FEASIBILITY ASSESSMENT OF APPROACHES TO WATER SUSTAINABILITY IN THE NORTHEAST METRO

SUMMARY

DECEMBER 2014

METROPOLITAN COUNCIL

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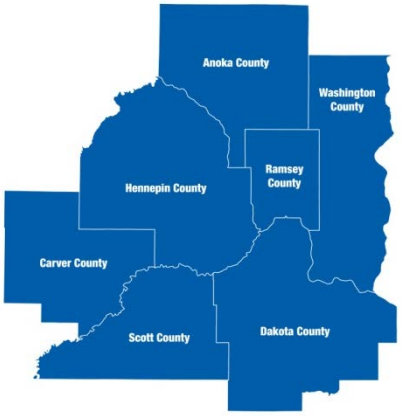

The Metropolitan Council is the regional planning organization for the seven-county Twin Cities area. The Council operates the regional bus and rail system, collects and treats wastewater, coordinates regional water resources, plans and helps fund regional parks, and administers federal funds that provide housing opportunities for low- and moderate-income individuals and families. The 17-member Council board is appointed by and serves at the pleasure of the governor.

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About this Report

The 2005 Minnesota Legislature directed the Metropolitan Council to “carry out planning activities addressing the water supply needs of the metropolitan area,” including the development of a Twin Cities Metropolitan Area Master Water Supply Plan (Minn. Stat., Sec. 473.1565). After completing that plan, the Council took on many technical and outreach projects that strengthen local and regional water supply planning efforts. These projects have also elevated the importance of water supply in local comprehensive planning, which is carried out by local communities.

This study is one of several the Council is leading to support an update to the Master Plan and other activities identified by the 2005 Minnesota Legislature to address the water supply needs of the seven-county metropolitan area. This study is funded from the Clean Water Legacy Fund (Minn. Laws 2013 Ch. 137, Art. 2, Sec. 9).

The Council retained Short Elliott Hendrickson Inc. (SEH) to complete this technical assessment of the capital and operational costs, as well as the potential benefits, of four approaches to the regional sustainability of water resources in the northeast metro area. This study has been carried out with input from and engagement with local stakeholders, including community public water utilities, through a water supply work group. This group continues to meet regularly to discuss the study along with other water supply topics of importance to group members.

This summary was prepared to communicate the key findings of this study.

Recommended Citation

Metropolitan Council. 2014. *Feasibility Assessment of Approaches to Water Sustainability in the Northeast Metro –Summary*. Prepared by Short Elliott Hendrickson Inc. Metropolitan Council: Saint Paul

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Study Objectives

The primary objective of this study is to understand the relative costs and implementation considerations of different approaches to water sustainability. The northeast metro provides a study area for this evaluation. The Minnesota Legislature requested this part of the metro area to be studied specifically, given the continued concern over lake levels and the interaction of groundwater and lakes in the area, especially White Bear Lake. The study area includes 13 communities.

The results will be incorporated in the Twin Cities Metropolitan Area Master Water Supply Plan. The study will be referenced to support future planning of metro area water supplies and water sustainability practices.

This feasibility assessment evaluates only three approaches to water supply:

- Approach 1: Connect northeast metro communities to Saint Paul Regional Water Services to supply drinking water (Saint Paul Expansion)
- Approach 2: Develop a surface water connection to a new sub-regional surface water treatment plant (New Surface Water Treatment Plant)
- Approach 3: Continued development of groundwater sources

In addition to the water supply approaches evaluated, the Council evaluated the feasibility of direct augmentation of White Bear Lake using water from the St. Croix and Mississippi Rivers. This project is evaluated separately in this study, as it does not directly involve drinking water supplies. In addition, a direct lake augmentation system would likely have different ownership with responsibility for constructing, operating, and maintaining the system.

The approaches were selected 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. The Council chose the communities in the study area based on proximity to new surface water supplies, proximity to sensitive surface water bodies, as well as their inclusion in the USGS study of White Bear Lake that was published in 2013.[1]

These are not the only viable approaches to achieve water sustainability in the northeast metro. The U.S. Geological Survey (USGS) has acknowledged that the communities included in the study area are not the only water users influencing White Bear Lake. There could be many other configurations of solutions that include other municipal water systems, private water users, and other solutions in addition to the infrastructure solutions considered in this study.

