



2023 ANNUAL
CONFERENCE & EXHIBIT



JANUARY 23, 2022

SESSION 9
PLANT OPERATION 1:
TROUBLESHOOTING, ISSUES, AND CREATIVE
SOLUTIONS IN FACILITY UPGRADES

**A Tale of Two Processes
How the Metropolitan District's Wet
Weather Process Expansion Program
led to Overall Plant Improvements.**

PRESENTERS – Jeff Bowers, MDC and Brian McGuire, Arcadis

Presentation Agenda

- The Metropolitan District Overview
- Wet Weather Expansion Project Overview
- Deep Dive – DUPCs & WW Flow Control
- Operations Engagement and Control Strategies
- Plant Improvements
- Questions

MDC Overview

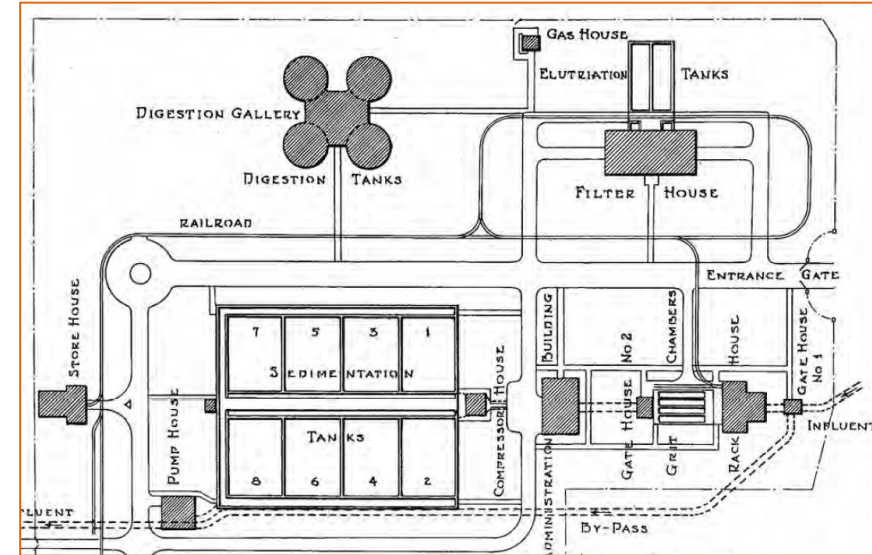
- Established in 1929, first on CT River to provide sewage treatment
- Serve 8 Member Towns
 - Responsible for serving 400,000+ customers
- Full-service utility
 - Water Supply, Water Treatment, Distribution Collection, Wastewater Treatment, All support services
- All WPC facilities operate continuously, 24hrs/day, 365 days/year

Facility Background

- Hartford Water Pollution Control Facility (HWPCF), in Hartford, CT
- Constructed 1930s, connected to combined sewer system
- Pre WWEP Flows: 60 – 90 – 120 mgd (Average, design, wet weather)

Process Details:

- Preliminary treatment with screening and grit tanks
- Conventional primary treatment
- Gravity flow through primary treatment
- Activated sludge with denitrification
- Seasonal disinfection
- Wet weather storage basin
- Incineration with heat recovery



