



Atlantic First Nations Water Authority SCADA Master Plan

Master Plan Presentation

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AGENDA

- Introductions – Consultant and Project
- Recap of Current State Summary & Desired State Recommendations
- Break
- SCADA Master Plan Recommendations
- Questions

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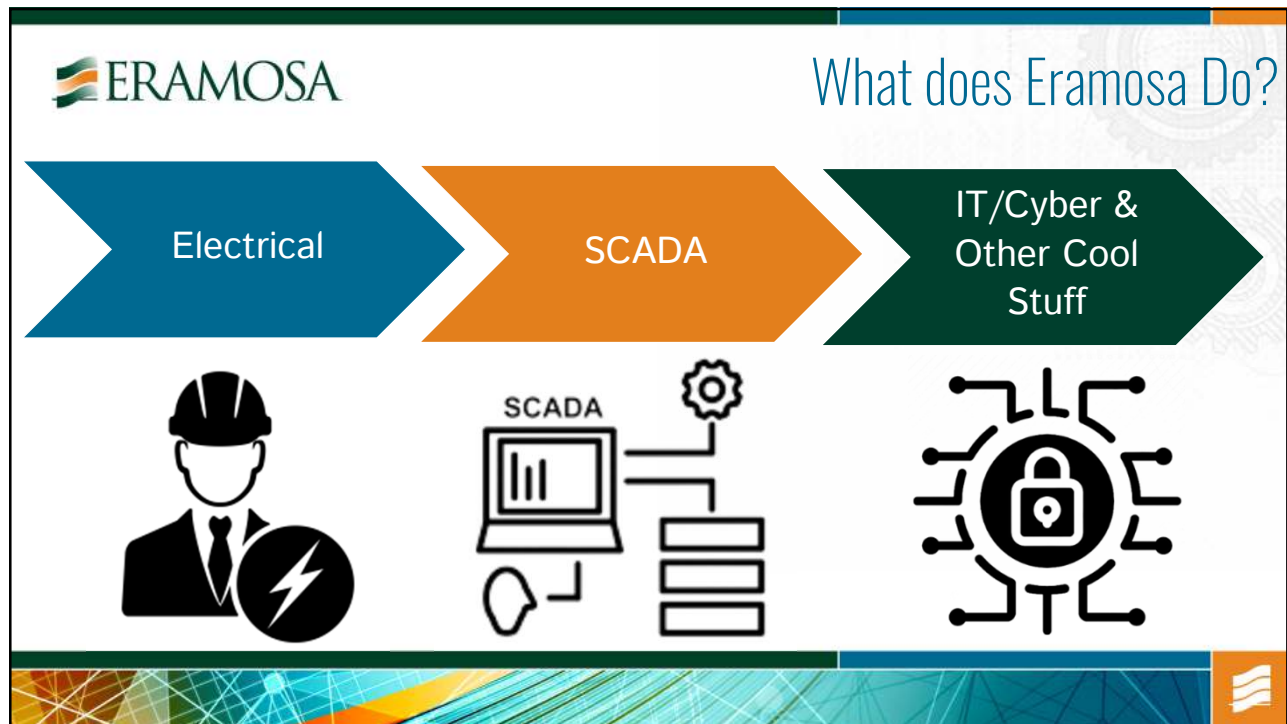
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Slide 4 of the presentation. It features the Eramosa logo in the top left corner. Below the logo, the text "Eramosa Engineering Inc." is displayed in a blue, sans-serif font. A bulleted list follows, detailing the company's history and office locations. The background is white with a faint, light blue pattern of hexagons and gears. At the bottom, there is a decorative footer with a colorful geometric pattern and a small Eramosa logo icon on the right.


Eramosa Engineering Inc.

- Established in 1998, Guelph, ON
- Currently 90 employees
- Offices:
 - Guelph, ON (Head Office)
 - Toronto, ON
 - London, ON
 - Calgary, AB
 - Kansas City, KS (Eramosa International Inc.)

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 SCADA, Process Control & Communications Master Plan Introduction & Purpose

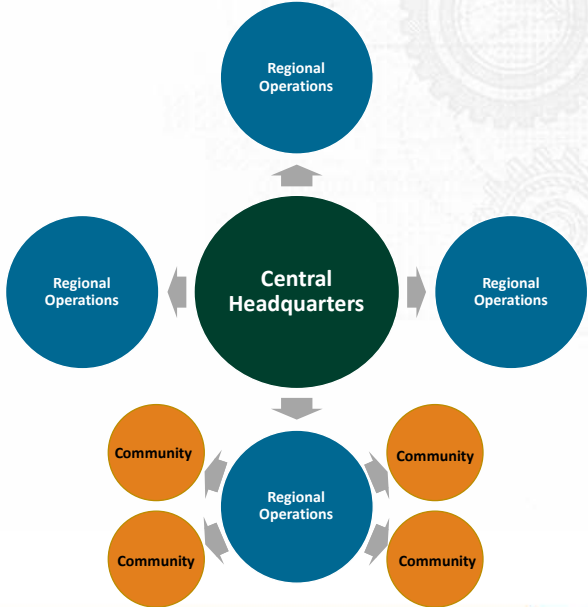

- AFNWA incorporated July 18, 2018 to own, operate, and maintain water and wastewater systems in participating communities to enhance service and build capacity within First Nation communities.
- AFNWA secured funding from Indigenous Services Canada (ISC) for asset management type initiatives.
- Intent of SCADA Master Plan project is to develop plans for the 5-year implementation of an integrated SCADA system.

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Full Service - Decentralized

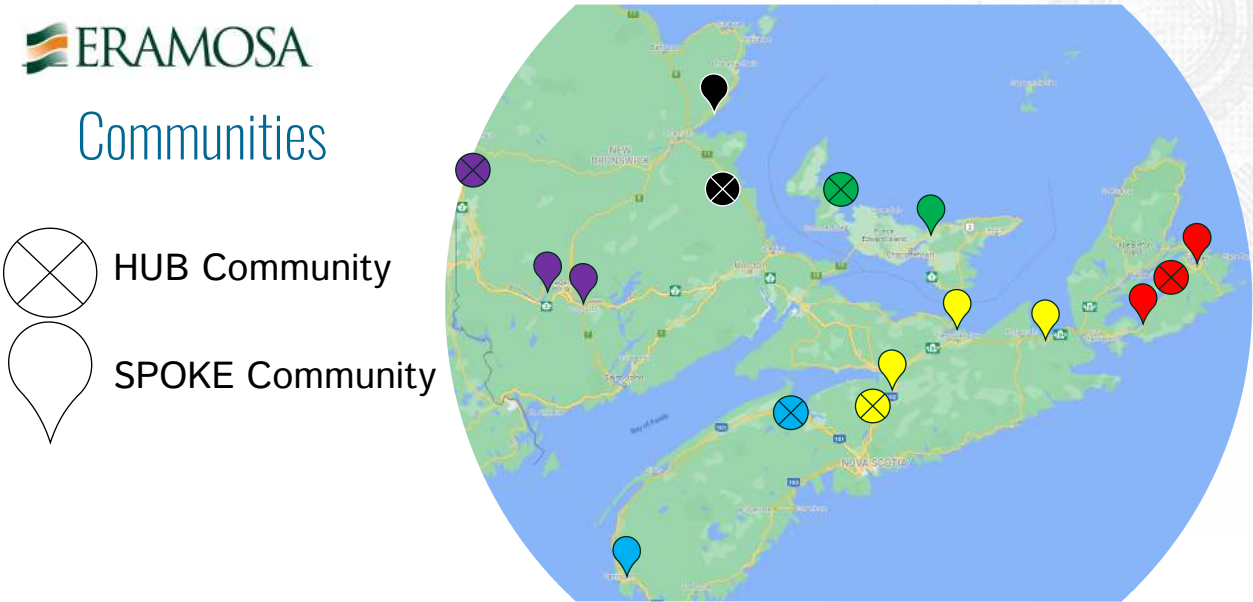
- Reflects Hub & Spoke model
- Tiered SCADA systems
 - Shared visibility to communities within a Regional Operations Area
 - Centralized monitoring of all systems
- Increased operational coverage







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Communities



-  HUB Community
-  SPOKE Community



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Scope

- Detailed Master Plan with costing for a fully coordinated and integrated system over 5 years.
- Recommendations for:
 - Technology
 - Resources
 - Training
 - Disaster Recovery
 - Cybersecurity

Objectives

- Develop communication framework
- Review current cybersecurity practices & develop plans
- Optimize for reliability and security
- Assess SCADA needs
- Recommend remote terminal unit (RTU) standards and transition plans
- Improve historian use and alarming systems

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Project Overview & Timelines


Project Award

SMP Awarded to Eramosa
Project Initiation & Scheduling


Desired State

Review Industry Best Practices
Evaluate Technology Options
Develop Technology Recommendations

Q4 2020




Q1 2021




Current State

Site Investigations
Phone Interviews
Current State Evaluation & Summary Report

Q2 2020



Q3 2021



Master Plan

Recommendations Priority Scoring
Implementation Roadmap
Capital & Operating Budgets

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The slide features the ERAMOSA logo in the top left corner, consisting of a stylized 'E' with three horizontal bars in green, orange, and blue, followed by the word 'ERAMOSA' in a dark green, sans-serif font. Below the logo is the word 'Purpose' in a blue, sans-serif font. Underneath 'Purpose' is a bulleted list of seven items. The background of the slide is white with a faint, light blue pattern of gears and hexagons. At the bottom, there is a decorative footer with a colorful, abstract geometric pattern in shades of green, blue, and orange, and a small orange square with a white stylized 'E' logo on the right side.

