could be utilized in this option that mate directly to the existing SLC terminals in order to speed wiring. Unless significant I/O changes are planned, or replacement of entire PLC cabinets is desired, it is recommended to transition using the first option in order to reduce the time and cost of the transition. This upgrade will provide a consistent level of programming environment, equipment support, and a higher level of standardization on control hardware.

As part of the upgrades to this facility, integration of the existing DFS HyperSCADA server into the CitectSCADA application for higher visualization into the lift station system should be considered. While the lift station system was not specifically evaluated as a part of this master plan, integration of lift stations into the CitectSCADA application would provide additional standardization, maintenance, and operator access benefits. This migration could also provide a means of lift station controller migration and allow for other controller platforms to be used.

Additionally, network components will be replaced at the time of PLC component replacements to upgrade network hardware to the Rockwell Automation Stratix series managed switches. The Stratix switches should be monitored by the new PLC system using the pre-built Rockwell add-on instruction for Stratix switches in the Studio 5000 PLC programming system. Additionally, all Rockwell network switches, PLCs, and motor control components should be connected to the central Rockwell Asset Center server for management and security. This upgrade will provide higher reliability, security, and manageability and standardize network components to aid in maintenance. Fiber optic cabling will be extended to provide redundant pathways around the SW WRF for higher communications reliability and be coordinated with network component upgrades to minimize downtime. Additional details related to this project can be found in Chapters 3 and 5 of the report and a summary table of PLC modifications in the appendix.

Additional security is planned to be added to the existing Engenius wireless links at the facility to further secure these links. Other existing wireless systems should be evaluated to ensure that security features such as encryption are turned on for all radio systems and that these systems are routed through firewalls where strong security features cannot be enabled and known vulnerabilities exist. No WiFi networks are planned to be added to facilities. WiFi is an expensive and insecure addition to plant sites for operator mobile access. Instead of the use of WiFi, it is recommended to use cellular if operator mobile access is desired. Mobile cellular access can be deployed in either a private M2M network or using public interfacing cellular with VPN access used similar to remote system access. For buildings have weak cellular service, cellular repeaters should be used in order to boost signal strength. This will provide boosted service for remote access as well as the benefit of staff cellular phones working within these buildings as well for calls. It is recommended for the County to deploy this system in coordination with their IT department.

8.4.2 Design

The design phase of this project should finalize the CitectSCADA architecture for the facility as well as WIN-911 architecture and thin client deployments based on County preferences at the time of design and known reliability of the communication between SW WRF and the IT datacenter. New SCADA graphics and PLC logic should be specified to be developed through a series of workshops to take place during construction and facilitated by the design engineer to ensure consistency of graphics and programming logic. New graphics should be context aware type graphics with standard objects and templates designed to match up with standard PLC add-on instructions. Design will include the following major aspects:

- Selection of hardware and networking components.

- Design specifications for the following:
  - General I&C Requirements.
  - Construction Sequencing.
  - Control Panel Requirements.
  - PLC Programming Requirements.
  - PLC Components.
  - Ethernet Network Components.
  - Fiber Optic Cabling and Testing.
  - System Testing and Commissioning.
  - Conduit Systems.
- Design Drawings:
  - Legends.
  - Communications block diagrams.
  - Fiber Optic Cable routing diagrams.
  - Photo Drawings showing upgrade requirements.
  - Example wiring details.
  - PLC I/O Layout or I/O List.
  - Electrical duct bank and fiber routing drawings.
  - Building power and fiber drawings to support upgrades.
- Bid Assistance.
- Construction services and commissioning assistance.

8.4.3 Construction

Construction requirements will include the following:

- Submittals and shop drawings for each control panel for O&M documentation.
- PLC replacements with new programming.
- PLC program conversion, corrections, and documentation.
- SCADA HMI applications programming.
- Integration with core SCADA system.
- Network switch configuration.
- Fiber Optic Cable installation and testing.
- Performance testing.
- Decommission existing systems.
- System commissioning.
- Penetration testing and baseline cybersecurity report.
- Provide final O&M documentation and training.

To facilitate a smoother integration, the entire PLC and HMI system should be developed and tested at the integrator's facility. This includes all HMI programming and PLC logic. The full updated HMI program should be deployed and either have existing I/O temporarily addressed to the new system and then transitioned or run the existing and new HMI systems in parallel until all PLCs are replaced. Hardware should be replaced sequentially following expansion of the fiber optic cable system to ensure that work at one PLC location will not negatively impact other areas of the plant.

8.4.4 Estimated Costs

The estimated costs associated with upgrading the PLC system are summarized in the following table. Costs are associated with the proposed fiber optic cabling upgrades presented in Chapter 5 and based on full PLC replacements including replacement of all I/O.

Table 8.3 SW WRF SCADA System Project Cost Estimate

Activities	Cost
Design	
Specifications	25,000
Drawings	220,000
Meetings	15,000
Project Management	25,000
Construction Services	90,000
Design Total	**375,000**
Construction	
PLC Upgrades	800,000
Drawings	50,000
Testing	50,000
HMI Application Updates	250,000
Server Hardware and software	80,000
Control Room Upgrades	100,000
Fiber Optic Cable	110,000
Pull Boxes	100,000
Ethernet Switches	40,000
Fiber Patch Panels	20,000
Submittals	25,000
O&M	25,000
Construction Total	**1,650,000**
Subtotal	2,025,000
25% Contingency	506,250
Total	**2,531,250**

8.4.5 Purpose

This project is meant to address the following major recommendations of the SCADA Master Plan:

- Upgrade outdated equipment and standardize PLC systems at the SW WRF.
- Add resiliency to the Fiber Optic Network.
- Add network management, standardization, and reliability to the Ethernet network.
- Standardize PLC programming platform and applications.
- Correct existing logic errors and increase automation.

- Provide operations staff with greater visibility into plant systems.

8.5 N WRF Upgrades

8.5.1 Scope and Description

This project includes the replacement of existing Legacy PLC systems and associated network hardware, OITs, and the addition of fiber optic cabling for modernization and standardization of equipment and added system resiliency at the N WRF. A new CitectSCADA HMI application will be developed for the N WRF facility and added to the central CitectSCADA HMI system. The facility level HMI system will be based on a local redundant set of CitectSCADA HMI servers with local WIN-911 alarm system and local Historian capabilities to buffer data to the master historian. The local CitectSCADA system will be part of N WRF cluster connected back to the central HMI server. There is an option to not use local redundancy but to use the central HMI server as a remote backup as well as being the location for a central WIN-911 system. Due to past communication issues, it is still recommended to keep local redundancy, but this can be re-evaluated at the time of system design. Thin clients will be managed using ThinManager and a local domain controller will be added. Additionally, the facility control room will be upgraded to provide modern monitors having resolution to match the application. Network and computer equipment will be removed from the existing control console and moved to a locked room within the building having air conditioning and sufficient space to house servers and network components. Thin clients will be provided in the control room at operator work areas and wall mounted large screen modular video wall solution will be utilized to allow operations staff to select content for display such as SCADA screens, security cameras, or news and weather information necessary for plant operation during normal and emergency conditions.

Existing PLCs to be replaced include legacy Rockwell Automation Allen-Bradley SLC PLCs. New PLCs will be based on the County's standard Rockwell Automation Allen-Bradley CompactLogix L33 Series. PLCs can be replaced using either of the two options presented in the report based on constraints and preferences during the design. The first option is to maintain exists SLC I/O and migrate the I/O to new CompactLogix controllers using the 1747-AENTR adaptor module. This option would minimize any re-wiring and re-termination of I/O and provide a fast and lower cost replacement. I/O could then be transferred at a later date depending on need and continued availability of SLC I/O cards. The second option would be to completely replace SLC controllers and I/O. This would upgrade the entire system including I/O to more modern components but would increase time and cost of the transition. Specialized wiring arms could be utilized in this option that mate directly to the existing SLC terminals in order to speed wiring. Unless significant I/O changes are planned, or replacement of entire PLC cabinets is desired, it is recommended to transition using the first option in order to reduce the time and cost of the transition. This upgrade will provide a consistent level of programming environment, equipment support, and a higher level of standardization on control hardware.

As part of the upgrades to this facility, integration of the existing DFS HyperSCADA server into the CitectSCADA application for higher visualization into the lift station system should be considered. While the lift station system was not specifically evaluated as a part of this master plan, integration of lift stations into the CitectSCADA application would provide additional standardization, maintenance, and operator access benefits. This migration could also provide a means of lift station controller migration and allow for other controller platforms to be used.

Additionally, network components will be replaced at the time of PLC component replacements to upgrade network hardware to the Rockwell Automation Stratix series managed switches. The

Stratix switches should be monitored by the new PLC system using the pre-built Rockwell add-on instruction for Stratix switches in the Studio 5000 PLC programming system. Additionally, all Rockwell network switches, PLCs, and motor control components should be connected to the central Rockwell Asset Center server for management and security. This upgrade will provide higher reliability, security, and manageability and standardize network components to aid in maintenance. Fiber optic cabling will be extended to provide redundant pathways around the N WRF for higher communications reliability and be coordinated with network component upgrades to minimize downtime. Additional details related to this project can be found in Chapters 3 and 5 of the report and a summary table of PLC modifications in the appendix.

Existing wireless systems should be evaluated to ensure that security features such as encryption are turned on for all radio systems and that these systems are routed through firewalls where strong security features cannot be enabled and known vulnerabilities exist. No WiFi networks are planned to be added to facilities. WiFi is an expensive and insecure addition to plant sites for operator mobile access. Instead of the use of WiFi, it is recommended to use cellular if operator mobile access is desired. Mobile cellular access can be deployed in either a private M2M network or using public interfacing cellular with VPN access used similar to remote system access. For buildings have weak cellular service, cellular repeaters should be used in order to boost signal strength. This will provide boosted service for remote access as well as the benefit of staff cellular phones working within these buildings as well for calls. It is recommended for the County to deploy this system in coordination with their IT department.

Upgrades at the N WRF should be coordinated with the SE WRF to ensure operation of the MARS system is not impacted by the upgrade process. Some upgrades may need to be incorporated into the SE WRF project to ensure a well-integrated MARS upgrade.

8.5.2 Design

The design phase of this project should finalize the CitectSCADA architecture for the facility as well as WIN-911 architecture and thin client deployments based on County preferences at the time of design and known reliability of the communication between N WRF and the IT datacenter. New SCADA graphics and PLC logic should be specified to be developed through a series of workshops to take place during construction and facilitated by the design engineer to ensure consistency of graphics and programming logic. New graphics should be context aware type graphics with standard objects and templates designed to match up with standard PLC add-on instructions. Design will include the following major aspects:

- Selection of hardware and networking components
- Design specifications for the following:
  - General I&C Requirements.
  - Construction Sequencing.
  - Control Panel Requirements.
  - PLC Programming Requirements.
  - PLC Components.
  - Ethernet Network Components.
  - Fiber Optic Cabling and Testing.
  - System Testing and Commissioning.
  - Conduit Systems.
- Design Drawings:
  - Legends.

  - Communications block diagrams.
  - Fiber Optic Cable routing diagrams.
  - Photo Drawings showing upgrade requirements.
  - Example wiring details.
  - PLC I/O Layout or I/O List.
  - Electrical duct bank and fiber routing drawings.
  - Building power and fiber drawings to support upgrades.
- Bid Assistance.
- Construction services and commissioning assistance.

8.5.3 Construction

Construction requirements will include the following:

- Submittals and shop drawings for each control panel for O&M documentation.
- PLC replacements with new programming.
- PLC program conversion, corrections, and documentation.
- SCADA HMI applications programming.
- Integration with core SCADA system.
- Network switch configuration.
- Fiber Optic Cable installation and testing.
- Performance testing.
- Decommission existing systems.
- System commissioning.
- Penetration testing and baseline cybersecurity report.
- Provide final O&M documentation and training.

To facilitate a smoother integration, the entire PLC and HMI system should be developed and tested at the integrator's facility. This includes all HMI programming and PLC logic. The full updated HMI program should be deployed and either have existing I/O temporarily addressed to the new system and then transitioned or run the existing and new HMI systems in parallel until all PLCs are replaced. Hardware should be replaced sequentially following expansion of the fiber optic cable system to ensure that work at one PLC location will not negatively impact other areas of the plant.

8.5.4 Estimated Costs

The estimated costs associated with upgrading the PLC system are summarized in the following table. Costs are associated with the proposed fiber optic cabling upgrades presented in Chapter 5 and based on full PLC replacements including replacement of all I/O.

Table 8.4 N WRF SCADA System Project Cost Estimate

Activities	Cost
Design	
Specifications	20,000
Drawings	185,000
Meetings	15,000
Project Management	25,000
Construction Services	80,000

Activities	Cost
Design Total	**325,000**
Construction	
PLC Upgrades	350,000
Drawings	50,000
Testing	50,000
HMI Application Updates	200,000
Server Hardware and software	80,000
Control Room Upgrades	100,000
Fiber Optic Cable	110,000
Pull Boxes	70,000
Ethernet Switches	25,000
Fiber Patch Panels	15,000
Submittals	25,000
O&M	25,000
Construction Total	**1,100,000**
Subtotal	1,425,000
25% Contingency	356,250
Total	**1,781,250**

8.5.5 Purpose

This project is meant to address the following major recommendations of the SCADA Master Plan:

- Upgrade outdated equipment and standardize PLC systems at the N WRF.
- Add resiliency to the Fiber Optic Network.
- Add network management, standardization, and reliability to the Ethernet network.
- Standardize PLC programming platform and applications.
- Correct existing logic errors and increase automation.
- Provide operations staff with increased system access and visibility.

8.6 SCADA Governance

8.6.1 Scope and Description

This project includes the creation of a SCADA Governance plan. The purpose of the SCADA Governance plan is to ensure consistent management and maintenance of system assets and that employees follow the proper workflows for optimal business performance and to meet strategic objectives. The critical starting point for this task is for the utility to first create a SCADA Governance team of stakeholders to ensure all system users and managers have a stake in policy development and review of the group's activities. The SCADA Governance plan also outlines policies in the following key areas as they relate to the SCADA group and its management:

1. SCADA Group Organization.
2. Policy and Procedure Management.
3. Asset Management Policies.
4. Document Control Policies.
5. Change Management Procedures.
6. Work Order Policies.
7. Project Definition and Execution.

These areas are key in establishing principles to meet the key objectives of:

- Availability - Staff and procedures in place to ensure systems are operational.
- Accountability - Justification of actions and decisions.
- Compliance - Changes and modifications are reviewed, tested, and documented.
- Standardization - All work and systems executed similarly.

The SCADA Governance Plan also includes the following sub policies which are part of other projects:

- Operational Policies.
- Disaster Recovery Policies.
- Emergency Response Policies.
- Cybersecurity Plan.
- Physical Security Plan.
- Standards and Specifications.

An additional portion of this project is to address SCADA system governance for conformance with industry best practices for cyber and physical security. System governance plays a key role in the development and implementation of security plans and implementations. This project will be critical for establishing decision makers, roles and responsibilities, and outlining priorities for system security.

Once initial policies are set for asset management then SCADA system assets can be populated in the CMMS system and work orders developed for these assets. This is most critical for SCADA assets which are not currently tracked in the utility CMMS. This project includes design service related to creation of plans and policies.

A subtask of this project is to develop physical and cyber security plans. These should be started in order to properly plan system security, develop guidelines for risk and vulnerability assessments, and associated emergency response plans. Additionally, this should give the County a foundation to address future potential requirements, similar to the America's Water Infrastructure Act (AWIA) requirement, in order to meet these requirements and additionally secure systems.

This task includes the development of physical and cyber security plans, including risk and vulnerability assessments to address the utility's security needs and to develop internal policies for security. These plans will provide the foundation of the utility's security program and provide a basis for mitigation planning to better secure the facilities and related infrastructure.

Physical Security planning should include the following aspects:

- Risk and Vulnerability assessments in accordance with AWWA G430 and J100 standards.
- Mitigation planning.
- Guidelines for perimeter security including the following:

  - Fencing and gate requirements.
  - Intrusion and entry detection and monitoring.
  - Mitigation of entry points and entry risks.
- Access credential management plan.
- Facility exterior and interior access control requirements.
- Definition of areas requiring camera and intrusion detection.
- Lighting requirements.
- IP Video management plan.
- Equipment standards.
- Training.
- Response Planning.

