

Study 2 - Surface Water Supply Alternatives

White Bear Lake Area Comprehensive Plan

White Bear Lake Area

MCES Contract 24P056C

MCES 190048 | July 9, 2026



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MCES Contract 24P056C
SEH No. MCES0 190048

July 9, 2026

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

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Study 2 - Surface Water Supply Alternatives

White Bear Lake Area Comprehensive Plan

Prepared for MCES

1 Introduction

The Minnesota legislature provided funding for the Metropolitan Council (Met Council) to form a work group to develop a comprehensive plan to ensure communities in the White Bear Lake area have access to sufficient drinking water to allow for municipal growth while ensuring the sustainability of surface and groundwater resources to supply the needs of future generations. A workgroup of area community stakeholders evaluated converting groundwater dependent water supplies to total or partial supplies from surface water as a potential water conservation method. The Met Council previously completed a similar analysis titled *Feasibility Assessment of Approaches to Water Sustainability in the Northeast Metro* (2014). Information from that study helped the work group identify several potential solutions for further study, primarily focused on conveying treated surface water from St. Paul Regional Water Services and/or a new regional surface water treatment facility to selected communities in the north and east metro Twin Cities area.

1.1 Study Objectives

The primary objective of this study is to understand the infrastructure requirements and relative costs of different alternatives to utilizing surface water to conserve groundwater supplies in the northeast metro. The Minnesota Legislature requested this part of the metro area to be studied specifically due to continued concern over area lake levels and the interaction of groundwater.

This study evaluates two primary approaches to conserve groundwater supplies:

- Approach 1 (Task 4): Convey treated surface water from Saint Paul Regional Water Services to various north and east communities (SPRWS Expansion)
- Approach 2 (Task 5): Construct a regional surface water treatment plant near the chain of lakes in the northeast metro and convey treated surface water to various north and east communities. (New Regional Surface Water Treatment Plant)

Both approaches include converting the existing communities that are groundwater dependent to partial or total supply from surface water. These approaches were previously selected and considered in consultation with stakeholders in the northeast metro, based on their potential to reduce impacts on surface water bodies, including White Bear Lake, from groundwater pumping activities.

With each of these two approaches, several alternatives were identified through DNR groundwater modeling for further evaluation of implementation and costs:

- Alternative 1: Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township (north and south systems).

- Alternative 1a – Additional option of including Hugo East
- Alternative 2: Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township (north and south systems).
 - Alternative 2a – Additional option of including Hugo East
- Alternative 3: Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township (north and south systems).
 - Alternative 3a – Additional option of including Hugo East
- Alternative 4: Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, North Oaks, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township (north and south systems).
- Alternative 5: Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.

Each alternative considers projected 2050 and ultimate water demands as provided by the Met Council.

In addition to these primary alternatives, this study is also being extended to the City of Lake Elmo. The City of Lake Elmo is one of the 14 communities in the East Metropolitan Area of the Twin Cities currently known to be affected by groundwater contaminated with PFAS compounds, and part of the 3M Settlement Conceptual Drinking Water Supply Plan. The study will evaluate the infrastructure requirements and costs to supply treated surface water from SPRWS to Lake Elmo, rather than staying on groundwater supplies.

1.2 Feasibility Assessment

The alternatives described in this study have all been previously identified by the MN DNR as viable options for preserving groundwater supplies.

1.3 Study Area

The study area encompasses the northeast metropolitan area of the Twin Cities, covering communities located northeast of the City of Saint Paul. The communities included in this study are Gem Lake, Hugo East (Hugo 2), Lake Elmo, Lino Lakes, Mahtomedi, North Oaks, North St. Paul, Shoreview, Vadnais Heights, White Bear Lake, and White Bear Township, along with portions of other adjacent municipalities. The study area spans parts of Ramsey, Washington, and Anoka Counties.

The study area is predominantly suburban in character, consisting of established residential neighborhoods, commercial corridors, and light industrial areas that have largely been built out over the past several decades. Several communities within the study area — including portions of North St. Paul and Shoreview — are fully developed first-ring suburban communities with limited remaining undeveloped land. Other communities, such as Hugo East and portions of Lake Elmo, include areas that are less densely developed or are anticipated to experience future growth. The study area is also home to several prominent natural water resources, including White Bear Lake and the Vadnais Chain of Lakes, which are central to the regional water supply and environmental concerns that motivated this study.

1.4 Key Study Assumptions

To evaluate infrastructure requirements and relative costs of the different alternatives, a few key assumptions regarding level of service and redundancy are included in the analysis of each alternative. These overall key assumptions are briefly described in this section, and more details for each alternative are provided in the associated report sections below.

For all alternatives evaluated, conveyance to each city's water distribution system is provided via a trunk main to a selected point in the community's water distribution system. Booster stations are provided at the point of connection and other locations as necessary to provide water at pressures to meet the destination city's water system hydraulic grade line. A booster chloramine injection facility is considered at each connection point to account for potential disinfectant decay along the trunk main conveyance route. SPRWS currently utilizes chloramine for chemical disinfection which is formed by combining chlorine with ammonia, and provides a longer lasting disinfectant residual than chlorine alone. Any improvements or operating costs downstream of the trunk main connection points would be the responsibility of the receiving city and are not included in this study.

The trunk main to convey water from the source to the city connections is assumed to consist of dual water mains to provide key redundancy in case of a main break. The dual mains are sized for full redundancy, with each sized for Met Council's projected Ultimate Development Max Day Demand (MDD) with a maximum pipe velocity of 5 ft/s velocity max in a single pipeline. This assumption provides a conservative basis for sizing and costing the water supply infrastructure. If demand increases beyond the projected Ultimate Development Max Day Demands, a third main would need to be installed. If a water supply and conveyance project were to move forward with design based on this study, the sizing of the dual force mains could be revisited and further evaluated for potential costs savings by designing for a less conservative main sizing and pros and cons considered based on further design efforts.

Booster station sizing is based on Ultimate Development Max Day Demands.

The SPRWS treatment plant expansion and a new plant would include key process redundancies with a focus on ensuring firm treatment capacity can meet the necessary maximum day demands.

1.5 Assessment Tasks

This study evaluates the feasibility and relative costs of two primary approaches to converting groundwater-dependent communities in the northeast metro to surface water supply. Approach 1 (Task 4) evaluates expanding the existing Saint Paul Regional Water Services (SPRWS) distribution system to convey treated surface water to select communities in the study area. Approach 2 (Task 5) evaluates the construction of a new regional surface water treatment plant near the Vadnais Chain of Lakes to serve the same communities. Both approaches are evaluated across five community subset alternatives (as well as additional evaluations for service to Hugo East for alternatives 1-3: alternatives 1a-3a), as identified through DNR groundwater modeling, each representing a different combination of communities to be served.

To support both approaches, the study also includes evaluation of key infrastructure components and supplementary analyses required to supply the projected water demands of the study area communities. The specific assessment tasks completed under this study are summarized below and described in detail in the subsequent chapters of this report:

1.5.1 SPRWS McCarrons WTP Capacity Evaluation

The McCarrons Water Treatment Plant (WTP) is the primary surface water treatment facility operated by SPRWS and serves as the source of treated surface water for Approach 1 (Task 4). This task evaluated the existing treatment capacity of the McCarrons WTP and determined the additional capacity and infrastructure improvements that would be required to supply projected 2050 and ultimate development demands for both SPRWS's existing customers and the northeast metro communities included in each of the five alternatives. Capital costs along with the increased operational and maintenance (O&M) costs related to increasing treatment capacities were estimated and incorporated into the overall cost comparisons for each alternative.

1.5.2 SPRWS Fridley Pump Station Evaluation

The SPRWS Fridley Pump Station draws raw water from the Mississippi River and conveys it east via transmission mains to the Vadnais Chain of Lakes for treatment at the McCarrons WTP. The pump station and conveyance system is crucial to supplying raw surface water for the SPRWS or a new regional surface WTP. This task evaluated the existing and potential upsized capacity of the Fridley pump station, including hydraulic analysis of the raw transmission mains, lake channels, and conduits to the WTP. The evaluation identified the additional pumping capacity and transmission infrastructure needed to meet projected demands for both approaches and under each of the five supply alternatives, including options for upsizing existing pumps, adding new pumps, and constructing additional raw transmission mains. Capital and O&M costs for identified improvements were estimated and incorporated into overall cost comparisons.

1.5.3 Approach 1 (Task 4) - SPRWS Expansion to Subsets of Communities

Approach 1 (Task 4) evaluates the feasibility of extending the SPRWS treated surface water distribution system to deliver water to northeast metro communities currently dependent on groundwater. Five community subset alternatives were evaluated (as well as additional evaluations for service to Hugo East for alternatives 1-3: alternatives 1a-3a), each reflecting a different combination of communities to be served based on DNR groundwater modeling scenarios. For each alternative, this task included hydraulic modeling of the proposed transmission system, identification of trunk main routes and booster station locations, needed McCarrons WTP expansions, development of phased 2050 and ultimate development system layouts, and preparation of capital and O&M cost estimates.

1.5.4 Approach 2 (Task 5) - New Surface Water Treatment Plant to Supply Subset of Communities

Approach 2 (Task 5) evaluates the feasibility of constructing a new regional surface water treatment plant located near the Vadnais Chain of Lakes and construction of transmission main to serve the same five community subset alternatives (as well as the additional evaluations for service to Hugo East for alternatives 1-3: alternatives 1a-3a) evaluated under Approach 1 (Task 4). This approach would utilize SPRWS's raw water infrastructure but would distribute treated water to communities via new dual trunk transmission mains (anticipated to be owned and operated by a newly established joint water commission). This approach would not utilize the McCarrons WTP or SPRWS finished water distribution system. This task included identification of potential treatment plant sites, evaluation of raw water quality and treatment process requirements, hydraulic modeling of the proposed distribution system, and development of

phased system layouts and cost estimates. The evaluation also addressed plant ownership and management options, including management by the northeast metro communities or by SPRWS.

1.5.5 Use of SPRWS Wells in Lieu of Fridley Pump Station Expansion

As an alternative to expanding the SPRWS Fridley Pump Station, this task evaluates the potential to use existing SPRWS groundwater wells during peak summer demand periods to supplement surface water supply and avoid or defer the need for pump station expansion. The evaluation estimated the groundwater pumping volumes needed from existing SPRWS wells to meet projected 2050 and ultimate development demands under each alternative, considering the existing pump station capacity, limited lake storage, and minimum reliable watershed runoff volumes during drought conditions. Groundwater pumping projections were also provided to the DNR for modeling of long-term groundwater effects on White Bear Lake. The relative costs of this approach versus expanding the Fridley Pump Station were factored in the financial analysis.

1.5.6 SPRWS to Supply Lake Elmo

At the request of the City of Lake Elmo, this task evaluates the feasibility of supplying the city with treated surface water from SPRWS as an alternative to continued reliance on groundwater. This evaluation built on layouts and cost estimates previously developed under the 3M East Metro PFAS Settlement conceptual drinking water supply plan, updating those plans to reflect current construction costs, revised water demand projections, and the communities included in this study. The task also estimated the additional McCarrons WTP and Fridley Pump Station capacity that would be required to serve Lake Elmo. Capital and O&M cost estimates for transmission mains and required SPRWS system improvements were developed and are presented in Chapter 8.

1.6 Water Demand

Existing and projected water demands were evaluated for each community included in the study alternatives described above. To estimate future average day water demands, projected 2050 water service populations and projected ultimate development water service populations were multiplied by historical Total Gallons Per Capita Per Day (TGPCD). To estimate future maximum day demands, estimated average day demands were multiplied by the historical maximum day/average day demand peaking factor (PF) since 2017.

Historical TGPCD and PF were determined for each community's water system based on ten years of recent water use data, starting in 2014 and ending in 2023. Data was taken from the 2014-2016 DNR Water Supply Plan, and 2017-2023 - DNR water use database.

Projected 2050 water service populations and projected ultimate development water service populations for each community were based on Met Council projections and a summary of existing and projected water service populations for each of the study area entities are presented in Table 1.

Table 1 – Water Service Population Data by Entity

Community/Entity	2023 Water Service Population	Projected 2050 Water Service Population	Projected Ultimate Water Service Population
Lake Elmo	11,020	24,560	28,000
Lino Lakes	17,696	25,161	55,700
Mahtomedi	9,396	10,881	12,506
North Oaks	195	6,006	6,006
North St. Paul	15,750	15,750	15,750
Shoreview	26,632	30,079	36,701
Vadnais Heights	13,025	14,746	19,706
White Bear Lake	25,736	27,162	36,481
White Bear Township	12,002	11,000	11,500
Saputo Dairy Foods	N/A	N/A	N/A
TOTAL	131,452	165,345	222,350

A summary of existing and projected water demands for each of the study area cities are presented in Table 2 – Water Demands by City.

Table 2 – Water Demands by City

Community/Entity	2023 Average Day Demand (MGD)	2023 Max Day Demand (MGD)	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)
Lake Elmo	1.49	5.57	12.4	14.1
Lino Lakes	2.02	5.25	7.46	16.5
Mahtomedi	0.71	2.09	2.97	3.41
North Oaks	0.05	0.13	4.24	4.24
North St. Paul	1.06	2.22	2.45	2.45
Shoreview	2.52	6.30	7.54	9.21
Vadnais Heights	1.43	3.43	3.89	5.19
White Bear Lake	2.12	5.03	6.01	8.08
White Bear Township	1.29	3.61	3.48	3.64
Saputo Dairy Foods	N/A	N/A	N/A	N/A

Projected 2050 and Ultimate water demands for each of the five study alternatives are presented in Table 3.

Table 3 – Projected Water Demands by Alternative for Sizing Water Supply Infrastructure

Community/Entity	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)
Alternative 1 – Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	16.3	20.3
Alternative 2 – Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	18.8	22.8
Alternative 3 – Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	20.6	24.6
Alternative 4 – Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	30.6	36.2
Alternative 5 – Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	9.50	11.7

Projected Ultimate water demands for the alternatives including supply to Hugo East are presented in Table 4.

Table 4 – Projected Water Demands for Sizing Water Supply Infrastructure, including Hugo East

Community/Entity	Ultimate Max Day Demand without Hugo East (MGD)	Ultimate Max Day Demand including Hugo East (MGD)	Percent Increase with Hugo East
Alternative 1a – incl. Supply to Hugo East	20.3	42.2	108%
Alternative 2a – incl. Supply to Hugo East	22.8	44.7	96%
Alternative 3a – incl. Supply to Hugo East	24.6	46.5	89%

2 SPRWS McCarrons WTP Capacity Evaluation

2.1 Existing and Future WTP Capacity

The SPRWS primarily withdraws water from the Mississippi River near Fridley, Minnesota, where it is conveyed east to the Vadnais Chain of Lakes. Water is withdrawn from Vadnais Lake where it is treated at the McCarrons WTP.

The McCarrons WTP is a conventional lime softening plant for surface water, with solids contact clarifiers, recarbonation and ozonation, filtration with biologically active carbon media, and disinfection. Major upgrades to the plant were last completed in 2025, with the construction of four new solids contact clarifiers. The plant currently has a total peak hydraulic capacity of 112 MGD, with a firm capacity of 84 MGD with one of the clarifiers out of service. The plant was designed with the ability to easily expand to 126 MGD total capacity, with a future firm capacity of 112 MGD by constructing a fifth lime softening clarifier and a fourth recarbonation/ozone basin.

While the plant is currently hydraulically limited by transmission pipelines and conduits, there is adequate physical space at the current site to increase the firm treatment capacity to 138 MGD (144 MGD total) by adding a sixth solids contact clarifier and fifth recarbonation and ozonation train. This treatment rate is limited by the filtration capacity, which consists of 24 filters each rated for 6 MGD (138 MGD firm with one filter out of service).

Table 5 provides a summary of the existing WTP capacity and potential future treatment capacity with additional treatment units installed.

Table 5 – SPRWS Current and Potential Treatment Plant Capacity

Number of Softening Trains	Number of Recarb/Ozone Trains	Firm Capacity (MGD)	Total Capacity (MGD)
(Current) 4	(Current) 3	84	112
5	4	112	140
6	4	126	144 ¹
6	5	138 ²	144 ¹
Note: 1. Limited by maximum total filtration capacity of 144 MGD 2. Limited by maximum firm filtration capacity of 138 MGD			

While the current permit language for the SPRWS' Mississippi River Appropriations is unclear, the interpretation based on quoted pump capacities in the permit is that SPRWS is allowed to pump up to 110 MGD each day from the Mississippi River. The Vadnais Chain of Lakes and raw conduits provides a significant volume of raw water storage, which would allow the McCarrons WTP to temporarily operate at rates exceeding the river appropriations. The current limit of 110 MGD meets the average day demand for all studied alternatives, which are discussed in later sections.

2.2 SPRWS Pumping Capacity Evaluation

The McCarrons WTP distributes water into SPRWS' distribution system in two Pressure Zones (PZ), the High Service PZ, and Low Service PZ. Both the Low Service and High Service PZ were evaluated for their capacity to supply water to the NE communities. With the Low Service PZ system designed to largely gravity feed down from a storage reservoir at the McCarrons campus, the High Service PZ was identified as the preferred connection point for pumping water to the NE communities.

SPRWS has ten (10) pumps at its McCarrons Booster Pump Station (BPS) which pump water into the Low Service PZ & High Service PZ. Six (6) of the ten pumps pump water into the High PZ with a total capacity of 190 MGD, and a firm capacity of 155 MGD. Based on these ratings,

the firm capacity of the High Service pumps exceeds the projected expanded demand in any of the proposed NE communities' supply scenarios, including adding Lake Elmo to any of the scenarios. The operating hydraulic Grade Line (HGL) of the High Service pumps is 1046'. The HGL for the NE communities ranges from 1090' to 1155'. The HGL difference between the SPRWS High Service HGL and the NE communities will need to be met with either in-line booster stations along the transmission mains and/or booster stations at the connections to individual communities. In some scenarios using in-line booster stations used to maintain pressures in the transmission mains result in needing pressure reduction stations at connection points to some communities. The use of in-line booster stations and pressure reducing stations or booster stations at connections to individual communities varies by alternative and is further detailed below.

A brief evaluation of the McCarron's pumping system was completed, including a review of pump operating scenarios and the capacity of the associated electrical system under both existing and proposed conditions. The current configuration includes high service and low service pumps supplied through a shared medium-voltage motor control system. Under typical operating conditions, the facility operates two high service pumps and one low service pump.

To support the White Bear Lake supply scenarios and meet peak demand conditions, the system was evaluated under a more aggressive operating case assuming simultaneous operation of four high service pumps and two low service pumps. While this scenario represents a maximum day condition rather than typical operation, it was used to confirm the system's ability to meet peak flow requirements. An electrical loading analysis was performed for this condition to assess available capacity within the medium-voltage system, including motor control centers (MCCs) and transformers. The results indicate that the existing system has sufficient capacity to support the proposed pumping operation; however, both the MCCs and transformers would be operating near their capacity limits.

Based on this evaluation, major upgrades to the medium-voltage system are not anticipated. However, depending on final design assumptions and actual operating conditions, targeted electrical improvements—such as transformer upgrades—may be warranted to maintain system redundancy and operational flexibility. These considerations should be further evaluated during subsequent design phases.

2.3 SPRWS Demand

Existing and projected water demands for the SPRWS were evaluated with the same methodology as each of the studied communities as noted in Section 1.5. Table 6 below provides the existing and projected future demands of the SPRWS.

Table 6 – SPRWS Water Demands

Community/Entity	2023 Average Day Demand (MGD)	2023 Max Day Demand (MGD)	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)
SPRWS	43.72	76.94	84.5	88.7

If the communities were switched to a surface water with water supplied from SPRWS, the combined total demands for each alternative are presented in Table 7 below, along with the additional firm capacity at SPRWS needed.

Table 7 – Projected Water Demands for Communities with SPRWS and Capacity Needed

Community/Entity	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)	2050 MDD Additional Firm Capacity Needed	Ultimate MDD Additional Firm Capacity Needed
Alternative 1 – SPRWS, Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	100.7	108.8	+16.7	+24.9
Alternative 2 – SPRWS, Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	103.1	111.3	+19.1	+27.3
Alternative 3 – SPRWS, Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	104.9	113.1	+20.9	+29.1
Alternative 4 – SPRWS, Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	114.9	124.8	+30.9	+40.8
Alternative 5 – SPRWS, Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	94.0	100.4	+10	+16.4

Projected Ultimate water demands for the alternatives including supply to Hugo East are presented in Table 8.

Table 8 – Projected Water Demands for and Additional Capacity Needed for SPRWS Expansion, including Hugo East

Community/Entity	Ultimate Max Day Demand including Hugo East (MGD)	Additional Firm Capacity Needed (MGD)
Alternative 1a – incl. Supply to Hugo East	122.6	+38.6
Alternative 2a – incl. Supply to Hugo East	125.0	+41.0
Alternative 3a – incl. Supply to Hugo East	126.8	+42.8

2.4 SPRWS Expansion Requirements

While the SPRWS currently has a total capacity that can meet most of the 2050 and Ultimate max day demands, the current firm treatment capacity does not meet any of the identified alternative needs. As reliable service is critical for a large regional utility, the existing McCarrons WTP would need to be expanded to ensure adequate firm capacity to support the additional NE metro communities.

All five of the Alternatives would require the same initial expansion of SPRWS to meet the 2050 MDD. An additional lime softening clarifier (5 total) and recarbonation/ozonation train (4 total) would be needed to provide a firm capacity of 112 MGD at McCarrons WTP. This expansion would be adequate to also meet the Ultimate MDD for Alternatives 1, 2, 3, and 5, and could be implemented in phases as needed. Alternative 4 has an Ultimate MDD of 115.9 MGD, which would require construction of a 6th clarifier.

When eastern Hugo East (Hugo 2) is added to the communities with SPRWS, one recarbonation basin and two clarifiers would be required to meet Ultimate demands, for a total of 6 clarifiers and 4 recarbonation/ozone basins.

Table 9 below provides a summary of the necessary plant expansions for each of the identified alternatives.

Table 9 – SPRWS Capacity Expansion

Community/Entity	2050 Expansion	Ultimate Expansion	Final Firm Capacity (MGD)	Final Total Capacity (MGD)
Alternative 1 – SPRWS, Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	+1 Clarifier +1 Recarb/Ozone	Not Required	112	140
Alternative 2 – SPRWS, Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	+1 Clarifier +1 Recarb/Ozone	Not Required	112	140
Alternative 3 – SPRWS, Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais	+1 Clarifier +1 Recarb/Ozone	+1 Clarifier	126	144

Community/Entity	2050 Expansion	Ultimate Expansion	Final Firm Capacity (MGD)	Final Total Capacity (MGD)
Heights (includes Gem Lake), White Bear Lake, and White Bear Township				
Alternative 4 – SPRWS, Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	+2 Clarifier +1 Recarb/Ozone	Not Required	126	144
Alternative 5 – SPRWS, Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	+1 Clarifier +1 Recarb/Ozone	Not Required	112	140
Alternative 1a – incl. Supply to Hugo East	N/A	+2 Clarifier +2 Recarb/Ozone	138	144
Alternative 2a – incl. Supply to Hugo East	N/A	+2 Clarifier +2 Recarb/Ozone	138	144
Alternative 3a – incl. Supply to Hugo East	N/A	+2 Clarifier +2 Recarb/Ozone	138	144

None of the identified alternatives requires expansion of the gravity filters at McCarrons WTP, which becomes the limiting factor of 144 MGD total capacity (138 MGD firm).

3 SPRWS Fridley Pump Station Capacity Evaluation

SPRWS Fridley Pump Station capacity evaluation (Assessment Task 1.5.2) is an evaluation of the St. Paul Regional Water System (SPRWS) Fridley Pump Station and its ability to supply additional water to serve White Bear Lake area communities.

This task assessment includes the following components:

- Confirmation of the existing capacity of the Fridley Pump Station and review of alternatives on how to increase the capacity to provide additional flows to the White Bear Lake area communities.
- Review of the existing standpipe and confirmation if the standpipe would need to be modified to accommodate future flows to the White Bear Lake area communities.
- Evaluation of the capacity of the existing conduits and a review of if additional conduit capacity is needed.
- Review the chain of lakes storage estimates and reliable watershed runoff volume estimates during the 1988 drought.

3.1 Fridley Pump Station Background and Existing Capacity

The Fridley Pump Station is located along the Mississippi River and pumps raw water to the McCarron's Water Treatment Plant. The pump station was originally built in 1924. The pump

station includes and two intake structures, intake screens, three horizontal split case pumps and two force mains leaving the facility; one is 60" and one is 36". The 36" main transitions to 60" in the yard outside the pump station. The system currently operates with two pumps in service under maximum flow conditions. Table 10 indicates the existing pump head and flow capacity.

Table 10 – Fridley Pump Station Existing Pump Information

Pump #	Make	Year Installed	Rated Flow (MGD)	Head (ft)	RPM	HP
Pump 5	Patterson SC-C0114048-01	2013	33.7	90	720	700
Pump 6	Patterson 77BT-2070-A-30	1978	35.3	160	514	1250
Pump 7	Patterson SC-C027917	2002	60.6	120	514	1250

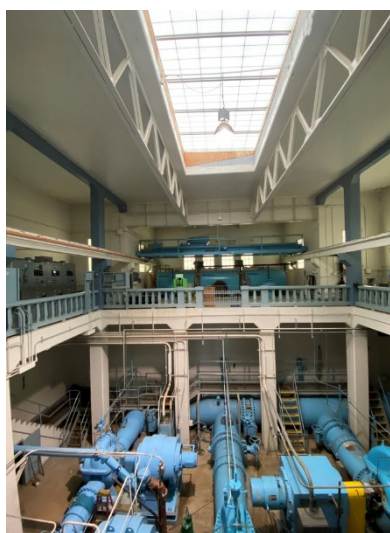


Figure 1 – Fridley Pump Station Interior

Hydraulic calculations were performed to confirm the capacity of the existing pump station. The calculated capacity of the existing system can be seen in Figure 2 through Figure 6, with the maximum capacity being approximately 76 MGD, with Pumps 6 & 7 running. Table 11 shows the calculated capacity of the existing pumps for different scenarios.

Table 11 – Fridley Pump Station Calculated Capacity

Pumps Operating	Conduit in Service	Flow (MGD)	Head (ft)
5 & 6	One	45	161
5 & 7	One	45	161
6 & 7	One	49	172
5 & 6	Two	64	136
5 & 7	Two	65	137
6 & 7	Two	76	150

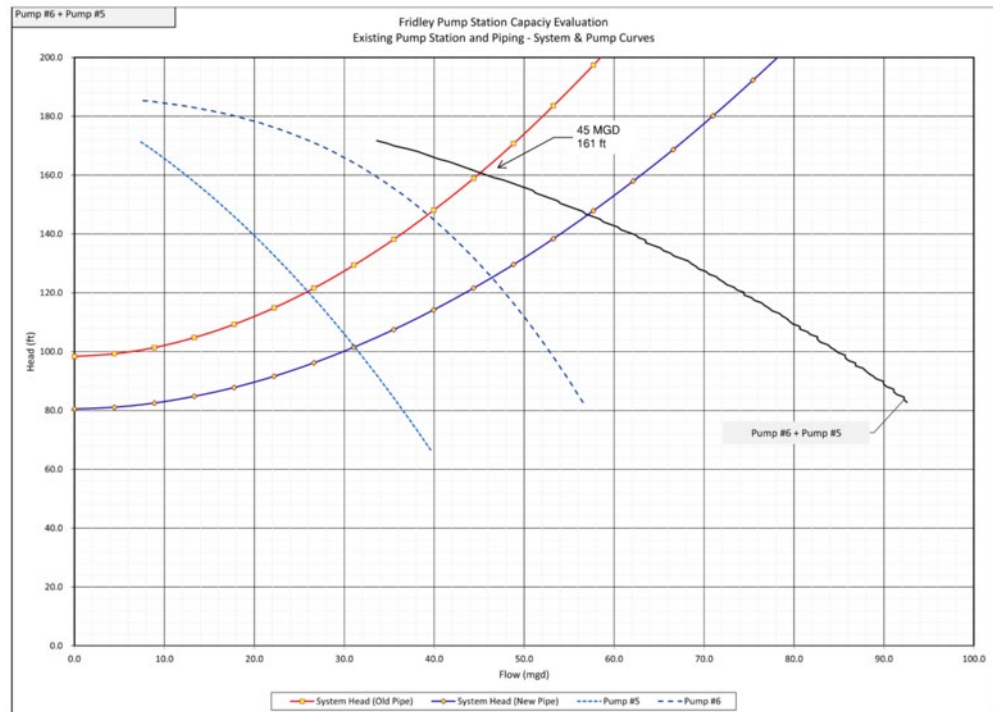


Figure 2 – Fridley Pump Station, Existing Pumps 5 & 6, Single Conduit

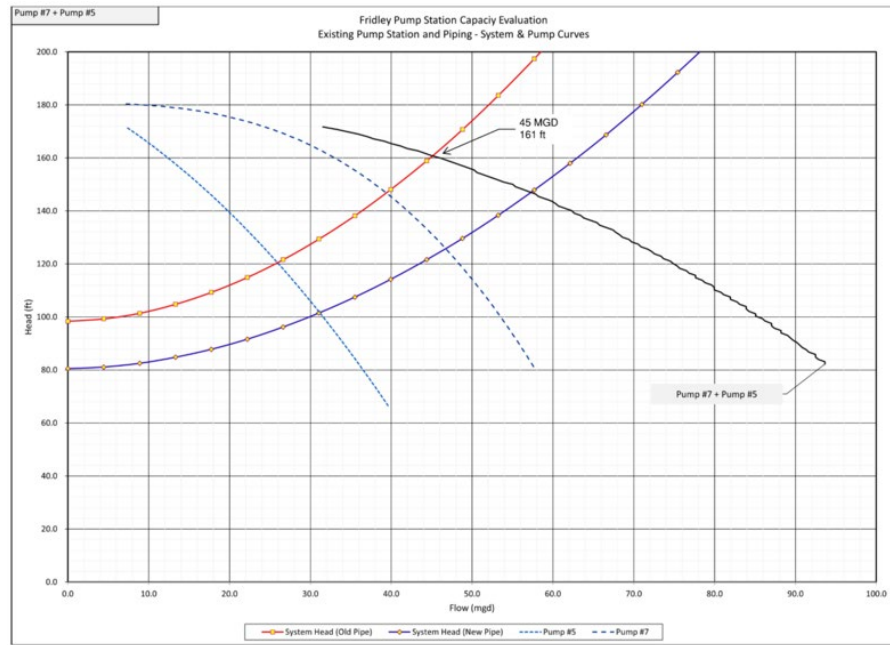


Figure 3 – Fridley Pump Station, Existing Pumps 6 & 7, Single Conduit

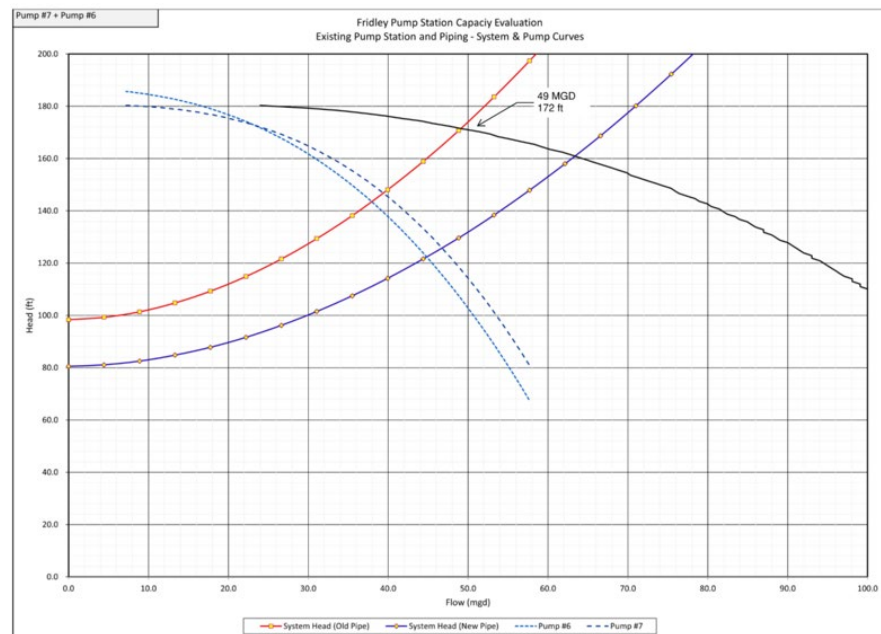


Figure 4 – Fridley Pump Station Existing Pumps 5 & 7, Single Conduit

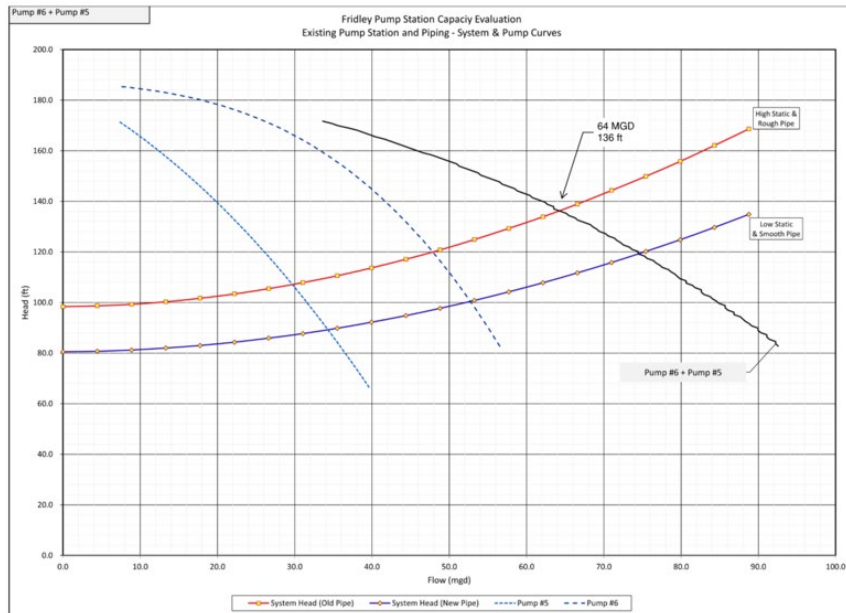


Figure 5 – Fridley Pump Station, Existing Pumps 5 & 6 Two Conduits

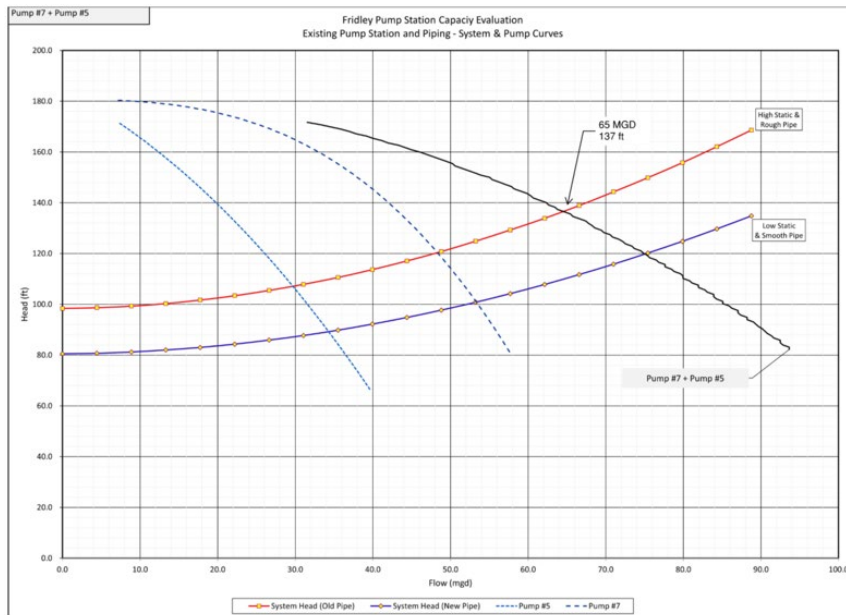


Figure 6 – Fridley Pump Station, Existing Pumps 5 & 7 Two Conduits

3.2 Fridley Pump Station Improvements

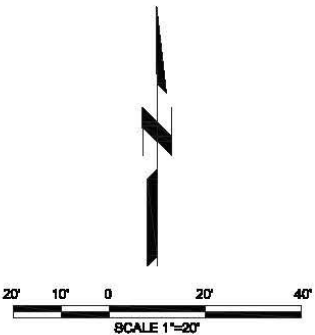
To provide additional raw water to serve the White Bear Lake area communities, the Fridley Pump Station must be expanded. The two flow rates considered for the capacity of the Fridley Pump Station are 100 mgd for Alternatives 1-5 and 130 mgd for Alternatives 1-3 with Hugo East (1a-3a). Both scenarios include flows for SPRWS plus flows for the White Bear Lake area communities. Eighty-two mgd is for SPRWS and 18 or 48 mgd would be for the White Bear Lake Area Communities. One important note is that the current Mississippi River Appropriations is limited to 110 mgd. The alternatives with Hugo East that require up to 130 mgd would necessitate an increase in the river appropriations limit. Two alternatives were reviewed to provide these flows; replacing the pumps in the Fridley Pump Station with larger capacity pumps and construction of a new pump station next to the Fridley Pump Station. These two alternatives are presented in the following sections.

3.2.1 Alternative 1 – Replace Existing Pumps in Fridley Pump Station

This alternative consists of replacing all three existing raw water intake pumps with new units. The system would be designed to operate with two duty pumps and one standby pump under maximum flow conditions. The existing fittings in the pump station would be upsized and the 36" section of conduit leaving the Pump Station would be upsized to 60". Hydraulic calculations were performed and pump selections were made to provide a total flow of 100 mgd and 130 mgd. For the purpose of identifying potential pumps, the pump manufacturer Patterson was utilized. Table 12 shows the pump selection and capacity for the different flow demands. Note that the same pump model works for both the 100 mgd and 130 mgd flow demands, but the pumps have different impellers and different motor sizes. Figure 7 provides a site plan for this alternative. Figure 8 provides a layout of the pump station with the new pumps, fittings and piping. Curves for the new 100 MGD and 130 MGD alternatives can be seen in Figure 9 and Figure 10.

Table 12 – Pump Selections for Expanding Fridley Pump Station Capacity

Pumps #	Pump Make	MGD	Head (ft)	RPM	HP
5 – 100 MGD	Patterson PDI.60	50	161	395	1,631
6 – 100 MGD	Patterson PDI.60	50	161	395	1,631
7 – 100 MGD	Patterson PDI.60	50	161	395	1,631
5 – 130 MGD	Patterson PDI.60	65	201	442	2,564
6 – 130 MGD	Patterson PDI.60	65	201	442	2,564
7 – 130 MGD	Patterson PDI.60	65	201	442	2,564



Black & Veatch Corporation
Austin, Texas
Business License No. F-0794
The Terrace 7, 2801 Via Fortuna # 100,
Austin, TX 78746

WHITE BEAR LAKE AREA
COMPREHENSIVE PLAN

**PRELIMINARY
NOT FOR
CONSTRUCTION**

REVISIONS AND RECORD OF ISSUE

DESIGNED:

DETAILED:

CHECKED:

APPROVED:

DATE:

PROJECT NO.:

CIVIL

ALTERNATIVE 1
SITE PLAN

FIGURE-7

OF

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(SCALE BAR IS 4" AT FULL SCALE) 0 1/2 1 2 3 4



INDIVIDUAL PUMP SUCTION WILL BE 60" FOR 130 MGD OF FLOW,
BUT ONLY 54" FOR 100 MGD OF FLOW.

**PRELIMINARY
NOT FOR
CONSTRUCTION**

PROJECT NO.:

ALTERNATIVE 1 PUMP STATION LAYOUT

OF

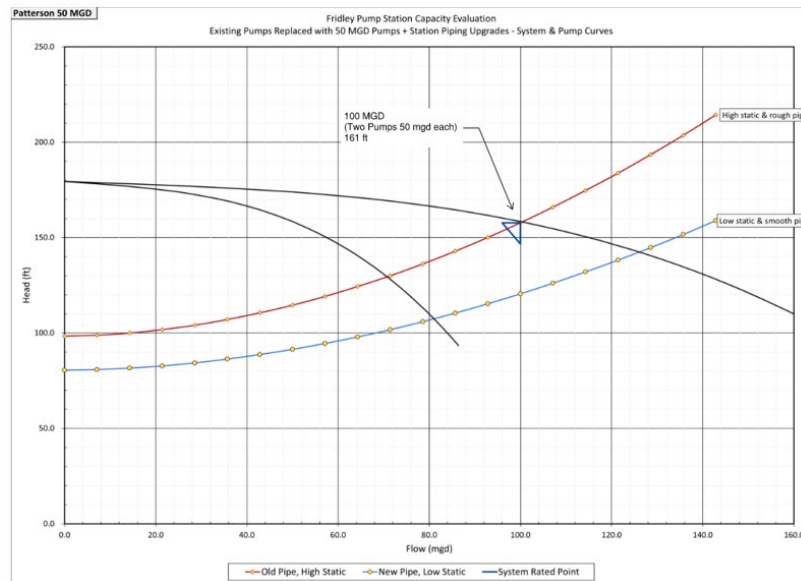


Figure 7 – Alternative 1 New Pumps – 100 mgd

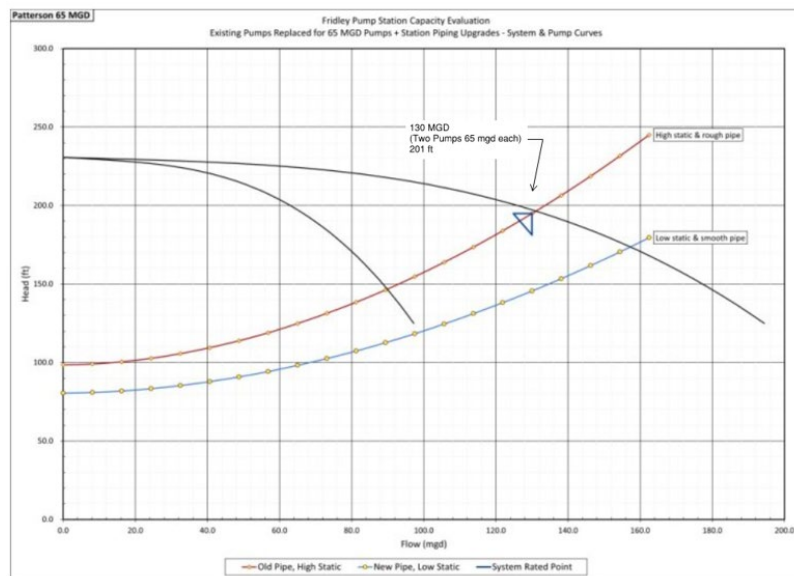


Figure 8 – Alternative 1 New Pumps – 130 mgd

Costs associated with upsizing the pumps in the Fridley Pump Station to provide 100 or 130 mgd are indicated in Table 13 below.

