primary Drinking Water Regulation (NPDWR); USEPA responded by promulgating the LCR, which was published in 1991. The stated goal of the LCR is to “minimize lead and copper at users’ taps while ensuring that treatment does not cause the system to violate ant NPDWR”. This goal is intended to be accomplished through the application of corrosion control strategies (i.e., varying pH levels, alkalinity levels, and inhibitor utilization). The LCR action levels for lead and copper were set at 0.015 mg/L and 1.30 mg/L, respectively, in the 90th percentile of samples measured at customers taps.

Another recent related regulation is the Reduction of Lead in Drinking Water Act of 2011. Congress signed the Act into law on January 4, 2011, which became effective on January 4, 2014. Provisions of the federal law revise the SDWA definition of “lead free” for piping, pipe fittings, plumbing fittings, and fixtures. The amendment reduces the lead limit from eight percent to 0.25% for brass and bronze. The limit for solder and flux remains at 0.2%. The federal law applies to the wettest surfaces of any product used in a drinking water system. The new requirement required suppliers, contractors, the engineering community, and water utilities to revise specifications for no-lead brass plumbing fittings and components such as curb stops, meters, regulators, check valves, and now fire hydrants. There is ongoing discussion regarding the USEPA’s interpretation of the law regarding the inclusion of system fire hydrants.

In January 2021, the USEPA passed the Revised Lead and Copper Rule (LCRR). These revisions were then halted to allow for the incoming administration to review and potentially revise the LCRR. The revisions were released by the EPA and considered effective on December 16th, 2021, along with the announcement of further revisions coming before the end of 2024.

The LCRR included changes to sample site selection criteria, sampling procedures, water quality monitoring, continued emphasis LSLR consecutive water system requirements. By October 16th, 2024, material of each service line within a water system is required to have been inventoried.

Arsenic Rule

Based on a Public Health Standard that dated back to 1942, the USEPA enforced an arsenic standard of 50 µg/L from 1975 through 2006. A revised Arsenic Rule was proposed and finalized in June 2000 and January 2001, respectively. This revised rule applies to all CWSs and NTNCWSs and requires compliance with a MCL of 10 µg/L, based on samples obtained from all entry points to the distribution system. In addition to the MCL, the rule also specifies a non-enforceable MCLG of zero. The compliance date for the revised Arsenic Rule was January 23, 2006. Exemptions could extend the compliance date by up to three years or up to nine years, depending on system size and its finished water arsenic concentration. Arsenic causes adverse health effects in humans at high exposure concentrations. High concentrations of arsenic typically lead to gastrointestinal irritation accompanied by difficulty in swallowing, thirst, hypertension, and convulsions. The lethal dosage for humans is estimated to range from 70 to 180 mg/L. According to the historical data from 1988 through 2014, the average arsenic concentration in treated water was 1.65 µg/L, which is well below the arsenic MCL.

Nitrate and Nitrite

Nitrate and nitrite are the only acute inorganic contaminants regulated under the Phase II/V Rules. The regulation for nitrate and nitrite became effective in 1992. Nitrate and nitrate from fertilizer are found in sewage and wastes from human and/or farm animals and generally get into drinking water from those activities. Excessive concentrations of nitrate in drinking water have caused serious illness and sometimes death in infants under six months of age. The USEPA, under the authority of the SDWA, has set the MCLG and MCL for nitrate at 10.0 mg/L and for nitrite at 1.0 mg/L (measured as nitrogen, N). The WHO has recommended guidelines for nitrate and nitrite in drinking water of 15 mg/L (as nitrogen) and 3 mg/L (as nitrogen), respectively.

Synthetic Organic Compounds Rule (SOC Rule)

SOCs are man-made compounds used for a variety of industrial and agricultural purposes. USEPA has established MCLs for thirty-three SOCs, which include contaminants such as pesticides, PCBs, and dioxin.

Radionuclides Rule

The USEPA proposed a NPDWR for six (6) radionuclides in 1991, which included combined radium 226, radium 228, (adjusted) gross alpha, beta particle and photon radioactivity, radon, and uranium. A revision to this rule, promulgating the final drinking water standards for (non-radon) radionuclides in drinking water, was published in December 2000. Systems had until early December 2003 to collect samples to use for grandfathering. The first three-year monitoring period ended December 2006. This rule, which applies to all CWSs, changes the monitoring requirements to include sampling from all distribution system entry points. The adverse health effects associated with exposure to radionuclides include radiotoxicity, which affects human tissue, and chemotoxicity, which affects human organs. Extended radionuclide exposure has also been linked to cancer.

Unregulated Contaminant Monitoring Rule

In the 1996 amendments to the SDWA require that once every five (5) years, the EPA issue a new list of no more than 30 unregulated contaminants to be monitored by PWSs. The Unregulated

Contaminant Monitoring Rule (UCMR) provides USEPA and other interested parties with scientifically valid data on the occurrence of contaminants in drinking water. This data serve as a primary source of occurrence and exposure information that the agency uses to develop regulatory decisions.

The first UCMR (UCMR 1) was published in September 1999 and required monitoring 26 contaminants between 2001 and 2003. UCMR 2, released in 2007, required to monitor 25 contaminants between 2008 and 2010. UCMR 3 monitoring took place from 2013-2015 and included monitoring for 28 chemicals and two viruses. The fourth UCMR (UCMR 4) was proposed on December 11, 2015. The proposal outlined 30 chemicals contaminants to be monitored between 2018 to 2020 using analytical methods developed by USEPA.

Strontium is also being reviewed for potential regulation. On October 20, 2014, the USEPA published a preliminary regulatory determination to regulate strontium and published a Health Reference Level of 1,500 µg/L. After receiving public comments, USEPA delayed final determination to consider additional data and decide if regulation would achieve meaningful health risk reduction. As of the recent Preliminary Regulatory Determination for Contaminants on the Fourth Drinking Water Contaminant Candidate List (published March 10, 2020), EPA is continuing to delay a final determination for strontium in order to further consider additional studies regarding strontium exposure.

UCMR 5 was published in December 2021. This rule requires sample collection between 2023 and 2025 to monitor 30 additional contaminants, 29 of which are related to PFAS. Following the sampling period, the information gathered will be used to guide future USEPA regulations.

Secondary Drinking Water Standards

Secondary Drinking Water Standards (SDWS) are composed of regulatory contaminant levels defined by the USEPA with their enforceability left to the discretion of the primacy agency – MDH. These secondary standards are composed of any contaminants that may affect the finished water appearance, taste and odor; promote adverse digestive effects; discolor human skin and teeth; or have economic impacts (hard or corrosive water on plumbing fixtures and equipment).

Aesthetic Effects

Aesthetic objectives are water quality objectives that a water supply system strives to meet, although they do not have adverse effects on public health. These objectives include controlling color, taste, odor, and foaming.

