Northeast Ohio Regional Sewer District

PLANNING NOW AND FOR THE FUTURE

Developing a PCS Master Plan for the NEORSD

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AGENDA

01 NEORSD Overview

02 PCS Vision and Goals

03 PCS Overview

04 Master Planning Process

05 NEORSD PCS Master Plan

06 Summary & Success Factors

07 PCS Master Plan Status

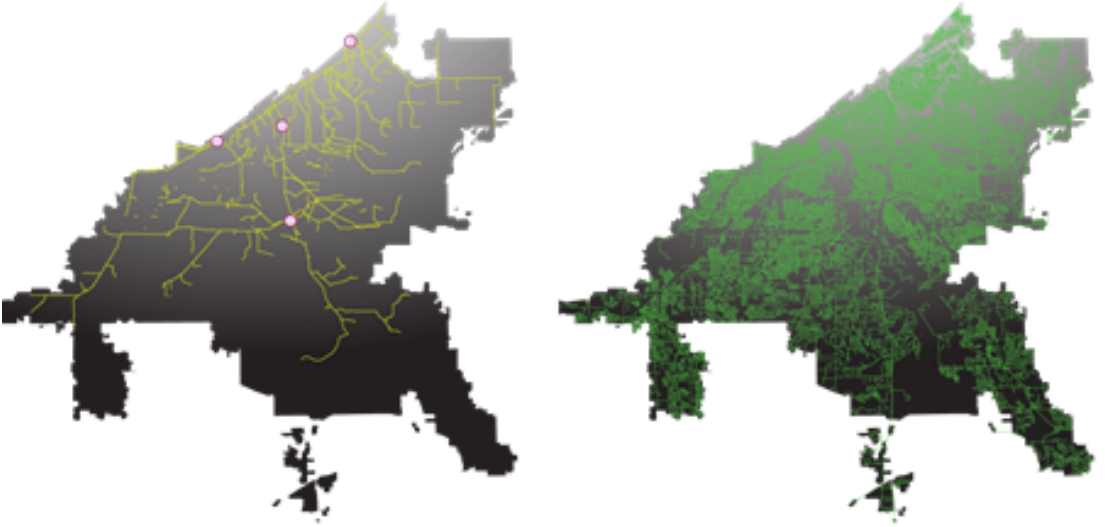
WHO WE ARE…

- Political subdivision of Ohio
- Created in 1972 by Court Order
  - Code of Regulations
  - Governed by seven Trustees
- Separate and distinct from the City of Cleveland and Cuyahoga County

WHAT WE DO…

- Wastewater Service to Cleveland and 61 communities
  - 1 million customers
  - 90+ billion gallons treated each year
  - 200 MGD average daily flow treated
- Additional services include:
  - Responsible for the CSO Permits
  - Water quality monitoring
  - Lake Erie beach monitoring and maintenance
  - New Regional Stormwater Program

Northeast Ohio Regional Sewer District



312 miles

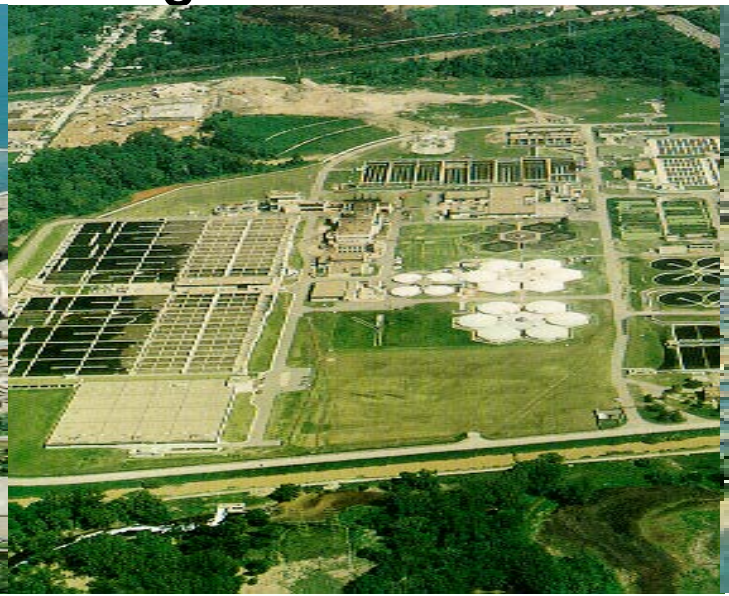
Total length of District-owned sewers and interceptors

3,107 miles

Total length of locally-owned sewers and interceptors

Northeast Ohio Regional Sewer District (NEORSD)