Table 13 – Fridley Pump Station Upgrades

Item	Total Capital Cost	Total Annual O&M Cost
OPTION 1 - Upsize Pumps to 100 MGD	\$29,780,000	\$278,000
OPTION 2 - Upsize Pumps to 130 MGD	\$34,540,000	\$824,000
Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.		

3.2.2 Alternative 2 – Add a New Pump Station to Provide Additional Flow

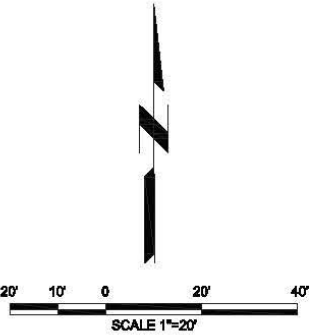
This alternative involves constructing a new pump station, located adjacent to the existing Fridley Pump Station. The new pump station would connect to the existing intake structure, so a new intake from the Mississippi River would not be required. The new pump station would house two or three new pumps, depending on the total flow required (100 or 130 mgd). The three pumps in the existing Fridley Pump Station would remain in service. A new 60" conduit would be provided for the discharge from the new pump station.

Hydraulic calculations were performed and pump selections were made to provide the required flows. For the 100 MGD scenario, 2 new pumps would be required in the new pump station, with one being in service and the other being a standby. The new pumps would be sized for 50 mgd each. In this scenario, the existing pump station would be assumed to provide 50 mgd and the new pump station would provide 50 mgd. Table 14 shows the pump selections for the new pump station for the different total demands. Figure 11 shows a layout of the new pump station. Figure 12 is a site plan showing the location of the new pump station. Curves for the new pumps are shown in Figure 13.

For the 130 MGD scenario, 3 new pumps would be required, with 2 being duty and 1 being a standby. The new pumps would be sized for 40.3 mgd each. In this scenario the existing pump station would be assumed to provide 50 mgd and the new pump station would provide 80 mgd. Figure 11 provides a layout of the new pump station. Figure 12 provides a site plan showing the location of the new pump station and new effluent main. Curves for the new pumps can be seen in Figure 14.

Table 14 – Pump Selections for Providing New (Second) Pump Station

Pumps #	Pump Make	MGD	Head (ft)	RPM	HP
Pump 1 – 100 MGD	Patterson PDI.60	50	157	395	1,586
Pump 2 – 100 MGD	Patterson PDI.60	50	157	395	1,586
Pump 1 – 130 MGD	Patterson PDI.60	40.3	243	705	1,982
Pump 2 – 130 MGD	Patterson PDI.60	40.3	243	705	1,982
Pump 3 – 130 MGD	Patterson PDI.60	40.3	243	705	1,982



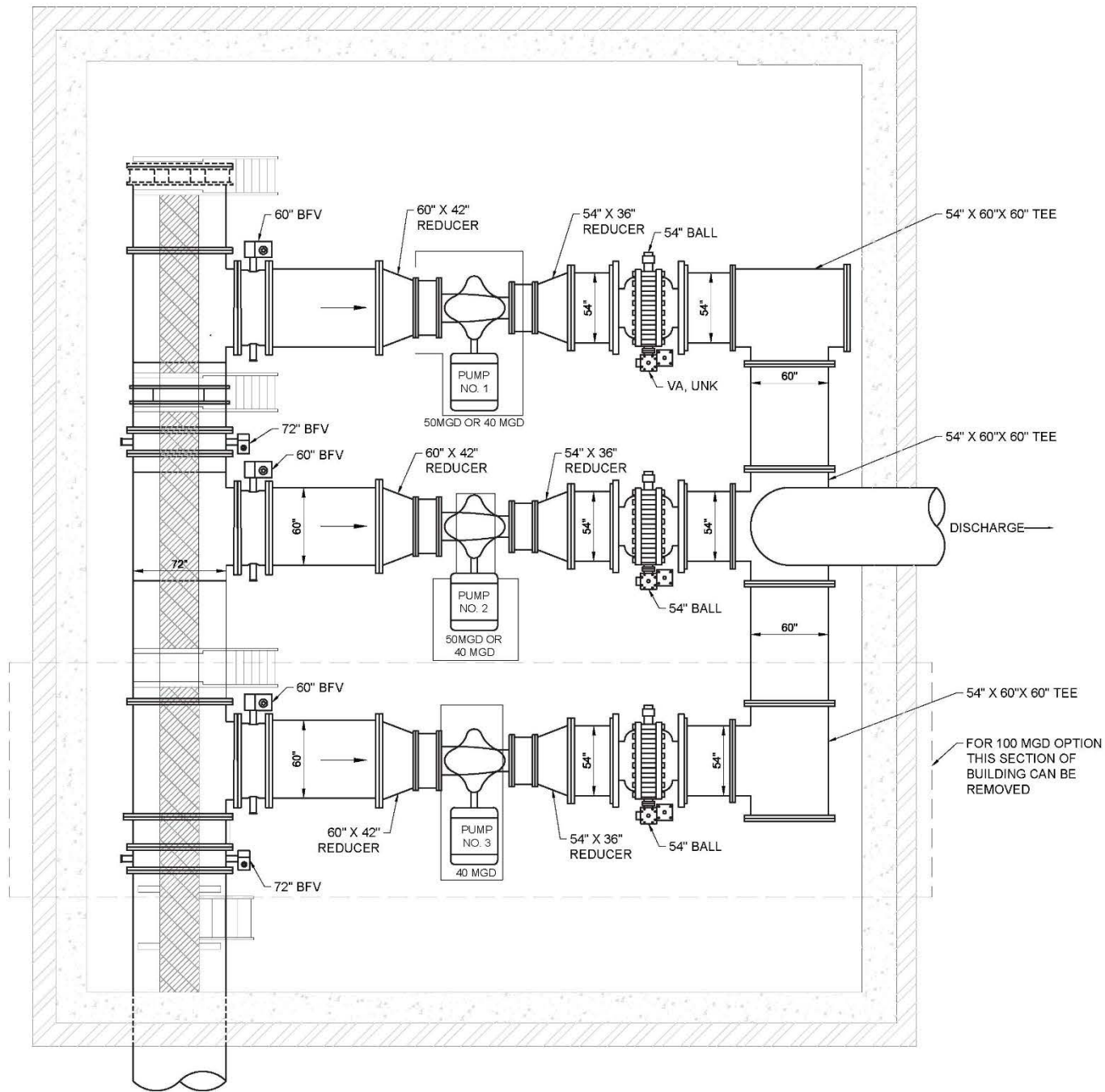
WHITE BEAR LAKE AREA
COMPREHENSIVE PLAN

**PRELIMINARY
NOT FOR
CONSTRUCTION**

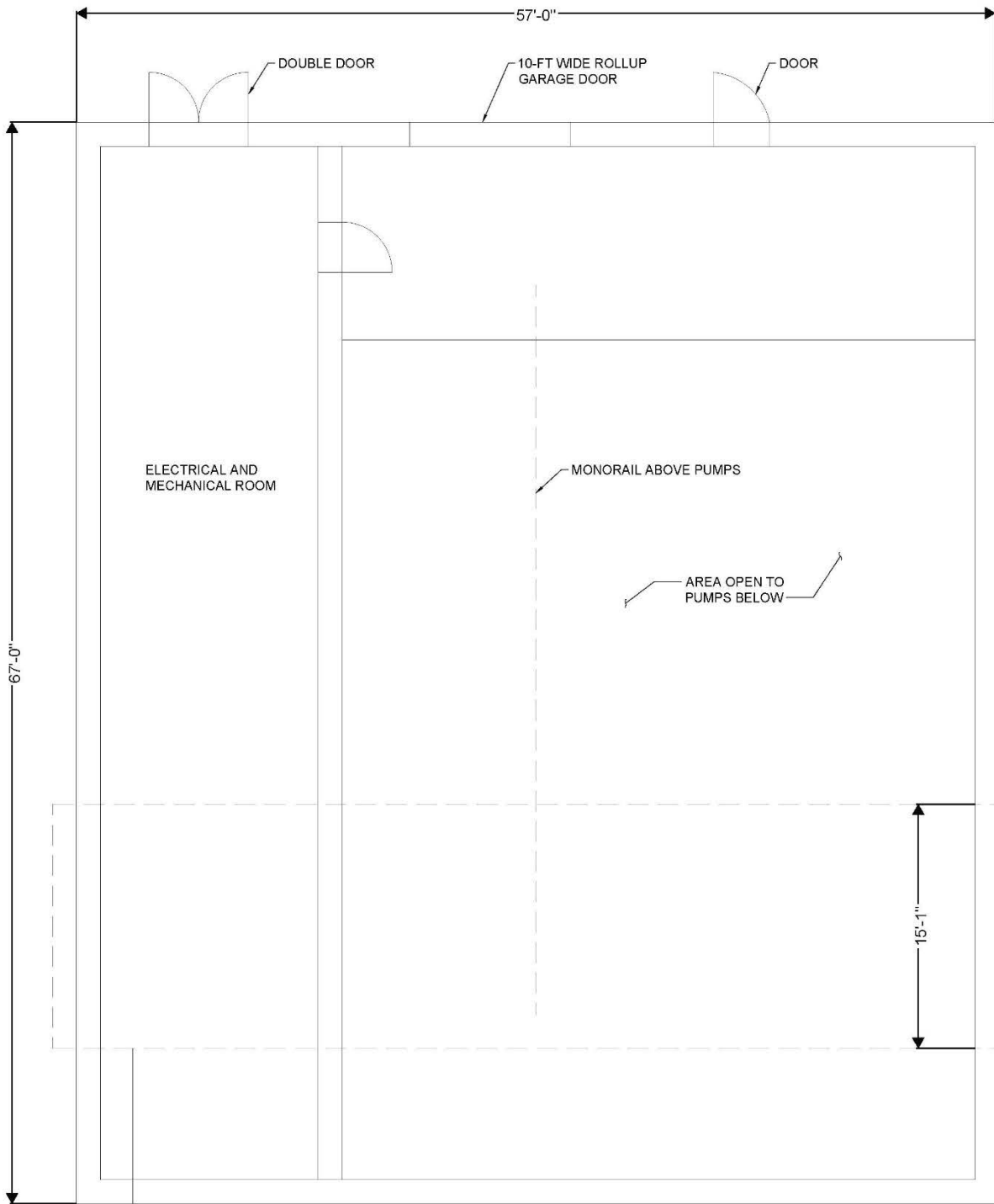
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CIVIL

ALTERNATIVE 2
SITE PLAN



BELOW GRADE BASEMENT PLAN
SCALE 1" = 5'



GRADE LEVEL FLOOR PLAN
SCALE 1" = 5'

NOTE:
INDIVIDUAL PUMP SUCTION WILL BE 60" FOR 130 MGD OF FLOW,
BUT ONLY 54" FOR 100 MGD OF FLOW.

5' 3' 0' 5' 10'
SCALE 1"=5'

(SCALE BAR IS 4" AT FULL SCALE) 0 1/2 1 2 3 4

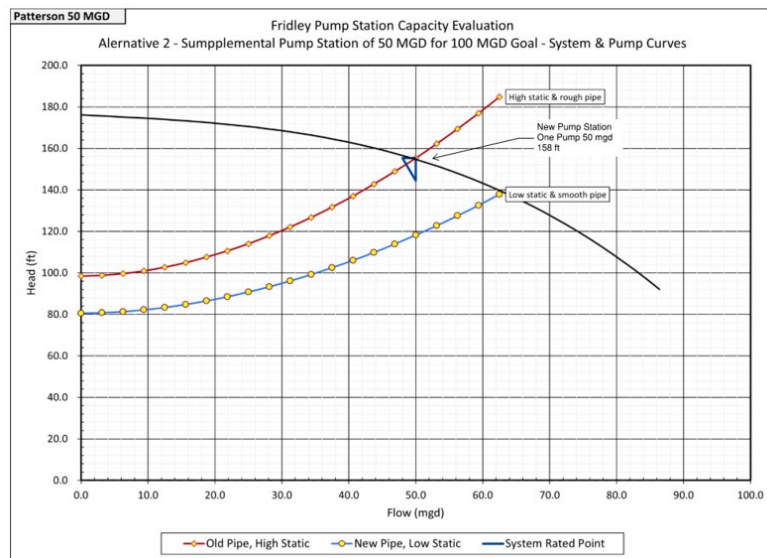


Figure 10 – Alternative 2 – New Pump Station – 100 mgd

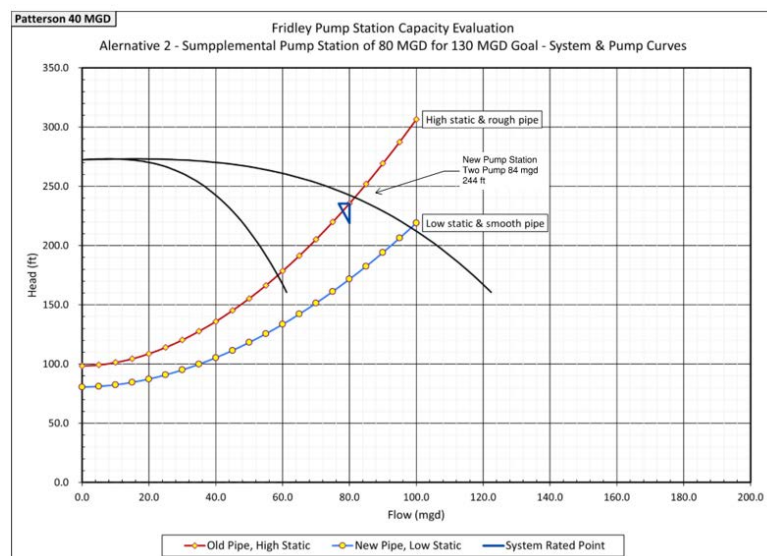


Figure 11 – Alternative 2 – New Pump Station – 130 mgd

Costs associated with constructing a new pump station next to the existing Fridley Pump Station to provide a total of 100 or 130 mgd are presented in Table 15.

Table 15 – New Pump Station Costs

Item	Total Capital Cost	Total Annual O&M Cost
OPTION 1 - New 100 MGD Pump Station, with 50 MGD from Fridley PS and 50 MGD from New PS	\$29,170,000	\$317,000
OPTION 2 - New 130 MGD Pump Station, with 50 MGD from Fridley PS and 80 MGD from New PS	\$35,000,000	\$676,000
Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.		

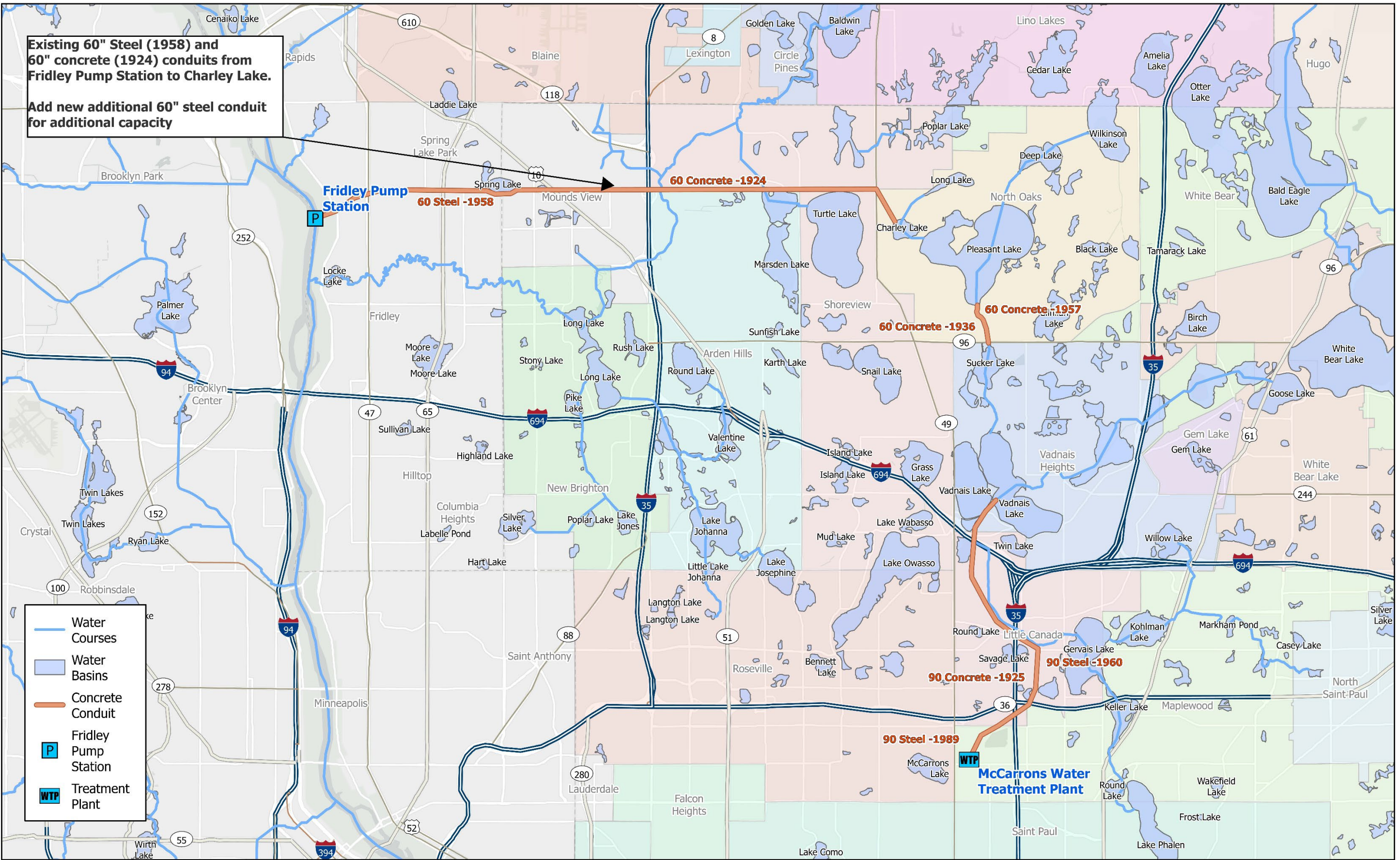
3.3 Surge Tower – Existing and Future Operation

The Fridley Pump Station has an existing 90-ft tall, 12-ft diameter surge tower located in the yard outside the pump station. If the pressure in the system becomes too great, the surge tower will overflow in lieu of damaging conduits or pumps. Hydraulic calculations were performed and based on the calculations the tower should be close to overflowing. Water marks in the tower show it normally reaches approximately 2/3 full. It is assumed under future conditions the tower would overflow. Therefore, it is also assumed the tower would be replaced with PRVs to protect the conduits from over pressurization.

3.4 Conduit Evaluation

Two existing 60-inch conduits convey raw water from the Fridley Pump Station to Charley Lake. From Charley Lake, water is conveyed through a series of lakes and conduits before it enters the McCarron's Water Treatment Plant. Refer to Figure 15 for routing of the conduits. The first conduit is concrete and dates to the 1920s, while the second is a steel conduit added in the 1950s. A condition assessment was performed in 2017 and found many minor defects that needed to be repaired. The recommendation from that assessment was to repair the defects. For this evaluation and report, it is assumed the existing conduits can continue to be reliably utilized. SPRWS plans to perform pressure testing of the existing conduits in the summer of 2026. If the results of this testing indicate potential issues with the conduits, this section of the report should be revised accordingly.

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	 0 0.55 1.1 Miles	Project: MCS0 190048 Print Date: 6/8/2026	Saint Paul Regional Water Services - Conduits White Bear Lake Area Comp Plan Study 2	Figure 15
		Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

The conduits from the Fridley Pump Station to Charley Lake are approximately 42,000 ft long. For conduits of this length and age, the velocity should be kept to 4 ft/sec, otherwise friction losses in the conduits can become excessive, impacting pump capacity. A velocity of 4 ft/sec results in a flow rate of 50 mgd, therefore, the recommended flow rate for each 60-inch conduit is 50 mgd (each). Higher velocities and flowrates are acceptable but should not be operated on a normal daily basis. In the case of the Fridley Pump Station the capacity of the conduits is limited by the existing pumps and the height of the existing surge tank. If one conduit is in service, the maximum flow is 52 mgd before the pumps back up on the pump curve and reach shutoff head. If two conduits are in service, the maximum total flow through two conduits is 95 mgd (42.5 mgd per conduit) before the pumps reach shutoff head.

For the alternative of delivering 100 mgd, the flow could be pumped through the two existing conduits, however since this would be a normal daily operating flow, a third conduit is recommended for redundancy.

For the alternative of delivering a total of 130 mgd, a third conduit would be required to deliver the flow under normal conditions. If a conduit had to be taken out of service, 65 mgd could be delivered through each conduit while maintenance or repairs is performed on the out of service conduit.

In general the conduits route from the Fridley Pump Station to Charley Lake though an easement that routes on the north side of Osborne Rd and County Road I. The easement is primarily open and has grass planted and has a bike path along the easement. For this report it is assumed the third conduit can fit within the existing easement. The two existing conduits have approximately 2 to 4 feet of cover above the conduits. It is assumed that the 3rd conduit would be installed parallel at the same depth, with the majority of the pipeline installed using open cut methodology. The new pipeline will have to cross approximately 50 driveways, 40 minor roads, 2 county roads, 5 highways, 1 railroad track, and 1 interstate. The conduit can be installed using open cut methods for driveways and minor roads, but will need to be tunneled for county roads, highways, railroad tracks and interstates. A cost estimate for the 3rd conduit is presented in Table 16 below. With a new steel transmission pipe, minimal maintenance costs are required. Estimated annual O&M costs assume periodic pipeline inspections.

Table 16 – Costs for 3rd Raw Water Conduit

Item	Quantity	Unit	Unit Price	Total
Capital Costs				
Conduit				
60" AWWA C200 Cement Mortar Lined	42,000	LF	\$1,562	\$65,591,000
Pipe Testing	1	LS	\$464,000	\$464,000
Welding	32,991	LF	\$580	\$19,135,000
Tunneling and Road Crossings	1	LS	\$1,133,000	\$1,133,000
Site Restoration	1	LS	\$113,000	\$113,000
Bike Path	1	LS	\$467,000	\$467,000
Subtotal	\$86,903,000			

Item	Quantity	Unit	Unit Price	Total
Contingency (20%)				\$17,381,000
Engineering/Admin/Legal (20%)				\$17,381,000
Total Capital Costs				\$121,665,000
Total Annual O&M Costs				\$30,000
Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.				

3.5 Chain of Lakes Evaluation

This study evaluates several alternatives that rely on water from the Chain of Lakes, including construction of a regional surface water treatment plant near the Chain of Lakes and the use of treated water from Saint Paul Regional Water Services (SPRWS), which sources from the same system. For these alternatives, it is important to understand the potential impacts of drought conditions on the Chain of Lakes. Specifically, this effort includes a review of available lake storage estimates and reliable watershed runoff volumes during the 1988 drought. The Supply System Capacity 1988 Drought Report from SPRWS was used as the primary reference for baseline assumptions and historical drought conditions.

The potential environmental constraints associated with increasing the current intake capacity from approximately 85 MGD to 100/130 MGD were evaluated. Key factors include:

- Mississippi River Withdrawal Limits
- Evaporative losses
- Groundwater and runoff interactions
- Available Storage (Charley, Pleasant, Vadnais, and Sucker Lakes)
- Environmental Considerations

3.5.1 Mississippi River Withdrawal Limits

The Supply System Capacity 1988 Drought Report identifies DNR action levels that limit maximum withdrawal from the Mississippi River during low-flow conditions. At a river flow of 1000 cfs, maximum withdrawal is limited to 56 MGD; at a river flow of 850 cfs, maximum withdrawal is limited to 45 MGD. Based on USGS flow records from 1931 through 2026 at Station 05288500 located at Hwy 610 in Brooklyn Park, MN, flows below 1000 cfs occur approximately 0.7 percent of the time, and flows at or below 850 cfs occur approximately 0.2 percent of the time; see Figure 16 below. This analysis of the Chain of Lakes was based on the DNR withdrawal limitations included in the 1988 Drought Report. There are currently new methods for determining if water withdrawal should be limited. However, the 1988 Drought Report restrictions are useful for general guidance, and the current restrictions would not change the results of this analysis.

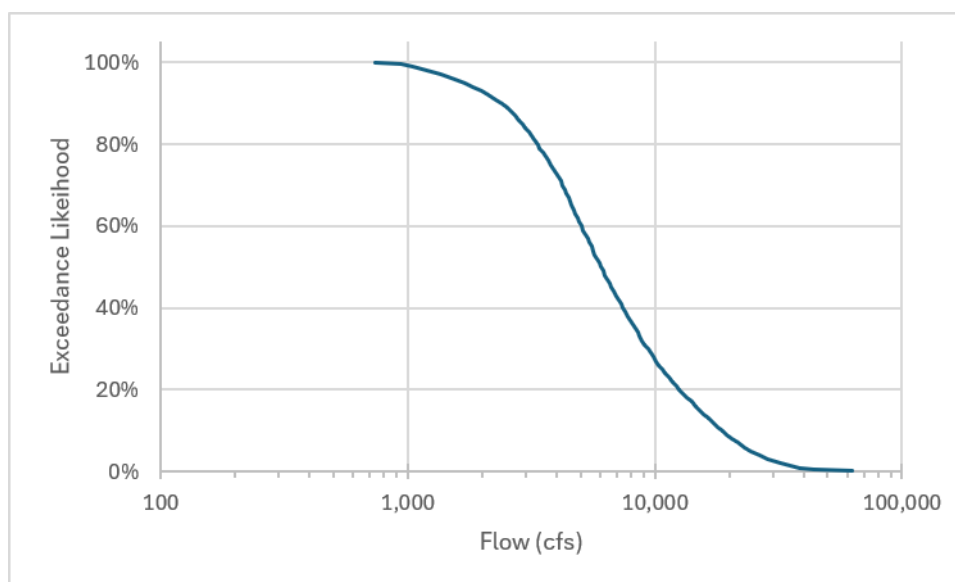


Figure 12 – Flow Distribution at USGS 05288500 between 1931 and 2026

Although these low-flow conditions occur infrequently, they represent critical constraints because projected demands of 100 MGD or 130 MGD would exceed the allowable Mississippi River withdrawal limits under those conditions. The 1988 Drought Report also included supply from the Fridley Pump Station, Centerville Pump Station, and groundwater wells. For this evaluation, It was assumed that only the Fridley Pumpage sourced from the Mississippi River is currently a viable source of water.

3.5.2 Evaporative Losses

The 1988 Drought Report aggregated evaporation, groundwater gains and losses to the lakes, and precipitation into a general “Environmental Gain/Loss” category. For this evaluation, these components were separated to provide clearer insight into the overall water balance.

Weekly lake evaporation rates were estimated using NOAA pan evaporation climatology for central Minnesota (NWS COOP), converted to open-water evaporation using standard USACE pan coefficients (EM 1110-2-1420), and adjusted based on established seasonal patterns documented in USGS lake water-balance literature (Winter, 1981). Average evaporative losses from the four lakes were estimated at approximately 44.6 MG per week, or 6.4 MGD; see Table 17 below. These losses represent a continuous demand on the system and must be accounted for when evaluating increased supply during drought conditions.

Table 17 – Estimated Evaporative Losses During the 1988 Drought

Drought Week	Dates	Evaporation (in/week)	Vadnais (604 ac)	Evaporation (MG/Week)			
				Sucker (63 ac)	Charley (37 ac)	Pleasant (607 ac)	Total
1	May 1 – May 7	0.85	14.0	1.5	0.9	14.0	30.3
2	May 8 – May 14	0.95	15.6	1.6	1.0	15.7	33.9

				Evaporation (MG/Week)			
Drought Week	Dates	Evaporation (in/week)	Vadnais (604 ac)	Sucker (63 ac)	Charley (37 ac)	Pleasant (607 ac)	Total
3	May 15 – May 21	1.05	17.2	1.8	1.1	17.3	37.4
4	May 22 – May 28	1.15	18.9	2.0	1.2	19.0	41.0
5	May 29 – Jun 4	1.25	20.5	2.2	1.3	20.6	44.5
6	Jun 5 – Jun 11	1.35	22.2	2.3	1.4	22.3	48.1
7	Jun 12 – Jun 18	1.45	23.8	2.5	1.5	23.9	51.7
8	Jun 19 – Jun 25	1.55	25.4	2.7	1.6	25.6	55.2
9	Jun 26 – Jul 2	1.6	26.3	2.8	1.6	26.4	57.0
10	Jul 3 – Jul 9	1.65	27.1	2.8	1.7	27.2	58.8
11	Jul 10 – Jul 16	1.7	27.9	2.9	1.7	28.0	60.6
12	Jul 17 – Jul 23	1.7	27.9	2.9	1.7	28.0	60.6
13	Jul 24 – Jul 30	1.65	27.1	2.8	1.7	27.2	58.8
14	Jul 31 – Aug 6	1.55	25.4	2.7	1.6	25.6	55.2
15	Aug 7 – Aug 13	1.45	23.8	2.5	1.5	23.9	51.7
16	Aug 14 – Aug 20	1.35	22.2	2.3	1.4	22.3	48.1
17	Aug 21 – Aug 27	1.25	20.5	2.2	1.3	20.6	44.5
18	Aug 28 – Sep 3	1.1	18.1	1.9	1.1	18.1	39.2
19	Sep 4 – Sep 10	0.95	15.6	1.6	1.0	15.7	33.9
20	Sep 11 – Sep 17	0.8	13.1	1.4	0.8	13.2	28.5
21	Sep 18 – Sep 24	0.65	10.7	1.1	0.7	10.7	23.2
22	Sep 25 – Sep 30	0.55	9.0	0.9	0.6	9.1	19.6
		1.25	20.6	2.2	1.3	20.6	44.6

3.5.3 Precipitation

For water supply planning, precipitation was conservatively excluded as a reliable source because rainfall is variable and less predictable than evaporative losses. Direct precipitation on the lakes is summarized in Table 18 to support the estimate of groundwater and runoff gains and losses. During the drought period evaluated, direct precipitation was generally less than 20 percent of the estimated evaporative loss and was not considered a dependable offset to system losses during dry conditions.

Table 18 – Estimated Precipitation During the 1988 Drought

Drought Week	Dates	Precipitation (in/week)	Vadnais (604 ac)	Precipitation (MG/Week)			
				Sucker (63 ac)	Charley (37 ac)	Pleasant (607 ac)	Total
1	May 1 – May 7	0.20	3.2	0.3	0.2	3.2	7.0
2	May 8 – May 14	0.43	7.1	0.7	0.4	7.1	15.4
3	May 15 – May 21	0.04	0.6	0.1	0.0	0.6	1.4
4	May 22 – May 28	0.08	1.3	0.1	0.1	1.3	2.8
5	May 29 – Jun 4	0.00	0.0	0.0	0.0	0.0	0.0
6	Jun 5 – Jun 11	0.00	0.0	0.0	0.0	0.0	0.0
7	Jun 12 – Jun 18	0.00	0.0	0.0	0.0	0.0	0.0
8	Jun 19 – Jun 25	0.08	1.3	0.1	0.1	1.3	2.8
9	Jun 26 – Jul 2	0.00	0.0	0.0	0.0	0.0	0.0
10	Jul 3 – Jul 9	0.00	0.0	0.0	0.0	0.0	0.0
11	Jul 10 – Jul 16	0.28	4.5	0.5	0.3	4.5	9.8
12	Jul 17 – Jul 23	0.43	7.1	0.7	0.4	7.1	15.4
13	Jul 24 – Jul 30	0.00	0.0	0.0	0.0	0.0	0.0
14	Jul 31 – Aug 6	0.98	16.2	1.7	1.0	16.2	35.1
15	Aug 7 – Aug 13	0.35	5.8	0.6	0.4	5.8	12.6
16	Aug 14 – Aug 20	0.08	1.3	0.1	0.1	1.3	2.8
17	Aug 21 – Aug 27	0.35	5.8	0.6	0.4	5.8	12.6

Drought Week	Dates	Precipitation (in/week)	Vadnais (604 ac)	Precipitation (MG/Week)			
				Sucker (63 ac)	Charley (37 ac)	Pleasant (607 ac)	Total
18	Aug 28 – Sep 3	0.51	8.4	0.9	0.5	8.4	18.2
19	Sep 4 – Sep 10	0.12	1.9	0.2	0.1	1.9	4.2
20	Sep 11 – Sep 17	0.28	4.5	0.5	0.3	4.5	9.8
21	Sep 18 – Sep 24	0.67	11.0	1.2	0.7	11.0	23.8
22	Sep 25 – Sep 30	0.24	3.9	0.4	0.2	3.9	8.4
		1.25	3.8	0.4	0.2	3.8	8.3

3.5.4 Groundwater and Runoff Interactions

The methodology used to develop the water balance in the 1988 Drought Report was not clearly documented, therefore assumptions were required to estimate the groundwater and runoff gains and losses in the system, as summarized in Table 19. A direct relationship between rainfall and the groundwater/runoff term was not evident from the 1988 Drought Report, suggesting that direct runoff from rainfall events was a smaller contributor than groundwater interaction. For example, drought weeks 2 and 12 both had a direct rainfall contribution of 15.4 MG/week; however, the calculated groundwater/rainfall term were -6.0 MG/week and -147.7 MG/week, respectively. If rainfall-driven runoff were the primary contributor, these values would be expected to be more consistent. During the 1988 drought period, groundwater and runoff contributed an average net gain of approximately 9.7 MG/week to the water balance. However, the combined direct precipitation and groundwater contribution offset only 40 percent of the estimated evaporative losses.

Table 19 – Estimated water balance during the 1988 drought

Drought Week	Dates	Environmental Gain/Loss(MG/wk)	Evaporation (MG/wk)	Rainfall (MG/wk)	Groundwater and Runoff (MG/wk)
1	May 1 – May 7	-68.6	-30.3	7.0	-45.3
2	May 8 – May 14	-24.4	-33.9	15.4	-6.0
3	May 15 – May 21	-14	-37.4	1.4	22.0
4	May 22 – May 28	57.6	-41.0	2.8	95.8
5	May 29 – Jun 4	-16.7	-44.5	0.0	27.8
6	Jun 5 – Jun 11	-108.2	-48.1	0.0	-60.1

Drought Week	Dates	Environmental Gain/Loss(MG/wk)	Evaporation (MG/wk)	Rainfall (MG/wk)	Groundwater and Runoff (MG/wk)
7	Jun 12 – Jun 18	50.4	-51.7	0.0	102.1
8	Jun 19 – Jun 25	114	-55.2	2.8	166.4
9	Jun 26 – Jul 2	-21.2	-57.0	0.0	35.8
10	Jul 3 – Jul 9	-88.8	-58.8	0.0	-30.0
11	Jul 10 – Jul 16	-149.6	-60.6	9.8	-98.8
12	Jul 17 – Jul 23	-192.8	-60.6	15.4	-147.7
13	Jul 24 – Jul 30	-11.2	-58.8	0.0	47.6
14	Jul 31 – Aug 6	48.1	-55.2	35.1	68.3
15	Aug 7 – Aug 13	11.5	-51.7	12.6	50.5
16	Aug 14 – Aug 20	-57.4	-48.1	2.8	-12.1
17	Aug 21 – Aug 27	-37.2	-44.5	12.6	-5.3
18	Aug 28 – Sep 3	-12.2	-39.2	18.2	8.8
19	Sep 4 – Sep 10	-34.1	-33.9	4.2	-4.5
20	Sep 11 – Sep 17	-23.3	-28.5	9.8	-4.6
21	Sep 18 – Sep 24	8.8	-23.2	23.8	8.1
22	Sep 25 – Sep 30	-16.1	-19.6	8.4	-4.9
	Average	-26.6	-44.6	8.3	9.7

3.5.5 Available Storage

Increasing water delivery from 85 MGD to 100 MGD or 130 MGD for drinking water would require accounting for an additional average environmental loss of approximately 27 MG per week, or 3.9 MGD. Under the 1,000 cfs river flow level, allowable Mississippi River withdrawal is limited to 56 MGD. Under the 850 cfs level, allowable withdrawal is limited to 45 MGD, requiring approximately 55 to 85 MGD from storage or other supplemental sources depending on the target delivery rate. The 1988 Drought Report identifies approximately 500 MG of available storage in the lakes. As summarized in Table 20, this storage provides only short-term supply. At the 1,000 cfs river flow level, available storage is estimated to provide approximately 6.4 to 10 days of supply for the 130 MGD and 100 MGD scenarios, respectively. Under the more restrictive 850 cfs level, available

storage is estimated to provide approximately 5.6 to 8.5 days of supply. These results indicate that lake storage can provide a temporary buffer during low-flow conditions but is not sufficient to sustain prolonged drought conditions at increased demand levels.

Table 20 – Water Balance Calculations

Target	85 MGD	100 MGD	130 MGD
Evap/Precip/GW/Ruoff loss	4	4	4
Allowable @ 1000 cfs	56	56	56
Allowable @ 850 cfs	45	45	45
Needed @ 1000 cfs	33	48	78
Needed @ 850 cfs	44	59	89
Lake Storage (500 MG)	Supply Days	Supply Days	Supply Days
Days @ River 1000 cfs	15	10	6.4
Needed @ River 850 cfs	11	9	5.6

3.5.6 Environmental Considerations

In addition to water supply limitations, increased system withdrawals would increase the flow rates between the lakes. The natural stream pathways between the lakes will have a higher velocity which has the potential to increase shear stresses and may result in increased sediment transport or scour of finer grained materials. Secondary effects may include changes in the aquatic habitat as well as stream temperature, and water quality. Currently, there is not sufficient information to fully characterize these potential impacts; therefore, additional hydraulic and environmental analysis is recommended to evaluate potential impacts on the streams and lakes and support future regulatory review.

4 Approach 1 (Task 4) - SPRWS Expansion to Subsets of Communities

Approach 1 (Task 4) considers expansion of SPRWS service to various subsets of communities in the NE Metro. Each Alternative considers various combinations of communities, with several common infrastructure additions needed. For all scenarios, an expansion of the McCarrons WTP would be required, as noted in Section 2, along with construction trunk transmission main to supply the identified communities. Additional booster stations are required in various locations to maintain adequate supply pressure along the entire transmission mains.

4.1 Development of Concept System

Several design decisions and assumptions were made in developing the concept of bringing treated water from SPRWS' McCarrons WTP to the northeast metro to replace groundwater supplies. These are as follows:

- A transmission system would connect to SPRWS' High Service PZ at the McCarrons WTP pump station.
- Due to the minimal increases in MDD from 2050 to Ultimate conditions, a new surface WTP would be sized and constructed to immediately handle the Ultimate MDD rather than the 2050 MDD with future expansion. The WTP would include redundancy in key process units, appropriate for a large regional treatment system.
- Due to the wide elevation range in the transmission mains, Inline booster pumps stations would be placed and sized to maintain pressures along the transmission mains, and when possible, meet nearby community HGLs to reduce the overall number of BPS required in each alternative. Inline booster pump stations may have multiple discharge lines to meet variable HGLs of nearby connections.
- If the inline booster pump stations are unable to meet community HGLs without over pressurizing the transmission system, additional booster pump stations would be needed at individual community connections. Inversely, if inline booster pump stations increase HGLs greater than 20' above a community's HGL, pressure reduction stations would be required at the connection point.
- Booster pump stations would be sized to meet the Ultimate MDD. Daily demands derived from system diurnal patterns greater than the Ultimate MDD are assumed to be supplied by storage in each of the water systems which will continue to be utilized.
 - This assumption is based on North Oaks constructing water storage and a booster station, or having access to storage through a regionalized system.
- Pipelines designed using new pipe roughness C-Factors, with additional minor losses applied at complex mechanical locations such as pump stations and large vertical/horizontal offsets such as railroad crossings.
- All transmission mains would be designed with fully redundant parallel mains, each sized to meet the Ultimate Max Day Demands on their own. No phasing would be considered.
- Transmission mains & inline BPS are designed to meet the following performance criteria with only one of the two redundant mains in service, to ensure the system is redundant and able to operate under emergency conditions:
 - Pressures: 30 to 85 PSI
 - Velocity: Less than 5 ft/sec (Note: This design criteria is for full redundancy, or one transmission main operating under ultimate maximum day demands.)
 - Headloss: Less than 3 ft per 1000 ft of pipe
- Calculation of anticipated water age at each connection was calculated based on transmission main volumes and average day demands. In most cases, estimated water age was less than a day and the greatest calculated values were approximately 1 day.