Part of security planning and modifications should include increased security at facilities to ensure the following:

- Process facilities cannot be accessed by general traffic at any time day or night without authenticated access.
- Buildings within facilities remain locked.
- Control rooms and critical control equipment can only be accessed by authorized staff.
- Camera and access control systems not associated with process control are located on non-process networks.
- SLAs or similar agreements are put in place with IT for standard electronic security component deployment.

Cybersecurity planning should include the following aspects:

- Risk and Vulnerability assessments in accordance with the AWWA cybersecurity use case tool and ICS-CERT CSET utility.
- Mitigation planning.
- Roles and Responsibilities.
- Audit Policies and Requirements.
- Architecture and Security Configuration Policies, Requirements, and guidelines.
- Data Security Policy and Procedures.
- Device Security Policy and Procedures.
- Access Control Policies and Procedures.
- Intrusion Detection Design Considerations.
- Personnel Security.
- Incident Response.
- Design Considerations - Cybersecurity Requirements.
- Training.
- Security Governance.
- Asset management.
- Recovery Plans.

This project includes design services to assist in plan generation.

8.6.2 Design

Design will include the following main aspects:

- Creation of a SCADA Governance Plan outlining the critical aspects necessary to consistently manage and maintain utility technical services for operation focusing on developing new policies and oversight for the SCADA system.
- Integration of GIS and CMMS Planning Activities into governance planning for a complete SCADA Governance Plan.
- Coordination with other sub policies being developed concurrently such as cyber and physical security plans and review and reference of existing policies such as IT and other Division policies currently in place.
- Coordination and updating of existing County policies such as Emergency Response.

8.6.3 Estimated Costs

The estimated costs associated with development of a comprehensive SCADA Governance Plan and related policies are summarized in the following table. These costs are not currently included in the overall SCADA project plan budget as numerous tasks may be completed internally or as a part of other projects:

Table 8.5 SCADA Governance Project Cost Estimate

Activities	Cost Estimate
SCADA Governance Plan	200,000
GIS Plan	50,000
CMMS Plan	50,000
Cybersecurity Plan	100,000
Physical Security Plan	50,000
Coordination with other Division policies	25,000
Coordination with County policies	25,000
Total	**500,000**

8.6.4 Purpose

This project addresses the following main items that were developed during staff workshops and recommendations of the SCADA Master Plan:

- Creation of a Governance Committee.
- Development and maintenance of system documentation such as policies, procedures, specifications, and standards.
- SCADA system management and maintenance.
- SCADA asset management, change management, and document control.
- Adherence to cyber and physical security best practices.
- Development of disaster recovery plans and policies related to SCADA infrastructure.

8.7 Add-on Projects

As a part of each project, other integrations and upgrades may be beneficial to meet County goals. Some of these upgrades can be incorporated into design and construction aspects of the

projects listed above with minimal cost impacts, while others may make more sense for the County to implement internally in order to maintain system consistency.

8.7.1 Hach WIMs Development

As systems are expanded, more data is available, and more data is concentrated in the central historian, the existing Hach WIMs system should also be expanded to use this data for additional key performance indicators (KPIs), operator and management dashboards, and enhanced system maintenance capabilities as discussed in Chapter 6 of this report. Expansion of the Hach WIMs system could be included in facility projects to expand monitoring of that facility, however, finding integrators with good Hach WIMs experience can be difficult. It is more common for internal staff to continue development and build their own customized reports and dashboards. It is recommended to continue in this fashion as the County has already begun. In addition to the current Hach WIMs administrator and developer, it is recommended to train a member(s) of the operations staff in development within the Hach WIMs system as well. This provides for a backup person to assist with the system as well as operator insight in dashboard and report management.

The use of Hach Claros should also be explored to assist with instrument maintenance and as a mobile interface for data access. This system can be further integrated with ThinManager to provide more secure and centralized access.

8.7.2 Power Monitoring

As a part of facility PLC upgrades, additional power monitoring should be added. Existing power monitoring equipment and motor control equipment that has Ethernet capabilities should be upgraded and connected as possible or replaced with new components to facilitate Ethernet integration of power monitoring data. By standardizing new power monitoring equipment on Allen-Bradley components, pre-built add-on instructions in the Allen-Bradley PLCs can be used to monitor these devices with minimal programming required. Existing system CTs and PTs can be utilized with upgraded power monitoring equipment to make transitions simpler and more cost effective. Facility power management screens should be developed to not only show power usage but to aid operations staff in making decisions to reduce power usage.

8.7.3 CMMS Integrations

As a part of CitectSCADA upgrades, the equipment model within CitectSCADA should be utilized to organize data based on equipment. This organization will facilitate connectivity to CMMS systems as noted in previous chapters. The County can work with their CMMS provider and CitectSCADA vendor in order to facilitate this integration and determine if middleware such as Avantis Condition Manager are required to facilitate connectivity based on the County's intended use of this integration. This first step for this integration is for the County to clearly determine their desired outcomes of this integration so that the necessary components can be developed. This work can be included in SCADA governance development to create a cohesive asset management program for SCADA assets and work order management.

8.8 Control System Team Purpose and Benefits

For each project, it is critical that the implementation is done consistently between facilities. To meet this criteria, the integration team will be critical to the success of all upgrades and will have a great impact on future maintenance and upgrade requirements. This section outlines the importance and requirements for the Control System Team (CST) in order to provide a cohesive

approach to addressing immediate and long-term control (SCADA) system maintenance, planning, and quality control needs.

Implementing a CST to manage the overall control system for the county facilities will have the following advantages:

- Eliminates the risk currently associated with having only one or two personnel capable of implementing programming changes to the SCADA system.
- Improves communication between various Operations and Maintenance staff as it relates to control system needs and wants.
- Provides a basis for team members to cross train in the various aspects of the SCADA systems, such as the control systems at the various WWTPs and WTP.
- Allows future projects at the plant to be constructed and documented according to county standards. This group would ensure control system standards continue to develop as needed, are updated and most importantly are enforced for all projects.
- Allows for long range planning related to control system updates.
- Balances workload for control system staff because CST members can share workload due to cross training.
- Provides a forum for systematically performing and tracking routine control system maintenance and updating associated system documentation.

8.8.1 Roles and Responsibilities

- To support the SCADA systems long term, making a combined team of CST, Maintenance, Engineering, and IIO staffs responsible for certain control system functions is recommended. Recommended key functions for the Engineering, CST, Maintenance, and IIO staff include responsibilities to support the SCADA systems. A team effort is envisioned among these groups.

8.8.2 Engineering Responsibilities

- Overall control system implementation should continue to be structured as an Engineering effort. This includes management of the control system tasks in capital improvement and rehabilitation and replacement projects.
- Engineering oversight should be accompanied by team leader support from the CST and IIO teams for all control system projects. This includes participation and commitment from each team member for capital improvement program (CIP) and replacement project planning and budgeting.
- Engineering responsibilities not only include enforcing control system standards but also providing turnkey solutions with team involvement. This ensures involvement from correct support team and enforces as built documentation, startup, and system commissioning.

8.8.3 CST and Maintenance Responsibilities:

- Ideally, the CST and Maintenance staff will support and maintain all components and programming for the field level and PLC level. At the process control system (PCS) level, the CST will support he Citect applications. CST and maintenance staff should also support internal networks to PCS, PLC, and field network levels including instrumentation and controls for the respective SCADA system.

8.8.4 IIO Responsibilities:

- IIO Responsibilities typically include fiber optic backbone at the enterprise level. Networks, network components, firewalls, servers, backup and recovery schemes, and historians.
- Near Term control (SCADA) system support may require additional personnel for all staff: CST, Maintenance and IIO staff.

8.8.4.1 Hardware Replacement

Background:

The SCADA Master Plan identifies a wide range of SCADA equipment/programmable logic controllers (PLCs) installed. The equipment varies considerably in terms of age, feature set, communication protocol, software and vendor support. Furthermore, most of these systems have been built in a piecemeal manner over the years by a wide variety of contractors, vendors, integrators, each with its own hardware design and programming approach.

As noted previously in this report field investigation found that although there are many different controllers in the Manatee County plant facilities, Rockwell PLCs are the most prevalent, which is consistent with industry standards.

Budgetary Costs:

The SCADA Master Plan identifies budgetary costs associated with replacement of the PLC equipment only for each control panel listed. Additional costs could be incurred if Manatee County replaces additional equipment in each control panel and the enclosure. For those control panels that may require additional or replacement surge protection, power supplies, relays, etc. the hardware and installation costs will increase.

Sequencing:

In an effort to manage the hardware and more specifically PLC replacement, below are some guidelines to determine potential order or sequencing of the PLC replacement work. The guidelines are intended to address those control panels with a higher replacement severity level first.

- Problematic control issues.
- Problematic electrical issues.
- Physical condition assessment.
- Process and operational significance.
- Age of hardware.
- Software compatibility with SCADA.

The quantity of hardware replacement projects, specifically PLC's, HMIs, and UPS is excessive. Utilizing the above guidelines is an approach that has proven effectiveness. It is recommended to begin with any networking projects to ensure the new PLCs will communicate effectively with the SCADA system when installed.

PLC Replacement Guidelines:

There are considerable planning tasks to be completed prior to performing the PLC hardware upgrade. The list below of planning tasks have been found to be very beneficial.

- When developing a new Rockwell Automation (Allen Bradley) PLC system regardless of size, it is best to utilize Rockwell's Integrated Architecture Builder (IAB). See the link below for further details.

  Rockwell Integrated Architecture Builder

- Update all PLC related drawings. This includes but is not limited to:
  - Power Wiring.
  - I/O module wiring.
  - Wire numbers.
  - Terminal numbers.
  - Control Panel layout.
- Complete PLC program migration to Studio 5000. It should be noted not all of the PLC program will be converted with the Rockwell software conversion utility. It will be necessary to test and verify the new program to ensure the program converted successfully as well as all features and functions converted properly.
- Prepare to update tags in the SCADA system if required.
- Procure the hardware.
- Develop a cut over plan. A cut over plan will identify the required tasks to perform the PLC upgrade. The cut over plan will identify the following:
  - Cut over phases (if more than one).
  - Resources.
  - Task identification number.
  - Task description.
  - Sub-Task (if any).
  - County Staff Coordination (identify county staff by names).
  - Notes (include shut down duration(s) Estimated start and finish dates and times for each task.

Below is an example of previous cut over plans that have been successful:

- Removal of existing PLC hardware.
- Removal of existing wiring (if necessary).
- Installation of new PLC hardware.
- Installation of new wiring including wire numbers and labels.
- CEET (Complete end to end testing). Test all new wiring.
- Test communication from PLC to SCADA and or other network equipment.
- Test data to/from PLC to/from SCADA.
- Test manual operation of control panel functionality.
- Test automatic operation of control panel automation.
- Complete system documentation.

8.9 Summary

The County currently has a general CIP program and other planned upgrade efforts for County facilities. This SCADA Master Plan should be coordinated with these other efforts where possible. Development of a SCADA governance committee having quarterly review meetings would help this effort to ensure synchronized implementation of the recommended improvements.

The main items addressed with the projects in this plan are focused around empowering staff with useable information, standardizing control system components and programming, and upgrading legacy hardware systems that are becoming increasingly harder to maintain. The projects listed in this chapter are intended to address these major items.

The following is a summary of the SCADA Master Plan:

Table 8.6 SCADA Master Plan Project Summary Table

Project Name	Estimated Start	Estimated Complete	Actual Start	Actual Complete	Budget
Core SCADA System	10/2020	7/2022			$1,431,250
SE WRF System SCADA	5/2021	5/2024			$2,462,500
SW WRF System SCADA	8/2021	12/2024			$2,531,250
N WRF System SCADA	1/2022	7/2024			$1,781,250
SCADA Governance	10/2020	8/2021			$500,000
Total	10/2020	FY24/25			$8,706,250

FY 2020 – 2024

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: Core SCADA System Project
Department: Public Works Projects
Project Manager:
Infra. Sales Tax:
Project # **Status:** Requested

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need:

Project Location

Countywide

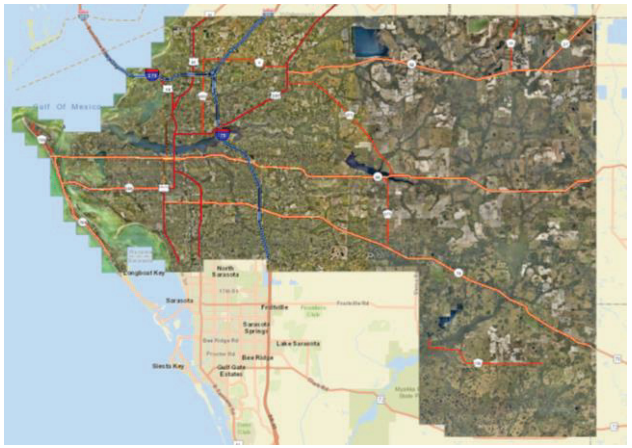
Description and Scope

Development of a centralized SCADA platform and SCADA related networking and security services. Project will include design and construction of the core SCADA system infrastructure to support central application management and access.

Rationale

To provide centralized management of SCADA system applications to reduce application maintenance and increase security and standardization.

Project Map



Schedule of Activities

Activity	Start	End	Amount
Design:	10/20	4/21	343,750
Land:			
Construction:	7/21	7/22	1,087,000
Equipment:			
Project Mgt:			
Total Budgetary Cost Estimate:			1,431,250

Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Funding Strategy

Utility Rates

Means of Financing

Funding Source	Amount
Rates	1,431,250
Total Funding:	1,431,250

Programmed Funding

Expended to Date	Appropriated to Date	FY2021	FY2022	FY2023	FY2024	FY2025	Future
0	0	400,000	1,031,250	0	0	0	0

FY 2020 – 2024
Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: SE WRF SCADA Upgrades
Department: Public Works Projects
Project Manager:
Infra. Sales Tax:
Project # **Status:** Requested

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need:

Project Location

SE WRF

Description and Scope

This project includes the replacement of existing Legacy PLC systems and associated network hardware, OITs, and the addition of fiber optic cabling for modernization and standardization of equipment and added system resiliency at the SE WRF and includes upgrades for the MARS and Dryer

Rationale

Upgrade outdated equipment and standardize PLC systems at the SE WRF. Add resiliency to the Fiber Optic Network. Standardize PLC programming platform and applications.

Project Map

Schedule of Activities

Activity	Start	End	Amount
Design:	5/21	5/22	443,750
Land:			
Construction:	6/22	5/24	2,018,750
Equipment:			
Project Mgt:			
Total Budgetary Cost Estimate:			2,462,500

Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Funding Strategy

Utility Rates

Means of Financing

Funding Source	Amount
Rates	2,462,500
Total Funding:	2,462,500

Programmed Funding

Expended to Date	Appropriated to Date	FY2020	FY2021	FY2022	FY2023	FY2024	Future
0	0	185,000	595,210	1,009,380	672,910	0	0

FY 2020 – 2024

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: SW WRF SCADA Upgrades
Department: Public Works Projects
Project Manager:
Infra. Sales Tax:
Project # **Status:** Requested

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need:

Project Location

SW WRF

Description and Scope

This project includes the replacement of existing Legacy PLC systems and associated network hardware, OITs, and the addition of fiber optic cabling for modernization and standardization of equipment and added system resiliency at the SW WRF

Rationale

Upgrade outdated equipment and standardize PLC systems at the SW WRF. Add resiliency to the Fiber Optic Network. Correct existing logic errors and increase automation.

Project Map

Schedule of Activities

Activity	Start	End	Amount
Design:	8/21	8/22	468,750
Land:			
Construction:	9/22	12/24	2,062,500
Equipment:			
Project Mgt:			
Total Budgetary Cost Estimate:			2,531,250

Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Funding Strategy

Utility Rates

Means of Financing

Funding Source	Amount
Rates	2,531,250
Total Funding:	2,531,250

Programmed Funding

Expended to Date	Appropriated to Date	FY2020	FY2021	FY2022	FY2023	FY2024	Future
0	0	78,125	550,000	960,000	943,125	0	0

FY 2020 – 2024

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: North WRF SCADA Upgrades
Department: Public Works Projects
Project Manager:
Infra. Sales Tax:
Project # **Status:** Requested

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need:

Project Location

North WRF

Description and Scope

This project includes the replacement of existing Legacy PLC systems and associated network hardware, OITs, and the addition of fiber optic cabling for modernization and standardization of equipment and added system resiliency at the N WRF.

Rationale

Upgrade outdated equipment and standardize PLC systems at the N WRF. Add resiliency to the Fiber Optic Network. Standardize PLC programming platform and applications.