- *Odor and Taste* are useful indicators of water quality even though odor-free water is not necessarily safe to drink. Odor is also an indicator of the effectiveness of different kinds of treatment. However, present methods of measuring taste and odor are still fairly subjective and the task of identifying an unacceptable level for each chemical in different waters requires more study. Also, some contaminant odors are noticeable even when present in extremely small amounts. It is usually very expensive and often impossible to identify, much less remove, the odor-producing substance if found in small concentrations. Standards related to odor and taste include: Chloride, Copper, Foaming Agents, Iron, Manganese, pH, Sulfate, Threshold Odor Number (TON), Total Dissolved Solids (TDS), and Zinc.

- *Color* may be indicative of dissolved organic material, inadequate treatment, high disinfectant demand and the potential for the production of excess amounts of DBPs. Inorganic contaminants such as metals are also common causes of color. In general, the point of consumer complaint is variable over a range from 5 to 30 color units, though most people find color objectionable over 15 color units. Rapid changes in color levels may provoke more citizen complaints than a relatively high and constant color level. Standards related to color include: Aluminum, Color, Copper, Foaming Agents, Iron, Manganese, and TDS.
- *Foaming* is usually caused by detergents and similar substances when water has been agitated or aerated as in many faucets. An off-taste described as oily, fishy, or perfume-like is commonly associated with foaming. However, these tastes and odors may be due to the breakdown of waste products rather than the detergents themselves. Standards related to foaming include Foaming Agents.

Cosmetic Effects

Cosmetic objectives address effects that do not damage the body, but typically produce undesirable visual effects, such as skin and tooth discoloration.

- *Skin discoloration* is a cosmetic effect related to silver ingestion. This effect, called argyria, does not impair body function, and has never been found to be caused by drinking water in the United States. A standard has been set; however, because silver is used as an antibacterial agent in many home water treatment devices, and so presents a potential problem which deserves attention. Skin discoloration is related to the ingestion of silver in levels above the non-enforceable SMCL of 0.10 mg/L.
- *Tooth discoloration and/or pitting* is caused by excess fluoride exposures during the formative period prior to eruption of teeth in children. Fluoride has the unique distinction of having an adverse health impact at high concentrations and a health benefit at low concentrations. High concentrations of fluoride cause fluorosis (mottling of teeth) and bone disease. The SMCL for fluoride is 2.0 mg/L, and the MCL is 4.0 mg/L. Above 2.0 mg/L,

fluorosis becomes more prominent. Low fluoride concentrations help prevent tooth decay. In 2015, the U.S. Department of Health and Human Services released the Public Health Service recommendation, updating the optimum concentration for fluoride in water from the old range of 0.7 to 1.2 mg/L, to a single value of 0.7 mg/L. At the same time, USEPA announced that it intends to consider tightening the MCL for fluoride.

Technical Effects

Adverse technical effects can cause damage to downstream water equipment processes and can sometimes reduce the effectiveness of treatment for other contaminants. In addition, damage can be caused within the distribution system components and fixtures within homes. These adverse technical effects include corrosivity and scaling.

By-products formed by corrosion of piping and plumbing have health, aesthetic, and economic implications. The SMCL for corrosivity is non-corrosive water. Additionally, the lead and copper rule requires utilities to distribute "non-corrosive" water. Corrosion control strategies may include 1) modifying the water quality so that it is less corrosive to the pipe material, 2) placing a protective barrier between the water and the pipe, and 3) use of pipe materials that do not corrode when in contact with water. Adjusting the alkalinity and pH is considered a passive mechanism to control corrosion by inducing the formation of less soluble compounds such as carbonates and phosphates to adhere to the pipe wall in the distribution system to minimize corrosion.

Copper can impact color and adversely affects the aesthetic quality of the finished water but is also a technical concern relating closely to the corrosivity of finished water. Corrosive water which remains in contact with copper plumbing or fixtures can result in water with an elevated copper concentration. Copper is not harmful below the SMCL of 1.0 mg/L.

The measure of the activity of hydrogen ions present in water is termed pH. The pH of the source water directly or indirectly impacts the effectiveness of many processes in water treatment including: 1) corrosion control, 2) softening, 3) membrane treatment and 4) chlorine disinfection, to name a few. The pH of water also has an impact of DBP formation.

Public water systems using the lime softening treatment process typically distribute water with a pH ranging from 8.7 to 9.2. Although this pH is greater than the pH range recommended by the Secondary Drinking Water Standards, the elevated pH is needed to position the post-softening carbonate system (also indicated by the forms of alkalinity in water) at a higher buffer intensity than would be achieved if the pH was closer to 8.3, where the water has little buffer intensity. The elevated pH keeps the water stable and resists the potential for pH depression by various reactions in the distribution system.

The EPA's SDWS are summarized in **Table A-1**.

Table A-1: Secondary Maximum Contaminant Limits

Contaminant	SDWS	Noticeable Effect Above SDWS
Aluminum	0.05 to 0.2 mg/L	Colored water
Chloride	250 mg/L	Salty taste
Color	15 color units	Visible tint
Copper	1.0 mg/L	Metallic taste; blue-green staining
Corrosivity	Non-corrosive	Metallic taste; corroded pipes/fixtures staining
Fluoride	2.0 mg/L	Tooth discoloration
Foaming Agents	0.5 mg/L	Frothy, cloudy; bitter taste; odor
Iron	0.3 mg/L	Rusty color; sediment; metallic taste; reddish staining
Manganese	0.05 mg/L	Back to brown color; black staining; bitter metallic taste
Odor	3 TON	Rotten-egg, musty or chemical smell
pH	6.5 – 8.5 SU	Low pH: bitter metallic taste; corrosion High pH: slippery feel; soda taste; deposits
Silver	0.1 mg/L	Skin discoloration; graying of the white part of the eye
Sulfate	250 mg/L	Salty taste
TDS	500 mg/L	Hardness; deposits; colored water; staining; salty tatse
Zinc	5 mg/L	Metallic taste

mg/L – Milligram per Liter; TON – Threshold Odor Number; SU – Standard Units

Other Water Quality Standards

There are other treatment objectives for finished water quality that are well documented. These additional objectives are not regulated but represent a reasonable approach for non-health threatening contaminants in potable water and primarily include hardness.

<u>Hardness</u>

Hardness in water does not have a regulatory limit; however, many utilities routinely include hardness removal as a treatment objective. Hardness in water originates predominantly from calcium and magnesium ions, but iron, manganese and strontium contribute. Total hardness is typically defined as the sum of the calcium and magnesium hardness expressed in milligrams per liter as CaCO3. Carbonate hardness is the portion of total hardness present associated with bicarbonate salts, while non-carbonate hardness is the portion of total hardness associated with non-carbonate salts. It should be noted that manganese levels are recommended by MDH as a health risk value and cannot be legally enforced. The hardness of water may be classified as soft (below 75 mg/L as CaCO3), moderate (75 to 150 mg/L as CaCO3), hard (150 to 300 mg/L as CaCO3), and very hard (above 300 mg/L as CaCO3. Although higher values of hardness are not dangerous, public acceptance typically favors a water supply below 150 mg/L as CaCO3. Hard water tends to leave scale in water heaters and precipitate on plumbing fixtures upon evaporation.