4.2 Community Subset Alternatives

Table 21 summarizes the community subset alternatives evaluated for Approach 1 (Task 4).

Table 21 – Alternatives Summary

Community/Entity	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)	Ultimate Max Day Demand including Hugo East (MGD)
Alternative 1 – Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	16.3	20.3	42.2
Alternative 2 – Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	18.8	22.8	44.7
Alternative 3 – Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	20.6	24.6	46.5
Alternative 4 – Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	30.6	36.2	N/A
Alternative 5 – Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	9.50	11.7	N/A

4.2.1 Alternative 1

In this alternative, SPRWS service would be expanded to Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township. To supply both the 2050 and Ultimate demands necessary for this alternative, an additional clarifier and recarbonation/ozonation basin would be required, as identified in Section 2.4 (Table 9).

The water main required for this alternative consists of 4 branches totaling approximately 99,200 feet (18.8 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix B for cost estimates for the required transmission system infrastructure.

4.2.1.1 Backbone: SPRWS McCarrons WTP North to Edgerton/Koehler Junction

The route departs the SPRWS McCarrons WTP heading east 6,500 linear feet to Roselawn Avenue/Edgerton Street, running through an Urban/Dense Suburban corridor carrying the largest expected pipe diameters in the system, with an I-35E overpass crossing. From Roselawn Avenue the main continues north along Edgerton Street 13,400 linear feet to the Edgerton/County Road D intersection, crossing Hwy 61 via jack and bore and including a major crossing of County

Road D. The backbone concludes with a 6,300 linear foot segment continuing north from County Road D to the Edgerton/Koehler Road junction, requiring a jack and bore crossing of I-35E with large-diameter pipes on both sides of the roadway and running in close proximity to Gervais Lake. The total length of the backbone for Alternative 1 is approximately 26,200 feet (5.0 miles).

4.2.1.2 Branch 1: East Spine — Edgerton/Koehler to Vadnais Heights Junction

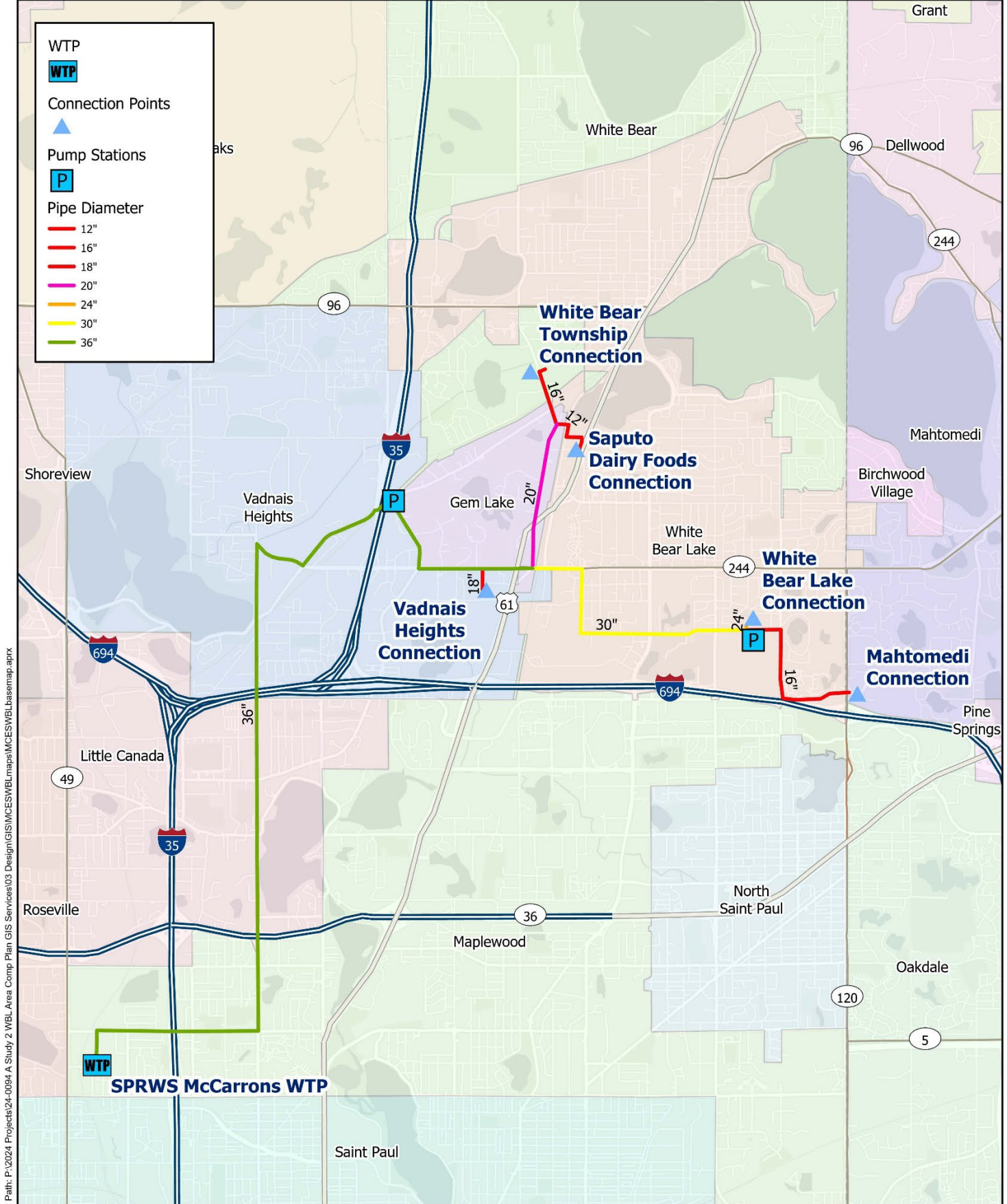
From the Edgerton/Koehler junction the route runs east 2,900 linear feet along Koehler Road to the McMenemy Street/Koehler Road junction, then continues east 5,100 linear feet to Centerville Street, then northeast 4,500 linear feet to Goose Lake/Labore Road — this segment crosses over I-35E and terminates at a pump station, with large-diameter parallel mains expected. The main then turns southeast 3,100 linear feet along Labore Road to County Road E, including one railroad crossing. Continuing east 3,300 linear feet to International Drive, the route passes through a Dense Suburban/Urban corridor and includes an 800 linear foot spur south on International Drive to the Vadnais Heights tower connection. The spine concludes with a final 2,000 linear foot urban stretch to the key junction at County Road E and Scheuneman Road (US 61 Service Road), just west of a railroad crossing. The total length of Branch 1 for Alternative 1 is approximately 20,900 feet (4.0 miles).

4.2.1.3 Branch 2: East from Junction — White Bear Lake and Mahtomedi

From the junction at County Road E and Scheuneman Road, the main continues east 2,100 linear feet to Willow Avenue along the south side of County Road E, crossing one railroad overpass. The route then follows Willow Avenue — which begins as a cul-de-sac and transitions into Linden Avenue — 9,200 linear feet to the White Bear Lake connection at Orchard Lane, crossing the street twice along the way. From the White Bear Lake connection the main continues 1,400 linear feet to Orchard Lane/Bellaire Avenue, crossing Orchard Lane at the WBL South connection and passing two major road crossings at White Bear Avenue at approximately 2,600 linear feet and McKnight Road at approximately 5,300 linear feet, with a road curve at approximately 4,300 linear feet. The branch then continues 2,700 linear feet along Bellaire Avenue to a junction near I-694, where Bellaire curves without directly intersecting the highway, then a final 2,800 linear feet to the Mahtomedi connection at Long Lake Road/Hwy 120, crossing Hwy 120 to reach the connection point. The total length of Branch 2 for Alternative 1 is approximately 18,200 feet (3.5 miles).

4.2.1.4 Branch 3: North from Junction — White Bear Township and Saputo Dairy

Also departing the Scheuneman Road junction, the main heads north 2,000 linear feet to Hwy 36 through an Urban/Dense Suburban corridor, crossing Hwy 36 via jack and bore with large-diameter pipes on both sides of the roadway and running in close proximity to Gervais Lake. Continuing north 3,900 linear feet along Scheuneman Road to Otter Lake Road, the route then splits into two spurs: a 1,700 linear foot spur to the Saputo Dairy Foods connection and a 2,500 linear foot spur to the WBT South connection, both requiring jack and bore railroad crossings. From the WBT South connection the main continues 5,200 linear feet north to Whitaker Street/Lincoln Avenue, then 4,900 linear feet through a Dense Suburban corridor to 4th Street/Bloom Avenue, crossing Hwy 96E via jack and bore. The route continues 2,400 linear feet to 8th Street/Long Avenue, then a final 11,300 linear foot suburban stretch North to the WBT North connection. The total length of Branch 3 for Alternative 1 is approximately 33,900 feet (6.4 miles).



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	0 0.6 1.2 Miles	Project: MCES0 190048 Print Date: 6/12/2026 Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 1
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4.2.2 Alternative 1a (Hugo East)

Alternative 1a communities from Alternative 1, with the addition of Hugo East.

To supply both the 2050 and Ultimate demands necessary for this Alternative, an additional two clarifiers and two recarbonation/ozonation basins would be required.

The water main consists of 5 branches totaling approximately 107,900 feet (20.4 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is needed to boost pressure at the Hugo East connection. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–3: Identical to Alternative 1 above.

4.2.2.1 Branch 4: Hugo East Extension

From the WBT North connection, the main continues 2,800 linear feet north to Hugo East Road/North County Line Road E, crossing a railroad via jack and bore. The route then continues 5,900 linear feet to the Hugo East connection. The total length of Branch 4 for Alternative 1a is approximately 8,700 feet (1.6 miles).

4.2.3 Alternative 2

In this Alternative, SPRWS service would be expanded to Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. To supply both the 2050 and Ultimate demands necessary for this Alternative, an additional clarifier and recarbonation/ozonation basin would be required, as identified in Section 2.4 (Table 9).

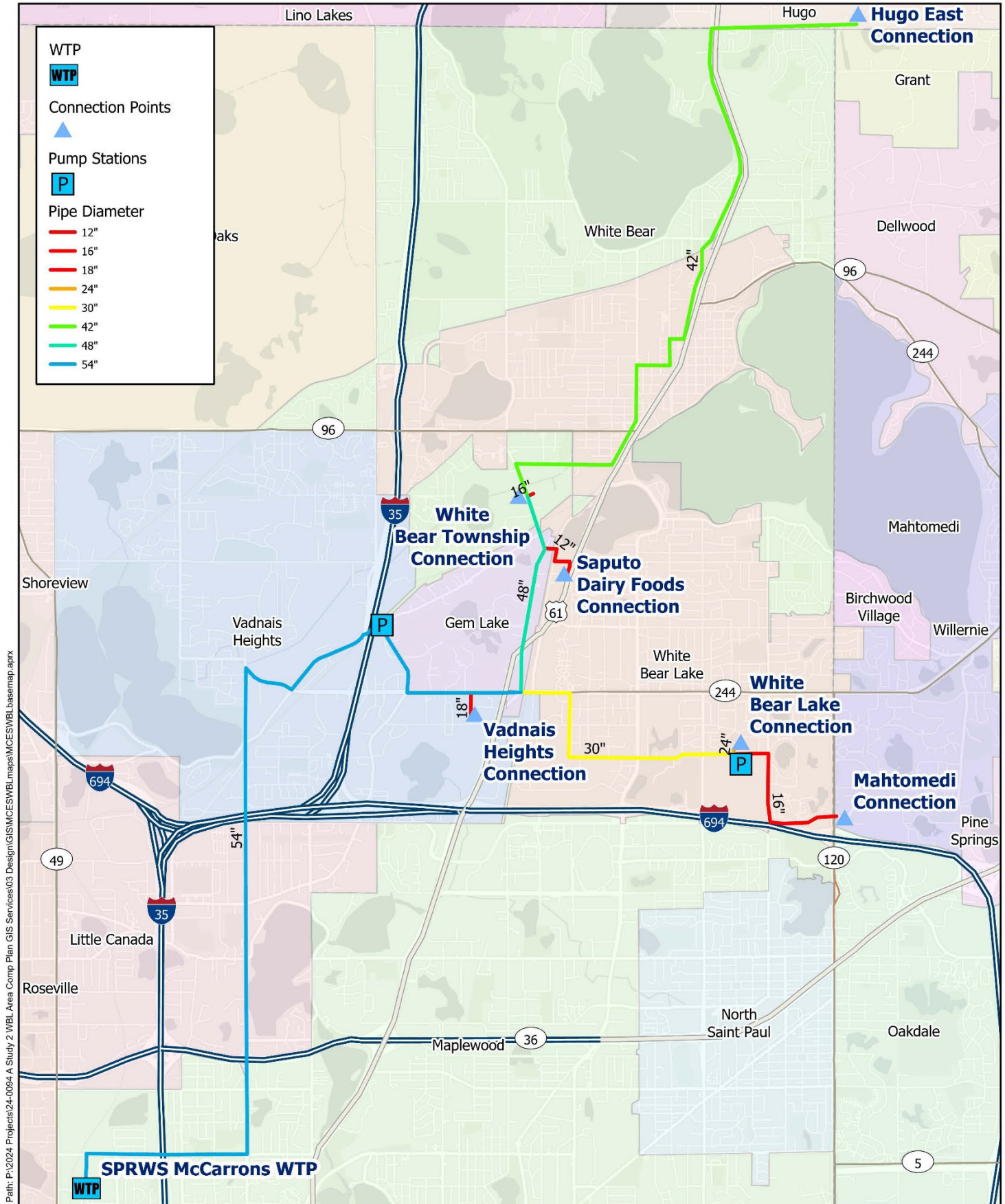
Alternative 2 includes all routes from Alternative 1, with one additional branch serving North St. Paul. The water main consists of 5 branches totaling approximately 106,900 feet (20.2 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods as well as the connection to Mahtomedi. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–3: Identical to Alternative 1 above.

4.2.3.1 Branch 4: South from Bellaire Junction — North St. Paul

From the Bellaire Avenue junction near I-694 — a mid-point along the Mahtomedi route — the main heads south 6,400 linear feet along Bellaire Avenue to the intersection of Helen Street N/14th Avenue E. This segment crosses I-694, passes under major power lines, and crosses the major intersection at 17th Avenue E. The route then continues 1,300 linear feet to 14th Avenue E/2nd Street N, crossing to the south side of 14th Avenue E to reach the North St. Paul connection. The total length of Branch 4 for Alternative 2 is approximately 7,700 feet (1.5 miles).

Figure 14– Approach 1 - Alternative 1 - Hugo East

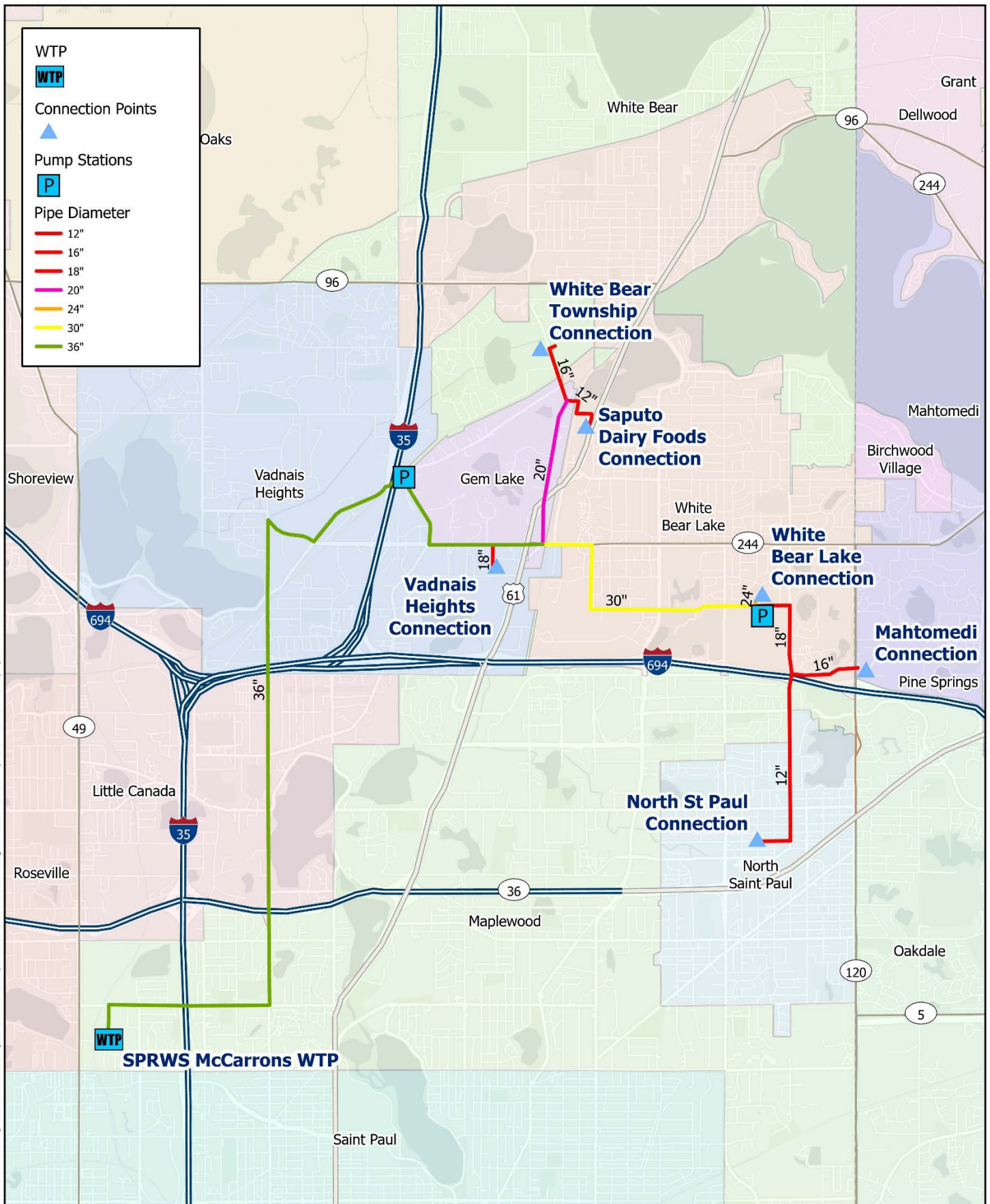


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	 0 0.6 1.2 Miles	Project: MCES0 190048 Print Date: 6/12/2026	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 1 Hugo
		Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

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0 0.6 1.2 Miles

Project: MCES0 190048
Print Date: 6/12/2026

Map by: gcarleton
Projection: NAD 1983
UTM Zone 15N
Source: Metropolitan Council,
MN DOT, & SEH Inc.

New Surface Water Treatment Plant to Supply Subset of Communities

White Bear Lake Area Comp Plan Study 2

Approach 1
Alternative 2

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4.2.4 Alternative 2a (Hugo East)

Alternative 2a includes all communities from Alternative 2, along with the addition of Hugo East.

To supply both the 2050 and Ultimate demands necessary for this Alternative, an additional two clarifiers and two recarbonation/ozonation basins would be required, as identified in Section 2.4 (Table 9). Alternative 2a includes all routes from Alternative 2, with one additional branch extending north to Hugo East. The water main consists of 6 branches totaling approximately 115,600 feet (21.9 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is needed to boost pressure at the Hugo East connection. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods as well as the connection to Mahtomedi. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–4: Identical to Task 4 Alternative 2 above.

4.2.4.1 Branch 5: Hugo East Extension

Identical to Alternative 1a Branch 4 above. The total length of Branch 5 for Alternative 2a is approximately 8,700 feet (1.6 miles).

4.2.5 Alternative 3

In this alternative, SPRWS service would be expanded to Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. To supply the demands necessary for this alternative, an additional clarifier and recarbonation/ozonation basin would be required to meet 2050 demands, with a second additional clarifier needed for ultimate demands, as identified in Section 2.4 (Table 9).

Alternative 3 includes all routes from Alternative 1, with one additional branch serving North Oaks. The water main consists of 6 branches totaling approximately 118,600 feet (22.5 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. An additional inline booster pump station (located near intersection of Highway 96 E and McMenemy Street in Vadnais Heights near North Oaks border) is needed to maintain pressure in the downstream transmission main serving North Oaks. A booster pump station is also needed at the connection to North Oaks. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–3: Identical to Alternative 1 above.

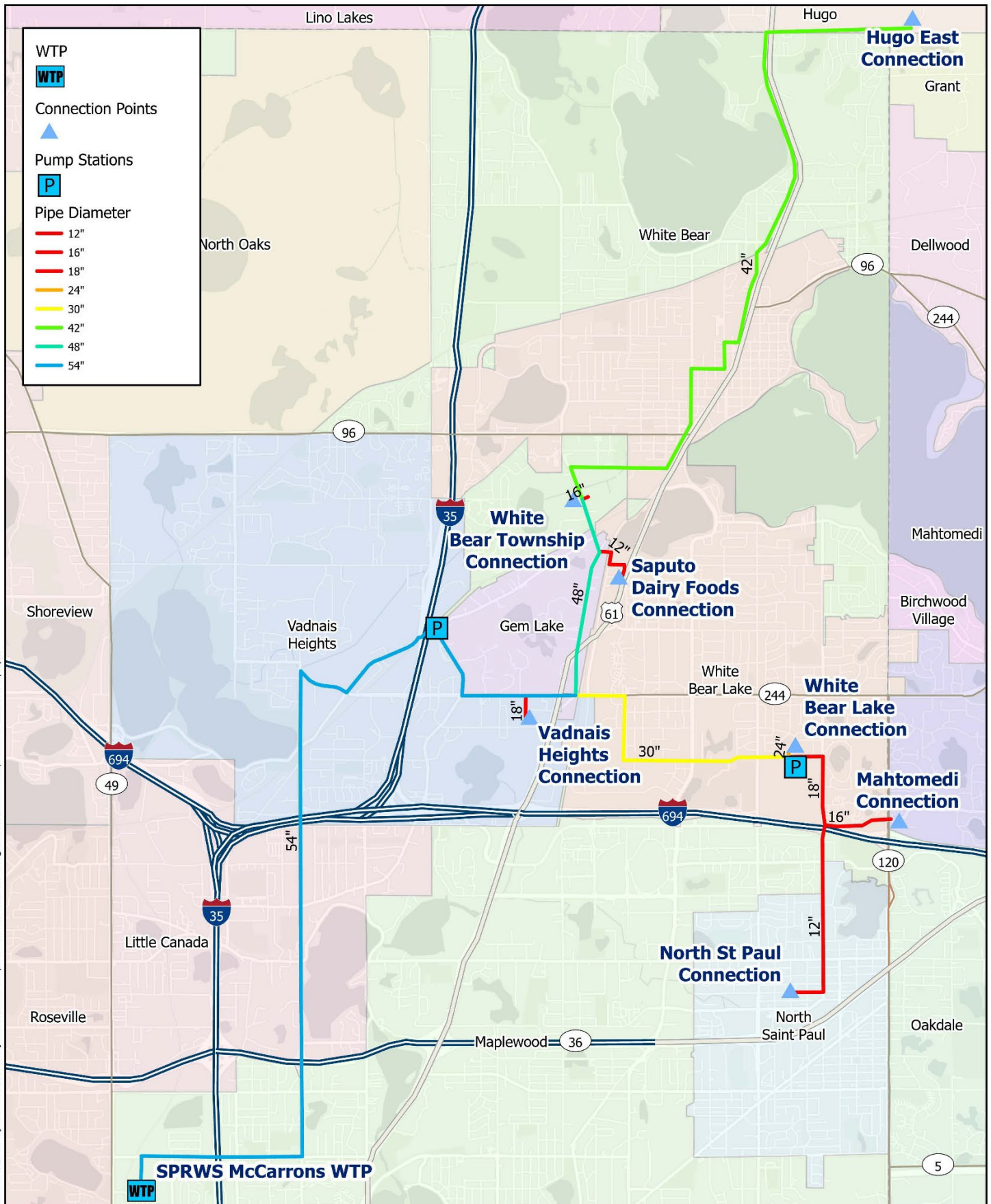
4.2.5.1 Branch 4: McMenemy Street North — to Hwy 96/McMenemy Street

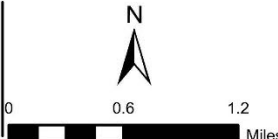
From the McMenemy/Koehler junction the main heads north along McMenemy Street 8,400 linear feet to the Hwy 96/McMenemy Street intersection, crossing one railroad along the way. This segment provides the backbone from which the North Oaks spur branches east. The total length of Branch 4 for Alternative 3 is approximately 8,400 feet (1.6 miles).

4.2.5.2 Branch 5: North Oaks Spur

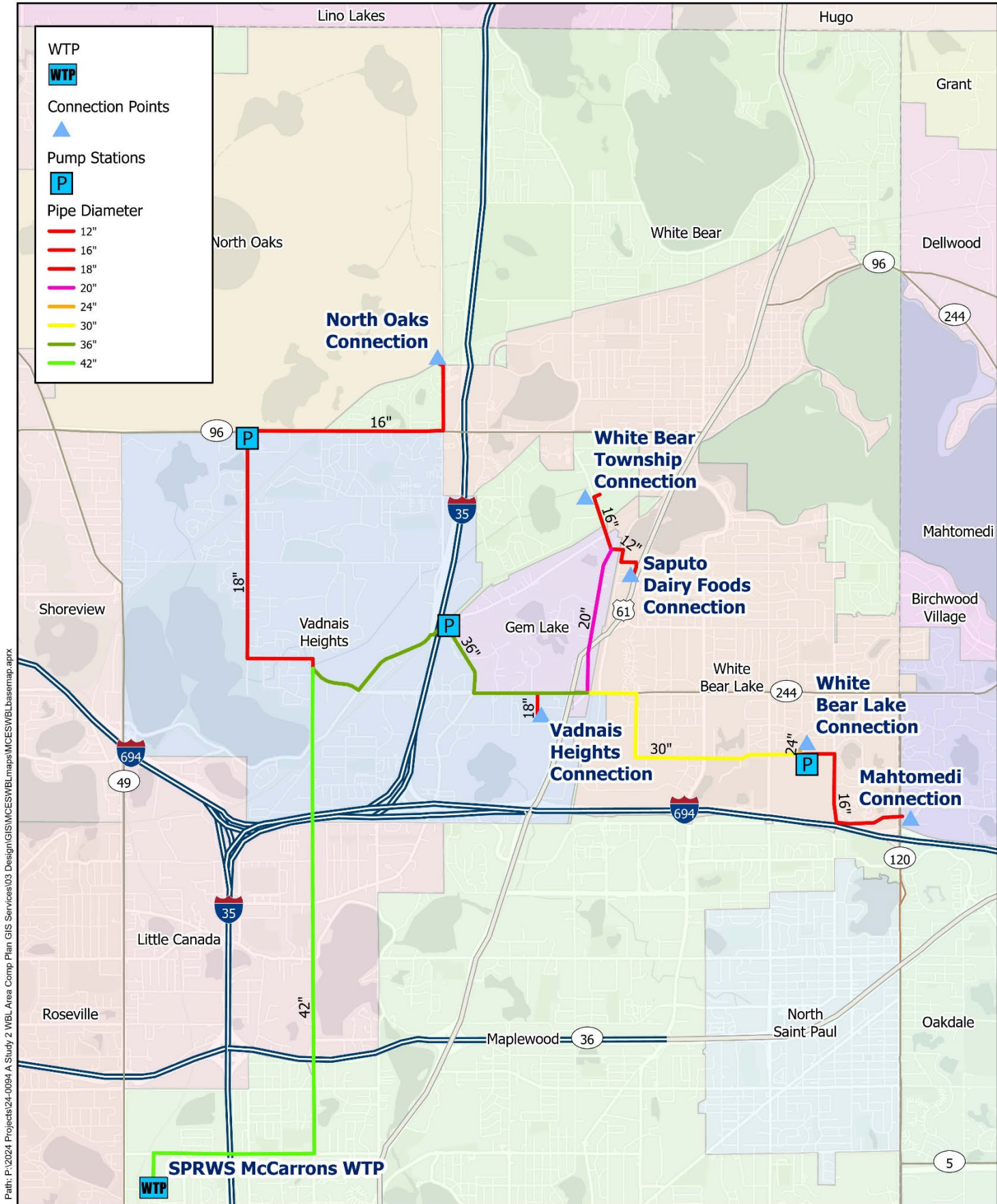
From the Hwy 96/McMenemy Street intersection the main continues east 8,000 linear feet along Hwy 96 to Centerville Road, including one railroad crossing and one Hwy 96 road crossing. Note: the routing documents suggest consideration of running northeast along the railroad (Robb Farm Road) to avoid the second railroad crossing. From Hwy 96/Centerville Road the route continues north 3,000 linear feet to the North Oaks connection, classified as Dense Suburban/potentially Urban, with one additional railroad crossing. The total length of Branch 5 for Alternative 3 is approximately 11,000 feet (2.1 miles).

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		Project: MCES0 190048 Print Date: 6/12/2026	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 2 Hugo
		Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

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	0 0.6 1.2 Miles	Project: MCES0 190048 Print Date: 6/12/2026 Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 3
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4.2.6 Alternative 3a (Hugo East)

Alternative 3a includes all communities from Alternative 3, along with the addition of Hugo East.

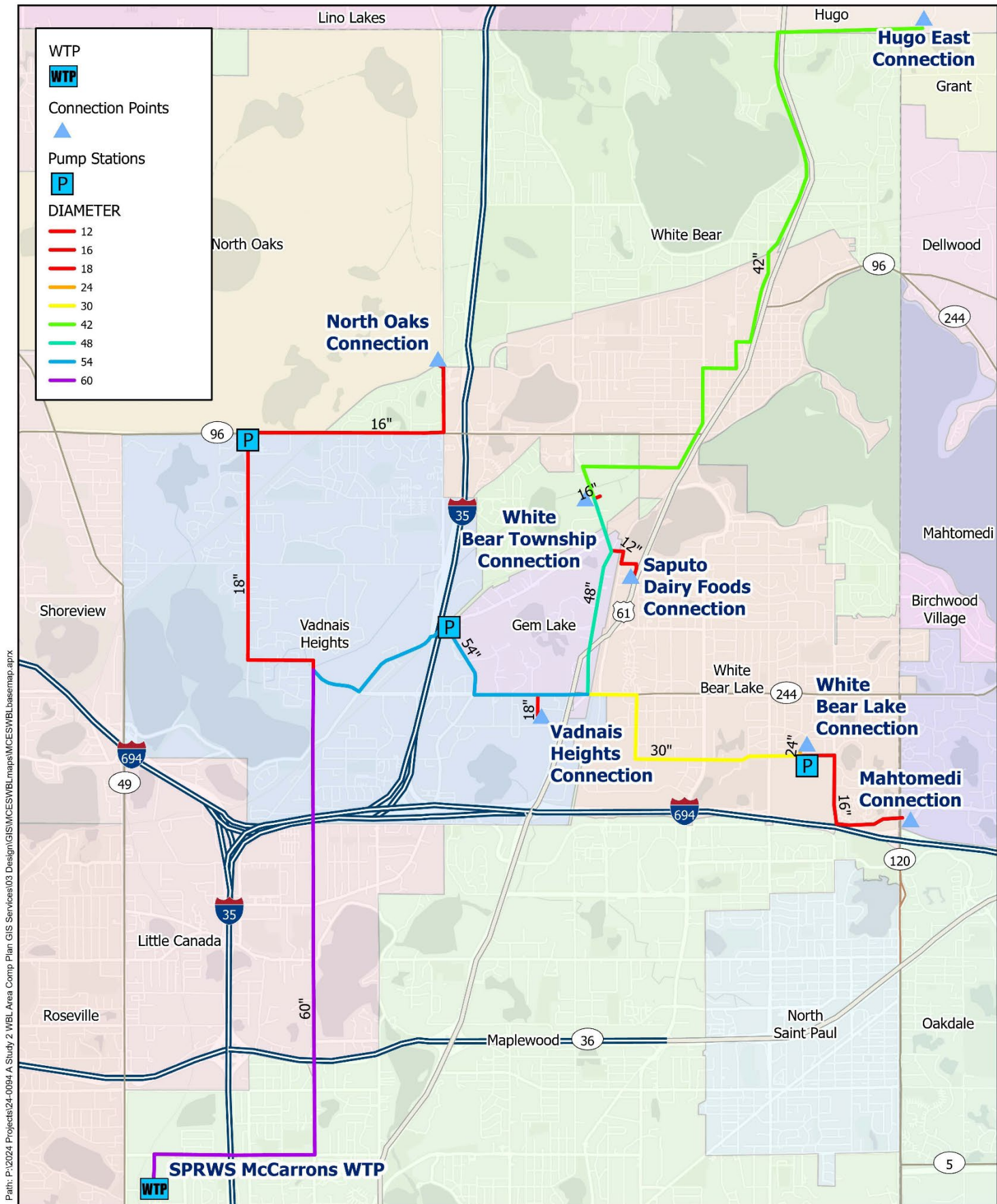
To supply both the 2050 and Ultimate demands necessary for this Alternative, an additional two clarifiers and two recarbonation/ozonation basins would be required, as identified in Section 2.4 (Table 9).

Alternative 3a includes all routes from Alternative 3, with one additional branch extending north to Hugo East. The water main consists of 7 branches totaling approximately 127,300 feet (24.1 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. An additional inline booster pump station (located near intersection of Highway 96 E and McMenemy Street in Vadnais Heights near North Oaks border) is needed to maintain pressure in the downstream transmission main serving North Oaks. A booster pump station is also needed at the connection to North Oaks and Hugo East. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–5: Identical to Alternative 3 above.

4.2.6.1 Branch 6: Hugo East Extension

Identical to Alternative 1a Branch 4 above. The total length of Branch 6 for Alternative 3a is approximately 8,700 feet (1.6 miles).



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		Project: MCES0 190048 Print Date: 6/12/2026 Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 3 Hugo
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4.2.7 Alternative 4

In this Alternative, SPRWS service would be expanded to Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, North Oaks, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. To meet 2050 and ultimate demands, two clarifier and one recarbonation/ozonation basin would be required, as identified in Section 2.4 (Table 9).

Alternative 4 includes all routes from Alternative 1, with three additional branches serving North St. Paul, North Oaks, and Shoreview. The water main consists of 8 branches totaling approximately 131,500 feet (24.9 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi and North Saint Paul. An additional inline booster pump station (located near intersection of Highway 96 E and McMenemy Street in Vadnais Heights near North Oaks border) is needed to maintain pressure in the downstream transmission mains serving both Shoreview and North Oaks. Booster pump stations are needed at the connection to Shoreview and North Oaks. In addition, a PRV to reduce pressure is needed at the connections to Saputo Dairy Foods and Mahtomedi. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone, Branches 1–3: Identical to Alternative 1 above.

4.2.7.1 Branch 4: McMenemy Street North — to Hwy 96/McMenemy Street

From the McMenemy/Koehler junction the main heads north along McMenemy Street 8,400 linear feet to the Hwy 96/McMenemy Street intersection, crossing one railroad along the way. This segment provides the backbone from which the North Oaks spur branches east. The total length of Branch 4 for Alternative 4 is approximately 8,400 feet (1.6 miles).

4.2.7.2 Branch 5: South from Bellaire Junction — North St. Paul

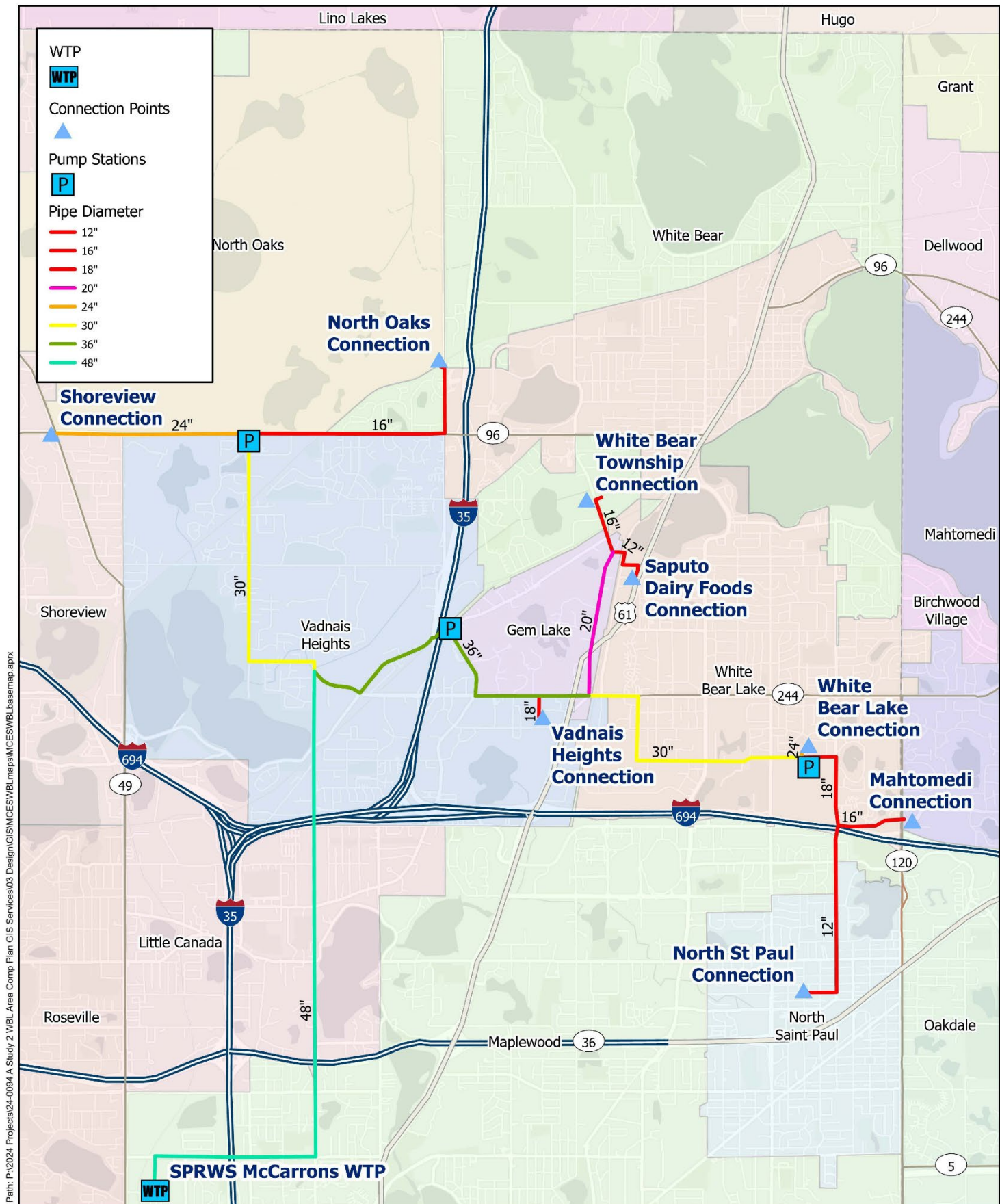
From the Bellaire Avenue junction near I-694, the main heads south 6,400 linear feet along Bellaire Avenue to Helen Street N/14th Avenue E, crossing I-694, passing under major power lines, and crossing the major intersection at 17th Avenue E. The route then continues 1,300 linear feet to 14th Avenue E/2nd Street N to reach the North St. Paul connection. The total length of Branch 5 for Alternative 4 is approximately 7,700 feet (1.5 miles).

4.2.7.3 Branch 6: North Oaks Spur

From the Hwy 96/McMenemy Street intersection the main continues east 8,000 linear feet along Hwy 96 to Centerville Road, including one railroad crossing and one Hwy 96 road crossing, then north 3,000 linear feet to the North Oaks connection with one additional railroad crossing. Note: the routing documents suggest consideration of running northeast along the railroad (Robb Farm Road) to avoid the second railroad crossing. The total length of Branch 6 for Alternative 4 is approximately 11,000 feet (2.1 miles).

4.2.7.4 Branch 7: Shoreview Spur

From the Hwy 96/McMenemy Street intersection, the main heads west 5,200 linear feet along Hwy 96 to the Shoreview connection at Hwy 96/Rice Street, classified as Suburban (lite). This segment includes a potential horizontal directional drill (HDD) crossing in the vicinity of Pleasant Lake and the Sucker Lake intake area. The total length of Branch 7 for Alternative 4 is approximately 5,200 feet (1.0 miles).



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	 0 0.6 1.2 Miles	Project: MCES0 190048 Print Date: 6/12/2026	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 4
		Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

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4.2.8 Alternative 5

In this Alternative, SPRWS service would be expanded to Saputo Dairy Foods, White Bear Lake, and White Bear Township. In addition, up to 3 MGD of treated wastewater would be injected into the aquifer to support increasing groundwater levels. To supply both the 2050 and Ultimate demands necessary for this Alternative, an additional clarifier and recarbonation/ozonation basin would be required, as identified in Section 2.4 (Table 9).

Alternative 5 uses a reduced subset of the network, serving only White Bear Lake, White Bear Township (north and south systems), and Saputo Dairy Foods. Vadnais Heights and Mahtomedi are not served, and the east spine through the Vadnais Heights corridor is not required. The aquifer injection component of up to 3 MGD treated wastewater is a separate element not reflected in the transmission main routing. The water main consists of 3 branches totaling approximately 88,700 feet (16.8 miles).

To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. A booster pump station is needed at the connection to White Bear Lake. In addition, a PRV to reduce pressure is needed at the connections to Saputo Dairy Foods. See below and Appendix B for cost estimates for the required transmission system infrastructure.

Backbone: Identical to Alternative 1 above.