Schedule of Activities

Activity	Start	End	Amount
Design:	1/22	12/22	406,250
Land:			
Construction:	1/22	7/24	1,375,000
Equipment:			
Project Mgt:			
Total Budgetary Cost Estimate:			1,781,250

Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Programmed Funding

Expended to Date	Appropriated to Date	FY2020	FY2021	FY2022	FY2023	FY2024	Future
0	0	0	332,500	835,000	613,750	0	0

Project Map

Funding Strategy

Utility Rates

Means of Financing

Funding Source	Amount
Rates	1,781,250
Total Funding:	1,781,250

FY 2020 – 2024

Category: Wastewater **Subcategory:** Wastewater Treatment
Project Title: SCADA Governance
Department: Public Works Projects
Project Manager:
Infra. Sales Tax:
Project # **Status:** Requested

Comprehensive Plan Information

CIE Project: **N** Plan Reference:
LOS/Concurrency: **N** Project Need:

Project Location

Countywide

Description and Scope

Development and maintenance of system documentation such as policies, procedures, specifications, and standards. SCADA asset management, change management, and document control. Development of disaster recovery plans and policies related to SCADA infrastructure.

Rationale

The purpose of the SCADA Governance plan is to ensure consistent management and maintenance of system assets and that employees follow the proper workflows for optimal business performance and to meet strategic objectives.

Schedule of Activities

Activity	Start	End	Amount
Design:	10/20	8/21	500,000
Land:			
Construction:			
Equipment:			
Project Mgt:			
Total Budgetary Cost Estimate:			500,000

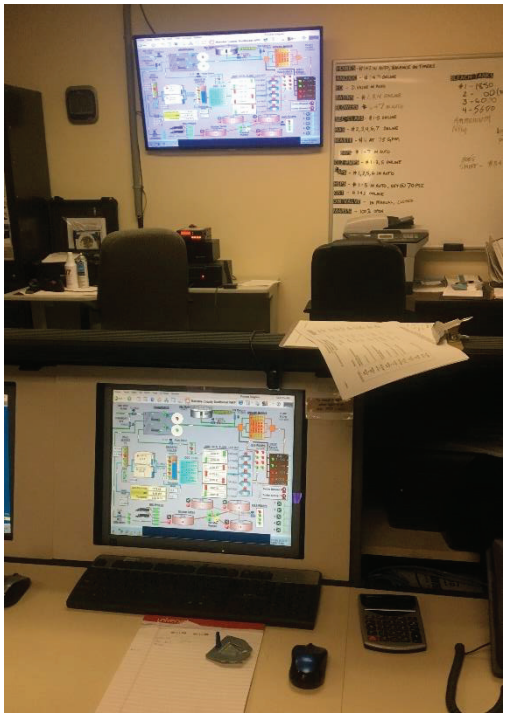
Operating Budget Impacts

Category	Fiscal Year	Amount
Personal:		
Non-Personal:		
Operating Capital:		
Operating Total:		

Programmed Funding

Expended to Date	Appropriated to Date	FY2020	FY2021	FY2022	FY2023	FY2024	Future
0	0	500,000	0	0	0	0	0