The alternatives evaluated should be viewed as examples. The best option for moving forward may be a hybrid of the examples considered in this study, and could involve approaches that were not considered in this study. For example, communities in the northeast metro could utilize less expensive approaches. These might include conservation or stormwater reuse to reduce groundwater pumping before making large-scale investments in alternative infrastructure solutions. Such a plan could couple these less expensive options with aggressive monitoring of groundwater and surface water, and set triggers for further action in the event these less expensive approaches are not effective.

Four ongoing activities will better inform decision-making related to water use in the northeast metro as they are completed.

[1] Jones, P.M. Trost, J.J., Rosenberry, D.O., Jackson, P.R., Bode, J.A., and O'Grady, R.M., 2013, Groundwater and Surface-Water Interactions near White Bear Lake, Minnesota, through 2011: U.S. Geological Survey Scientific Investigations Report 2013-5044.

1. The USGS is conducting a study, *Characterizing Groundwater and Surface Water Interaction in Northeast Metro Area Lakes, MN,* with funding from the Council through a Clean Water Fund grant. This study will provide critical information on the surface water/groundwater interaction in the area. This will allow for better understanding of how proposed approaches will mitigate low lake levels. The study is expected to be complete in 2016.

2. The Council is completing a feasibility assessment of the potential for aquifer recharge and reusing stormwater in the North and East Metro Groundwater Management Area. The study area for this feasibility assessment includes the communities in the current study area, and additional communities in Anoka, Ramsey, and Washington counties. The results of this study, expected in 2015, will evaluate the potential of using alternative approaches to reduce impacts to lakes and to address other identified water sustainability issues within the Groundwater Management Area.

3. University of Minnesota Technical Assistance Program (MnTAP) will identify opportunities for industrial water users in the North and East Metro Groundwater Management Area to reduce their water consumption as part of the Minnesota Department of Natural Resources (DNR) strategies under the Groundwater Management Area plan. The source of water in this delineated region is almost exclusively groundwater. Several approaches will be used for this effort in order to reach, inform, and interact with a broad range of industrial users. This work is expected to be completed in the summer of 2015.

4. The DNR is completing a management plan for the North and East Metro Groundwater Management Area. This plan is currently in development, and could impact future groundwater appropriations, groundwater monitoring activities, and the assessment of water use sustainability in the area.

The results of these activities will provide useful information to determine the best course to move the northeast metro in the direction of greater sustainability of water resources. In addition, communities participating in this study have noted that groundwater use could be further reduced by more active conservation programs. Further investigation is needed of the potential for conservation to both reduce future groundwater use and recharge the aquifer and connected surface water bodies.

Below are key findings for the approaches evaluated for this study. Following the findings is a series of fact sheets that summarize the advantages and disadvantages of each alternative evaluated.

Approach 1: Saint Paul Expansion

Saint Paul Regional Water Services (SPRWS) operates a regional water system that borders the southern-most communities in the study area. Saint Paul obtains its water primarily from the Mississippi River via an intake and pumping station in Fridley. This water is pumped east to Charley Lake in North Oaks, from which it flows by gravity through a chain of lakes to Vadnais Lake in Vadnais Heights. Water is pumped from Vadnais Lake to the McCarrons Water Treatment Plant (WTP) in Maplewood. Figure 1 shows a schematic of Saint Paul's water supply system.

Figure 1. Saint Paul Supply System Schematic

The Council evaluated three alternatives for serving water to communities in the study area from Saint Paul Regional Water Services. Each alternative assumes wholesale delivery of water via dedicated transmission mains from the water treatment plant to a centralized location in the water distribution system of each of the communities served:

- **Alternative 1A:** Service to North Saint Paul via the Hazel Park boosted pressure zone.
- **Alternative 1B:** Service to Shoreview, Vadnais Heights, White Bear Lake, White Bear Township, and Mahtomedi directly from McCarrons Water Treatment Plant. North Saint Paul would still be served via the Hazel Park boosted pressure zone as in Alternative 1A.
- **Alternative 1C:** Service to all 13 communities in the study area, which includes Shoreview, Vadnais Heights, White Bear Lake, White Bear Township, Mahtomedi, North Saint Paul, Hugo, Centerville, Lino Lakes, Circle Pines, Lexington, Columbus, and Forest Lake.

