



# Case Study: IOSight’s technologies help launch Chicago’s first real-time microbial water quality monitoring project

## THE WATER INNOVATION CHALLENGE

Chicago’s urban waterway is often seen as unsuitable for human interaction due to its real or perceived pollution levels. In the past, detecting microbial pollutants in waterways required water samples to be drawn from the river and sent to a testing lab, delaying the ability to give the public accurate and timely information about fluctuating pollution levels.

Today, recent innovations in sensing and analytical technology make real-time microbial water quality assessment possible, and they are just now beginning to be tested in real-life applications.

**Current**, together with its technical and cooperating partners, sought to foster a solution to address the region’s need for water quality information so citizens can make educated decisions about when and how to safely interact with the Chicago River system. By working with technology partner **IOSight**, who specializes in water quality data management and analytics, and other critical partners, **Current** launched the pilot project known as **H2NOW Chicago**.

**H2NOW Chicago** is being implemented in the Chicago River system and will improve understanding of microbial water quality via real-time surface water measurement, data monitoring, and sharing. The data will be shared via the **H2NOW Chicago** website and is poised to improve community understanding and engagement with the river. H2NOW is the first such pilot project in the US to cover an entire river system and to do it in-situ.

## THE WATER INNOVATION OPPORTUNITY

**Current** developed H2NOW to measure microbial pollutants in an urban waterway in real-time and to contribute critical microbial data to a bigger-picture understanding of factors affecting water quality in the Chicago River.

## STAKEHOLDERS

**Current**, Project Lead  
*Chicago, IL*

**IOSight, Inc.**, Technology Partner  
*Israel*

Developer of the iGreen and iShed platforms, which deliver best-in-class data management and analytics for the water and energy sectors.

in cooperation with

**Metropolitan Water Reclamation District of Chicago (MWRD)**

Fall 2020

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The initial pilot project aimed to identify, with frequency and accuracy never before possible, the levels of microbial pollution in the Chicago River. **Current** leads all aspects of project design, coordination, and implementation, including water quality assessment and analysis.

**Current** realized that to execute the H2NOW program successfully a **combination of innovative technologies** and project partners would be required. These technologies include real-time water quality probes (**Proteus Instruments**), data transmission and telecommunications (**Ayyeka, Comcast and Outpost Central**), and a lab-equivalent microbiology testing apparatus (**Tecta-PDS**).

In addition, a **robust data management and analytics platform** was required to collect, manage, visualize, and analyze the data from Proteus probes and other sources, which **IOSight's** solutions provide. To advance the H2NOW goal of expanding the data set about the Chicago River's water quality, **Current** also collects data from other programs, such as MWRD's water quality monitoring program, which provides information about combined sewer overflow (CSO) occurrences, total daily rainfall, water reclamation plant effluent, and flow from Lake Michigan.

## IOSIGHT'S SOLUTIONS FOR H2NOW

**IOSight** is an Israel-based data management and analytics solution provider focused on the water sector. **IOSight's** solutions include the mature **iGreen** data management platform and **iShed** – an algorithm-based analytics solution for real-time water quality monitoring in rivers and watersheds. **IOSight** has over 100 installations worldwide, including a unique implementation of **iShed** at Israel's Jordan River watershed.

For H2NOW, **IOSight** is implementing **iGreen** for standardizing and storing data from the Proteus probes and other sources, as well as providing a variety of options and tools for visualizing this data. **iShed** will provide predictive analytics capabilities to derive insights about microbial water quality from historical and real-time data and detect water quality anomalies.

H2NOW has enhanced **IOSight's** opportunities for implementing **iShed** across the US and global **surface water quality monitoring market**. The H2NOW program partners include a variety of private

"We consider the partnership with **Current** as a strategic alliance, which has yielded this successful installation in the Chicago River. We are very fortunate to be a member of a unique team that installed a state-of-the-art end-to-end real-time water quality monitoring platform providing insights, detecting anomalies, and designed to serve the public visiting the Chicago River."

— Natan Zuta, IOSight  
CEO and Co-  
Founder



and public organizations from Chicago and other regions and countries (see PROJECT PARTNERS).

## EXPECTED PROJECT OUTCOMES

By discovering, analyzing and sharing water quality data, H2NOW can provide a much more accurate understanding of river water quality, making the public more likely to use the river for recreation, work and relaxation and to advocate for its continued health and well-being.

Given that the Chicago River’s water quality has been improving over recent decades, **Current** anticipates that broader awareness will make the river increasingly appealing to the public. This, in turn, can create a positive economic ripple effect by boosting engagement with water-based activities and corresponding business development.

H2NOW has the potential to improve public health and safety by enabling residents and visitors to check water quality online in real-time before they interact with the waterway. This project can also lead to improved environmental stewardship by providing policymakers, conservationists, water utilities, property developers, and industries that use the river with new insights into microbial pollution patterns and how they vary over time and location in the waterway.

With this knowledge, Chicagoans will have a better understanding of the river and how to protect it.