Project Purpose and Goals

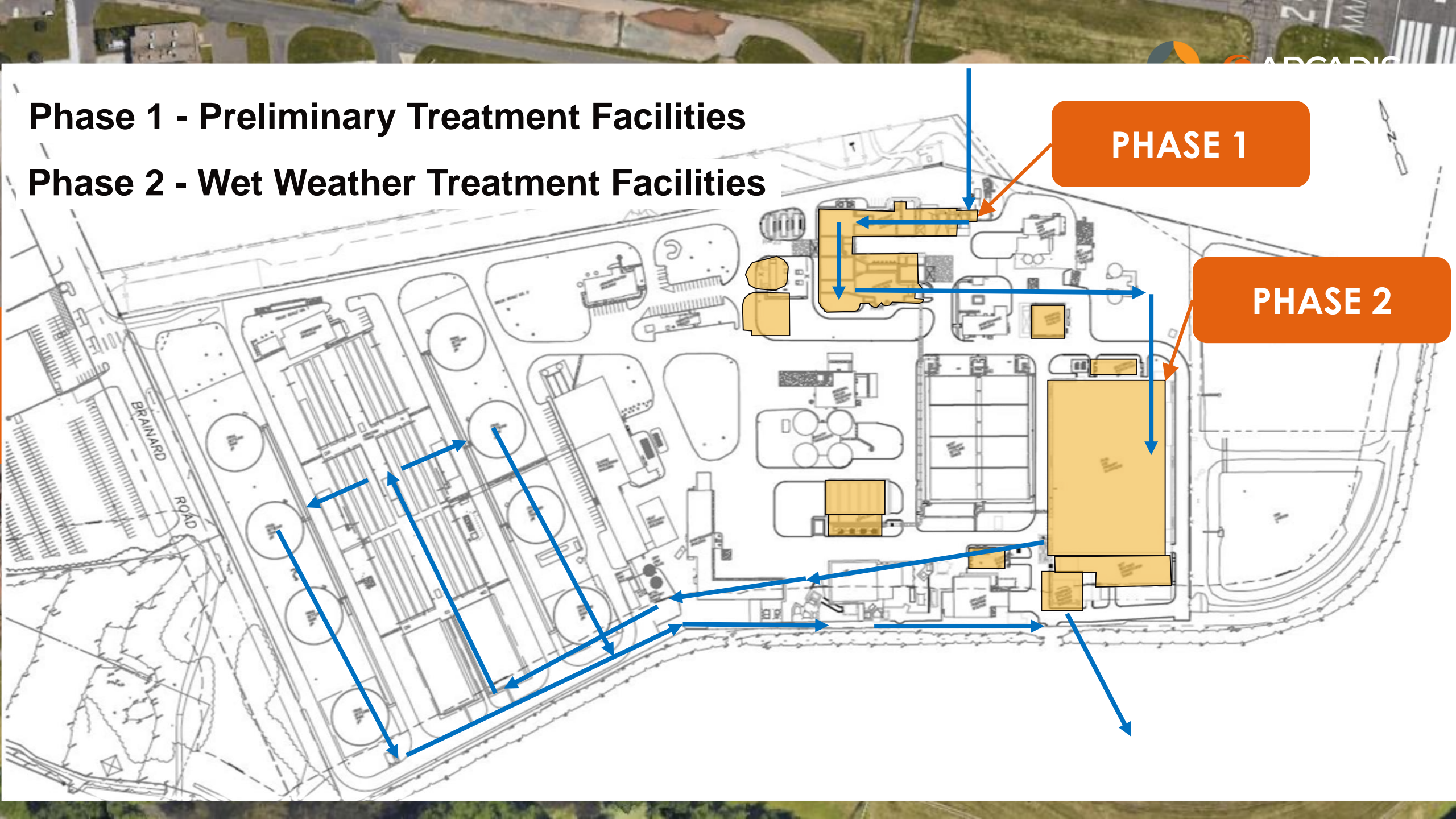


Hartford Water Pollution Control Facility Overview



Phase 1 - Preliminary Treatment Facilities

Phase 2 - Wet Weather Treatment Facilities





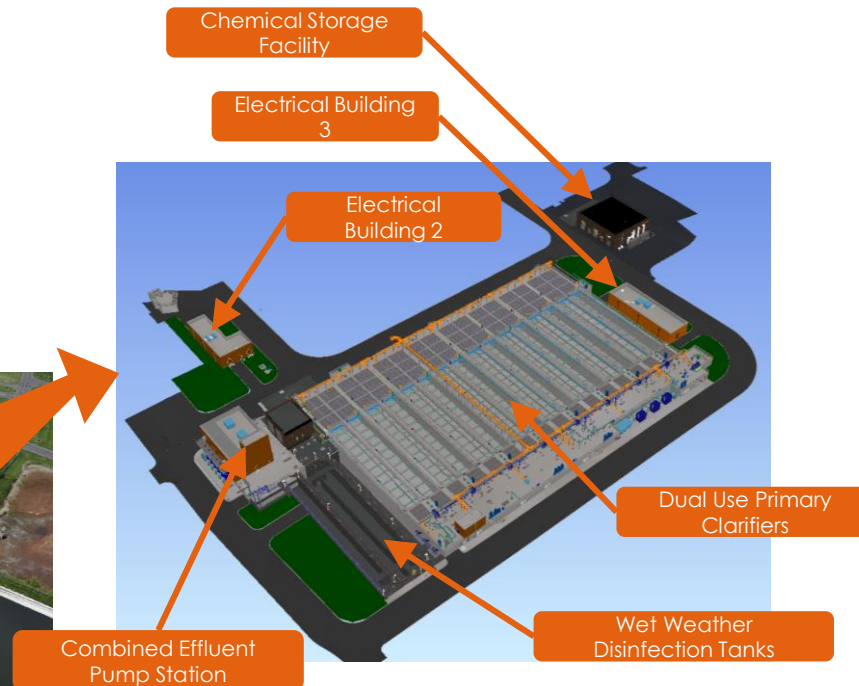
Phase 1 - Headworks Facility Expansion

- Coarse Bar Rack Facility
- Influent Pump Station
- Fine Screens and Screening Handling
- Grit Removal
- Odor Control



Phase 2 – Contract 2012-21

- 200 MGD Dual Use Primary Treatment Capacity
- 110 MGD Wet Weather Treatment Capacity
- 200 MGD Combined Plant Effluent / Wet Weather Flow Pumping and Gravity Discharge Capability



Dual Use Primary Clarifiers

Dual use refers to the ability for the clarifiers to operate under different modes

- **Mode 1** – Dry Weather
- **Mode 2** – Wet Weather
- **Mode 3** - Chemical Enhanced Primary Treatment (CEPT)
- 8 Primary Rectangular Clarifiers
 - Total Area: 75,000sq ft
 - SOR of 1,200 gpd/sq ft at 90 MGD