Project Map



Funding Strategy

Utility Rates

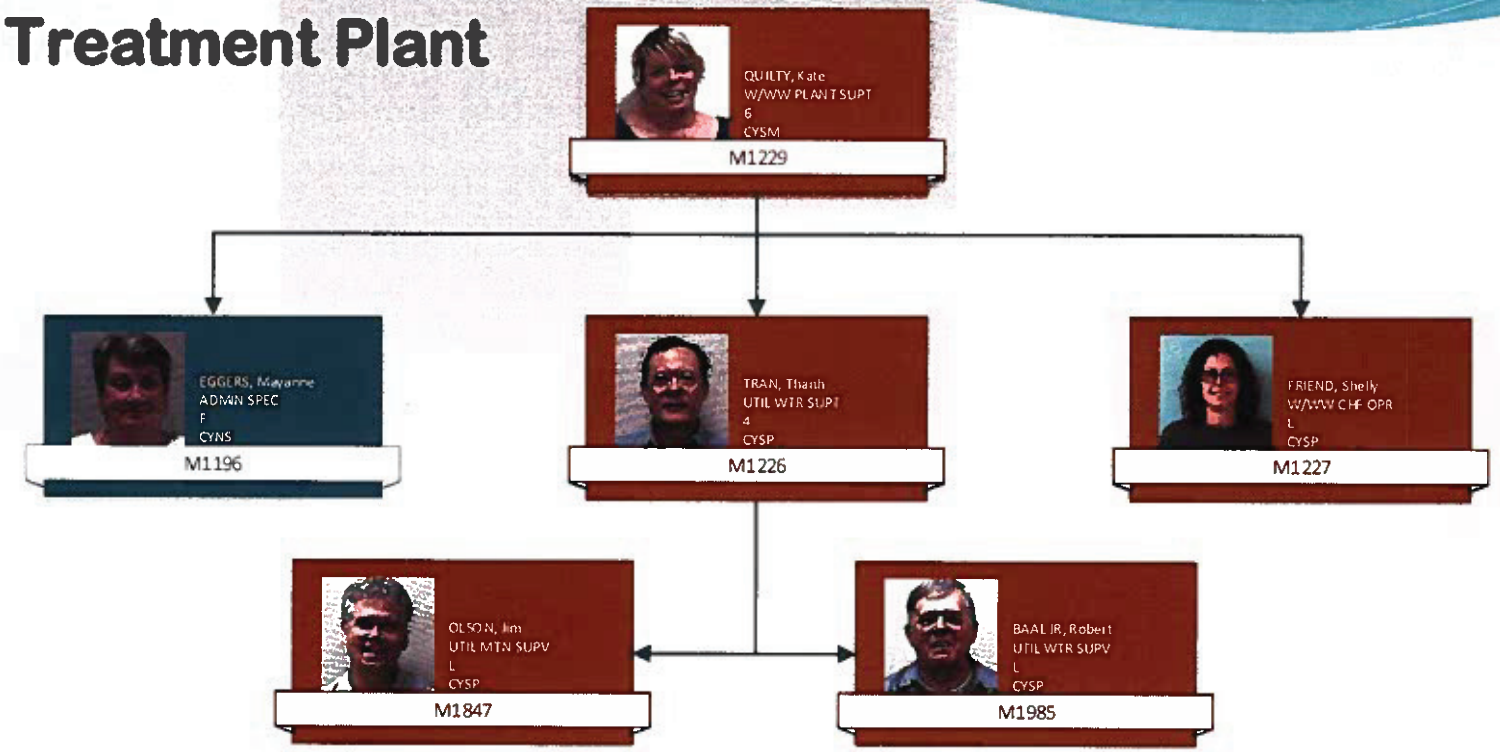
Means of Financing

Funding Source	Amount
Rates	500,000
Total Funding:	500,000

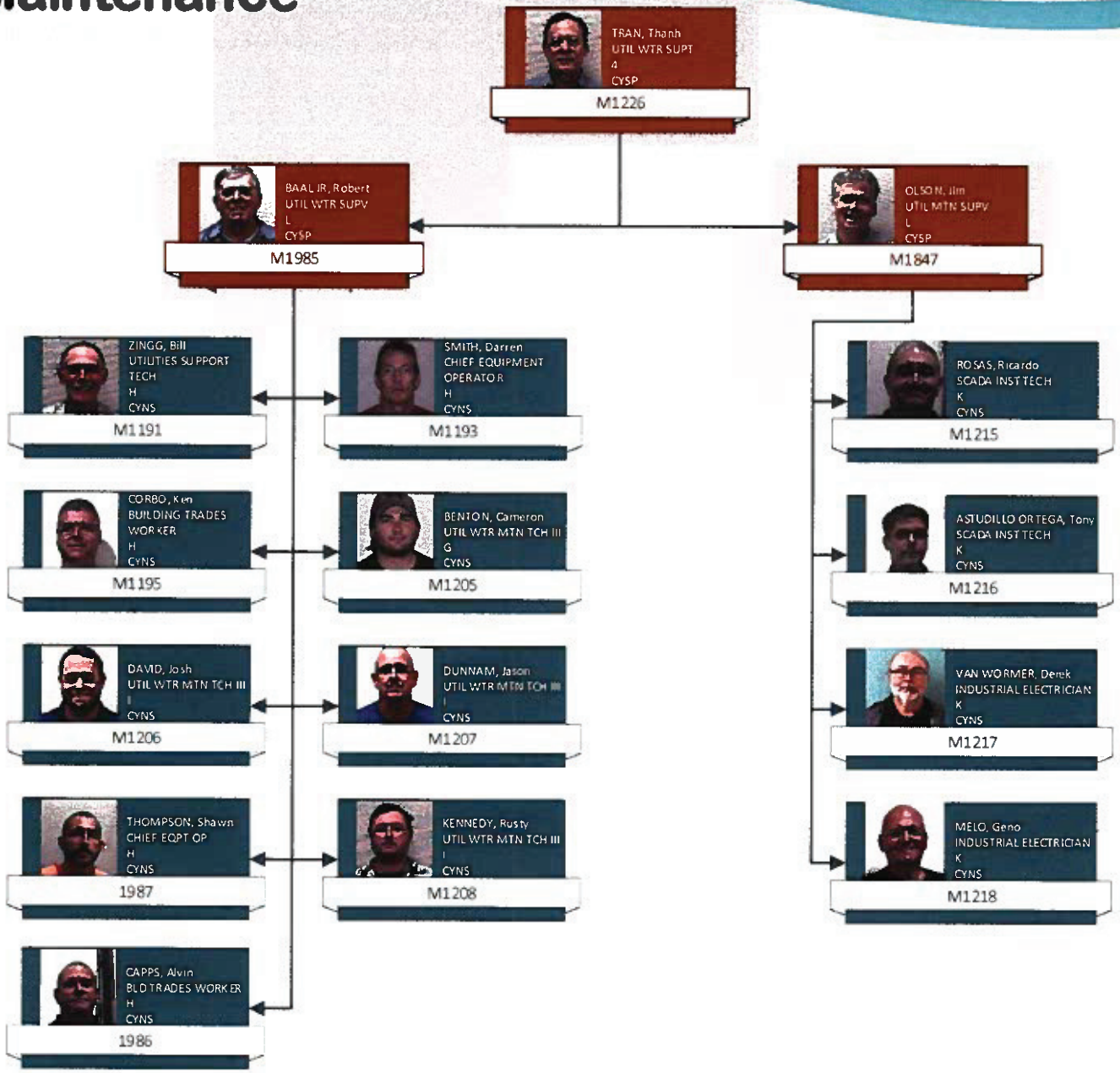
Appendix A

ORGANIZATIONAL CHARTS

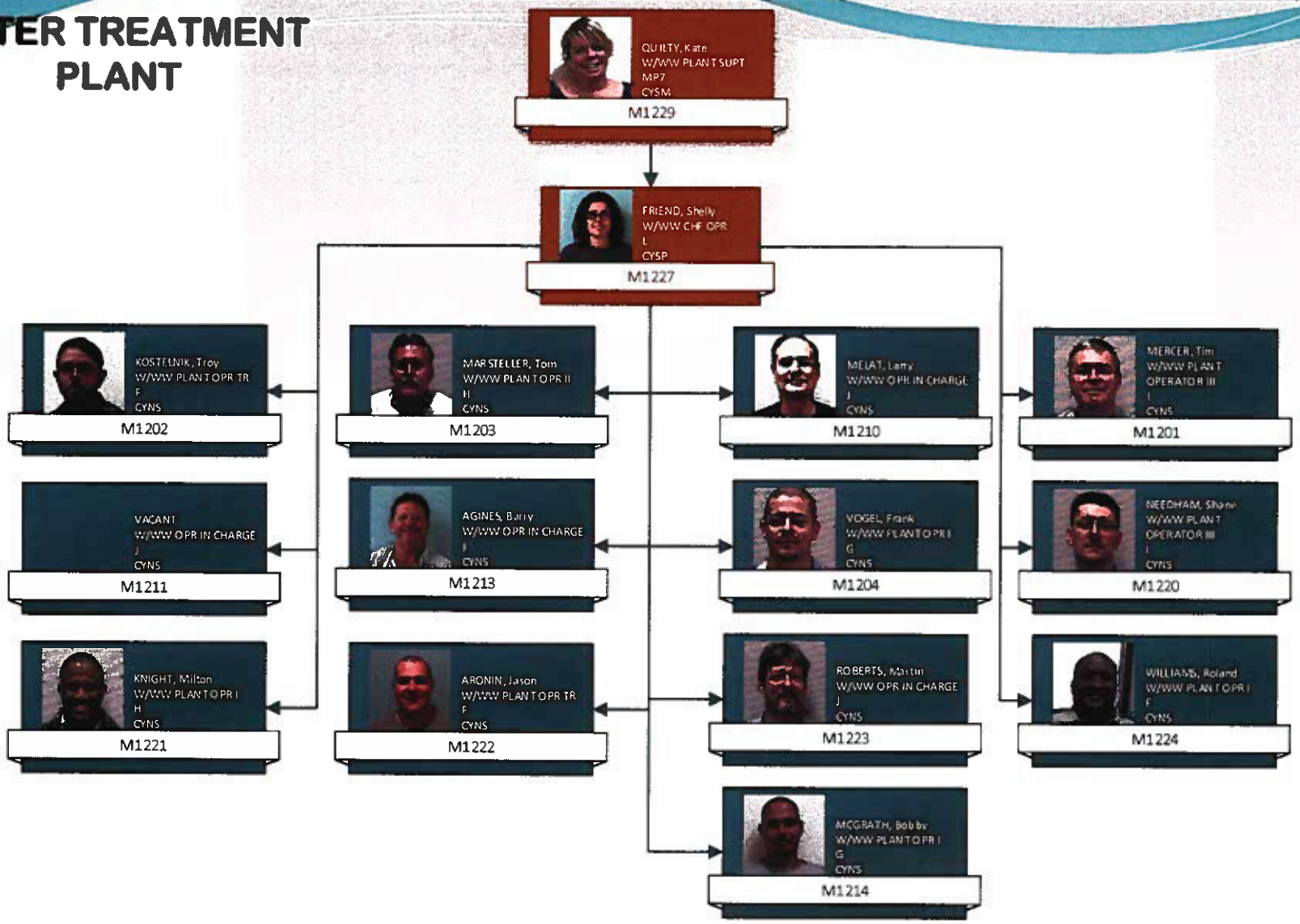
Water Treatment Plant



Water Treatment Plant Maintenance — UTILITIES



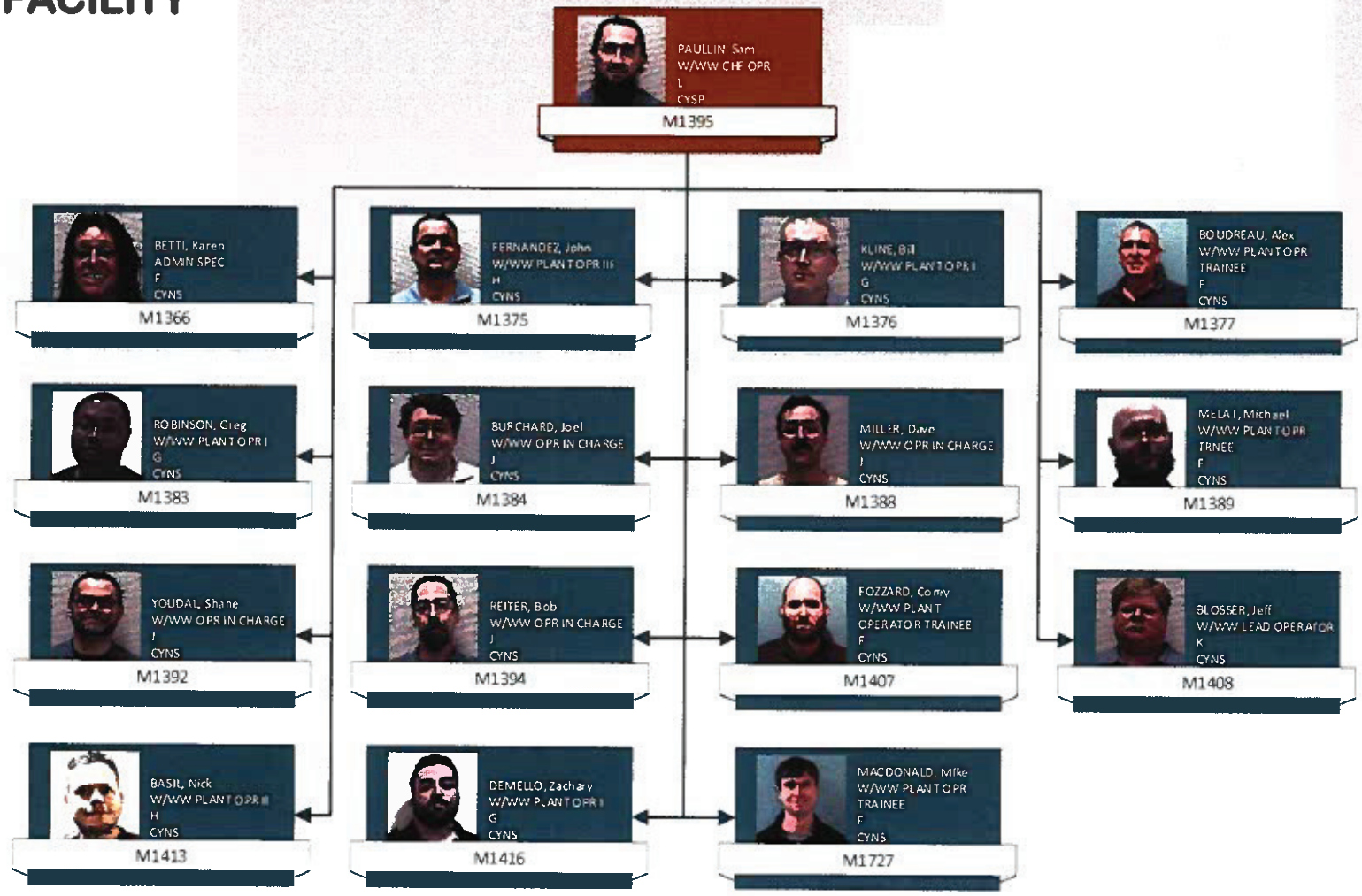
WATER TREATMENT PLANT



UTILITIES

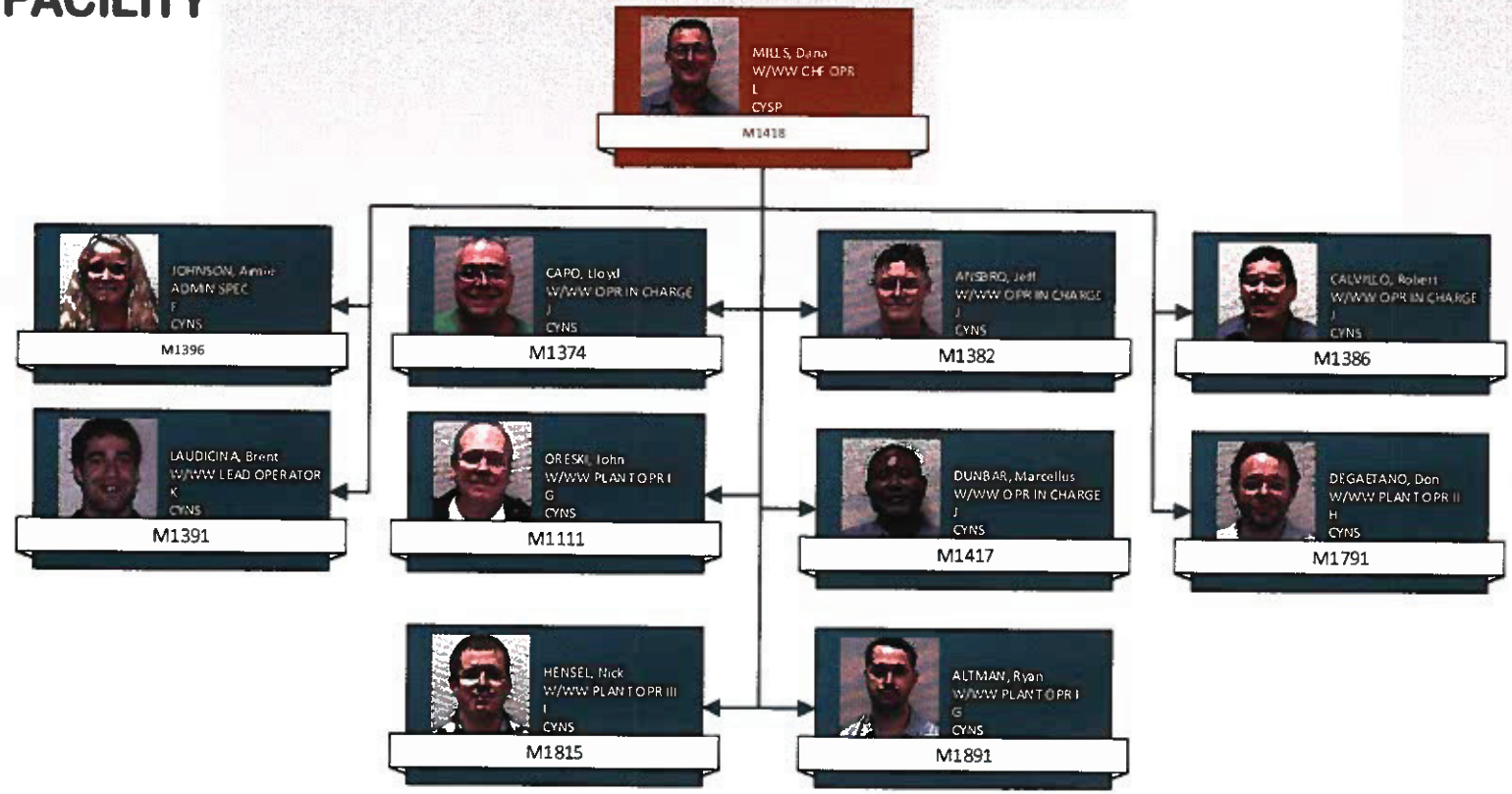
WASTEWATER

SW WATER RECLAMATION FACILITY

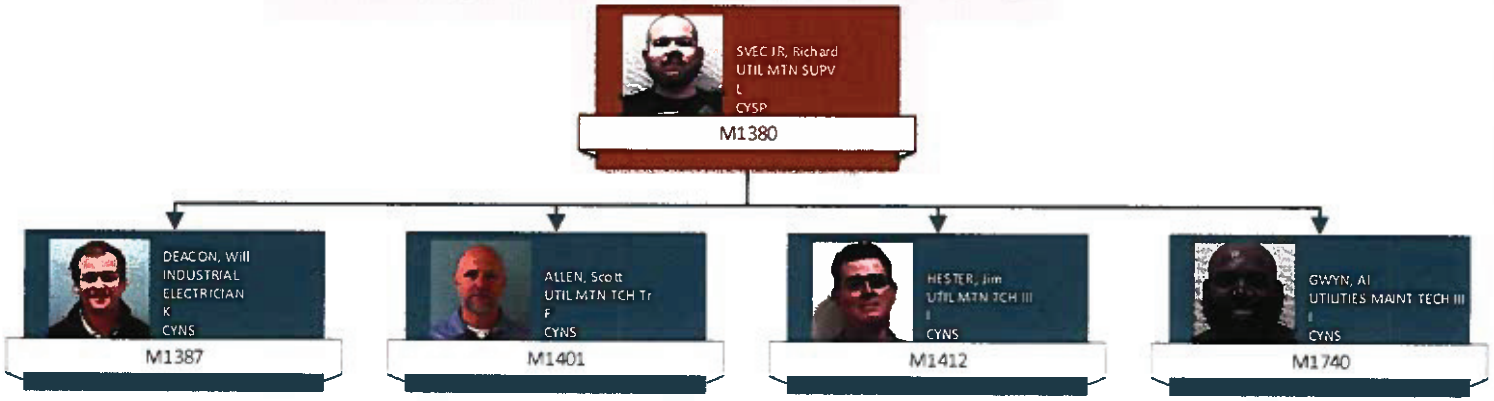


SE WATER RECLAMATION FACILITY

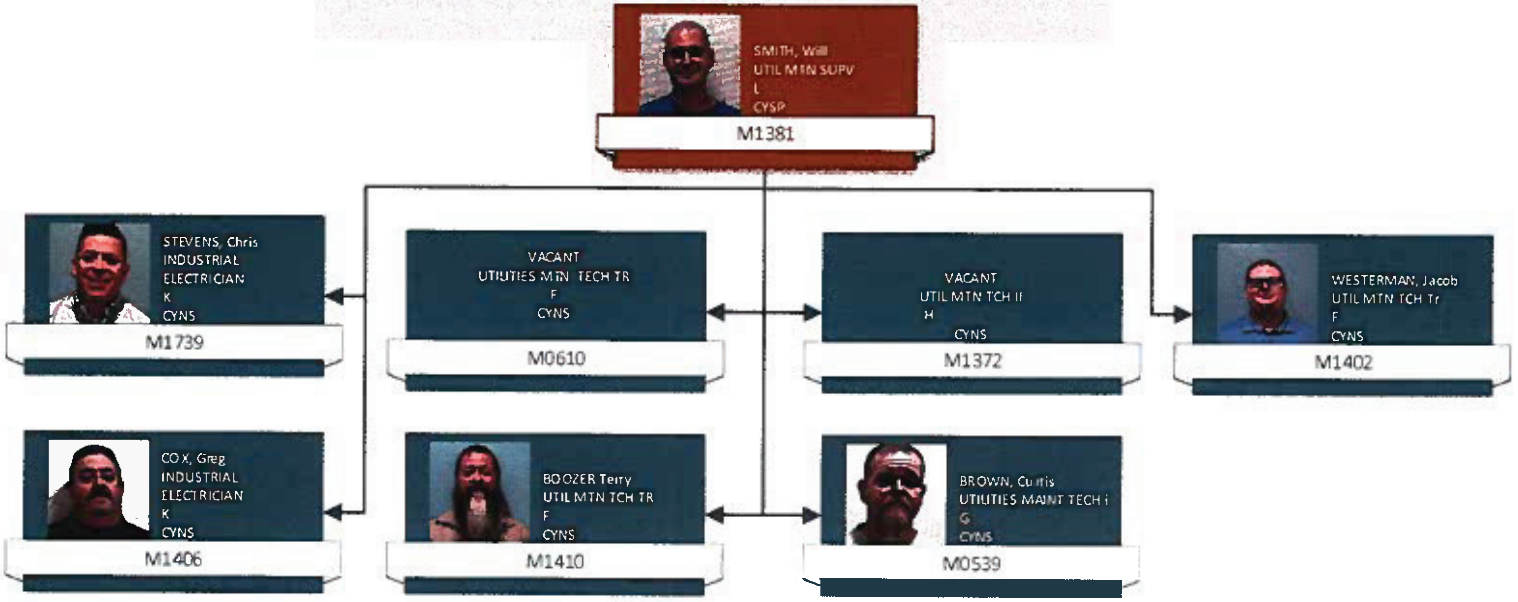
NORTH REGIONAL WATER RECLAMATION FACILITY



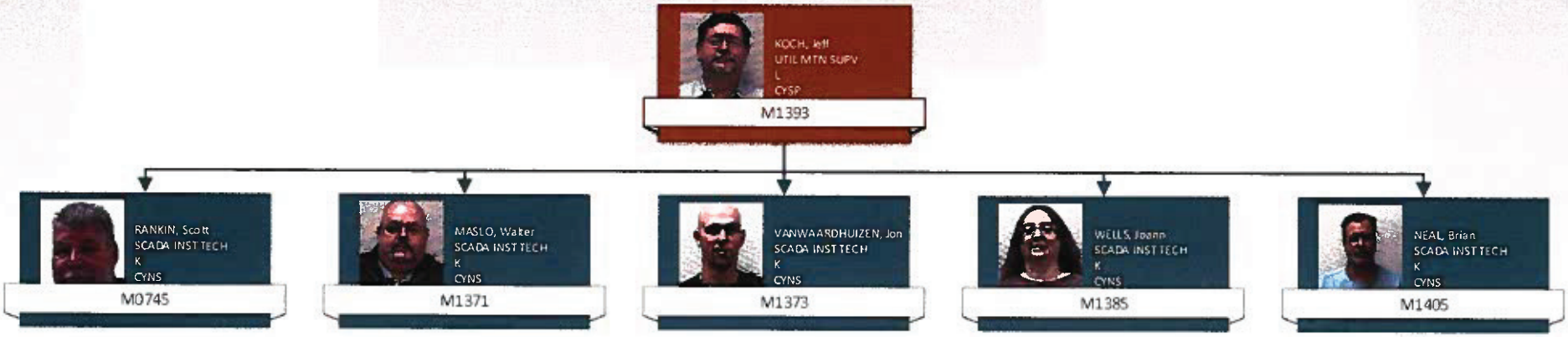
NORTH RETIONAL WATER RECLAMATION FACILITY