- Gain an understanding of facilities and processes
- Identify existing SCADA assets
- Document current conditions
- Assess maturity of existing systems
- Identify what works well, what doesn't and why
- Understand where each community is with SCADA today
- Focus on product obsolescence, level of available support and alignment with industry best practices and standards

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Approach

- Review of background information
- Site visits
- Virtual workshops with communities constrained by pandemic travel restrictions
- Evaluate existing infrastructure against industry best practices
- Preliminary recommendations for individual communities, facilities, and systems

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Summary

- Little or no documentation
- Mix of hardware platforms
- Wide range of software versions in use
- Several operating systems no longer supported
- Minimal security measures in place
- Majority of sewage lift stations not integrated with SCADA

Component	Level 0	Level I	Level II	Level III	Level IV
Community A		W/WWW			
Community B	W/WWW				
Community C	WW	W			
Community D	W/WWW				
Community E	WW		W		
Community F	WW	W			
Community G	W/WWW				
Community H			W/WWW		
Community I		W/WWW			
Community J		W/WWW			
Community K	W/WWW				
Community L	W/WWW				
Community M	WW	W			
Community N		W/WWW			
Community O	WW	W			
Community P	WW	W			


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DESIRED STATE



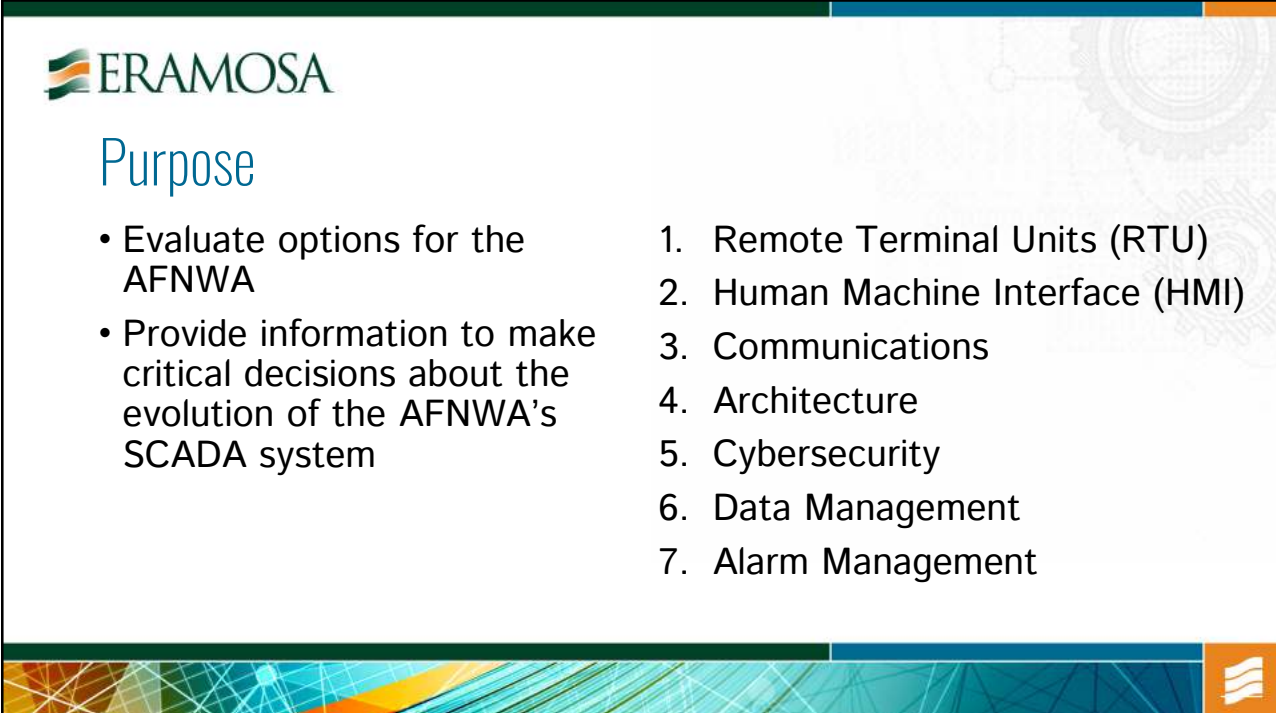
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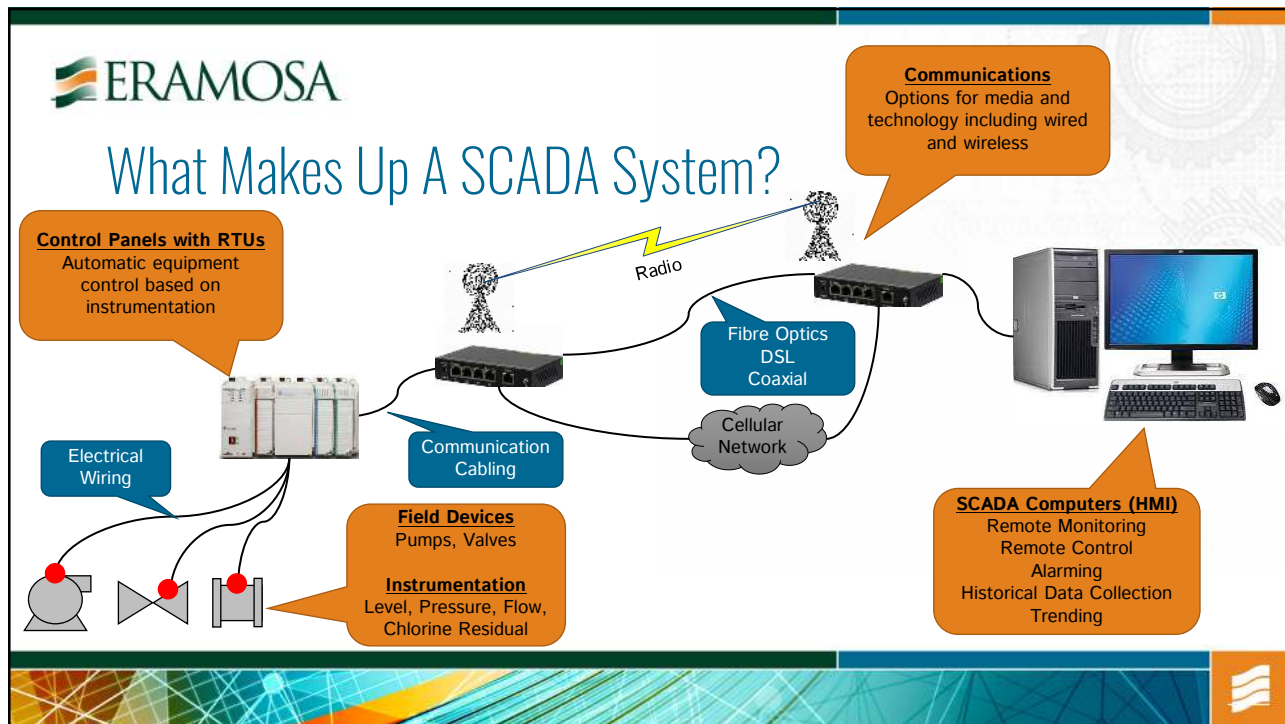
Purpose

- Evaluate options for the AFNWA
- Provide information to make critical decisions about the evolution of the AFNWA's SCADA system

