



CITY COUNCIL WORK SESSION REPORT

September 13, 2021

**TITLE: PRESENTATION AND DISCUSSION OF THE CITY'S WATER
TREATMENT PLANT ALTERNATIVES EVALUATION AND
RECOMMENDATIONS**

EXECUTIVE SUMMARY

To ensure reliable, high-quality water into the future, the City of Ann Arbor (City) must invest in significant infrastructure improvements. In September 2016, staff presented to City Council a summary of the *2015 Water Treatment Plant Alternatives Evaluation*, which recommended rehabilitating portions of the City's water treatment plant in lieu of other options that included purchasing water wholesale from an external provider. The 2015 Study considered criteria such as impact on rates, water quality, environmental stewardship, operational impact, reliability of water supply over the long-term, consistency with the City's strategic priorities, and other criteria.

Purpose of the Work Session Sufficient time has passed since 2016 to warrant revisiting the recommendations from the 2015 Study. With new water quality challenges surfacing, such as PFAS and *Cryptosporidium*, and a newly elected Council, this work session will re-present the recommendations from 2015, seek Council members' feedback and answer their questions on the proposed recommendations.

Following this work session, staff will be providing a resolution for City Council's consideration on the path forward for rehabilitating the City's water treatment plant.

Financial Impact The 2015 Study found that rehabilitation the City's water treatment infrastructure would be the most cost-effective option with the lowest impact on rates over the long-term. The capital costs for implementation is estimated up to \$87M (2015 dollars; approximately \$108M in 2021 dollars). In contrast, the capital cost associated with pump stations and pipelines to connect the City's distribution system to the regional water system was estimated to be more expensive (\$289M in 2015 dollars; or approximately \$355M in 2021 dollars). Other capital costs that were not included in the 2015 report and warrant further study include:

- Additional upgrades for the City's water treatment plant – Costs for an additional 25 million gallons per day (MGD) of *Cryptosporidium* treatment and potential treatment enhancements for PFAS and 1,4-dioxane if needed in the future.
- Potential upgrades within the regional water supply system – Costs for enhancements to the regional supplier's pumping, pipelines and storage that may be necessary to accommodate the City as a customer.

It is anticipated that connection to a regional supply will also result in higher annual operation and maintenance costs resulting from: (1) a portion of the water treatment plant costs that will remain with the City to operate and maintain pumping, storage and remaining facilities used to distribute the water within the City's distribution system, and (2) the monthly fixed charge and commodity charge to purchase drinking water from the regional supplier. While the magnitude of this increase cannot be fully determined without negotiation with the regional water supplier, it is

anticipated that the increase in annual operation and maintenance costs could be between 30 and 100 percent higher than rehabilitating the existing water treatment plant.

Therefore, staff recommends moving forward with the 2015 recommendation to rehabilitate the water treatment plant for the following reasons:

- The City has the ability to manage current and future water quality threats and challenges once it invests in its infrastructure.
- While capital costs to connect to the regional supply have not been fully quantified, it is anticipated that they would significantly exceed the cost of rehabilitating the City's water treatment plant.
- Maintaining water system autonomy enables the City to align water system planning with community values, including carbon neutrality and environmental impacts, and keep control of water restrictions, growth and rate development.
- The City's carbon footprint will significantly increase under a regional water supply solution due to energy requirements to pump water from its source to Ann Arbor's customers.

The following sections describe the Background, 2015 Study Conclusion and Recommendations, Comparison of Two Alternatives, Cost and Revenue Requirements, Changes Since 2015, and Next Steps. At the beginning of each section key takeaways are identified.

Background

Key Takeaways: The City of Ann Arbor water treatment plant was constructed in 1938, and the City is still using components of this original infrastructure. Portions of the current plant are over 80 years old and have exceeded their service life. While the plant meets current regulatory requirements for drinking water, this aged infrastructure does not meet current design standards and results in many operational and maintenance issues. To continue to provide reliable, high-quality water into the future, the City evaluated a range of alternatives.

