

Regional Smart Water Platform Provides Widespread Benefits

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Great Lakes Water Authority provides water to nearly 40% of Michigan's population.

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Great Lakes Water Authority (GLWA) is a regional water authority that provides drinking water for nearly 40% of Michigan's population. GLWA collaborates with 88 member partners across 112 communities to serve 3.8 million residents over a 1,698-square-mile service region. Drinking water is supplied through five water treatment plants and 19 pump stations, with an average supply of 450 mgd (Figure 1).

GLWA is one of the largest water systems in the United States, with an expansive regional footprint spanning several political boundaries, counties, cities, villages, and townships (Figure 2). Given its sheer size, GLWA must think holistically and regionally to drive collaboration and ensure water of unquestionable quality while keeping a keen eye on affordability.

A concern in one part of GLWA's regional system can affect multiple communities, which vary in size from a few thousand residents to tens of thousands. Vulnerabilities in community-owned distribution systems include deterioration of water quality due to stagnation or aging water, as well as pressure fluctuations due to breaks or water hammer in transmission lines. Being able to pinpoint issues in a complex distribution system saves time, money, and resources for regional and local teams.

GLWA's Regional Smart Water Platform

One of GLWA's strategic objectives is to promote peer-to-peer knowledge-sharing to avoid duplications and enhance efficiency. GLWA offered its member communities a common geographic information system (GIS)-based smart water platform called AURA, developed by Aquasight (Figure 3). The platform is integrated with a set of standard data services, analytics, and advanced artificial intelligence-based insights. Each community

simply confirms its participation, and GLWA activates the community's part of the smart system.

GLWA's smart water platform is set up for all of its communities. Built-in GIS boundaries are integrated with more than 5,965 total-coliform and bacteria sampling sites, 695 corrosion control and turbidity sites, and 3,100 lead and copper sampling sites. In addition, the system is integrated with 334 flow and pressure meter assets that feed real-time data into the platform with an integrated live-weather radar system.

Communities can add their own data, such as water distribution GIS network layers and hydraulic models, to help with digital twin visualizations and water main residence time (water age) estimates. In addition, communities can access the platform anytime, anywhere through

the cloud-based system. The tool is not just a data hub or real-time data access portal; it also provides the following information:

- Chlorine heat maps
- Early warning on water quality hot spots
- A compliance dashboard
- A flushing advisor
- Flow and pressure analytics
- A sample-site risk index
- Vulnerable locations
- Smart reporting
- Automated daily flow
- Pressure and quality updates
- Seasonal water quality distribution

Some communities have opted for more advanced features. For example, smart meter integration enables automated water loss accounting and uses a built-in algorithm for smart meter anomaly detection, allowing communities to respond faster to customer leaks. In addition, advanced asset management plan capabilities help communities manage and maintain asset useful life and risk metrics while considering on-demand, iterative capital-planning scenarios and replacement plans for water infrastructure. More advanced communities are looking to integrate distribution pressure meters to create real-time pressure maps and manage customer complaints.

When a community agrees to participate in the program, which is offered for free through GLWA, it takes only a few weeks to activate its site. During the COVID-19 pandemic, more than 20 communities opted into the program, which has allowed them to operate virtually and access critical information and intelligence online. The Michigan Department of Environment, Great Lakes, and Energy,

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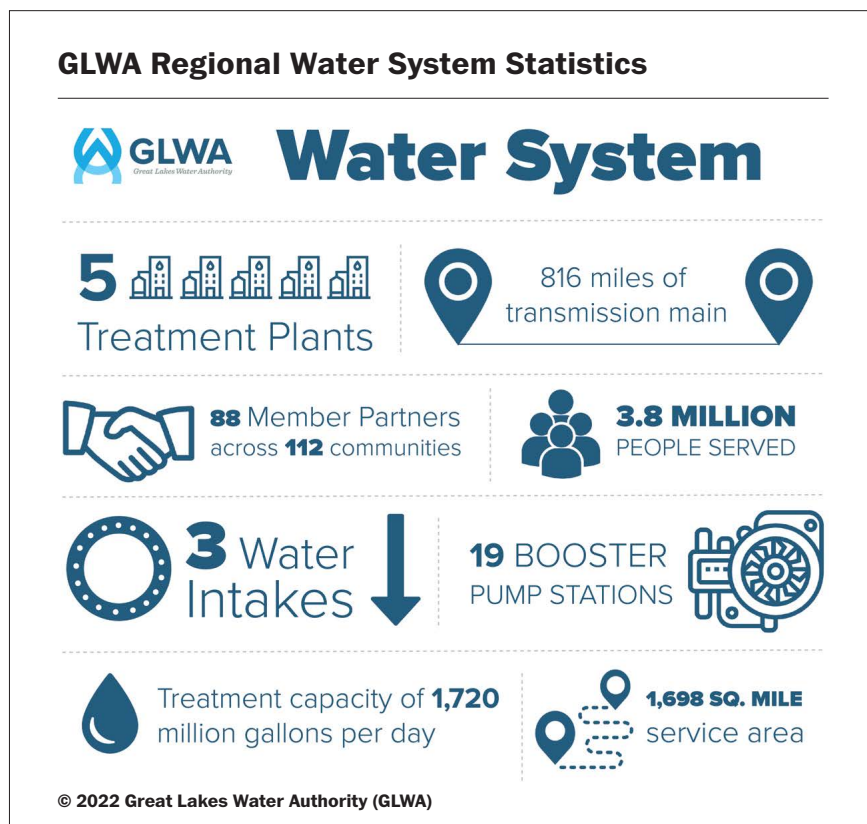


