Augmentation Feasibility Study Q&A

Q1. What is the recommended water source for augmentation?

Source: Turtle Lake Augmentation Study (a/k/a "Augmentation Feasibility Study"), Section 1.0 Conclusions and Recommendations

The recommended water source for augmentation is the Saint Paul Regional Water Service water along Country Road I. This augmentation source was based on low infrastructure costs and ability to treat source water to protect lake water quality.

Q2. What is the estimated total cost of the augmentation system?

Source: Based upon the Memo to City Council, March 2, 2016, from Mark Maloney, Public Works Director. Included in City Council Meeting packet.

The most likely scenario of augmentation for Turtle Lake identified in the 2015 study, adjusted for inflation and including normal project contingencies, has a total project cost estimate of $2.0-$2.5 million.

Q3. Has City of Shoreview or Ramsey County agreed to provide funding if an augmentation project moves forward?

The Turtle Lake Homeowners Association (TLHA) Board requested the City of Shoreview indicate what level of support they would provide if an augmentation system moves forward. However, the City Council suggested the next step in the process is for the City and the TLHA to determine the homeowner's level of support for the project.

To date, there has been no financial commitment from the City, State, or County for an augmentation project. Thus, the cost estimates in question 2 above assume no financial support from the City, State, or County.

Q4. What is the estimated cost per homeowner if an augmentation system was to move forward?

Source: Based upon the Memo to City Council, March 2, 2016, from Mark Maloney, Public Works Director. Included in City Council Meeting packet. Also based upon discussions with City Staff.

Per Ramsey County records, 207 separate parcels directly abut Turtle Lake:

- 203 private residential properties
- 1 City of Shoreview parcel (extension of Birch Lane South)
- 1 Ramsey County parcel (Turtle Lake Park)
- 2 State of Minnesota parcels (public access/parking lot)

Simply dividing estimated project costs across the 207 benefitting properties results in an assessment of $12,100/property.

City Staff indicated three payment options for construction costs. Homeowners can elect the option fitting their needs.

Option 1 – Total assessment of $12,100 can be paid up front.
Option 2 – Costs can be assessed over a 15 year period. Based upon an estimated total cost of $2.5 million, and assuming no financial support from the City, County, or State, City Staff has estimated the annual assessment to homeowners would be $1,105/year for 15 years. This payment option includes an assumed interest rate of 3-4%.
Option 3 – Eligible seniors can use a senior deferral option where payments would not be due until sale of the parcel. With this option the assessment balance will accrue interest until sale of the parcel.

Operating Costs – In addition to construction costs, City Staff estimates operating costs to be $100-$300/year for each parcel. In years Turtle Lake is not augmented, operating costs are estimated to be $100 for each parcel. When augmented, midrange operating cost are estimated to be $150-$200/year but could be as high as $300 in years of low water. Operating costs are added to each parcels City quarterly utility bill. Operating costs are billed the year after they are incurred (e.g., actual cost of operating the system in 2017 would be added to the utility quarterly billing 2018).

Q5. What is the history of Turtle Lake Augmentation?

From 1928 to 1989, Turtle Lake was augmented 40 of the 62 years. Augmentation ranged from 5-168 days each year, with an average of 54 days. An average of 157 million gallons was augmented into the lake, which is an average of 12.8˝ for each of the 40 years (total of 6.3 billion gallons) See page 4 of the Augmentation Feasibility Study for further Turtle Lake historical augmentation information. The Study also includes an analysis of hypothetical augmentation from 1990-2013 on pages 13-18.

Q6. What governmental agencies were involved in the feasibility study process?

Source: Turtle Lake Augmentation Study Progress Report, May 2015

Representatives from the following agencies met with SEH, City of Shoreview staff, and representatives from the TLHA Board as part of the feasibility study process: Metropolitan Council, Rice Creek Watershed District, Minnesota Department of Natural Resources, St. Paul Regional Water System, and Ramsey County Environmental Services.

If the project goes forward, one of the first phases is final design. During this phase agencies review the augmentation system and provide feedback on the system and permits needed. Agencies have been involved with the initial design, but they do not formally commit to permitting the system until final design is completed. At this stage, permits and agreements will be required from the DNR, St. Paul Water Authority, and the City of Shoreview.

Q7. Is there more background on the use of the sand filter and water quality impacts?

Source: SEH

Sand filtration is a common approach to water quality treatment. The City's new (drinking) water treatment plant utilizes sand filtration to remove impurities and meet drinking water standards.