The water treatment plant, which has a current capacity of 50 MGD, provides drinking water to about 125,000 people in Ann Arbor and neighboring townships. Surface water from the Huron River (approximately 85 percent of the supply) and groundwater (15 percent) are treated to make the water safe for consumption and household purposes. Ann Arbor's water has consistently exceeded regulatory requirements and has won awards for its taste and quality.

Risks from failure to act include higher maintenance requirements and costs, and reduced water quality. The components of the plant constructed in 1938 do not meet current design standards enforced by the Michigan Department of Environment, Great Lakes and Energy (EGLE).

The 2015 Study explored the following options to address these risks:

- Construct new or expand existing well fields.
- Construct a new water treatment plant.
- Join a regional water provider.
- Rehabilitate the existing water treatment plant.

Each alternative was assessed against the City's water quality goals, sustainability framework, customer service requirements, and regulatory compliance.

2015 Study Conclusion and Recommendations

Key Takeaways: The recommendation at the conclusion of the 2015 Study was to rehabilitate the existing water treatment plant.

The 2015 Study concluded that changes to the treatment regime were not necessary but that parts of the treatment plant needed rehabilitation. Recommendations from the 2015 Study made in support of the conclusion included:

- **Recommendation for what source to use:** The preferred source of supply for the City of Ann Arbor continues to be existing sources, treated at the City's water treatment plant, in conjunction with treatment improvements at the water treatment plant.
- **Recommendations for improved redundancy (backup):** Future consideration should be made for implementation of redundant sources.
- **Recommendation to manage aging infrastructure:** Replace the portion of the water treatment plant pretreatment facilities constructed in 1938 and 1949 (also known as Plant 1) and design the new equipment to potentially accommodate the replacement of the pretreatment facilities constructed in 1965 and 1975 (also known as Plant 2) sometime in the future.

The capital cost for the immediate needs were estimated at \$87M in 2015 dollars to rehabilitate a portion of the water treatment plant (approximately \$108M in 2021 dollars).











This recommendation was based upon many factors, including cost, water quality, environmental stewardship, operational impact, reliability of water supply over the long-term, consistency with Ann Arbor's strategic priorities, and other criteria. The recommended option was presented to Council in September 2016. The full report is available [online](#) for your review.

Comparison of Two Alternatives

Key Takeaways: Two of the alternatives that were featured in the 2015 Study include: (1) rehabilitation of the water treatment plant; and (2) connecting to the Great Lakes Water Authority and becoming a member community. This section compares these two alternatives side-by-side and supports staff’s recommendation to continue with the rehabilitation of the City’s water treatment plant.

Multiple alternatives were considered in the 2015 Study to address the two primary components of water supply: (1) what source is used; and (2) how the water is treated. Only two¹ of the alternatives require discussion: (1) rehabilitate the City’s water treatment plant; and (2) connect and purchase water from a regional supplier. Rehabilitating the City’s water treatment plant involves replacing a portion of the existing facilities (Plant 1) within the next five years, and potentially replacing another portion (Plant 2) within the next 20 years (Figure 1). Water would continue to be sourced from a combination of the Huron River (85 percent) and groundwater (15 percent). The regional water supply alternative involves connecting and purchasing water from the Great Lakes Water Authority (GLWA), which sources its water from the Detroit River and treats it at multiple GLWA water treatment plants. Pumps and pipes are needed to transport the water approximately 30 miles from the regional supplier’s treatment facilities to the City. Some of this infrastructure is already available, and some needs to be built (Figure 2). In this alternative, a portion of the existing water treatment plant would be demolished but the site would continue to operate with some components and a reduced staff to distribute drinking water to the City’s customers.

Summary Comparison The following table provides a high-level evaluation of the risks and impacts between the two alternatives. Red denotes higher risk/impact, green denotes lower risk/impact, and yellow medium risk/impact. A detailed explanation is provided in Appendix A.