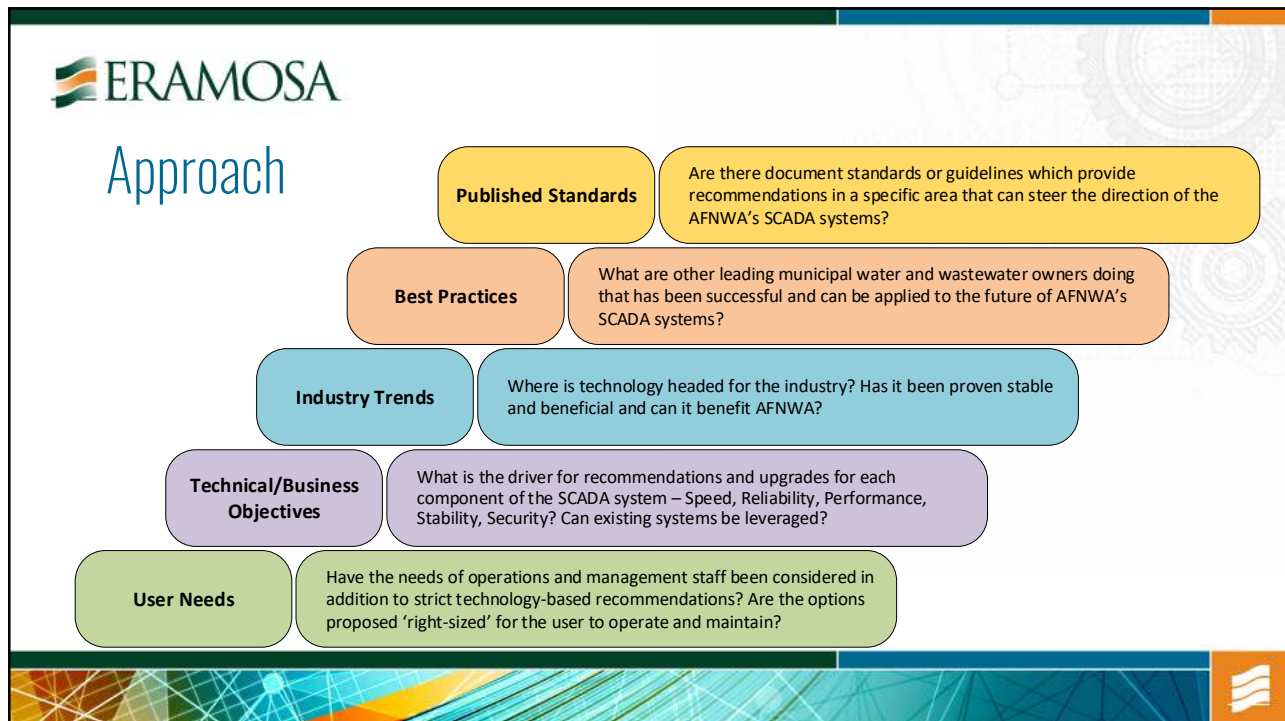
1. Remote Terminal Units (RTU)
2. Human Machine Interface (HMI)
3. Communications
4. Architecture
5. Cybersecurity
6. Data Management
7. Alarm Management



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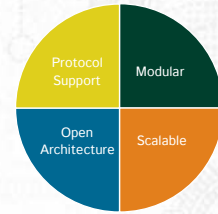


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RTU Recommendations

- Rockwell Automation – Allen-Bradley – CompactLogix Series
 - AOI/UDT code use for modularization
 - Expandable I/O and memory
 - Interoperability
 - Native Ethernet CIP communications
 - Excellent distributor support geographically
 - 8/10 AFNWA communities with PLCs installed have at least some AB hardware
 - Strong integrator support



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RTU Recommendations

- Generally, low priority replacements/upgrades
 - No known concerns with existing hardware/software functionality
 - Some outdated/unsupported can be replaced earlier
 - Most *should* communicate to any SCADA platform, gateways/converters can be used in rare situations
- Recommend developing hardware/software standards and guidelines during 1st year with implementation following in later years

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HMI Recommendations

- Standardize on VTScada
 - Strong integrator knowledgebase and level of support
 - Company is local to the installation area
 - Historical upgrade path/approach is excellent
 - No reliance on underlying O/S components
 - Shortest time to release for security patching
 - License purchase and support cost is competitive with others



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HMI Recommendations

- Review options for licensing and architecture with Trihedral
- Short-term focus on addressing HMI needs directly related to cybersecurity, possibly temporary measures
- Develop standards for tagging, graphics, colours, alarming, historical data collection, etc.
- In combination with Communications recommendations, develop detailed SCADA architecture design
- Rollout new SCADA platform in parallel with existing community systems with staged transition

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SCADA Server Communications Recommendations

Recommendation Priority	Primary Connection	Secondary Connection
1	Fibre Optics	Coaxial
2	Fibre Optics	DSL
3	Fibre Optics	Cellular
4	Coaxial	DSL
5	Coaxial	Cellular
6	DSL	Cellular

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Remote Site Communications Recommendations

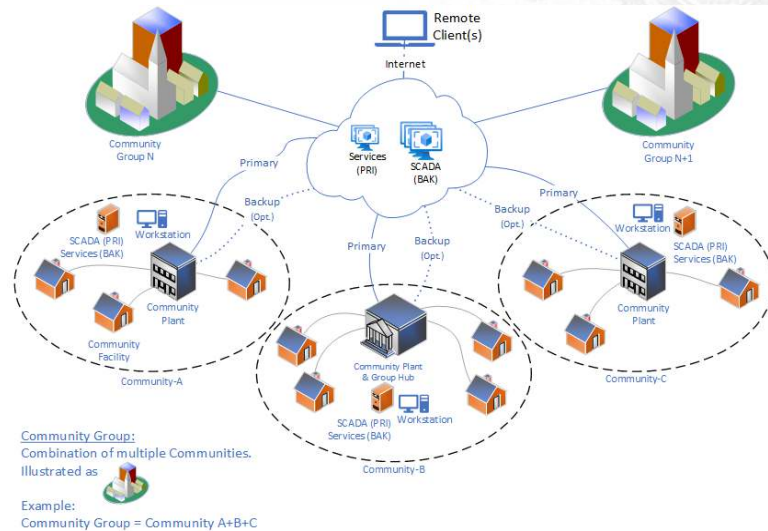
Recommendation Priority	Technology
1 (Existing Connection)	900MHz Unlicensed Wireless
1 (New Connection)	Cellular
2 (New Connection)	5.8GHz Unlicensed Wireless
3 (New Connection)	2.4GHz Unlicensed Wireless
4 (New Connection)	900MHz Unlicensed Wireless
5 (New Connection)	Licensed Wireless
6 (New Connection)	Internet (DSL/Coaxial)

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Architecture Recommendation

- Hybrid Cloud & On-Premise SCADA servers



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Cybersecurity Recommendations

- Develop a cybersecurity governance framework
- Apply user-based HMI security with role-based functionality and auto-logout/timeout
- Utilize firewalls on internet connected systems
- Implement intrusion detection and prevention systems
- Establish a centralized logging and monitoring solution
- Implement endpoint protection
- Implement a disaster recovery and backup solution



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Cybersecurity Recommendations

- Cloud architecture for centralized services
- Firewalls at community plants
- Resources
- Training

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Data Management Recommendations

- Native SCADA time-series (process) historian
- Location, backups, tiered collection, etc. all dependent on SCADA and communications architecture
- Automated reporting options
- Potential integration of manually recorded data with automatically recorded SCADA data

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Alarm Management Recommendations

- Software based alarm dialing system only
 - Highly configurable for alarm schedules, escalation, etc.
 - Product tied to SCADA platform recommendation, recommend native for VTScada instead of third-party
- Hardware based dialers not recommended
 - Typically requires on-site presence to modify
 - Requires hard connection to at least one PLC
 - Limitation of alarming functionality and density
 - To follow full service decentralized model, data concentrator(s) would be required

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Communities with MTAs

- Option 1
 - Data sharing and remote access to SCADA system owned by the authority operating
- Option 2
 - Install dedicated SCADA system owned by the community
 - Install PLC panel(s) and connect to existing instrumentation, or add new for flow, pressure, residual at transfer points
 - Connect to existing PLC's at facilities owned by community, but operated and maintained by others