4.2.8.1 Branch 1: East — White Bear Lake

From the Edgerton/Koehler junction the route runs east 2,200 linear feet along Koehler Road directly to the Koehler/Centerville Street junction, then continues northeast 4,500 linear feet to Goose Lake/Labore Road, southeast 3,100 linear feet along Labore Road to County Road E, and east 3,300 linear feet to the Scheuneman Road junction. From the Scheuneman Road junction the main continues east following the same routing as Branch 2 above through White Bear Lake, terminating at the Bellaire Avenue junction near I-694 without continuing to Mahtomedi. The total length of Branch 1 for Alternative 5 is approximately 28,600 feet (5.4 miles).

4.2.8.2 Branch 2: North from Junction — White Bear Township and Saputo Dairy

Identical to Alternative 1 Branch 3 above. The total length of Branch 2 for Alternative 5 is approximately 33,900 feet (6.4 miles).

This alternative includes the injection of up to 3 MGD of treated wastewater into the aquifer to increase groundwater recharge. *Study No. 6 – Wastewater Reuse for Aquifer Injection or Direct Lake Augmentation (SEH, 2026)* provides a comprehensive study of treatment requirements and siting, along with capital and operating cost estimates. The study noted wastewater reuse for aquifer injection would have a modest beneficial effect on White Bear Lake water levels, but requires a treatment process with very high capital and O&M costs, and significant regulatory challenges. The study identified a potential wastewater reuse facility on the west side of White Bear Lake, which would include an effluent diversion structure, low lift pumping, raw and waste equalization tanks, wastewater treatment and advanced RO treatment, ground storage, aquifer injection watermain, and injection wells. The previous study provided conceptual level capital and O&M costs for 2 MGD and 3.8 MGD aquifer injection scenarios. Costs were estimated for the 3 MGD required for this Alternative 5 as shown below.

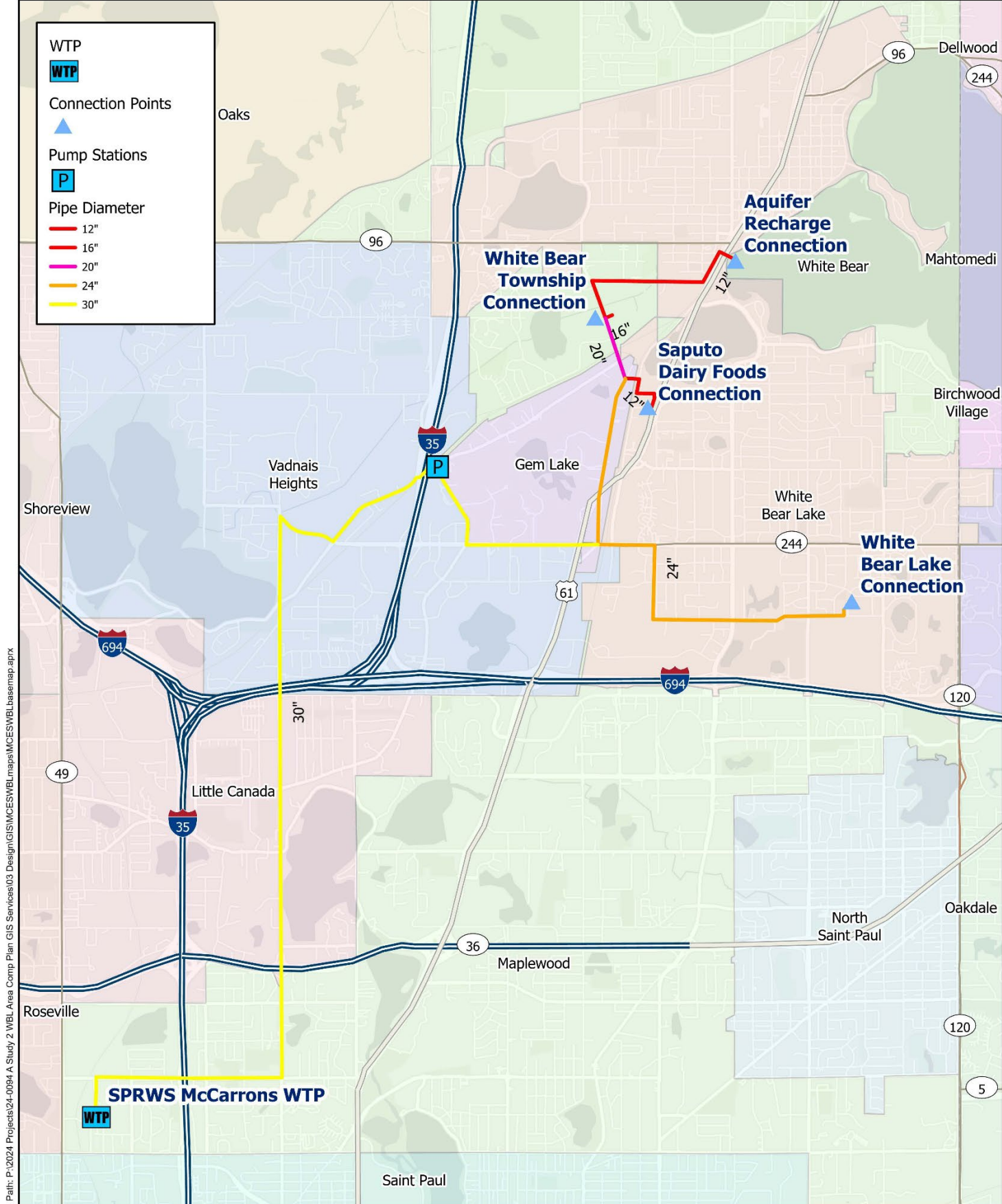
Table 22 – Wastewater Treatment and Aquifer Injection Costs

Capacity (MGD)	Construction Costs	Construction Contingency	Easement and Land Acquisition	Pilot Testing	Engineering	Construction Administration	Total Cost	Annual O&M
3	\$149,000,000	\$59,600,000	\$2,000,000	\$3,000,000	\$31,300,000	\$31,300,000	\$276,200,000	\$1,960,000

Table Notes:

1) Costs proportioned from Study No. 6 – Wastewater Reuse for Aquifer Injection or Direct Lake Augmentation, SEH, 2026

2) Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.



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	N 0 0.5 1 Miles	Project: MCES0 190048 Print Date: 6/12/2026 Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 1 Alternative 5
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4.3 Cost Summary - Alternatives 1-5

Table 23 provides a cost summary of each of the Alternatives, provided with phased 2050 Scenario and Ultimate costs. These represent project cost estimates that include contingencies, engineering, administration, and legal costs along with construction costs. Detailed cost methodology is provided in Appendix A, along with detailed cost tables in Appendix B and E.

Table 23 – Approach 1 (Task 4) Alternatives 1-5 Capital Cost Summary

Community/Entity	2050 Scenario Capital Cost	Ultimate Capital Cost	Total
Alternative 1			
Transmission Main & Pumping	\$ 251,100,000	No Change	\$ 251,100,000
SPRWS Expansion	\$ 46,420,000	No Change	\$ 46,420,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 448,355,000	No Change	\$ 448,355,000
Alternative 2			
Transmission Main & Pumping	\$ 260,400,000	No Change	\$ 260,400,000
SPRWS Expansion	\$ 46,420,000	No Change	\$ 46,420,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 457,655,000	No Change	\$ 457,655,000
Alternative 3			
Transmission Main & Pumping	\$ 319,200,000	No Change	\$ 319,200,000
SPRWS Expansion	\$ 46,420,000	\$ 21,830,000	\$ 68,250,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 516,455,000	\$ 21,830,000	\$ 538,285,000
Alternative 4			
Transmission Main & Pumping	\$ 364,800,000	No Change	\$ 364,800,000
SPRWS Expansion	\$ 68,250,000	No Change	\$ 68,250,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 583,885,000	No Change	\$ 583,885,000
Alternative 5			
Transmission Main & Pumping	\$ 221,600,000	No Change	\$ 221,600,000
SPRWS Expansion	\$ 46,420,000	No Change	\$ 46,420,000
Wastewater Treatment & Aquifer Injection	\$ 276,200,000	No Change	\$ 276,200,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 695,055,000	No Change	\$ 695,055,000

Community/Entity	2050 Scenario Capital Cost	Ultimate Capital Cost	Total
Alternative 1 (Hugo East)			
Transmission Main & Pumping	\$ 486,100,000	No Change	\$ 486,100,000
SPRWS Expansion	N/A	\$ 92,840,000	\$ 92,840,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 642,765,000	\$ 92,840,000	\$ 735,605,000
Alternative 2 (Hugo East)			
Transmission Main & Pumping	\$ 497,200,000	No Change	\$ 497,200,000
SPRWS Expansion	N/A	\$ 92,840,000	\$ 92,840,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 653,865,000	\$ 92,840,000	\$ 746,705,000
Alternative 3 (Hugo East)			
Transmission Main & Pumping	\$ 560,100,000	No Change	\$ 560,100,000
SPRWS Expansion	N/A	\$ 92,840,000	\$ 92,840,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 716,765,000	\$ 92,840,000	\$ 809,605,000
Note: Costs include a new additional PS along with Fridley PS due to lower capital costs.			

4.4 Operation and Maintenance Costs - Alternatives 1-5

4.4.1 Annual Costs

Table 24 provides a summary of the annual operations & maintenance costs for each of the Alternatives. These costs include a combination of raw and final distribution pumping along with additional treatment costs at the McCarrons WTP. Detailed cost methodology is provided in Appendix A, along with detailed cost table in Appendix E.

Table 24 – Approach 1 (Task 4) Alternatives Annual O&M Cost Summary

Community/Entity	Total Annual O&M Cost
Alternative 1	\$7,325,400
Alternative 2	\$8,381,000
Alternative 3	\$8,845,100
Alternative 4	\$12,665,700
Alternative 5	\$4,687,700
Alternative 1 (Hugo East)	\$13,265,300
Alternative 2 (Hugo East)	\$13,421,000
Alternative 3 (Hugo East)	\$14,227,200
Notes:	
1) Costs assume new Fridley Pump Station	
2) All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.	

4.5 Advantages and Disadvantages - Alternatives 1-5

Table 25 summarizes the advantages and disadvantages of Alternatives 1 through 5 under Approach 1 (SPRWS Expansion), along with the Hugo East sub-alternatives (1a, 2a, and 3a) that extend service to the eastern Hugo growth area. Capital and O&M costs increase as communities are added, reflecting longer transmission mains and added pumping and treatment capacity. Alternatives that include North Oaks (3, 4, and 3a) serve a community nearer the Vadnais chain of lakes, which may provide a more direct benefit to lake levels.

Table 25 – Approach 1 (Task 4) Alternatives 1-5 Advantages and Disadvantages

Alternative	Communities Served	Capital Cost	Annual O&M	Watermain Length	Advantages	Disadvantages
1	Mahtomedi, Saputo, White Bear Lake, Vadnais Heights, White Bear Twp (5)	\$448.3M	\$7.3M	40 mi	Lowest cost; simplest to build and govern	Serves fewest communities (5 of 9)
2	Alt 1 + North St. Paul (6)	\$457.6M	\$8.3M	44 mi	Adds North St. Paul at low added cost	Excludes North Oaks, Shoreview, Hugo
3	Alt 1 + North Oaks (6)	\$538.2M	\$8.8M	57 mi	Serves North Oaks, nearest the lakes	~20% costlier than Alt 1
4	Alt 1 + North Oaks, North St. Paul, Shoreview (8)	\$583.8M	\$12.6M	60 mi	Broadest coverage; greatest lake benefit	Highest cost and O&M of base alternatives

Alternative	Communities Served	Capital Cost	Annual O&M	Watermain Length	Advantages	Disadvantages
5	Saputo, White Bear Lake, White Bear Twp + aquifer injection (3)	\$695.0M	\$4.6M	40 mi	Lowest O&M; recharges aquifer directly	Highest base capital; serves only 3 directly
1a (Hugo East)	Alt 1 + Hugo East (6)	\$735.6M	\$13.2M	57 mi	Extends Alt 1 to Hugo growth area	Higher cost; longer mains than Alt 1
2a (Hugo East)	Alt 2 + Hugo East (7)	\$746.7M	\$13.4M	61 mi	Extends Alt 2 to Hugo growth area	Higher cost; longer mains than Alt 2
3a (Hugo East)	Alt 3 + Hugo East (7)	\$809.6M	\$14.2M	70 mi	Extends Alt 3 to Hugo growth area	Highest cost; longest mains

5 Approach 2 (Task 5) - New Surface Water Treatment Plant

The second approach to providing treated surface drinking water for the northeast metro communities involves the development of a new surface water treatment plant in lieu of receiving treated surface water from the SPRWS. The regional surface water treatment plant would provide wholesale water service by treating raw water from the Vadnais chain of lakes, utilizing the SPRWS raw water supply infrastructure. Previous studies have determined that attempting to treat raw water from the Saint Croix River would require extensive lengths of forcemain and pumping equipment, along with expected difficulties with permitting a pump station on a protected riverway.

A new surface WTP is expected to utilize solids contact clarifiers for surface water treatment and lime softening similar to the new SPRWS McCarrons Plant upgrades. Carbon dioxide is utilized for recarbonation, along with fluoridation and chloramination for the distribution system.

All of the identified Alternatives in this study would include the same treatment plant processes, locations, and features. The primary difference between the alternatives would be plant treatment and pumping capacity, along with varying trunk main sizes and alignment.

5.1 New Surface Water Treatment Plant Location

One primary location was identified as a possible site for a new WTP. This wooded site is on the east side of Vadnais Lake and owned by SPRWS. This location is located near the northeast metro communities and reduces the quantity of raw and finished transmission mains required. Treating water from Vadnais Lake also takes advantage of the entire chain of lakes which act as sedimentation basins. This provides a better and known raw water quality compared to directly off the Mississippi River or St. Croix River, resulting in easier treatment and lower operating costs. The location would be suitable and identical for all the Alternatives studied.

5.2 New Surface Water Treatment Plant Regulatory Requirements

A new surface WTP would need to be designed and adhere to the United States Environmental Protection Agency's Surface Water Treatment Rules (SWTRs) including the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR). This rule builds upon earlier rules to reduce illnesses associated with *Cryptosporidium* and other microbial pathogens often found in water. The key provisions of this rule include source water monitoring to characterize *Cryptosporidium* to determine whether additional treatment requirements beyond the normal log removal requirements for filtered systems.

5.3 Development of Concept System

Several design decisions and assumptions were made in developing the concept of bringing treated water from a new surface WTP to the northeast metro to replace groundwater supplies. These are as follows:

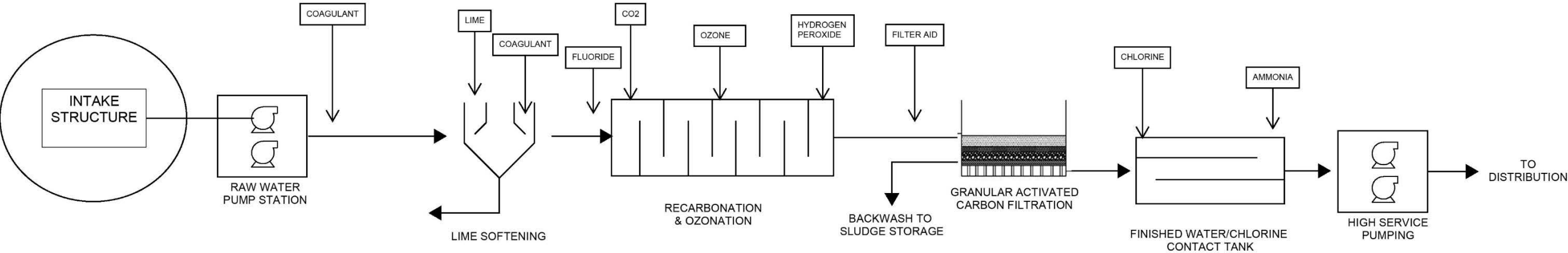
- A new surface WTP would be constructed at Vadnais Lake, on existing SPRWS property.
- With the same raw water supply, the new WTP would utilize a similar treatment process to the SPRWS McCarrons WTP.
- Due to the minimal increases in MDD from 2050 to Ultimate conditions, a new surface WTP would be sized and constructed to immediately handle the Ultimate MDD rather than the 2050 MDD with future expansion. The WTP would include redundancy in key process units, appropriate for a large regional treatment system.
- Due to the wide elevation range in the transmission mains, Inline booster pumps stations would be placed and sized to maintain pressures along the transmission mains, and when possible, meet nearby community HGLs to reduce the overall number of BPS required in each alternative. Inline booster pump stations may have multiple discharge lines to meet variable HGLs of nearby connections.
- If the inline booster pump stations are unable to meet community HGLs without over pressurizing the transmission system, additional booster pump stations would be needed at individual community connections. Inversely, if inline booster pump stations increase HGLs greater than 20' above a community's HGL, pressure reduction stations would be required at the connection point.
- Booster pump stations would be sized to meet the Ultimate MDD. Daily demands derived from system diurnal patterns greater than the Ultimate MDD are assumed to be supplied by storage in each of the water systems which will continue to be utilized.
 - This assumption is based on North Oaks constructing water storage and a booster station, or having access to storage through a regionalized system.
- Pipelines designed using new pipe roughness C-Factors, with additional minor losses applied at complex mechanical locations such as pump stations and large vertical/horizontal offsets such as railroad crossings.
- All transmission mains would be designed with fully redundant parallel mains, each sized to meet the Ultimate Max Day Demands on their own. No phasing would be considered.
- Transmission mains & inline BPS are designed to meet the following performance criteria with only one of the two redundant mains in service, to ensure the system is redundant and able to operate under emergency conditions:
 - Pressures: 30 to 85 PSI

- Velocity: Less than 5 ft/sec (Note: This design criteria is for full redundancy, or one transmission main operating under ultimate maximum day demands.)
- Headloss: Less than 3 ft per 1000 ft of pipe
- Booster Stations at connections to local systems are only needed at certain connections and are alternative dependent. Required booster stations have been identified and expected costs determined. Connections without booster stations are assumed to consist of above grade metering stations with pressure reducing valves as needed.
- Calculation of anticipated water age at each connection was calculated based on transmission main volumes and average day demands. In most cases, estimated water age was less than a day and the greatest calculated values were approximately 1 day.

5.4 Treatment Processes

A new regional surface WTP would consist of identical process treatments and water quality for each alternative, with variations only in plant design capacities and treatment train sizes. As the raw water supply would be identical to the SPRWS McCarrons WTP, it is assumed the new WTP would consist of lime softening with solids contact clarifiers, recarbonation and ozonation, filtration with biologically active carbon media, and disinfection. Ozonation would be utilized for taste and odor along with emerging contaminants, followed by primary disinfection with free chlorine and then ammonia addition for monochloramine residual. This disinfection method generally provides greater levels of disinfection and reduces the formation of regulated disinfection byproducts (DBP) through the removal of DBP precursors from oxidation and biologic filtration, combined with reduced free chlorination. Monochloramine provides a longer lasting residual suitable for large distribution systems with higher water age.

Figure 25 depicts an overall process flow diagram of the proposed treatment process applicable for all alternatives. All process units would include redundancy to provide a robust regional water system.



Regional WTP Process Flow Diagram

While lime softening is not required to meet regulatory requirements, it can also remove additional dissolved minerals and contaminants that conventional coagulation clarification cannot, such as dissolved silica and metals. Providing centralized softening to customers can also eliminate the need for individual home softening systems. This provides a significant environmental benefit by reducing salt usage and reducing chlorides discharged to the environment. Ozonation reduces the possibility of taste and odor issues and helps remove contaminants of emerging concern and other disinfection byproducts.

5.5 Treatment Plant Capacity and Sizing

As the 2050 MDD and Ultimate MDD for each alternative does not increase significantly, it is recommended that the proposed plants are sized for the Ultimate MDD rather than a phased approach. As the process includes large solids contact clarifiers, designing to the 2050 demand may result in excessive capacity to meet the Ultimate MDD.

As Alternatives 1, 2, and 3 have similar Ultimate MDDs, the new WTP proposed for these alternatives are assumed to be nearly identical for conceptual level site and layouts. In addition, Alternatives 1-3 with Hugo East are similar in capacity and assumed to be identical for the purpose of preliminary site layouts. Table 26 provides a summary of the proposed WTP capacities for the various scenarios. These capacities have been selected to meet the ultimate MDD for each of the various scenarios with major process redundancy included.

Table 26 – Proposed Regional SWTP Capacities

Scenario	Firm Capacity (MGD)
Alternative 1	21
Alternative 2	23
Alternative 3	25
Alternative 4	36
Alternative 5	12
Alternative 1 with Hugo East	43
Alternative 2 with Hugo East	45
Alternative 3 with Hugo East	47

In developing conceptual plant layouts, each of the regional SWTP scenarios includes key process units redundancies and assumes additional building footprint necessary for chemical rooms, administrative offices, laboratory, mechanical and electrical rooms, garage, storage, and a sludge processing building. It is assumed that the majority of equipment would be installed indoors, typical for treatment plants in the Midwest.

5.6 Regional Plant Operations

There is not currently an organizational structure to operate a new regional surface water treatment plant, which would be expected to require 10 to 12 full-time employees consisting of licensed water operators, maintenance technicians, and laboratory or water quality technicians. The WTP is anticipated to be owned and managed by a new regional water authority. Advantages to a new regional authority are centered around rate transparency, equity, and future

flexibility. A regional authority makes funding simpler, as White Bear Lake levels are a regional resource problem.

5.7 Community Subset Alternatives

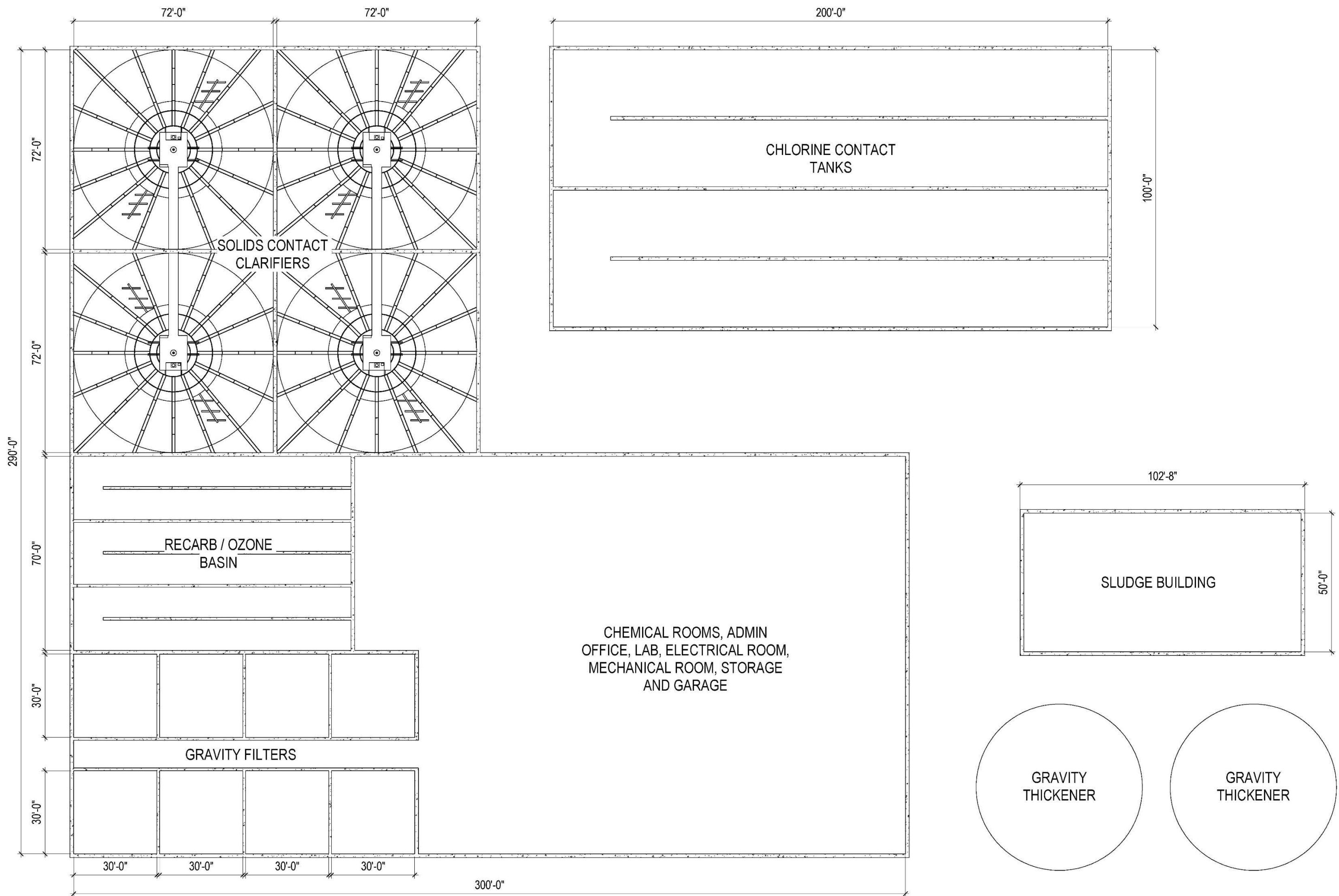
Table 27 (Repeat of previous table) summarizes the community subset alternatives evaluated for Approach 2 (Task 5).

Table 27 – Alternatives Summary

Community/Entity	2050 Max Day Demand (MGD)	Ultimate Max Day Demand (MGD)	Ultimate Max Day Demand including Hugo East (MGD)
Alternative 1 – Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	16.3	20.3	42.2
Alternative 2 – Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	18.8	22.8	44.7
Alternative 3 – Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	20.6	24.6	46.5
Alternative 4 – Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	30.6	36.2	N/A
Alternative 5 – Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	9.50	11.7	N/A

5.8 Alternative 1

The northeast communities connected to a new surface water treatment plant for Alternative 1 include Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township. The proposed surface WTP for Alternative 1 would be constructed with a firm capacity of 24 MGD, capable of handling the Ultimate MDD. Figure 26 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternative 2 and 3.



The trunk water main proposed as part of Alternative 1 is shown on Figure 27, which also includes the location of booster stations for each community.

The water main consists of 4 branches totaling approximately 71,000 feet (13.5 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix C for cost estimates for the required transmission system infrastructure.

5.8.1 Branch 1: WTP South — East Spine to Vadnais Heights Junction

The route departs the new Regional WTP heading south on McMenemy Street, covering 1,000 linear feet to Koehler Road. From there it turns east along Koehler Road for 5,100 linear feet to Centerville Street, then continues northeast 4,500 linear feet to Goose Lake/Labore Road — this segment crosses over I-35E and terminates at a pump station, with large-diameter parallel mains expected. The main then turns southeast 3,100 linear feet along Labore Road to County Road E, including one railroad crossing. Continuing east 3,300 linear feet to International Drive, the route passes through a Dense Suburban/Urban corridor and includes an 800-linear-foot spur south on International Drive to the Vadnais Heights tower connection. The spine concludes with a final 2,000 linear foot urban stretch to the key junction at County Road E and Scheuneman Road (US 61 Service Road), just west of a railroad crossing. The total length of Branch 1 for Alternative 1 is approximately 19,000 feet (3.6 miles).

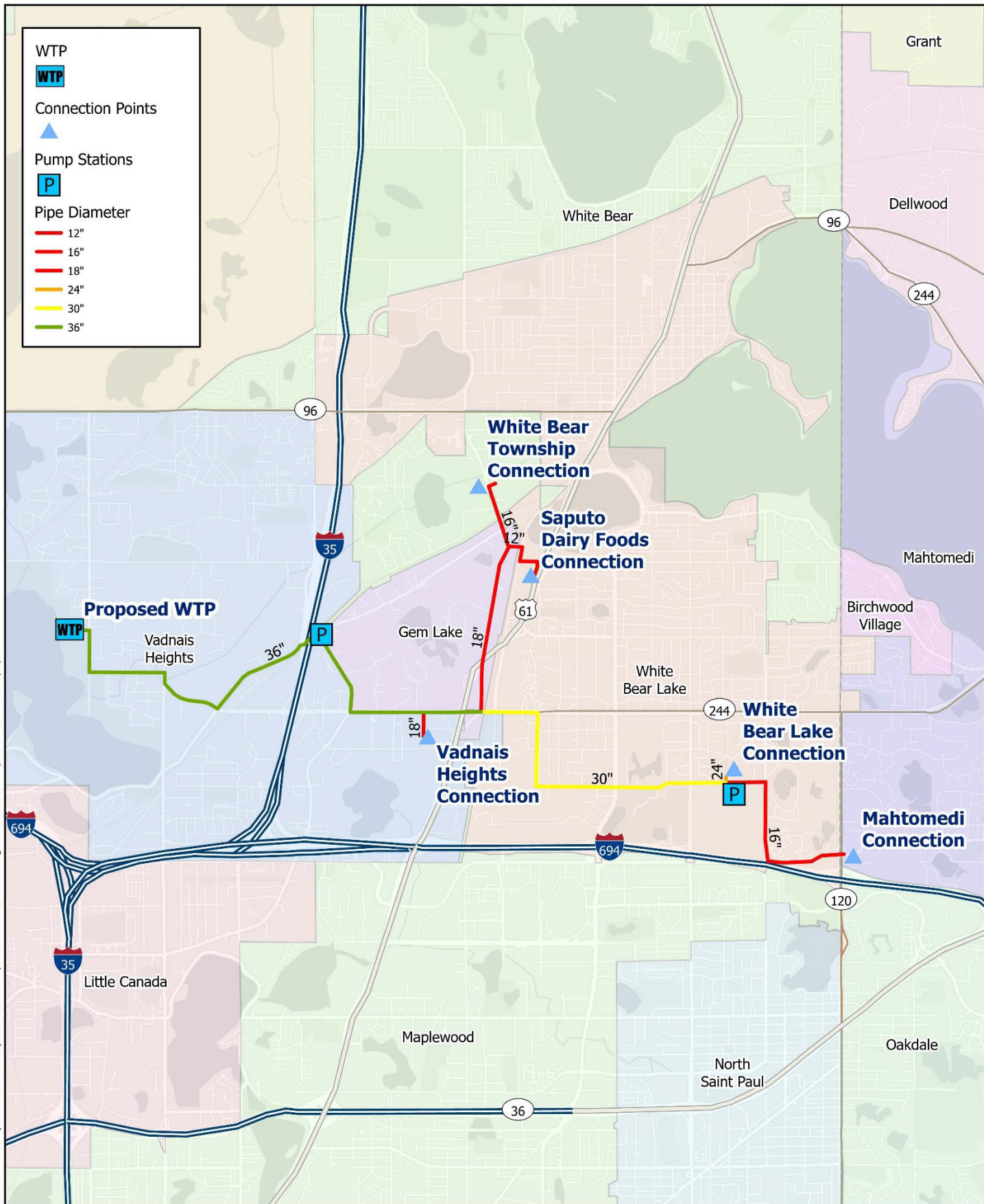
5.8.2 Branch 2: East from Junction — White Bear Lake and Mahtomedi

From the junction at County Road E and Scheuneman Road, the main continues east 2,100 linear feet to Willow Avenue along the south side of County Road E, crossing one railroad overpass. The route then follows Willow Avenue — which begins as a cul-de-sac and transitions into Linden Avenue — 2,650 linear feet to Orchard Lane. It continues 6,550 linear feet to the White Bear Lake connection on Orchard Lane, crossing White Bear Avenue at approximately 2,600 linear feet and McKnight Road at approximately 5,300 linear feet, with a road curve at approximately 4,300 linear feet. The branch then continues 1400 linear feet to Bellaire Avenue then runs along Bellaire Avenue for 2700 feet to a junction near I-694 (note: Bellaire curves and does not directly intersect I-694). From the junction the route continues 2,800 linear feet to the Mahtomedi connection at Long Lake Road/Hwy 120, crossing Hwy 120 to reach the connection point. The total length of Branch 2 for Alternative 1 is approximately 18,100 feet (3.4 miles).

5.8.3 Branch 3: North from Junction — White Bear Township and Saputo Dairy

Also departing the Scheuneman Road junction, the main heads north 2,000 linear feet to Hwy 36 through an Urban/Dense Suburban corridor, crossing Hwy 36 via jack and bore with large-diameter pipes on both sides of the roadway and running in close proximity to Gervais Lake. Continuing north 3,900 linear feet along Scheuneman Road to Otter Lake Road, the route then splits into two spurs: a 1,700 linear foot spur west to the Saputo Dairy Foods connection and a 2,500 linear foot spur to the WBT South connection, both requiring jack and bore railroad crossings. From the WBT South connection the main continues 5,200 linear feet north to Whitaker Street/Lincoln Avenue, then 4,900 linear feet through a Dense Suburban corridor to 4th Street/Bloom Avenue, crossing Hwy 96E via jack and bore. The route continues 2,400 linear feet to 8th Street/Long Avenue, then a final 11,300 linear foot suburban stretch north to the WBT North connection. The total length of Branch 3 for Alternative 1 is approximately 33,900 feet (6.4 miles).

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 SEH	 0 0.5 1 Miles	Project: MCES0 190048 Print Date: 6/12/2026	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Approach 2 Alternative 1
		Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

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5.9 Alternative 1a (Hugo East)

The proposed surface WTP for Alternative 1a would be constructed with a firm capacity of 42 MGD. Figure 28 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternatives 2a and 3a.

Alternative 1a includes all routes from Alternative 1, with one additional branch extending north to Hugo East. The water main consists of 5 branches totaling approximately 88,100 feet (16.7 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is needed to boost pressure at the Hugo East connection. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix C for cost estimates for the required transmission system infrastructure.

Branches 1–3: Identical to Alternative 1 above.

5.9.1 Branch 4: Hugo East Extension

From the WBT North connection, the main continues 2,800 linear feet north to Hugo East Road/North County Line Road E, crossing a railroad via jack and bore. The route then continues 5,900 linear feet to the Hugo East connection. The total length of Branch 5 for Alternative 1a is approximately 8,700 feet (1.6 miles).

5.10 Alternative 2

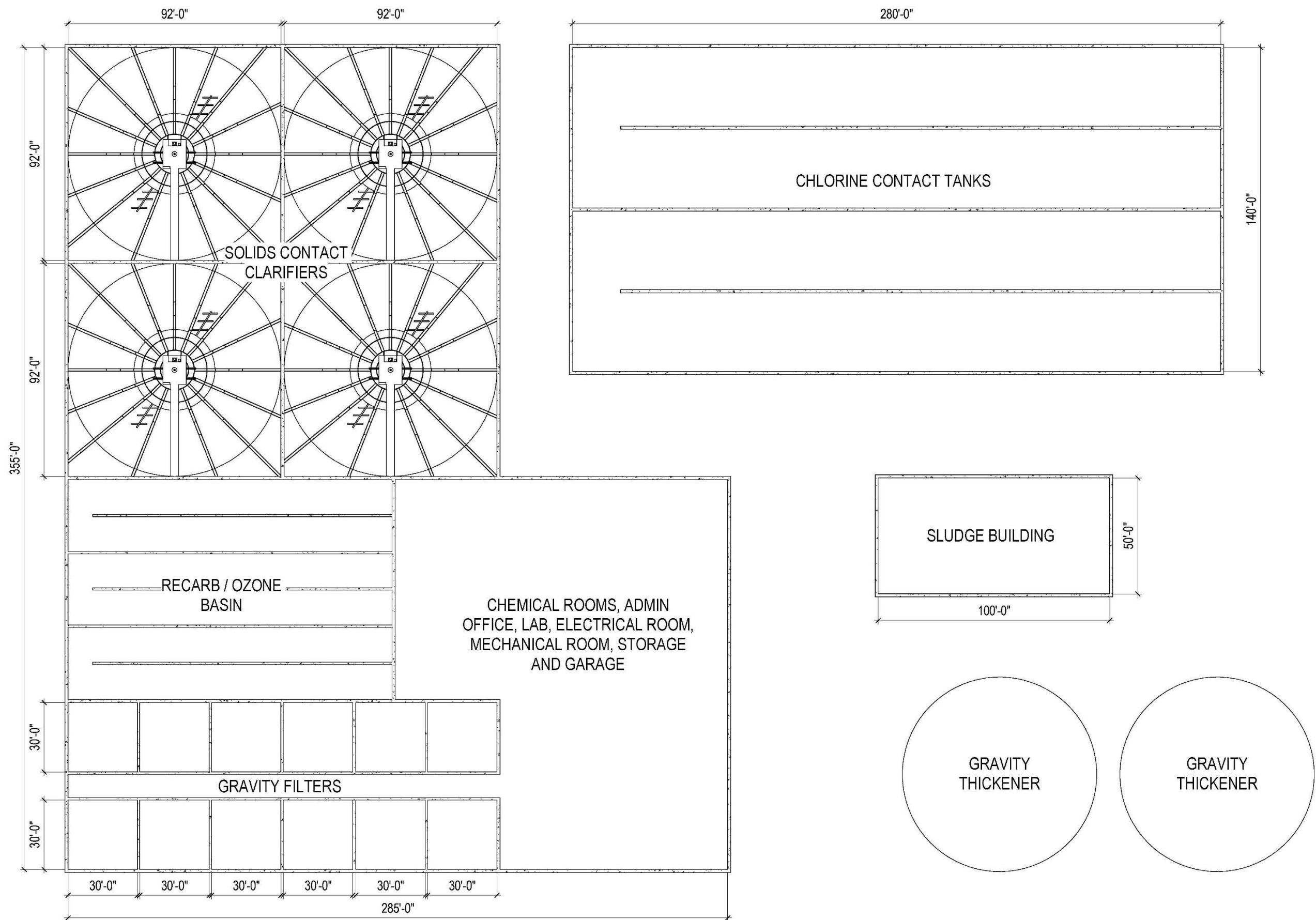
The northeast communities connected to a new surface water treatment plant for Alternative 2 include Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. The proposed surface WTP for Alternative 2 would be constructed with a capacity of 24 MGD. Figure 30 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternative 1 and 3.

Alternative 2 includes all of the same routes as Alternative 1, with one additional branch serving North St. Paul. The water main consists of 4 branches totaling approximately 78,700 feet (15.0 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods as well as the connection to Mahtomedi. See below and Appendix C for cost estimates for the required transmission system infrastructure.

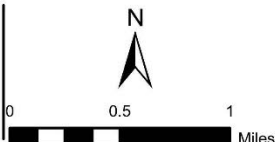
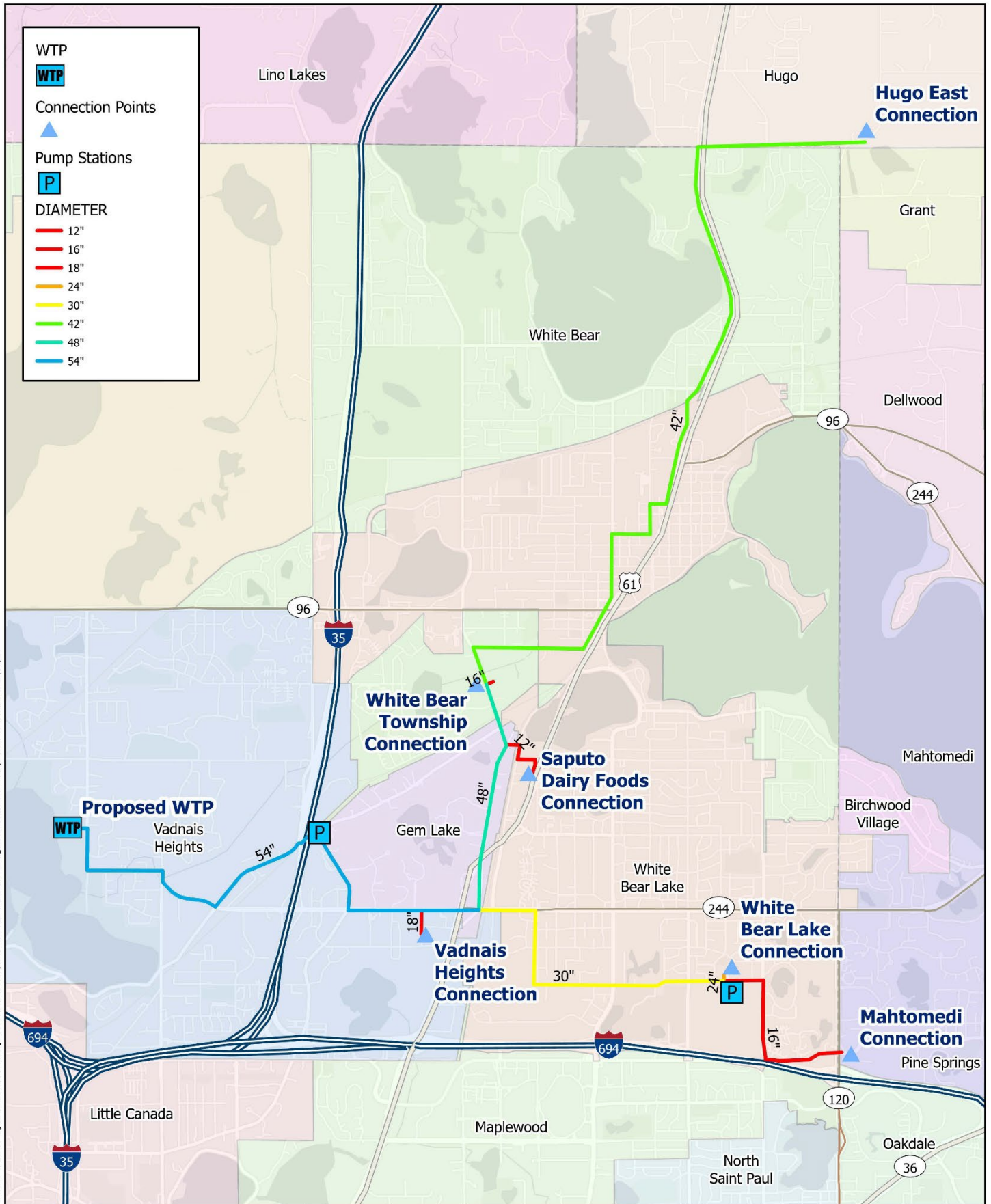
Branches 1–3: Identical to Alternative 1 above.