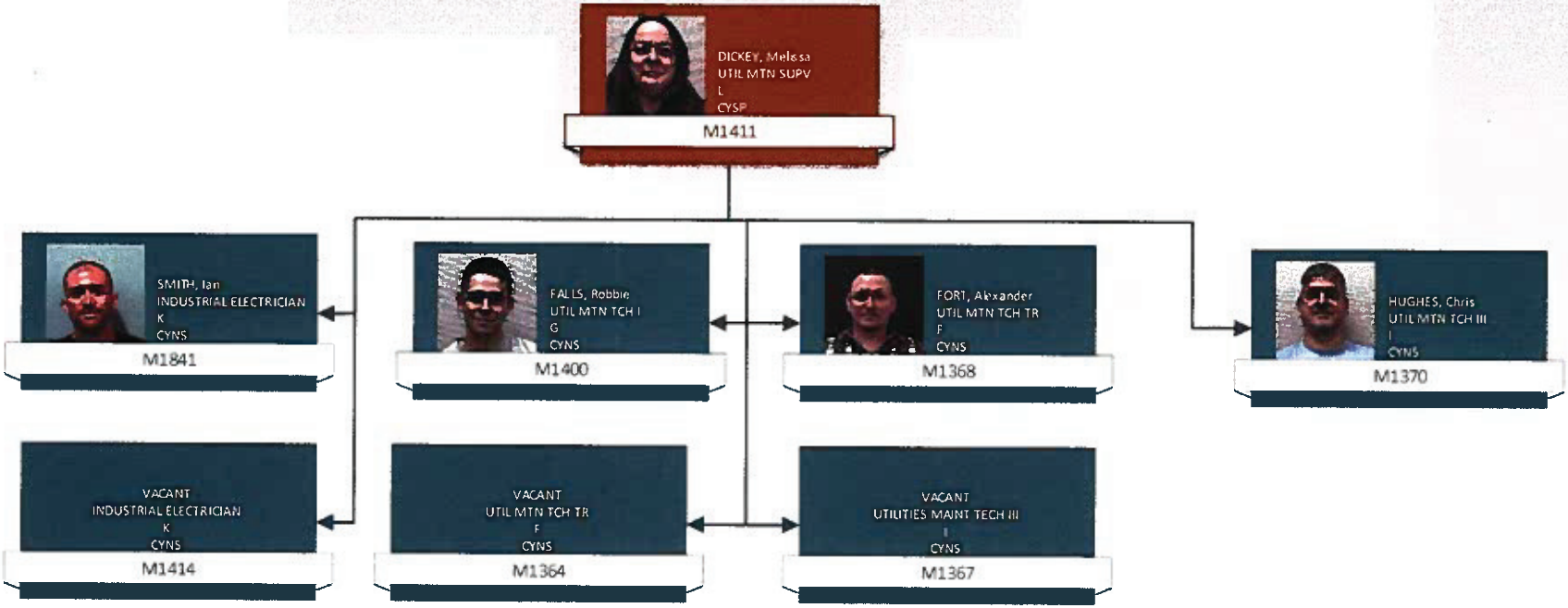
SE WATER RECLAMATION FACILITY



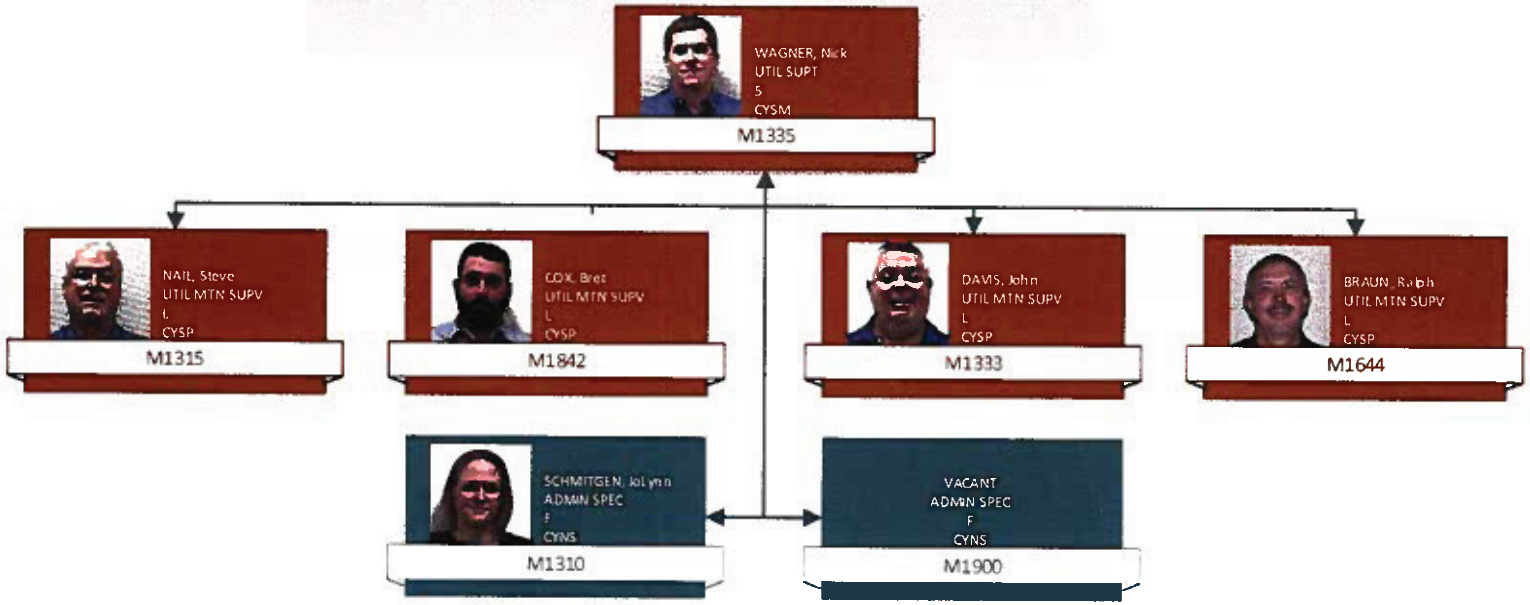
SW WATER RECLAMATION FACILITY



SW WATER RECLAMATION FACILITY

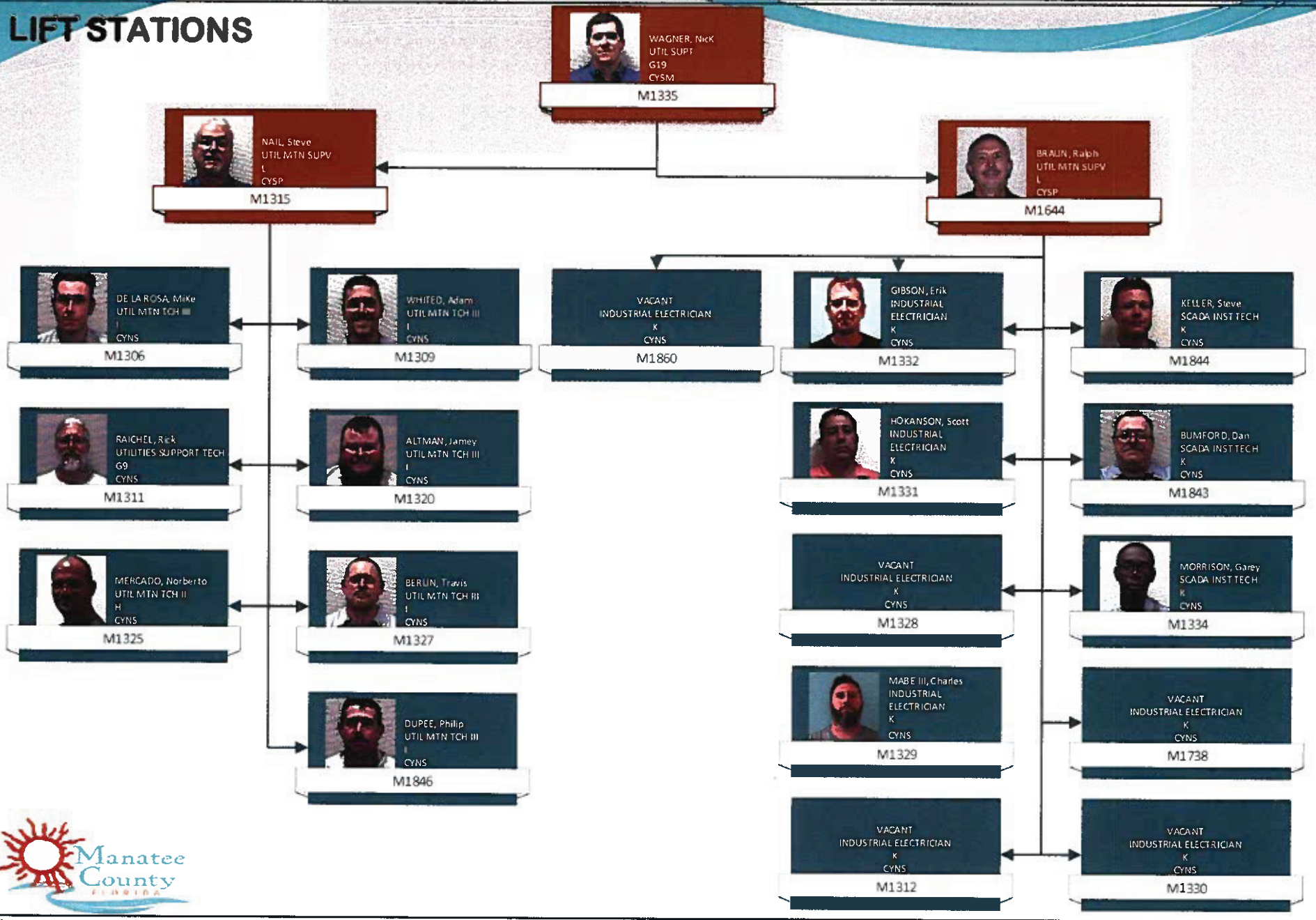


LIFT STATIONS



UTILITIES

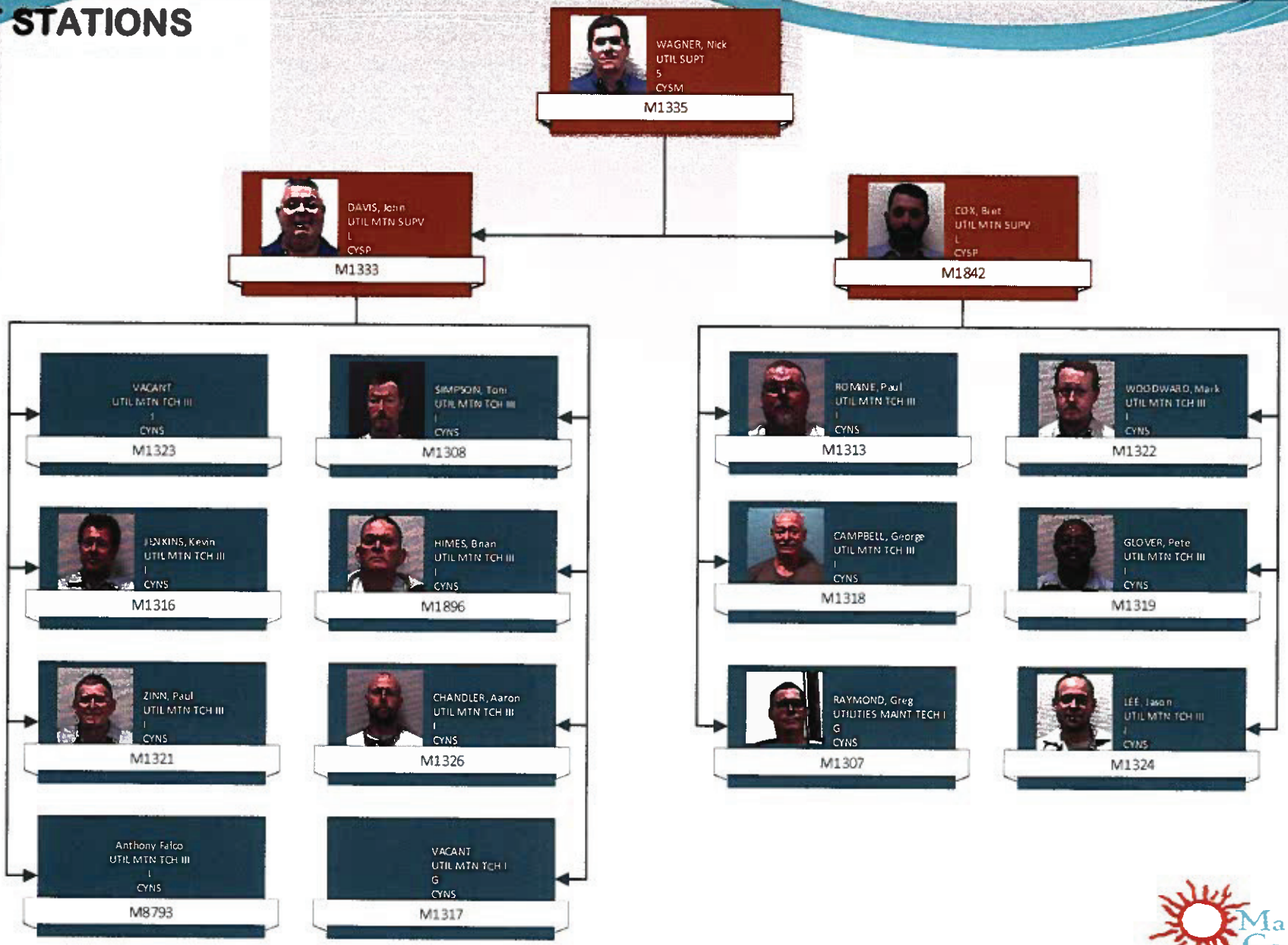
LIFT STATIONS



Manatee County FLORIDA

UTILITIES

LIFT STATIONS



Appendix B

JOB DESCRIPTIONS

INSTRUMENT TECHNICIAN

Class Code: 232-100

Bargaining Unit: None Represented

MANATEE COUNTY GOVERNMENT
Established Date: Apr 11, 2009
Revision Date: Mar 2, 2011

SALARY RANGE

$16.44 - $25.50 Hourly
$34,195.20 - $53,040.00 Annually

GENERAL INFORMATION:

G12

This classification performs technical work in preventative and corrective maintenance and repair of electrical, electronic and pneumatic instrumentation in waste/water treatment plants or lift stations. Work also involves installation and modification of electronic instruments and control systems, including microprocessor/computer control systems and interfaces.

Working Conditions
Indoor/Outdoor situation; high noise environment while performing certain responsibilities. Lifting equipment up to 50 lbs. alone; up to 100 lbs. with assistance.

JOB DUTIES:

Essential Functions
These are intended only as illustrations of the various types of work performed. The omission of specific duties does not exclude them from the position.

Performs preventative and corrective maintenance of instrumentation of waste/water treatment plants, lift stations, and related facilities.

Performs necessary adjustments and calibrations of instrumentation by using prepared chemical standards and portable electronic meters and related calibration equipment.

Installs new equipment and wires units according to electrical codes and schematics and diagrams provided; troubleshoots and makes repairs to all existing equipment.

Uses test equipment such as programmable logic controllers (PLCs), multimeters, digital voltmeters, digital calibrators, digital logic probes, oscilloscopes, frequency measuring meters and other pertinent electrical and electronic measuring devices. May be required to utilize Supervisory Control and Data Acquisition Systems (SCADA).

Calibrates all existing electrical equipment instruments with the use of calibration equipment mentioned above.

Services and repairs hydraulic, pneumatic, hydro-pneumatic and electro-pneumatic instrument/control systems.

Prepares necessary records and reports; prepares drawings, sketches and schematics.

Install, repair, maintain, and configure the radio telemetry system for all 533 manatee county lift stations.

Install, diagnose, repair lift station control panels as necessary when electricians need assistance.

Install, maintain, diagnose and repair field instrumentation used in control systems or for data acquisition in the telemetry system. These may be, but are not limited to flow meters, pressure transmitters, level sensors, rain gauges, vibration sensors.

Design new control systems and new data acquisition monitoring applications when necessary.

Bench test radio equipment to determine if it needs repair.

Perform any training that needs to be given to new instrument technicians, as well as training of electricians and mechanics on any equipment.

Performs other related work (including weather or other extreme emergency duties) as required.

Technical Requirements

Knowledge of principles and practices applied to preventative and corrective maintenance of electrical, electronic, pneumatic, microprocessor and other instrumentation of water treatment plants.

Knowledge of methods of operation of modern equipment and instrumentation of water treatment plants and related facilities and of work hazards and appropriate precautionary measures.

Knowledge of high and low voltage equipment and all types of flow meters, recorders and transmitters.

Knowledge of programmable logic controllers (PLCs), indicators, controllers, and other sensing equipment.

Knowledge of scientific electronic instrumentation of chemical monitoring systems repairs.

Knowledge and understanding of Supervisory Control and Data Acquisition Systems (SCADA).

Ability to read and understand programmable logic controllers (PLCs) ladder logic.

Ability to read and interpret electrical schematics, blueprints, piping layouts, and single line drawings.

Ability to read and understand specifications, instructions and recommendations.

Ability to distinguish colors.

Ability to apply theory, experience, and training in a logical and systematic fashion.

Ability to effectively deal with problems on a priority basis and investigate all possible causes before arriving at a conclusion.

Ability to establish and maintain effective working relationships with plant/field personnel, supervisor, and others.

Ability to work inside and outside in variable humidity and weather conditions, in noisy conditions, with solvents, on slippery and uneven surfaces, on or with moving objects, below ground level, in water, with odors and unusual fatigue factors; ability to perform strenuous work in adverse weather environments.

Ability to climb and descend ladders and stairs.

Ability to lift and move up to 50 pounds.

Ability to safely operate/drive a vehicle (car or pick up truck).

Ability to work emergency situations as required; ability to work after hours when needed and participate in a "standby" schedule.

MINIMUM QUALIFICATIONS:

High school diploma or equivalent certificate of competency. Prior courses or technical training in electronics, instrumentation and controls highly desired. Minimum of four (4) years experience in repair, inspection, adjustment, and calibration of electronic controls and instrumentation. Valid driver's license with valid Florida driver's license within 30 days of hire. Equivalent combinations of education and experience may be considered.

POSITION SPECIFIC:

ELECTRONICS, MAINTENANCE

INDUSTRIAL CONTROL TECHNICIAN

Class Code: 225-102

Bargaining Unit: None Represented

MANATEE COUNTY GOVERNMENT
Revision Date: Sep 20, 2017

SALARY RANGE

$18.48 - $28.65 Hourly
$38,438.40 - $59,592.00 Annually

GENERAL INFORMATION:

Paygrade: G14

Under general supervision, performs a variety of high level technical tasks relating to the maintenance, service, or installation of three phase electrical industrial plants. May work with high voltages when modifying, repairing, or installing electrical equipment and may be required to assume responsibility of controlling electrical emergencies. May initiate maintenance or repairs based on computerized radio telemetry reports or maintenance management system reports. Work is performed with considerable independence and reviewed for results obtained. Incumbent will be required to work after hours, weekends, and holidays when needed.

Working Conditions

Indoor/Outdoor situation; high noise environment while performing certain responsibilities. Lifting equipment up to 50 lbs. alone; up to 75 lbs. with assistance.

JOB DUTIES:

Essential Functions

These are intended only as illustrations of the various types of work performed. The omission of specific duties does not exclude them from the position.

Performs maintenance, modification, repair, testing and installation of electrical fixtures and equipment in three phase industrial plants, including wiring, lighting, machinery, power appliances, overhead circuits, motors, relays, switches, and control boxes up to and including 4160-V, AC applications and, DC applications.

Performs emergency repair of industrial motor control centers.

Troubleshoots and repairs motors, appliances, heating and cooling equipment, and transformers. Works with single phase, split phase and three phase wiring.

Interprets and ensures compliance with existing electrical codes. Procures internal safety permits and wire numbers.

Works with electro-mechanical equipment and instrumentation motor control and process equipment; recommends replacement when necessary.

Maintains, repairs, adjusts, and installs electrical motors, generators, automatic power transfer switches, variable frequency drives,

radio telemetry systems, meters, timers and control centers in industrial applications.

Installs conduit, wall outlets, and fittings.