Westerly WWTC



Southerly WWTC

Easterly WWTC

WESTERLY WWTP

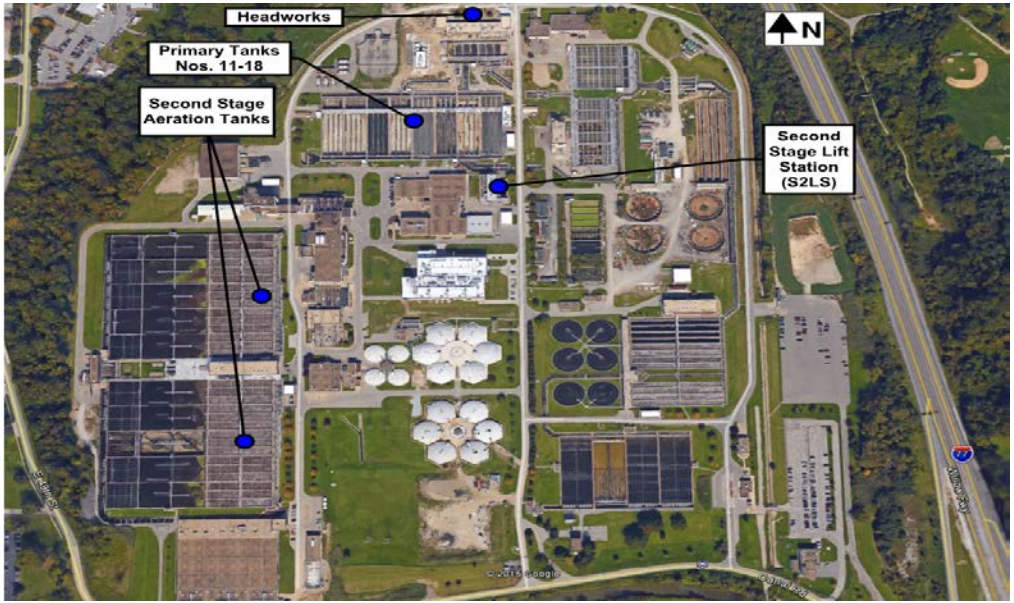
- Trickling filters; biosolids-multiple hearth incineration
  - Plant discharges to Lake Erie
  - Serves 100,000
  - Average day 26mgd; 100mgd full treatment
  - 100-300 mgd wet weather
  - Future wet weather up to 411 mgd

EASTERLY WWTP

- Activated sludge; biosolids pumped to Southerly
  - Plant discharges to Lake Erie
  - Serves 330,000
  - Average day 90 mgd; 300 mgd full treatment
  - Currently being increased to 400 mgd full treatment
  - Future Chemically Enhanced High Rate Treatment from 400 to 900 mgd

SOUTHERLY WWTP

- 2 stage nitrification plant using biologically activated sludge; effluent filtration; biosolids-fluidized bed incineration plant which converts waste heat to electricity
  - Plant discharges to Cuyahoga River
  - Serves 530,000
  - Average day 120mgd
  - 400mgd full treatment
  - Preliminary/primary currently being upgraded from 400 to 735mgd
  - Future full treatment up to 615 mgd



PCS MISSION

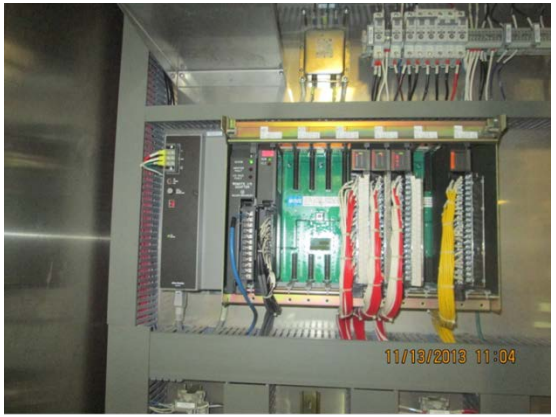
The Northeast Ohio Regional Sewer District Process Control and Automation Systems (PCAS) will provide our staff and facilities with the technology to provide exemplary environmental stewardship, as economically and effectively as possible.