Key findings of the analysis of Approach 1 are as follows:

- The Saint Paul raw water main and pumping are essentially at capacity with existing Saint Paul maximum daily demands (approximately 80 million gallons per day). However, significant storage exists in the chain of lakes used by Saint Paul (3.5 billion gallons) that could be used to provide additional water to the northeast metro.
- The Saint Paul McCarrons Water Treatment Plant currently has approximately 30 million gallons per day of excess capacity.
- The six communities nearest to the Saint Paul water system (Shoreview, Vadnais Heights, White Bear Lake, White Bear Township, Mahtomedi, and North Saint Paul) could be served by Saint Paul without expanding its major water treatment facility or improving its raw water delivery system to the plant. To expand service beyond these six communities, additional large-scale infrastructure improvements would be needed. This would significantly increase the capital costs of the system.
- The Saint Paul Hazel Park pressure zone, which is adjacent to North Saint Paul and White Bear Lake, has limited capacity to provide water to the northeast metro. Only North Saint Paul can be served from the Hazel Park pressure zone without large-scale infrastructure improvements.
- A new trunk water main that connects to the Saint Paul McCarrons Water Treatment Plant is necessary to bring water to the majority of the northeast metro.

Approach 2: New Surface Water Treatment Plant

The Council considered two alternative sites for a new water treatment plant with a surface water source from the Mississippi River. The preferred site after initial screening is on Vadnais Lake, and would use the raw water source of Saint Paul Regional Water Services. Three alternatives were evaluated for serving water to communities in the study area from a new water treatment plant:

- **Alternative 2B:** Service to Shoreview, Vadnais Heights, White Bear Lake, White Bear Township, Mahtomedi, and North Saint Paul (similar to Alternative 1B, replacing service from Saint Paul with service from a new water treatment plant with a capacity of 40 million gallons per day).
- **Alternative 2C:** Service to all communities in the study area (similar to Alternative 1C, replacing service from Saint Paul with service from a new water treatment plant with a capacity of 60 million gallons per day).
- **Alternative 2D:** Service to Shoreview, Vadnais Heights, White Bear Lake, White Bear Township, Mahtomedi, and North Saint Paul with service from a new water treatment plant sized to meet average day demands. Peak demands will be met by each community's existing

groundwater supply system (conjunctive use of surface water and groundwater). The new infrastructure in this alternative is similar to Alternative 2B, but smaller in size since it does not need capacity to meet peak demands. The water treatment plant capacity in this case is 15 million gallons per day.

Key findings of the analysis of Approach 2 are as follows:

- Saint Paul Regional Water Services owns land on Vadnais Lake, which could serve as a location for a new water treatment plant.
- The water quality in Vadnais Lake is better than the Mississippi River due to chemical treatment, oxygen being added, and settling of solids. Preliminary screening of plant sites based on water quality and location resulted in the identification of Vadnais Lake as the preferred site for a new water treatment plant at this concept level.
- Conjunctive use of surface water and groundwater is feasible. However, it presents an engineering challenge with regard to mixing, and must be carefully designed and operated to avoid uncontrolled byproducts in the distribution system.
- A conjunctive use system could be significantly less expensive than a system that would provide exclusively surface water to meet all demands, while providing nearly the same benefits in terms of aquifer recovery.

Approach 3: Continued Development of Groundwater Sources

The current course of utilizing groundwater exclusively to meet the water supply needs of northeast metro communities will not be without capital costs. At least two communities are planning for future water treatment facilities to improve the quality of water in their distribution systems, and two communities are planning for the construction of additional well facilities between now and 2040. This study identified approximately $90 million is anticipated capital investments for water supply and treatment facilities for study area communities through 2040, if they were to continue to use groundwater supplies.

Some of these costs might be necessary even with a switch to a surface water source. For example, it would likely be recommended that cities continue to maintain their existing well supply infrastructure over time. If conjunctive use of groundwater and surface water were implemented, communities would likely also maintain existing groundwater treatment plants, and may decide to also continue with plans for future groundwater treatment plants.

Despite the estimated costs, the continued use of groundwater is significantly less costly than surface water, both from a capital and operational cost perspective. The cost of water for northeast metro communities currently ranges from $1.34 / 1,000 gallons to $3.69 / 1,000 gallons. Saint Paul Regional Water Services customers, by comparison, pay an average of $3.70 / 1000 gallons for surface water.

In addition to an analysis of the cost of this approach, the potential impacts to aquifer levels and lake levels need to be considered. Groundwater modeling conducted as part of this study indicates some continued decline in water levels in the Prairie du Chien – Jordan aquifer under this scenario.

Lake Augmentation

The Council evaluated the feasibility of augmenting White Bear Lake water levels with water from the Mississippi River and St. Croix River. Key findings are as follows:

- The St. Croix River is significantly further away and has significantly higher pumping pressure required than water from the Mississippi River for augmentation. In addition, the St. Croix River is a National Scenic Riverway, making construction in or near the river difficult from a regulatory standpoint.