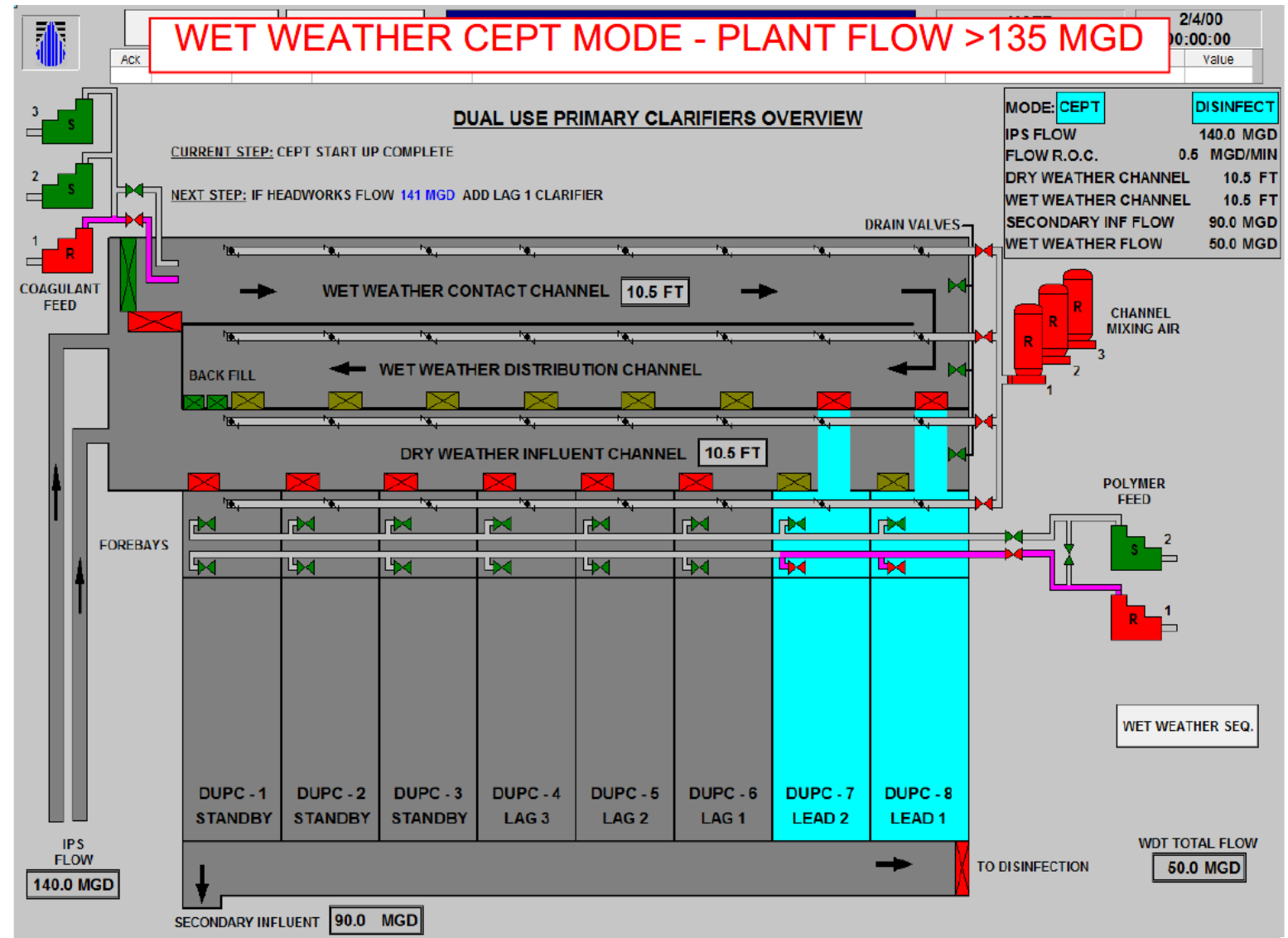
Dual Use Primary Clarifiers

Dry Weather Mode

Wet Weather Mode

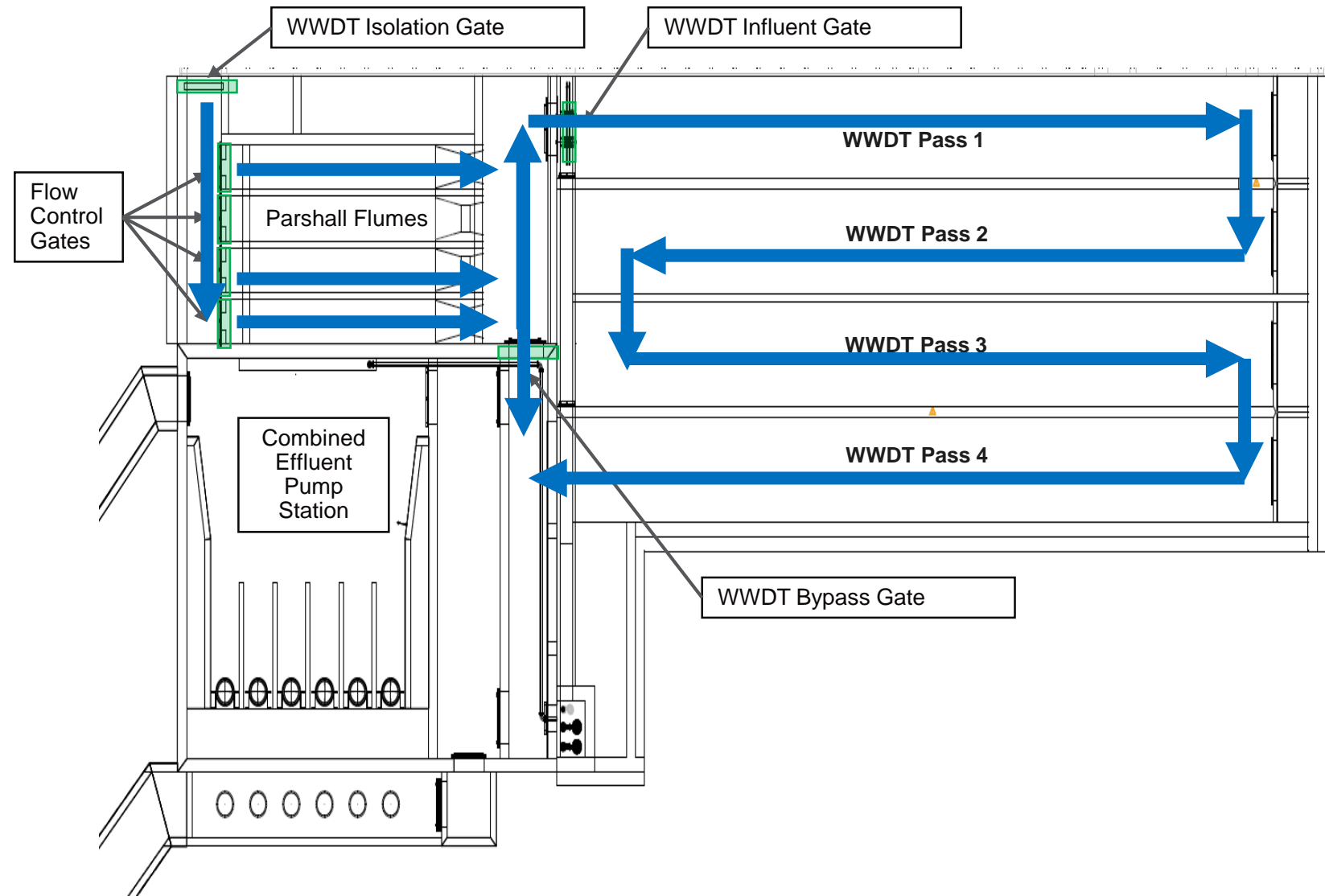
Dual Use Mode

- Addition of Coagulant (ferric or alum) to influent
 - 1 – 2 minute contact time
 - Dose of 20 – 50 mg / L
- Addition of Flocculant (polymer) to forebay
 - Dose of 0.5 – 1.5 mg/L



Flow Control Gate and Parshall Flumes

- 4 motor operated slide gates
- 4 Parshall Flumes
- 2 Discharge paths based on season
 - Disinfection through WWDT Influent Gate
 - Bypass through WWDT Bypass Gate