Potential Future Regulations

The Stage 2 D/DBPR and other drinking water regulations continue to focus on DBPs and microbial contaminants, and it is likely that future versions of these rules will result in increasingly stringent regulations. A major challenge for surface water systems is the concern that efforts to reduce the health risks presumed by DBPs could lead to increased health risks from microbiological contaminants, or conversely, that the increased concern over meeting the treatment technique requirements for the removal and/or inactivation of Giardia, viruses, Cryptosporidium, and other microbes could lead to increased health risks associated with DBPs. Microbial benchmarking will help balance actual health risks associated with microbial contaminants and perceived health risks associated with DBPs. If regulatory history is a precedent, ground water systems will also be included in any new DBP rule.

Distribution System Rule

There have been discussions about implementation of a distribution system regulation in the future. The Distribution System Rule is intended to help maintain treated water quality as water is transported from the treatment facility to the tap. This regulation is in early development, and the issues of concern were published in white papers on the topics of water quality decay, biofilms, cross connections, buried infrastructure, finished water storage, ground water intrusion, leaching, nitrification, and water mains. The main issues of concern are if the water is not stabilized properly for corrosion control prior to entering the distribution system or if the disinfection residual concentrations are too low in areas of the distribution system.

Emerging Contaminants

Emerging contaminants such as EDCs, personal care products (PCPs), and pharmaceutically active compounds (PhACs) are becoming increasingly important with respect to drinking water treatment, as all three (3) groups of compounds are being monitored and researched with respect to public health impacts. EDCs are chemicals, predominately manmade, that interfere with normal hormone functions in living organisms. Known EDCs include pesticides, dioxins, polychlorinated biphenyls (PCBs), and heavy metals. PCPs and PhACs include shampoos, pheromones, fragrances, herbal substances, over the counter medicines, and prescription medications. In response to a congressional mandate, the USEPA has developed the Endocrine Disruptor Screening Program to help identify endocrine disruptors from the estimated 87,000 chemicals used today. To a lesser extent, PCPs and PhACs are also under review by USEPA. It is possible that any number of these compounds may become regulated or added to the CCL within the planning horizon for this document.

Appendix B: Detailed Well No. 4 Water Quality Results

Data was collected in December 2024, except for Combined radium which was measured again in January 2025 due to a sampling error on the first sample event (**Table B-1**).

Table B-1 Well 4 Water Quality Data

Parameter	Measured Value	Unit
Bromide	0.059	mg/L
Sulfate	31	mg/L
Chloride	110	mg/L
Perchlorate	0.00069	mg/L
Sodium	38	mg/L
Silica	22	mg/L
Potassium	2.5	mg/L
Magnesium	36	mg/L
Iron	0.015	mg/L
Calcium	110	mg/L
Silica, Dissolved	22	mg/L
Iron, Dissolved	<0.010	mg/L
Aluminum	<0.020	mg/L
Arsenic	0.0010	mg/L
Barium	0.075	mg/L
Boron	0.024	mg/L
Cadmium	<0.00050	mg/L
Chromium	0.0030	mg/L
Copper	0.0039	mg/L
Manganese	0.012	mg/L
Nickel	<0.0050	mg/L
Strontium	0.140	mg/L
Zinc	<0.0050	mg/L
Manganese, Dissolved	0.012	mg/L
Total Hardness as CaCO3	420	mg/L
Calcium Hardness as CaCO3	270	mg/L
Magnesium Hardness as CaCO3	150	mg/L
pH	7.3	SU
Turbidity	0.15	NTU
Ammonia	<0.030	mg/L
Nitrite as N (EPA 353.2)	<0.010	mg/L
Nitrate as N (SM Nitrate)	2.8	mg/L

Parameter	Measured Value	Unit
Alkalinity, Total (As CaCO3)	290	mg/L
Bicarbonate Alk. as CaCO3	290	mg/L
Carbonate Alkalinity as CaCO3	5.9	mg/L
Total Dissolved Solids	580	mg/L
Total Suspended Solids	<10	mg/L
Temperature	20	Celsius
Fluoride	1.1	mg/L
Phosphate, ortho	0.38	mg/L
Orthophosphate as PO4	0.12	mg/L
Total Organic Carbon	0.623	mg/L
Dissolved Organic Carbon	0.640	mg/L
Gross Alpha	1.92	pCi/L
Combined Radium 226/228	0.420	pCi/L
1,1,1,2-Tetrachloroethane	<0.00050	mg/L
1,1,1-Trichloroethane	<0.00050	mg/L
1,1,2,2-Tetrachloroethane	<0.00050	mg/L
1,1,2-Trichloroethane	<0.00050	mg/L
1,1-Dichloroethane	<0.00050	mg/L
1,1-Dichloroethene	<0.00050	mg/L
1,1-Dichloropropane	<0.00050	mg/L
1,2,3-Trichlorobenzene	<0.00050	mg/L
1,2,3-Trichloropropane	<0.00050	mg/L
1,2,4-Trichlorobenzene	<0.00050	mg/L
1,2,4-Trimethylbenzene	<0.00050	mg/L
1,2-Dibromo-3-Chloropropane	<0.00020	mg/L
1,2-Dibromoethane (EDB)	<0.00020	mg/L
1,2-Dichlorobenzene	<0.00050	mg/L
1,2-Dichloroethane	<0.00050	mg/L
1,2-Dichloropropane	<0.00025	mg/L
o-Xylene	<0.00050	mg/L
m-Xylene & p Xylene	<0.00050	mg/L
1,3,5-Trimethylbenzene	<0.00050	mg/L
1,3-Dichlorobenzene	<0.00050	mg/L
1,3-Dichloropropane	<0.00050	mg/L

Parameter	Measured Value	Unit
1,4-Dichlorobenzene	<0.00050	mg/L
2,2-Dichloropropane	<0.00050	mg/L
2-Chlorotoluene	<0.00050	mg/L
4-Chlorotoluene	<0.00050	mg/L
Benzene	<0.00050	mg/L
4-Isopropyltoluene	<0.00050	mg/L
Bromobenzene	<0.00050	mg/L
Bromochloromethane	<0.00050	mg/L
Bromodichloromethane	<0.00050	mg/L
Bromoform	<0.00050	mg/L
Bromomethane	<0.00050	mg/L
Carbon tetrachloride	<0.00050	mg/L
Chloroethane	<0.00050	mg/L
Chlorobenzene	<0.00050	mg/L
Chloromethane	<0.00050	mg/L
Dichlorodifluoromethane	<0.00050	mg/L
Dichloromethane	<0.00050	mg/L
Dibromochloromethane	<0.00050	mg/L
Ethylbenzene	<0.00050	mg/L
Hexachlorobutadiene	<0.00025	mg/L
Isopropylbenzene	<0.00025	mg/L
Naphthalene	<0.00050	mg/L
Methyl-tert-butyl Ether (MTBE)	<0.00050	mg/L
Styrene	<0.00050	mg/L
Tetrachloroethene	<0.00050	mg/L
Toluene	<0.00050	mg/L
Trichloroethylene	<0.00050	mg/L
Trichlorofluoromethane	<0.00050	mg/L
Vinyl chloride	<0.00020	mg/L
tert-Butylbenzene	<0.00050	mg/L
cis-1,2-Dichloroethylene	<0.00050	mg/L
cis-1,3-Dichloropropylene	<0.00050	mg/L
n-Butylbenzene	<0.00050	mg/L
N-Propylbenzene	<0.00050	mg/L
sec-Butylbenzene	<0.00050	mg/L
trans-1,2-Dichloroethylene	<0.00050	mg/L
trans-1,3-Dichloropropylene	<0.00050	mg/L