5.10.1 Branch 4: South from Junction — North St. Paul

From the Bellaire Avenue junction near I-694 — introduced along the Mahtomedi route — the main heads south 6,400 linear feet along Bellaire Avenue to the intersection of Helen Street N/14th Avenue E. This segment crosses I-694, passes under major power lines along Bellaire Avenue, and crosses the major intersection at 17th Avenue E. The route then continues 1,300 linear feet to 14th Avenue E/2nd Street N, crossing to the south side of 14th Avenue E to reach the North St. Paul connection. The total length of Branch 5 for Alternative 2 is approximately 7,700 feet (1.5 miles).



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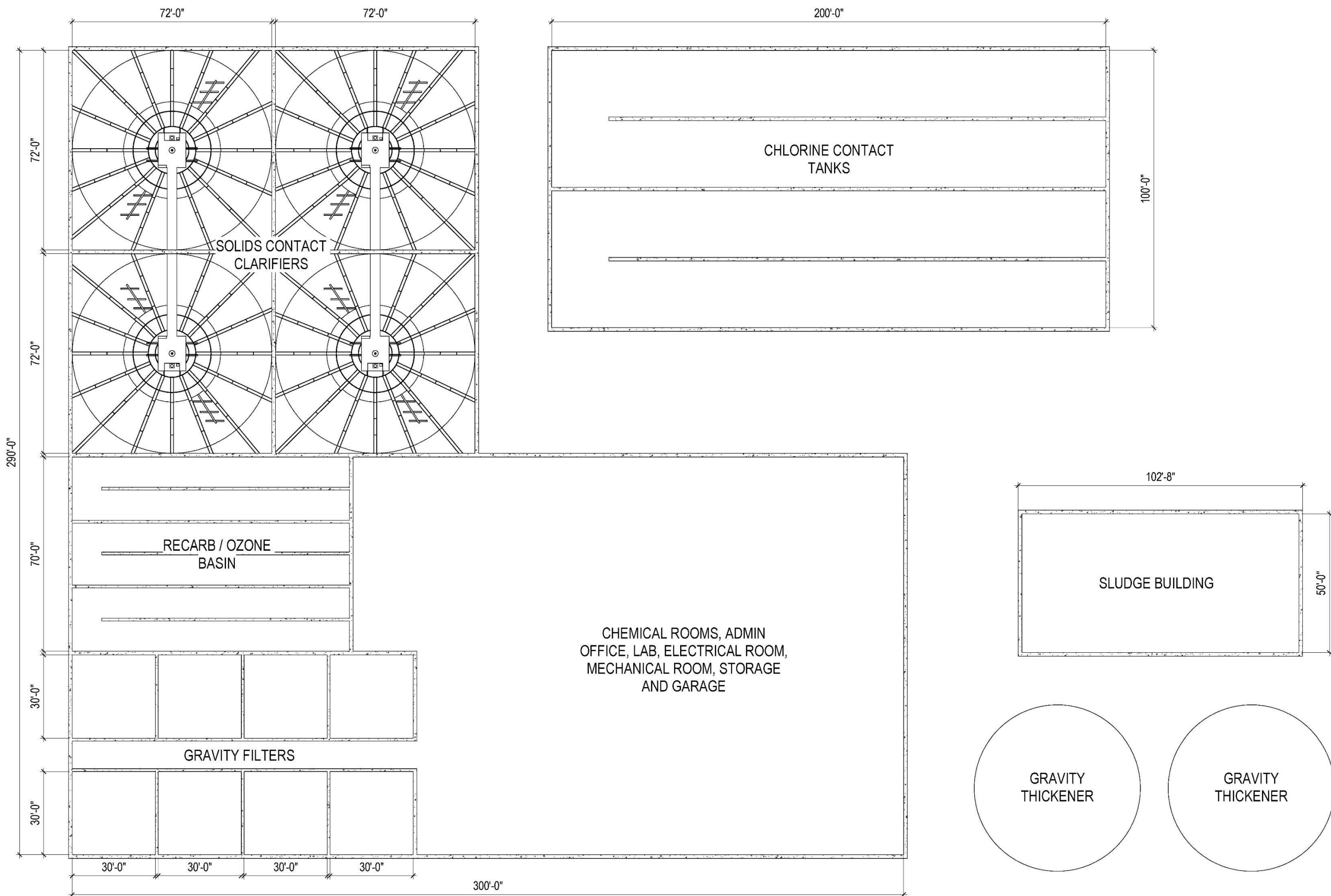
Map by: gcarleton
Projection: NAD 1983
UTM Zone 15N
Source: Metropolitan Council,
MN DOT, & SEH Inc.

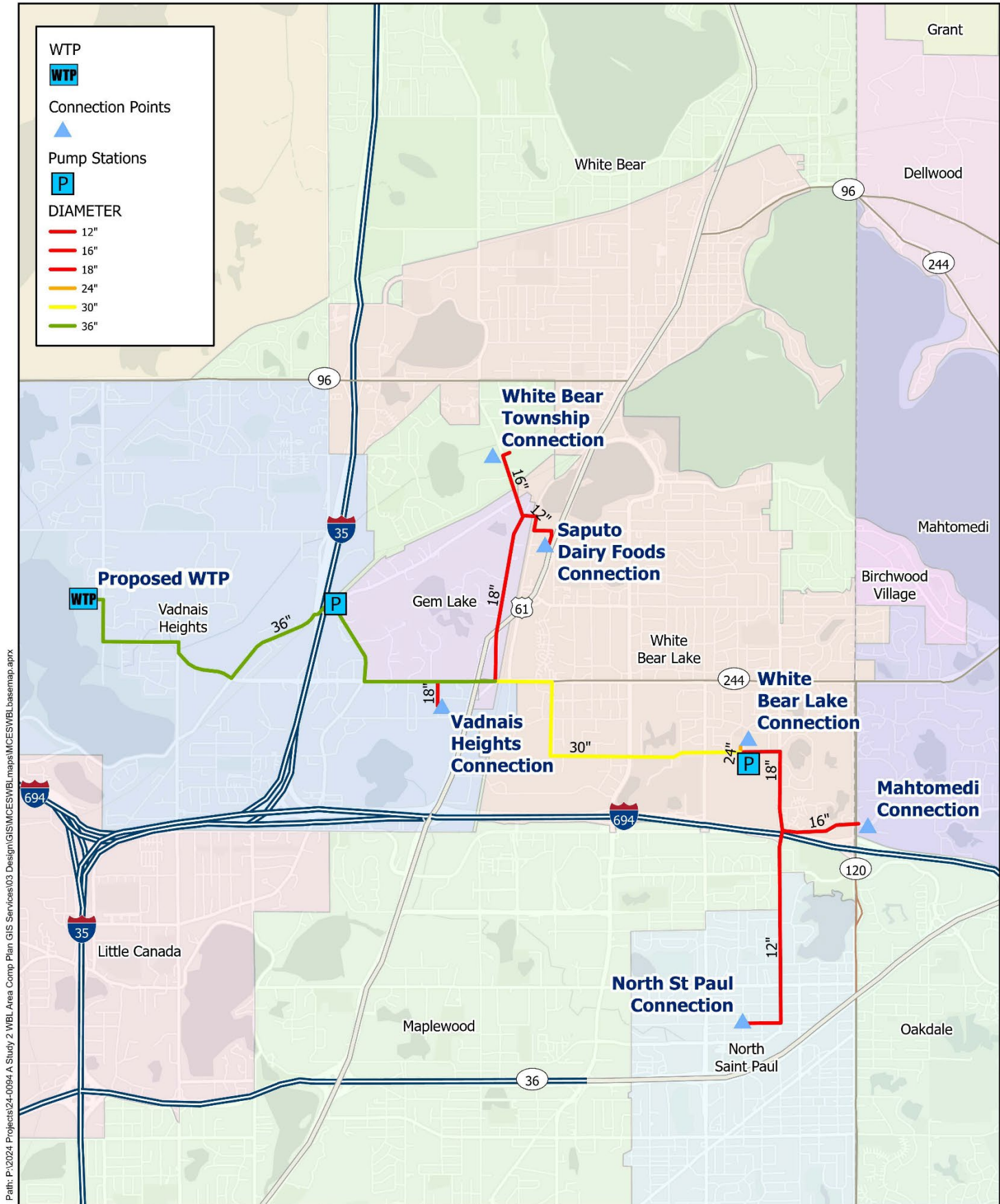
New Surface Water Treatment Plant to Supply Subset of Communities

White Bear Lake Area Comp Plan Study 2

Approach 2
Alternative 1
Hugo

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5.11 Alternative 2a (Hugo East)

The proposed surface WTP for Alternative 2a would be constructed with a firm capacity of 42 MGD. Figure 32 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternatives 1a and 3a.

Alternative 2a includes all routes from Alternative 2, with one additional branch extending north to Hugo East. The water main consists of 6 branches totaling approximately 95,800 feet (18.1 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is needed to boost pressure at the Hugo East connection. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods as well as the connection to Mahtomedi. See below and Appendix C for cost estimates for the required transmission system infrastructure.

Branches 1–4: Identical to Alternative 2 above.

5.11.1 Branch 5: Hugo East Extension

Identical to Alternative 1a Branch 5 above. The total length of Branch 6 for Alternative 2a is approximately 8,700 feet (1.6 miles).

5.12 Alternative 3

The northeast communities connected to a new surface water treatment plant for Alternative 3 include Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. The proposed surface WTP for Alternative 3 would be constructed with a capacity of 24 MGD. Figure 34 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternative 1 and 2.

Alternative 3 includes all of the same routes as Alternative 1, with two additional branches serving North Oaks. The water main consists of 5 branches totaling approximately 90,400 feet (17.1 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is also needed at the connection to North Oaks. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix C for cost estimates for the required transmission system infrastructure.

Branches 1–3: Identical to Alternative 1 above.

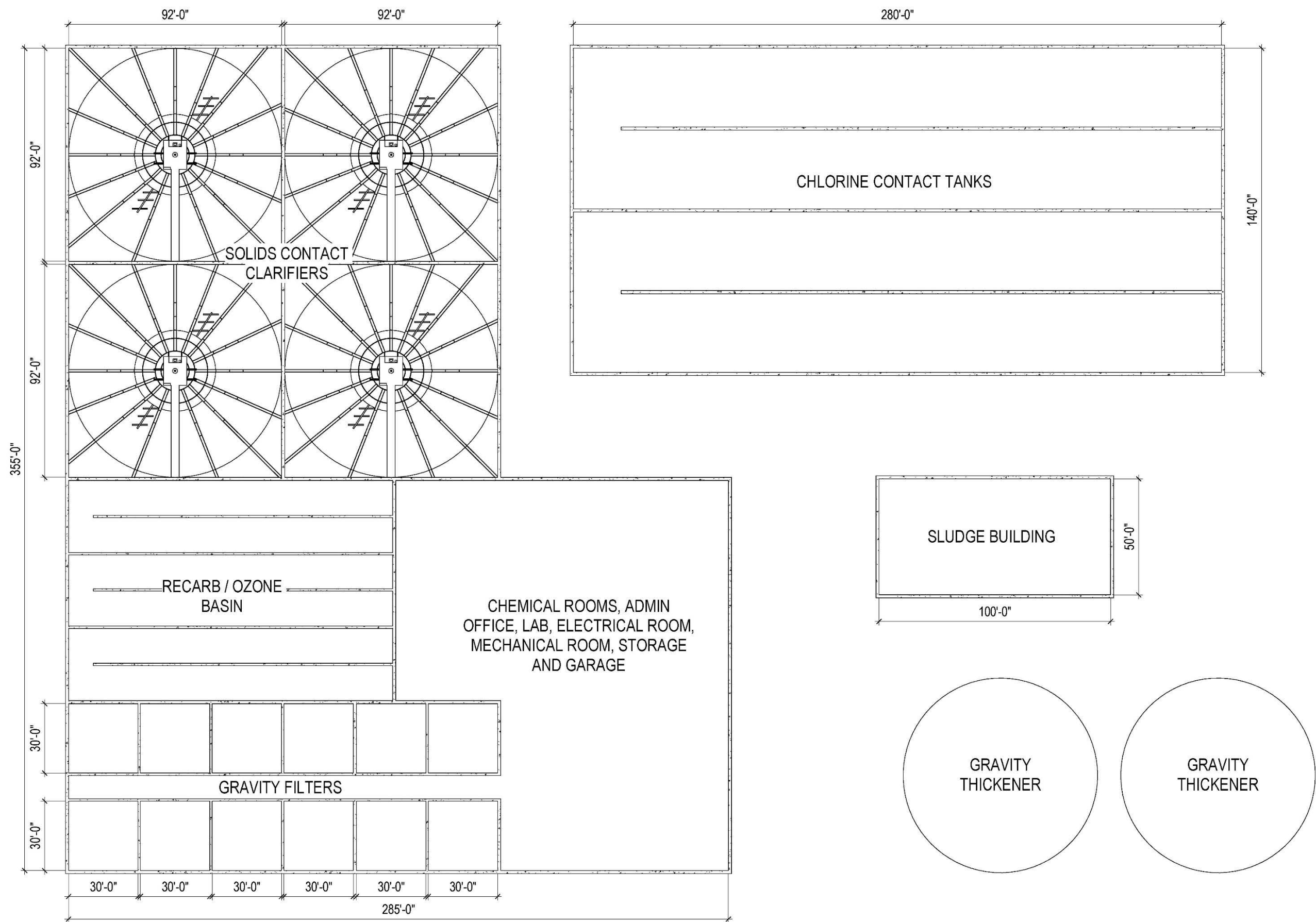
5.12.1 Branch 4: WTP North — to Hwy 96/McMenemy Street

A northern leg departs the WTP heading north along McMenemy Street 8,400 linear feet to the Hwy 96/McMenemy Street intersection, crossing one railroad along the way. The total length of Branch 4 for Alternative 3 is approximately 8,400 feet (1.6 miles).

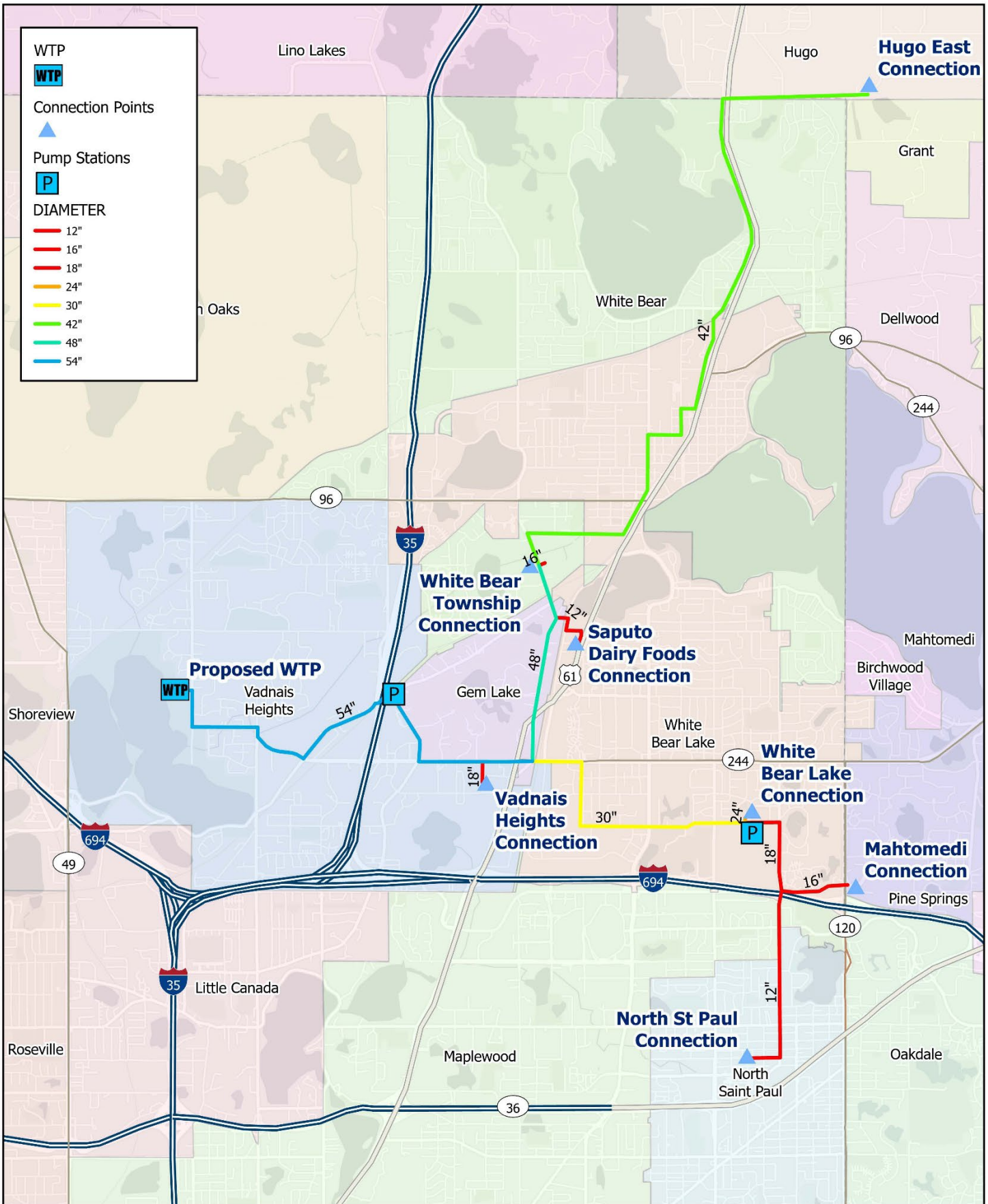
5.12.2 Branch 5: North Oaks Spur

From the Hwy 96/McMenemy Street intersection — where Branch 4 terminates — the main continues east 8,000 linear feet along Hwy 96 to Centerville Road, including one railroad crossing

and one Hwy 96 road crossing. Note: the routing documents suggest consideration of running northeast along the railroad (Robb Farm Road) to avoid the second railroad crossing. From Hwy 96/Centerville Road the route continues north 3,000 linear feet to the North Oaks connection, classified as Dense Suburban/potentially Urban, with one additional railroad crossing. The total length of Branch 5 for Alternative 3 is approximately 11,000 feet (2.1 miles).



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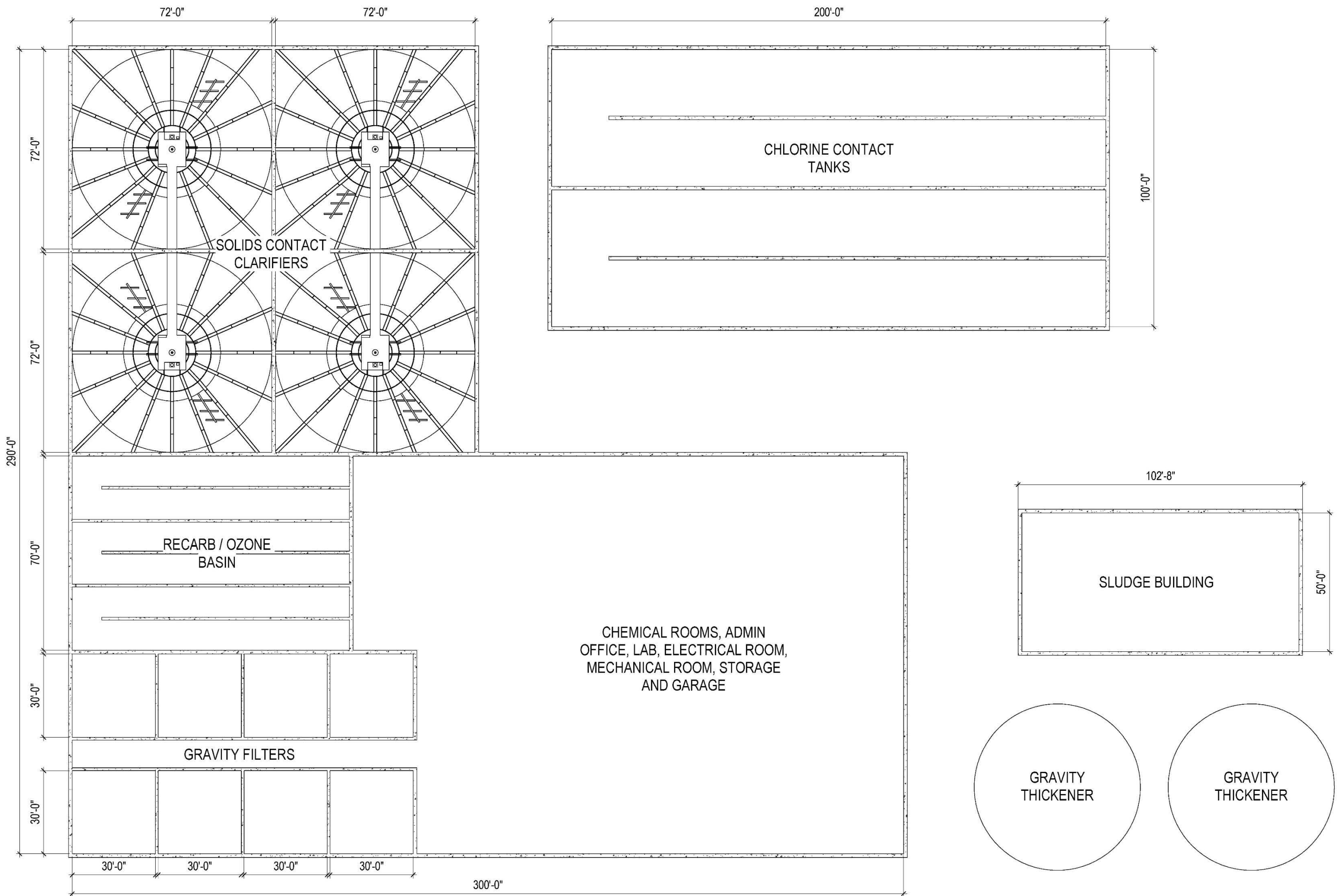
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UTM Zone 15N
Source: Metropolitan Council,
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New Surface Water Treatment Plant to Supply Subset of Communities

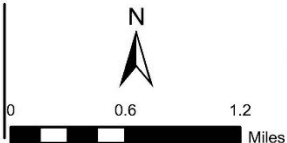
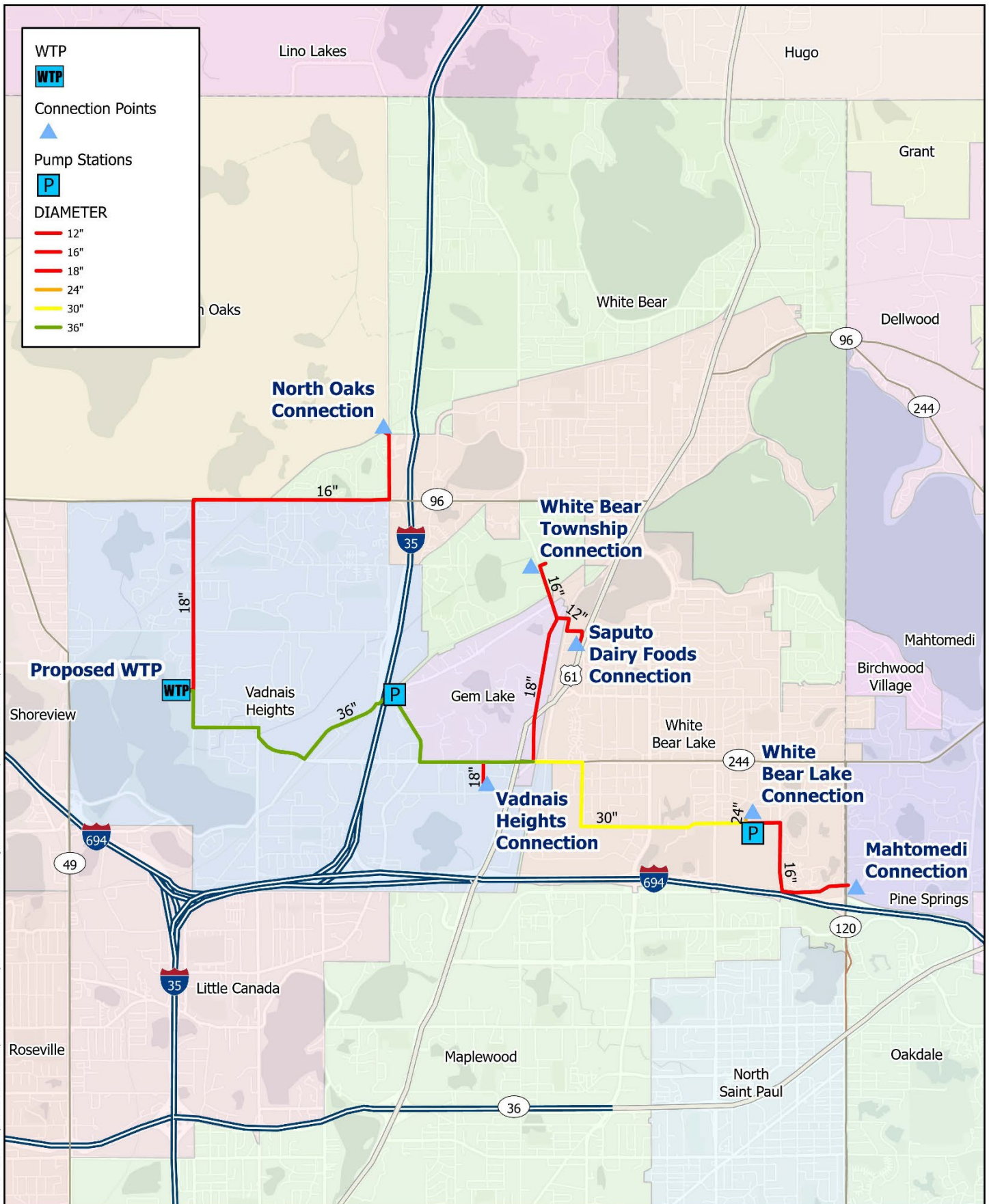
White Bear Lake Area Comp Plan Study 2

Approach 2
Alternative 2
Hugo

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New Surface Water Treatment Plant to Supply Subset of Communities

White Bear Lake Area Comp Plan Study 2

Approach 2
Alternative 3

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5.13 Alternative 3a (Hugo East)

The proposed surface WTP for Alternative 3a would be constructed with a firm capacity of 42 MGD. Figure 36 provides a conceptual treatment plant layout for this Alternative, which is identical to Alternatives 1a and 2a.

Alternative 3a includes all routes from Alternative 3, with one additional branch extending north to Hugo East. The water main consists of 6 branches totaling approximately 99,100 feet (18.8 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi. A booster pump station is also needed at the connection to North Oaks and Hugo East. In addition, a PRV to reduce pressure is needed at the connection to Saputo Dairy Foods. See below and Appendix C for cost estimates for the required transmission system infrastructure.

Branches 1–5: Identical to Alternative 3 above.

5.13.1 Branch 6: Hugo East Extension

Identical to Alternative 1a Branch 5 above. The total length of Branch 6 for Alternative 3a is approximately 8,700 feet (1.6 miles).

5.14 Alternative 4

The northeast communities connected to a new surface water treatment plant for Alternative 4 include Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, North Oaks, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township. The proposed surface WTP for Alternative 3 would be constructed with a capacity of 33 MGD. Figure 38 provides a conceptual treatment plant layout for this Alternative.

Alternative 4 includes all routes from Alternative 3, with one additional branches serving Shoreview. The water main consists of 7 branches totaling approximately 95,600 feet (18.1 miles). To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. An inline booster pump station is also needed to boost pressure to the White Bear Lake connection and to the downstream transmission main to Mahtomedi and North Saint Paul. A booster pump station is needed at the connection to North Oaks. In addition, a PRV to reduce pressure is needed at the connections to Saputo Dairy Foods and Mahtomedi. See below and Appendix C for cost estimates for the required transmission system infrastructure.

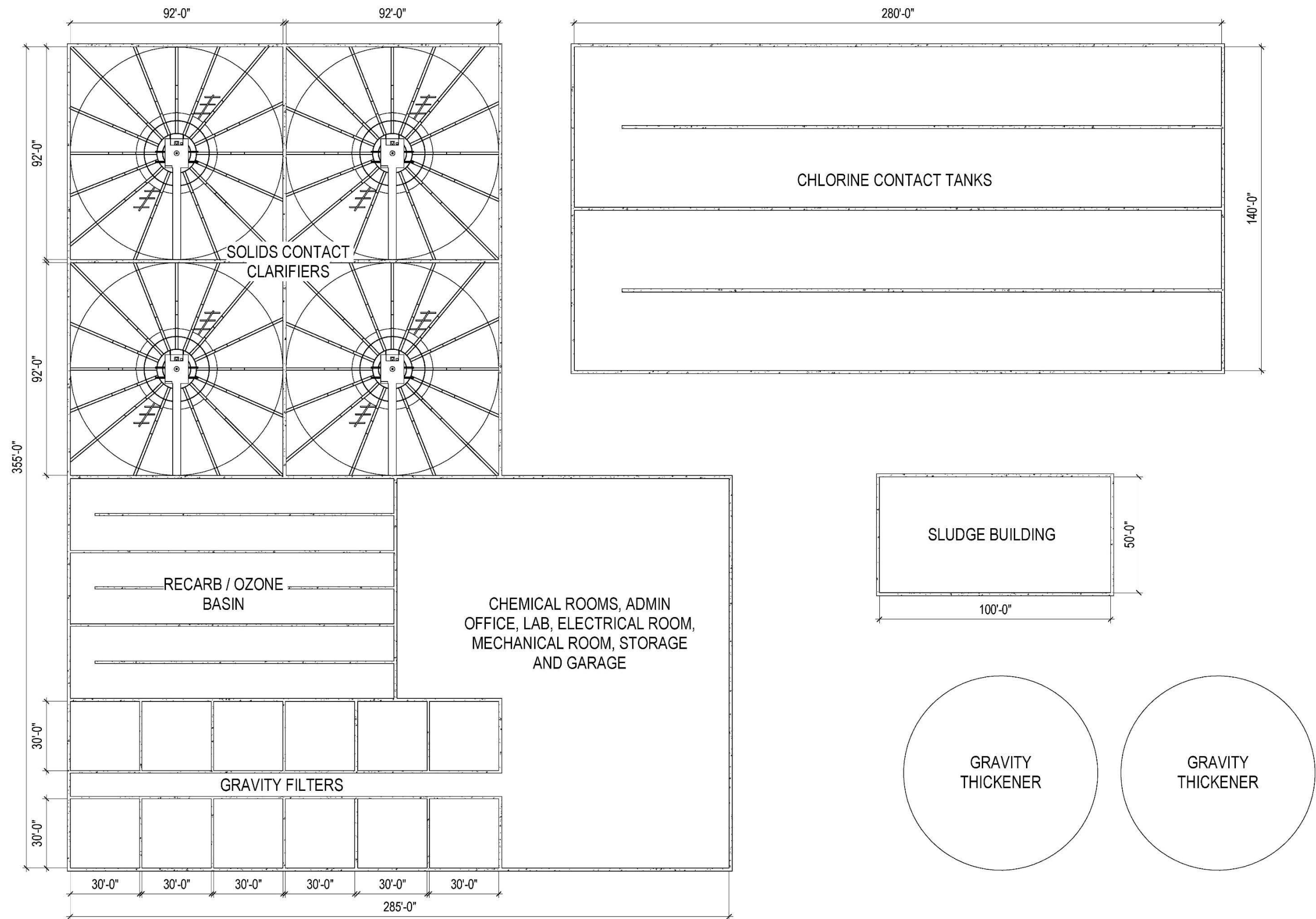
Branches 1–5: Identical to Alternative 3 above.

5.14.1 Branch 6: Shoreview Spur

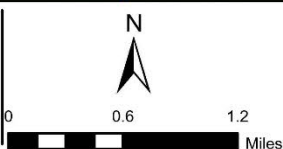
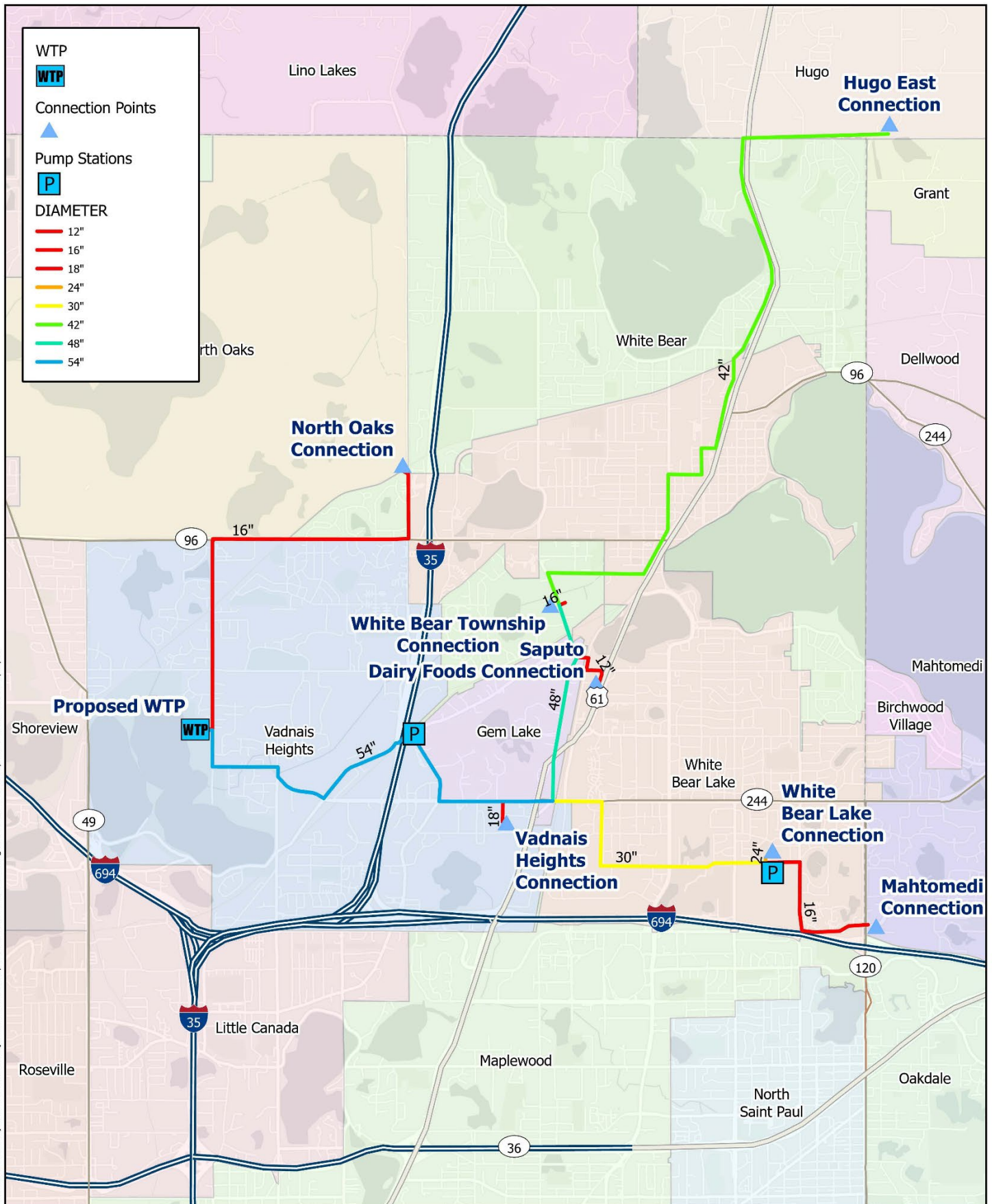
From the Hwy 96/McMenemy Street intersection, the main heads west 5,200 linear feet along Hwy 96 to the Shoreview connection at Hwy 96/Rice Street, classified as Suburban (lite). This segment includes a potential horizontal directional drill (HDD) crossing in the vicinity of Pleasant Lake and the Sucker Lake intake area. The total length of Branch 7 for Alternative 4 is approximately 5,200 feet (1.0 miles).

5.15 Alternative 5

The northeast communities connected to a new surface water treatment plant for Alternative 4 include Saputo Dairy Foods, White Bear Lake, and White Bear Township in Addition to up to 3 MGD of Treated Wastewater Injected into Aquifer. The proposed surface WTP for Alternative 3 would be constructed with a capacity of 12 MGD. Figure 40 provides a conceptual treatment plant layout for this Alternative.