Criteria	Rehabilitate the City’s Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supplier (Alternative 2)
Ongoing risk to current and future source water quality		
Treated water quality risk		
Ability to respond to community values on topics like carbon neutrality and environmental impacts*		
City’s carbon footprint		
Cost/impact on revenue requirements		

*See “Governance/Autonomy” in Appendix A

¹ Multiple alternatives for a regional water supply solution were evaluated in the 2015 Study but only one is compatible with GLWA’s model contract and bylaws. One alternative to treat water within the City was carried forward. Therefore, only two viable alternatives remain for consideration in the work session.

Figure 1: Rehabilitate the City's Water Treatment Plant on the Existing Site (Alternative 1)



The immediate needs for the plant include the replacement of the pretreatment facilities and portion of the plant that was originally built in 1938 and 1949, referred to as the Plant 1 Replacement. Replacing the portion of the plant built in 1965 and 1975 is potentially necessary in the future,

Figure 2: Connect and Purchase Water from a Regional Supply (GLWA) (Alternative 2)



To convey the water from GLWA's existing system near Joy Road Station and Ypsilanti Station, the City would need to build additional pumping capacity and pipelines to connect GLWA to the City-owned distribution system. The feasibility of using existing GLWA pumps and pipelines to bring water from multiple GLWA water treatment plants to points of connection to the City was not evaluated in the 2015 Study.

Cost and Revenue Requirements

Key Takeaways: Both alternatives will result in increased system costs and revenue requirements. For rehabilitation of the City's water treatment plant (Alternative 1), capital costs are already estimated for the replacement of a portion of the plant and are included in the current system's financial model. For Alternative 2, capital costs to bring the water from the regional water supplier to the City have not been fully identified and therefore are not included in the current system's financial model. From a review of available information, (1) the annualized operation and maintenance costs for Alternative 2 will likely be 30 to 100 percent higher than Alternative 1, and (2) the annualized costs for debt service of capital improvements for Alternative 2 can potentially be three times higher than Alternative 1. Detailed discussions with the regional water supplier and EGLE are necessary to confirm cost impacts and resulting revenue requirements.

Revenue requirements and resulting rate impacts are annually reviewed and presented to City Council for approval. Recommended drinking water rates follow cost-of-service best practices and include annual operation and maintenance expenses and capital needs.

Components included in the revenue requirements and the impacts associated with capital requirements are shown in Figure 3. Alternative 1 (rehabilitating the City's water treatment plant) is illustrated on the left and Alternative 2 (connecting to the regional water supplier and purchasing water) is shown on the right.

Many of the components that are included in the revenue requirements will remain the same for both alternatives, as can be seen in Figure 3. Revenue requirements resulting in a difference for the two alternatives include:

- The annualized cost of capital for the replacement of Plant 1 is only carried in Alternative 1 (left column).
- A reduction of water treatment plant costs, the cost of purchasing water from the regional supplier, and the annualized cost of capital for pump stations and pipelines to connect to the regional supplier are only carried in Alternative 2 (right column).

The water treatment plant operation and maintenance budget will not be eliminated entirely by a regional supply solution: 20 to 40 percent of the currently budgeted amount will be required for distribution of the purchased water.²

To determine the cost to purchase water from the regional supplier, detailed discussions with the supplier are needed. However, GLWA's service charges adopted for fiscal year 2022 are publicly available and provide information on the current rates paid by the member communities. Wholesale member community rates are comprised of: (1) a monthly service charge, and (2) a commodity charge. Rates are established during contract negotiations based primarily on cost of service and adjusted annually through a defined rate-setting process. If the average monthly service charge and average commodity charge from all the regional supplier's wholesale member communities are applied to the City's average daily water demands, this yields an estimated revenue requirement that is estimated to be 30 to 100 percent greater than the currently budgeted revenue requirement for the operation and maintenance of the City's water treatment plant.³ Given the City's distance from the source, this estimate is believed to be conservative and the City's actual revenue requirement is likely to be higher.

The capital cost of upgrades is included in annual revenue requirements because capital costs are paid over time through municipal bonds, the debt service for which are carried in the City's operating budget of Figure 3. Capital investments for some upgrades were estimated in the 2015 Study for both alternatives and these are shown using

² Under both alternatives, the City would need to operate and maintain storage reservoirs and pump stations within the City, standby power generators, some chemical systems, sampling, the control room, security, and grounds. Staff estimate that 20 to 40 percent of the costs would remain.