Parameter	Measured Value	Unit
Xylenes, Total	<0.00050	mg/L
Alachlor	<0.000099	mg/L
Atrazine	<0.000099	mg/L
Benzo[a]pyrene	<0.000020	mg/L
Di(2-ethylhexyl)adipate	<0.00059	mg/L
Di(2-ethylhexyl)phthalate	<0.000590	mg/L
gamma-BHC (Lindane)	<0.000020	mg/L
Heptachlor epoxide	<0.0000099	mg/L
Methoxychlor	<0.000099	mg/L
Simazine	<0.000069	mg/L
Endothall	<0.005	mg/L
1,2-Dibromoethane (EDB)	<0.000010	mg/L
1,2-Dibromo-3-Chloropropane	<0.000010	mg/L
Chlordane	<0.0001	mg/L
PCB-1016	<0.000080	mg/L
PCB-1221	<0.00010	mg/L
PCB-1232	<0.00010	mg/L
PCB-1242	<0.00010	mg/L
PCB-1248	<0.00010	mg/L
PCB-1254	<0.00010	mg/L
PCB-1260	<0.00010	mg/L
Polychlorinated biphenyls	<0.00010	mg/L
Total PCBs as DCB	<0.00010	mg/L
Toxaphene	<0.00050	mg/L
2,4,5-TP (silvex)	<0.00010	mg/L
2,4-D	<0.00010	mg/L
Dalapon	<0.0010	mg/L
Dinoseb	<0.00020	mg/L
Pentachlorophenol	<0.000040	mg/L
Picloram	<0.00010	mg/L
Aldicarb sulfone	<0.00070	mg/L
Aldicarb sulfoxide	<0.00050	mg/L
Carbofuran	<0.00090	mg/L
Oxamyl	<0.0010	mg/L
AMPA	<0.0060	mg/L
Diquat	<0.00040	mg/L
2,3,7,8-TCDD	<0.0039	mg/L

Appendix C: Preliminary Design Documents

TYPICAL INSTRUMENT CODES / LETTER COMBINATIONS

INITIAL LETTER	MEASURED OR INITIATING VARIABLE	SWITCH					ALARMS					SENSOR / TRANSMITTER			LOCAL
		HIGH HIGH	HIGH	LOW	LOW LOW	DIFF.	HIGH HIGH	HIGH	LOW	LOW LOW	DIFF.	ELEMENT	INDICATING	BLIND	READOUT
A	ANALYSIS		ASH									AE	AIT	AT	
F	FLOW		FSH									FE	FIT	FT	FI
I	CURRENT		ISH												
L	LEVEL	LSHH	LSH	LSL	LSLL		LAHH	LAH	LAL	LALL		LE	LIT	LT	LI
M	MOISTURE					PDSH		MAH				ME	MIT	MT	
P	PRESSURE		PSH			TDSH		PAH	PAL		PDAL	PE	PIT	PT	PI
T	TEMPERATURE	TSHH	TSH					TAH	TAL		TDAL	TE	TIT	TT	TI
W	WEIGHT/TORQUE	WSHH	WSH	WSL	WSLL		WAHH	WAH	WAL			WE	WIT	WT	WI

VALVE/GATE LEGEND

MARK	DESCRIPTION
	AIR RELEASE
	AIR VACUUM / RELEASE
	GENERIC
	GATE
	BUTTERFLY
	PLUG
	PINCH
	BALL
	BALL V-NOTCH THROTTLING
	KNIFE GATE
	MUD
	NEEDLE
	DIAPHRAGM
	GENERIC N.C.
	GATE N.C.
	BUTTERFLY N.C.
	PLUG N.C.
	PINCH N.C.
	BALL N.C.
	KNIFE GATE N.C.
	NEEDLE N.C.
	DIAPHRAGM N.C.
	CHECK
	SURGE ANTICIPATOR
	PRESSURE REDUCING
	PRESSURE SUSTAINING / FLOW CONTROL VALVE
	3-WAY
	4-WAY
	ANGLE
	RUPTURE DISK - PRESSURE
	REDUCED PRESSURE ZONE / BACKFLOW PREVENTER
	GATE (GENERIC)
	STOP PLATE
E	WEIR GATE (MANUAL AND ACTUATED)
E	SLUICE GATE (MANUAL AND ACTUATED)
	DIVERTER GATE
	STRAINER
	BASKET STRAINER
	CAP
	QUICK CONNECT/ADAPTER
	AUTO FEED VALVE

VALVE ACTUATOR LEGEND

MARK	DESCRIPTION
	DIAPHRAGM
M	ROTARY MOTOR
E	ELECTRIC
P	PNEUMATIC
H	HYDRAULIC
S	SOLENOID
	HAND
HW	HAND WHEEL
CW	CHAIN WHEEL
FS	FLOOR STAND
FB	FLOOR BOX
	WEIGHTED PRESSURE RELIEF
P	PILOT RELIEF

PUMP LEGEND

MARK	DESCRIPTION
	GENERIC
MP	CHEMICAL FEED / METERING PUMP
	PROGRESSIVE CAVITY
VT	VERTICAL TURBINE - IN BASIN
VT	VERTICAL TURBINE - IN CAN
VT	VERTICAL TURBINE - IN BASIN (TOP)
VT	VERTICAL TURBINE - IN CAN (TOP
WP M	SUBMERSIBLE WELL PUMP

BLOWER LEGEND

MARK	DESCRIPTION
	ROOTS BLOWER
	BLOWER - GENERIC

EQUIPMENT LEGEND

MARK	DESCRIPTION
M	MOTOR - PUMPS/BLOWERS
	AERATOR
	MIXER
	POLYMER INLINE MIXER
	CALIBRATION COLUMN / FLOW INDICATOR
PD	PULSATION DAMPENER
	AERATION DIFFUSERS
	JET MIXING HEADER
	EJECTOR
	EDUCTOR
	CHEMICAL STORAGE TANK
	DESSICANT DRYER
	FLOW STRAIGHTENING
	HYDRANT
	SEDIMENT TRAPPER FILTER
F	AIR FILTER
R	PRESSURE REGULATOR