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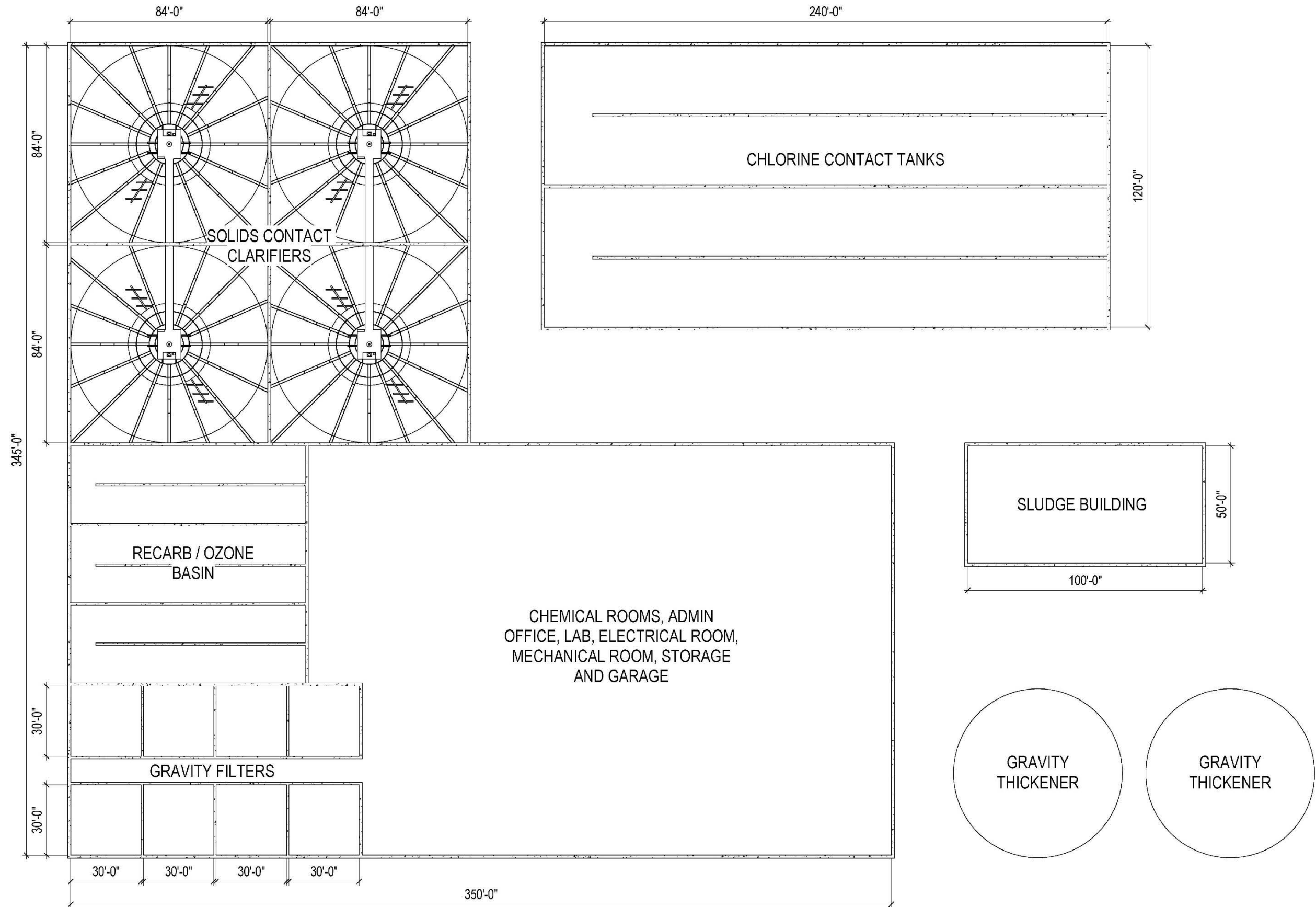


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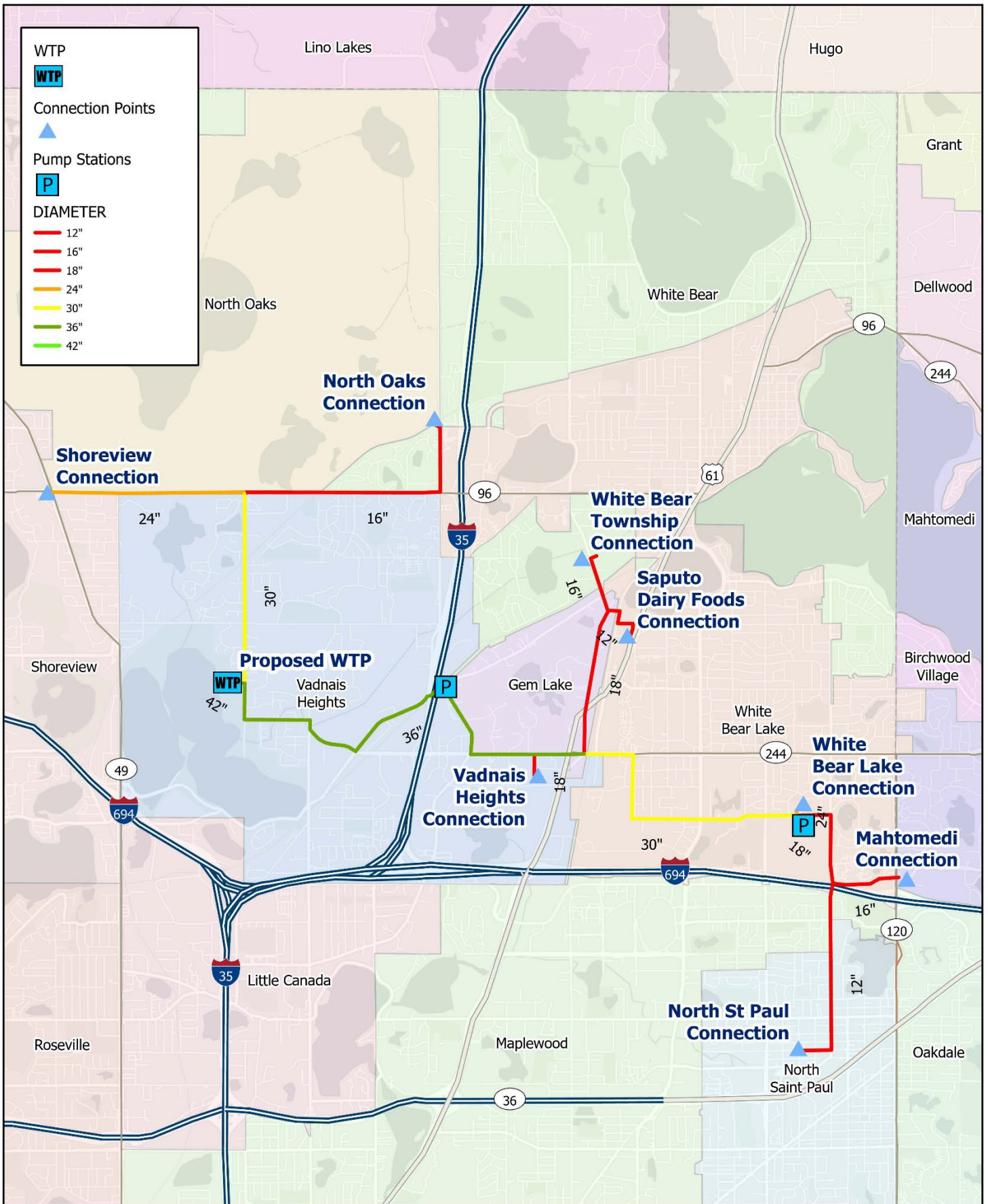
**New Surface Water Treatment
Plant to Supply Subset of Communities**
White Bear Lake Area Comp Plan Study 2

Approach 2
Alternative 3
Hugo

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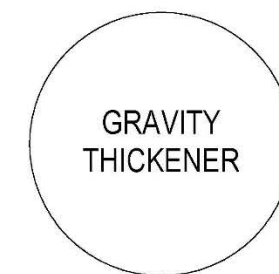
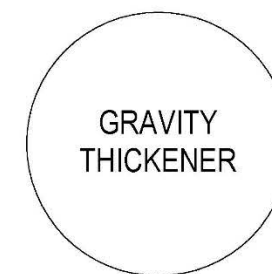
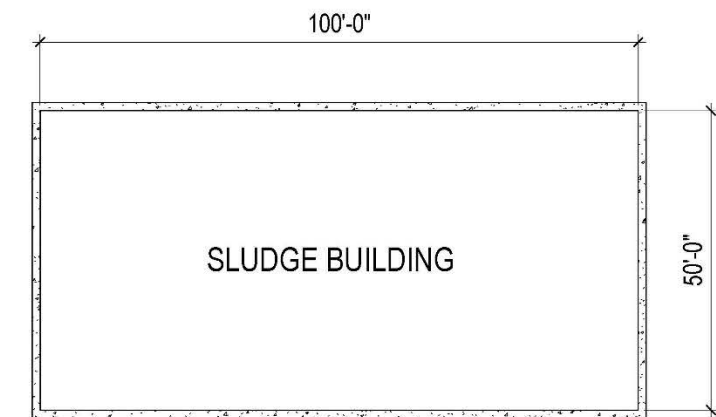
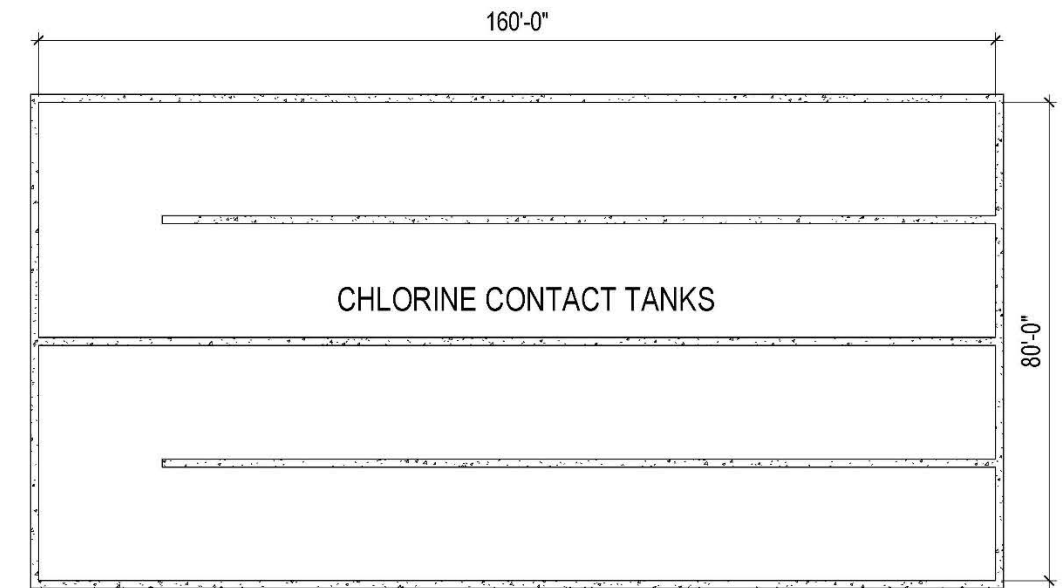
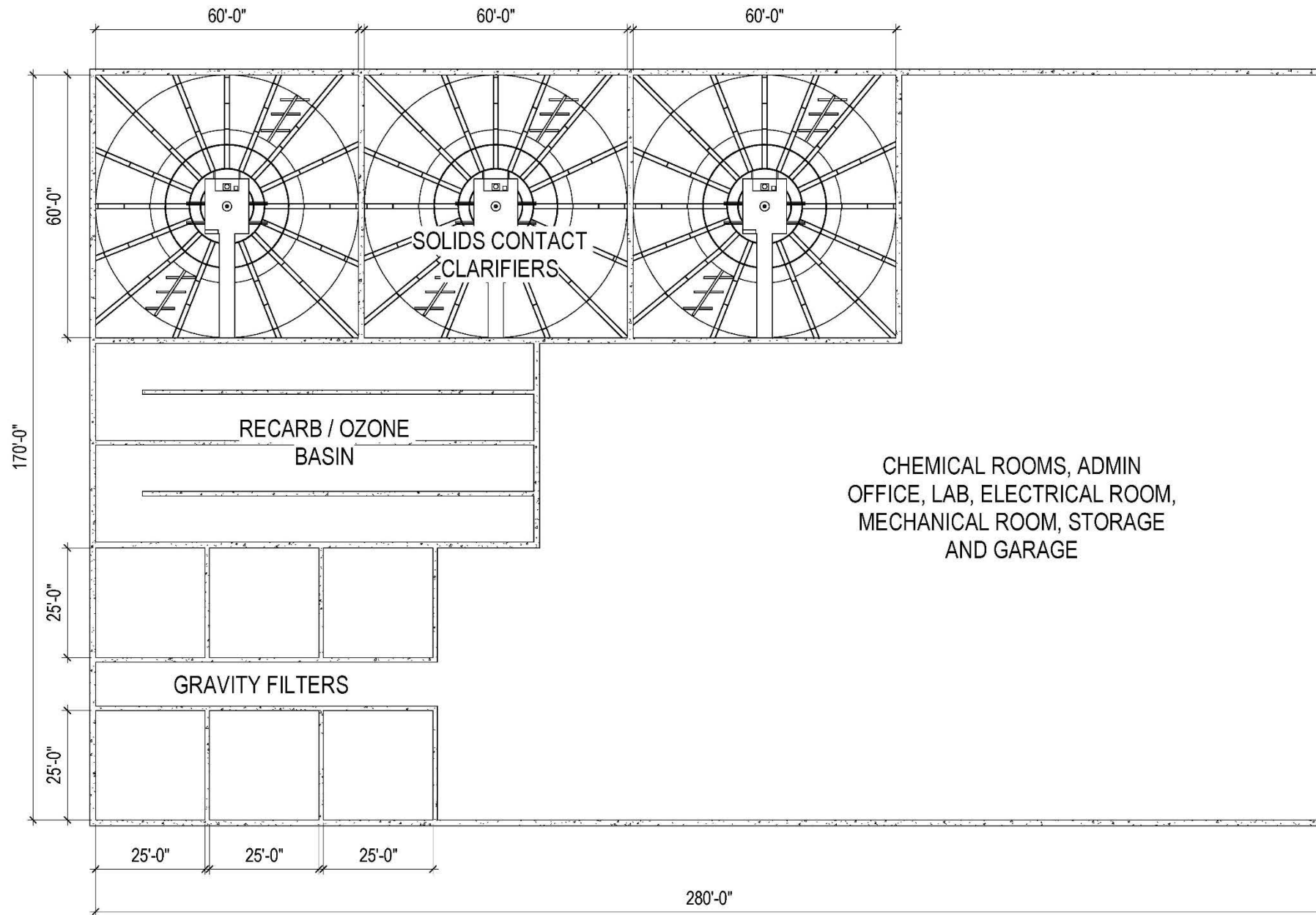


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		Map by: gearleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.		

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1 Alternatives 5, 12 MGD Firm Capacity (24 MGD)
5 1/16" = 1'-0"

0 8' 16' 32'

Alternative 5 uses a reduced subset of the Alternative 1 backbone, serving only White Bear Lake, White Bear Township (south system), and Saputo Dairy Foods, and does not extend to Mahtomedi or the WBT North connection. The aquifer injection component is a separate element not reflected in the transmission main routing. The water main consists of 3 branches totaling approximately 43,400 feet (8.2 miles).

To maintain transmission main pressures, an inline booster pump station (located near intersection of Goose Lake Road and Labore Road in Vadnais Heights near Gem Lake border) is needed. A booster pump station is needed at the connection to White Bear Lake. In addition, a PRV to reduce pressure is needed at the connections to Saputo Dairy Foods and Mahtomedi. See below and Appendix C for cost estimates for the required transmission system infrastructure.

5.15.1 Branch 1: WTP South — East Spine to Vadnais Heights Junction

Identical to Alternative 1. The total length of Branch 1 for Alternative 5 is approximately 19,000 feet (3.6 miles).

5.15.2 Branch 2: East from Junction — White Bear Lake

This branch follows the same route as Alternative 1 from the Scheuneman Road junction east but terminates at the White Bear Lake connection on Orchard Ln near Bellaire Ave rather than continuing to Mahtomedi. The two segments from the Bellaire Avenue junction onward to Mahtomedi are not included. The total length of Branch 2 for Alternative 5 is approximately 11,300 feet (2.1 miles).

5.15.3 Branch 3: North from Junction — White Bear Township (South) and Saputo Dairy

This branch follows the same route as Alternative 1 from the Scheuneman Road junction north to the Hwy 36 crossing, then along Scheuneman Road to Otter Lake Road, and out to the Saputo Dairy and WBT South connections including their respective jack and bore railroad crossings. The route does not continue north beyond the WBT South connection. The total length of Branch 3 for Alternative 5 is approximately 13,100 feet (2.5 miles)..

This alternative includes the injection of up to 3 MGD of treated wastewater into the aquifer to increase groundwater recharge. *Study No. 6 – Wastewater Reuse for Aquifer Injection or Direct Lake Augmentation (SEH, 2026)* provides a comprehensive study of treatment requirements and siting, along with capital and operating cost estimates. The study noted wastewater reuse for aquifer injection would have a modest beneficial effect on White Bear Lake water levels, but requires a treatment process with very high capital and O&M costs, and significant regulatory challenges. The study identified a potential wastewater reuse facility on the west side of White Bear Lake, which would include an effluent diversion structure, low lift pumping, raw and waste equalization tanks, wastewater treatment and advanced RO treatment, ground storage, aquifer injection watermain, and injection wells. The previous study provided conceptual level capital and O&M costs for 2 MGD and 3.8 MGD aquifer injection scenarios. Costs were estimated for the 3 MGD required for this Alternative 5 as shown below.

Table 28 – Wastewater Treatment and Aquifer Injection Costs

Capacity (MGD)	Construction Costs	Construction Contingency	Easement and Land Acquisition	Pilot Testing	Engineering	Construction Administration	Total Cost	Annual O&M
3	\$149,000,000	\$59,600,000	\$2,000,000	\$3,000,000	\$31,300,000	\$31,300,000	\$276,200,000	\$1,960,000
Table Notes: 1) Costs proportioned from Study No. 6 – Wastewater Reuse for Aquifer Injection or Direct Lake Augmentation, SEH, 2026 2) All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.								

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Project: MCES0 190048
Print Date: 6/12/2026

Map by: gcarleton
Projection: NAD 1983
UTM Zone 15N
Source: Metropolitan Council,
MN DOT, & SEH Inc.

New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2

Approach 2
Alternative 5

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

5.16 Cost Summary – Alternatives 1-5

Table 29 provides a cost summary of each of the Alternatives, provided with phased 2050 Scenario and Ultimate costs. These represent project cost estimates that include contingencies, engineering, administration, and legal costs along with construction costs. Detailed cost methodology is provided in Appendix A, along with detailed cost tables in Appendix B and E.

Table 29 – Approach 2 (Task 5) – Alternatives 1-5 Capital Cost Summary

Community/Entity	2050 Scenario Capital Cost	Ultimate Capital Cost	Total
Alternative 1			
Transmission Main & Pumping	\$ 135,600,000	No Change	\$ 135,600,000
Surface WTP	\$ 292,500,000	No Change	\$ 292,500,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 578,935,000	No Change	\$ 578,935,000
Alternative 2			
Transmission Main & Pumping	\$ 143,600,000	No Change	\$ 143,600,000
Surface WTP	\$ 308,750,000	No Change	\$ 308,750,000
Additional PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 603,185,000	No Change	\$ 603,185,000
Alternative 3			
Transmission Main & Pumping	\$ 166,500,000	No Change	\$ 166,500,000
Surface WTP	\$ 325,000,000	No Change	\$ 325,000,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 642,335,000	No Change	\$ 642,335,000
Alternative 4			
Transmission Main & Pumping	\$ 186,300,000	No Change	\$ 186,300,000
Surface WTP	\$ 432,000,000	No Change	\$ 432,000,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 769,135,000	No Change	\$ 769,135,000
Alternative 5			
Transmission Main & Pumping	\$ 124,900,000	No Change	\$ 124,900,000
Surface WTP	\$ 180,000,000	No Change	\$ 180,000,000
Wastewater Treatment & Aquifer Injection	\$ 276,200,000	No Change	\$ 276,200,000
Additional Fridley PS & Conduit	\$ 150,835,000	No Change	\$ 150,835,000
TOTAL	\$ 731,935,000	No Change	\$ 731,935,000
Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.			

Community/Entity	2050 Scenario Capital Cost	Ultimate Capital Cost	Total
Alternative 1 (Hugo East)			
Transmission Main & Pumping	\$ 359,900,000	No Change	\$ 359,900,000
Surface WTP	\$ 449,400,000	No Change	\$ 449,400,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 965,965,000	No Change	\$ 965,965,000
Alternative 2 (Hugo East)			
Transmission Main & Pumping	\$ 368,900,000	No Change	\$ 368,900,000
Surface WTP	\$ 473,000,000	No Change	\$ 473,000,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 998,565,000	No Change	\$ 998,565,000
Alternative 3 (Hugo East)			
Transmission Main & Pumping	\$ 383,200,000	No Change	\$ 383,200,000
Surface WTP	\$ 496,700,000	No Change	\$ 496,700,000
Additional Fridley PS & Conduit	\$ 156,665,000	No Change	\$ 156,665,000
TOTAL	\$ 1,036,565,000	No Change	\$ 1,036,565,000
Notes:			
1) Costs include a new additional Pump Station (PS) along with existing Fridley Pump Station due to lower capital costs.			
2) All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.			

5.17 Operations and Maintenance Costs – Alternatives 1-5

5.17.1 Annual Costs

Table 30 provides a summary of the annual operations & maintenance costs for each of the Alternatives. These costs include a combination of raw and final distribution pumping along with a new regional treatment plant. Detailed cost methodology is provided in Appendix A, along with detailed cost table in Appendix E.

Table 30 – Approach 2 (Task 5) Alternatives Annual O&M Cost Summary

Community/Entity	Total Annual O&M Cost
Alternative 1	\$12,447,700
Alternative 2	\$13,061,600
Alternative 3	\$13,207,400
Alternative 4	\$17,857,200
Alternative 5	\$7,719,300
Alternative 1 (Hugo East)	\$19,156,900
Alternative 2 (Hugo East)	\$19,621,100
Alternative 3 (Hugo East)	\$19,692,600
Notes:	

Community/Entity	Total Annual O&M Cost
1) Costs assume new Fridley Pump Station. 2) All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.	

5.18 Advantages and disadvantages

Table 20 summarizes the advantages and disadvantages of Alternatives 1 through 5 under Approach 2 (New Regional Surface Water Treatment Plant), along with the Hugo East sub-alternatives (1a, 2a, and 3a). Because the new plant sits at Vadnais Lake adjacent to the served communities, transmission mains are shorter than the corresponding Approach 1 alternatives; however, the capital and O&M cost of each Approach 2 alternative is higher than its Approach 1 equivalent due to the cost of building and operating a new regional treatment plant.

Table 31 – Approach 2 (Task 5) Alternatives 1-5 Advantages and Disadvantages

Alternative	Communities Served	Capital Cost	Annual O&M	WTP Firm Cap. (MGD)	Watermain Length	Advantages	Disadvantages
1	Mahtomedi, Saputo, White Bear Lake, Vadnais Heights, White Bear Twp (5)	\$578.9M	\$12.4M	21	27 mi	Lowest cost of Approach 2; smallest plant	Serves fewest communities (5 of 9)
2	Alt 1 + North St. Paul (6)	\$603.1M	\$13.0M	23	31 mi	Adds North St. Paul	Excludes North Oaks, Shoreview, Hugo
3	Alt 1 + North Oaks (6)	\$642.3M	\$13.2M	25	38 mi	Serves North Oaks, nearest the lakes	Larger plant and mains than Alt 1-2
4	Alt 1 + North Oaks, North St. Paul, Shoreview (8)	\$769.1M	\$17.8M	36	42 mi	Broadest coverage; greatest lake benefit	Highest cost; largest plant (36 MGD)
5	Saputo, White Bear Lake, White Bear Twp + aquifer injection (3)	\$731.9M	\$7.7M	12	30 mi	Lowest O&M; recharges aquifer directly	High capital; serves only 3 directly
1a	Alt 1 + Hugo East (6)	\$965.9M	\$19.1M	43	45 mi	Extends Alt 1 to Hugo growth area	Higher cost; larger plant than Alt 1
2a	Alt 2 + Hugo East (7)	\$998.5M	\$19.6M	45	50 mi	Extends Alt 2 to Hugo growth area	Higher cost; larger plant than Alt 2
3a	Alt 3 + Hugo East (7)	\$1,036.5M	\$19.6M	47	52 mi	Extends Alt 3 to Hugo growth area	Highest cost; largest plant (47 MGD)

6 Use of SPRWS Wells In Lieu of SPRWS Fridley Pump Station Expansion Evaluation

This task explores use of the existing SPRWS wells in lieu of expansion of the SPRWS Fridley pump station. The evaluation analyzes both the projected Year 2050 demand and the projected ultimate demand.

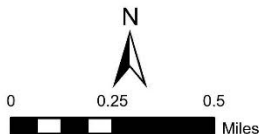
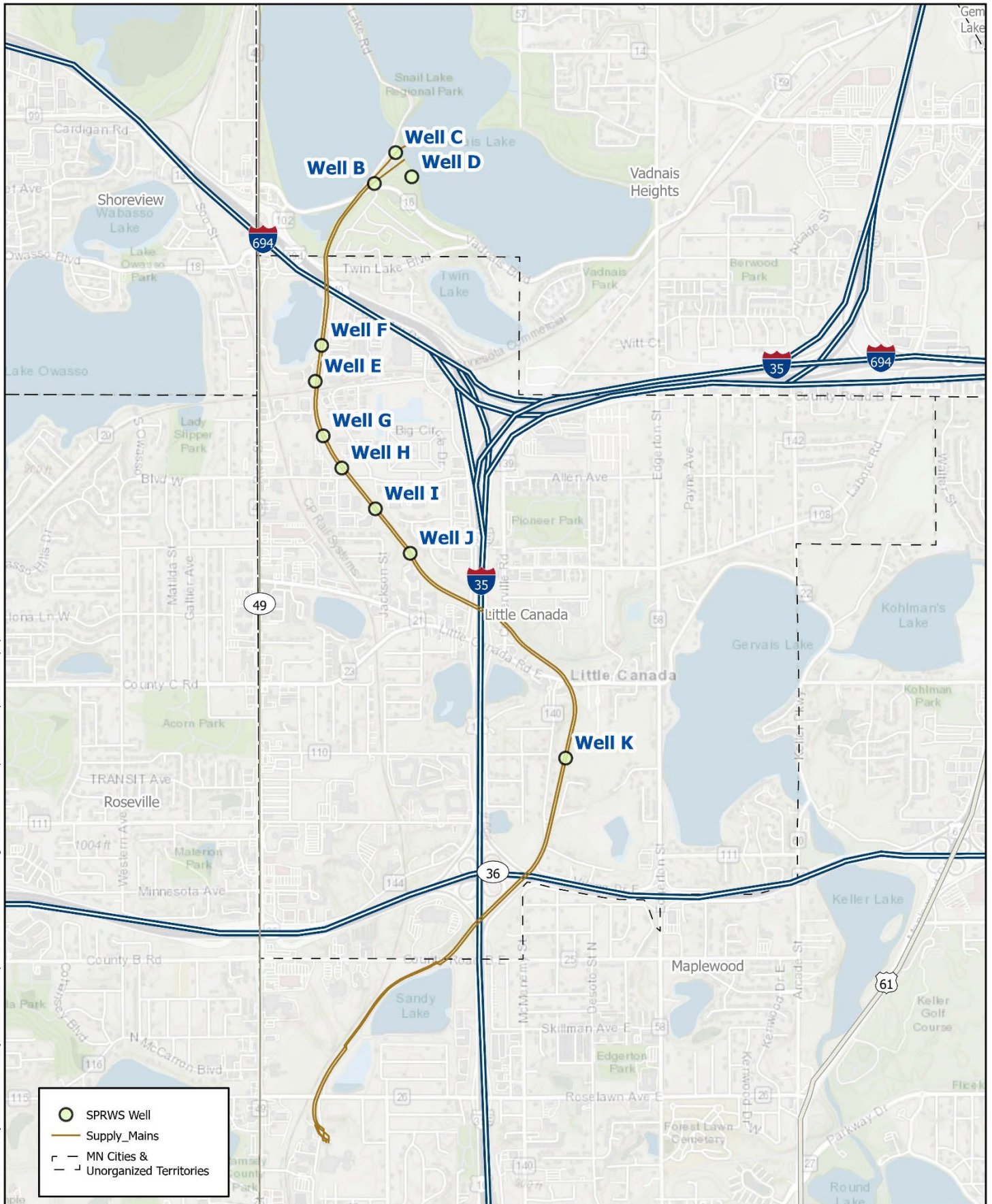
6.1 Existing SPRWS Wells

SPRWS has 10 Prairie du Chien – Jordan aquifer wells. The ten wells have a combined capacity of 45 MGD. As of 2024, water quality of three of the ten wells exceeded the EPA's PFOA limit of 4 parts per trillion (ppt). The capacity of all wells with the exception of the three exceeding PFOA totals approximately 34 MGD.

Table 32 – SPRWS Wells

Well	Year Installed	Unique Well No.	Capacity per SPRWS Records (MGD)
B ¹	1977	133312	3.38
C	1977	127292	4.32
D	1982	151583	5.76
E	1985	151579	5.18
F	2004	706803	4.75
G ¹	2004	706802	2.66
H ¹	2008	753666	4.93
I	2008	753667	4.35
J	2008	759568	4.93
K	2008	759569	4.93
Total			45.19
Total without B, G, H (See note 1)			34.22
Table Notes:			
¹ Well water quality exceeds PFOA limit of 4 ppt.			

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Project: MCES0 190048
Print Date: 6/4/2026

Map by: gcarleton
Projection: NAD 1983
UTM Zone 15N
Source: SPRWS, Metropolitan Council
MN DOT, & SEH Inc.

SPRWS Well Locations

White Bear Lake Area Comp Plan Study 2

Figure
1

This map is neither a legally recorded map nor a survey map and is not intended to be used as one. This map is a compilation of records, information, and data gathered from various sources listed on this map and is to be used for reference purposes only. SEH does not warrant that the Geographic Information System (GIS) Data used to prepare this map are error free, and SEH does not represent that the GIS Data can be used for navigational, tracking, or any other purpose requiring exacting measurement of distance or direction or precision in the depiction of geographic features. The user of this map acknowledges that SEH shall not be liable for any damages which arise out of the user's access or use of data provided.

A summary of projected Ultimate water demands, including SPWRS existing service area, for each of the five study alternatives are presented in Table 33.

Table 33 – Required SPRWS Well Water Demands by Alternative for Ultimate Max Day Demands

Community/Entity	Ultimate Max Day Demand for Study Area (MGD)	Ultimate Max Day Demand for SPRWS Service Area (MGD))	Total Demand (MGD)
Alternative 1 – Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	20.3	88.7	109.0
Alternative 2 – Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	22.8	88.7	111.5
Alternative 3 – Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	24.6	88.7	113.3
Alternative 4 – Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	36.2	88.7	124.9
Alternative 5 – Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	11.7	88.7	100.4
Alternative 1a (Hugo East)	42.2	88.7	130.9
Alternative 2a (Hugo East)	44.7	88.7	133.4
Alternative 3a (Hugo East)	46.5	88.7	135.2

Based on a comparison of historic demand data from year 2014 to year 2023, a summer average day demand to annual average day demand was calculated for each community considered in alternatives 1 through 5. Table 34 summarizes these flows.

Table 34 – Average Summer Day Demand Comparison to Annual Average Day

Community/Entity	Annual Daily Average Demand (MGD)	Summer Daily Average Demand MGD	Summer/Annual Average Day Peak Factor
Lake Elmo	0.74	1.38	1.9
Mahtomedi	0.65	1.03	1.6
North St. Paul	1.0	1.3	1.3
Shoreview	2.3	3.5	1.5
Vadnais Heights	1.3	1.9	1.5
White Bear Lake	2.1	2.9	1.4
White Bear Township	1.2	1.9	1.6
SPRWS	40.0	49.7	1.3
Table Notes: Based on year 2014 to 2023 data			

A summary of projected average summer day demand, including SPRWS, for ultimate development for each of the five study alternatives including SPWRS are presented in Table 35.

Table 35 – Projected Average Summer Demand by Alternative for Ultimate Development Scenario

Community/Entity	Average Summer Day Demand (MGD)	90 Day Demand Based on Average Summer Day Demands (MG)
Alternative 1 – Supply Mahtomedi, Saputo Dairy Foods, White Bear Lake, Vadnais Heights (includes Gem Lake), and White Bear Township	17.5	1,575 MG
Alternative 2 – Supply Mahtomedi, North St. Paul, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	18.9	1,700 MG
Alternative 3 – Supply Mahtomedi, North Oaks, Saputo Dairy Foods, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	19.9	1,790 MG
Alternative 4 – Supply Mahtomedi, North Oaks, North St. Paul, Saputo Dairy Foods, Shoreview, Vadnais Heights (includes Gem Lake), White Bear Lake, and White Bear Township	26.2	2,360 MG
Alternative 5 – Supply Saputo Dairy Foods, White Bear Lake, and White Bear Township (north and south systems) from SPRWS and up to 3 MGD of treated wastewater injected into aquifer.	13	1,170 MG
Table Notes: Does not consider scenarios with addition of Hugo East demands		

6.2 SPRWS Well Appropriations

Per the 2019 Water Supply Plan, in 2016 SPRWS reduced its permitted groundwater appropriation withdrawals from 16.8 billion gallons to 2.5 billion gallons. 2.5 billion gallons per year equates to 6.8 MGD on average if wells were to be used all year. Assuming wells are only used for four months of the year, 2.5 billion gallons per year equates to approximately 20.5 MGD.

Prior to the 2016 reduction in permitted groundwater appropriation withdrawals, SPRWS was approved to pump up to 30,000 gpm, which equates to approximately 43.2 MGD; and up to 16.8 billion gallons per year, which equates to approximately 46.0 MGD.

6.3 Potential Use of SPRWS Wells

As noted above, the ten SPRWS wells have a combined total capacity of 45 MGD. Excluding the three wells with recent water quality testing indicating PFOA over the MCL, the remaining seven wells have a capacity of 34 MGD.

Including all wells, SPRWS has a current total of 121 MGD of raw water supply. This is sufficient to meet the Ultimate MDD water demand for all alternatives evaluated in Approach 1, with the exception of Alternative 2a (with Hugo East) and Alternative 3a (with Hugo East). Excluding the three wells with PFOA above the MCL, SPRWS has a current total of 110 MGD of raw water supply. This is sufficient to meet the Ultimate MDD water demand for all alternatives evaluated in Approach 1, with the exception of Alternative 2a (with Hugo East) and Alternative 4. This may be acceptable given the raw water storage in the chain of lakes.

The use of SPRWS wells in lieu of expanding pumping capacity does not address the lack of raw conduit redundancy. Also, the use of the SPRWS wells is not anticipated to be a long-term solution due to potential for PFAS migration within the groundwater system as the wells are pumped.

If the use of SPRWS wells in lieu of expanding pumping capacity were to be further considered, potential impacts to White Bear Lake water elevations would need to be modeled by DNR using the estimated 90 Day Demand Based on Average Summer Day Demands presented above.

7 SPRWS to supply City of Lake Elmo

This assessment (Task 1.5.6) evaluates the feasibility of St. Paul Regional Water Services (SPRWS) supplying 10 MGD to Lake Elmo. This evaluation is limited to the 10 MGD supply to Lake Elmo and does not consider combined demands from other White Bear Lake area communities. The assessment includes a review of required modifications to the Fridley Pump Station, the conveyance system from the Fridley Pump Station to the Chain of Lakes, McCarrons Water Treatment Plant, and the distribution system serving Lake Elmo.

7.1 Fridley Pump Station Modifications to Provide Water for Lake Elmo

A hydraulic analysis of the existing Fridley Pump Station determined that the current capacity is 76 MGD with Pumps 6 and 7 operating and two conduits in service. The McCarron's Water Treatment Plant has a capacity of 82 MGD. Therefore, this analysis evaluated upsizing the

Fridley Pump Station to provide 92 MGD to McCarron's. Table 37 summarizes the rated capacity of each existing pump.

Table 36– Fridley Pump Station Existing Capacities

Pump	Capacity MGD
Pump 5	33.7
Pump 6	35.3
Pump 7	50.6

As noted, when Pumps 6 and 7 are in service, they can deliver 76 MGD. Pump 7 can deliver 50.6 MGD when operating alone; however, when operating in parallel with another pump, additional headloss shifts the operating point on the pump curve, reducing its output to approximately 39 MGD. Given that pumps 5 and 6 are lower rated capacity than Pump 7, the existing pumps cannot achieve 92 MGD with one pump out of service. Refer to Section 3 of this report for additional information on the existing Fridley Pump Station capacity.

A pump selection was performed in conjunction with the hydraulic analysis. Three new pumps, each rated at 54 MGD, were selected to provide 92 MGD with one pump out of service. Table 38 summarizes the pump selections.

Table 37– Pump Selections to Provide Water to SPRWS and Lake Elmo

Pump #	Pump Make	MGD	Head (ft)	RPM	HP
5	Patterson PDI.60	54	156	395	1,676
6	Patterson PDI.60	54	156	395	1,676
7	Patterson PDI.60	54	156	395	1,676

Figure 43 shows a proposed layout of the Fridley Pump Station with the upsized pumps, piping and fittings.



NOTE:
INDIVIDUAL PUMP SUCTION WILL BE 60" FOR 130 MGD OF FLOW,
BUT ONLY 54" FOR 100 MGD OF FLOW.

WHITE BEAR LAKE AREA COMPREHENSIVE PLAN

**PRELIMINARY
NOT FOR
CONSTRUCTION**

REVISIONS AND RECORD OF ISSUE	
DESIGNED:	
ETAILED:	
CHECKED:	
APPROVED:	
DATE:	
PROJECT NO.:	

CIVIL

FRIDLEY PUMP STATION
MODIFICATIONS FOR
PUMP STATION LAYOUT
LAKE ELMO ADDITION

FIGURE-43 OF

7.2 Fridley Pump Station Conduit Review for Providing Water to McCarrons for Lake Elmo

The Fridley Pump Station conveys raw water to the McCarron's Water Treatment Plant through two 60" conduits and then a chain of lakes and canals. Based on typical operating velocity ranges for large-diameter transmission mains, the existing 60-inch conduits are estimated to convey approximately 50 MGD each, or 100 MGD total. With the proposed pumps in service, as described in the previous section, the existing conduits can convey the required flow of 92 MGD to serve water needed for SPRWS and Lake Elmo. Under this scenario, a third conduit would not be included, resulting in reduced system redundancy. However, the existing two conduits have sufficient capacity to convey the required 92 MGD, and a third conduit is not considered justified for the incremental 10 MGD increase in demand.

7.3 McCarron's Water Treatment Plant Modifications Required to Provide Water for Lake Elmo

The McCarron's Water Treatment Plant currently has a rated capacity of 82 MGD, which limits its ability to meet the additional 10 MGD demand associated with supplying Lake Elmo under ultimate maximum day demand conditions. Providing this additional capacity would require expansion of the facility to approximately 92 MGD. Based on typical treatment process constraints and facility configuration, this expansion would include the addition of one clarifier to increase solids removal capacity and one recarbonation/ozone basin to maintain adequate treatment capacity and water quality performance at higher flows.

7.4 Pumping & Transmission from McCarrons to Lake Elmo

The 3M settlement plan called for a connecting to SPRWS' distribution system at the site of the 10 MG Hillcrest Ground Storage Reservoir in east St Paul near the Maplewood border. The design called for a booster pump station at the reservoir location and transmission East to Oakdale and Lake Elmo. That same routing was maintained for this analysis. In addition, in the 3M settlement, SPRWS indicated that an additional 10,140 feet of 30" transmission main to reinforce supply to the Hillcrest Reservoir was necessary to maintain normal distribution operations. After reviewing that plan under the WBL Comp study parameters, it was determined that significant additional transmission mains would need to be added to the SPRWS distribution system to supply water to Lake Elmo under the Ultimate MDD conditions.

7.4.1 Pumping to Lake Elmo

The BPS to Lake Elmo is located on the grounds adjacent to the SPRWS Hillcrest Reservoir. The typical HGL at the Hillcrest reservoir is approximately 1016'. The operating HGL of Lake Elmo is 1127.4'. To supply the ultimate MDD demand of 10.44 MGD to Lake Elmo, the BPS calls for 12 MGD firm pumping capacity with 150' of head gain.

7.4.2 Water Main Transmission

The water main required for this alternative consists of 3 segments totaling approximately 49,700 LF (linear feet) or 9.41 miles. The route and transmission main sizing can be seen in Figure 44 below. The SPRWS distribution system reinforcement mains are designed as a single transmission main sized to provide redundancy to the existing SPRWS distribution system, to allow it to supply Lake Elmo. These mains are sized to function within the SPRWS distribution

system. Segment 1 conveys water from the McCarrons discharge lines to approximately the existing Hazel Park Booster Pump Station in SPRWS High Service pressure zone. Segment 2 remains in the High Service pressure zone, and conveys water to the Lake Elmo Booster Pump Station, which is at the site of SPRWS' Hillcrest Reservoir. The Hillcrest Reservoir site is presently only connected by a single isolated 2 mile long 24" main. The 36" main provides redundancy, while the Hillcrest reservoir, provides flexibility in operation of pumping to Lake Elmo. Using the Hazel Park BPS to reduce pipe sizes was considered, but would require a complete reconstruction of the Haze Park BPS, and redesigning how SPRWS operates the eastern half of its distribution system.

The transmission main to Lake Elmo is designed to be fully redundant with the same design metrics as the other transmission mains in this study.

7.4.2.1 Segment 1 – SPRWS Reinforcement Main: SPRWS Connection to Hazel Park BPS

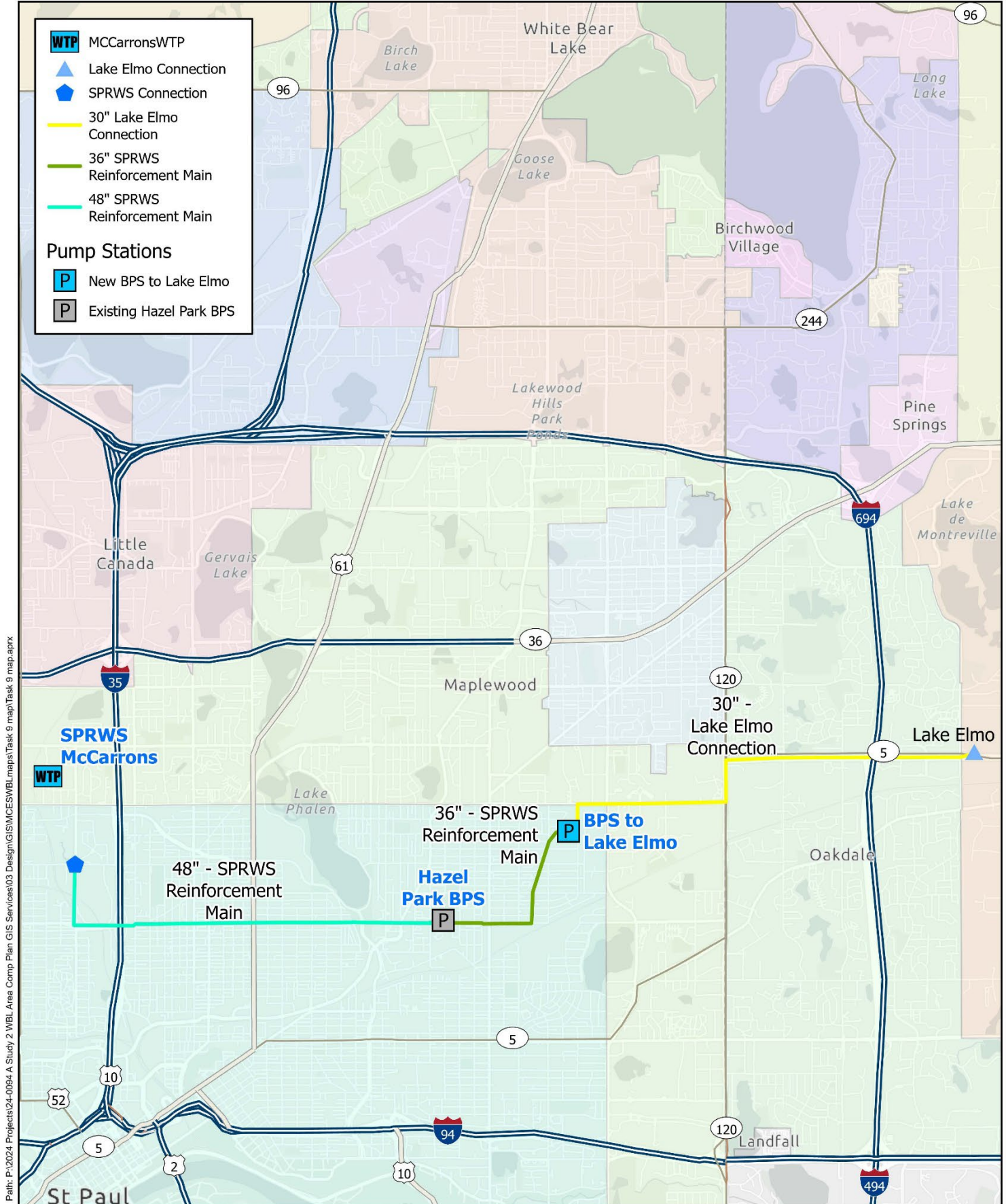
The route departs from the SPRWS connection point at the intersection of Arlington Ave & Jackson St heading south 2,800 linear feet to Maryland Ave & Jackson St with a RR crossing. From Jackson St the main continues east along Maryland Ave E 16,200 linear feet to the SPRWS Hazel Park BPS at Hazelwood St, crossing Hwy I-35E and other major crossings at Edgerton St, Payne Ave, Arcade St, and White Bear Ave. The total length of the route is approximately 19,000 feet (3.6 miles).