## PROJECT GOALS

(Set Jointly by Current and IOSight)

1. H2NOW will pursue continuous data collection from diverse data sources, including those listed below.
  - **Current’s** Proteus probes (in-situ)
  - **Current’s** weekly grab samples analyzed by Tecta-PDS
  - MWRD’s O’Brien Water Reclamation Plant (WRP) daily effluent testing
  - MWRD’s total daily precipitation data
  - MWRD’s CSO event alerts

“IOSight’s analytics tools are critical to H2NOW because they help make information about the Chicago River meaningful and actionable to the public. Better data helps us understand how to better use and preserve this natural resource for recreation, economic development, and ecological restoration. **Current** is proud to partner with IOSight on this novel project.”

— Alaina Harkness,  
Current Executive  
Director

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- MWRD's data on Lake Michigan flow to the Chicago River through the Chicago River Controlling Works
  - MWRD's data on Chicago River's flow reversal during high-impact precipitation events
2. H2NOW will provide data validation, normalization, and integration.
  3. H2NOW will utilize visualization tools and dashboards showing real-time and other types of data.
  4. H2NOW will implement the iShed predictive analytics algorithm to detect potential sensor malfunctions and unusual changes in water quality conditions.

## IN-DEPTH: IOSIGHT'S SOLUTIONS

IOSight is implementing a combination of their **iGreen** data management platform and their **iShed** predictive analytics solution to communicate and analyze real-time water quality levels and detect contamination.

**iShed** is an algorithm-based solution for water quality monitoring and water security in rivers and watersheds. **iShed** was co-developed by IOSight and Mekorot, Israel's national water company, and provides reliable pollution detection and speed of propagation calculation in rivers and watersheds. The **iShed** algorithm eliminates 95% of false alarms.

**iGreen** dashboards, reports, smartphone apps and GIS displays serve as the solid foundation for **iShed**. The system integrates both automatic on-line data and manual feed, or semi-automatic data collection (e.g. laboratory data, manual feedings), and has multiple dashboards and reporting displays to present and analyze values. The system includes a data input display for smartphones and web platforms.

**iShed** is installed at the Jordan River / Lake Kinneret watershed and has been operational since 2017. It has already provided reliable early warning alarms of contamination that could have affected the key fresh water supply of Israel. (See Figure 1.)

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Figure 1. iShed Inputs and Outputs Diagram



## IOSIGHT SYSTEM ATTRIBUTES

- **Integration and synchronization** of data from diverse sources (utilizing in H2NOW).
- **Identification and evaluation of anomalies** in river water quality by (utilizing in H2NOW):
  - Applying an algorithm combining engineering rules and several mathematical techniques, and
  - Continuously producing **Water Quality Indexes** for each station.
- **Filtering structural false alarms.**
- **Propagation calculation** – monitoring and forecasting of downstream contamination spread.
- **Geographical online display** of real-time data and model output.
- **User-friendly dashboard interface** for decision support in routine and in time of pollution event (utilizing in H2NOW).
- Automatic launch of **various smart reports.**
- **Event management system** – presenting each event’s background and a comprehensive managerial view.
- **Not a “black box”** – the algorithm can be customized – data sources, analytics techniques, and weights can fit each site’s requirements.

“Together with an additional project with the City of Chicago Water Department, in which our iGreen system provides unified data management and dashboarding platform for three separated SCADA systems, we have established a significant position and reference in the Midwest and in the US in general. Our projects in Chicago have already contributed significantly to our continued market success and project wins.”

— Natan Zuta,  
IOSight CEO and  
Co-Founder

## H2NOW DASHBOARD SCREENSHOTS

A significant benefit of the IOSight **iGreen** platform is the online dashboards that provide the public with accessible, real-time water quality analysis and data. Highlighted in this section are screenshots of these dashboards. Figure 2 shows the main dashboard. Figure 3 shows water quality analysis over time. Figure 4 shows the geographical locations of the water quality data sources, and Figure 5 depicts how these dashboards appear on mobile devices.