GOALS FOR THE MASTER PLAN

- Guide development of a Process Control System that:
  - Supports the mission of the District's operations
  - Is flexible, expandable, reliable, secure, and optimized
  - Is adaptable to changes in technology
  - Leverages District's investments
  - Integrates with other enterprise systems
  - Supports Inter-departmental synergy
  - Is built on consistent specifications, functionality & communications

OVERVIEW OF NEORSD PCS SYSTEMS

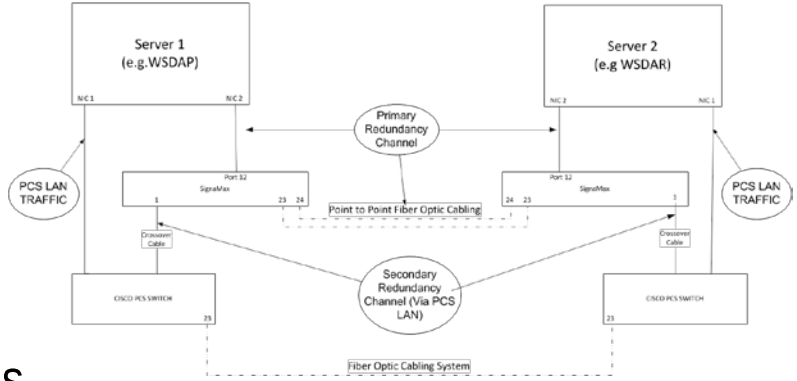
- In-Plant
  - Allen Bradley PLCs – Majority are aging PLC5 vintage
  - Fiber Optic Based Networks
  - Cimplicity and Wonderware HMI systems



- Collection System
  - Rockwell Automation PLC5 and MicroLogix PLC's
  - Mixed communication systems (Radio & Telephone)
  - Limited Cimplicity HMI
  - Separate Telog data logger system (cellular technology)

OVERVIEW OF NEORSD PCS SYSTEMS

- Key Features
  - Redundant Servers
  - Virtualization Technology
  - Geographically Distributed Servers
  - PCS HMI clients for support of field operations

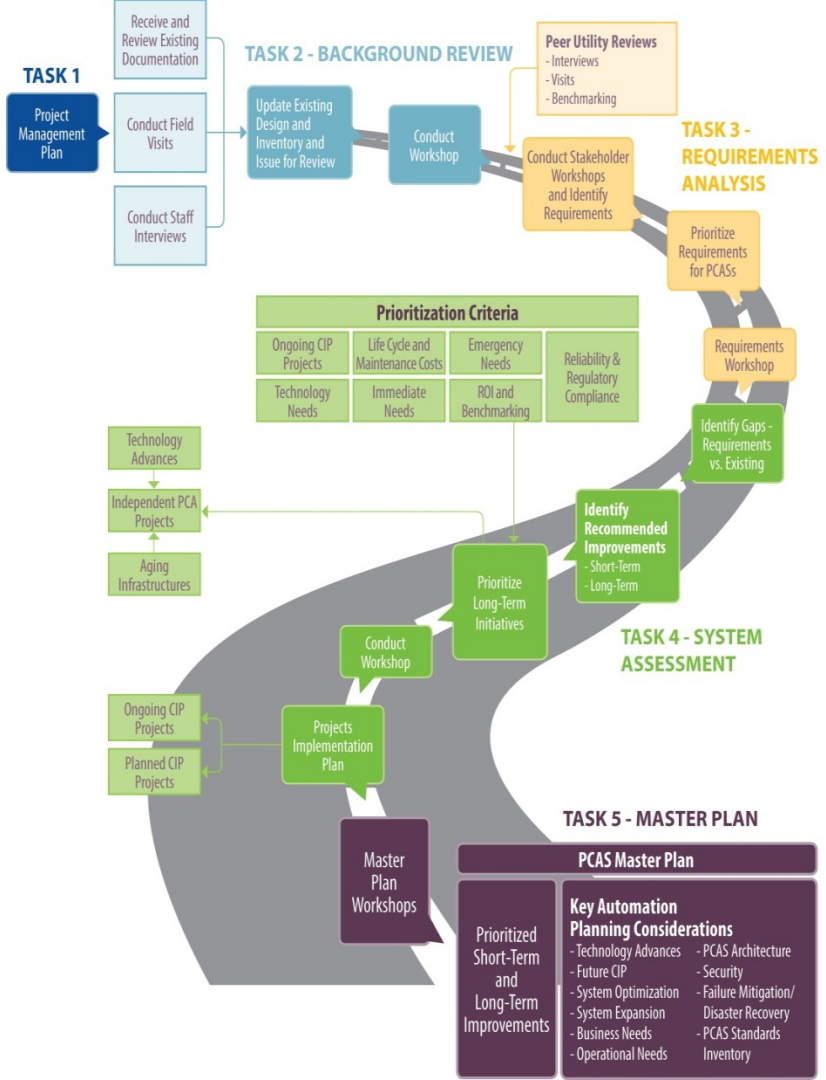


- Key Technical Challenges
  - Operating with two HMI systems
  - Limited data collection and reporting
  - Aging Hardware and Software
  - Lack of accurate documentation