7.4.2.2 Segment 2 – SPRWS Reinforcement Main: Hazel Park BPS to Lake Elmo BPS

From the intersection of Maryland Ave E and Hazelwood St, near the SPRWS Hazel Park BPS the route runs east 4,500 linear feet to Maryland Ave & Luella St N, then continues north 4,250 linear feet along Luella St N/Furness Pkwy to Furness Pkwy & Hoyt Ave E, then continuing east 500 linear feet along Hoyt Ave E to the approximate location of the Lake Elmo BPS near the Hillcrest Reservoir. The total length of the route is approximately 9,250 feet (1.75 miles).

7.4.2.3 Segment 3 – Lake Elmo Transmission: Lake Elmo BPS to Lake Elmo Connection

From the Lake Elmo BPS, the route returns ~100 linear ft south to Hoyt Ave E, then proceeding 400 linear feet east to Hoyt Ave E & Winthrop St N. The route then proceeds 1,300 linear feet to Larpenteur Ave E, then proceeding east 6,600 linear feet along Larpenteur Ave E to Geneva Ave N with a major crossing at McKnight Rd N. The route then goes 1,850 linear feet North along Geneva Ave N to 34th St N, then proceeding east 11,300 linear feet along 34th St N to the connection with Lake Elmo at the northeast corner of Ideal Ave N & 34th St N with major crossings at the underpass of Hwy I-694 and Ideal Ave N. The Total Length of the route is approximately 21,450 feet (4.1 miles).



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	N 0 0.5 1 Miles	Project: MCES0 190048 Print Date: 6/12/2026 Map by: gcarleton Projection: NAD 1983 UTM Zone 15N Source: Metropolitan Council, MN DOT, & SEH Inc.	New Surface Water Treatment Plant to Supply Subset of Communities White Bear Lake Area Comp Plan Study 2	Lake Elmo
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7.5 Opinion of Probable Construction and O&M costs to provide water to Lake Elmo

The following table includes the construction costs and O&M costs to provide water to Lake Elmo.

Table 38– Construction and O&M Costs to Provide Water to Lake Elmo

Community/Entity	2050 Scenario Capital Cost	Ultimate Capital Cost	Total	Total Annual O&M Cost
Lake Elmo				
Transmission Main & Pumping	\$ 202,000,000	No Change	\$ 202,000,000	\$ 236,700
SPRWS Expansion	\$ 46,420,000	No Change	\$ 46,420,000	\$ 4,540,000
Fridley Pump Station Expansion	\$ 24,070,000	No Change	\$ 24,070,000	\$ 233,000
TOTAL	\$ 272,490,000	No Change	\$ 272,490,000	\$ 5,009,700
Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.				

8 Evaluation of Alternatives, Conclusion, and Recommendations

8.1 Summary of Costs

Tables 39 and 40 below provide an overview summary of the total implementation costs and O&M costs for both Approach 1 and 2.

Table 39 – APPROACH 1 – SPRWS Expansion to NE Metro Communities

Community/Entity	2050 Expansion Capital Cost	Ultimate Expansion Capital Cost	Total Ultimate Capital Cost	Total Annual O&M Cost
Alternative 1	\$448,355,000	No Change	\$448,355,000	\$7,325,400
Alternative 2	\$457,655,000	No Change	\$457,655,000	\$8,381,000
Alternative 3	\$516,455,000	\$21,830,000	\$538,285,000	\$8,845,100
Alternative 4	\$583,885,000	No Change	\$583,885,000	\$12,665,700
Alternative 5	\$695,055,000	No Change	\$695,055,000	\$4,687,700
Alternative 1 w/Hugo East	\$642,765,000	\$92,840,000	\$735,605,000	\$13,265,300
Alternative 2 w/Hugo East	\$653,865,000	\$92,840,000	\$746,705,000	\$13,421,000
Alternative 3 w/Hugo East	\$716,765,000	\$92,840,000	\$809,605,000	\$14,227,200

Table 40 – APPROACH 2 – New Regional Surface WTP to Supply NE Metro Communities

Community/Entity	2050 Expansion Capital Cost	Ultimate Expansion Capital Cost	Total Ultimate Capital Cost	Total Annual O&M Cost
Alternative 1	\$578,935,000	No Change	\$578,935,000	\$12,447,700
Alternative 2	\$603,185,000	No Change	\$603,185,000	\$13,061,600
Alternative 3	\$642,335,000	No Change	\$642,335,000	\$13,207,400
Alternative 4	\$769,135,000	No Change	\$769,135,000	\$17,857,200
Alternative 5	\$731,935,000	No Change	\$731,935,000	\$7,719,300
Alternative 1 w/Hugo East	\$965,965,000	No Change	\$965,965,000	\$19,156,900
Alternative 2 w/Hugo East	\$998,565,000	No Change	\$998,565,000	\$19,621,100
Alternative 3 w/Hugo East	\$1,036,565,000	No Change	\$1,036,565,000	\$19,692,600

Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

8.2 Comparison of advantages and disadvantages

Table 41 compares the overall advantages and disadvantages of the two approaches evaluated in this study. Approach 1 expands the existing Saint Paul Regional Water Services (SPRWS) system to convey treated surface water to the northeast metro communities, while Approach 2 constructs a new regional surface water treatment plant near the Vadnais chain of lakes to serve the same communities. Both approaches are evaluated across the same community subset alternatives (1 through 5, plus the Hugo East sub-alternatives 1a, 2a, and 3a) and rely on the same Fridley Pump Station and raw water conduit improvements; the primary differences are the source of treated water, the resulting transmission main lengths, and the overall capital and operating costs.

Table 41 – Comparison of Approach 1 and Approach 2 Advantages and Disadvantages

Approach	Capital Cost Range	Annual O&M Range	Advantages	Disadvantages
Approach 1 SPRWS Expansion	\$448M - \$809M	\$4.6M - \$14.2M	Lower capital and operating cost than Approach 2 Uses existing SPRWS system	Longer transmission mains (~40-70 mi); Relies on SPRWS as sole wholesale supplier
Approach 2 New Regional SWTP	\$578M - \$1,036M	\$7.7M - \$19.7M	Shorter mains (~27-52 mi) Dedicated regional plant Independent of the SPRWS	Higher capital and operating cost than Approach 1 New plant must be sited, built, owned, and staffed.

8.3 Comparison of Capital, Labor, and Operation and Maintenance Costs

Table 42 presents a side-by-side comparison of the ultimate capital and annual operation and maintenance (O&M) cost for each alternative under both approaches, including the Hugo East sub-alternatives (1a, 2a, and 3a). For every alternative, Approach 1 (SPRWS Expansion) is lower in both capital and O&M cost than the corresponding Approach 2 (New Regional Surface WTP)

alternative, primarily because Approach 1 uses the existing SPRWS treatment facilities rather than a new regional plant.

Table 42 – Comparison of Approach 1 and Approach 2 Capital and O&M Costs by Alternative

Alternative	Approach 1 Capital	Approach 1 O&M	Approach 2 Capital	Approach 2 O&M	Lower-Cost Approach
1	\$448.3M	\$7.3M	\$578.9M	\$12.4M	Approach 1
2	\$457.6M	\$8.3M	\$603.1M	\$13.0M	Approach 1
3	\$538.2M	\$8.8M	\$642.3M	\$13.2M	Approach 1
4	\$583.8M	\$12.6M	\$769.1M	\$17.8M	Approach 1
5	\$695.0M	\$4.6M	\$731.9M	\$7.7M	Approach 1
1a	\$735.6M	\$13.2M	\$965.9M	\$19.1M	Approach 1
2a	\$746.7M	\$13.4M	\$998.5M	\$19.6M	Approach 1
3a	\$809.6M	\$14.2M	\$1,036.5M	\$19.6M	Approach 1

Note: Capital costs reflect ultimate development conditions. Approach 2 costs include the new regional treatment plant; both approaches include the same Fridley Pump Station and raw water conduit improvements.

Table 43 presents costs for each alternative compared to average annual water demand served by each alternative. This comparison also shows Approach 1 to be a more cost-effective approach as compared to Approach 2.

Table 43– Comparison of Cost per Water Provided by Alternative

Alternative	Capital Costs	Annual O&M Costs	Average Day Demand (MGD)	Average Annual Demand (MG)	Approximate Capital Cost per Million Gallons (\$/MG)
Approach 1					
1	\$448.3M	\$7.3M	7.6	2,774	\$161,600
2	\$457.6M	\$8.3M	8.6	3,139	\$145,800
3	\$538.2M	\$8.8M	9.1	3,322	\$162,000
4	\$583.8M	\$12.6M	13.4	4,891	\$119,400
5	\$695.0M	\$4.6M	4.6	1,679	\$414,000
1a (w/ Hugo East)	\$735.6M	\$13.2M	13.0	4,745	\$155,000
2a (w/ Hugo East)	\$746.7M	\$13.4M	14.0	5,110	\$146,100
3a (w/ Hugo East)	\$809.6M	\$14.2M	14.5	5,293	\$153,000
Approach 2					

Alternative	Capital Costs	Annual O&M Costs	Average Day Demand (MGD)	Average Annual Demand (MG)	Approximate Capital Cost per Million Gallons (\$/MG)
1	\$574.5M	\$12.4M	7.6	2,774	\$208,700
2	\$598.8M	\$13.0M	8.6	3,139	\$192,200
3	\$637.9M	\$13.2M	9.1	3,322	\$193,400
4	\$764.7M	\$17.8M	13.4	4,891	\$157,300
5	\$727.5M	\$7.7M	4.6	1,679	\$435,900
1a (w/ Hugo East)	\$961.6M	\$19.1M	13.0	4,745	\$203,600
2a (w/ Hugo East)	\$994.2M	\$19.6M	14.0	5,110	\$195,400
3a (w/ Hugo East)	\$1,032.2M	\$19.6M	14.5	5,293	\$195,800

Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

8.4 Conclusion & Recommendations

All the evaluated scenarios accomplish the primary goal of conserving and recharging groundwater in the northeast metro communities. Overall, Approach 1 is the preferred recommendation due to significantly lower capital and lifecycle costs capable by leveraging existing infrastructure. Higher-cost alternatives (particularly Alternative 4 and Hugo East scenarios) provide broader regional groundwater benefits but require larger system expansions. In addition to utilizing existing infrastructure, expanding the SPRWS takes advantage of operational efficiency and expertise, optimizes regional resources, and provides greater regulatory and funding strength. Future treatment upgrades if needed for PFAS or other emerging contaminants could be implemented more easily and at lower cost.

If maximizing long-term regional resilience was the primary objective, Approach 2 provides a strategic advantage with the construction of a new surface WTP. While not included in this evaluation, additional interconnections could be added to the new surface water treatment plant to support emergency supply to other communities in the region, including with SPRWS.

This study recommends expanding the Fridley Pump Station to either 100 MGD for Alternatives 1-5 or 130 MGD for Alternatives 1a-3a with Hugo East by constructing a new adjacent pump station (\$29.1M–\$35.0M). As the raw water supply is currently limited by conveyance capacity, a third 60-inch raw water conduit is recommended for redundancy at 100 MGD and required for 130 MGD, with an estimated cost of approximately \$122M.

Appendix A

Transmission System Cost Estimating Methodology

MEMORANDUM

DATE: June 2026

RE: White Bear Lake Study 2 Transmission Main System Cost Estimating Methodology

This memorandum summarizes the cost estimating methodology used in estimating costs for the transmission main systems, including water main and booster pump stations. Precise cost estimating at a study phase level can be challenging. To develop costs for this study, bid prices and cost estimates from a variety of recent projects were analyzed. Data sources included MnDOT Bid Price as well as a number of recent water main and booster station projects completed by the consulting engineers' team. Prices are based on the engineer's best knowledge at the time of preparation. The accuracy is a function of economic conditions and external influence that can fluctuate greatly.

With the exception of crossings below railroads or major highways, costs assume all water main is to be installed via open-cut construction. To determine the basis for the water main installation unit costs, the proposed alignments were considered and each segment classified into one of three categories:

- Watermain installed 100% under the roadway
- Watermain installed 50% under the roadway
- Watermain installed 0% under the roadway

Unit costs (per linear feet) were then developed for each of the three categories, for each main size included in the study. Water main sizes ranged from 12-inch diameter up to 60-inch diameter. The costs associated with each main size and each category were evaluated and a linear foot cost defined based on the percentage of the water main to be installed under the roadway. The costs for watermain installed under the roadway include costs for the watermain, removal of existing roadway, excavation, backfill and full replacement of the roadway impacted.

In addition to the water main costs, valves, fittings, and other pipe appurtenances were assumed at 50% of the water main costs based on evaluation of recent projects. Several other undefined costs associated with watermain installation exist and are not easily determined. These costs include other trenching or dewatering costs, other pavement removal and replacement costs (such as for neighboring drives), conflicts with the proposed alignments, traffic control, allowances, and other construction activity costs. These costs make up the majority of the project costs and are unknown without a significant effort. In order to estimate these costs, similar projects that were recently bid were reviewed and total project costs compared to the length of watermain installed. Each relevant bid item was reviewed and the prices were removed from the project if they were accounted for in the defined costs listed above. This method provided a unit price per foot for these undefined costs.

All railroad crossings were assumed to be jack and bore installations, with the length per crossing determined by analyzing the proposed pipeline alignments. Crossings below major roads were assumed to be installed by horizontal directional drilling (HDD) for pipes up to a 30-inch diameter. All crossings for larger pipe were assumed to be completed by jack and bore installations. Costs for drilling pads/pits were

also accounted for dependent on the number of locations where HDD or jack and bore installation is required along each proposed alignment.

A cost for easements/land acquisition was assigned to all locations where pipe is proposed to be installed outside of existing roadway rights-of-way. Based on discussions with communities included in this project, and Engineer's knowledge of recent projects, a cost of \$6 per square foot was assumed for easements/land acquisition. The actual costs can be very site specific, but the assumed \$6 per square foot is a conservative estimate that was applied to any watermain proposed to be installed either 50% or 0% in the roadway. A 40 feet wide easement/land acquisition was assumed, equating to a cost of \$240 per linear feet of watermain where applicable.

The tables below summarize unit cost by pipe diameter and classification. All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

12-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 575	\$ 425	\$ 225
Water Main (HDD)	LF	\$ 425	\$ 425	\$ 425
Water Main (Jack and Bore)	LF	\$ 1,360	\$ 1,360	\$ 1,360
Drilling Pads/Pits	EA	\$ 63,750	\$ 63,750	\$ 63,750
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 104	\$ 91	\$ 74

16-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 625	\$ 475	\$ 275
Water Main (HDD)	LF	\$ 500	\$ 500	\$ 500
Water Main (Jack and Bore)	LF	\$ 1,600	\$ 1,600	\$ 1,600
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Mobilization and Misc. Site Restoration	LF	\$ 123	\$ 108	\$ 88

18-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 650	\$ 500	\$ 300
Water Main (HDD)	LF	\$ 540	\$ 540	\$ 540
Water Main (Jack and Bore)	LF	\$ 1,728	\$ 1,728	\$ 1,728
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 132	\$ 116	\$ 95

20-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 690	\$ 540	\$ 340
Water Main (HDD)	LF	\$ 583	\$ 583	\$ 583
Water Main (Jack and Bore)	LF	\$ 1,866	\$ 1,866	\$ 1,866
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 143	\$ 125	\$ 102

24-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
	Unit	100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 770	\$ 620	\$ 420
Water Main (HDD)	LF	\$ 630	\$ 630	\$ 630
Water Main (Jack and Bore)	LF	\$ 2,016	\$ 2,016	\$ 2,016
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 154	\$ 135	\$ 110

30-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,000	\$ 850	\$ 600
Water Main (Jack and Bore)	LF	\$ 2,378	\$ 2,378	\$ 2,378
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 182	\$ 160	\$ 130

36-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,150	\$ 1,000	\$ 750
Water Main (Jack and Bore)	LF	\$ 2,735	\$ 2,735	\$ 2,735
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 209	\$ 184	\$ 150

42-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,400	\$ 1,200	\$ 900
Water Main (Jack and Bore)	LF	\$ 2,954	\$ 2,954	\$ 2,954
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 226	\$ 198	\$ 162

48-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,600	\$ 1,400	\$ 1,100
Water Main (Jack and Bore)	LF	\$ 3,190	\$ 3,190	\$ 3,190
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 244	\$ 214	\$ 174

54-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,800	\$ 1,600	\$ 1,300
Water Main (Jack and Bore)	LF	\$ 3,445	\$ 3,445	\$ 3,445
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 264	\$ 231	\$ 188

60-inch

ITEM DESCRIPTION	UNIT	ZONE CLASSIFICATION		
		100% in roadway	50% in roadway	0% in roadway
Water Main (Open-Cut)	LF	\$ 1,900	\$ 1,700	\$ 1,400
Water Main (Jack and Bore)	LF	\$ 3,721	\$ 3,721	\$ 3,721
Drilling Pads/Pits	EA	\$ 75,000	\$ 75,000	\$ 75,000
Easements/Land Acquisition (\$6, SF, 40 ft wide)	LF	\$ 240	\$ 240	\$ 240
Misc. Site Restoration	LF	\$ 285	\$ 250	\$ 203

Hydraulic modeling was performed for each scenario to determine the most cost-effective way to convey water to each community served in the scenario while also maintaining desired pie velocities and pressures in the transmission main. The recommended solution for individual scenarios includes a combination of inline pressure booster stations along the transmission main and booster stations and/or pressure reducing valves at the connection to individual community feeds. The need for booster stations and/or pressure reducing valves at the community feed points was determined by examining the hydraulic grade line of the system to which the connection is to be made.

Based on the required flow rates and pressure boost needed, the approximate horsepower of pumping was calculated for each booster station. This sizing of pumps was then used for calculating costs for the booster stations. Booster station costs include estimated costs for the pumps, as well as estimated cost for a booster station building; piping, valves and appurtenances; electrical and controls; an emergency generator, and earthwork/site civil improvements at the booster station.

Estimated yearly operation and maintenance costs include the following: Based on previous project experience, 3% of the capital costs for the pumping equipment is used to determine the costs in the "Equipment Maintenance" totals to cover items such as pump seal replacement or other typical equipment upkeep costs. A general amount of \$3,500 was assumed for heating the building and another \$3000 was identified for other miscellaneous building costs. The "Operator Costs" are based on an assumed 4 hours per week of time and an hourly cost of \$80. The pumping energy costs assumed the pumps were 75% efficient at pumping the average daily flow and a KW-hr cost of \$0.17, and pumped on average 12 hours per day. The following table outlines the probable costs of operation and maintenance in 2026 dollars.

The following tables summarize estimated booster station costs, as well as estimated annual operations and maintenance costs for each booster station included in each scenario. All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

					Estimated Cost							O&M Costs					
Location	Scenario	Ultimate Max Day Demand (MGD)	TDH for Booster Pump(s) (ft)	Estimated Booster Pump Sizing (HP)	Pumps	Booster Station Building	Piping, Valves, Appurtenances	Electrical and Controls	Emergency Generator	Earthwork/ Site Civil	Total	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Approach 1												Approach 1					
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 1	18.8	115	510	\$ 160,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 300,000	\$ 195,000	\$ 2,824,000	\$ 283,000	\$ 4,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 311,300
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 1	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi	Approach 1 - Alt 1	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 1 (Hugo)	48.9	115	1,320	\$ 350,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 350,000	\$ 226,000	\$ 4,031,000	\$ 733,000	\$ 10,500	\$ 17,000	\$ 3,500	\$ 3,000	\$ 767,000
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 1a (Hugo)	7.3	35	60	\$ 67,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 90,000	\$ 177,000	\$ 2,047,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi	Approach 1 - Alt 1a (Hugo)	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Hugo East Connection Booster Station	Approach 1 - Alt 1a (Hugo)	30.1	104	740	\$ 200,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,271,000	\$ 411,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 440,500
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 2	21.1	130	650	\$ 195,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 300,000	\$ 195,000	\$ 2,859,000	\$ 361,000	\$ 5,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 390,400
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 2	7.3	45	80	\$ 80,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,080,000	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	Approach 1 - Alt 2	5.3	105	140	\$ 105,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,105,000	\$ 78,000	\$ 3,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 104,700
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 2a (Hugo)	51.2	115	1,380	\$ 355,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 350,000	\$ 226,000	\$ 4,036,000	\$ 767,000	\$ 10,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 801,200
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 2a (Hugo)	7.3	45	80	\$ 80,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,080,000	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	Approach 1 - Alt 2a (Hugo)	5.2	100	130	\$ 98,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,098,000	\$ 72,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 98,400
Higo East Connection Booster Station	Approach 1 - Alt 2a (Hugo)	30.1	109	770	\$ 200,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,271,000	\$ 428,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 457,500
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 3	22.7	105	560	\$ 200,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,271,000	\$ 311,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 340,500
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 3	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi	Approach 1 - Alt 3	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Shoreview Inline Combo BPS																	
East to North Oaks	Approach 1 - Alt 3	3.9	120	110	\$ 90,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 110,000	\$ 169,000	\$ 1,586,000	\$ 61,000	\$ 2,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 87,200
North Oaks Connection Booster Station	Approach 1 - Alt 3	3.9	48	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 3 (Hugo)	48.9	100	1,150	\$ 335,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 330,000	\$ 226,000	\$ 3,996,000	\$ 639,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 672,600
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 3a (Hugo)	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi	Approach 1 - Alt 3a (Hugo)	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Shoreview Inline Combo BPS																	
East to North Oaks	Approach 1 - Alt 3a (Hugo)	3.9	120	110	\$ 90,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 110,000	\$ 169,000	\$ 1,586,000	\$ 61,000	\$ 2,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 87,200
North Oaks Connection Booster Station	Approach 1 - Alt 3a (Hugo)	3.9	46	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 4	21	110	550	\$ 180,000	\$ 756,000	\$ 1,164,000	\$ 375,000	\$ 300,000	\$ 195,000	\$ 2,970,000	\$ 306,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 334,900
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 1 - Alt 4	7.3	45	80	\$ 80,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,080,000	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	Approach 1 - Alt 4	5.3	100	130	\$ 90,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,090,000	\$ 72,000	\$ 2,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 98,200
North Oaks Shoreview Inline Combo BPS																	
Inline Booster Station West to Shoreview	Approach 1 - Alt 4	8.0	75	5	\$ 35,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 75,000	\$ 177,000	\$ 2,000,000	\$ 3,000	\$ 1,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 27,600

					Estimated Cost							O&M Costs					
Location	Scenario	Ultimate Max Day Demand (MGD)	TDH for Booster Pump(s) (ft)	Estimated Booster Pump Sizing (HP)	Pumps	Booster Station Building	Piping, Valves, Appurtenances	Electrical and Controls	Emergency Generator	Earthwork/ Site Civil	Total	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster Station East to North Oaks	Approach 1 - Alt 4	3.9	100	100	\$ 87,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 110,000	\$ 169,000	\$ 1,583,000	\$ 56,000	\$ 2,600	\$ 17,000	\$ 3,500	\$ 3,000	\$ 82,100
North Oaks Connection Booster Station	Approach 1 - Alt 4	3.9	62	60	\$ 67,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,543,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Shoreview Connection Booster Station	Approach 1 - Alt 4	8	29	60	\$ 67,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 90,000	\$ 177,000	\$ 2,047,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 1 - Alt 5	13.3	130	410	\$ 180,000	\$ 630,000	\$ 1,058,000	\$ 341,000	\$ 300,000	\$ 186,000	\$ 2,695,000	\$ 228,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 256,900
White Bear Lake Connection Booster Station	Approach 1 - Alt 5	7.3	39	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800

					Estimated Cost							O&M Costs					
Location	Scenario	Ultimate Max Day Demand (MGD)	TDH for Booster Pump(s)	Estimated Booster Pump Sizing (HP)	Pumps	Booster Station Building	Piping, Valves, Appurtenances	Electrical and Controls	Emergency Generator	Earthwork/ Site Civil	Total	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Approach 2												Approach 2					
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 1	18.8	100	440	\$ 180,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 300,000	\$ 195,000	\$ 2,844,000	\$ 244,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 272,900
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 1	7.3	35	60	\$ 67,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 90,000	\$ 177,000	\$ 2,047,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi	Approach 2 - Alt 1	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 1a (Hugo)	48.9	100	1,150	\$ 335,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 330,000	\$ 226,000	\$ 3,996,000	\$ 639,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 672,600
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 1a (Hugo)	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline to Mahtomedi	Approach 2 - Alt 1a (Hugo)	3.0	65	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Higo East Connection Booster Station	Approach 2 - Alt 1a (Hugo)	30.1	110	780	\$ 190,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,261,000	\$ 433,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 462,200
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 2	21.1	75	370	\$ 230,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 120,000	\$ 195,000	\$ 2,714,000	\$ 206,000	\$ 6,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 236,400
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 2	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	Approach 2 - Alt 2	5.3	95	120	\$ 95,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,095,000	\$ 67,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 93,400
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 2 (Hugo)	51.2	100	1,200	\$ 335,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 330,000	\$ 226,000	\$ 3,996,000	\$ 667,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 700,600
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 2a (Hugo)	7.3	45	80	\$ 80,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,080,000	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	Approach 2 - Alt 2a (Hugo)	5.2	100	130	\$ 98,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,098,000	\$ 72,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 98,400
Higo East Connection Booster Station	Approach 2 - Alt 2a (Hugo)	30.1	107	760	\$ 190,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,261,000	\$ 422,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 451,200
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 3	18.8	55	250	\$ 220,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 110,000	\$ 195,000	\$ 2,694,000	\$ 139,000	\$ 6,600	\$ 17,000	\$ 3,500	\$ 3,000	\$ 169,100
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 3	7.3	35	60	\$ 67,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 90,000	\$ 177,000	\$ 2,047,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi	Approach 2 - Alt 3	3.0	60	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Connection Booster Station	Approach 2 - Alt 3	3.9	57	60	\$ 67,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,543,000	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 3 (Hugo)	48.9	55	630	\$ 190,000	\$ 915,000	\$ 1,691,000	\$ 499,000	\$ 300,000	\$ 226,000	\$ 3,821,000	\$ 350,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 379,200
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 3a (Hugo)	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi	Approach 2 - Alt 3a (Hugo)	3.0	65	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Connection Booster Station	Approach 2 - Alt 3a (Hugo)	3.9	71	70	\$ 75,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 110,000	\$ 169,000	\$ 1,571,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Hugo East Connection Booster Station	Approach 2 - Alt 3a (Hugo)	30.1	108	770	\$ 200,000	\$ 756,000	\$ 1,397,000	\$ 413,000	\$ 300,000	\$ 205,000	\$ 3,271,000	\$ 428,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 457,500
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 4	21	70	350	\$ 240,000	\$ 630,000	\$ 1,164,000	\$ 375,000	\$ 110,000	\$ 195,000	\$ 2,714,000	\$ 194,000	\$ 7,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 224,700
White Bear Lake Inline Combo BPS																	
White Bear Lake Connection Booster Station	Approach 2 - Alt 4	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	Approach 2 - Alt 4	5.3	95	120	\$ 95,000	\$ 521,000	\$ 882,000	\$ 282,000	\$ 110,000	\$ 177,000	\$ 2,067,000	\$ 67,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 93,400
North Oaks Connection Booster Station	Approach 2 - Alt 4	3.9	53	50	\$ 60,000	\$ 347,000	\$ 588,000	\$ 282,000	\$ 90,000	\$ 169,000	\$ 1,536,000	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Inline Booster (Goose Lake Rd /Labore Rd)	Approach 2 - Alt 5	13.3	60	190	\$ 200,000	\$ 630,000	\$ 1,058,000	\$ 341,000	\$ 110,000	\$ 186,000	\$ 2,525,000	\$ 106,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 135,500
White Bear Lake Connection Booster Station	Approach 2 - Alt 5	7.3	40	70	\$ 75,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,075,000	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800

					Estimated Cost							O&M Costs					
Location	Scenario	Ultimate Max Day Demand (MGD)	TDH for Booster Pump(s)	Estimated Booster Pump Sizing (HP)	Pumps	Booster Station Building	Piping, Valves, Appurtenances	Electrical and Controls	Emergency Generator	Earthwork/ Site Civil	Total	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
SPWRS to Lake Elmo												SPWRS to Lake Elmo					
Inline Booster Station to Lake Elmo	SPWRS to Lake Elmo	10.4	150	370	\$ 240,000	\$ 521,000	\$ 882,000	\$ 310,000	\$ 110,000	\$ 177,000	\$ 2,240,000	\$ 206,000	\$ 7,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 236,700

Connections to community systems that do not include a booster station are proposed to be above grade structures with flow meters, pressure reducing valves, and controls and telemetry to allow the inlet valve to communicate with the community system's distribution system (either elevated water storage level or system pressure) to control flow.

Detailed cost estimates for transmission watermain systems for each alternative, indicating overall watermain length and classification, booster stations and connections to community water distribution systems are included as a separate Appendix.

https://sehincazure-my.sharepoint.com/personal/clarson_sehinc_com/documents/mces wbl study 2 shared folder/working folder/report appendices/app a - transmission system cost estimating methodology memo.docx

Appendix B

Detailed Transmission System Cost Estimates, Approach 1 (Task 4)

APPENDIX B – Detailed Transmission System Cost Estimates, Approach 1

Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations

APPROACH 1, ALTERNATIVE 1				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	9,400	\$2,585,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	9,400	\$823,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 20-inch - 100% in Road	LF	\$ 690	2,000	\$1,380,000
Misc. Site Restoration, 20-inch - 100% in Road	LF	\$ 143	2,000	\$286,000
Water Main (Open-Cut), 20-inch - 0% in Road	LF	\$ 340	3,900	\$1,326,000
Misc. Site Restoration, 20-inch - 0% in Road	LF	\$ 102	3,900	\$398,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	30,800	\$35,420,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	30,800	\$6,450,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	5,300	\$3,975,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	5,300	\$793,000
Miscellaneous Pipeline Costs	LF	\$ 10	69,750	\$698,000
Easements	LF	\$ 240	42,250	\$10,140,000
Water Main (HDD), 20-inch - Hwy 61 crossing	LF	\$ 583	250	\$146,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 Crossing	LF	\$ 2,735	300	\$821,000
Water Main (Jack and Bore), 36-inch - Hwy 36 Crossing	LF	\$ 2,735	325	\$889,000
Water Main (Jack and Bore), 36-inch - Hwy 35E Crossing	LF	\$ 2,735	375	\$1,026,000
Drilling Pads/Pits	EA	\$ 75,000	9	\$675,000

Transmission System Cost Estimates
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SUBTOTAL - SINGLE MAINS				\$84,751,000
SUBTOTAL - DUAL MAINS				\$ 169,502,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,824,000	1	\$2,824,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
Connection to Local Municipality System	EA	\$ 675,000	5	\$3,375,000
SUBTOTAL - CONSTRUCTION				\$179,312,000
CONTINGENCY (20%)				\$35,862,400
ENGINEERING/ADMIN/LEGAL (20%)				\$35,862,400
GRAND TOTAL				\$251,100,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 283,000	\$ 4,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 311,300
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
TOTAL	\$ 350,000	\$ 8,900	\$ 51,000	\$ 10,500	\$ 9,000	\$ 429,400

APPROACH 1, ALTERNATIVE 1a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	6,900	\$1,898,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	6,900	\$604,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	2,000	\$3,200,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	2,000	\$489,000
Water Main (Open-Cut), 48-inch - 0% in Road	LF	\$ 1,100	3,900	\$4,290,000
Misc. Site Restoration, 48-inch - 0% in Road	LF	\$ 174	3,900	\$680,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	30,800	\$55,440,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	30,800	\$8,125,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	4,500	\$7,200,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	4,500	\$1,042,000
Water Main (Open-Cut), 54-inch - 0% in Road	LF	\$ 1,300	5,300	\$6,890,000
Misc. Site Restoration, 54-inch - 0% in Road	LF	\$ 188	5,300	\$999,000
Miscellaneous Pipeline Costs	LF	\$ 10	99,750	\$998,000
Easements	LF	\$ 240	58,850	\$14,124,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000

Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000
Water Main (Jack and Bore), 48-inch - Hwy 61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000
Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy 61 Crossing	LF	\$ 3,445	300	\$1,034,000
Water Main (Jack and Bore), 54-inch - Hwy 36 Crossing	LF	\$ 3,445	325	\$1,120,000
Water Main (Jack and Bore), 54-inch - Hwy 35E Crossing	LF	\$ 3,445	375	\$1,292,000
Drilling Pads/Pits	EA	\$ 75,000	11	\$825,000
SUBTOTAL - SINGLE MAINS				\$166,112,000
SUBTOTAL - DUAL MAINS				\$332,224,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 4,031,000	1	\$4,031,000
White Bear Lake Connection Booster Station	LS	\$ 2,047,000	1	\$2,047,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
Hugo East Connection Booster Station	LS	\$ 3,271,000	1	\$3,271,000
Connection to Local Municipality System	EA	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$347,159,000
CONTINGENCY (20%)				\$69,431,800
ENGINEERING/ADMIN/LEGAL (20%)				\$69,431,800
GRAND TOTAL				\$486,100,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 733,000	\$ 10,500	\$ 17,000	\$ 3,500	\$ 3,000	\$ 767,000
White Bear Lake Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Hugo East Connection Booster Station	\$ 411,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 440,500
TOTAL	\$ 1,205,000	\$ 20,300	\$ 68,000	\$ 14,000	\$ 12,000	\$ 1,319,300

APPROACH 1, ALTERNATIVE 2				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	9,400	\$2,585,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	9,400	\$823,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 20-inch - 100% in Road	LF	\$ 690	2,000	\$1,380,000
Misc. Site Restoration, 20-inch - 100% in Road	LF	\$ 143	2,000	\$286,000
Water Main (Open-Cut), 20-inch - 0% in Road	LF	\$ 340	3,900	\$1,326,000
Misc. Site Restoration, 20-inch - 0% in Road	LF	\$ 102	3,900	\$398,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	30,800	\$35,420,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	30,800	\$6,450,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	5,300	\$3,975,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	5,300	\$793,000
Miscellaneous Pipeline Costs	LF	\$ 10	77,450	\$775,000
Easements	LF	\$ 240	42,250	\$10,140,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (HDD), 20-inch - Hwy 61 crossing	LF	\$ 583	250	\$146,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 Crossing	LF	\$ 2,735	300	\$821,000
Water Main (Jack and Bore), 36-inch - Hwy 36 Crossing	LF	\$ 2,735	325	\$889,000
Water Main (Jack and Bore), 36-inch - Hwy 35E Crossing	LF	\$ 2,735	375	\$1,026,000

Drilling Pads/Pits	EA	\$ 75,000	10	\$750,000
SUBTOTAL - SINGLE MAINS				\$87,421,000
SUBTOTAL - DUAL MAINS				\$174,842,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,859,000	1	\$2,859,000
White Bear Lake Connection Booster Station	LS	\$ 2,080,000	1	\$2,080,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,105,000	1	\$2,105,000
Connection to Local Municipality System	EA	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$185,936,000
CONTINGENCY (20%)				\$37,187,200
ENGINEERING/ADMIN/LEGAL (20%)				\$37,187,200
GRAND TOTAL				\$260,400,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 361,000	\$ 5,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 390,400
White Bear Lake Connection Booster Station	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	\$ 78,000	\$ 3,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 104,700
TOTAL	\$ 483,000	\$ 11,500	\$ 51,000	\$ 10,500	\$ 9,000	\$ 565,000

APPROACH 1, ALTERNATIVE 2a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	6,900	\$2,070,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	6,900	\$652,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 48-inch - 0% in Road	LF	\$ 1,100	3,900	\$4,290,000
Misc. Site Restoration, 48-inch - 0% in Road	LF	\$ 174	3,900	\$680,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	32,800	\$59,040,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	32,800	\$8,652,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	4,500	\$7,200,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	4,500	\$1,042,000
Water Main (Open-Cut), 54-inch - 0% in Road	LF	\$ 1,300	5,300	\$6,890,000
Misc. Site Restoration, 54-inch - 0% in Road	LF	\$ 188	5,300	\$999,000
Miscellaneous Pipeline Costs	LF	\$ 10	107,450	\$1,075,000
Easements	LF	\$ 240	58,850	\$14,124,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000
Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000

Water Main (Jack and Bore), 48-inch - Hwy 61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000
Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy 61 Crossing	LF	\$ 3,445	300	\$1,034,000
Water Main (Jack and Bore), 54-inch - Hwy 36 Crossing	LF	\$ 3,445	325	\$1,120,000
Water Main (Jack and Bore), 54-inch - Hwy 35E Crossing	LF	\$ 3,445	375	\$1,292,000
Drilling Pads/Pits	EA	\$ 75,000	12	\$900,000
SUBTOTAL - SINGLE MAINS				\$169,440,000
SUBTOTAL - DUAL MAINS				\$338,880,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 4,036,000	1	\$4,036,000
White Bear Lake Connection Booster Station	LS	\$ 2,080,000	1	\$2,080,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,098,000	1	\$2,098,000
Higo East Connection Booster Station	LS	\$ 3,271,000	1	\$3,271,000
Connection to Local Municipality System	EA	\$ 675,000	7	\$4,725,000
SUBTOTAL - CONSTRUCTION				\$355,090,000
CONTINGENCY (20%)				\$71,018,000
ENGINEERING/ADMIN/LEGAL (20%)				\$71,018,000
GRAND TOTAL				\$497,200,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 361,000	\$ 5,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 390,400
White Bear Lake Connection Booster Station	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	\$ 78,000	\$ 3,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 104,700
TOTAL	\$ 483,000	\$ 11,500	\$ 51,000	\$ 10,500	\$ 9,000	\$ 565,000

APPROACH 1, ALTERNATIVE 3				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	17,400	\$4,785,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	17,400	\$1,523,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	20,000	\$6,000,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	20,000	\$1,890,000
Water Main (Open-Cut), 20-inch - 100% in Road	LF	\$ 690	2,000	\$1,380,000
Misc. Site Restoration, 20-inch - 100% in Road	LF	\$ 143	2,000	\$286,000
Water Main (Open-Cut), 20-inch - 0% in Road	LF	\$ 340	3,900	\$1,326,000
Misc. Site Restoration, 20-inch - 0% in Road	LF	\$ 102	3,900	\$398,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	5,300	\$3,975,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	5,300	\$793,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	26,200	\$36,680,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	26,200	\$5,925,000
Miscellaneous Pipeline Costs	LF	\$ 10	100,750	\$1,008,000
Easements	LF	\$ 240	45,250	\$10,860,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000
Water Main (HDD), 20-inch - Hwy 61 crossing - Hwy 61 crossing	LF	\$ 583	250	\$146,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000

Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000
Water Main (Jack and Bore), 18-inch - RR Crossing	LF	\$ 1,728	100	\$173,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 Crossing - Hwy 61 crossing	LF	\$ 2,735	300	\$821,000
Water Main (Jack and Bore), 42-inch - Hwy 36 Crossing	LF	\$ 2,954	325	\$960,000
Water Main (Jack and Bore), 42-inch - Hwy 35E Crossing	LF	\$ 2,954	375	\$1,108,000
Drilling Pads/Pits	EA	\$ 75,000	13	\$975,000
SUBTOTAL - SINGLE MAINS				\$106,956,000
SUBTOTAL - DUAL MAINS				\$213,912,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 3,271,000	1	\$3,271,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
East to North Oaks	LS	\$ 1,586,000	1	\$1,586,000
North Oaks Connection Booster Station	LS	\$ 1,536,000	1	\$1,536,000
Connection to Local Municipality System	EA	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$227,966,000
CONTINGENCY (20%)				\$45,593,200
ENGINEERING/ADMIN/LEGAL (20%)				\$45,593,200
GRAND TOTAL				\$319,200,000

APPROACH 1, ALTERNATIVE 3a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	14,900	\$4,098,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	14,900	\$1,304,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	12,300	\$3,690,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	12,300	\$1,162,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	6,600	\$11,880,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	6,600	\$1,741,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	4,500	\$7,200,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	4,500	\$1,042,000
Water Main (Open-Cut), 54-inch - 0% in Road	LF	\$ 1,300	9,200	\$11,960,000
Misc. Site Restoration, 54-inch - 0% in Road	LF	\$ 188	9,200	\$1,733,000
Water Main (Open-Cut), 60-inch - 100% in Road	LF	\$ 1,900	26,200	\$49,780,000
Misc. Site Restoration, 60-inch - 100% in Road	LF	\$ 285	26,200	\$7,464,000
Miscellaneous Pipeline Costs	LF	\$ 10	96,850	\$969,000
Easements	LF	\$ 240	61,850	\$14,844,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000

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Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000
Water Main (Jack and Bore), 18-inch - RR Crossing	LF	\$ 1,728	100	\$173,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000
Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000
Water Main (Jack and Bore), 48-inch - Hwy 61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	3,190	\$10,177,000
Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy 61 crossing	LF	\$ 3,445	300	\$1,034,000
Water Main (Jack and Bore), 60-inch - Hwy 36 Crossing	LF	\$ 3,721	325	\$1,209,000
Water Main (Jack and Bore), 60-inch - Hwy 35E Crossing	LF	\$ 3,721	375	\$1,395,000
Drilling Pads/Pits	EA	\$ 75,000	15	\$1,125,000
SUBTOTAL - SINGLE MAINS				\$192,294,000
SUBTOTAL - DUAL MAINS				\$384,588,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 3,996,000	1	\$3,996,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
East to North Oaks	LS	\$ 1,586,000	1	\$1,586,000
North Oaks Connection Booster Station	LS	\$ 1,536,000	1	\$1,536,000
Connection to Local Municipality System	EA	\$ 675,000	7	\$4,725,000
SUBTOTAL - CONSTRUCTION				\$400,042,000
CONTINGENCY (20%)				\$80,008,400
ENGINEERING/ADMIN/LEGAL (20%)				\$80,008,400
GRAND TOTAL				\$560,100,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 639,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 672,600
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
East to North Oaks	\$ 61,000	\$ 2,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 87,200
North Oaks Connection Booster Station	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
TOTAL	\$ 795,000	\$ 18,700	\$ 85,000	\$ 17,500	\$ 15,000	\$ 931,200