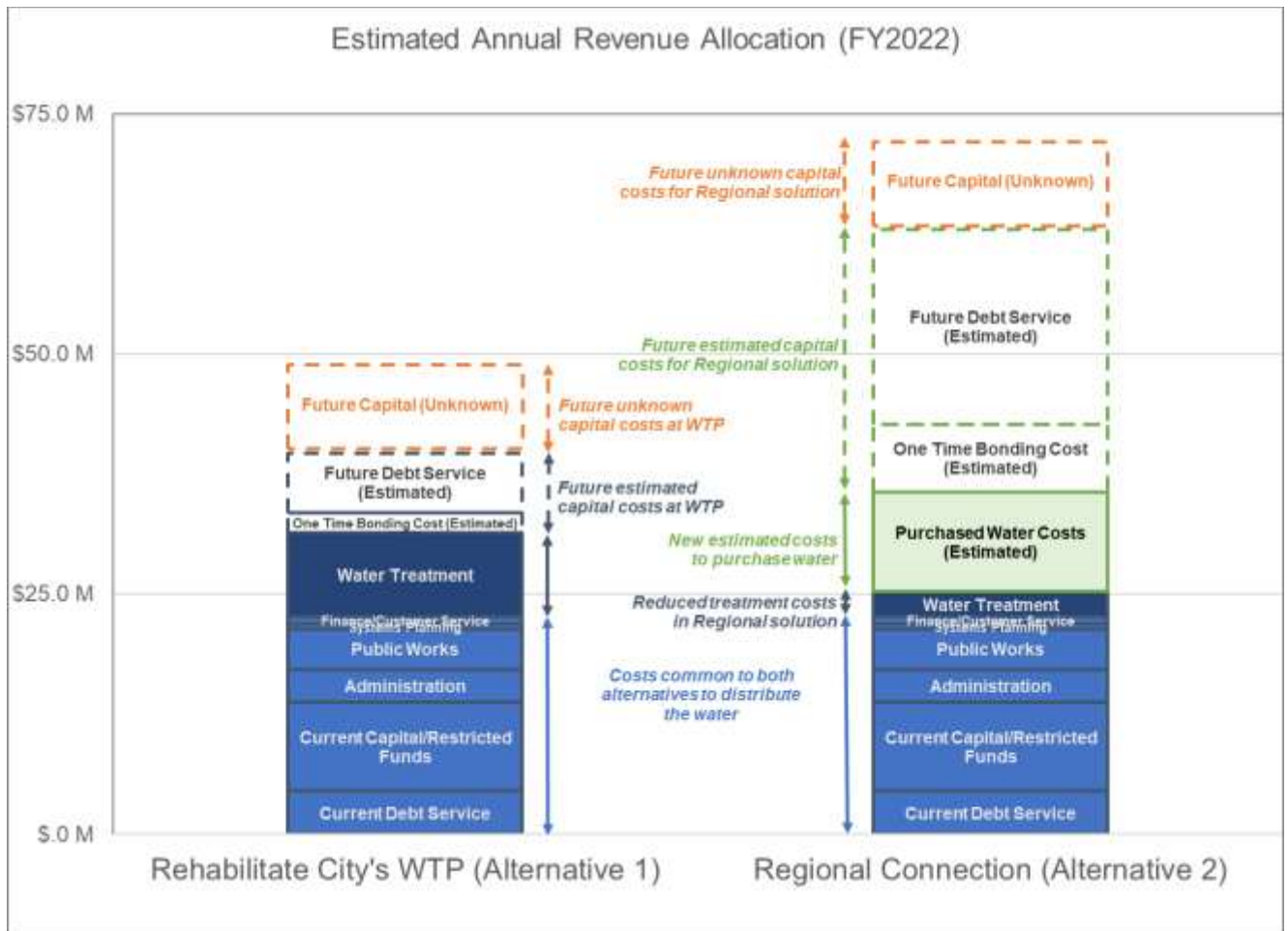
³ This comparison is based upon an average day water production of 14 million gallons and the operation and maintenance budget allocated for the water treatment budget for fiscal year 2022 of approximately \$30M.