The augmentation project has two main objectives: (1) provide adequate volume to maintain water levels in periods of below average precipitation, and (2) not degrade in-lake water quality. The first is relatively simple, relying on sizing pumps and pipes to deliver the desired amount of water to the lake. The water quality question is more complicated. The 2011 study addressed lake response – how quality would change in response to receiving volumes of water from different sources. In the 2015 study, it became apparent the analysis should not focus on lake response. Rather, effort should focus on identifying water quality treatment approaches resulting in no change to in-lake water quality conditions.

In lake management, phosphorus is the limiting nutrient most frequently tied to lake quality and eutrophication. As total phosphorus concretion rises, water column transparency is reduced. Elevated phosphorus levels lead to high frequencies of algal blooms and excess weed growth.

The Saint Paul Regional Water Services adds a chemical coagulant – ferric chloride – to raw water drawn from the Mississippi River prior to entering large conduits flowing through Shoreview to Charley Lake. Ferric chloride interacts with phosphorus and forms a floc. After a long enough contact time, the floc settles out of the water column, in this case to the bottom of Charley Lake. This process "binds" phosphorus so it is not available for algae or plant growth.

There were concerns regarding drawing augmentation water from the conduits. First, if unfiltered water was diverted into the lake, floc would form and settle in Turtle Lake. This was undesirable and had the potential of having bond phosphorus released under certain low oxygen conditions in the lake. Second, assuming water would flow through small filters intended to screen out invasive species like zebra mussels, the fear was floc would clog screens, greatly reducing effectiveness of the augmentation system. Therefore, using advanced sand filtration was believed to be a reasonable answer.

A water treatment "pilot" plant was brought on site to optimize design of a sand filter system. Alternatives included size and configuration of filters and size of filter media. After testing many alternatives, the use of sand filters as the primary means to filter floc was ruled out. Floc formation in conduits was incomplete – velocities in the pipes are too swift to allow adequate contact time for floc to form in a strong way. Thus, sand filters were not as effective as hoped for removing phosphorus.

Further testing of water flow through zebra mussel screens was performed to better understand operational issues due to anticipated plugging. Zebra mussel screens are much finer than sand filter media, therefore, screens will retain smaller particulates. Testing confirmed screens could in fact retain floc, thereby reducing phosphorus. Testing also showed filter plugging could be managed with frequent back-flushing without negatively effecting overall augmentation efficiency.

An obvious question was whether or not sand filters would be of any value; would zebra mussel screens alone do the job? The proposed water quality treatment process includes sand filtration in front of zebra mussel screens. Advantages:

- Removal of organic and inorganic particles contributing to turbidity and color issues, and removal of larger particulates to protect zebra mussel filters, reducing plugging and damage to screens;
- With chemical addition, sand filters can be used to remove other constituents in water, including iron and turbidity.
- A treatment system with sand filters can be configured to address water quality permit conditions which may change in the future (same discussion is a big part of the White Bear Lake augmentation debate).

The final treatment system design will identify types and amounts of chemical dosing that could be used in combination with sand filters to achieve maximum water quality benefit. Ferric chloride is already present in raw water acting as a coagulant. Other polymers like alum (aluminum sulfate) are also used to bind phosphorus. Other chemicals (e.g., sodium permanganate) could be used as oxidants. Oxidants oxidize iron and some organics, further improving water quality.

There is a cost for adding sand filtration to the proposed treatment system. However, the benefit is improved water quality and flexibility for future changes to required treatment.

Q8. How was the targeted water level for augmentation determined?

The targeted water level of 891-892 is based upon the target water level used when the lake was previously augmented.

Q9. We currently have high water levels. If the poll results in a "no," will we consider augmentation at a future date?

If the poll comes back with a majority voting no, the City of Shoreview is indicating the lake level would have to drop very low for an extended period – possibly 7-8 years before the City would entertain revisiting augmentation. The City 's view on this does not prevent homeowners, per state statute, from requesting the City at any time to begin the process to form a LID to augment Turtle lake.

Q10. What are the next steps?

The homeowners poll is the next step. The City will tabulate results. If enough yes votes are cast to meet a super majority the City is requiring, the project goes forward and construction could begin in 2017 or 2018 (see pages 38-39 of the Augmentation Feasibility Study for a detailed listing of next steps). If homeowners vote no to augmentation, work on the project ceases.