



COMMISSION FILE NO: 25-014-1 **DATE INTRODUCED:** January 13, 2025

INTRODUCED BY: Executive Director (Signature on File in the Office of the Commission)

REFERRED BY COMMISSION CHAIRPERSON TO: Policy, Finance and Personnel Committee

RELATING TO: Approval of the Supervisory Control and Data Acquisition Master Plan

SUMMARY:

The Commission is requested to approve the Supervisory Control and Data Acquisition (SCADA) Master Plan (Plan) for MMSD Facilities as a guiding document for MMSD.

A SCADA system is a distributed computer system used by operators and managers for process monitoring, control, and automation. SCADA originated in the power industry to monitor remote sites. SCADA has evolved to encompass control systems used in many utilities, industries, and manufacturing processes. SCADA systems provide:

- Operator visibility and alarms.
- Automatic and manual control.
- Data display and logging.

The District owns the Jones Island Water Reclamation Facility (JIWRF), South Shore Water Reclamation Facility (SSWRF), and a 310-mile sewer collection, conveyance, and inline storage system (Conveyance System). There is a separate SCADA system for JIWRF, SSWRF, and the Conveyance System. Within the District, these SCADA systems are commonly referred to as the instrumentation and control (I&C) system at JIWRF and SSWRF and the Conveyance SCADA system.

ATTACHMENTS: **BACKGROUND** **KEY ISSUES** **RESOLUTION**
FISCAL NOTE **S/W/MBE** **OTHER** Executive Summary

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SUMMARY (Cont'd)

Approval of the Supervisory Control and Data Acquisition Master Plan

The Conveyance SCADA system monitors and controls the Metropolitan Interceptor Sewer (MIS) system, Inline Storage System (ISS), pump stations, diversion structures, overflow structures, weather stations, and monitoring sites. The Conveyance SCADA system utilizes approximately 160 programmable logic controllers (PLC's) with instrumentation distributed across the system to provide local and remote control functions. A combination of private radios and cellular modems provide SCADA system communication between the PLC's and the Central Control Room (CCR) located at JIWRF. The Human Machine Interface (HMI) system, located in CCR, allows operators to interact with the Conveyance SCADA system. A historian system provides long term logging of conveyance data. Some components of the existing SCADA system (e.g., PLC's) were installed in the early 2000's and are near the end of their useful service lives. Some components were upgraded within the last eight years (e.g., servers, radios, modems).

The JIWRF and SSWRF SCADA systems are very similar to each other, but they operate independently. Nearly all process equipment has local control panels for local operator control. Instruments are scattered throughout the Water Reclamation Facilities (WRF's) to monitor operating parameters including equipment status, position, flow, level, pressure, and temperature. Approximately 250 PLC's are distributed throughout the WRF's. The PLC's are connected to a plant network ring for communication. The HMI system has clients (operator interface points) in area control rooms and in process areas, which are distributed throughout the WRF's. The historian system consists of a redundant pair of collector servers and a single storage server. Most existing WRF SCADA system components were installed in the mid-2000's and are near the end of their useful service lives. Some components were upgraded within the last eight years (e.g., servers, network devices, some PLC components).

The District's SCADA systems are critical assets that allow a multitude of users to monitor, manage, and control the WRF's and Conveyance System. The importance of ongoing functionality and reliability of these systems cannot be overstated. The District SCADA systems are aging and outdated. Many of the control components utilized are no longer produced, and factory support has ended or will be ending. SCADA system technology has advanced significantly over the past 20 years and continues at a rapid pace.

Cybersecurity is a concern that continues to grow as technology becomes more interconnected and the ability to access systems becomes more widespread. When the District's current systems went into place, isolation from outside networks was considered the primary, and very effective, method by which SCADA systems can remain secure. That is no longer the case. Modern systems and threats require more sophisticated practices, deterrents, monitoring, oversight, complexity, and documentation.

SUMMARY (Cont'd)

Approval of the Supervisory Control and Data Acquisition Master Plan

Based on these factors, the District developed a SCADA Master Plan via Project M03112. The purpose of the plan is to maintain and improve the reliability, functionality, and security of the District's SCADA systems through the year 2035.

The Plan recommends many upgrades to the aging hardware and software for all three SCADA systems. Recommendations, provided here at a high level, include:

- Upgrading Conveyance and WRF PLC's, HMI, and Historian systems. When upgrading the Conveyance System, use a power industry standard protocol for PLC communication provided by Rockwell (Allen-Bradley) or Schneider Electric.
- Continuing to utilize Rockwell hardware at the WRF's, which allows the reuse of much of the existing coding and wiring, reduces testing required, maintains consistency, leverages existing expertise developed, and dramatically reduces the cost that would be associated with a platform change.
- Replacing uninterruptable power supply equipment at the WRF's.

The Plan recommends cybersecurity initiatives. High level recommendations include:

- Implementing the federal Cybersecurity and Infrastructure Security Agency's (CISA) best practices and security controls.
- Increasing threat detection, management, and response.
- Expanding vulnerability detection to vulnerability management.
- Defining and documenting security governance.
- Enhancing network documentation.
- Verifying the security of vendor products.

The Plan recommends upgrading communication infrastructure, including the WRF fiber optic rings, Conveyance radio base station equipment, and Conveyance cellular modems. Recommendations include implementing new, standardized and more accessible ways to manage control equipment code and documentation.

The Plan recommends conducting a plantwide process hazard analysis and at each WRF every five years to identify process safety risks and hazards. The Plan further recommends conducting a layers of protection analysis (LOPA) for the highest risk hazards to assess if the level of protection is acceptable. Results of the LOPA will determine if and where a safety instrumented system is needed. Conducting these analyses will assure proper safety systems and protections are in place.

SCADA system equipment typically has a shorter life cycle than other WRF and Conveyance System assets. The Plan includes recommended time frames for proactive equipment replacements to maintain SCADA system reliability. These include five years for server equipment; 10 years for network and communication equipment; and 20 years for PLC's.

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The Plan organizes the SCADA recommendations into a series of capital projects. The Conveyance SCADA Upgrades project was added to the District's 10-year plan with the 2025 budget. The other projects will be added to the 10-year plan with the 2026 budget. The following is a summary of the recommended capital projects (estimated in 2024 dollars):

Conveyance SCADA Upgrades	\$ 28 million
WRF SCADA Upgrades	\$ 57 million
Cybersecurity	\$ 4 million
WRF Fire Alarm Network	\$ 2 million
WRF Uninterruptible Power Supply Replacement	\$ 0.7 million
WRF Hazard & Protection Analyses	\$ 0.3 million
SCADA Management Programs	\$ 0.2 million
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	\$ 92 million

The Plan also provides annual operation and maintenance costs related to the SCADA recommendations (estimated in 2024 dollars):

Cybersecurity Engineer	\$ 180,000
Technical Support	\$ 108,000
Software Licensing/Support	\$ 255,000
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	\$ 543,000

RESOLUTION

Approval of the Supervisory Control and Data Acquisition Master Plan

RESOLVED, by the Milwaukee Metropolitan Sewerage Commission, that the Supervisory Control and Data Acquisition Master Plan is approved, and that the Executive Director is authorized to implement the plan, subject to Milwaukee Metropolitan Sewerage Commission budget approval.