the hatched boxes in Figure 3 to recognize the difference in costs while showing that the exact amounts are not known. Potential unknown future capital costs exist with both alternatives:

- Additional treatment requirements necessary for *Cryptosporidium* and potentially necessary for PFAS and 1,4-dioxane are unknown and not included in Alternative 1.
- For the connection to the regional supply, the estimated annualized costs to upgrade the City's water system to receive water from the regional supplier are included in Alternative 2. However, costs that may be necessary to upgrade the regional supplier's infrastructure to deliver water to the City are unknown and therefore not included.

As indicated in Figure 3, it is anticipated that the annualized capital, and operation and maintenance costs for Alternative 2 will be greater than Alternative 1.

Figure 3: Revenue Allocation for Both Alternatives⁴



⁴ Annual costs for purchased water are only an estimate, based on the average of GLWA member communities monthly and commodity charges. The future capital cost needs are based on amortizing the estimated cost to rebuild a portion of the water treatment plant as described in the 2015 Study as part of Alternative 1 (i.e., \$108M in today's dollars) and the cost for two pipelines and two pump stations in the City to accommodate a connection with GLWA as part of Alternative 2 (i.e., \$355M in today's dollars).

Changes Since 2015

Key Takeaways: Since 2015, the City has encountered several new water quality challenges. PFAS and *Cryptosporidium* have been detected in the Huron River upstream of the water treatment plant's intakes. Contaminated groundwater with 1,4 dioxane has continued to migrate eastward toward the Huron River. During this time the City has also made several improvements that have bolstered both the quality and reliability of the City's drinking water.

Changes in policy, governance, and operations since 2015 include:

1. Most of the Council members are new since 2015. The new members did not participate in the 2016 work session and did not hear the recommendations.
2. In April 2020, the City launched its *A2Zero Climate Action Plan*, which charts a path to carbon neutrality by the year 2030 that uses six core strategies aimed at increasing reliance on renewable energy, increasing energy efficiency, reducing vehicle travel, improving materials disposal, and other strategies. The regional water supply alternative, which requires pumping water from the metropolitan Detroit area, may not align with the A2Zero Plan.
3. GLWA is a regional drinking water provider with the capacity to service the City and all of its customers. GLWA was formed in 2014, just before the 2015 Study was completed.

The City has actively pursued water treatment improvements since the completion of the 2015 Study, investing in infrastructure to ensure continued reliable service, safety, and water quality. In the past five years, the Water Treatment Services Unit (WTSU) has undertaken these activities to advance the 2015 recommendations:

1. **Adding UV disinfection to improve treatment of *Cryptosporidium* present in the river source.**
Cryptosporidium is a pathogen linked to waterborne disease and gastrointestinal illness. New equipment was added in 2019 as part of an interim solution (\$2.7M construction cost) to treat 50 percent of the water treatment plant's capacity. The Department of Environment, Great Lakes, and Energy (EGLE) may require that additional equipment be added to treat the full plant production as part of future improvements.
2. **Improving the effectiveness of the existing water treatment plant to remove PFAS from drinking water.**
PFAS are a family of persistent environmental pollutants present in the river source. The City has modified its treatment process to improve removal of these contaminants. Improvements include modifying the type of granular activated carbon used in its filters, increasing the volume of carbon in its filters, and increasing the replacement frequency of carbon in its filters.
3. **Monitoring the 1,4-dioxane groundwater plume to predict breakthrough to the river source.**
In 2019, the Water Treatment Services Unit retained experts to evaluate migration of 1,4 dioxane in groundwater beneath the City and develop a plan for additional monitoring.
4. **Replacing the instrumentation and control system to improve automation of the treatment plant.**
Construction started in 2020 for the Supervisory Control and Data Acquisition System project, at a cost of ~\$4.5M. The old system was over 25 years old. This project replaces hardware and programming, positioning the water treatment plant for another 20 years, with improvements to control, monitoring, and trending.
5. **Ongoing structural and architectural improvements to the water treatment plant.**
The City has almost completed a multi-million dollar, 2-year architectural and structural improvement project that touched on nearly every part of the water treatment plant and distribution system outstations. Improvements included roof replacements, masonry restoration, concrete repair, interior space improvements and a variety of other work to our processes.