Detects causes of electrical failures; calculates line leads to determine wire and equipment size and capacity; prepares sketches for electrical layout and installations.

Performs other related work (including weather or other extreme emergency duties) as required.

MINIMUM QUALIFICATIONS:

High school diploma or equivalent certificate of competency.

Must have a minimum of six (6) years' experience as an Industrial (non-residential) Electrician
OR
a minimum of 3 years of experience as an Industrial (non-residential) Electrician with satisfactory completion of recognized training/certification program for electricians.

Valid driver's license with valid Florida driver's license within 30 days of hire.

Equivalent combinations of education and experience may be considered.

Desired - Licensed Master Industrial Electrician or State Electrical Contractor.

Knowledge/Skills/Abilities

Technical Requirements

Knowledge of the National Electrical Codes (NEC), use and care of advanced tools, equipment and testing devices of the electrical trade, and occupational hazards and safety precautions of the trade, including working with high voltages up to 4160-V, AC and DC circuits.

Knowledge of specialized testing equipment, high voltage safety equipment, and specialized high voltage material for repair of high voltage equipment; knowledge of high and low voltage equipment, knowledge of indicators, controllers and other process sensing equipment.

Knowledge of diesel engine controls with interface to electrical generator and automatic power transfer switches; knowledge of radio telemetry systems with interface to electro-mechanical controls.

Knowledge of manufacturers and their equipment for interfacing new technical equipment with old existing equipment.

Knowledge of CADD drawing programs.

Ability to analyze telemetry reports to predict failures of monitored equipment.

Ability to read and interpret intricate electrical control schematics, blue prints, piping layouts, single line drawings, with some knowledge of electronic schematics.

Ability to establish and maintain effective working relationships with others.

Ability to communicate clearly and effectively, orally, and in writing.

Ability to perform strenuous work tasks under adverse weather conditions.

Ability to work after-hours, weekends, and holidays when needed.

Ability to distinguish colors for various purposes, i.e., wiring, labels, etc.

Ability to climb and descend ladders.

Skill in the use of tools, materials and equipment used in the electrical trade.

Ability to understand ladder logic.

KEYWORDS:

Electronics, Facility Management, Maintenance, Professional, Trades, Water Treatment, Wastewater

CLASS SPEC TITLE 6:

03/23/2013
Entry pay for qualified applicant is $18.00/hour

INDUSTRIAL ELECTRICIAN

Class Code: 225-101

Bargaining Unit: None Represented

MANATEE COUNTY GOVERNMENT
Established Date: Apr 11, 2009
Revision Date: Mar 13, 2019

SALARY RANGE

$18.48 - $28.65 Hourly
$38,438.40 - $59,592.00 Annually

GENERAL INFORMATION:

Pay grade: G14
Under general supervision, performs a variety of high level technical tasks relating to the installation, maintenance or service of three phase electrical systems. May work with high voltages when installing, modifying or repairing electrical equipment and may be required to assume responsibility of controlling electrical emergencies. May initiate troubleshooting to motor controls or repairs based on computerized radio telemetry reports or maintenance management system reports. Oversees the work of lower level technical maintenance or laborer positions. Work is performed with considerable independence and reviewed for results obtained. Incumbent will be required to work after hours, weekends, and holidays when needed.

Working Conditions
Indoor/Outdoor situation; high noise environment while performing certain responsibilities. Lifting equipment up to 50 lbs. alone; up to 75 lbs. with assistance.

JOB DUTIES:

Essential Functions
These are intended only as illustrations of the various types of work performed. The omission of specific duties does not exclude them from the position.

Oversees the work of lower level technical maintenance or laborer positions.

Oversees installation, maintenance, modification, and repair of electrical fixtures and equipment in three phase industrial plants, including wiring, lighting, machinery, power appliances, overhead circuits, motors, relays, switches, and control boxes up to and including 4160-V, AC application and DC voltages.

Performs emergency repair of industrial motor control centers.

Installs motors, appliances, heating and cooling equipment, and transformers. Works with single phase, split phase and three phase wiring.

Interprets and ensures compliance with existing electrical codes. Procures permits and layout numbers.

Works with electro-mechanical equipment and instrumentation motor control and process equipment; recommends replacement when necessary.

Installs, maintains, repairs and adjusts electrical motors, generators, automatic power transfer switches, variable frequency drives, eddy current drives, radio telemetry systems, meters, timers and control centers in industrial applications.

Installs conduit, wall outlets, and fittings.

Detects causes of electrical failures; calculates line leads to determine wire and equipment size and capacity; prepares sketches for electrical layout and installations.

Performs other related work (including weather or other extreme emergency duties) as required.

Technical Requirements

Knowledge of the National Electrical Codes (NEC), use and care of advanced tools, equipment and testing devices of the electrical trade, and occupational hazards and safety precautions of the trade, including working with high voltages up to 4160-V, AC and DC circuits.

Knowledge, or ability to obtain knowledge, of specialized testing equipment, high voltage safety equipment, and specialized high voltage material for repair of high voltage equipment; knowledge of high and low voltage equipment, knowledge of indicators, controllers and other process sensing equipment.

Knowledge of lathe and mill press operations.

Knowledge of diesel engine controls with interface to electrical generator and automatic power transfer switches; knowledge of radio telemetry systems with interface to electro-mechanical controls.
Knowledge of manufacturers and their equipment for interfacing new technical equipment with old existing equipment.

Knowledge of computer CADD drawing programs.

Ability to analyze telemetry reports to predict failures of monitored equipment.

Ability to read and interpret intricate electrical control schematics, blue prints, piping layouts, single line drawings, with some knowledge of electronic schematics.

Ability to effectively oversee and direct the work of others.

Ability to establish and maintain effective working relationships with others.

Ability to communicate clearly and effectively, orally, and in writing.

Ability to perform strenuous work tasks under adverse weather conditions.

Ability to work after-hours, weekends, and holidays when needed.

Ability to distinguish colors for various purposes, i.e., wiring, labels, etc.

Ability to climb and descend ladders.

Skill in the use of tools, materials and equipment used in the electrical trade.

MINIMUM QUALIFICATIONS:

High school diploma or equivalent certificate of competency.

Must have a minimum of six (6) years' experience as an Industrial (non-residential) Electrician or a minimum of 3 years of experience as an Industrial (non-residential) Electrician with satisfactory completion of recognized training/certification program for electricians.

Valid driver's license with valid Florida driver's license within 30 days of hire.

Equivalent combinations of education and experience may be considered.

Desired - Licensed Master Industrial Electrician or State Electrical Contractor.

POSITION SPECIFIC:

KEYWORDS:

Electronics, Facility Management, Maintenance, Professional, Trades, Water Treatment, Wastewater

CLASS SPEC TITLE 6:

03/23/2013
Entry pay for qualified applicant is $18.00/hour

SCADA INSTRUMENTATION TECHNICIAN

Class Code: 325-102

Bargaining Unit: None Represented

MANATEE COUNTY GOVERNMENT
Established Date: Jun 2, 2012
Revision Date: Oct 17, 2015

SALARY RANGE

$19.59 - $30.37 Hourly
$40,747.20 - $63,169.60 Annually

GENERAL INFORMATION:

PAY GRADE: G15

This classification performs a variety of advanced technical duties related to operating, maintaining, installing and troubleshooting instrumentation, process control and Supervisory Control and Data Acquisition (SCADA) systems for the County's waste/water treatment plants or wastewater lift stations system.

Working Conditions
Indoor/Outdoor situation; high noise environment while performing certain responsibilities. Lifting equipment up to 50 lbs. alone; up to 100 lbs. with assistance.

JOB DUTIES:

Essential Functions
These are intended only as illustrations of the various types of work performed. The omission of specific duties does not exclude them from the position.

Facilitate/perform the implementation, coordination, supervision and maintenance of the SCADA Network.

Responsible for configuring, documenting and programming of the automation and control systems.

Responsible for all control aspects of in-house projects including design, programming, simulation, testing and start-up.

Perform general electrical work such as program VFDs, troubleshoot motor control panels and pull wire occasionally.

Perform preventative and corrective maintenance of instrumentation of waste/water treatment plants, lift stations, and related facilities.

Perform necessary adjustments and calibrations of instrumentation by using prepared chemical standards and portable electronic meters and related calibration equipment.

Install new equipment and wires units according to electrical codes and schematics and diagrams provided; troubleshoot and make repairs to all existing equipment.

Use test equipment such as multimeters, digital voltmeters, digital calibrators, digital logic probes, oscilloscopes, frequency measuring meters and other pertinent electrical and electronic measuring devices.

Calibrate all existing electrical equipment instruments with the use of calibration equipment mentioned above.

Service and repair hydraulic, pneumatic, hydro-pneumatic and electro-pneumatic instrument/control systems.

Prepare necessary records and reports; prepare drawings, sketches and schematics.

Install, repair, maintain, and configure the radio telemetry system for all 533 manatee county lift stations. Install, diagnose, repair lift station control panels as necessary when electricians need assistance.

Install, maintain, diagnose and repair field instrumentation used in control systems or for data acquisition in the telemetry system. These may be, but are not limited to flow meters, pressure transmitters, level sensors, rain gauges, vibration sensors.

Design new control systems and new data acquisition monitoring applications when necessary.

Bench test radio equipment to determine if it needs repair.

Perform any training that needs to be given to new instrument technicians, as well as training of electricians and mechanics on any equipment.

Perform other related work (including weather or other extreme emergency duties) as required.

Technical Requirements
Knowledge of principles and practices of SCADA systems, specifically as applied to preventative and corrective maintenance of SCADA, including its electrical, electronic, pneumatic, microprocessor and other instrumentation components at water treatment plants.

Knowledge of methods of operation of modern equipment and instrumentation of water and wastewater treatment plants and related facilities and of work hazards and appropriate precautionary measures.

Knowledge of PLC and SCADA programming with Rockwell (RSLogix 500, Panelview, DeviceNet), Citect, Siemens and DFS.

Knowledge of antenna theory and related test equipment used to diagnose transmit/receive problems with radio telemetry systems.

Knowledge of tagging conventions, data logging and reporting, Boolean logic and symbol conventions.

Knowledge of external paging, alarming and reporting actions.

Knowledge of telemetry systems.

Knowledge of Autocad.

Knowledge of high and low voltage equipment and all types of flow meters, recorders and transmitters.

Knowledge of programmable logic controllers (PLCs), indicators, controllers, and other sensing equipment.

Knowledge of scientific, electronic instrumentation of chemical monitoring systems repairs.

Ability to read and understand programmable logic controllers (PLCs) ladder logic.

Ability to read, interpret, prepare and verify control schematics, diagrams, electrical schematics, blueprints, piping layouts, and single line drawings.

Ability to read and understand specifications, instructions and recommendations.

Ability to distinguish colors.

Ability to apply theory, experience, and training in a logical and systematic fashion.

Ability to effectively deal with problems on a priority basis and investigate all possible causes before arriving at a conclusion.

Ability to establish and maintain effective working relationships with plant/field personnel, supervisor, and others.

Ability to work inside and outside in variable humidity and weather conditions, in noisy conditions, with solvents, on slippery and uneven surfaces, on or with moving objects, below ground level, in water, with odors and unusual fatigue factors; ability to perform strenuous work in adverse weather environments.

Ability to climb and descend ladders and stairs.

Ability to work from aerial platform and perform repairs to antenna and coaxial cables.

Ability to lift and move up to 50 pounds.

Ability to safely operate/drive a vehicle (car or pickup truck).

Ability to work emergency situations as required; ability to work after hours when needed and participate in a "standby" schedule.

MINIMUM QUALIFICATIONS:

High school diploma or equivalent certificate of competency. Prior courses or technical training in electronics, instrumentation and controls highly desired. Minimum of Five (5) years experience in repair, inspection, adjustment, and calibration of electronic controls and instrumentation. Valid driver's license with valid Florida driver's license within 30 days of hire. Equivalent combinations of education and experience may be considered.

KEYWORDS:

ELECTRONICS, MAINTENANCE

SENIOR INDUSTRIAL ELECTRICIAN

Class Code: 138-100

Bargaining Unit: None Represented

MANATEE COUNTY GOVERNMENT
Established Date: Apr 11, 2009
Revision Date: Nov 7, 2011

SALARY RANGE

$20.46 - $31.72 Hourly
$42,556.80 - $65,977.60 Annually

GENERAL INFORMATION:

Pay grade: G16

This classification performs supervisory and skilled electrical, electronic air conditioning, and instrumentation maintenance work for water/wastewater facilities. Work involves establishing priorities on maintenance and repair work, scheduling and assigning work orders to electricians and technicians, and inspecting their work. Work also involves performing specialized repair and maintenance activities.

Working Conditions
Indoor/outdoor situation; high noise environment while performing certain responsibilities. Lifting equipment up to 25 lbs. alone; up to 50 lbs. with assistance.

JOB DUTIES:

Essential Functions
These are intended only as illustrations of the various types of work performed. The omission of specific duties does not exclude them from the position.

Assists in planning work;establishes priorities.

Receives work orders or requests for repair or maintenance; prioritizes work; assigns, schedules, directs and evaluates work of assigned staff; conducts field inspections of work in process and upon completion to ensure that all work is performed according to code and safety regulations.

Directs and performs maintenance on electrical and electronic equipment, controls, air conditioning systems and other plant and lift station equipment; schedules preventative maintenance on equipment; modifies equipment as needed; installs new equipment up to and including 4160-V, AC application and DC voltages.

Maintains records on repair and maintenance activities and prepares reports. Confers with other supervisors and utility company representatives on projects involving electrical work; reviews plans and specifications; submits recommendations to improve the functioning of plant and lift station electrical equipment.

Troubleshoots electrical problems in plant and lift station equipment and takes corrective action.

Analyzes radio telemetry reports to predict problems with monitored equipment and issues work orders for corrective action; installs, configures, and maintains Radio Telemetry and Supervisory Control And Data Acquisition (SCADA) Systems.

Monitors computerized maintenance management work order system; establishes, maintains, and adjusts equipment maintenance schedules.

Participates in selection of new electricians and technicians; provides orientation to new hires; enforces safety regulations.

Additional Duties
Performs other related work (including weather or other extreme emergency duties) as required.

MINIMUM QUALIFICATIONS:

High school graduate/equivalent. Must be licensed as a Master Industrial Electrician or State Electrical Contractor, or may consider a minimum of eight (8) years experience as an industrial (non-residential) electrician with satisfactory completion of recognized training/certification program for electricians. Minimum of one (1) year of supervisory experience. Certified training in computerized maintenance management systems and radio telemetry desired. Valid Florida driver's license. Equivalent combinations of education and experience may be considered.

Knowledge/Abilities/Skills
Knowledge of the National Electrical Codes (NEC), use and care of advanced tools, equipment and testing devices of the electrical trade, and occupational hazards and safety precautions of the trade, including working with high voltages up to 4160-V, AC and DC circuits.
Knowledge of the principles and practices applied to preventative and corrective maintenance of electronic, microprocessors, and other instrumentation of water and wastewater treatment plants.
Knowledge of components, software, and operation of radio telemetry systems.
Knowledge of components, operations and management of Supervisory Control and Data Acquisitions Systems (SCADA).
Knowledge of components, operation, and management of computerized maintenance management systems.
Ability to diagnose the seriousness of electrical and electronic failures and take appropriate corrective action.
Ability to schedule, assign, prioritize and evaluate work of assigned staff.
Ability to establish and maintain effective working relationships with others.
Ability to analyze vibration analysis reports and telemetry reports.
Ability to make estimates of time and materials accurately.
Ability to work from drawings, schematics and specifications, and to carry out oral and written instructions.
Ability to operate and maintain a computerized maintenance management system.
Ability to perform strenuous work tasks under adverse weather conditions.
Ability to work after hours, weekends and holidays when needed.
Ability to distinguish colors for various purposes, i. e., wiring, labels, etc.
Ability to climb and descend ladders.
Ability to work emergency situations as required.
Skill in locating and adjusting defects in electrical and electronic systems and equipment.
Skill in the use of tools, materials and equipment used in the electrical trade.
Skill in the use of advanced computer systems.