Operations Engagement and Control Strategies



Operator Engagement

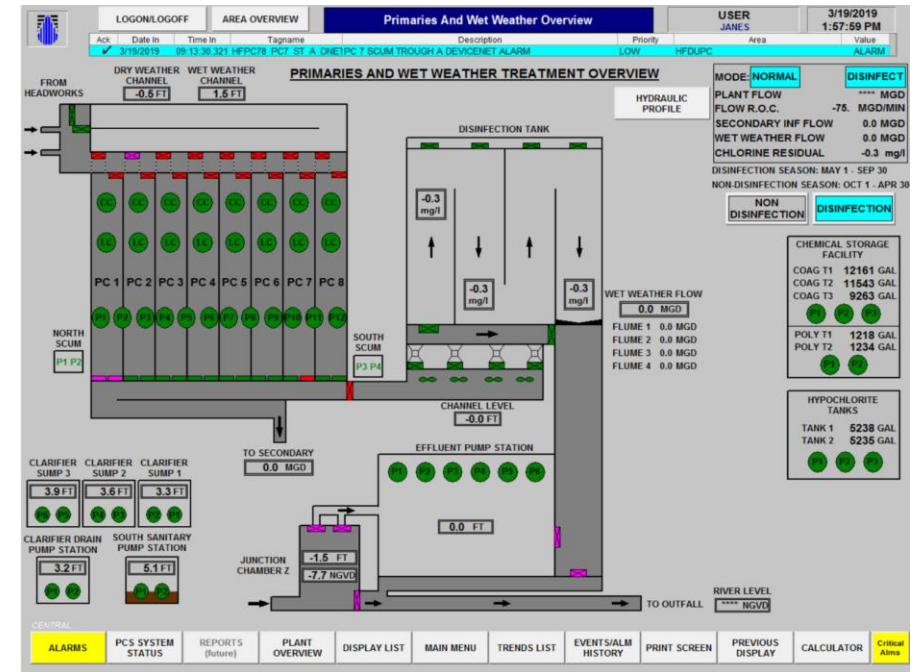
- Bi-weekly operations (AESS) workshops
- HMI Development
- Control Strategy Development
- SCADA Simulation Demonstrations
- Commissioning

Engagement early and often with MDC Operations drove understanding and planning for startup needs.

- Shift Operators
- Operation Supervisors
- Plant Supervisors
- Project Managers
- Systems Integrator
- I&C/ SCADA Managers / Techs
- Design Consultants
- Electrical Techs

SCADA Simulation – WW Weather Master Modes

	Dry weather	Wet weather	High wet weather flows	
Non-Disinfection Season	<ul style="list-style-type: none"> •DUPC Normal •Gravity 	<ul style="list-style-type: none"> •DUPC WW •WWDT Bypass •Gravity 	<ul style="list-style-type: none"> •CEPT treatment •WWDT Bypass •Gravity 	Gravity Non-disinfection season, or river elevation low (look up table)
Disinfection Season	<ul style="list-style-type: none"> •DUPC Normal •Gravity 	<ul style="list-style-type: none"> •DUPC WW •WWDT On •Gravity 	<ul style="list-style-type: none"> •CEPT treatment •WWDT On •Gravity 	
Non-Disinfection Season	<ul style="list-style-type: none"> •DUPC Normal •CEPS Pumping 	<ul style="list-style-type: none"> •DUPC WW •WWDT Bypass •CEPS Pumping 	<ul style="list-style-type: none"> •CEPT treatment •WWDT Bypass •CEPS Pumping 	Pumping Disinfection season, or river elevation high (look up table)
Disinfection Season	<ul style="list-style-type: none"> •DUPC Normal •CEPS Pumping 	<ul style="list-style-type: none"> •DUPC WW •WWDT On •CEPS Pumping 	<ul style="list-style-type: none"> •CEPT treatment •WWDT On •CEPS Pumping 	



All operational modes were simulated, including the automatic transitions between pumping and gravity operation based on river elevations

A large, bright orange rectangular box containing the text "Overall Plant Improvements" in white, bold, sans-serif font. The background of the entire image is a wide-angle shot of an industrial facility with a grid of metal grates on the floor and various pipes and machinery in the distance.

Overall Plant Improvements

Safety and Maintenance

Safety:

- Ventilation and Ventilation Monitoring
- Lighting and Receptacles
- Draining and de-energizing equipment

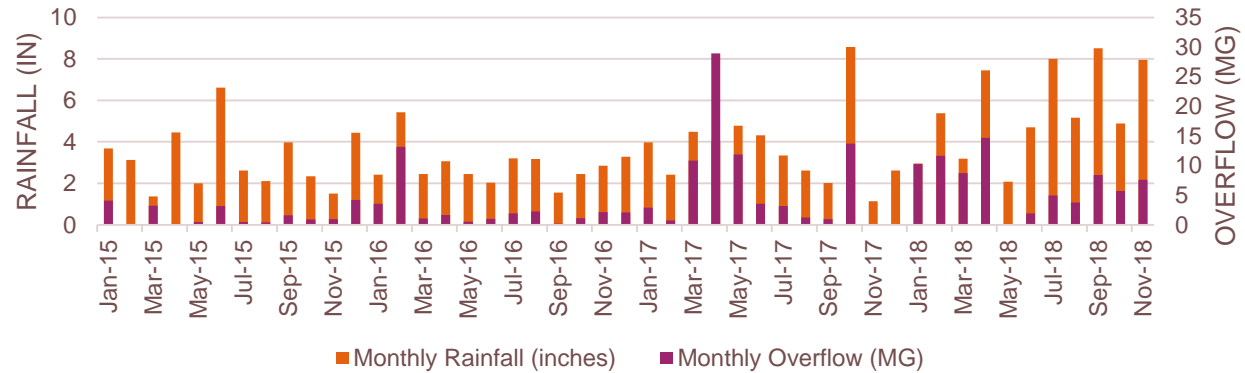
Maintenance:

- Easier access
- Lock out / Tag out Procedures
- Automatic flush and purge sequences

Collections Improvements

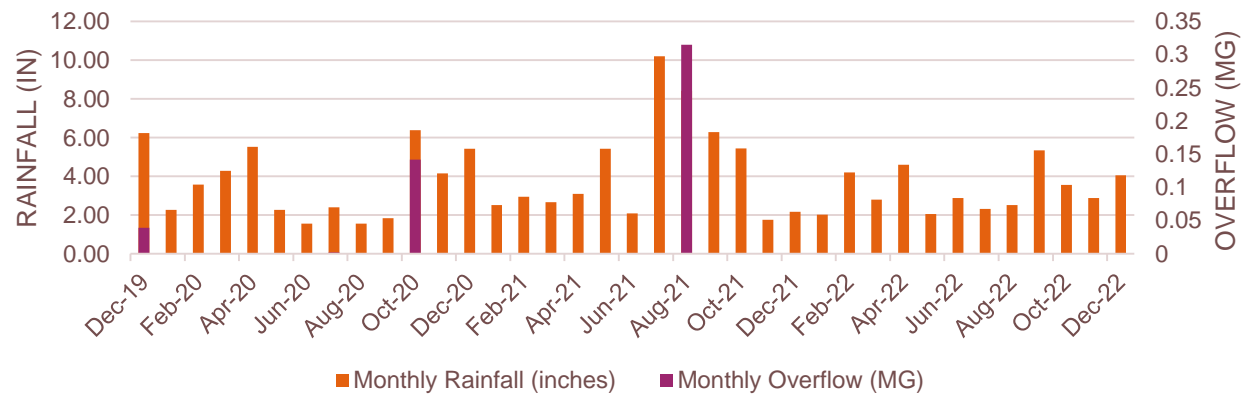
- Lower HGL
- **Reduction in CSOs**
- Improved flow in collection system