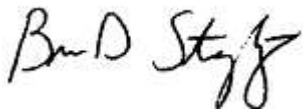
6. **Steere Farm Well Field Improvements Project.**
From 2018 to 2019, the City performed construction of the \$3M Steere Farm Well Field Improvements Project which provided upgrades to this critical infrastructure, which delivers approximately 15 percent of the City's raw water. The project included converting the well pumps from natural gas engines to electrical power with generator backup for emergencies. Improvements also included upgrades to all three well pumps and replacement of all three well houses.
7. **Barton Pump Station Electrical Improvements Project.**
In 2016, the City completed a \$2.3 electrical improvements project at the Barton Raw Water Pump Station. This project replaced the entire original electrical system with new switchgear including configurations to improve reliability and uninterrupted power.
8. **Integrating the costs to rehabilitate the water treatment plant into the Water System Capital Improvement Plan (CIP) and water rate structure.**
Council approved rate hikes at 6 percent for the next six years.

NEXT STEPS

Based on the 2015 Study and reassessment of current conditions, staff believe that it is unlikely that cost savings, schedule acceleration, or improved services that would include reliability and quality, can be realized by purchasing water from an external provider such as GLWA. Therefore, staff recommend that the City proceed with design to upgrade the City's water treatment plant. That said, staff recognize that Council may be interested in furthering the evaluation of the GLWA option.

As such, staff will present two resolutions for Council consideration at a future Council meeting. The first resolution will be to approve a contract to proceed to conceptual design of upgrades to the City's water treatment plant. The second resolution will amend that contract to add re-evaluating the costs and feasibility of purchasing water from GLWA. It is anticipated that this additional work will cost approximately \$300,000 and add one to two years to the project schedule. Staff will provide a final cost and schedule impact as part of this second resolution. While staff do not recommend approval of this second resolution, this approach would allow Council to independently evaluate and discuss this alternative.

Submitted by:







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Attachments:



Appendix A – Comments to Support Risk Assessment



Appendix A – Comments to Support Risk Assessment



Table A1: Detailed comparison of two alternatives for the future of the City's water treatment plant.

Evaluative Criteria	Rehabilitate the City's Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supply (Alternative 2)
Current and Future Source Water Quality Threats and Risk	 <p>Long-term, the City can manage water quality threats in the source water</p> <p><i>Cryptosporidium</i> – present in river source, effective treatment was installed in 2020</p> <p>1,4-dioxane – risk of groundwater plume reaching the Huron River upstream of the City intake; studies are ongoing to predict timing</p> <p>PFAS – present in river source and partially removed by existing treatment; future risk if new compounds are detected with potential health impacts</p>	 <p>Long term, the regional water supplier can manage water quality threats in the source water</p> <p><i>Cryptosporidium</i> – no foreseen major change to pathogen risk, including <i>Cryptosporidium</i></p> <p>1,4-dioxane – no foreseen risk in source water</p> <p>PFAS – not currently present in source water but remains a future risk</p> <p>Algae and algal toxins – risk of harmful algal blooms in source water, with effective treatment available</p>
Treated Water Quality Risk	 <p>Short-term treated water quality impacts due to future treatment changes are less likely</p>	 <p>Short-term treated water quality impacts during transition to a regional water supply are more likely and may undermine public confidence in the water supply</p> <p>For example, changing disinfectant from chloramine to free chlorine in the distribution system potentially affects the taste and odor of the water and formation of regulated disinfection by-products</p>