- The Mississippi River is impaired with zebra mussels, as is Vadnais Lake. Augmentation from this source will require filtration.
- With filtration, augmentation with water from Vadnais Lake is not anticipated to degrade White Bear Lake water quality.
- Saint Paul Regional Water Services has sufficient capacity to draw and convey 2 billion gallons of water annually (2 BG/yr) for augmentation.
- Based on historic data, it is not certain if augmentation of 2 BG/yr will maintain the water level of White Bear Lake at the ordinary high water level, though it is likely that the water level will be improved in the lake through the augmentation system.
- It is unlikely that augmenting White Bear Lake will provide benefit to other lakes. It is currently uncertain to what degree augmentation will provide benefit to the underlying bedrock aquifer that serves a water supply for northeast metro communities.

Evaluation of Alternatives

The Council analyzed the alternatives and estimated the capital, operational, and maintenance costs of each. In addition, a qualitative evaluation of other advantages and disadvantages was completed for each alternative, including water source reliability, potential to impact lake levels, implementation obstacles, and water rate impacts. The evaluations are presented at the end of this summary.

Conclusions

The analyses conducted for this feasibility assessment yielded previously unknown information about potential approaches to improve the sustainability and reliability of groundwater in the northeast metro area and the Twin Cities region. Importantly, this includes information about the necessary infrastructure components and costs of some of the infrastructure solutions that have been proposed.

Groundwater flow modeling was also used to estimate the potential benefit to the Prairie du Chien – Jordan aquifer due to reduced groundwater pumping that would result from the alternatives evaluated in this study. Given the relationship between water levels in White Bear Lake and water levels in the aquifer, it is reasonable to extrapolate that an increase in aquifer level would over time cause the lake level to increase. Where aquifer levels are estimated to increase over a broader area, it is likely that other lakes that have similar connectivity to the aquifer would also receive some benefit. The magnitude of benefit is difficult to assess with our current understanding of the hydrogeologic system. This understanding is expected to increase with the current investigation of the USGS, which is scheduled to be completed in 2016.

The use of surface water to replace groundwater use for municipal supplies was evaluated at multiple scales to estimate how the costs and benefits of such approaches change as a greater number of communities are included. It is clear from the analysis at multiple system scales that there is less benefit obtained at greater marginal cost as the system is expanded outward toward less densely developed communities. This is in part due to the proximity of the source of water. Therefore, if a surface water supply is implemented in the future, it would be sensible to target it to a geographic area that has greater density, is as close to the source of water as possible, and reduces pumping in proximity to sensitive surface water features.

Direct augmentation of White Bear Lake with Mississippi River water via Vadnais Lake was found to be feasible, though the system required would need to be very large in scale in order to overcome the historically documented seepage rates from the lake to the aquifer below.[2] In addition, if future

[2] Minnesota Department of Natural Resources, 1998, Lake-Ground Water Interaction: Report to the Legislative Committee on Minnesota Resources.

groundwater pumping or climate conditions cause further reductions in the underlying aquifer system, the rate of seepage from the lake could increase over time. The benefits of a lake augmentation system would be exclusive to the lake water levels, not likely providing any broader benefit to other lakes or to water source reliability.

None of the proposed approaches would be easy to implement. All have significant capital and operational costs, and additional discussion is needed to determine who should be responsible for those costs if any of these approaches were implemented. There are, however, models for cost sharing that have been implemented in other locations in the United States that could be used as a starting point for discussion. Two of these models have been applied to the northeast metro in the full report to illustrate the potential impacts to rate payers with implementation.

Communities in the study area have expressed a desire to explore the potential to use conservation, stormwater capture for irrigation, aquifer recharge, or other less expensive methods to reduce groundwater use before switching their supply source to surface water at significant expense. However, such approaches could take longer and would result in less aquifer recovery than elimination of groundwater use through a switch to surface water. Decision makers and the DNR will need to decide whether this approach is acceptable given the risk of additional declines in lake level or of slower recovery of lake level.