INSTRUMENT LEGEND

MARK	DESCRIPTION
	FLOW METER - MAGNETIC
	FLOW METER - TURBINE OR PROPELLER
	FLOW METER - POSITIVE DISPLACEMENT
	FLOW METER - CORIOLLIS
	FLOW METER - SONIC OR ULTRASONIC
	FLOW TUBE
	ORIFICE PLATE
	OPEN CHANNEL WEIR PLATE
	OPEN CHANNEL FLUME
	THERMAL DISPERSION FLOW ELEMENT
	ULTRASONIC LEVEL SENSOR
	RADAR LEVEL SENSOR
	DIAPHRAGM SEAL

GENERAL NOTES

1. THE SYMBOLIZATION AND NOMENCLATURE USED ON THESE P&ID DRAWINGS ARE BASED ON ISA STANDARDS AND INDUSTRY CONVENTIONS. SOME MODIFICATIONS AND ADDITIONS HAVE BEEN MADE FOR CLARIFICATIONS AND OMISSIONS IN STANDARDS.
2. THE SYMBOLIZATION AND NOMENCLATURE SHOWN HERE APPLIES TO P&ID DRAWINGS ONLY. ADDITIONAL LEGENDS MAY BE USED ON OTHER DRAWINGS.
3. SOME SYMBOLS MAY NOT BE SHOWN ON THIS LEGEND, NOT ALL SYMBOLS SHOWN MAY NECESSARILY BE USED ON THESE DRAWINGS.

GENERAL INSTRUMENT OR FUNCTION SYMBOLS LEGEND

	FIELD MOUNTED	PRIMARY LOCATION ACCESSIBLE
DISCRETE INSTRUMENTS		

HAND SWITCH ABBREVIATIONS

MARK	DESCRIPTION
ESP	EMERGENCY STOP
FOR	FORWARD OFF REVERSE
HOA	HAND OFF AUTO
HOR	HAND OFF REMOTE
HORN	ALARM HORN
L/R	LOCAL REMOTE
LOR	LOCAL OFF REMOTE
LSR	LOCAL STOP REMOTE
O/C	OPEN CLOSE
OCA	OPEN CLOSE AUTO
OCR	OPEN CLOSE REMOTE
OSC	OPEN STOP CLOSE
COAO	CLOSE OFF AUTO OPEN
OA	OPEN AUTO
POT	POTENTIOMETER
RST	RESET
SS	START STOP
STR	START
WDA	WET DRY AUTO

PROCESS EQUIPMENT LINETYPE / COLOR LEGEND

EXISTING	PROPOSED	FUTURE	DESCRIPTION
			PROCESS PIPING / FLOW
			CHEMICAL PIPING
			PIPE FITTING
			EQUIPMENT
			VALVES
			SENSORS
			INSTRUMENT
			PLANT AIR

POWER AND COMMUNICATION CABLE LINETYPE / COLOR LEGEND

EXISTING	PROPOSED	FUTURE	DESCRIPTION
			SIGNAL - ELECTRIC
24VDC	24VDC	24VDC	24VDC POWER
120VAC	120VAC	120VAC	120VAC POWER
208VAC	208VAC	208VAC	208VAC POWER
240VAC	240VAC	240VAC	240VAC POWER
480VAC	480VAC	480VAC	480VAC POWER
			SCADA NETWORK (FIBER)
E/IP	E/IP	E/IP	SCADA NETWORK (ETHERNET/IP)
M/TCP	M/TCP	M/TCP	SCADA NETWORK (MODBUS/TCP)
DNET	DNET	DNET	SCADA NETWORK (DEVICENET)

ANNOTATION LEGEND

MARK	DESCRIPTION
	EQUIPMENT TAG
	ON/OFF PAGE CONNECTOR 1-WAY
	BREAK
	PROCESS FLOW DIRECTION
	HART TOTALIZER
IS	ANALOG INPUT / INTRINSICALLY SAFE ANALOG INPUT
	ANALOG OUTPUT
IS	DIGITAL INPUT / INTRINSICALLY SAFE DIGITAL INPUT
	DIGITAL OUTPUT
PSR	PUMP SUPERVISORY RELAY
HIM	HARDWARE INTERFACE MODULE
HMI	HUMAN MACHINE INTERFACE
I	INTERLOCK
	PIPE JUMP
	LEAK PROBE

CIRCUIT DESIGNATOR

REFER TO CABLE & CONDUIT SCHEDULE(s)

XXXX

NUMERALS INDICATE CIRCUIT NUMBER

LEADER ADDED FOR CLARITY WHEN SHOWN

EQUIPMENT DESIGNATOR

DEVICE

ID NUMBER

XXX - YYYYY

BFV1-02455 SAMPLE EQUIPMENT TAG

MATCH LINE NUMBER

CONTINUED FROM DRAWING NUMBER

A IC3

RAW WATER

TREAMENT STREAM

MATCH LINE NUMBER

CONTINUED TO DRAWING NUMBER

A IC3

RAW WATER

TREAMENT STREAM

INSTRUMENT SYMBOL

ISA FUNCTION

FIT XXX

PROCESS TAG

XXX

ANALYTICAL INSTRUMENT TYPE

HAND SWITCH FUNCTION

XXX

INSTRUMENT SYMBOL

HS XXX

ISA FUNCTION

PROCESS TAG

FUNCTION

XXXX

INSTRUMENT SYMBOL

YN XXX

ISA FUNCTION

X

PROCESS TAG

COLOR INDICATOR

A = AMBER

G = GREEN

R = RED

W = WHITE

AES2

Certification of Individual Project Design Disciplines Are Included On Their Individual Drawings, Respectively

Advanced Engineering and Environmental Services, LLC

NOT FOR CONSTRUCTION

PRELIMINARY

STATUS: PRELIMINARY - NOT FOR CONSTRUCTION

SYM	DATE	APPR

PROJECT TITLE:

SOUTH ST. PAUL PFAS FESABILITY STUDY

Advanced Engineering and Environmental Services, LLC www.ae2s.com

SHEET TITLE:

INSTRUMENT SYMBOLS AND ABBEVIATIONS

CLIENT:

CITY OF SOUTH ST. PAUL

SOUTH ST. PAUL, MINNESOTA

PREPARED BY: SGR

CHECKED BY: IBV

APPROVED BY: BJJ

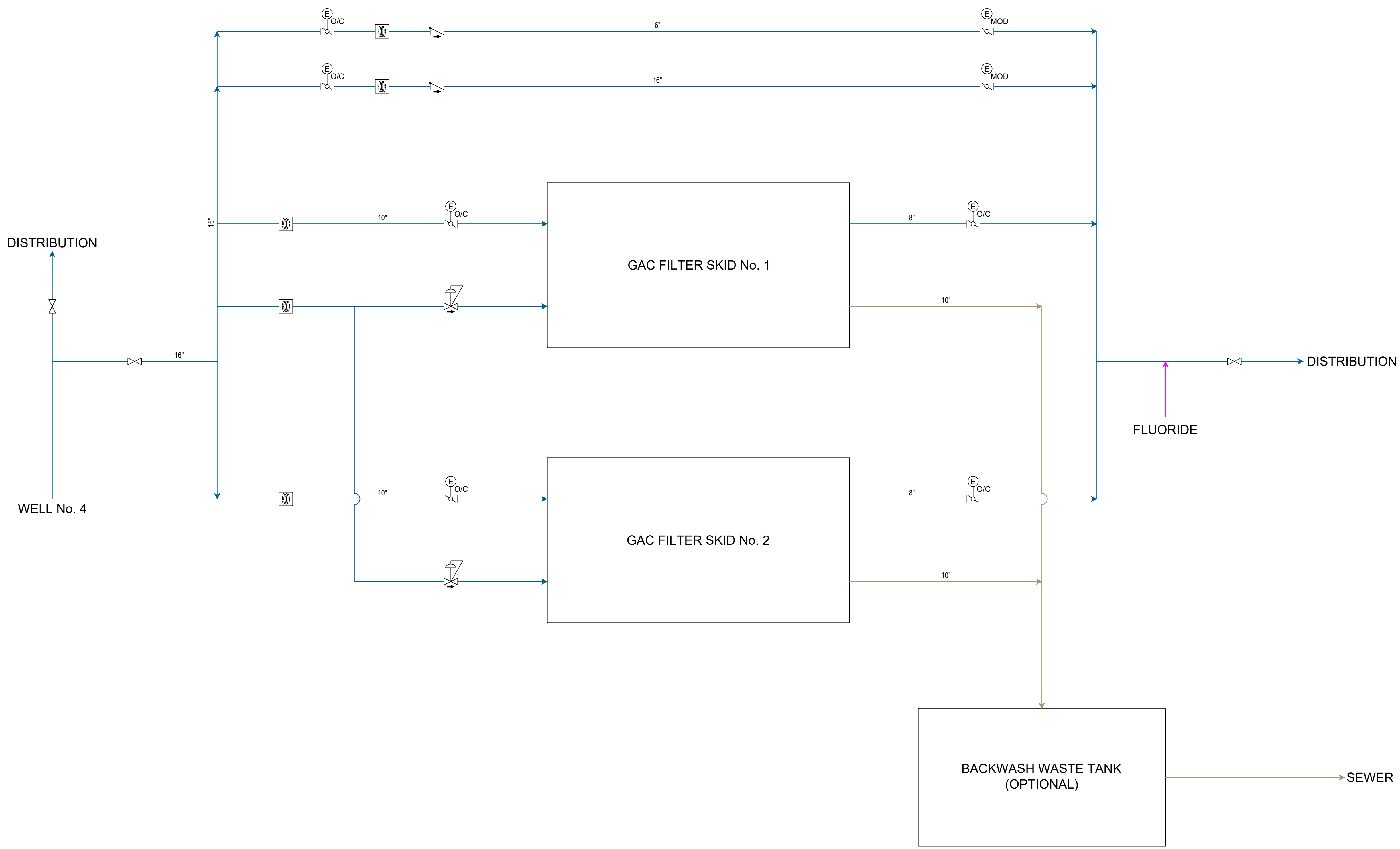
PROJECT NO: 05491-2024-002

DATE: DECEMBER 2025

ALT. PROJECT NO: XXX-XXXX

SHEET DESIGNATOR: GEN

SHEET NO: P001



1 P002 **PROCESS FLOW DIAGRAM**
SCALE: NONE

AES2

Certification of Individual Project Design Disciplines Are Included On Their Individual Drawings, Respectively

Advanced Engineering and Environmental Services, LLC
NOT FOR CONSTRUCTION
PRELIMINARY

STATUS: PRELIMINARY - NOT FOR CONSTRUCTION

SYM	DATE	APPR

PROJECT TITLE: **SOUTH ST. PAUL PFAS FESABILITY STUDY**

Advanced Engineering and Environmental Services, LLC www.ae2s.com

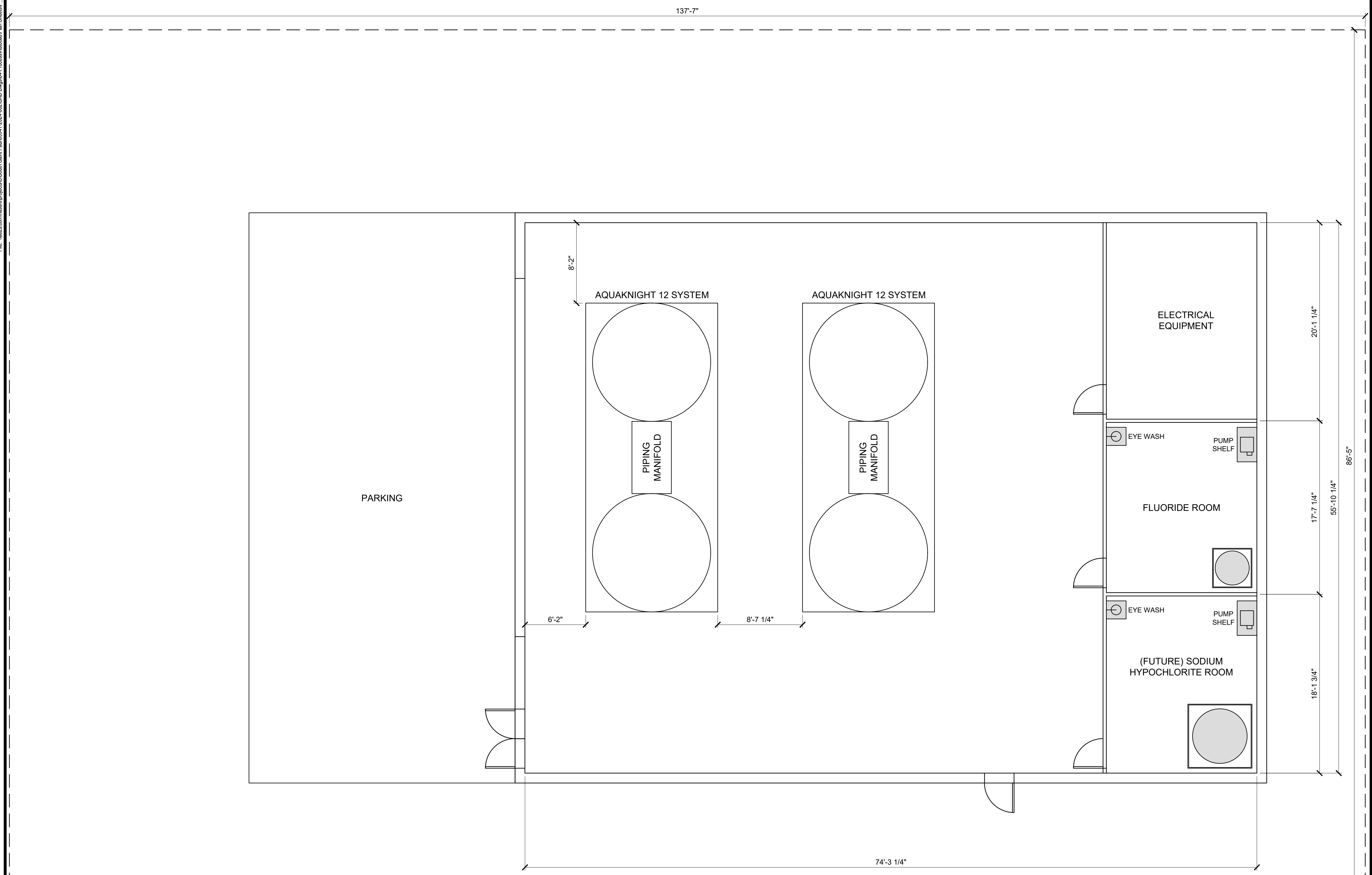
SHEET TITLE: **PROCESS FLOW DIAGRAM - GAC**