PCS MASTER PLAN

Challenges leading to the need for a plan

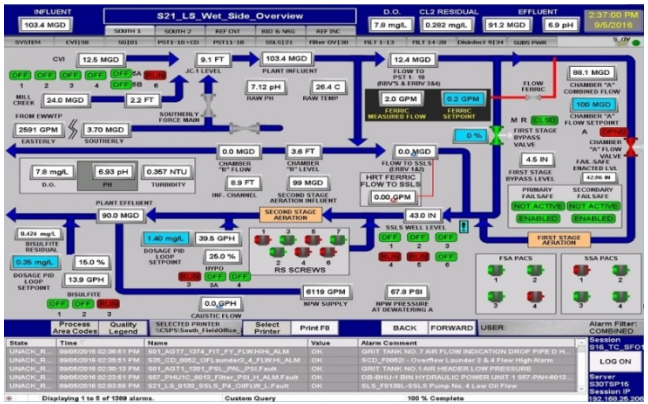
- Transition from Cimplicity to Wonderware
  - Poorly Planned & Implemented
  - HMI System instability
  - Implementation challenges led to issues with operator engagement
- Limited in-house expertise and resources
- Aging infrastructure not supported
- Operational Data Management System
  - Proprietary & aging enterprise-wide



PCS MASTER PLAN

Key Assumptions

- Standardized on Rockwell Automation PLC/PAC Hardware
- Standardized on Wonderware HMI
- Leverage Telog data logging system



MASTER PLANNING PROCESS

- Current State Assessment
- Requirements Analysis
- Gap Analysis
- System Assessment
- Compilation of Master Plan

MASTER PLANNING PROCESS

Current State Assessment

- Field Investigations
  - Extensive data gathering at each Plant
  - Representative sites in Collection System
- Reviewed & Gathered Existing System Documentation
  - PLC infrastructure
  - Network Infrastructure
  - PCS Servers & Workstations
- Developed Current State Technical Memorandum

MASTER PLANNING PROCESS

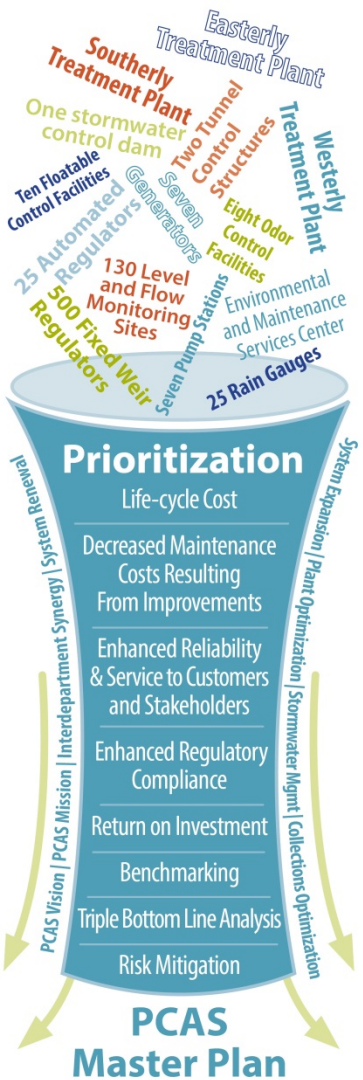
Requirements Analysis

- Requirements Workshops
  - Eight workshops with multiple stakeholders
- Requirements Categorized
  - Alarm & Event Management
  - Control Philosophy
  - Data Management and Reporting
  - HMI HW / SW Functionality
  - Network Systems & PCS Architecture
  - PLC/RTU Design and Functionality
  - Organization / Practices
  - System Documentation

MASTER PLANNING PROCES

Requirements Analysis

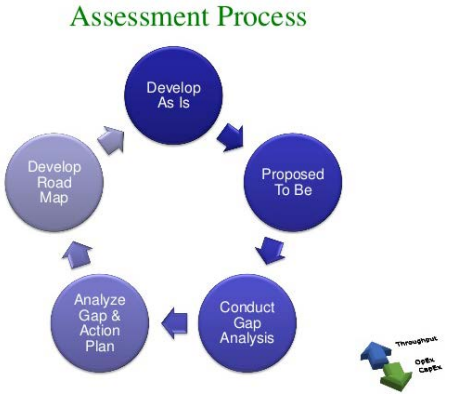
- Consolidated and Prioritized Requirements
  - Critical
  - High
  - Medium
  - Low
- Initially 89 individual requirements
- Consolidated to 55
- Reviewed and Validated with Core Team