HARTFORD WPCF - SM-2 OVERFLOW DATA - PRE-WWEP FACILITIES STARTUP



44 out of 47 months with CSO Events

HARTFORD WPCF - SM-2 OVERFLOW DATA - POST WWEP FACILITIES STARTUP

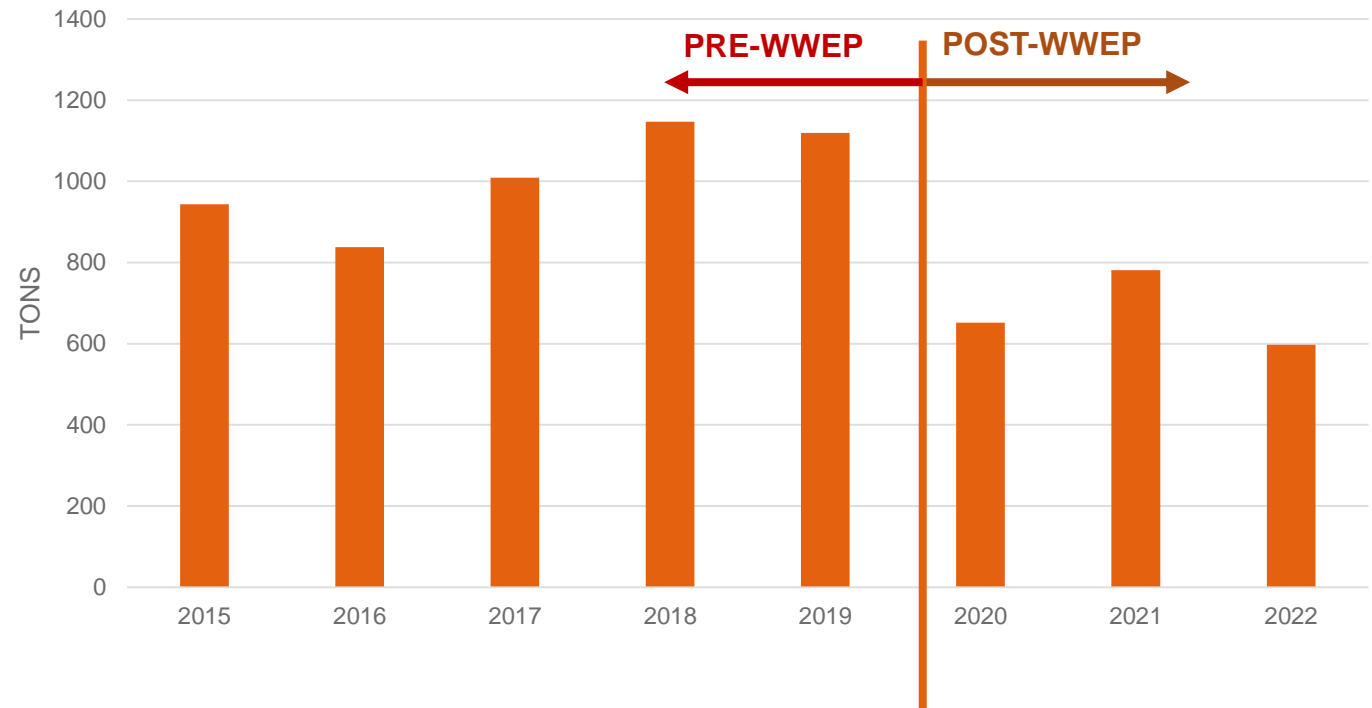


5 out of 37 months with CSO Events

Headworks Improvements

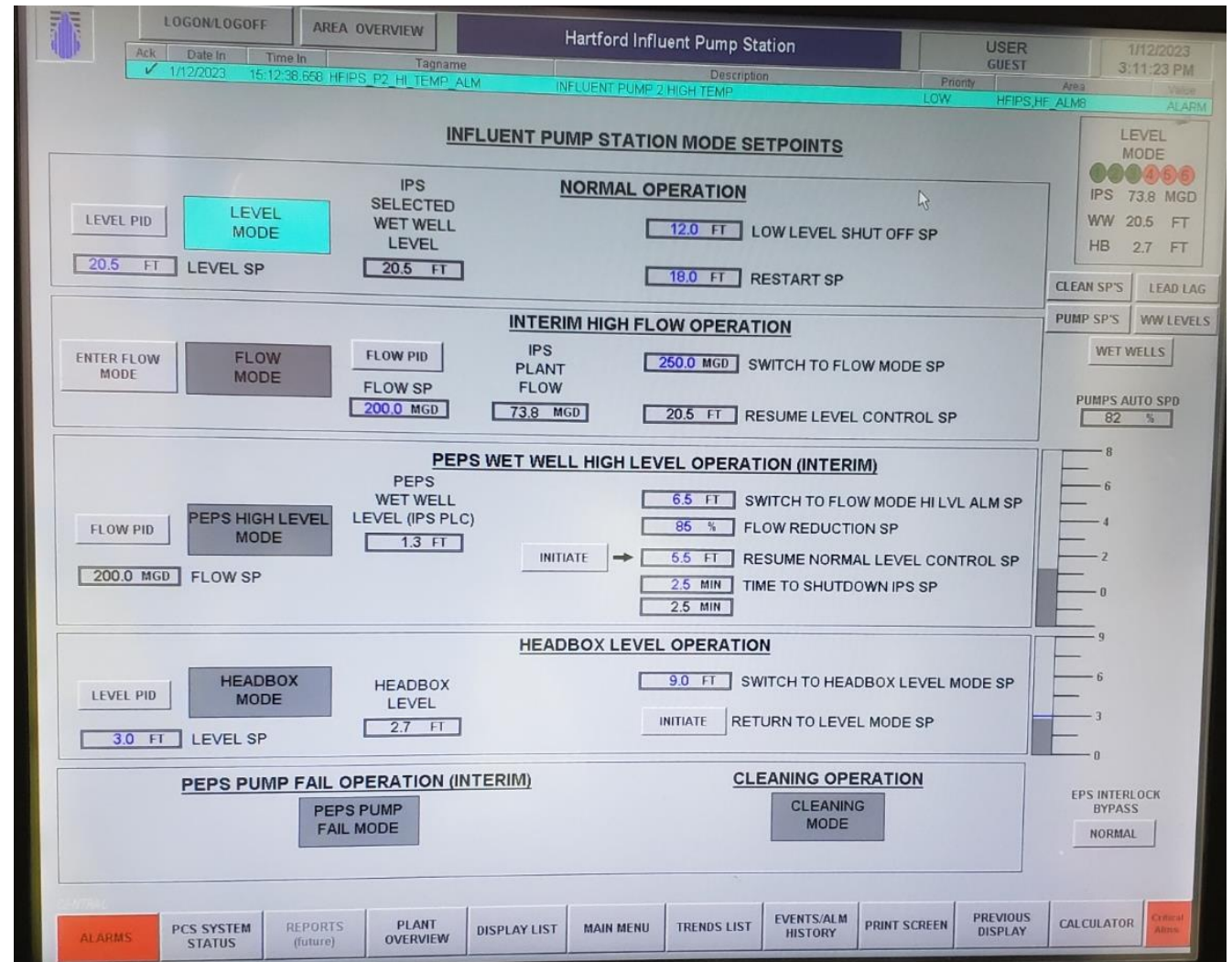
- Improved Screening Removal
- Improved Grit Removal