CLIENT: **CITY OF SOUTH ST. PAUL**
SOUTH ST. PAUL, MINNESOTA

PREPARED BY: SGR
CHECKED BY: IBV
APPROVED BY: BJJ

PROJECT NO: 05491-2024-002
DATE: DECEMBER 2025
ALT. PROJECT NO: XXX-XXXX

SHEET DESIGNATOR: **GEN**
SHEET NO: **P002**



1 P101 **ALTERNATIVE No. 1 LAYOUT**

0 2' 4' 6' 8' 10' 12' 14'

NORTH

AES2

Certification of Individual Project Design Disciplines Are Included On Their Individual Drawings, Respectively

Advanced Engineering and Environmental Services, LLC

NOT FOR CONSTRUCTION

PRELIMINARY

STATUS: PRELIMINARY - NOT FOR CONSTRUCTION

SYM	DATE	APPR

PROJECT TITLE:

SOUTH ST. PAUL PFAS FESABILITY STUDY

Advanced Engineering and Environmental Services, LLC www.ae2s.com

SHEET TITLE:

PRELIMINARY ALTERNATIVE No. 1 LAYOUT

CLIENT:

CITY OF SOUTH ST. PAUL

SOUTH ST. PAUL, MINNESOTA

PREPARED BY: SGR

CHECKED BY: IBV

APPROVED BY: BJJ

PROJECT NO: 05491-2024-002

DATE: DECEMBER 2025

ALT. PROJECT NO: XXX-XXXX

SHEET DESIGNATOR: **WTP**

SHEET NO: **P101**

File: \\ae2s.com\nasun\projects\SSouth Saint Paul\05491-2024-002\CAD Dwgs\04-Process\Autocad\Plan Sheets\P_Preliminary Alt 1 Layout.dwg

Plotted By: Shelby Reynolds Date: Friday, December 12, 2025

WORK SESSION AGENDA REPORT

DATE:	February 9, 2026
DEPARTMENT:	Economic Development
PREPARED BY:	Ryan Garcia
AGENDA ITEM NUMBER:	2.B.

MEETING TYPE
Regular Meeting

AGENDA ITEM
400 Richmond Street Update

ACTION TO BE CONSIDERED OR DESIRED OUTCOME
Staff is seeking Council feedback on:

- Property re-use/redevelopment
- Timing of sale
- Leaseback considerations
- Approach to environmental conditions

OVERVIEW
At the July 28, 2025 closed session meeting of the City Council, consideration was given to three responses to a Request for Proposal to purchase the City-owned property at 400 Richmond Street East. Council reviewed general terms of acquisition and development and the consensus was to proceed with negotiations for the purchase of the property by McNamara Contracting, Inc. McNamara, which also owns Apple Valley Ready-Mix (AVR), communicated via their proposal an interest in acquiring the land and improvements at 400 Richmond Street for the purpose of constructing a concrete ready-mix production facility at the property and retaining all of the existing "main building" for office, maintenance, and indoor storage. AVR's goal as stated at the time was to secure land use entitlements for their proposed use in the relatively near-term, acquire the property from the City, lease the property back to the City until such time as the new public works facility was completed, and then to repurpose the property for their stated end-use.

Since that time, AVR has undertaken a process to prepare planning documents for their proposed use, seeking and ultimately obtaining City approval of a site plan and Conditional Use Permits for their proposed development. With this important milestone crossed, AVR/McNamara are prepared to re-engage on a Purchase Agreement and Lease Agreement for the property. However, there is some uncertainty and concern that Council sentiment has shifted since the July 2025 Proposal was accepted. In addition, AVR/McNamara has suggested that certain conditions identified in the course of their due diligence are motivating them to contemplate changes to one or more conditions as outlined in their July 2025 Proposal/LOI.

Staff is looking to clarify Council's interest and intent in continuing in pursuit of a purchase agreement with AVR/McNamara prior to devoting additional time and resources (by both the City and AVR/McNamara) in the drafting of formal agreements or further diligence related to this proposal. Further, we are looking to clarify Council's timeline expectations as it relates to sale of the property, including whether the concept of leasing the property back after closing has lost its appeal. As a reminder, the purpose of closing early and leasing back was generally two-fold:

- It allowed for the City to realize a near-term infusion of unrestricted/cash financing to support the public works project.
- It allowed AVR/McNamara certainty that they had ownership and entitlements to the property for their future use, and also kept open the possibility that they could begin some level of site preparation at the property during the latter stages of the City's occupancy.

Finally, to date we have not yet received the completed Phase II Environmental Site Investigation for this property. Unfortunately, the City has not previously completed environmental due diligence on this site so environmental conditions, to the extent such exist, are a blind spot for this property. While it is premature to speculate, there is the possibility that recognized environmental conditions exist requiring remediation given the nature of the site and historic use on and around the property. We'd like to discuss at least in broad terms how Council would envision preparing for and approaching this issue as we proceed.

SOURCE OF FUNDS

Staff recommends that sales proceeds from 400 Richmond would support the Capital Program Fund, specifically to assist in funding the construction of a replacement Public Works Central Maintnenance Facility.

ATTACHMENTS

1. Confidential Attachment - Non-Public, July 2025 Proposal - McNamara - 400 Richmond Street (1)

WORK SESSION AGENDA REPORT

DATE:	February 9, 2026
DEPARTMENT:	City Administrator
PREPARED BY:	Ryan Garcia
AGENDA ITEM NUMBER:	2.C.

MEETING TYPE
Regular Meeting

AGENDA ITEM
Villaume Avenue Property / Road Connection

ACTION TO BE CONSIDERED OR DESIRED OUTCOME
Staff is seeking Council feedback on two potentially related items:

- The owner of a rental property located at 118 Villaume Avenue has asked if the City would like to buy his existing duplex property.
- Staff is seeking clarification from Council as to whether the extension of Villaume Avenue from its current terminus to Doug Woog Arena should be identified as a priority.

OVERVIEW
118 Villaume Avenue
Staff has been approached by the property owner at 118 Villaume Avenue to inquire if the City would have an interest in acquiring the existing property, which is developed with a duplex and is served by a (failing) private septic system. The property has an active rental license and has passed its most recent rental inspection. According to MN Department of Revenue records, the owner purchased the property for $175,000 in September 2023. Dakota County property tax assessor data indicates a total value of $239,400 for the land and improvements. When pressed for an asking price, the owner responded that we should "make him an offer" while indicating he has "other interested parties". Conversations several months ago with the property owner suggested that he was entertaining (at the time) demolishing the structure and attempting to redevelop the property, although no application or staff analysis took place. Its placement on the bluff, existing grades, and the lack of public sanitary sewer all complicate the feasibility of redeveloping this property.