Figure 1

along with Michigan's regulatory authority, has encouraged the use of such a platform for GLWA's 112 member communities. Currently, 40 communities have opted into using the tool.

Success Stories

GLWA recently conducted an independent survey with a user group and received overwhelmingly positive feedback. For example, communities liked the GIS views of water quality and instantaneous access to this intelligence. Flushing advisors and dead-end management tools helped prioritize community flushing programs. The user-friendly visualizations and graphics required minimal to no training. Alert tools are used to react to large events such as pressure drops (main breaks) and schedule maintenance for as-needed flushing.

Digital twin capabilities have allowed for better understanding on how the overall system is behaving, and they help fine-tune hydraulic models. In addition, simple capabilities, such as being able to download years of data with a few clicks and view real-time purchased water or historical statistics, were found to be very useful. Experience with

GLWA Regional Water System Map

What is AURA?

AURA is a GIS-based smart water platform with built-in visualization, data analytics and artificial intelligence. It merges pressures, flows, water quality data, GIS files, hydraulic models* and smart meter data* (* where available)

Value & Benefits of AURA?

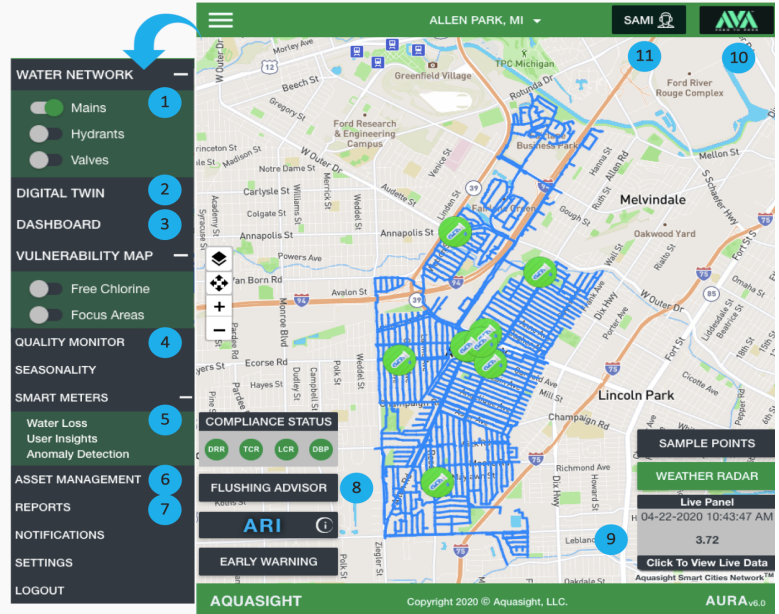
- Flows & pressures analytics
- Water quality analytics
- Real-time data access
- Reporting & alerting
- Early warning on quality
- Flushing advisor
- Stagnant mains & dead-end management
- Live hydraulic model simulation (digital twin)
- Water loss
- Asset management plans
- Smart meter anomaly detection
- Peer collaboration

Can I export data from AURA?

Yes, AURA supports download of data for quality, flows, smart meters and asset management plans

Why are certain features missing in my app?