KEYWORDS:

Building Maintenance, Construction Maintenance, Construction Trades, Electronics, Trades, Maintenance

Appendix C

CAREER LADDER ELECTRICAL

ELECTRICIAN LADDER REQUIREMENTS

EMPLOYEE:	John Doe	ID#	M0000XX	Section	401	Pos #		DOH	

TITLE	REQUIREMENT	DATE ACHIEVED	DATE HIRED /PROMOTED
Prerequisite to be hired as a trainee:	Must have HS Diploma or GED with electrical aptitude and pass a one year in an electrical apprenticeship or technical school.		
Industrial Electrician Trainee	Apprenticeship		**01/01/2016**
Must complete trainee requirements in the first year of County Employment.	Possession of " Confined Space Training" Certification Possession of " Blood Borne and Water Borne Pathogen Safety Course" Certification - County Possession of " Electrical Safety" course -- cost and class unknown possible given by County Possession of " Blood Borne and Water Borne Pathogen Safety Course" Certification County Possession of "Electrical troubleshooting and Preventive Maintenance" course completion. (American Trainco $1980.00 +3 day hotel/travel- offered in Tampa) Possession of "UDEMY PLC Programming From Scratch" course completion. ($15.00 online) Possession of "AM1956 Electrical Schematics" course completion. (Polk State $498.00 +2 day hotel/travel) Possession of "Drives- VFD online course" -- cost and class? Prerequisite to be promoted to an Electrician I: Must demonstrate proficiency and complete Electrician I requirements with two years County employment as a trainee.		
Industrial Electrician I	Electrician		**01/01/2016**
Prerequisite to be hired: Must have HS Diploma or GED with six years' experience in Industrial Motor Controls, 480 VAC switchgear, VFD, PLC troubleshooting, and 4-20 analog controls. Must complete trainee requirements in the first year of County Employment and the Electrician I requirements in the second year of County Employment.	Possession of "Arc Flash Electrical Safety" Certification ($2000.00? + 1 day hotel/travel) Possession of "Conductors, Terminators & Splices AM1958" (Polk State $498.00 + 1 day hotel/travel) Possession of "Electrical Theory AM1952" (Polk State $498.00 +2 day hotel/travel) Possession of "ControlLogix System Fundamentals. CCP146 (Polk State) (Polk State $798.00 ?+2 day hotel/travel) Possession of "Water & Wastewater Treatment" AMI2080 (Polk State $1520.00 +3 d day hotel/travel) Prerequisite to be promoted to an Electrician II: Must demonstrate proficiency and complete Trainee, Electrician I, and Electrician II requirements and have a minimum of five years County employment as an Electrician I and/or Electrician Trainee.		

ELECTRICIAN LADDER REQUIREMENTS

Industrial Electrician II	Equivalent to a Journeyman Electrician		**01/01/2016**
Prerequisite to be hired: Must have HS Diploma or GED and a Journeyman's license with six years' experience in Industrial Motor Controls, 480 VAC switchgear, VFD, PLC troubleshooting, and 4-20 analog controls. Must complete trainee requirements in the first year of County Employment and Electrician I requirements by the third year of County Employment.	Possession of "Generators & Emergency Power" (American Trainco $990.00 +2 day hotel/travel) Possession of "DFS - TAC PACK TCU Certification" (DFS $498.00? + 2 day hotel/travel??) Possession of "Motors, Drives and Control Circuits" (American Trainco $990.00 +2 d day hotel/travel) Possession of "System Problem Solving and Troubleshooting - Rockwell GEN-003" (Polk State (40 Hours) EM-206: Electrical Troubleshooting -- $2520.00? +4 day hotel/travel) Possession of "Modular Programming for Machine Applications: 9393-MODPROG" for Studio 5000 ControlLogix® ($399.00 ROCKWELL AUTOMATION CD) Prerequisite to be promoted to an Electrician II : Must demonstrate proficiency and complete Trainee, Electrician I, and Electrician II requirements and have a minimum of five years County employment as an Electrician I and/or trainee.		
Industrial Electrician III	Equivalent to a Master Electrician's License		**01/01/2016**
Prerequisite to be hired: Must have HS Diploma or GED and a Master Electrician license with six years' experience in Industrial Motor Controls, 480 VAC switchgear, VFD, PLC troubleshooting, and 4-20 analog controls. Must complete trainee requirements in the first year of County Employment and	Possession of "PowerFlex 700 vector control communications over Devicenet" (Polk State $1520.00 +4 day hotel CCA12/travel) Possession of "EM204 Advanced Motor Control" (Polk State $1520.00 +4 day hotel CCA12/travel) Possession of "CCP153 Studio 5000 Logix Designer Level 2: ControlLogix® Maintenance and Troubleshooting" (Polk State $1520.00 + 4 day hotel/travel) Possession of "CitectSCADA / Vijeo Citect Architecture and Redundancy Virtual Training" ($1000.00? Citect/BCI Online training) Prerequisite: Must demonstrate proficiency and complete Industrial Electrician II requirements and have minimum three years County employment as an Electrician II.		

ELECTRICIAN LADDER REQUIREMENTS

Electrician I requirements by the third year of County Employment.			
Electrical Supervisor			**01/01/2016**
Must complete Electrical Supervisor requirements in the first four years of County Employment.	Possession of " "EPE Supervisor Training" Certification by County Possession of "Microsoft Word office" Certification by County Possession of "Microsoft Excel office" Certification by County Possession of "Effective Team Building" Certification by County Possession of "Workplace Sensitivity" Certification by County Possession of " Leadership Academy" Certification by County Possession of "Employment Law 101" Certification by County Possession of "Advanced supervisory Development Program" Certification by County Prerequisite: Must demonstrate proficiency and complete Electrical/SCADA Supervisor requirements and have minimum one year County employment as an Electrician III or SCADA III and be interviewed and be offered the open position.		

Appendix D

EQUIPMENT LIST

Facility	Tag Number	Control Panel	Description	Manufacturer	Platform	Model #	CPU	Comm	QTY	DI	QTY	DO	QTY	AI	QTY	AO	QTY	RTD	QTY	Thermocouple	QTY	Relay	QTY	Notes:
MCMRS		63rd Street PLC Panel	63rd Street MARS PLC	Allen-Bradley	SLC	SLC5/05				IA16	3	OA16	1	INI4i	3									
MCMRS		Rye Road PLC Panel	Rye Road MARS PLC	Allen-Bradley	SLC	SLC5/05				IA16	4	OA16	1	INI4i	3									
MCMRS		Spencer Parish PLC Panel	Spencer Parish MARS PLC	Allen-Bradley	SLC	SLC5/05				IA16	3	OA16	1	INI4i	3									
North WRF		MARS_NE	SLC 5/05	Allen-Bradley	SLC	1747-L553C				IB16	1	OB16	1	NI8	1	NO4I	1							
North WRF		SP-1	SLC 5/05	Allen-Bradley	SLC	1747-L553C				IB16	2	OB16	1	NI8	1	NO4I	1							
North WRF		SP-2	SLC 5/05	Allen-Bradley	SLC	1747-L553C				IB16	1	OB16	1	NI8	1	NO4I	1							
North WRF		SP-3	SLC 5/05	Allen-Bradley	SLC	1747-L553C				IB16	4	OB16	1	NI8	2									
North WRF		SP4_N	SLC 5/05	Allen-Bradley	SLC	1747-L553C				IB16	6	OB16	1	NI8	3	NO4I	2							
North WRF		NE_Everfilt	SLC 5/05	Allen-Bradley	SLC	1747-L553C				I*16	5	O*8	6	NI4	1									
North WRF		Lake Filter North	SLC 5/05	Allen-Bradley	SLC	1747-L541C				I*16	5	O*8	6	NI4	1									
North WRF		ADF12PLC	SLC 5/05	Allen-Bradley	SLC	1747-L542C				IA16	5	OW16	3	NI8	1									
North WRF		Micro Clarifier Pump West	Micrologix 1100	Allen-Bradley	MicroLogix	1763																		
North WRF		Sludge Pump #1	Micrologix 1100	Allen-Bradley	MicroLogix	1763																		
North WRF		Sludge Pump #2	Micrologix 1100	Allen-Bradley	MicroLogix	1763																		
SE WRF		Headworks MCC	SP2-A Rack 0	Allen-Bradley	SLC	SLC5/05				IA16	3	OW16	2	NI8	4	NO4I	2							
SE WRF		Headworks MCC	SP2-B Rack 1	Allen-Bradley	SLC	SLC5/05				IA16	3			NI8	1									
SE WRF		Headworks MCC	SP2-B Rack 2	Allen-Bradley	SLC					IA16	3	OW16	3	NI8	1									
SE WRF		Headworks	Spiragrit Control Panel- Micrologix	Allen-Bradley	MicroLogix	1400 (X 2)																		
SE WRF		Beltpress Office	SP-4	Allen-Bradley	SLC	SLC5/05				IB16	1	OW16	2	NI8	4	NO4I	1							
SE WRF		Bio-Solids Building	RTO	Allen-Bradley	SLC	SLC5/05				IA16	4	OW16	2	NI4	2	NO4I	2	NR4	1	NT8	1			
SE WRF		Bio-Solids Building	R10-10 (PLC 10)	Allen-Bradley	SLC	SLC5/05				IA16	1	OW16	2							NT8	1			
SE WRF		Bio-Solids Building	Micrologix-Burner Mgmt Panel	Allen-Bradley	MicroLogix	1500				IA16	1			IF4	1	OF2	1	IT6	1					
SE WRF		Blower Building	SP-3	Allen-Bradley	SLC	SLC5/05				IA16	4	OW16	1	NI8	2	NO4I	3							
SE WRF		Main MCC	SP1-A	Allen-Bradley	SLC	SLC5/05				IA16	3	OW16	2	NI8	2	NO4I	2							
SE WRF		Main MCC	SP1-B Rack 1	Allen-Bradley	SLC					IA16	2	OW16	1	NI8	2	NO4I	3							
SE WRF		Main MCC	SP1-B Rack 2	Allen-Bradley	SLC					IA16	4			NI8	3									
SE WRF		In front of Nova filters	SP5	Allen-Bradley	SLC	SLC5/05				IB16	4													
SE WRF		Main MCC High Service Room	SP6	Allen-Bradley	CompactLogix	Compact Logix L33ER				IQ16	2	OW16	1	IF41	2									
SE WRF		GBT Panel	GBT1	Allen-Bradley	SLC	SLC5/05				IA16	3	OW16	2	NI8	1	NO4I	1							
SE WRF		GBT2 Panel	GBT2	Allen-Bradley	CompactLogix	Compact Logix L30ER				IA16	3	OW16	3	IF8	1	OF4	1							
SE WRF		Main MCC back room	RTD HSP1	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Main MCC back room	RTD HSP2	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Main MCC back room	RTD HSP3	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Main MCC back room	RTD HSP4	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Main MCC back room	RTD Jockey P1	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Main MCC back room	RTD Jockey P2	Allen-Bradley	MicroLogix	Micrologix 1100																		
SE WRF		Poly Room	Polyomer Mixing Management Panel	Allen-Bradley	MicroLogix	Micrologix 1000																		
SE WRF		Main MCC	Generator Controller	GE	Other	90-30																		
SE WRF		Landfill Gas Panel	Landfill flame station	GE	Other	Versamax																		
SW WRF		Operations Room	Operations Room SW_RU SLC-5/05	Allen-Bradley	SLC	1747-L553C		1747-SDN	1	1746-IA16	1	1746-OA16	1	1746-NI8	1	1746-NO4I	1							
SW WRF		LSPS SP-1	Low Service PS (LSPS) SP-1 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	6	1746-OB16	1	1746-NI8	5	1746-NO4I	2							
SW WRF		Chemical Bldg SP-2	Chemical Bldg SP-2 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	3	1746-OB16	1	1746-NI8	4	1746-NO4I	3							
SW WRF		DAF Bldg SP-3	DAF Bldg SP-3 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	3	1746-OB16	1	1746-NI8	1	1746-NO4I	1							
SW WRF		Headworks Bldg SP-4	Headworks Bldg SP-4 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	6	1746-OB16	2	1746-NI8	4	1746-NO4I	4							
SW WRF		Sludge Transfer Pump Bldg SP-5	Digester Bldg SP-5 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	4	1746-OB16	1	1746-NI8	4	1746-NO4I	1							
SW WRF		Dewatering Bldg SP-6	Dewatering Bldg SP-6 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IB16	1	1746-OB16	1	1746-NI8	1	1746-NO4I	1							
SW WRF		?	Electric South Bldg	Allen-Bradley	Other																			
SW WRF		Blower Bldg SP-8	Blower Bldg SP-8 SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IA16	6			1746-NI8	2	1746-NO4I	3					1748-OX8	2	
SW WRF		Sludge Pump Bldg SP-17	Sludge Pump Bldg SLC-5/05	Allen-Bradley	SLC	1747-L553C				1746-IA16	4	1746-OB16	1	1746-NI8	2									
SW WRF		ASR Well SP-10	ASR Well SP-10 Micrologix	Allen-Bradley	MicroLogix	1500 LRP Ser. C								1769-IF4	3	1769-OF8C	1							
SW WRF		North Lake Level SP-11	North Lake Level SP-11 Micrologix	Allen-Bradley	MicroLogix	1100 Ser. A																		
SW WRF		North Lake Reject PS SP-12	North Lake Reject PS SP-12 Micrologix	Allen-Bradley	MicroLogix	1100 Ser. A				1762-IQ16	1													
SW WRF		Reuse PS SP-13	Plant Reuse PS SP-13 Micrologix	Allen-Bradley	MicroLogix	1100 Ser. A																		
SW WRF		ABW #1	ABW SLC-5/05	Allen-Bradley	SLC	1747-L552C		1747-SN	1	1746-IA16	2	1746-OW16	1	1746-NI8	1	1746-NO4I	1							
SW WRF		North Lake PS SP-14	North Lake PS SP-14 SLC-5/05	Allen-Bradley	SLC	1747-L552C				1746-IB16	2	1746-OW16	2	1746-NI8	1									
SW WRF		Nova Filters SP-15	Nova Filters SP-15 SLC-5/05	Allen-Bradley	SLC	1747-L552C				1746-IB16	4	1746-OW16	1	1746-NI8	1	1746-NO8I	1							
SW WRF		HSPS SP-16	High Service SP (HSPS) SP-16 SLC-5/05	Allen-Bradley	SLC	1747-L552C				1746-IB16	3	1746-OA8	1	1746-NI8	1									
SW WRF		HSPS SP-16B	High Service PS (HSPS) CompactLogix 5370	Allen-Bradley	CompactLogix	1769-L18ER-BB1B																		
SW WRF		LSPS SP-1B	Low Service PS (LSPS) CompactLogix 5370	Allen-Bradley	CompactLogix	1769-L18ER-BB1B																		
SW WRF		HSPS 1 VFD	HSPS 1 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B								1762-IF2OF2	1			1762-IR4	2					

SW WRF	HSPS 2 VFD	HSPS 2 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	HSPS 3 VFD	HSPS 3 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	HSPS 4VFD	HSPS 4 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	HSPS 5 VFD	HSPS 5 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	LSPS 1 VFD	LSPS 1 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B					1762-IR4	2				
SW WRF	LSPS 2 VFD	LSPS 2 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B					1762-IR4	2				
SW WRF	LSPS 3 VFD	LSPS 3 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	LSPS 4 VFD	LSPS 4 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	LSPS 5 VFD	LSPS 5 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	LSPS 6 VFD	LSPS 6 VFD Micrologix	Allen-Bradley	MicroLogix	1100 Ser. B			1762-IF2OF2	1	1762-IR4	2				
SW WRF	South Elec. Buildnig SP-18	South Electrical Bldg SLC	Allen-Bradley	SLC	SLC-5/05										
SW WRF	Turbo Blower Bldg Blower 1	Turbo Blower No. 1 Compact Logix	Allen-Bradley	CompactLogix	CompactLogix L33ER										
SW WRF	Turbo Blower Bldg Blower 2	Turbo Blower No. 2 Compact Logix	Allen-Bradley	CompactLogix	CompactLogix L33ER										
SW WRF	Turbo Blower Bldg SP-19	New Blower Bldg CompactLogix	Allen-Bradley	CompactLogix	CompactLogix L33ER	1	1		2	1					
SW WRF	Dewatering Bldg	Dewatering Bldg Polymer Feed Pumps 5 & 6 SLC	Allen-Bradley	SLC	SLC-5/05										
SW WRF	Dewatering Bldg	Dewatering Bldge Polymer Mixing System SLC	Allen-Bradley	SLC	SLC-5/05										
SW WRF	Headwork Bldg	Grit Classifier Micrologix	Allen-Bradley	MicroLogix	1400 Ser. B										1762-OW8

Controller	**QTY**	**Percentage**
SLC	39	50.6%
CompactLogix	7	9.1%
MicroLogix	28	36.4%
Other	3	3.9%
Total	**77**	