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Sewage Lift Stations

- Large number of stations with no remote monitoring or control
- Many in poor condition, electrically
- SMP team coordinating with Asset Management project team to align recommendations
 - Options to tie new PLC control panels and SCADA into existing systems
 - Potential benefits of combining replacement of electrical panels with addition of SCADA panels

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Resources & Training

- Recommendations for AFNWA staff to support the SMP implementation
- Recommendations for AFNWA staff to provide long-term support of the desired state SCADA system
- Recommendations for training programs over the lifecycle of the 5 year implementation

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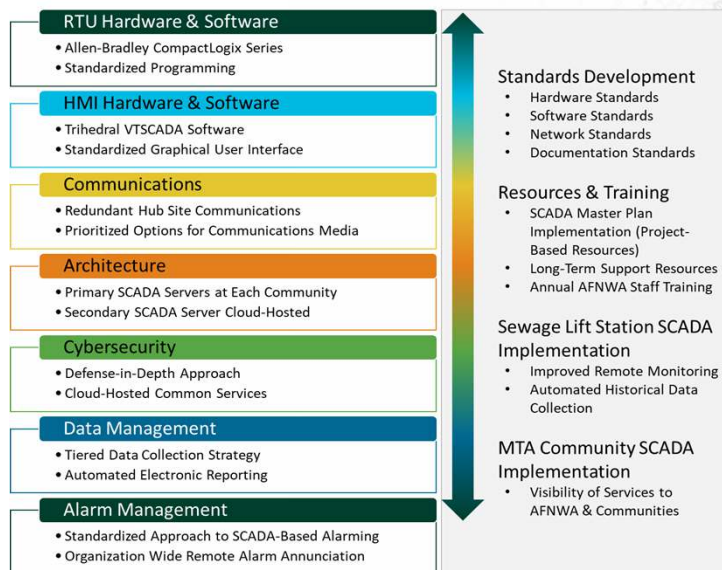
Standards

- Set of standards to maintain consistency during design, development, implementation and long-term support
 - Programming Standards
 - Tagging/Coding Standards
 - Alarming Standards
 - Documentation Standards
 - Testing Standards
 - Drawing Standards
 - Network Standards

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Summary



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SCADA Master Plan

- Executive Summary
- Operational Alignment
- Current State Summary
- Desired State Options
- Desired State Recommendations
- Implementation Roadmap
- Capital Expenditure Plans

The flowchart illustrates the SCADA Master Plan process. It begins with a funnel representing the 'CURRENT STATE (WHAT THE AFNWA HAS)', which includes inputs like HMI, PLC/FIELD DEVICES, ALARM MANAGEMENT, DATA MANAGEMENT, CYBER SECURITY, COMMUNICATION, and CONTROL SYSTEMS. This state is filtered through 'INDUSTRY TRENDS', 'INFORMATION GATHERING', 'BEST PRACTICES', 'PUBLISHED STANDARDS', 'STAKEHOLDER WORKSHOPS', and 'BUSINESS OBJECTIVES'. The process then moves to a 'DESIRED STATE (WHERE THE AFNWA WANTS TO BE)', defined by a 'DESIRED OUTCOME' and a 'GAP ANALYSIS'. This leads to 'INITIATIVES IDENTIFIED (PROJECTS)', followed by 'PROJECT GROUPING & PRIORITIZATION'. A 'SCHEDULE & BUDGETING' phase (spanning 2021-2025) is supported by 'RESOURCES' and leads to an 'IMPLEMENTATION PHASE', which finally results in the 'SCADA MASTER PLAN'. A note indicates 'WHAT NEEDS TO BE DONE TO GET THERE' between the scheduling and implementation phases.


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PRIORITY ANALYSIS OF RECOMMENDATIONS

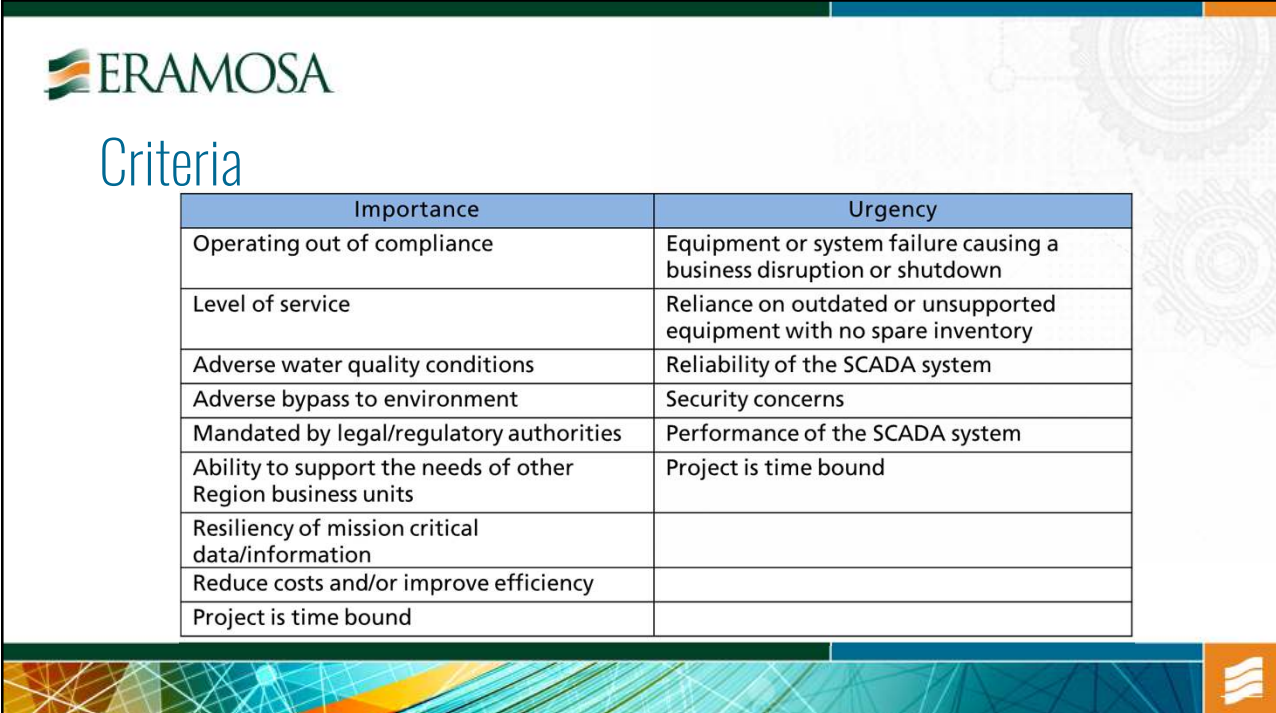


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Criteria

Importance	Urgency
Operating out of compliance	Equipment or system failure causing a business disruption or shutdown
Level of service	Reliance on outdated or unsupported equipment with no spare inventory
Adverse water quality conditions	Reliability of the SCADA system
Adverse bypass to environment	Security concerns
Mandated by legal/regulatory authorities	Performance of the SCADA system
Ability to support the needs of other Region business units	Project is time bound
Resiliency of mission critical data/information	
Reduce costs and/or improve efficiency	
Project is time bound	



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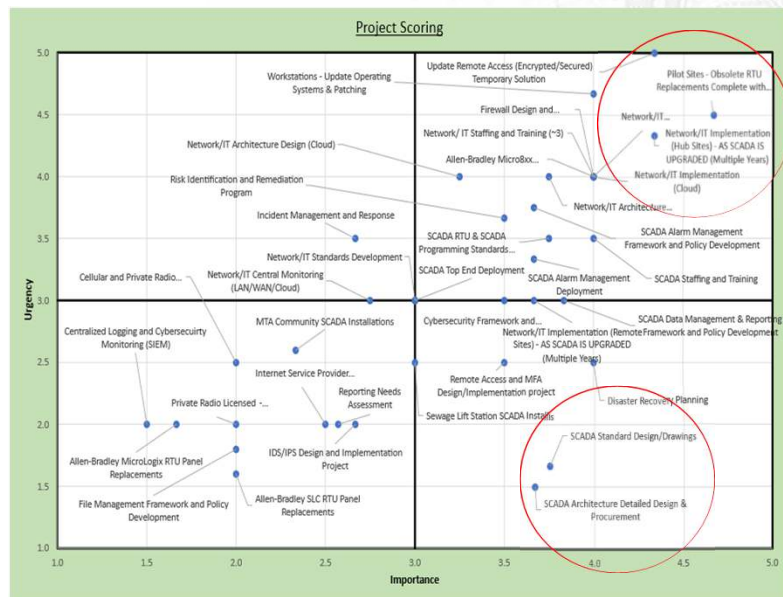


Definition

- 5**
 - Project mitigates . . .
 - Project ensures . . .
- 4**
 - Project greatly improves. . .
 - Project greatly reduces the risk of . . .
- 3**
 - Project somewhat improves . . .
 - Project somewhat reduces the risk of . . .
- 2**
 - Project slightly improves . . .
 - Project slight reduces the risk of . . .
- 1**
 - Project does not affect . . .
 - Project does not reduce the risk of . . .