Some features require GIS files or hydraulic model to be activated such as chlorine vulnerability map and digital twin, others are add-on features such as smart meters & asset management



Feature Highlights:

- | | |
|----------------------------|---------------------------|
| 1. GIS Layer Management | 6. Asset Management Plan* |
| 2. Digital Twin | 7. Biweekly Report |
| 3. Dashboard | 8. Dead End Flushing |
| 4. Quality Monitor | 9. Live Data Connect |
| 5. Water Loss/Smart Meter* | 10. AVA Peer to Peer |
| | 11. SAMI Stats and Alerts |

*add-on feature

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Figure 2

the smart water platform also resulted in several practical case studies:

- One city used a digital twin to correctly calibrate its hydraulic model. In addition, the city used the system's dead-end identification algorithm and high residence times to develop a new process for selecting water quality sample sites.

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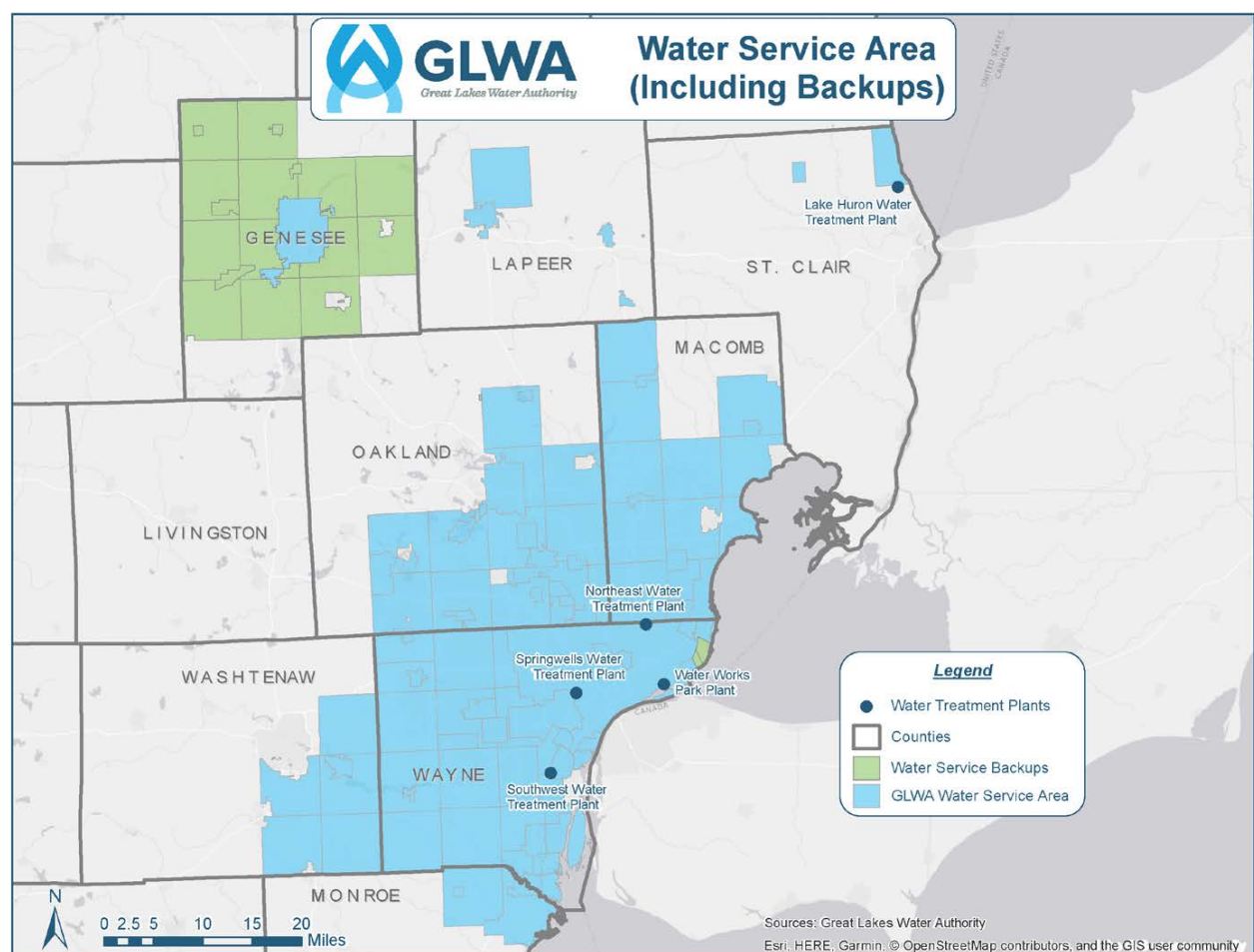
- A city discovered a valve was left closed after a main repair, causing an artificial dead end that led to chlorine residual instabilities until the valve was reopened. Treatment plant operators did not know the event's effect until after the system was implemented. In addition, the city used the system's asset management capability to manage its organizational knowledge of asset life and risk metrics, which eliminated hours and possibly days of human effort in updating the plans. In addition, insights on water loss accounting were used to justify smart-meter technology upgrades with the city council.
- A city integrated its smart meters into the platform, saving significant time in calculating water loss because the system now automatically performs this task. In addition, the system's

