



Alternative Water Source Evaluation

Part 3 – Conservation Measures

Village of Oswego, Illinois

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BAXTER & WOODMAN
Consulting Engineers

Village of Oswego, IL
Alternative Water Source Evaluation – Part 3
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LIST OF ABBREVIATIONS

avg	-	average
CDWM	-	Chicago Department of Water Management
CMAP	-	Chicago Metropolitan Agency for Planning
DWC	-	DuPage Water Commission
EPA	-	Environmental Protection Agency
ft	-	feet
ft ²	-	square feet
ft ³	-	cubic feet
gpd	-	gallons per day
gpm	-	gallons per minute
gpcpd	-	gallons per capita per day
IAWC	-	Illinois American Water Company
IDNR	-	Illinois Department of Natural Resources
IEPA	-	Illinois Environmental Protection Agency
ISWS	-	Illinois State Water Survey
max	-	maximum
MG	-	million gallons (or mil gal)
MGD	-	million gallons per day
mg/L	-	milligrams per liter (parts per million in dilute solutions)
min	-	minimum
PRV	-	pressure reducing valve
psi	-	pounds per square inch
US EPA	-	United States Environmental Protection Agency

14. PART 3 INTRODUCTION

Part 3 of the Alternative Water Source Evaluation (Study) includes detail on conservation measures and is a companion document to the Part 1 and Part 2 reports. The purpose of the Study is to update and align the previous source water analyses completed for the Fox River Option (Engineering Enterprise, Inc., 2017) and Lake Michigan Water via DuPage Water Commission Option (AECOM, 2018) with two new Lake Michigan Water alternatives: the proposed Joliet Water Commission Option and the Illinois American Water Option. The specific design recommendations from the previous Fox River and DWC studies have not been altered as part of this study.

The Village is partnering with the Village of Montgomery and United City of Yorkville to evaluate several alternative water supply sources. The alternatives evaluated in the Study are sized to meet the 2050 demands of Montgomery, Oswego, and Yorkville, with consideration given to the ultimate demand when the three communities are fully developed.

Part 1 of the Study provided the following:

- A summary of the existing water source in Montgomery, Oswego, and Yorkville
- An analysis of population and water demand projections and water conservation efforts
- A summary of Oswego's existing water system
- The results of the Illinois State Water Survey analysis
- An overview of the Fox River and Lake Michigan alternative water sources
- A description of the comprehensive Study approach and next steps

Part 2 of the Study provided the following:

- An overview of the key considerations used for evaluation
- A detailed discussion of the identified water source options
- The internal system improvements necessary when changing water sources

Part 3 of the Study provides the following:

- A discussion of the need and requirements for water conservation
- Examples of conservation measures in other areas
- An overview of current conservation practices in Oswego
- Examples of proposed conservation measures

Future parts of the Study will address the following:

- Cost estimates
- Funding alternatives
- Public information meeting

Water is an essential and finite resource. Water use demands are impacted by population and development growth and climate; over the past 50 years in the United States, population has doubled while water demands have tripled. According to the American Water Works Association

(AWWA), water conservation is the practice of using water effectively to reduce unnecessary usage. Conservation is critical to ensuring the availability of water, sustaining the natural world and supporting economic, recreation, and drinking water needs.

Development of new water supply and distribution infrastructure is a very costly endeavor. Implementation of water conservation practices may allow Oswego to defer some capital improvements in the short term, but the projected population and development growth in the region means that conservation alone will not be enough to address the need for an alternative water source.

15. THE NEED FOR WATER CONSERVATION

According to the Illinois State Water Survey (ISWS), the deep sandstone aquifer used by Montgomery, Oswego, Yorkville, and many neighboring communities is being pumped beyond its sustainable yield and water levels in the aquifer are dropping, putting many supply wells in the area at risk. The aquifer is projected to be at severe risk of depletion and may no longer be able to meet the regional maximum day water demands in the near future. Conservation of this valuable resource is critical to ensuring water availability for regional prosperity and economic development.

15.1 Water Demand Projections

The water supply system must be able to meet the maximum day demand, meaning that all treatment and supply facilities must be sized for the maximum day demand, which can be more than double the average day demand. For the purpose of the Study, all alternatives are being evaluated for the 2050 maximum day demand.