Scoring Results





Summary of Recommendations

- Standards
- Detailed Design
- Pilot Sites
- Phase Upgrades Over Time
 - Water
 - Wastewater
 - Sewage Lift Stations

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ALIGNMENT WITH KEY OBJECTIVES

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RTU Hardware & Software Upgrades

- Allen-Bradley CompactLogix hardware & software
- Standards modules of code/logic for consistency
- Open communications architecture
- Non-proprietary
- Compliance with industry standards
- Well supported by distributors and integrators in Atlantic Canada
- Leverages investments made to date by majority of communities

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HMI Hardware & Software Upgrades

- Trihedral VTSCADA software
- New hardware to replace legacy existing
- New operating systems to replace legacy existing
- Standardized hardware for ease of support across AFNWA
- Standardized deployment – O/S, software installs, configurations
- Leverages investment made to date by majority of communities and maintains product familiarity (VTSCADA)

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Communications Framework

- Prioritized options given as recommendations
- Remote sites have single link
- Hub sites have redundant links
- Final decisions on a link-by-link basis to follow:
 - Geography
 - Availability
 - Redundancy requirements

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Cybersecurity Plans

- Defense-in-depth approach recommended with multiple layers to the security systems
- Product recommendations may change over time as threats and solutions adapt
- Ultimately the measures put in place are result of a risk evaluation based on acceptable tolerance, likelihood of intrusion, and ability to respond and restore

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Improve Data & Alarming Strategies

- Recommendations for both utilize built-in tools within VTSCADA
- Improved data collection, archiving, and backup measures
- AFNWA wide alarm annunciation approach
- Options for automated reporting over time
- Includes standards for both data and alarm management

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Resources & Training

- Recommendations for AFNWA staff to support the SMP implementation
- Recommendations for AFNWA staff to provide long-term support of the desired state SCADA system
- Recommendations for training programs over the lifecycle of the 5 year implementation
- Ultimate number of resources required somewhat dependent on level of support provided by existing community integrators vs. AFNWA staff for existing systems during implementation

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RECOMMENDED APPROACH



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Design, Standards, and Integration

- Single firm responsible
 - Design
 - Drawings
 - Specifications
 - Construction management
 - Integration
 - Narratives
 - Programming
 - Commissioning
 - Training
 - Warranty support



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Hardware & Software Supply

- Software
 - Procured directly by AFNWA
 - License registration in the name of the AFNWA
 - Cost savings by eliminating markups by third-party distributors/suppliers
- Hardware
 - Supplied through one or more contractors
 - May be some exceptions where advantageous for AFNWA to procure
- RTU Panels
 - Single source of supply for consistency and standardization

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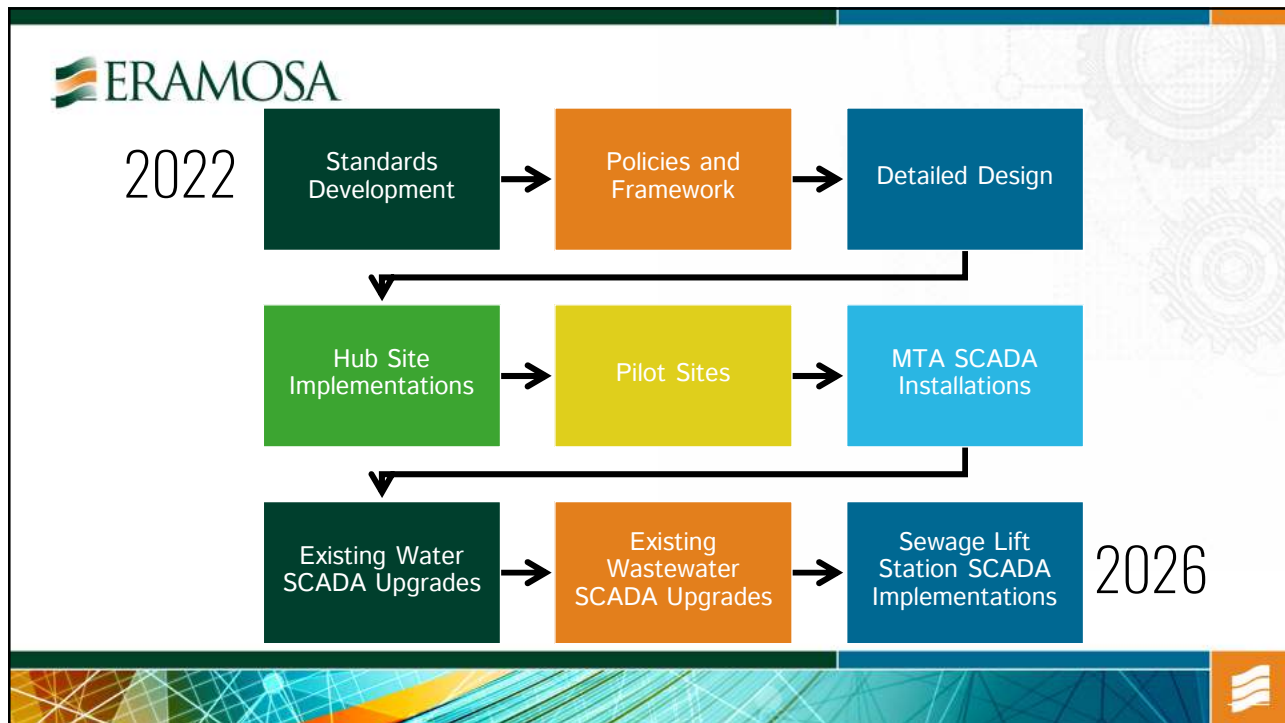
Installation

- By one or more reputable and licensed electrical contractors
- Option to pre-qualify
- Multiple installation contracts
 - Avoid being locked in for an extended duration
 - Monitor performance/profess and adjust terms as required
 - Promotes competitive pricing by avoiding 'price holding' over extended durations