smart-meter anomaly-detection capability has transformed how the city's billing department conducts meter audits. The technology saved residents thousands of dollars and detected leaks two to four weeks sooner than without it. In addition, new sample sites reinforced that the area was experiencing low chlorine residuals and pushed for a targeted flushing program to clean out lines and refresh residuals. Residuals improved after these actions were taken.

- A township uses automated daily-flow accounting notification to compare each day's purchased flow with previous time periods, which helps determine whether there is unusual water consumption in the system. Such automation saves time and effort for member communities.

In addition to member community benefits, the smart water system has significantly helped GLWA's internal team. For example, the authority often receives requests from member communities for access to water data to

GLWA Smart Water Platform



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GLWA—Great Lakes Water Authority

Figure 3

generate Consumer Confidence Reports (CCRs) and support troubleshooting efforts. These requests can be overwhelming, given the size of the regional system. The smart water system provides real-time insights and historical intelligence on demand, and it has virtually eliminated the need to manually handle these requests. In addition, while troubleshooting a specific issue or its origination, the system provides complete transparency and helps with risk mitigation and management.

The smart water platform's evolution has supported continuous improvement throughout the system. A recent addition to the platform are e-learning videos that educate new users within minutes on how to use the system. GLWA is developing a full regional intelligence model that will help the agency optimize the entire system and look for any deterioration as the water flows through thousands of miles of water network. Finally, the smart water platform allows for peer-to-peer exchange of best practices and ideas to improve quality, economics, and efficiencies for the entire region.

Regional collaboration is an invaluable trend, and Great Lakes Water Authority's regional smart water platform is a manifestation of this.

Lessons Learned

Regional collaboration is an invaluable trend, and GLWA's regional smart water platform is a manifestation of this. GLWA already supplies drinking water and provides water quality testing services, so offering the regional smart water platform is a natural extension. GLWA learned important lessons during the platform's deployment:

- **Procurement efficiencies and leverage.** The process of procuring the smart water platform individually by each of the 112 communities would have been an exceptionally difficult task. GLWA made this a global offering, which removed procurement hurdles and took advantage of wholesale pricing to create a win-win for all stakeholders.
- **Flexibility and standardization.** By standardizing the platform, it is possible to drive a common set of metrics, language, reporting, training efficiencies, and more. But not all communities are at the same level of

digital experience, so the system was designed to be flexible. Communities that do not have GIS, hydraulic modeling, or smart meters can benefit from the system's use, but those that have such technologies can tap into more advanced capabilities.

- **Risk management and transparency.** Having actionable intelligence is critical for a high-performance, regional, interconnected system. The smart water platform helps troubleshoot problems and pinpoint issues. It is designed to minimize risks, drive transparency, and provide real-time intelligence to those who can fix the problems.
- **Reimagining and repurposing data.** The platform allows data to be repurposed in ways that were not previously imagined. For example, water quality data, used primarily for compliance and CCRs, now are also used to predict geospatial issues. Similarly, meters used primarily for billing are now used to detect water loss and in-home resident leaks, saving significant time and money.
- **Work automation.** The modern utility workforce is often asked to do more with less. Any smart water platform must help with automation—not just provide more work. Capabilities such as automated daily summaries on water data help utility managers and operators keep tabs on the system without much heavy lifting.
- **Next-generation workforce and digital legacy.** As the water sector prepares for staff retirements in the coming years, it is imperative that the skilled workforce pass on its knowledge to the next generations. GLWA's smart water platform captures the knowledge and historical performance of each of the member communities so it can be used for training. More importantly, the next generation of workers is more adept at consuming data and using digital tools, so it is a critical evolution in digital infrastructure to support 21st-century water infrastructure.

GLWA is proud to help pave the way for innovative technology where regional water systems intersect with smart water. The continuous evolution of the authority's shared smart water platform provides a solid foundation for the communities GLWA serves and a great example for water systems exploring similar strategies. 📍

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<https://doi.org/10.1002/awwa.1908>