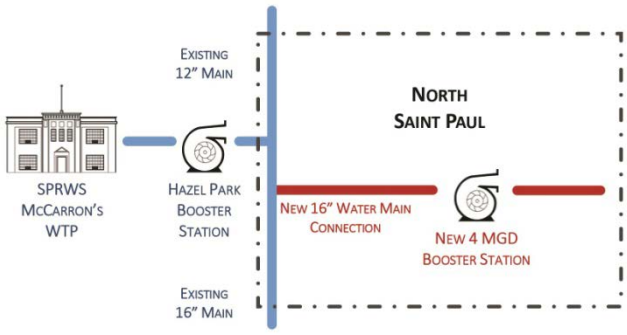
Additional Work is in Progress

Several pieces of information not found in this investigation could be important considerations in water supply planning decisions for the northeast metro area. This evaluation of alternatives stops short of identifying the best way forward. Local government units, state lawmakers, the DNR, and other stakeholders should all be part of the discussion in developing a plan for water supply for the region that protects our natural resources in the most cost-effective manner. This future plan could include one or more of the options investigated in this study, and could also include other approaches not evaluated here.

Currently unanswered questions include:

- **What is the potential to use conservation, aquifer recharge, or stormwater reuse to reduce aquifer impacts from pumping activities?** The Council is leading an ongoing study to look at aquifer recharge and stormwater reuse for the North and East Metro Groundwater Management Area, which is expected to be completed in 2015. Additional evaluation of conservation potential is recommended.
- **How much will changes in pumping impact the water levels in White Bear Lake, and how long will those changes take?** The current USGS study in the northeast metro, to be completed in 2016, will develop a localized groundwater model that will consider groundwater-surface water interactions, and will incorporate a significant amount of new data currently being collected from lakes in the northeast metro.
- **What is the sustainable limit for groundwater withdrawals in the northeast metro?** The Council, in coordination with the DNR, is trying to make an initial assessment of sustainable levels of groundwater use in sub-regional areas across the metro area that would prevent future problems with water use. This is a complex problem, due to the complexity of the physical systems involved. There is not currently a timeline for completion of this activity, though it is acknowledged that identifying sustainable limits on water use is essential for future planning.

Approach 1 - Alternative 1A – Saint Paul Service Expanded to North Saint Paul



Description

Alternative 1A would provide service from Saint Paul Regional Water Services to North Saint Paul by extending water main from the Saint Paul Regional Water Services Hazel Park pressure zone in Maplewood and building a booster station.

People Served by System in 2040: 15,400

Total Reduction in Groundwater Pumping: 548 million gallons per year (7% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$5,108,000
Capital Cost per Million Gallons of Capacity	$9,300
Annual Operations and Maintenance Cost	$1,380,000
Operations and Maintenance Cost per Million Gallons of Capacity	$2,500

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

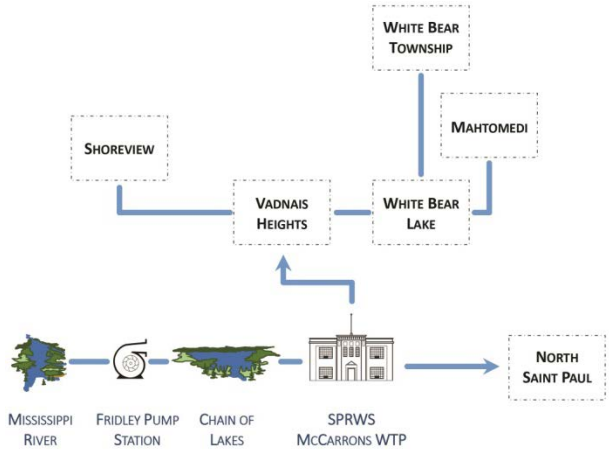
Advantages

- Low capital cost
- Ease of implementation

Disadvantages

- Very small expected benefit to aquifer levels or lake levels as a stand-alone option
- Study area communities could have less control over operation of water supply and treatment system

Approach 1 - Alternative 1B – Saint Paul Service Expanded to Select Northeast Metro Communities



Description

Alternative 1B would provide service from Saint Paul Regional Water Services to Mahtomedi, North Saint Paul, Shoreview, Vadnais Heights, White Bear Lake, and White Bear Township by extending water main and building booster stations. Alternative 1B requires major trunk water main, but does not add capacity to the Saint Paul Regional Water Services McCarrons water treatment plant (WTP) or raw water pumping or conveyance.