The Part 1 report provided a detailed analysis of the current and projected water demands for Montgomery, Oswego, and Yorkville. A summary of the 2020 and 2050 water demand projections in million gallons per day (MGD) is included as Table 1. The combined water demands for the three communities are expected to increase by more than 75% by 2050. This poses a severe risk to the reliability of the deep sandstone aquifer that is used by Montgomery, Oswego, Yorkville, and other neighboring communities. Reduction in maximum day demands could lead to cost savings through smaller infrastructure, less treatment, and reduced pumping.

TABLE 1
Water Demand Projection Summary

	Parameter	Montgomery	Oswego	Yorkville	Total
2020	Average Day (MGD)	2.36	2.38	1.62	6.36
	Maximum Day (MGD)	4.03	5.04	3.88	12.95
2050	Average Day (MGD)	3.4	3.77	4.06	11.23
	Maximum Day (Current Trends) (MGD)	5.53	7.99	7.62	21.14
	Maximum Day (Contractual Limit/LRI) (MGD)	5.53	6.41	6.91	18.85

As shown above, two demand scenarios were developed to project water demands to 2050. The Current Trends (CT) scenario assumes that per capita water demand trends remain constant through 2050. The Contractual Limit/Less Resource Intensive (CL/LRI) scenario reflects the general downward trend in per capita water consumption in the region and contractual limitations on the MDD:ADD ratio, a common requirement of Lake Michigan water suppliers. For Oswego alone, the difference between the CT and CL/LRI projections is 1.58 MGD, a difference of just over 20%. For the three communities combined, the maximum day demand is reduced by 2.32 MGD under the CL/LRI scenario.

The ISWS report states that even under the CL/LRI demand scenario, “ the sandstone aquifer will no longer be a reliable source of water for Oswego within a few decades.” The report goes on to state:

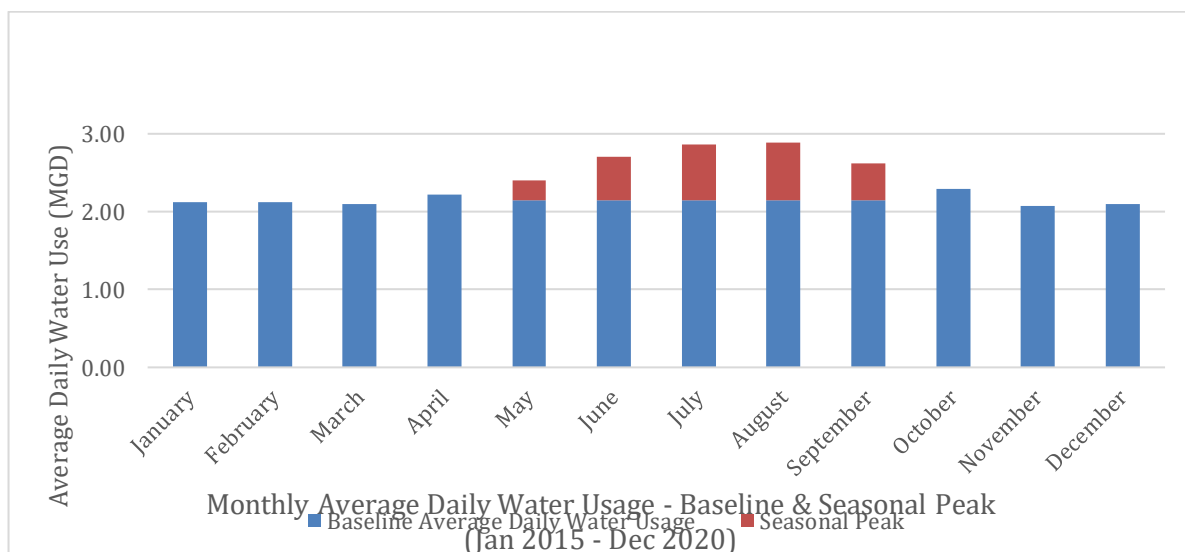
Withdrawals from the sandstone aquifer in the... region have been unsustainable for over a century. Over the decades, the aquifer has slowly depleted and now many supply wells are threatened. If withdrawals continue to exceed sustainable supply, irreparable declines in water levels will occur, impacting the already limited timeline of availability for this water source. (ISWS, 2021, p. 5)

Water conservation is critical to minimizing withdrawals from the depleted aquifer but conservation alone will not make the deep aquifer a sustainable water supply source.

