Executive Summary

Watershed management starts here

Designing Sensor Networks and Locations on an Urban Sewershed Scale
(SENG6R16/4835)

The Central Issue

Many utilities operating sanitary sewer and combined storm sewer systems are faced with water quality and quantity challenges related to collection system management. These challenges are primarily related to the control of industrial/commercial wastewater inflows and wet weather flows that affect the viability of treatment and water reuse operations and the frequency/pollutant loading into the environment from system overflows. With the recent emergence of low-cost, reliable water quality and quantity sensors and the exponential increases in computing power, the promise of real-time monitoring and operation of collection systems to address these challenges is being realized.

Context and Background

This research examines the current state of remote monitoring technology applications in urban sewersheds, including the greatest challenges facing wastewater and combined wastewater and stormwater systems. Information was collected from utilities and technology providers through an online survey, case studies, and an expert workshop. The researchers identified the different types of technologies being used and examined the future use of advanced sensors (those that monitor, collect, and transfer measurements in near real-time and can be remotely deployed) in urban sewersheds to solve critical problems being experienced in the water sector.

Findings and Conclusions

Utilities, consultants, researchers, regulators, vendors, and academics will find the possibilities suggested in this research exciting. The concepts described in the report are just the beginning of the application and use of the massive data sets available to utilities through connected devices. Edge computing real-time control, and predictive analytics are some of the practices that offer promise in improving services in the digital utility. The use of sensors not only at WRRFs, but also in receiving waters and sewersheds, can help reduce capacity issues, I&I, and CSOs, and assist in asset management and identification of aging infrastructure within the network.

Management and Policy Implications

The emergence of improved capabilities to process from existing and real-time data allows utilities to change the way their assets are managed, operated, and maintained. The solutions also allow users to improve their compliance abilities through innovative uses of existing assets, which are demonstrated to save millions. This is significant considering that the cost of consent decrees can run into billions of dollars. Because utilities must comply with water quality control and overflow reduction
requirements, sensor-based networks on a sewershed scale for real-time decision making and operation can optimize collection system performance before investing in major, capital-intensive projects.

### Related WRF Research

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<tr>
<th>Project Title</th>
<th>Research Focus</th>
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<tr>
<td><strong>Compendium of Sensors and Monitors and Their Use in the Global Water Industry [SENG1C11]</strong></td>
<td>Documents information on commercially available instrument types, capital and operating costs, and users’ real-world experiences with sensors in the global water/wastewater industry. Final report includes 22 case studies from water utilities and an online Compendium database that provides a guide for facility managers, operators, and designers for selecting and operating real-time water quality monitoring solutions.</td>
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<tr>
<td><strong>Leveraging Other Industries – Big Data Management: Phase I [SENG7R16/4836]</strong></td>
<td>Examines the current capabilities and state of knowledge of Internet of Things (IoT) and Big Data processing within the water industry and certain non-water sectors. Findings indicate that the water/wastewater industry has not embraced Big Data analytics and IoT as rapidly as other industries.</td>
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<td><strong>Defining Attributes and Demonstrating Benefits of Intelligent Water Systems [4614]</strong></td>
<td>Includes literature reviews on existing intelligent water technologies for both drinking water and wastewater utilities.</td>
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<td><strong>Workforce Skills of the Future [SENG5C16]</strong></td>
<td>Provides an understanding of key workforce trends driving change and the future workforce skills requirements to enable success in the water sector over a long-term horizon to 2040 focusing on customer trends and the future of work.</td>
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<td><strong>Considerations for Security and Communications for Intelligent Water Systems [4670]</strong></td>
<td>Identifies the types of information sources used by water utilities, as well as the associated communication media and protocols. Assesses the security risks associated with each information source and whether current cybersecurity measures in use provide acceptable protection. Includes an Intelligent Water Systems Matrix that presents security considerations for communication methodologies used by the most common information systems.</td>
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<td><strong>Intelligent Water Networks Summit [4714]</strong></td>
<td>Documents information and practical experiences among utilities interested in intelligent water networks. Topics covered includes cybersecurity, big data, smart network design and implementation, maintenance, and other relevant topics.</td>
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<td><strong>AMI-Meter Data Analytics [4741]</strong></td>
<td>Investigates how advanced metering infrastructure (AMI) data can best be used and identifies strategies for AMI data analyses, using case studies to demonstrate the value of AMI data. Includes a meter performance index, which will allow utilities with AMI data to define their meter maintenance and replacement strategies based on actual meter performance.</td>
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