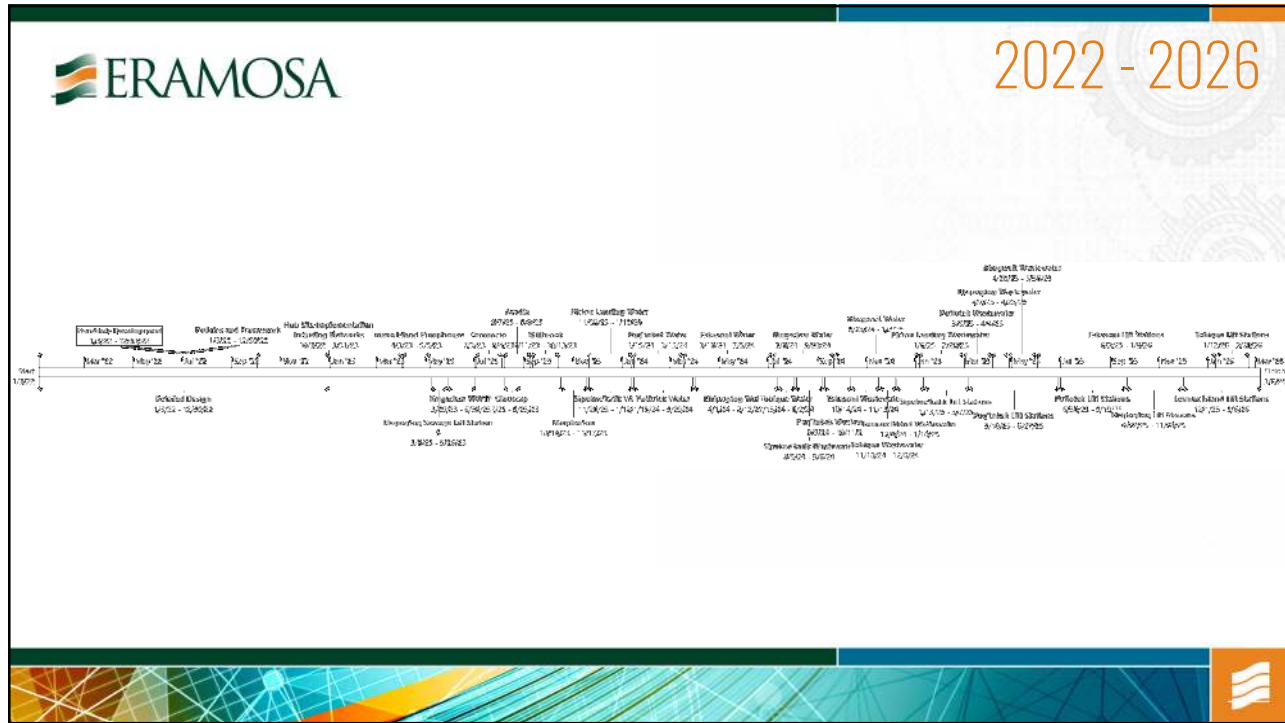
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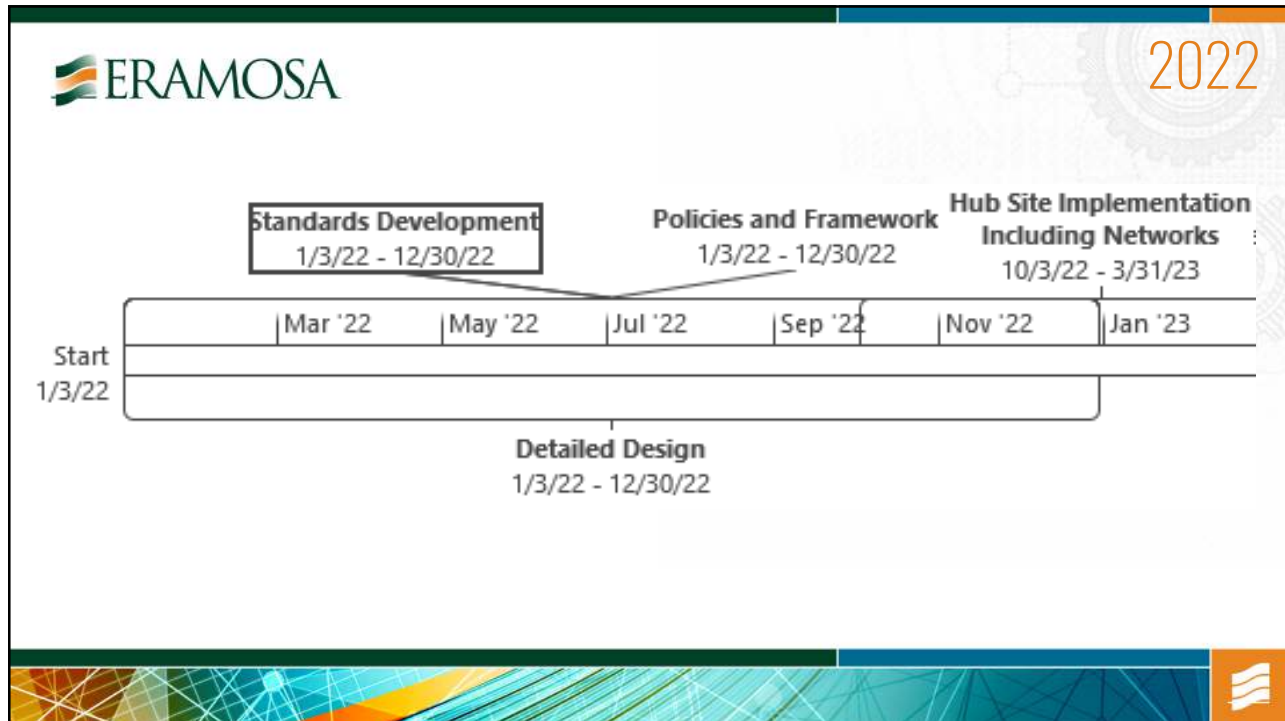
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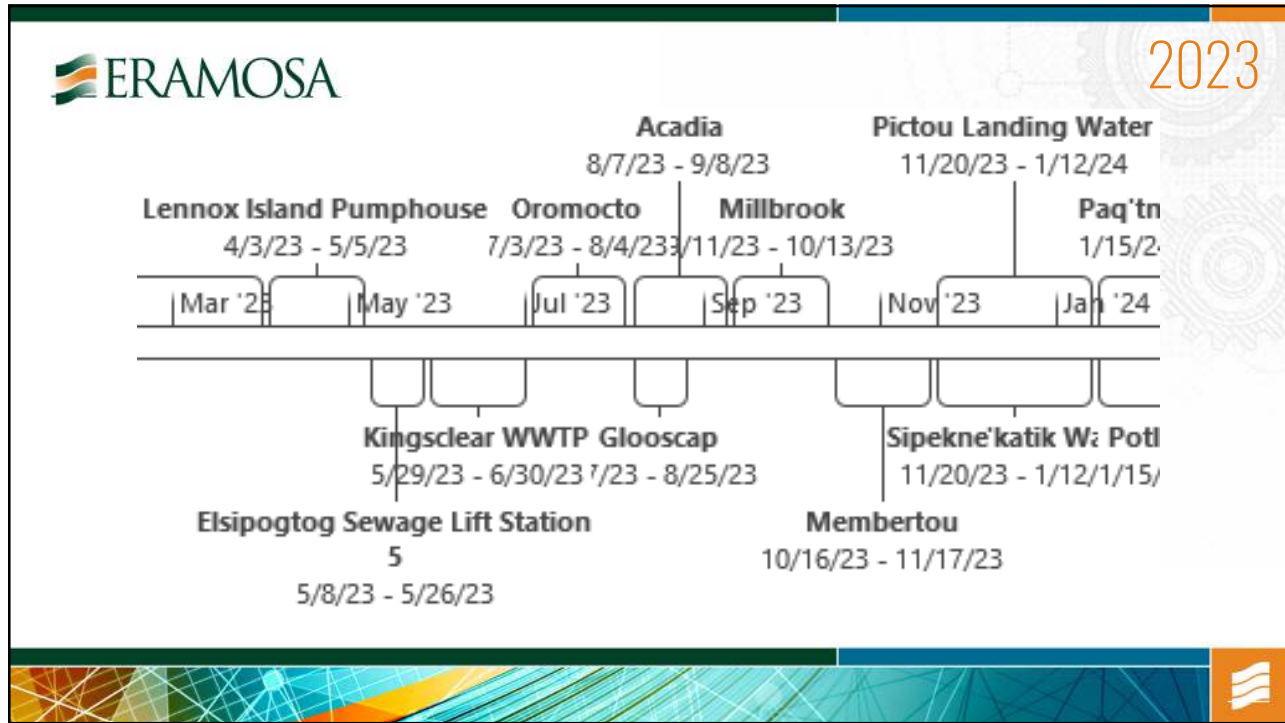
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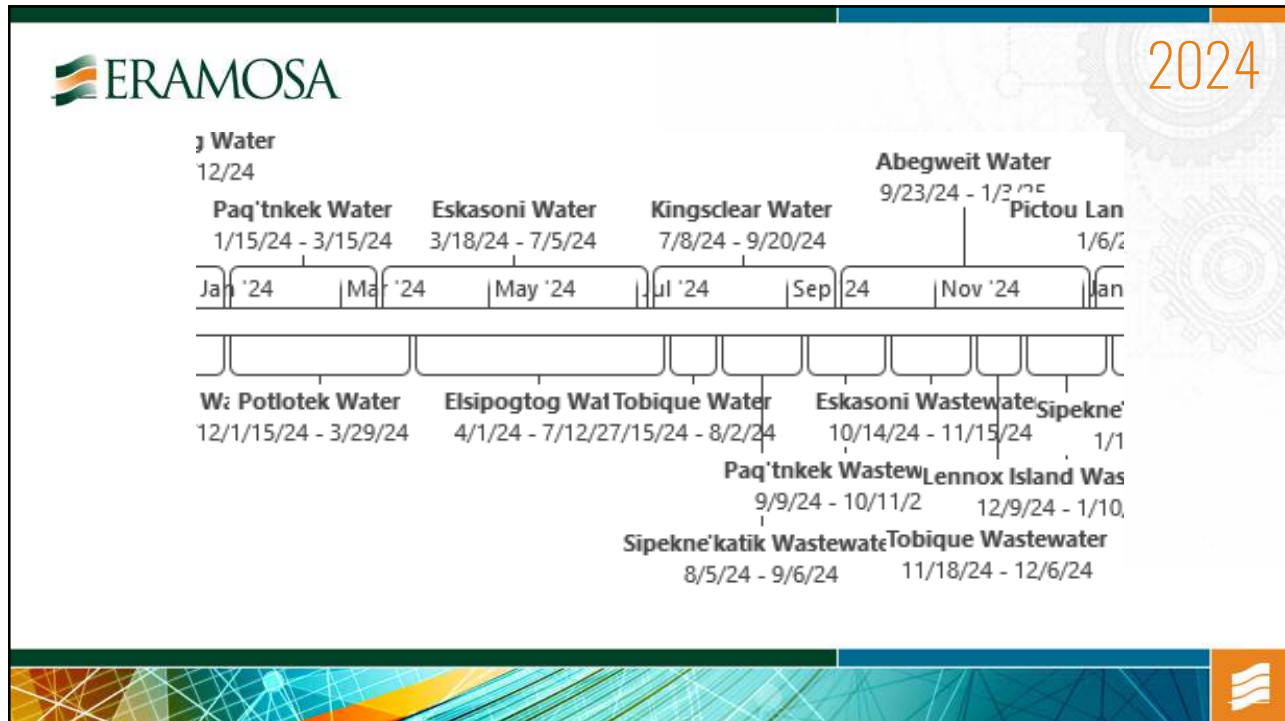