15.2 Oswego Peak Water Usage Trends

As discussed in the Part 1 report, water demands in Oswego increase during warmer months due to landscaping, irrigation, and seasonal construction water use. Figure 1 shows the water usage trends in Oswego based on data recorded for 2015-2020. Oswego’s average daily demands increase by nearly 0.75 MGD over the baseline water usage during this seasonal peak.

FIGURE 1
Oswego Baseline and Seasonal Peak Water Usage



Reducing the seasonal peak demands observed during the summer months can result in a lower MDD:ADD ratio. As discussed in the Part 1 Report, the three Lake Michigan alternatives evaluated in this Study require a MDD:ADD ratio of 1.7. Currently, the MDD:ADD ratios for Montgomery, Oswego, and Yorkville are 1.71, 2.12, and 2.39, respectively.

15.3 IDNR Requirements

A U.S. Supreme Court Decree [*Wisconsin v. Illinois*, 449 U.S. 48 (1980)] limits Illinois' diversion of Lake Michigan water. That Decree also contains language that has been incorporated into Illinois law, the Level of Lake Michigan Act (615 ILCS 50), which sets forth the Department's Lake Michigan water allocation goal. Lake Michigan water use is limited to an annual average of 3200 cubic feet per second (cfs) or 2.1 billion gallons per day. The goal of Illinois' Lake Michigan water conservation program is taken directly from Illinois state law, and is stated below:

"The Department shall require that all feasible means reasonably available to the State and its municipalities, political subdivisions, agencies and instrumentalities shall be employed to conserve and manage the water resources of the region and the use of water therein in accordance with the best modern scientific knowledge and engineering practice." (615 ILCS 50/5)

The IDNR administers the Lake Michigan allocation process in the state of Illinois. If a Lake Michigan option is selected, the Village of Oswego will need to apply for a Lake Michigan water allocation. Allocation permit applications are submitted to IDNR, which then reviews the application and holds a public allocation hearing for each applicant. After review of the permit application, the IDNR determines anticipated water needs for each applicant based on the following criteria:

- Current and projected population;
- Current and projected per capita consumption;
- The nature and extent of industrial, municipal, and hydrant uses;
- Implementation of conservation practices; and
- Non-revenue water flows (required to be 10% or less of net annual pumpage)

Non-revenue water assesses the difference between purchased and billed water. Section 15.4 discusses this in more detail.

Table 2 summarizes the conservation practices that are required for a Lake Michigan allocation according to Section 3730.307 of the Illinois State Administrative Code and highlights the practices performed and/or included in the Village's ordinance.

TABLE 2

Summary of IDNR Lake Michigan Allocation Conservation Requirements

Conservation Practice		Performed but Not Included in Existing Oswego Ordinance	Satisfied by Existing Oswego Ordinance
1)	Leakage monitoring and correction for storage, transmission and distribution systems.	Yes	No
2)	Metering of all new construction. When practicable and feasible, the Department recommends sub-metering in new multi-family buildings.	No	No
3)	Metering of existing non-metered services as part of any major remodeling.	No	No
4)	The adoption of ordinances requiring that new and replacement plumbing fixtures be a labeled WaterSense product, as specified by US EPA.	No	No
5)	The adoption of ordinances requiring the installation of closed system air conditioning in all new construction and in all remodeling.	No	No
6)	The adoption of ordinances requiring that all lavatories for public use in new construction or remodeling be equipped with metering or self-closing faucets.	No	No
7)	The adoption of ordinances requiring that all newly constructed or remodeled car wash installations be equipped with a water recycling system.	No	No
	The adoption of ordinances that restrict non-essential outside water uses to prevent excessive, wasteful use. These shall provide that unrestricted lawn sprinkling will not be allowed from May 15 through September 15 of each year by requiring, as a minimum, that lawn sprinkling shall not occur on consecutive days nor shall any lawn sprinkling occur during at least a 6 hour period in the middle of the day (i.e., 10 a.m. through 4 p.m., noon to 6 p.m.) when evapotranspiration is at its highest. New lawns (less than 3 months old) may be exempted from this provision.	NA	Yes
8)	In addition, new/replacement sprinkler systems shall be equipped with a WaterSense labeled irrigation controller and shall be in compliance with Section 2.5(g) of the Illinois Plumbing License Law [225 ILCS 320].	No	No

Conservation Practice		Performed but Not Included in Existing Oswego Ordinance	Satisfied by Existing Oswego Ordinance
9)	Development and implementation of public programs to encourage efficient water use.	No	No
10)	Installation of facilities and implementation of programs to reduce to a reasonable minimum, and to accurately account for, water used for navigational and discretionary diversion purposes.	No	No

The Village of Oswego is evaluating their current water conservation ordinance for compliance with IDNR requirements.