People Served by System in 2040: 105,876

Total Reduction in Groundwater Pumping: 4,564 million gallons per year (57% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$155,440,000
Capital Cost per Million Gallons of Capacity	$34,000
Annual Operations and Maintenance Cost	$10,757,000
Operations and Maintenance Cost per Million Gallons of Capacity	$2,400

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

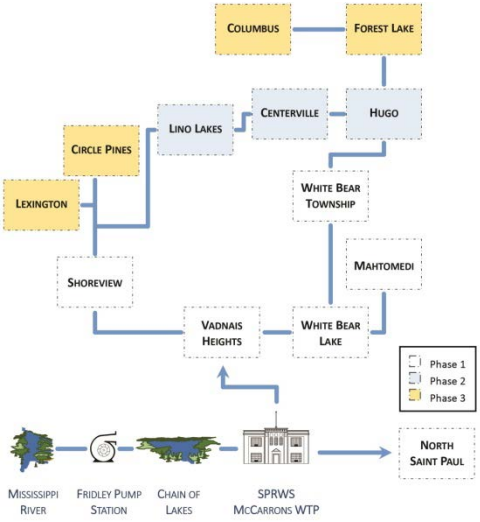
Advantages

- Maximizes use of existing infrastructure, and does not require significant improvements in current SPRWS supply and treatment infrastructure
- Would increase water supply reliability by creating multiple sources for northeast metro communities
- Aquifer recovery expected
- Existing organizational structure to own and operate system

Disadvantages

- Uncertainty in response of lakes to changes in groundwater level
- Increase in operational costs for water supplies of northeast metro communities, and higher water rates for residents and businesses
- Large capital cost
- Study area communities could have less control over operation of water supply and treatment system

Approach 1 - Alternative 1C – Saint Paul Service Expanded to All Northeast Metro Communities



Description

Alternative 1C would provide service from Saint Paul Regional Water Services to all 13 of the northeast metro communities by extending water main and building booster stations. Alternative 1C requires major trunk water main and booster stations, expansion of Saint Paul Regional Water Services raw water pumping and conveyance systems, and expansion of the Saint Paul Regional Water Services McCarrons water treatment plant.

People Served by System in 2040: 191,050

Total Reduction in Groundwater Pumping: 8,009 million gallons per year (100% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$623,442,000
Capital Cost per Million Gallons of Capacity	$78,000
Annual Operations and Maintenance Cost	$20,000,000
Operations and Maintenance Cost per Million Gallons of Capacity	$2,500

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

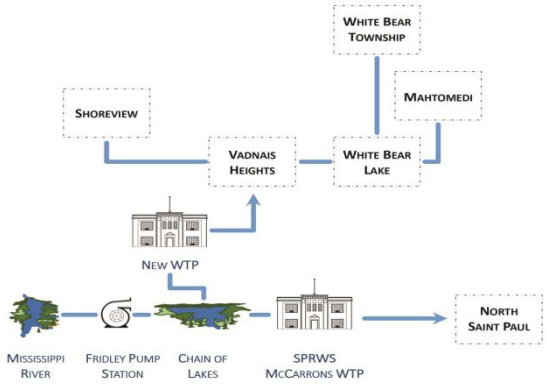
Advantages

- Would increase water supply reliability by creating multiple sources for northeast metro communities
- Aquifer recovery expected
- Existing organizational structure to own and operate system

Disadvantages

- Large investment in expansion of existing supply and treatment infrastructure required
- Uncertainty in response of lakes to changes in groundwater level
- Increase in operational costs for water supplies of northeast metro communities, and higher water rates for residents and businesses
- Very large capital cost, and less benefit per dollar invested compared with Alternative 1B
- Study area communities could have less control over operation of water supply and treatment system

Approach 2 - Alternative 2B – New Surface Water Treatment Plant Service to Select Northeast Metro Communities



Description

Alternative 2B would provide water from a new surface water treatment plant to Mahtomedi, Shoreview, Vadnais Heights, White Bear Lake, and White Bear Township. North Saint Paul would be served by Saint Paul Regional Water Services. Alternative 2B requires major trunk water main and a new surface water treatment plant with capacity of 40 million gallons per day (MGD). Alternative 2B does not upgrade the Saint Paul Regional Water Services raw water pumping or conveyance systems.