HWPCF ANNUAL GRIT AND SCREENING TOTALS (WET TONS)



Headworks Improvements

- Influent Pump Station Control Modes:
- **Flow Mode**



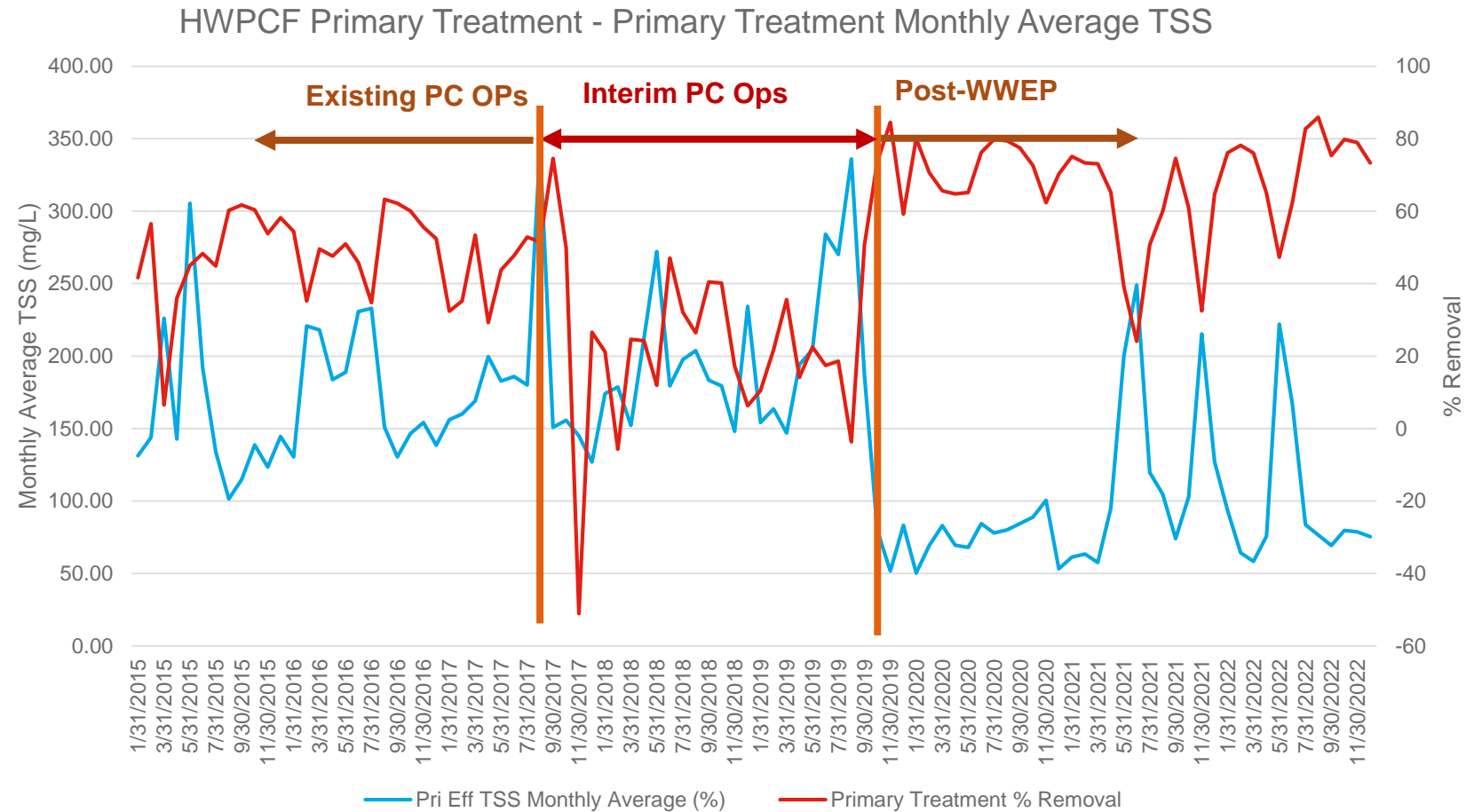
The screenshot displays the control interface for the Hartford Influent Pump Station. At the top, there is a navigation bar with 'LOGON/LOGOFF', 'AREA OVERVIEW', and 'Hartford Influent Pump Station'. A table shows an active alarm: 'INFLUENT PUMP 2 HIGH TEMP' on 1/12/2023 at 15:12:38.658, with a priority of 'LOW' and area 'HFIPS,HF_ALM8'. The interface is divided into several operational mode sections:

- NORMAL OPERATION:** Includes 'LEVEL MODE' (selected) with a 'LEVEL SP' of 20.5 FT and 'LEVEL PID'. It also shows 'IPS SELECTED WET WELL LEVEL' at 20.5 FT, 'LOW LEVEL SHUT OFF SP' at 12.0 FT, and 'RESTART SP' at 18.0 FT.
- INTERIM HIGH FLOW OPERATION:** Features 'FLOW MODE' (selected) with 'FLOW SP' at 200.0 MGD and 'IPS PLANT FLOW' at 73.8 MGD. It includes 'SWITCH TO FLOW MODE SP' at 250.0 MGD and 'RESUME LEVEL CONTROL SP' at 20.5 FT.
- PEPS WET WELL HIGH LEVEL OPERATION (INTERIM):** Shows 'PEPS HIGH LEVEL MODE' (selected) with 'WET WELL LEVEL (IPS PLC)' at 1.3 FT and 'FLOW SP' at 200.0 MGD. It includes an 'INITIATE' button, 'SWITCH TO FLOW MODE HI LVL ALM SP' at 6.5 FT, 'FLOW REDUCTION SP' at 85%, 'RESUME NORMAL LEVEL CONTROL SP' at 5.5 FT, and 'TIME TO SHUTDOWN IPS SP' at 2.5 MIN.
- HEADBOX LEVEL OPERATION:** Displays 'HEADBOX MODE' (selected) with 'HEADBOX LEVEL' at 2.7 FT and 'LEVEL SP' at 3.0 FT. It includes 'SWITCH TO HEADBOX LEVEL MODE SP' at 9.0 FT and 'RETURN TO LEVEL MODE SP'.
- PEPS PUMP FAIL OPERATION (INTERIM):** Shows 'PEPS PUMP FAIL MODE' (selected).
- CLEANING OPERATION:** Shows 'CLEANING MODE' (selected).

On the right side, there is a 'LEVEL MODE' indicator with a 5-dot scale (dots 1-5 are lit), and a 'LEVEL MODE' box showing 'IPS 73.8 MGD', 'WW 20.5 FT', and 'HB 2.7 FT'. Below this are buttons for 'CLEAN SP'S', 'LEAD LAG', 'PUMP SP'S', 'WW LEVELS', 'WET WELLS', and 'PUMPS AUTO SPD' at 82%. A vertical scale on the right indicates levels from 0 to 8. At the bottom, there is a navigation bar with buttons for 'ALARMS', 'PCS SYSTEM STATUS', 'REPORTS (future)', 'PLANT OVERVIEW', 'DISPLAY LIST', 'MAIN MENU', 'TRENDS LIST', 'EVENTS/ALM HISTORY', 'PRINT SCREEN', 'PREVIOUS DISPLAY', 'CALCULATOR', and 'Critical Alarms'.