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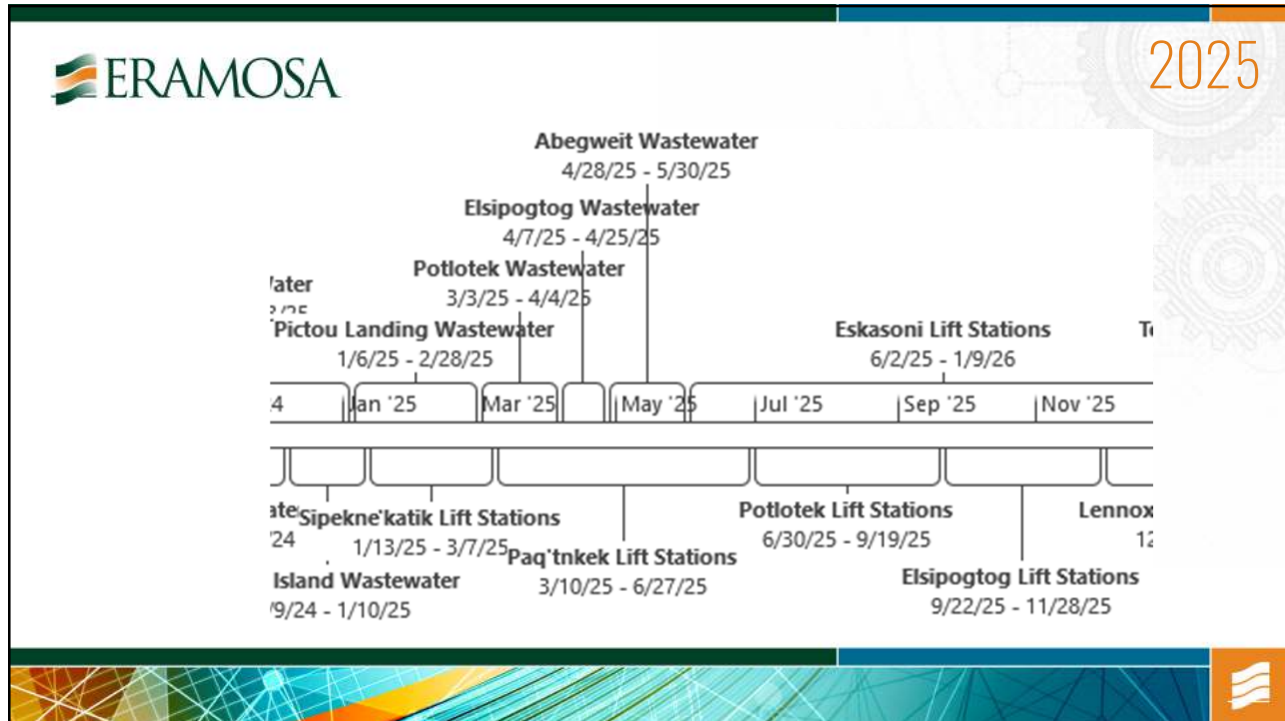
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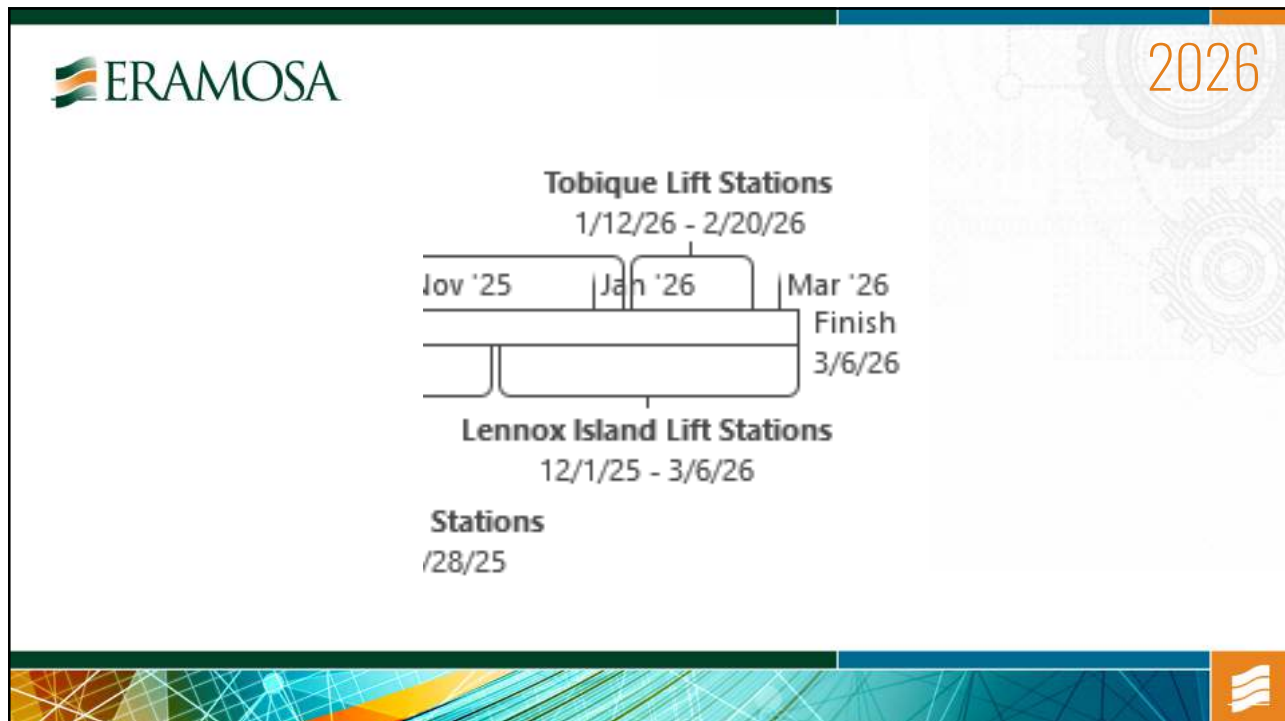
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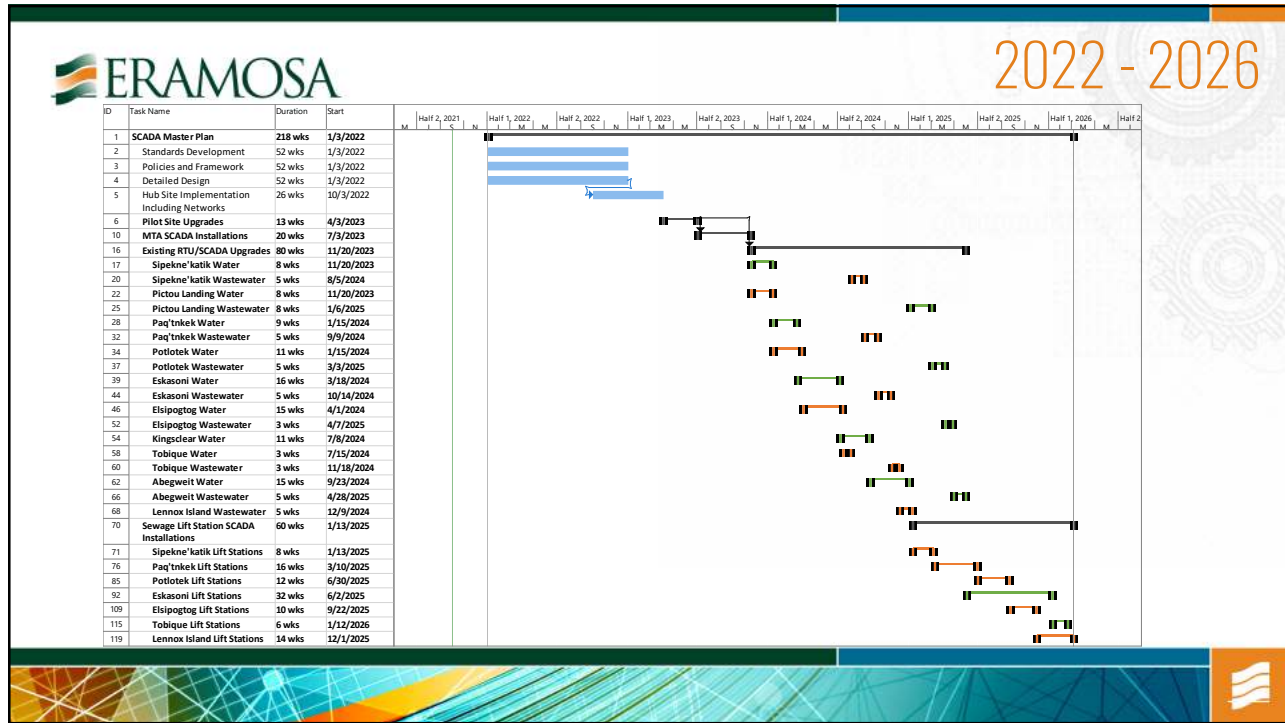
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Capital