MASTER PLANNING PROCESS

System Assessment & Gap Analysis

- Evaluated the Current State against Validated Requirements
- Developed the Recommended Actions to Implement Requirements
- Prepared Preliminary Project List



MASTER PLANNING PROCESS

System Assessment

- Refined Project List
  - Short-Term Projects
    - 6 month or less implementation period
    - Lower cost, potentially by internal resources
  - Longer-Term Initiatives
    - Longer Design & Implementation

ST1	Wonderware System Stability Improvements	$ 187,500
ST16	Seasonal Disinfection Readiness Strategy	$ 101,300
ST17	Mill Creek Gate Control	$ 206,900
ST2	Mitigate Nuisance Alarms for Critical Process Parameters	$ 110,100
ST4	Power Failure/Recovery Approach	$ 109,900
ST5	Effect of Collection System Control Actions on Plant Operations	$ 63,800
ST7	Trending Development	$ 83,000

LT1	Southerly WWTC HMI Validation	$ 497,000
LT2	Easterly WWTP HMI Validation	$ 386,500
LT3	Westerly WWTP HMI Validation	$ 307,100
LT4	Develop PCS Training Program	$ 193,200
LT9	Wastewater Flow Management Plan Implementation	$ 488,900

- Initial Projects – 14 short-term, 14 longer-term
- After Reviews & Discussions – 18 short-term, 19 longer-term

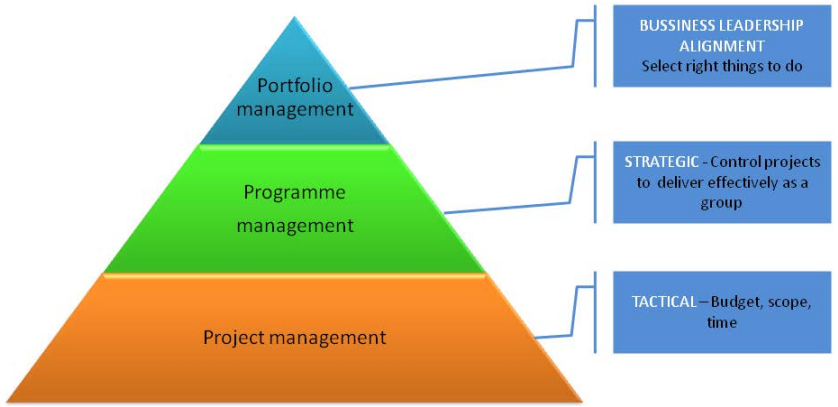
NEORSD PCS MASTER PLAN

- 18 Short Term Projects
  - Estimated Budget - $1.95M
- 19 Long Term Projects
  - Estimated Budget - $53.57M

MASTER PLANNING PROCESS

Master Plan Development

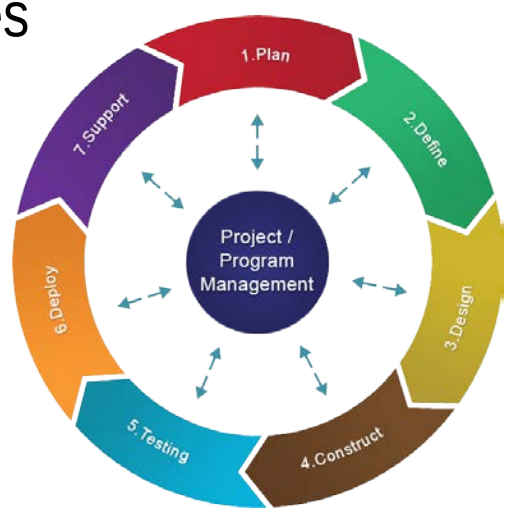
- Shift from Individual Projects into an Overall Program
- Budgetary Program Planning
- Development of Non-Project Related Master Planning Issues



PCS MASTER PLAN CURRENT STATUS

Automation Program Management (APM)

- Master Plan implemented as a program in two phases
- 1st phase awarded in June 2016
- 12 program elements: 38 projects
- 1st phase 48 months, 2nd phase planned start 2019
- Estimated program budget $74M



QUESTIONS?

Special Thanks to:

- Northeast Ohio Regional Sewer District Team:
  - Ronald B. Czerski – Deputy Director of O&M
  - Andrea Remias, P.E. – Project Manager
  - NEORSD PC&A group
  - Senior Management
- HDR Team:
  - Paul Gauche, P.E – Project Engineer
  - Rich Atoulikian, P.E, PMP – Client Service Manager
  - Terry Draper, P.E, PMP (Currently with EMA) – Technical Lead