People Served by System in 2040: 105,876

Total Reduction in Groundwater Pumping: 4,564 million gallons per year (57% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$226,632,000
Capital Cost per Million Gallons of Capacity	$50,000
Annual Operations and Maintenance Cost	$9,137,000
Operations and Maintenance Cost per Million Gallons of Capacity	$2,000

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

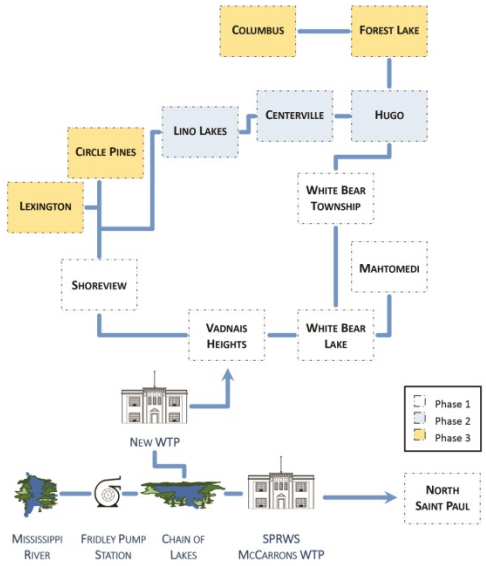
Advantages

- Would increase water supply reliability by creating multiple sources for northeast metro communities
- Aquifer recovery expected
- Study area communities could retain greater control over operation of water supply and treatment system

Disadvantages

- Uncertainty in response of lakes to changes in groundwater level
- Increase in operational costs for water supplies of northeast metro communities, and higher water rates for residents and businesses
- Higher capital cost than equivalent option to provide service from Saint Paul system (Alternative 1B)
- There is not currently an organizational structure to own and operate the system

Approach 2 - Alternative 2C – New Surface Water Treatment Plant Service to All Northeast Metro Communities



Description

Alternative 2C would provide water from a new surface water treatment plant to all 13 of the northeast metro communities. North Saint Paul would be served by Saint Paul Regional Water Services. Alternative 2C requires major trunk water main, booster stations, and a new surface water treatment plant with capacity of 60 MGD. Alternative 2C upgrades the Saint Paul Regional Water Services raw water pumping and conveyance systems.

People Served by System in 2040: 191,050

Total Reduction in Groundwater Pumping: 8,009 million gallons per year (100% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$609,473,000
Capital Cost per Million Gallons of Capacity	$76,000
Annual Operations and Maintenance Cost	$15,909,000
Operations and Maintenance Cost per Million Gallons of Capacity	$2,000

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

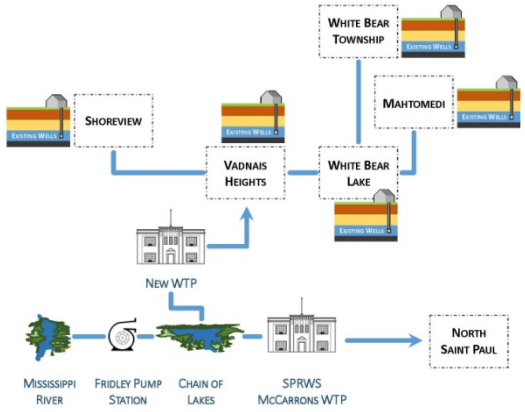
Advantages

- Would increase water supply reliability by creating multiple sources for northeast metro communities
- Significant aquifer recovery expected
- Study area communities could retain greater control over operation of water supply and treatment system

Disadvantages

- Large investment in new infrastructure
- Very large capital cost, and less benefit per dollar invested compared with Alternative 2B
- Uncertainty in response of lakes to changes in groundwater level
- Increase in operational costs for water supplies of northeast metro communities, and higher water rates for residents and businesses
- There is not currently an organizational structure to own and operate the system

Approach 2 - Alternative 2D – Conjunctive Use of Surface Water and Groundwater for Select Northeast Metro Communities



Description

Alternative 2D would provide water from a new surface water treatment plant to Mahtomedi, Shoreview, Vadnais Heights, White Bear Lake, and White Bear Township for average day use. Existing wells would be utilized to help meet peak demands. North Saint Paul would be served by Saint Paul Regional Water Services. Alternative 2D requires major trunk water main and a new surface water treatment plant with capacity of 15 MGD. Alternative 2D does not upgrade the Saint Paul Regional Water Services raw water pumping or conveyance systems.