Evaluative Criteria	Rehabilitate the City's Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supply (Alternative 2)
Compatibility with A2Zero Climate Action Plan (2020)	 <p>Likely more compatible with A2Zero</p> <p>Energy to pump water is the most significant contributor to carbon footprint</p> <p>Portions of the existing distribution system are operated by gravity, reducing energy costs</p>	 <p>Likely less compatible with A2Zero</p> <p>Energy needed to pump the water from the regional water supplier's treatment facilities to the City's distribution system is substantial</p> <p>Distance between regional supplier's nearest treatment facility and the City's distribution system is approximately 30 miles</p> <p>Additional pumping facilities would likely be needed at the point of wholesale connection to address the City's topography</p>
Change to Governance and Ownership	 <p>City retains complete control over drinking water infrastructure, including the use of water restrictions, voluntary treatment objectives that exceed regulatory requirements, and any decision to serve additional geographic areas</p> <p>City retains ability to establish community values on topics like carbon neutrality and environmental impacts</p>	 <p>City would enter into a contract with the regional water supplier, with a contractual structure that may limit use and would need the approval of the regional supplier to expand into new geographical areas</p> <p>The regional supplier may share in some operational considerations of the City's system</p> <p>City would be one of almost 100 member communities already connected to the regional supplier</p> <p>Community values would not necessarily be able to be realized as part of a regional water solution, including values that are legislated or directed by Council</p>

Evaluative Criteria	Rehabilitate the City's Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supply (Alternative 2)
Potential Implementation Schedule Impacts	 <p>Shorter timeline for implementation</p> <p>Schedule risk managed by the City</p> <p>Begin conceptual design phase in 2022, with completion in 2023</p> <p>Begin Construction in about five to six years from now</p>	 <p>Longer timeline for implementation</p> <p>Higher schedule risk, some of which would be out of the City's control</p> <p>Begin discussions and conceptual design phase in 2022; expected to add 1 to 2 years to project schedule (additional engineering cost and staff cost estimated at \$300,000)</p> <p>Begin construction in six to eight or more years from now</p> <p>Timing for potential capital planning for the regional system has not been identified</p> <p>Timing for easement and land acquisition for pumping and conveyance has not been identified and could be challenging</p>

Evaluative Criteria	Rehabilitate the City's Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supply (Alternative 2)
Potential Capital Cost Impacts	 <p>Immediate capital cost is lower; there are some future cost risks</p> <p>Immediate capital improvements (in 2021 dollars):</p> <ul style="list-style-type: none"> • Refurbish a portion of the existing water treatment plant (\$108M) • Permanent <i>Cryptosporidium</i> treatment cost, piping and new building (~\$10 to 15M) <p>Potential unknown capital improvements that may be needed in the future:</p> <ul style="list-style-type: none"> • Refurbish additional portion of the water treatment plant (Plant 2), if necessary (cost unknown) • PFAS enhanced treatment (timing, scope and cost unknown) • 1,4-dioxane treatment (timing, scope and cost unknown) 	 <p>Immediate capital cost is higher and not all capital costs have been identified; there is some immediate cost risk</p> <p>Potential opportunity for cost sharing is unknown</p> <p>Immediate capital improvements within the City's water system (in 2021 dollars):</p> <ul style="list-style-type: none"> • Upgrades to City's transmission and pumping system to accommodate regional water supply (~\$355M) • Repurpose existing City water treatment plant (cost unknown) <p>Potential unknown capital improvements to regional water supplier's system:</p> <ul style="list-style-type: none"> • Potential upgrades to regional water supplier's transmission and pumping system to provide adequate flow to two points of connection to City's transmission system (timing, scope and cost unknown)

Evaluative Criteria	Rehabilitate the City's Water Treatment Plant (Alternative 1)	Connect and Purchase Water from a Regional Supply (Alternative 2)
Potential Annual Operating and Maintenance Cost Impacts	 <p>Annual O&M costs will increase but less than Alternative 2</p>	 <p>Annual O&M costs will increase and there is some future cost risk</p> <p>Annual O&M costs for the City's distribution system remain</p> <p>Annual O&M costs for a portion of the existing water treatment plant is reduced to less than 50 percent</p> <p>Annual commodity and service charges are estimated to be 30 to 100 percent higher than Alternative 1 (the magnitude of the increase can only be determined through discussions with GLWA)</p>