The IDNR requires a public water supply permit for any withdrawal from a public waterway such as the Fox River. For the times when the Fox River’s flow is reduced, the IDNR uses the 7Q10, or “7 day 10 year low flow” to quantify how much water flows during prolonged periods of dry weather. Partial or full restrictions would be placed by IDNR on the withdrawal rates when the river falls below the 7Q10. During these times, the communities would need to rely on water produced from the network of backup wells. The IDNR water supply permit does not require specific water conservation measures at this time but conservation measures may be recommended or required during the permitting process.

Regardless of a community’s source of water, water efficiency and conservation are critical strategies to maintaining long-term water supply.

15.4 Non-Revenue Water

Non-Revenue Water is the difference between the volume of water produced and the volume of water billed to your customers. Water loss occurs in two distinct manners:

- *Apparent Losses* occur due to meter inaccuracies, billing system errors and unauthorized consumption. These apparent losses cost your utility revenue and result in skewed data regarding your customer’s consumption.
- *Real Losses* occur when you have water main breaks or leaks, including service leaks. These real losses increase your water production costs and can negatively impact your water resources.

The IDNR requires each utility that receives Lake Michigan water to comply with the American Water Works Association (AWWA) M36 Water Audits and Loss Control Programs methodology to determine the non-revenue water in their annual water accounting reports (LMO-2). The IDNR has established a 10% non-revenue water goal for all utilities that receive Lake Michigan water as of 2019, which is a reduction from 12% previously. Water utilities that do not comply with the non-

revenue water standard are required to prepare and submit a water system improvement and/or compliance plan with the goal of meeting the 10% non-revenue water goal.

As part of the Study, the AWWA M36 Water Audit Software was used to confirm the Village's estimates of water produced, authorized consumption, unauthorized consumption, customer metering inaccuracies, water losses, and annual costs of water losses. Calculating the theoretical Water Calendar Year 2019 Water Audit, ranging from October 1, 2018 through September 30, 2019, shows that the Village supplied 861.3 million gallons (MG) and billed 765.7 MG, which amounts to 95.7 MG or 11% non-revenue water for the year.

With 11% non-revenue water, the Village of Oswego is right on the cusp of compliance with IDNR. However, there are reasons to expect the non-revenue water to decrease once an alternate water source is found:

- Well Operations – Water wasted from well activities (maintenance, backwashing, flushing, etc.) will no longer appear in the system.
- Master Meter Error – Currently, the supply-side water is estimated through the eight well pumps of varying ages and accuracies. When the alternate water supply is connected, and the Village is only utilizing between one to three new master meters to account for supply, the potential percent error will be reduced significantly due to both meter age and quantity.

16. WATER CONSERVATION TRENDS

16.1 Water Conservation Practices in the Region

According to the Chicago Metropolitan Agency for Planning (CMAP), over 85 percent of municipalities in the Chicago region have lawn water guidelines. The high percentage of communities that have implemented water conservation requirements can be attributed to the IDNR requirements detailed previously, as well as voluntary guidelines like those issued by the Northwest Water Planning Alliance (NWPA), a consortium of more than 80 communities in DeKalb, Kane, Kendall, Lake, and McHenry counties.

According to the NWPA, lawn watering and other outdoor water uses can account for 30 percent of Illinois home water usage throughout the summer. The NWPA promotes water conservation by encouraging member communities to adopt the Regional Water Conservation Lawn Watering Ordinance, which establishes limits on outdoor water use. The NWPA has developed and promotes sustainable water policies, practices and outreach resources such as providing water bill inserts that help promote residential water use efficiency and the impacts of a leaking water faucet. NWPA also promotes WaterSense, a voluntary partnership program sponsored by the U.S. Environmental Protection Agency (US EPA), which is both a label for water-efficient products and a resource for helping save water.