APPROACH 1, ALTERNATIVE 4				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	10,500	\$2,888,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	10,500	\$919,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	6,900	\$2,070,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	6,900	\$652,000
Water Main (Open-Cut), 20-inch - 100% in Road	LF	\$ 690	2,000	\$1,380,000
Misc. Site Restoration, 20-inch - 100% in Road	LF	\$ 143	2,000	\$286,000
Water Main (Open-Cut), 20-inch - 0% in Road	LF	\$ 340	3,900	\$1,326,000
Misc. Site Restoration, 20-inch - 0% in Road	LF	\$ 102	3,900	\$398,000
Water Main (Open-Cut), 24-inch - 0% in Road	LF	\$ 420	5,200	\$2,184,000
Misc. Site Restoration, 24-inch - 0% in Road	LF	\$ 110	5,200	\$573,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	21,500	\$12,900,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	21,500	\$2,796,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	5,300	\$3,975,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	5,300	\$793,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	26,200	\$41,920,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	26,200	\$6,399,000
Miscellaneous Pipeline Costs	LF	\$ 10	105,950	\$1,060,000
Easements	LF	\$ 240	45,250	\$10,860,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000

Water Main (HDD), 20-inch - Hwy 61 crossing	LF	\$ 583	250	\$146,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	300	\$714,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 crossing	LF	\$ 2,735	300	\$821,000
Water Main (Jack and Bore), 48-inch - Hwy 36 Crossing	LF	\$ 3,190	325	\$1,037,000
Water Main (Jack and Bore), 48-inch - Hwy 35E Crossing	LF	\$ 3,190	375	\$1,196,000
Drilling Pads/Pits	EA	\$ 75,000	15	\$1,125,000
SUBTOTAL - SINGLE MAINS				\$120,401,000
SUBTOTAL - DUAL MAINS				\$240,802,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,970,000	1	\$2,970,000
White Bear Lake Connection Booster Station	LS	\$ 2,080,000	1	\$2,080,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,090,000	1	\$2,090,000
Inline Booster Station West to Shoreview	LS	\$ 2,000,000	1	\$2,000,000
Inline Booster Station East to North Oaks	LS	\$ 1,583,000	1	\$1,583,000
North Oaks Connection Booster Station	LS	\$ 1,543,000	1	\$1,543,000
Shoreview Connection Booster Station	LS	\$ 2,047,000	1	\$2,047,000
Connection to Local Municipality System	EA	\$ 675,000	8	\$5,400,000
SUBTOTAL - CONSTRUCTION				\$260,515,000
CONTINGENCY (20%)				\$52,103,000
ENGINEERING/ADMIN/LEGAL (20%)				\$52,103,000
GRAND TOTAL				\$364,800,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 306,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 334,900
White Bear Lake Connection Booster Station	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	\$ 72,000	\$ 2,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 98,200
Inline Booster Station West to Shoreview	\$ 3,000	\$ 1,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 27,600
Inline Booster Station East to North Oaks	\$ 56,000	\$ 2,600	\$ 17,000	\$ 3,500	\$ 3,000	\$ 82,100
North Oaks Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Shoreview Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
TOTAL	\$ 547,000	\$ 18,200	\$ 119,000	\$ 24,500	\$ 21,000	\$ 729,700

APPROACH 1, ALTERNATIVE 5				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 50% in Road	LF	\$ 425	1,400	\$595,000
Misc. Site Restoration, 12-inch - 50% in Road	LF	\$ 91	1,400	\$128,000
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	6,900	\$1,553,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	6,900	\$513,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 24-inch - 100% in Road	LF	\$ 770	2,000	\$1,540,000
Misc. Site Restoration, 24-inch - 100% in Road	LF	\$ 154	2,000	\$309,000
Water Main (Open-Cut), 24-inch - 50% in Road	LF	\$ 620	2,100	\$1,302,000
Misc. Site Restoration, 24-inch - 50% in Road	LF	\$ 135	2,100	\$284,000
Water Main (Open-Cut), 24-inch - 0% in Road	LF	\$ 420	15,600	\$6,552,000
Misc. Site Restoration, 24-inch - 0% in Road	LF	\$ 110	15,600	\$1,720,000
Water Main (Open-Cut), 30-inch - 100% in Road	LF	\$ 1,000	30,800	\$30,800,000
Misc. Site Restoration, 30-inch - 100% in Road	LF	\$ 182	30,800	\$5,608,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	4,500	\$3,825,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	4,500	\$719,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	5,300	\$3,180,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	5,300	\$689,000
Miscellaneous Pipeline Costs	LF	\$ 10	69,450	\$695,000
Easements	LF	\$ 240	41,650	\$9,996,000
Water Main (HDD), 24-inch - Hwy 61 crossing	LF	\$ 630	250	\$157,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 12-inch	LF	\$ 1,360	250	\$340,000
Water Main (Jack and Bore), 20-inch - RR Crossing	LF	\$ 1,866	100	\$187,000
Water Main (Jack and Bore), 24-inch - RR Crossing	LF	\$ 2,016	325	\$655,000
Water Main (Jack and Bore), 24-inch - County Rd E Crossing	LF	\$ 2,016	100	\$202,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 30-inch - Hwy 61 crossing	LF	\$ 2,378	300	\$714,000
Water Main (Jack and Bore), 30-inch - Hwy 36 Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - Hwy 35E Crossing	LF	\$ 2,378	375	\$892,000
Drilling Pads/Pits	EA	\$ 75,000	10	\$750,000

SUBTOTAL - SINGLE MAINS				\$75,717,000
SUBTOTAL - DUAL MAINS				\$151,434,000
Inline Booster (Goose Lake Rd/Labore Rd)	LS	\$ 2,695,000	1	\$2,695,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Connection to Local Municipality System	EA	\$ 675,000	3	\$2,025,000
Connection to Aquifer	EA	\$ 600,000	1	\$600,000
SUBTOTAL - CONSTRUCTION				\$158,229,000
CONTINGENCY (20%)				\$31,645,800
ENGINEERING/ADMIN/LEGAL (20%)				\$31,645,800
GRAND TOTAL				\$221,600,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Miso Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 228,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 256,900
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
TOTAL	\$ 267,000	\$ 7,700	\$ 34,000	\$ 7,000	\$ 6,000	\$ 321,700

Appendix C

Detailed Transmission System Cost Estimates, Approach 2 (Task 5)

APPENDIX C – Detailed Transmission System Cost Estimates, Approach 2

Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

APPROACH 2, ALTERNATIVE 1				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	9,400	\$2,585,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	9,400	\$823,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	2,850	\$1,853,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	2,850	\$377,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	3,900	\$1,170,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	3,900	\$369,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	9,200	\$6,900,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	9,200	\$1,376,000
Miscellaneous Pipeline Costs	LF	\$ 10	47,450	\$475,000
Easements	LF	\$ 240	14,050	\$3,372,000
Water Main (Jack and Bore), 18-inch- Hwy 61 crossing	LF	\$ 1,728	250	\$432,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000

Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 Crossing	LF	\$ 2,735	300	\$821,000
Drilling Pads/Pits	EA	\$ 75,000	6	\$450,000
SUBTOTAL - SINGLE MAINS				\$43,511,000
SUBTOTAL - DUAL MAINS				\$87,022,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,844,000	1	\$2,844,000
White Bear Lake Connection Booster Station	LS	\$ 2,047,000	1	\$2,047,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
Connection to Local Municipality System	EA	\$ 675,000	5	\$3,375,000
SUBTOTAL - CONSTRUCTION				\$96,824,000
CONTINGENCY (20%)				\$19,364,800
ENGINEERING/ADMIN/LEGAL (20%)				\$19,364,800
GRAND TOTAL				\$135,600,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 244,000	\$ 5,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 272,900
White Bear Lake Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
TOTAL	\$ 305,000	\$ 9,200	\$ 51,000	\$ 10,500	\$ 9,000	\$ 384,700

APPROACH 2, ALTERNATIVE 1a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	6,900	\$1,898,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	6,900	\$604,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	2,000	\$3,200,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	2,000	\$489,000
Water Main (Open-Cut), 48-inch - 50% in Road	LF	\$ 1,400	6,400	\$8,960,000
Misc. Site Restoration, 48-inch - 50% in Road	LF	\$ 214	6,400	\$1,372,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	4,600	\$8,280,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	4,600	\$1,213,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	13,700	\$21,920,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	13,700	\$3,171,000
Miscellaneous Pipeline Costs	LF	\$ 10	79,950	\$800,000
Easements	LF	\$ 240	48,250	\$11,580,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000
Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000
Water Main (Jack and Bore), 48-inch - Hwy 61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000

Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy 61 crossing	LF	\$ 3,445	300	\$1,034,000
Drilling Pads/Pits	EA	\$ 75,000	9	\$675,000
SUBTOTAL - SINGLE MAINS				\$121,058,000
SUBTOTAL - DUAL MAINS				\$242,116,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 3,996,000	1	\$3,996,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
Higo East Connection Booster Station	LS	\$ 3,261,000	1	\$3,261,000
Connection to Local Municipality System	LS	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$257,034,000
CONTINGENCY (20%)				\$51,406,800
ENGINEERING/ADMIN/LEGAL (20%)				\$51,406,800
GRAND TOTAL				\$359,900,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 639,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 672,600
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
Higo East Connection Booster Station	\$ 433,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 462,200
TOTAL	\$ 1,139,000	\$ 19,900	\$ 68,000	\$ 14,000	\$ 12,000	\$ 1,252,900

APPROACH 2, ALTERNATIVE 2				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	9,400	\$2,585,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	9,400	\$823,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	2,850	\$1,853,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	2,850	\$377,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	3,900	\$1,170,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	3,900	\$369,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	9,200	\$6,900,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	9,200	\$1,376,000
Miscellaneous Pipeline Costs	LF	\$ 10	55,150	\$552,000
Easements	LF	\$ 240	14,050	\$3,372,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (HDD), 18-inch - Hwy 61 crossing	LF	\$ 540	250	\$135,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 crossing	LF	\$ 2,735	300	\$821,000
Drilling Pads/Pits	EA	\$ 75,000	6	\$450,000
SUBTOTAL - SINGLE MAINS				\$45,809,000
SUBTOTAL - DUAL MAINS				\$91,618,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,714,000	1	\$2,714,000

White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,095,000	1	\$2,095,000
Connection to Local Municipality System	EA	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$102,552,000
CONTINGENCY (20%)				\$20,510,400
ENGINEERING/ADMIN/LEGAL (20%)				\$20,510,400
GRAND TOTAL				\$143,600,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 206,000	\$ 6,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 236,400
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	\$ 67,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 93,400
TOTAL	\$ 312,000	\$ 12,100	\$ 51,000	\$ 10,500	\$ 9,000	\$ 394,600

APPROACH 2, ALTERNATIVE 2a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	6,900	\$1,898,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	6,900	\$604,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	2,000	\$3,200,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	2,000	\$489,000
Water Main (Open-Cut), 48-inch - 50% in Road	LF	\$ 1,400	6,400	\$8,960,000
Misc. Site Restoration, 48-inch - 50% in Road	LF	\$ 214	6,400	\$1,372,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	4,600	\$8,280,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	4,600	\$1,213,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	13,700	\$21,920,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	13,700	\$3,171,000
Miscellaneous Pipeline Costs	LF	\$ 10	87,650	\$877,000
Easements	LF	\$ 240	48,250	\$11,580,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000

Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000
Water Main (Jack and Bore), 48-inch - Hwy61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000
Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy61 crossing	LF	\$ 3,445	300	\$1,034,000
Drilling Pads/Pits	EA	\$ 75,000	9	\$675,000
SUBTOTAL - SINGLE MAINS				\$123,653,000
SUBTOTAL - DUAL MAINS				\$247,306,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 3,996,000	1	\$3,996,000
White Bear Lake Connection Booster Station	LS	\$ 2,080,000	1	\$2,080,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,098,000	1	\$2,098,000
Higo East Connection Booster Station	LS	\$ 3,261,000	1	\$3,261,000
Connection to Local Municipality System	EA	\$ 675,000	7	\$4,725,000
SUBTOTAL - CONSTRUCTION				\$263,466,000
CONTINGENCY (20%)				\$52,693,200
ENGINEERING/ADMIN/LEGAL (20%)				\$52,693,200
GRAND TOTAL				\$368,900,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 667,000	\$ 10,100	\$ 17,000	\$ 3,500	\$ 3,000	\$ 700,600
White Bear Lake Connection Booster Station	\$ 44,000	\$ 2,400	\$ 17,000	\$ 3,500	\$ 3,000	\$ 69,900
Inline Booster Station to Mahtomedi, N St Paul	\$ 72,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 98,400
Higo East Connection Booster Station	\$ 422,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 451,200
TOTAL	\$ 1,205,000	\$ 21,100	\$ 68,000	\$ 14,000	\$ 12,000	\$ 1,320,100

APPROACH 2, ALTERNATIVE 3				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	17,400	\$4,785,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	17,400	\$1,523,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	2,850	\$1,853,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	2,850	\$377,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	12,300	\$3,690,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	12,300	\$1,162,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	9,200	\$6,900,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	9,200	\$1,376,000
Miscellaneous Pipeline Costs	LF	\$ 10	66,850	\$669,000
Easements	LF	\$ 240	17,050	\$4,092,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000
Water Main (HDD), 18-inch - Hwy 61 crossing	LF	\$ 540	250	\$135,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000
Water Main (Jack and Bore), 18-inch - RR Crossing	LF	\$ 1,728	100	\$173,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000

Water Main (Jack and Bore), 36-inch - Hwy 61 crossing	LF	\$ 2,735	300	\$821,000
Drilling Pads/Pits	EA	\$ 75,000	9	\$675,000
SUBTOTAL - SINGLE MAINS				\$53,510,000
SUBTOTAL - DUAL MAINS				\$107,020,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,694,000	1	\$2,694,000
White Bear Lake Connection Booster Station	LS	\$ 2,047,000	1	\$2,047,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
North Oaks Connection Booster Station	LS	\$ 1,543,000	1	\$1,543,000
Connection to Local Municipality System	EA	\$ 675,000	6	\$4,050,000
SUBTOTAL - CONSTRUCTION				\$118,890,000
CONTINGENCY (20%)				\$23,778,000
ENGINEERING/ADMIN/LEGAL (20%)				\$23,778,000
GRAND TOTAL				\$166,500,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 139,000	\$ 6,600	\$ 17,000	\$ 3,500	\$ 3,000	\$ 169,100
White Bear Lake Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Connection Booster Station	\$ 33,000	\$ 2,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 58,500
TOTAL	\$ 233,000	\$ 12,400	\$ 68,000	\$ 14,000	\$ 12,000	\$ 339,400

APPROACH 2, ALTERNATIVE 3a (w/HUGO)				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	1,700	\$383,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	1,700	\$126,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	15,900	\$4,373,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	15,900	\$1,391,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	850	\$553,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	850	\$112,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Water Main (Open-Cut), 42-inch - 100% in Road	LF	\$ 1,400	7,300	\$10,220,000
Misc. Site Restoration, 42-inch - 100% in Road	LF	\$ 226	7,300	\$1,651,000
Water Main (Open-Cut), 42-inch - 50% in Road	LF	\$ 1,200	11,300	\$13,560,000
Misc. Site Restoration, 42-inch - 50% in Road	LF	\$ 198	11,300	\$2,243,000
Water Main (Open-Cut), 42-inch - 0% in Road	LF	\$ 900	13,900	\$12,510,000
Misc. Site Restoration, 42-inch - 0% in Road	LF	\$ 162	13,900	\$2,245,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	2,000	\$3,200,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	2,000	\$489,000
Water Main (Open-Cut), 48-inch - 50% in Road	LF	\$ 1,400	6,400	\$8,960,000
Misc. Site Restoration, 48-inch - 50% in Road	LF	\$ 214	6,400	\$1,372,000
Water Main (Open-Cut), 54-inch - 100% in Road	LF	\$ 1,800	4,600	\$8,280,000
Misc. Site Restoration, 54-inch - 100% in Road	LF	\$ 264	4,600	\$1,213,000
Water Main (Open-Cut), 54-inch - 50% in Road	LF	\$ 1,600	13,700	\$21,920,000
Misc. Site Restoration, 54-inch - 50% in Road	LF	\$ 231	13,700	\$3,171,000
Miscellaneous Pipeline Costs	LF	\$ 10	91,950	\$920,000
Easements	LF	\$ 240	51,250	\$12,300,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000

Water Main (Jack and Bore), 18-inch - RR Crossing	LF	\$ 1,728	100	\$173,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 42-inch - Hwy 96 Crossing	LF	\$ 2,954	175	\$517,000
Water Main (Jack and Bore), 42-inch - RR Crossing	LF	\$ 2,954	100	\$295,000
Water Main (Jack and Bore), 48-inch - Hwy 61 crossing	LF	\$ 3,190	250	\$798,000
Water Main (Jack and Bore), 54-inch - RR Crossing	LF	\$ 3,445	100	\$345,000
Water Main (Jack and Bore), 54-inch - Hwy 61 crossing	LF	\$ 3,445	300	\$1,034,000
Drilling Pads/Pits	EA	\$ 75,000	12	\$900,000
SUBTOTAL - SINGLE MAINS				\$128,329,000
SUBTOTAL - DUAL MAINS				\$256,658,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 3,821,000	1	\$3,821,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi	LS	\$ 1,536,000	1	\$1,536,000
North Oaks Connection Booster Station	LS	\$ 1,571,000	1	\$1,571,000
Hugo East Connection Booster Station	LS	\$ 3,271,000	1	\$3,271,000
Connection to Local Municipality System	EA	\$ 675,000	7	\$4,725,000
SUBTOTAL - CONSTRUCTION				\$273,657,000
CONTINGENCY (20%)				\$54,731,400
ENGINEERING/ADMIN/LEGAL (20%)				\$54,731,400
GRAND TOTAL				\$383,200,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 350,000	\$ 5,700	\$ 17,000	\$ 3,500	\$ 3,000	\$ 379,200
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
North Oaks Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Hugo East Connection Booster Station	\$ 428,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 457,500
TOTAL	\$ 884,000	\$ 18,100	\$ 85,000	\$ 17,500	\$ 15,000	\$ 1,019,600

APPROACH 2, ALTERNATIVE 4

ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	9,400	\$2,115,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	9,400	\$699,000
Water Main (Open-Cut), 16-inch - 100% in Road	LF	\$ 625	3,000	\$1,875,000
Misc. Site Restoration, 16-inch - 100% in Road	LF	\$ 123	3,000	\$368,000
Water Main (Open-Cut), 16-inch - 0% in Road	LF	\$ 275	17,400	\$4,785,000
Misc. Site Restoration, 16-inch - 0% in Road	LF	\$ 88	17,400	\$1,523,000
Water Main (Open-Cut), 18-inch - 100% in Road	LF	\$ 650	2,850	\$1,853,000
Misc. Site Restoration, 18-inch - 100% in Road	LF	\$ 132	2,850	\$377,000
Water Main (Open-Cut), 18-inch - 0% in Road	LF	\$ 300	3,900	\$1,170,000
Misc. Site Restoration, 18-inch - 0% in Road	LF	\$ 95	3,900	\$369,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	2,100	\$1,785,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	2,100	\$336,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	17,600	\$10,560,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	17,600	\$2,289,000
Water Main (Open-Cut), 36-inch - 100% in Road	LF	\$ 1,150	4,600	\$5,290,000
Misc. Site Restoration, 36-inch - 100% in Road	LF	\$ 209	4,600	\$963,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 1,000	4,500	\$4,500,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 184	4,500	\$827,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 750	9,200	\$6,900,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 150	9,200	\$1,376,000
Miscellaneous Pipeline Costs	LF	\$ 10	74,550	\$746,000
Easements	LF	\$ 240	17,050	\$4,092,000
Water Main (HDD), 12-inch - I-694 Crossing	LF	\$ 425	500	\$213,000
Water Main (HDD), 16-inch - Hwy 96 Crossing	LF	\$ 500	175	\$88,000
Water Main (HDD), 18-inch - Hwy 61 crossing	LF	\$ 540	250	\$135,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	150	\$240,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 16-inch - RR Crossing	LF	\$ 1,600	125	\$200,000
Water Main (Jack and Bore), 18-inch - RR Crossing	LF	\$ 1,728	100	\$173,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	325	\$773,000
Water Main (Jack and Bore), 30-inch - County Rd E Crossing	LF	\$ 2,378	100	\$238,000

Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	300	\$714,000
Water Main (Jack and Bore), 36-inch - RR Crossing	LF	\$ 2,735	100	\$274,000
Water Main (Jack and Bore), 36-inch - Hwy 61 crossing	LF	\$ 2,735	300	\$821,000
Drilling Pads/Pits	EA	\$ 75,000	9	\$675,000
SUBTOTAL - SINGLE MAINS				\$59,638,000
SUBTOTAL - DUAL MAINS				\$119,276,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,714,000	1	\$2,714,000
White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Inline Booster Station to Mahtomedi, N St Paul	LS	\$ 2,067,000	1	\$2,067,000
North Oaks Connection Booster Station	LS	\$ 1,536,000	1	\$1,536,000
Connection to Local Municipality System	EA	\$ 675,000	8	\$5,400,000
SUBTOTAL - CONSTRUCTION				\$133,068,000
CONTINGENCY (20%)				\$26,613,600
ENGINEERING/ADMIN/LEGAL (20%)				\$26,613,600
GRAND TOTAL				\$186,300,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 194,000	\$ 7,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 224,700
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
Inline Booster Station to Mahtomedi, N St Paul	\$ 67,000	\$ 2,900	\$ 17,000	\$ 3,500	\$ 3,000	\$ 93,400
North Oaks Connection Booster Station	\$ 28,000	\$ 1,800	\$ 17,000	\$ 3,500	\$ 3,000	\$ 53,300
TOTAL	\$ 328,000	\$ 14,200	\$ 68,000	\$ 14,000	\$ 12,000	\$ 436,200

APPROACH 2, ALTERNATIVE 5				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 12-inch - 50% in Road	LF	\$ 425	1,400	\$595,000
Misc. Site Restoration, 12-inch - 50% in Road	LF	\$ 91	1,400	\$128,000
Water Main (Open-Cut), 12-inch - 0% in Road	LF	\$ 225	6,900	\$1,553,000
Misc. Site Restoration, 12-inch - 0% in Road	LF	\$ 74	6,900	\$513,000
Water Main (Open-Cut), 20-inch - 0% in Road	LF	\$ 340	11,700	\$3,978,000
Misc. Site Restoration, 20-inch - 0% in Road	LF	\$ 102	11,700	\$1,194,000
Water Main (Open-Cut), 24-inch - 100% in Road	LF	\$ 770	2,000	\$1,540,000
Misc. Site Restoration, 24-inch - 100% in Road	LF	\$ 154	2,000	\$309,000
Water Main (Open-Cut), 24-inch - 50% in Road	LF	\$ 620	2,100	\$1,302,000
Misc. Site Restoration, 24-inch - 50% in Road	LF	\$ 135	2,100	\$284,000
Water Main (Open-Cut), 24-inch - 0% in Road	LF	\$ 420	10,800	\$4,536,000
Misc. Site Restoration, 24-inch - 0% in Road	LF	\$ 110	10,800	\$1,190,000
Water Main (Open-Cut), 30-inch - 100% in Road	LF	\$ 1,000	4,600	\$4,600,000
Misc. Site Restoration, 30-inch - 100% in Road	LF	\$ 182	4,600	\$838,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 850	4,500	\$3,825,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 160	4,500	\$719,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 600	9,200	\$5,520,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 130	9,200	\$1,197,000
Miscellaneous Pipeline Costs	LF	\$ 10	53,200	\$532,000
Easements	LF	\$ 240	14,600	\$3,504,000
Water Main (HDD), 24-inch - Hwy 61 crossing	LF	\$ 630	250	\$157,000
Water Main (Jack and Bore), 12-inch - RR Crossing	LF	\$ 1,360	100	\$136,000
Water Main (Jack and Bore), 12-inch	LF	\$ 1,360	250	\$340,000
Water Main (Jack and Bore), 20-inch - RR Crossing	LF	\$ 1,600	100	\$160,000
Water Main (Jack and Bore), 24-inch - RR Crossing	LF	\$ 2,016	325	\$655,000
Water Main (Jack and Bore), 24-inch - County Rd E Crossing	LF	\$ 2,016	100	\$202,000
Water Main (Jack and Bore), 30-inch - RR Crossing	LF	\$ 2,378	100	\$238,000
Water Main (Jack and Bore), 30-inch - Hwy 61 crossing	LF	\$ 2,378	300	\$714,000
Drilling Pads/Pits	EA	\$ 75,000	7	\$525,000
SUBTOTAL - SINGLE MAINS				\$40,984,000
SUBTOTAL - DUAL MAINS				\$81,968,000
Inline Booster (Goose Lake Rd /Labore Rd)	LS	\$ 2,525,000	1	\$2,525,000

White Bear Lake Connection Booster Station	LS	\$ 2,075,000	1	\$2,075,000
Connection to Local Municipality System	EA	\$ 675,000	3	\$2,025,000
Connection to Aquifer	EA	\$ 600,000	1	\$600,000
SUBTOTAL - CONSTRUCTION				\$89,193,000
CONTINGENCY (20%)				\$17,838,600
ENGINEERING/ADMIN/LEGAL (20%)				\$17,838,600
GRAND TOTAL				\$124,900,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster (Goose Lake Rd /Labore Rd)	\$ 106,000	\$ 6,000	\$ 17,000	\$ 3,500	\$ 3,000	\$ 135,500
White Bear Lake Connection Booster Station	\$ 39,000	\$ 2,300	\$ 17,000	\$ 3,500	\$ 3,000	\$ 64,800
TOTAL	\$ 145,000	\$ 8,300	\$ 34,000	\$ 7,000	\$ 6,000	\$ 200,300

Appendix D

Detailed Transmission System Cost Estimates, SPRWS to Lake Elmo

APPENDIX D – Detailed Transmission System Cost Estimates, SPRWS to Lake Elmo

Note: All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations

SPRWS Supply to Lake Elmo				
ITEM DESCRIPTION	UNIT	UNIT PRICE	APPROXIMATE QUANTITY	TOTAL
Water Main (Open-Cut), 30-inch - 100% in Road	LF	\$ 425	1,000	\$400,000
Misc. Site Restoration, 30-inch - 100% in Road	LF	\$ 91	182	\$73,000
Water Main (Open-Cut), 30-inch - 50% in Road	LF	\$ 225	850	\$8,925,000
Misc. Site Restoration, 30-inch - 50% in Road	LF	\$ 74	160	\$1,678,000
Water Main (Open-Cut), 30-inch - 0% in Road	LF	\$ 340	600	\$5,910,000
Misc. Site Restoration, 30-inch - 0% in Road	LF	\$ 102	130	\$1,281,000
Water Main (Open-Cut), 36-inch - 50% in Road	LF	\$ 620	1,000	\$5,100,000
Misc. Site Restoration, 36-inch - 50% in Road	LF	\$ 135	184	\$937,000
Water Main (Open-Cut), 36-inch - 0% in Road	LF	\$ 420	750	\$1,913,000
Misc. Site Restoration, 36-inch - 0% in Road	LF	\$ 110	150	\$381,000
Water Main (Open-Cut), 48-inch - 100% in Road	LF	\$ 1,600	2,800	\$4,480,000
Misc. Site Restoration, 48-inch - 100% in Road	LF	\$ 244	2,800	\$684,000
Water Main (Open-Cut), 48-inch - 50% in Road	LF	\$ 1,400	16,500	\$23,100,000
Misc. Site Restoration, 48-inch - 50% in Road	LF	\$ 214	16,500	\$3,537,000
Miscellaneous Pipeline Costs	LF	\$ 10	47,700	\$477,000
Easements	LF	\$ 240	35,300	\$8,472,000
Water Main (Jack and Bore), 30-inch - 694 Crossing	LF	\$ 2,378	500	\$1,189,000
Water Main (Jack and Bore), 48-inch - Hwy 35E Crossing	LF	\$ 3,190	400	\$1,276,000
Water Main (Jack and Bore), 48-inch - RR Crossing	LF	\$ 3,190	100	\$319,000
Drilling Pads/Pits	EA	\$ 75,000	7	\$525,000
SUBTOTAL - SINGLE MAINS				\$70,657,000
SUBTOTAL - DUAL MAINS				\$141,314,000
Inline Booster Station to Lake Elmo	LS	\$ 2,240,000	1	\$2,240,000
Connection to Lake Elmo	LS	\$ 675,000	1	\$675,000
SUBTOTAL - CONSTRUCTION				\$144,229,000
CONTINGENCY (20%)				\$28,845,800
ENGINEERING/ADMIN/LEGAL (20%)				\$28,845,800
GRAND TOTAL				\$202,000,000

Annual O&M Costs

Booster Station	Annual Pumping Energy Costs	Annual Equipment Maintenance	Annual Operator Costs	Building Heating	Misc Costs	Total
Inline Booster Station to Lake Elmo	\$ 206,000	\$ 7,200	\$ 17,000	\$ 3,500	\$ 3,000	\$ 236,700

Appendix E

Surface Water Treatment Plant Cost Estimating Methodology

MEMORANDUM

DATE: June 2026

RE: White Bear Lake Study 2 Water Treatment Plant Cost Estimating Methodology

This memorandum summarizes the cost estimating methodology used in estimating costs for an expansion of SPRWS' McCarrons WTP and also for a new regional surface WTP to serve the northeast metro area communities. Precise cost estimating at a study phase level can be challenging. To develop costs for this study, bid prices and cost estimates from a variety of recent similar projects were analyzed. Data sources included recent project bid data as well as several recent surface water treatment plant designs completed by the consulting engineers' team. For the McCarrons WTP expansion, costs were estimated using the latest costs available from the on-going McCarrons WTP expansion. Prices are based on the engineer's best knowledge at the time of preparation. Accuracy is a function of economic conditions and external influence that can fluctuate greatly. Each Alternative requires varying numbers of additional clarifiers and recarbonation/ozone basins which are identified in the respective sections of the report.

For a new regional WTP, costs can fluctuate greatly based on additional considerations such as green infrastructure, administrative spaces, and other architectural designs. As the new regional WTP would utilize the same raw water source as McCarrons, the treatment units were assumed to be identical. Conceptual level sizing of major process units were completed to evaluate overall building needs, with assumed areas for supporting needs such as electrical and mechanical rooms, storage, administrative offices, and laboratory space. Equipment is assumed to be located within enclosed and heated spaces typical for water treatment facilities in the upper Midwest.

Estimated yearly operation and maintenance costs for the SPRWS expansion were proportioned from SPRWS treatment costs included in Cost of Service Study to Serve Wholesale Customers, SPRWS, prepared by Progressive Consulting Engineers, February 2013.

Estimated yearly operation and maintenance costs for a new WTP include the following: Based on previous project experience, 2% of the capital costs is used to determine the costs in the "Equipment Maintenance" totals to cover building and other typical equipment upkeep costs. The "Operator Costs" are based on an assumed 10 to 12 full time equivalent staff necessary for a regional surface water treatment plant of this size, consisting of operators, maintenance technicians, and water quality/administrative support, with an average \$120,000/year total compensation assumed. Chemical costs were estimated and scaled based on recent usages and costs from the City of Moorhead MN, which is a 16 MGD lime softening facility. The pumping energy costs assumed the pumps were 70% efficient at pumping the average daily flow and a KW-hr cost of \$0.17, based on the average day demands. An additional 0.25% was used to account for additional miscellaneous administrative and regulatory costs of operation.

Detailed capital and O&M costs for each approach and alternative are included in the following pages. All cost estimates are stated at current (2026) value, without adjustment for inflation or future market fluctuations.

APPROACH 1: McCarrons WTP - Clarifier Addition (Each)

Item	Cost
Structures & Equipment	\$ 10,062,000
Modification of Gallery Spaces	\$ 2,568,000
Electrical Components	\$ 1,282,000
Raw Water Piping	\$ 907,000
Comms Infrastructure	\$ 339,000
Demolition, Shoring, & Infrastructure Rerouting	\$ 429,000
CONSTRUCTION TOTAL	\$ 15,587,000
CONTINGENCY (20%)	\$ 3,118,000
ENGINEERING/ADMIN/LEGAL (20%)	\$ 3,118,000
TOTAL	\$ 21,823,000

APPROACH 1: McCarrons WTP - Recarb/Ozone Basin (Each)

Item	Cost
Structures & Equipment	\$ 14,182,000
Modification of Hallways	\$ 856,000
Electrical Components	\$ 1,282,000
Comms Infrastructure	\$ 677,000
Relocation of Chem Storage Tanks, Demo of Overflow, etc.	\$ 572,000
CONSTRUCTION TOTAL	\$ 17,569,000
CONTINGENCY (20%)	\$ 3,514,000
ENGINEERING/ADMIN/LEGAL (20%)	\$ 3,514,000
TOTAL	\$ 24,597,000

Approach 1 Total O&M

Community/Entity	McCarrons Expansion O&M Costs	Raw Water Pumping O&M Costs	Booster Station Pumping O&M Costs	Total Annual O&M Cost
Alternative 1	\$6,550,000	\$346,000	\$429,400	\$7,325,400
Alternative 2	\$7,470,000	\$346,000	\$565,000	\$8,381,000
Alternative 3	\$7,900,000	\$346,000	\$599,100	\$8,845,100
Alternative 4	\$11,590,000	\$346,000	\$729,700	\$12,665,700
Alternative 5	\$4,020,000	\$346,000	\$321,700	\$4,687,700
Alternative 1 w/Hugo East	\$11,240,000	\$706,000	\$1,319,300	\$13,265,300
Alternative 2 w/Hugo East	\$12,150,000	\$706,000	\$565,000	\$13,421,000
Alternative 3 w/Hugo East	\$12,590,000	\$706,000	\$931,200	\$14,227,200

Costs assume adding a new Fridley Pump Station along with utilizing existing Fridley PS

APPROACH 2, ALTERNATIVE 1

Cost Item	Units	Total Price
General Conditions	1	\$30,468,750
Sitework	1	\$12,187,500
Building/Structures	1	\$71,093,750
Mechanical Equipment	1	\$18,281,250
Electrical & Controls Equipment	1	\$20,312,500
Process Equipment	1	\$30,468,750
Residuals Equipment	1	\$20,312,500
SUBTOTAL		\$203,125,000
Contingencies	\$40,625,000	\$39,000,000
SUBTOTAL CONSTRUCTION		\$243,750,000
Eng/Admin/Legal	\$48,750,000	\$46,800,000
GRAND TOTAL		\$292,500,000

APPROACH 2, ALTERNATIVE 2

Cost Item	Units	Total Price
General Conditions	1	\$32,161,458
Sitework	1	\$12,864,583
Building/Structures	1	\$75,043,403
Mechanical Equipment	1	\$19,296,875
Electrical & Controls Equipment	1	\$21,440,972
Process Equipment	1	\$32,161,458
Residuals Equipment	1	\$21,440,972
SUBTOTAL		\$214,409,722
Contingencies	20%	\$42,881,944
SUBTOTAL CONSTRUCTION		\$257,291,667
Eng/Admin/Legal	20%	\$51,458,333
GRAND TOTAL		\$308,750,000

APPROACH 2, ALTERNATIVE 3

Cost Item	Units	Total Price
General Conditions	1	\$33,854,167
Sitework	1	\$13,541,667
Building/Structures	1	\$78,993,056
Mechanical Equipment	1	\$20,312,500
Electrical & Controls Equipment	1	\$22,569,444
Process Equipment	1	\$33,854,167
Residuals Equipment	1	\$22,569,444
SUBTOTAL		\$225,694,444
Contingencies	20%	\$45,138,889

SUBTOTAL CONSTRUCTION		\$270,833,333
Eng/Admin/Legal	20%	\$54,166,667
GRAND TOTAL		\$325,000,000

APPROACH 2, ALTERNATIVE 4

Cost Item	Units	Total Price
General Conditions	1	\$45,000,000
Sitework	1	\$18,000,000
Building/Structures	1	\$105,000,000
Mechanical Equipment	1	\$27,000,000
Electrical & Controls Equipment	1	\$30,000,000
Process Equipment	1	\$45,000,000
Residuals Equipment	1	\$30,000,000
SUBTOTAL		\$300,000,000
Contingencies	20%	\$60,000,000
SUBTOTAL CONSTRUCTION		\$360,000,000
Eng/Admin/Legal	20%	\$72,000,000
GRAND TOTAL		\$432,000,000

APPROACH 2, ALTERNATIVE 5

Cost Item	Units	Total Price
General Conditions	1	\$18,750,000
Sitework	1	\$7,500,000
Building/Structures	1	\$43,750,000
Mechanical Equipment	1	\$11,250,000
Electrical & Controls Equipment	1	\$12,500,000
Process Equipment	1	\$18,750,000
Residuals Equipment	1	\$12,500,000
SUBTOTAL		\$125,000,000
Contingencies	20%	\$25,000,000
SUBTOTAL CONSTRUCTION		\$150,000,000
Eng/Admin/Legal	20%	\$30,000,000
GRAND TOTAL		\$180,000,000

APPROACH 2, ALTERNATIVE 1a (WITH HUGO EAST)

Cost Item	Units	Total Price
General Conditions	1	\$46,812,500
Sitework	1	\$18,725,000

Building/Structures	1	\$109,229,167
Mechanical Equipment	1	\$28,087,500
Electrical & Controls Equipment	1	\$31,208,333
Process Equipment	1	\$46,812,500
Residuals Equipment	1	\$31,208,333
SUBTOTAL		\$312,083,333
Contingencies	20%	\$62,416,667
SUBTOTAL CONSTRUCTION		\$374,500,000
Eng/Admin/Legal	20%	\$74,900,000
GRAND TOTAL		\$449,400,000

APPROACH 2, ALTERNATIVE 2a (WITH HUGO EAST)

Cost Item	Units	Total Price
General Conditions	1	\$49,270,833
Sitework	1	\$19,708,333
Building/Structures	1	\$114,965,278
Mechanical Equipment	1	\$29,562,500
Electrical & Controls Equipment	1	\$32,847,222
Process Equipment	1	\$49,270,833
Residuals Equipment	1	\$32,847,222
SUBTOTAL		\$328,472,222
Contingencies	20%	\$65,694,444
SUBTOTAL CONSTRUCTION		\$394,166,667
Eng/Admin/Legal	20%	\$78,833,333
GRAND TOTAL		\$473,200,000

APPROACH 2, ALTERNATIVE 3a (WITH HUGO EAST)

Cost Item	Units	Total Price
General Conditions	1	\$51,739,583
Sitework	1	\$20,695,833
Building/Structures	1	\$120,725,694
Mechanical Equipment	1	\$31,043,750
Electrical & Controls Equipment	1	\$34,493,056
Process Equipment	1	\$51,739,583
Residuals Equipment	1	\$34,493,056
SUBTOTAL		\$344,930,556
Contingencies	20%	\$68,986,111
SUBTOTAL CONSTRUCTION		\$413,916,667
Eng/Admin/Legal	20%	\$82,783,333
GRAND TOTAL		\$496,700,000

O&M COSTS - NEW REGIONAL WTP

Alternative	Annual Electrical Costs	Annual Chemical Costs	Annual Equipment Maintenance	Annual Operator Costs	Sludge Processing / Disposal	Misc Costs- Admin, Regulatory, Etc.	Total for WTP
Alt 1	\$290,000	\$2,509,000	\$6,290,000	\$1,320,000	\$521,000	\$787,000	\$11,717,000
Alt 2	\$323,000	\$2,839,000	\$6,444,000	\$1,320,000	\$589,000	\$806,000	\$12,321,000
Alt 3	\$379,000	\$3,004,000	\$6,396,000	\$1,320,000	\$623,000	\$800,000	\$12,522,000
Alt 4	\$568,000	\$4,423,000	\$8,640,000	\$1,440,000	\$918,000	\$1,086,000	\$17,075,000
Alt 5	\$190,000	\$1,519,000	\$3,510,000	\$1,200,000	\$315,000	\$439,000	\$7,173,000
Alt 1 w/Hugo East	\$479,000	\$4,291,000	\$8,976,000	\$1,440,000	\$890,000	\$1,122,000	\$17,198,000
Alt 2 w/Hugo East	\$523,000	\$4,621,000	\$8,935,000	\$1,440,000	\$959,000	\$1,117,000	\$17,595,000
Alt 3 w/Hugo East	\$557,000	\$4,786,000	\$9,058,000	\$1,440,000	\$993,000	\$1,133,000	\$17,967,000

Note – O&M Costs presented are associated with the Regional WTP only, and assume new Fridley Pump Station adjacent to existing Fridley PS.

Approach 2 Total O&M

Community/Entity	WTP O&M Cost	Raw Water Pumping Costs	Booster Station Pumping Costs	Total Annual O&M Cost
Alternative 1	\$11,717,000	\$346,000	\$384,700	\$12,447,700
Alternative 2	\$12,321,000	\$346,000	\$394,600	\$13,061,600
Alternative 3	\$12,522,000	\$346,000	\$339,400	\$13,207,400
Alternative 4	\$17,075,000	\$346,000	\$436,200	\$17,857,200
Alternative 5	\$7,173,000	\$346,000	\$200,300	\$7,719,300
Alternative 1 w/Hugo East	\$17,198,000	\$706,000	\$1,252,900	\$19,156,900
Alternative 2 w/Hugo East	\$17,595,000	\$706,000	\$1,320,100	\$19,621,100
Alternative 3 w/Hugo East	\$17,967,000	\$706,000	\$1,019,600	\$19,692,600

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