Primary Treatment Improvements

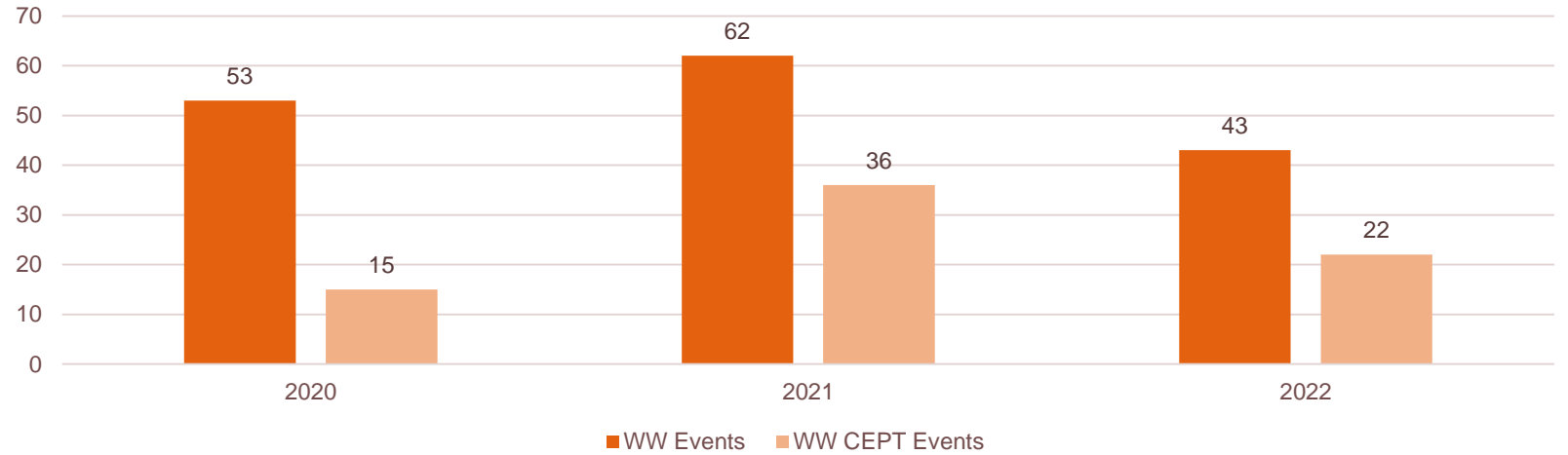
- Improved TSS Capture



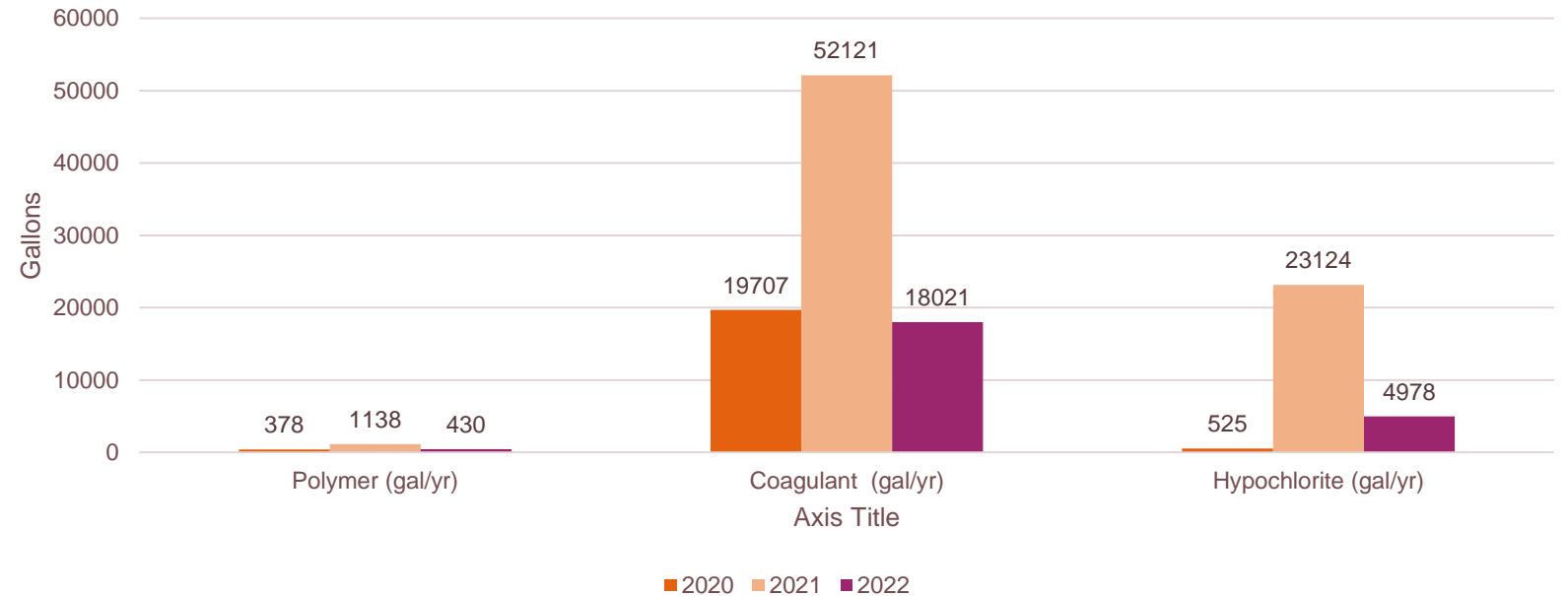
Primary Treatment Improvements

- **CEPT Chemical Usage**

HWPCF Wet Weather Events post-WWEP



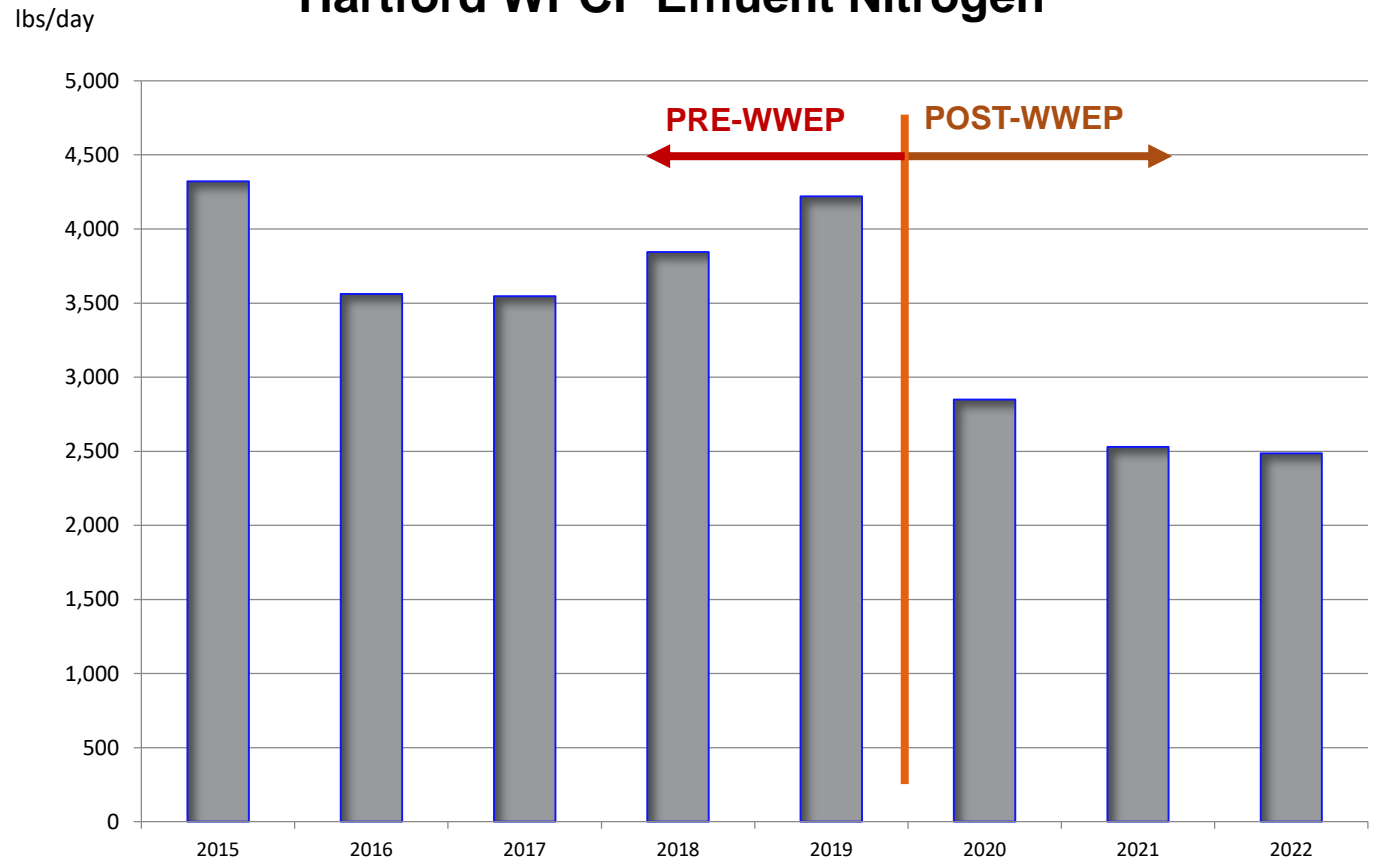
HWPCF CEPT Chemical Usage



Secondary Treatment Improvements

- Reduction in Effluent Nitrogen
- Flow Control to Secondary System to maximize treatment
- Increased durations for BNR during wet weather operation
- % Removal in new PC helped to stabilize Plant SRT

Hartford WPCF Effluent Nitrogen



Wet Weather Improvements

- Eliminate need for CSO Storage Lagoon
- Reduce Labor for cleaning and Odors and maintenance
- **Self cleaning disinfection tank**
- Reduce maintenance of additional pumps and lagoon system



Acknowledgements



Questions?



Brian McGuire
Project Civil Engineer
Arcadis
Middletown, CT
Brian.McGuire@arcadis.com
860-503-1451



Jeff Bowers
Plant Manager
MDC
Hartford, CT
J.Bowers@themdc.com
860-278-7850 x3548

Contact Information