Project/Task/Initiative Description	Budget	Start Year	Duration (Yrs)	Annual Budget	2022	2023	2024	2025	2026
SCADA Architecture Detailed Design & Procurement	\$ 410,440	1	1	\$ 410,440	\$ 435,066	\$ -	\$ -	\$ -	\$ -
SCADA Standard Design/Drawings	\$ 87,461	1	1	\$ 87,461	\$ 92,709	\$ -	\$ -	\$ -	\$ -
SCADA RTU & SCADA Programming Standards Development	\$ 147,261	1	1	\$ 147,261	\$ 156,097	\$ -	\$ -	\$ -	\$ -
SCADA Data Management & Reporting Framework and Policy Development	\$ 59,861	1	1	\$ 59,861	\$ 63,453	\$ -	\$ -	\$ -	\$ -
Reporting Needs Assessment	\$ 55,261	3	1	\$ 55,261	\$ -	\$ -	\$ 61,893	\$ -	\$ -
Pilot Sites - Obsolete RTU Replacements Complete with SCADA (New)	\$ 261,000	1	1	\$ 261,000	\$ 276,660	\$ -	\$ -	\$ -	\$ -
SCADA Staffing and Training	\$ 122,061	1	5	\$ 24,412	\$ 25,877	\$ 26,609	\$ 27,342	\$ 28,074	\$ 28,806
File Management Framework and Policy Development	\$ 59,861	1	1	\$ 59,861	\$ 63,453	\$ -	\$ -	\$ -	\$ -
RTU & SCADA Upgrades	\$ 2,436,000	2	3	\$ 812,000	\$ -	\$ 885,080	\$ 909,440	\$ 933,800	\$ -
SCADA Alarm Management Framework and Policy Development	\$ 64,461	1	1	\$ 64,461	\$ 68,329	\$ -	\$ -	\$ -	\$ -
SCADA Alarm Management Deployment	\$ 59,861	1	1	\$ 59,861	\$ 63,453	\$ -	\$ -	\$ -	\$ -
MTA Community SCADA Installations	\$ 261,000	2	1	\$ 261,000	\$ -	\$ 284,490	\$ -	\$ -	\$ -
Sewage Lift Station SCADA Installs	\$ 4,785,000	4	2	\$ 2,392,500	\$ -	\$ -	\$ -	\$ 2,751,375	\$ 2,823,150
Network/IT Staffing and Training	\$ 10,000	1	1	\$ 10,000	\$ 10,600	\$ -	\$ -	\$ -	\$ -
Network/IT Standards Development	\$ 25,000	1	1	\$ 25,000	\$ 26,500	\$ -	\$ -	\$ -	\$ -
Network/IT Architecture Design (Physical Typical)	\$ 35,000	1	1	\$ 35,000	\$ 37,100	\$ -	\$ -	\$ -	\$ -
Network/IT Architecture Design (Cloud)	\$ 30,000	1	1	\$ 30,000	\$ 31,800	\$ -	\$ -	\$ -	\$ -
Internet Service Provider Service Assessments	\$ 45,000	1	2	\$ 22,500	\$ 23,850	\$ 24,525	\$ -	\$ -	\$ -
Cellular and Private Radio Propagation Study	\$ 100,000	1	1	\$ 100,000	\$ 106,000	\$ -	\$ -	\$ -	\$ -
Private Radio Licensed Renewal or Application	\$ 30,000	1	1	\$ 30,000	\$ 31,800	\$ -	\$ -	\$ -	\$ -
Network/IT Implementation Pilot Sites	\$ 90,000	1	1	\$ 90,000	\$ 95,400	\$ -	\$ -	\$ -	\$ -
Network/IT Implementation (Cloud)	\$ 30,000	1	1	\$ 30,000	\$ 31,800	\$ -	\$ -	\$ -	\$ -
Network/IT Implementation (Remote Sites)	\$ 525,000	2	4	\$ 131,250	\$ -	\$ 143,063	\$ 147,000	\$ 150,938	\$ 154,875
Network/IT Implementation (Hub Sites)	\$ 420,000	2	1	\$ 420,000	\$ -	\$ 457,800	\$ -	\$ -	\$ -
Network/IT Central Monitoring (LAN/WAN/Cloud)	\$ 70,000	1	1	\$ 70,000	\$ 74,200	\$ -	\$ -	\$ -	\$ -
Cybersecurity Framework and Policy Development	\$ 52,000	1	1	\$ 52,000	\$ 55,120	\$ -	\$ -	\$ -	\$ -
Risk Identification and Remediation Program	\$ 102,800	1	5	\$ 20,560	\$ 21,794	\$ 22,410	\$ 23,027	\$ 23,644	\$ 24,261
Incident Management and Response	\$ 120,000	1	5	\$ 24,000	\$ 25,440	\$ 26,160	\$ 26,880	\$ 27,600	\$ 28,320
Disaster Recovery Planning	\$ 72,000	1	5	\$ 14,400	\$ 15,264	\$ 15,696	\$ 16,128	\$ 16,560	\$ 16,992
Remote Access and MFA Design/Implementation	\$ 57,200	1	1	\$ 57,200	\$ 60,632	\$ -	\$ -	\$ -	\$ -
Firewall Design and Implementation Program	\$ 51,200	1	5	\$ 10,240	\$ 10,854	\$ 11,162	\$ 11,469	\$ 11,776	\$ 12,083
IDS/IPS Design and Implementation Project	\$ 330,305	2	2	\$ 160,153	\$ -	\$ 174,566	\$ 179,371	\$ -	\$ -
Centralized Logging and Cybersecurity Monitoring (SIEM)	\$ 51,200	1	1	\$ 51,200	\$ 54,272	\$ -	\$ -	\$ -	\$ -
TOTALS (excluding escalation - 3%)	\$ 11,046,235				2022	2023	2024	2025	2026
					\$ 1,957,523	\$ 2,071,561	\$ 1,402,549	\$ 3,943,767	\$ 3,088,487
TOTALS (including escalation - 3%)					\$	\$	\$	\$	\$ 12,463,887

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Operating

- Annual licensing for VTSCADA support
- Ongoing cybersecurity detection and prevention solutions
- Approximately \$100,000 annual combined

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Scope

- Detailed Master Plan with costing for a fully coordinated and integrated system over 5 years.
- Recommendations for:
 - Technology
 - Resources
 - Training
 - Disaster Recovery
 - Cybersecurity

Objectives

- Develop communication framework
- Review current cybersecurity practices & develop plans
- Optimize for reliability and security
- Assess SCADA needs
- Recommend remote terminal unit (RTU) standards and transition plans
- Improve historian use and alarming systems

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QUESTIONS?



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