WaterSense partners are ambassadors spreading the water-efficiency message. Becoming a WaterSense partner is free and offers exclusive member-only resources, networking opportunities, and branding. NWPA encourages all member communities to become WaterSense partners.

More locally, the City of Aurora has a Water Conservation Ordinance that implements a fine of \$50 up to a maximum fine amount of \$1,000 per violation. Key elements of the ordinance include:

- Customers are permitted to water lawns based on the "odd/even" protocol (based on last digit of street address), between the hours of 6 a.m. and 9 a.m. and 6 p.m. to 9 p.m. This provides an average of 21 hours of potential watering time per week.
- Customers with permanently installed, automatic irrigation systems are permitted to water lawns and other landscape using those systems under the same provisions listed above. This provides an average of 21 hours of potential watering time per week.
- Median strips and other areas that cannot be identified as "odd" or "even" are designated as "even" for the purpose of this ordinance.
- Watering is not permitted on July 31st and August 31st of each year. This applies to all customers, automatic or manual systems, odd or even addresses, etc.
- Plant watering using harvested rainwater, reclaimed greywater, or recycled effluent may be performed at any time.

- The waste of water is prohibited. No person shall allow water to run off into a ditch or street, nor shall any person spray or sprinkle streets or sidewalks.
- Watering of plants, trees, gardens, etc., and filling of swimming pools having a volume of less than 50 gallons, is permitted at all times, provided a hand-held hose of one-inch diameter or less is used.
- Washing of vehicles is permitted at all times, provided a hose of one-inch diameter or less equipped with a shut-off type nozzle is used.
- Sod laying and lawn seeding are prohibited during the months of July and August each year. During other months, special permits for watering of sod or seed during the first 10 days after placement may be obtained from the Buildings and Permits Division.
- Special permits regulating the use of water for landscaping purposes by commercial enterprises may be obtained from the Department of Public Works.

Small changes in daily practices can have an impact on total daily water usage. The City of Chicago has an education program to encourage conservation and better management of the Lake Michigan Water Resource. Information is shared with residents such as the following:

- Turning the water off while brushing your teeth, shaving, or washing your face could save between 10 and 20 gallons of water per person per week.
- The bathroom accounts for 75 percent of the water used inside the home.
- A typical toilet uses up to five gallons per flush.
- A faucet dripping at the rate of one drop per second wastes 2,700 gallons per year.
- A leaky toilet wastes more than 50 gallons of water per day.
- Run the dishwasher and washing machine only when there is a full load or use low water level features.
- Water your lawn in the early morning, when temperatures are cooler, to minimize evaporation.

Many utilities and entities in the Chicagoland area, such as the Metropolitan Water Reclamation District of Greater Chicago and the City of Batavia, have rain barrel programs, providing rain barrels to residents at low costs and providing educational information. Rain barrels can be attached to downspouts to capture rainwater from the roof and save it for later use. Rain barrels minimize the amount of water going to the sewer system as well as the use of potable water for watering plants.

In the Manual of Water Supply Practices (M1), AWWA outlines seasonal water rates that establish a higher price for water consumed during a peak-demand season. Seasonal water rates reflect the increased cost of providing services during peak demand periods and provide a price signal to

customers to conserve water during peak seasons. Two approaches are outlined: High-Demand/Low-Demand approach, and Excess-Use approach. The High-Demand/Low-Demand uses a specific rate for each season (i.e. different rates for winter and summer). The Excess-Use approach charges a higher rate for consumption above a specified threshold. The Village of Algonquin uses the Excess-Use approach by charging a “Conservation Surcharge” for water consumption over 20,000 gallons per month. The Conservation Surcharge is in effect year round and triples the billing rate for consumption over the threshold.

16.2 Water Conservation Practices in the Country

California is a national leader in water efficiency and conservation initiatives due to its population, culture, geography, and drought-prone climate. During times of drought in 2012 through 2016, the following practices were banned statewide in California:

- Using water on outdoor landscaping that causes runoff onto adjacent properties or paved areas
- Using water during or within 48 hours after measurable rainfall
- Using a hose to wash vehicles unless the hose has a shutoff nozzle or similar device
- Using water in a fountain or other decorative water feature, except where part of a recirculating system.