People Served by System in 2040: 105,876

Total Reduction in Groundwater Pumping: 3,928 million gallons per year (49% of total water use in study area)

Cost Summary Table

Capital Cost[1]	$163,906,000
Capital Cost per Million Gallons of Capacity	$41,000
Annual Operations and Maintenance Cost	$7,539,000
Operations and Maintenance Cost per Million Gallons of Capacity	$1,900

[1]Based on April 2014, no escalation to date of construction

Evaluation of Alternative

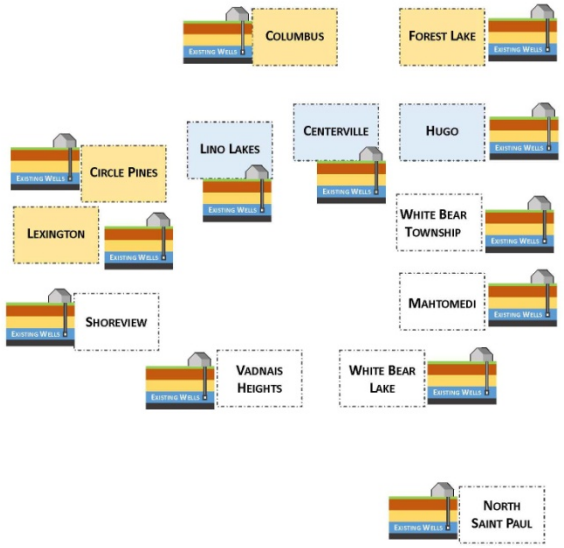
Advantages

- Study area communities could use surface water or groundwater as needed, with greater management flexibility to respond to supply constraints
- Would increase water supply reliability by creating multiple sources for northeast metro communities
- Significant aquifer recovery expected, similar in magnitude to system that is designed to meet peak demands of study area communities
- Significantly lower cost than system that is designed to meet peak demands of study area communities
- Study area communities could retain greater control over operation of water supply and treatment system

Disadvantages

- Need to maintain two water supply systems
- Uncertainty in response of lakes to changes in groundwater level
- Increase in operational costs for water supplies of northeast metro communities, and higher water rates for residents and businesses
- Could likely be accomplished less expensively using existing supply and treatment infrastructure in the Saint Paul system
- There is not currently an organizational structure to own and operate the system

Approach 3 – Continued Development of Groundwater Sources



Description

Approach 3 characterizes a system with continued use of groundwater. Existing community water supply systems will be upgraded with in-kind replacement of aging infrastructure. When additional supply is needed, new wells would be drilled. Community comprehensive plans for new wells and future treatment plants serve as the basis for new infrastructure.

People Served by System in 2040: 191,050

Total Reduction in Groundwater Pumping: 0

Cost Summary Table

Capital Cost[1]	$90,990,000
Capital Cost per Million Gallons of Capacity	$11,400
Annual Operations and Maintenance Cost	No Additional Cost[2]
Operations and Maintenance Cost per Million Gallons of Capacity	No Additional Cost[2]

[1]Based on April 2014, no escalation to date of construction

[2]Current water rates assumed to be representative of future operational costs for each community

Evaluation of Alternative

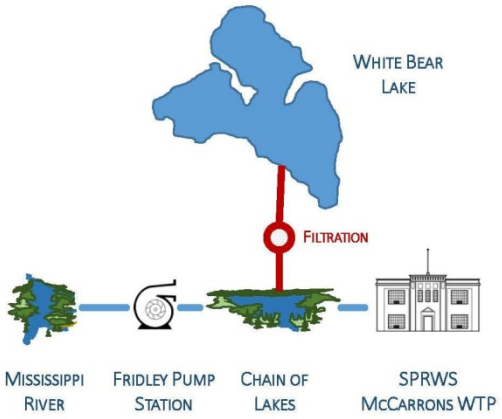
Advantages

- Lowest capital cost of options considered
- Ease of implementation
- Study area communities retain control over operation of water supply and treatment systems

Disadvantages

- Potential for continued decline in aquifer and lake levels

Direct Augmentation of White Bear Lake



Description
Direct augmentation of White Bear Lake with two billion gallons per year of water from the Mississippi River. A pumping and filtration facility would be constructed near Vadnais Lake with water main to convey water to White Bear Lake.

People Served by System in 2040: N/A

Total Reduction in Groundwater Pumping: N/A

Cost Summary Table

Capital Cost[1]	$50,000,000
Capital Cost per Million Gallons of Capacity	N/A[2]
Annual Operations and Maintenance Cost	$300,000
Operations and Maintenance Cost per Million Gallons of Capacity	N/A[2]

[1]Based on April 2014, no escalation to date of construction
[2]N/A – not applicable: this alternative does not provide a drinking water supply

Evaluation of Direct Augmentation of White Bear Lake

Advantages

- Would provide immediate benefit to White Bear Lake

Disadvantages

- Uncertainty in response of lake to additional volume added by augmentation (correct design capacity uncertain at this time)
- High capital cost
- Unlikely to provide benefit to water supply reliability or other regional surface water bodies

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