Figure 2. Real-Time Water Quality Dashboard

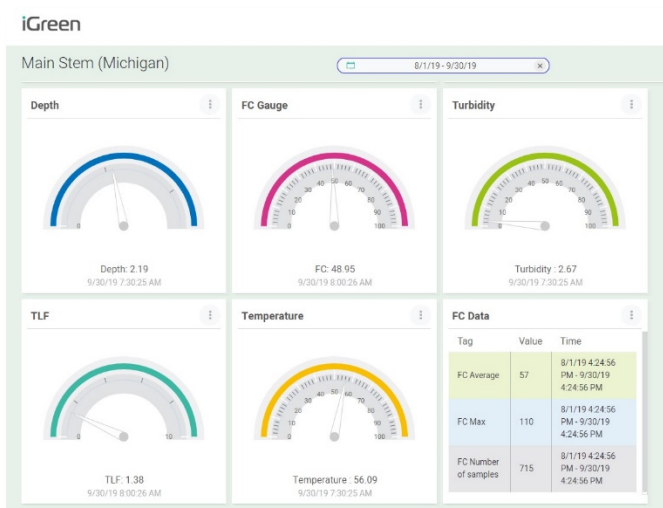
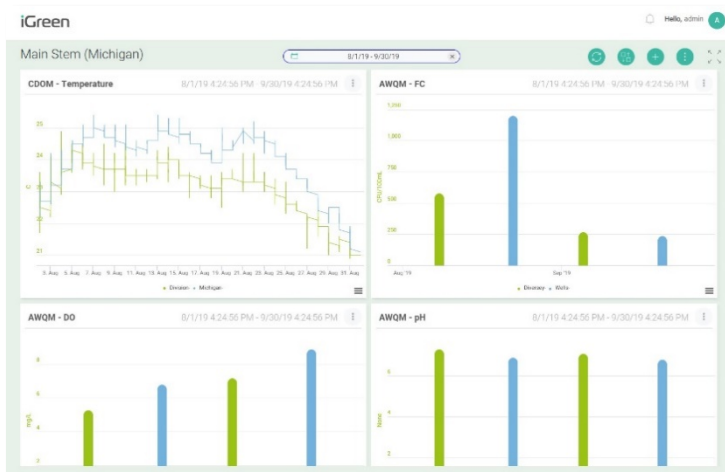


Figure 3. Water Quality Dashboard-Continuous/Periodic Monitoring Data



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Figure 4. Map View

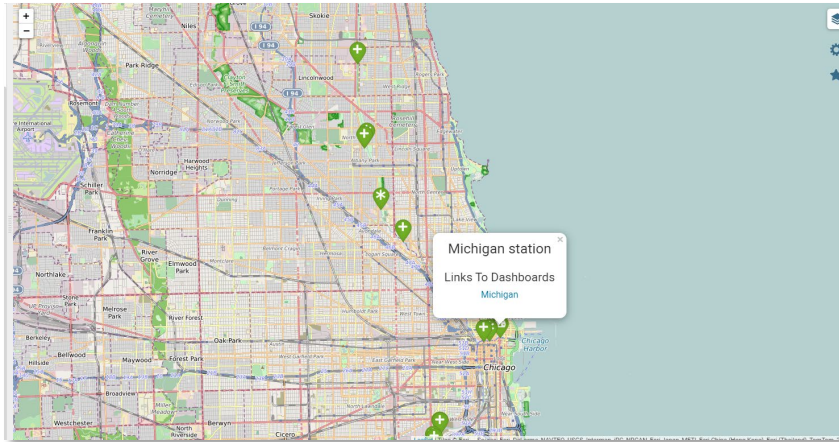
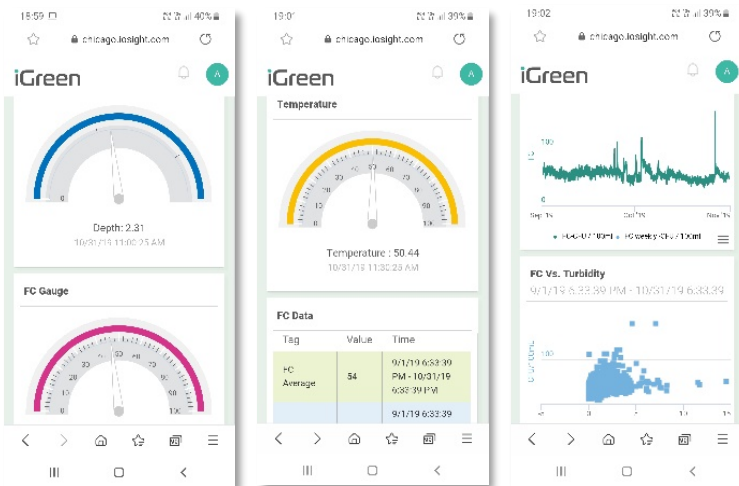


Figure 5. Mobile Dashboards



## TIMELINE

H2NOW will continue through the summer of 2021, barring unexpected delays that may arise due to the COVID-19 pandemic - this will include the establishment of data flow, standardization, normalization, and validation thresholds, and the implementation of the iShed predictive algorithm should be possible after a sufficient amount of data is collected.

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## H2NOW PROJECT PARTNERS

Metropolitan Water Reclamation District of Greater Chicago, Metropolitan Planning Council, City of Chicago Department of Water Management, Comcast, Ayyeka, ESRI, Forest Preserves of Cook County, Friends of the Chicago River, Green Diamond Solutions, IOSight, North River Commission, Proteus Instruments, Shedd Aquarium, Sierra Club, South Loop Chamber of Commerce, Tecta-PDS, University of Illinois Urbana-Champaign, Urban Rivers, Veracet

*CURRENT is a nonprofit water innovation hub. Our mission is to collaborate with a wide variety of stakeholders to grow the blue economy, drive innovation, and solve water problems. Founded in Chicago in 2016, we bring together utilities, corporations, research institutions, and advocates to develop solutions to pressing water challenges that would be too risky or even impossible for any one group to undertake alone.*

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