During non-drought times, many water suppliers and municipalities implement conservation measures such as:

- Time of day watering restrictions
- Rebates on high efficiency appliances and devices
- Free evaluations of irrigation system, installation of efficient devices, and repair of irrigation leaks

The Association of California Water Agencies and California Department of Water Resources created a statewide water conservation program in 2009 called Save Our Water. The primary objective of Save Our Water is to make water conservation a daily habit among Californians. Save Our Water provides resources to residents and partners with local agencies to promote water conservation practices.

Nevada, the driest state in the United States, is another leader in water conservation. Conservation measures in Nevada include the Water Smart Landscape Rebate program by Southern Nevada Water Authority (SNWA), which replaced nearly 174 million square feet of ornamental lawns and saved an average of 3.4 billion gallons of water annually since 1989. SNWA also promotes WaterSense products, saving approximately two billion gallons of water annually, according to US EPA.

Nevada will be the first state to permanently ban “non-functional” turf grass, which makes up more than 30% of all grass in the Las Vegas area. The ban does not apply to grass at single-family homes, parks, and golf courses. The ban is estimated to conserve approximately 10% of the available water supply from the Colorado River.

17. WATER CONSERVATION IN OSWEGO

Per capita demand is calculated by dividing the average day pumpage by the estimated population for the year. Based on 2015-2020 water use records, per capita demand in Oswego is approximately 68 gallons per capita per day (gcd), which is on the lower end for a community in Northeastern Illinois. This lower per capita demand can be attributed to the largely residential population of the Village with minimal industrial water demand. Another factor contributing to the lower per capita demand is the fact that a large portion of the Village was developed within the last 30 years and was likely constructed with more efficient fixtures and appliances due to the US EPA WaterSense program. While further reductions of the average day per capita demand in Oswego may be limited, there are opportunities to reducing the peak demands described in Section 15.2.

17.1 Current Water Conservation Measures

Oswego has enacted several regulations to promote water conservation, including even/odd day lawn watering restrictions, prohibition of planting new sod or grass seed during July and August, and regulations on filling swimming pools. The Village partners with the Conservation Foundation to implement a rain barrel program for residents. The Village works with the Northwest Water Planning Alliance to design, advocate, and implement regional conservation measures.

17.2 Proposed Water Conservation Measures

The Village proposes to amend its current water conservation ordinance to meet the IDNR requirements outline in Section 15.3.

17.3 Additional Water Conservation Considerations

The Village should take into consideration the water demand impacts of different types of future developments. Water demands should be reviewed for proposed developments and the long-term effects on water demands and water supply availability should be considered.

As described in Section 16, water rate structures can be used to promote water conservation by increasing rates for large water users or water use over a specific threshold. Outdoor water use can be metered and surcharged during peak times.

The Village can promote or require “smart irrigation”, which uses technology to monitor weather, soil conditions, evaporation, and plant water use to automatically adjust watering schedules to the conditions of the site.

The Village could consider cost sharing programs to facilitate the replacement of inefficient fixtures, appliances, and irrigation systems.

18. CONCLUSION

18.1 Oswego Next Steps

The Village will consider the adoption of the IDNR requirements detailed in Section 15.3. As a best management practice, the Village should consider codifying any additional water conservation practices that are currently performed but not codified. The Village will evaluate other possible conservation measures that go beyond the IDNR requirements, and define the ones most appropriate for the Village's system and residents.

18.2 Study Next Steps

Future parts of this Study will include cost estimates for each option to compare the expected construction costs, as well as operations and maintenance costs of each option. In addition to cost estimates, the Study will identify sources of funding including the Water Infrastructure Finance Investment Act (WIFIA), IEPA State Revolving Fund (SRF), and revenue bonds. Conservation ordinances, schedules for permits, and state legislative initiatives are under review.

A public information meeting will be held this summer, and feedback from the Board and public will be incorporated before finalizing the Study.

18.3 Part 3 Conclusion

Part 1 of the Study established the existing regional water source limitations and risk of well depletion. Part 2 of the Study described the four water source alternatives available to Montgomery, Oswego, and Yorkville. Part 3 of the Study detailed the importance of water conservation and provided examples of conservation measures that could be implemented to reduce water demands.

Water conservation alone will not be enough to allow Montgomery, Oswego, and Yorkville to continue using the deep aquifer as their primary water sources. However, more efficient use of this finite resource is critical. Water conservation may allow the communities to defer the cost of some capital improvements in the short term and could lead to cost savings by reducing the size of the required infrastructure and reducing treatment and pumping costs.