Facility	Tag Number	Control Panel	Description	Manufacturer	Model #	Notes:
MCMRS		63rd Street PLC Panel	63rd Street MARS PLC Copper Switch	Phoenix Contact		
MCMRS		63rd Street PLC Panel	63rd Street MARS FOC Switch	Phoenix Contact		
MCMRS		63rd Street Radio Panel	63rd Street MARS FOC Switch	Phoenix Contact		
MCMRS		Rye Road PLC Panel	Rye Road MARS PLC Copper Switch	Phoenix Contact		
MCMRS		Rye Road PLC Panel	Rye Road MARS FOC Switch	Phoenix Contact		
MCMRS		Rye Road Radio Panel	Rye Road MARS FOC Switch	Phoenix Contact		
MCMRS		Spencer Parish PLC Panel	Spencer Parish MARS PLC Copper Switch	Phoenix Contact		
MCMRS		Spencer Parish PLC Panel	Spencer Parish MARS FOC Switch	Phoenix Contact		
MCMRS		Spencer Parish Radio Panel	Spencer Parish MARS FOC Switch	Phoenix Contact		
North WRF		Operations Room	Baseline Switch	3COM	2916-SFP Plus	
North WRF		Operations Room	Ethernet\Fiber Optic Switch	3COM	5500-E1 28-Port FX	
North WRF		Operations Room - DFS Encl.	Ethernet Switch	Netgear	Auto 10/100	
North WRF		Operations Room - DFS Encl.	Ethernet/Fiber Optic Switch	Phoenix Contact	FL MC 10/100 Base - T/FO G1300	
North WRF		Headworks SP-1	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 6TX-2FX	
North WRF		NWRF PLC Clarifiers SP-2	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 6TX-2FX	
North WRF		Sludge Pump # 1	Ethernet Switch	Phoenix Contact	SFNB 5TX	
North WRF		Sludge Pump # 2	Ethernet Switch	Phoenix Contact	SFNB 5TX	
North WRF		ABW # 1	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 6TX-2FX	
SE WRF		Headworks	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		Spiragrit Control Panel	Ethernet Switch	Lanolinx	LNX-500A	
SE WRF		Belt Press Office SP-4	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		RTO	Ethernet Switch	Netgear	FS105	
SE WRF		SE Dryer Bldg.	Ethernet Switch (10.215.24/4)			
SE WRF		SP-3	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		SP5	Ethernet	Phoenix Contact	LM4TX/2FX	
SE WRF		SP6	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		SP6	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		SP6	Ethernet	Phoenix Contact	SFN8 STX	
SE WRF		GBT1	Ethernet\Fiber Optic Switch	Phoenix Contact	LM4TX/2FX ST-E	
SE WRF		GBT2	Ethernet\Fiber Optic Switch	N-Tron	508 FX2	
SE WRF		Dryer	(Panel on East wall) Ethernet to RS-232	Allen Bradley	1761-NET-ENI	Serial to IP converter
SW WRF		LSPS 3 VFD	Ethernet Switch	Phoenix Contact	SFN 5TX	
SW WRF		LSPS 4 VFD	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 4TX-1FX	
SW WRF		LSPS 5 VFD	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 4TX-1FX	
SW WRF		LSPS 6 VFD	Ethernet/Fiber Optic Switch	Phoenix Contact	SFN 4TX-1FX	
SW WRF		Operations Room	AB - DFS Digi One Module	Digi One	IAP	Serial to IP converter
SW WRF		Sludge Pump Bldg SP-17	Sludge Tank Pump Bldg SP-17 Digi One Module	Digi One	IAP	Serial to IP converter
SW WRF		Turbo Blower Bldg	Turbo Blower Bldg Digi One Module	Digi One	IAP	Serial to IP converter
SW WRF		South Electrical Bldg	South Electrical Bldg Dig One Module	Digi One	IAP	Serial to IP converter

		Percentage
Phoenix Contact	27	69%
Other	12	

Facility	Tag Number	Control Panel	Description	Manufacturer	Model #	Operating System	HMI Software	Notes:
MCMRS		63rd Street PLC Panel	63rd Street MARS OIT	Xycom	3115T	Windows 7	Citect 6.0	
MCMRS		Rye Road PLC Panel	Rye Road MARS OIT	Xycom	3115T	Windows 7	Citect 6.0	
MCMRS		Spencer Parish PLC Panel	Spencer Parish MARS OIT	Xycom	3115T	Windows 7	Citect 6.0	
North WRF		Clarifiers Bldg SP-2	Citect Touch Screen Workstation	Proface	PS4700-V1-1P-AN-A-2G-XP-SHD-DVD	Windows 7	Citect 7.5	
North WRF		Dewatering Bldg	Citect Touchscreen SP-3	Proface	PS4700-V1-1P-AN-A-2G-W732-SSD-DVD	Windows 7	Citect 7.5	
North WRF		Electrical Bldg	Citect Touchscreen SP-4	Proface	PS4700-V1-1P-AN-A-2G-XP-SHD-DVD	windows 7	Citect 7.5	
North WRF		Rye Mars Booster Station	Citect Touchscreen Rye				Citect	
North WRF		Spencer Mars	Citect Touchscreen Spencer				Citect	
SE WRF		RTO	Allen Bradley Panelview 1000	AB	Panel View 1000			
SE WRF		Dryer (East Wall)	East Well	AB	Panel View Plus 400			
SE WRF		Bio-Solids Operations Room	New RTO Panel View	AB	Panel View Plus 1250			
SE WRF		SP-1	View only	Proface	PS4700-1S-N270	Windows 7	Citect 7.5	
SE WRF		GBT1	View only	Proface	PS4700-1S-N270	Windows 7	Citect 7.5	
SE WRF		Poly Room	Poly HMI Panel	Total Control Products	QPKSTDN000-A			
SW WRF		Admin Bldg Operations Room	BCPC056169.bcc.ad.mymanatee.org Citect Primary SCADA Server	HP		Windows 7	Citect 7.5	
SW WRF		Admin Bldg Operations Room	BCPC056167.bcc.ad.mymanatee.org Citect Backup SCADA Server	HP		Windows 7	Citect 7.5	
SW WRF		Admin Bldg Operations Room	BCPC056245.bcc.ad.mymanatee.org Citect Workstation	HP		Windows 7	Citect 7.5	
SW WRF		Electrical Bldg SP-1	Electrical Bldg Citect Touch Screen Workstation	Proface	PS4700-VI-IP-AN-A-2G-W732-SSD-DV	Windows 7	Citect 7.5	
SW WRF		Headworks Bldg SP-4	Headworks Bldg Citect Touch Screen Workstation	Proface		Windows 7	Citect 7.5	
SW WRF		Sludge Transfer Bldg SP-5	Digester Bldg Citect Touch Screen Workstation	Proface		Windows 7	Citect 7.5	
SW WRF		Dewatering Bldg Office	BCPC013632.bcc.ad.mymanatee.org Citect Workstation	HP		Windows 7	Citect 7.5	
SW WRF		Blower Buidling SP-8	Blower Bldg Total Control QuickPanel	Total Control	QuickPanel	N/A		
SW WRF		ABW #1	ABW #1 OPI PanelView 600	Allen-Bradley	PanelView 600	N/A	PanelBuilder 32 or FactoryTalkME	
SW WRF		North Lake PS SP-14	North Lake PS OPI Maple System HMI	Maple Systems	HMI5070TH	NA	NA	
SW WRF		High Service PS SP-16	High Service Bldg Citect Touch Screen Workstation	Proface		Windows 7	Citect 7.5	
SW WRF		Sludge Pump Bldg SP-17	Sludge Tank Pump Bldg SP-17 Citect Touch Screen Workstation	Proface		Windows 7	Citect 7.5	
SW WRF		South Electrical Bldg SP-18	South Electrical Bldg Citect Touch Screen Workstation	Proface		Windows 7	Citect 7.5	
SW WRF		Turbo Blower Bldg SP-19	New Blower Bldg Touch Screen Workstation	Allen-Bradley	PanelView 1000			
SW WRF		Turbo Blower Bldg	New Turbo Blower No. 1 PanelView 600	Allen-Bradley	PanelView 600	N/A	PanelBuilder 32 or FactoryTalkME	
SW WRF		Turbo Blower Bldg	New Turbo Blower No. 2 PanelView 600	Allen-Bradley	PanelView 600	N/A	PanelBuilder 32 or FactoryTalkME	
SW WRF		Dewatering Bldg	Dewatering Bldg Polymer Feed Pumps 5 & 6 PanelView 600	Allen-Bradley	PanelView 600	N/A	PanelBuilder 32 or FactoryTalkME	
SW WRF		Dewatering Bldg	Dewatering Bldge Polymer Mixing System PanelView 600	Allen-Bradley	PanelView 600	N/A	PanelBuilder 32 or FactoryTalkME	

Facility	Tag Number	Location	Description	Manufacturer	Model #	Comm	Notes:
SW WRF		Sludge Tank Pump Bldg	Sludge Tank Power Monitoring 1	Square D	PM 800	DeviceNet	
SW WRF		Sludge Tank Pump Bldg	Sludge Tank Power Monitoring 2	Square D	PM 800	DeviceNet	
SW WRF		Turbo Blower Bldg	Turbo Blower Bldg Power Monitoring 1	Square D	PM 800	DeviceNet	
SW WRF		Turbo Blower Bldg	Turbo Blower Bldg Power Monitoring 2	Square D	PM 800	DeviceNet	
SW WRF		South Electrical Bldg	South Electrical Bldg Power Monitoring 1	Square D	PM 800	DeviceNet	
SW WRF		South Electrical Bldg	South Electrical Bldg Power Monitoring 2	Square D	PM 800	DeviceNet	

Facility	Tag Number	Control Panel	Description	Manufacturer	Model #	Frequency
MCMRS		63rd Street Radio Panel	63rd Street Ethernet Radio	MDS	iNET 900	
MCMRS		Rye Road Radio Panel	Rye Road Ethernet Radio	MDS	iNET 900	
MCMRS		Spencer Parish Radio Panel	Spencer Parish Ethernet Radio	MDS	iNET 900	
SW WRF		Chemical Bldg SP-2	Chemical Bldg Ethernet Radio	Engenius	ENH500	
SW WRF		North Lake Level SP-11	North Lake Level Ethernet Radio	Engenius	ENH500	
SW WRF		Reuse PS SP-13	Plant Reuse PS Ethernet Radio	Engenius	ENH500	
SW WRF		ABW #1 Bridge	ABW #1 Bridge Ethernet Radio	Engenius	ENH500	
SW WRF		Reject Lake PS SP-12	North Lake Reject PS Ethernet Radio	Engenius	ENH500	

Facility	Tag Number	Control Panel / Location	Description	Manufacturer	Model #	Notes:
MCMRS		63rd Street PLC Panel	UPS	Eaton	5S 700	
MCMRS		63rd Street Radio Panel	UPS	Tripp-Lite		
MCMRS		Rye Road PLC Panel	UPS	Eaton	5S 700	
MCMRS		Rye Road Radio Panel	UPS	Tripp-Lite		
MCMRS		Spencer Parish PLC Panel	UPS	APC	5S 700	
MCMRS		Spencer Parish Radio Panel	UPS	Tripp-Lite		
North WRF		Admin. Bldg		KW Controls	510028104	
North WRF		Admin Bldg.	under console	Eaton	PW9120 2000	
North WRF		Dana's Office		APC	Backups 750	
North WRF		Operators' Console	under console	APC	Smart-UPS750	
North WRF		Electrical Bldg.		APC	Smart-UPS750	
North WRF		Lake Gravity Filters SP-9		APC	Smart-UPS750	
North WRF		Clarifier Bldg. SP-2		APC	Smart-UPS750	
North WRF		Dewatering Bldg.		APC	Smart-UPS750	
SE WRF		SP-1		Tripp-Lite	OMNIVS1500XL	
SE WRF		SP-2	Headworks MCC	Tripp-Lite	OMNIVS1500XL	
SE WRF		SP-3		Tripp-Lite	OMNIVS1500XL	
SE WRF		SP-4	Belt Press Bldg. (Office)	Tripp-Lite	OMNIVS1500XL	
SE WRF		SP-5	Nova Filters	APC	1500	
SE WRF		SP-6	HSPS	APC	RT 1500	
SE WRF		GBT1	GBT	Tripp-Lite	OMNIVS1500XL	
SE WRF		GBT2	GBT2	Liebert	GXT3	
SE WRF		BCPC013441	Dryer Bldg. (Upstairs PC)	APC	Backup-UPS 750	
SE WRF		Dryer Office Network		APC	Smart UPS 750	
SE WRF		Dryer Office Network BCPC58375		APC	Backup-UPS 1500	
SE WRF		Dryer Office Network BCPC58372		APC	Backup-UPS 1500	
SE WRF		Dryer Office Network Switch Gear		Eaton	9PX6000	
SE WRF		Dryer Office Network Switch Gear		Eaton	9PX6000 EBM	
SE WRF		Dryer Office Network Switch Gear		Eaton	9PX6000 PPDM	
SE WRF		Dryer Office BCPC15004		APC	Backup-UPS 750	
SW WRF		63rd ave		APC	Pro 700	
SW WRF		Chlorine Bldg	PH and Chlorine meters	APC	Pro 700	
SW WRF		RU-SW	Admin Electrical room	APC	Pro 700	

SW WRF	SP-1	Electric Building	APC	Pro 700
SW WRF	SP-2	Chemical Building	APC	Pro 700
SW WRF	SP-3	DAF building	APC	Pro 700
SW WRF	SP-4	Head works building	APC	Pro 700
SW WRF	SP-5	Sludge Transfer Building	APC	Pro 700
SW WRF	SP-6	Dewatering	APC	Pro 700
SW WRF	SP-17	Sludge Tank Pump Bldg	Eaton	9130
SW WRF	SP-8	Blower building	APC	Pro 1500
SW WRF	SP-15	Nova Lake Filter	APC	Smart1500
SW WRF	SP-16	High Service	APC	Smart UPS 1500
SW WRF	NA	norht wall of headworks	APC	LS-500
SW WRF	ABW panel	south end of ABW 1	APC	Pro 700
SW WRF	ABW panel	on bridge of ABW 1	APC	Pro 700
SW WRF	NA	Dewatering Office PC	APC	Pro 700
SW WRF	Admin Console	Ops north pc		Backup UPS 750
SW WRF	Admin Console	Ops middle pc	APC	SMT2200
SW WRF	Admin Console	Ops south pc		
SW WRF	Office	Jeff koch office	APC	Pro 700
SW WRF	Office	scada office pc	APC	Pro 700
SW WRF	Office	scada office plc board	APC	Pro 700
SW WRF	Office	Ops room lab	APC	SMT2200
SW WRF	SP-18	South Electrical Bldg	Eaton	9130
SW WRF	SP-19	Turbo Blower Bldg SP-19	Cyber Power	625VA
SW WRF	P.P. 25	Turbo Blower Bldg patch p	Eaton	35 750

Eaton	**9**
APC	**29**
Tripp-Lite	**8**
Other	**11**

Appendix E

SLCMIGRATION

Migration Solutions

SLC 500 to CompactLogix 5380 and 5069 Compact I/O

Allen-Bradley
by ROCKWELL AUTOMATION

Overview

In today's economy it is necessary to have migration solutions that help you to achieve increased productivity and lessen your risk of maintaining your legacy equipment. You need to work with a supplier that has the product, service, and industry knowledge to partner with you on an upgrade strategy that will help you maximize your competitive advantage.

Rockwell Automation® and its partners will work with you to outline a plan that fits your application needs and long-term goals. We can help you migrate all at once or in phases, at the pace that is comfortable for you and fits your budget.

With your goals in mind, Rockwell Automation has developed a migration strategy that will allow you to quickly and easily migrate from SLC-based control to Logix-based control and Integrated Architecture, while maintaining the existing field wiring. This approach will:

- Lower conversion time and labor costs
- Reduce risk by preserving existing field wiring connections
- Lower engineering costs
- Minimize production downtime

Simplifying SLC™ Migrations

- Minimizes risk and reduces labor time
  - convert I/O without disturbing field wiring connections
  - code conversion tools reduce time to rewrite controller program
- Improves migration and planning using Integrated Architecture Builder tool
- Supports various network topologies with the proven technology of EtherNet/IP

New Control System Benefits

- Increased flexibility with new open architecture
- Reduced development time and costs through re-use of engineering practices
- Maximized returns on existing assets through improved control and monitoring
- Increased access to plant and production information
- One programming environment for discrete, motion, process, drive, batch, and safety control

Rockwell Automation