The property sits at the dead-end of Villaume Avenue, which is effectively 8th Street South extended east of 1st Avenue South, and rests more or less at the top of the bluff with a significant dropoff to the east which is where Doug Wood Arena sits. The property has not been on the radar for public safety, code enforcement, or rental licensing and generally the City/EDA have gotten out of the business of acquiring single/two-family residential property as the cost to acquire residential property is at this point significantly outpacing the availability of public resources to undertake such efforts. All this said, unless there is a compelling reason to acquire this property, Staff would suggest that we have higher priorities for limited funds than entertaining this property owner's overtures.

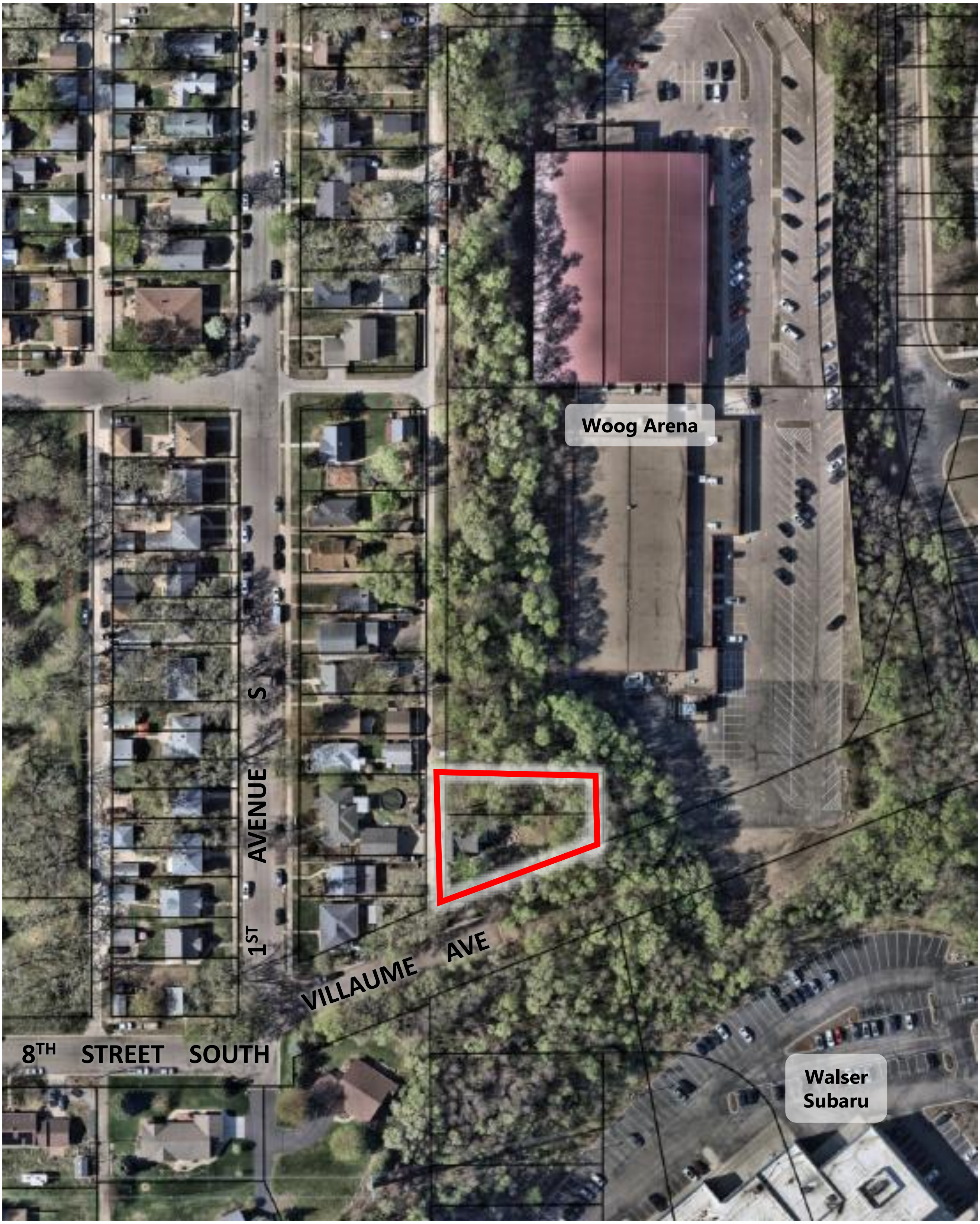
Villaume Avenue Extension
Although the topic hasn't formally come up, over the past year occasional staff/council chatter has surfaced about an extension of Verderosa Avenue to provide a secondary/relief point of access to Doug Woog Arena, a topic that the owner of 118 Villaume also brought up. Again, staff analysis of this idea has been cursory at best. At a very high level, such a road/driveway extension would not be perfectly straightforward. The City Engineer notes the following - again based on only a very cursory level of consideration (no in depth analysis):

- We would need to grade the area significantly and most likely need to add retaining walls as some of the existing LIDAR contours show slopes of 40% (we typically don't like to exceed 10% on roadways/driveways).
- We will lose the area that I believe is currently used for snow storage, meaning that we will lose parking during the winter months because some snow will have to be stockpiled on the lot.

Staff understands that until the late 1990s, Villaume did extend from "up the hill" to the Woog Arena parking lot, at which time the road was demolished presumably to make as much room for parking as possible on the south end of the property and we suspect because the significantly steep grades made winter maintenance/access/safety at least somewhat tricky. Assuming those conditions were motivating factors, they would almost certainly be factors if the decision was made to invest (significantly) in this extension in the present.

SOURCE OF FUNDS
Neither of these initiatives has been identified as a priority in the City's various planning documents (Housing Strategy, Comp Plan, CIP) and as such there is currently no well-defined funding source for either. If Council identified these initiatives as a priority, further discussion about funding sources, and the shuffling of previously identified priorities, would be prudent.

ATTACHMENTS
1. Orientation Map - 118 Villaume



118 Villaume Avenue

WORK SESSION AGENDA REPORT

DATE: February 9, 2026
DEPARTMENT: Economic Development
PREPARED BY: Ryan Garcia
AGENDA ITEM NUMBER: 2.D.

MEETING TYPE
Regular Meeting

AGENDA ITEM
Closed Session Pursuant to Minnesota Statutes § 13D.05 (c) (3), to consider offers to purchase real property at 316 Malden Street (No Attachment)

ACTION TO BE CONSIDERED OR DESIRED OUTCOME

OVERVIEW
Council will hold a closed session discussion to consider offers to purchase the property at 316 Malden Street, received from Endeavor Development and LandSpec.

SOURCE OF FUNDS

ATTACHMENTS
None