A Success Story (So Far) - The Challenges and Successes Encountered in the Expansion, Modernization, and Optimization of One Oregon's Largest Treatment Plants

2010 PNWS – AWWA Conference

EWEB

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Today’s Presentation

- Background on Plant
- Recent Expansion
- Concurrent Plant Upgrades
- Filter Optimization
- What’s Next

Hayden Bridge Filtration Plant

36 mgd Conventional, 72 mgd Direct Filtration

12 Dual Media Filters

Single Source of Supply for 180,000 People

Issues With The Plant

- Multiple expansions/additions with little work done on initial plant
- Not all work consistent
- Nobody took anything out
- Many cases of “aging infrastructure”

“State of the Art Facility”?

EWEB's Plans for Plant

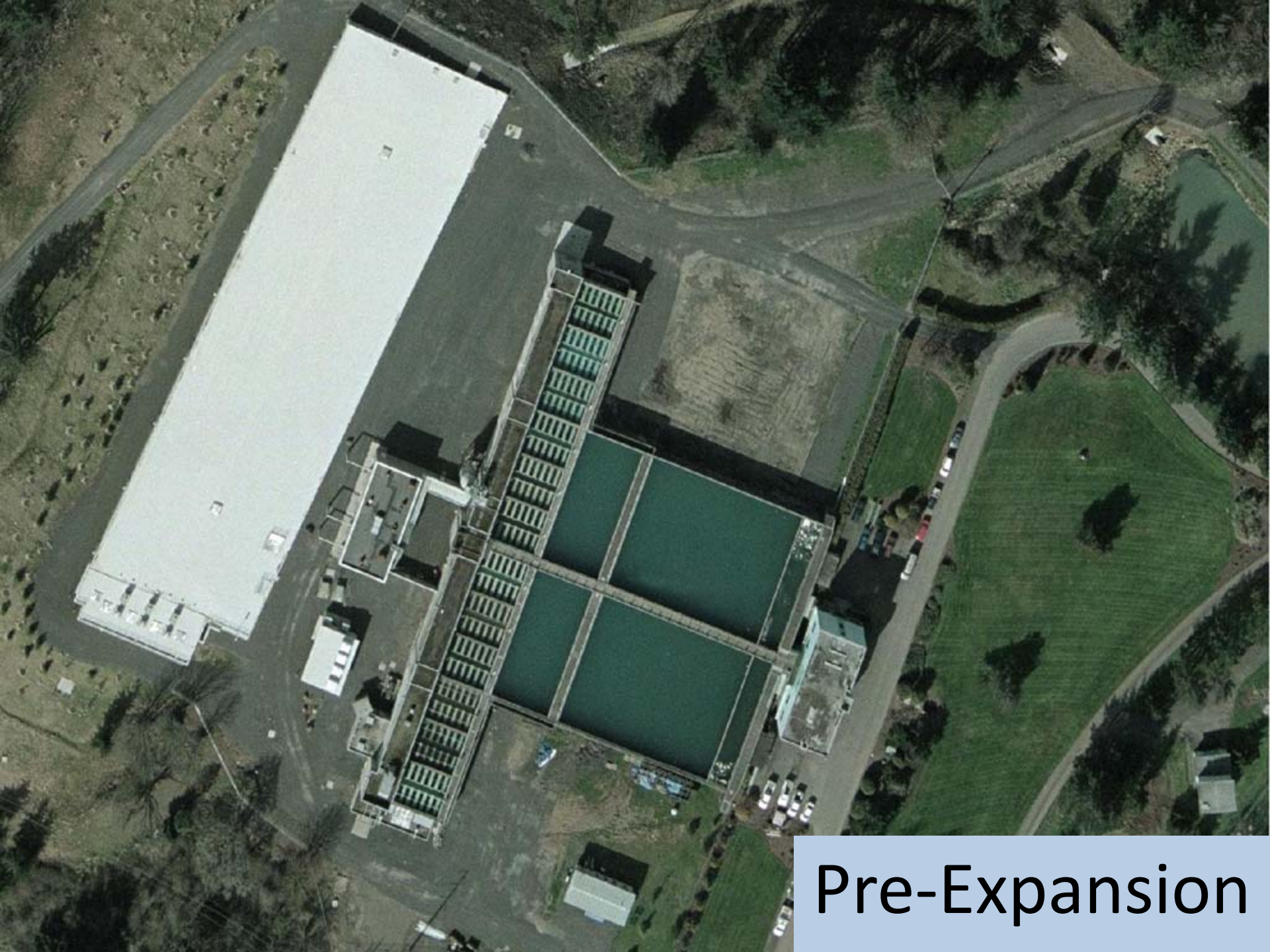
1. Expand to:
   - Increase Capacity
   - Provide Redundancy
2. Upgrade existing systems as redundant systems are constructed
   - Mechanical
   - Electrical
   - Instrumentation
3. Automation as improvements allow

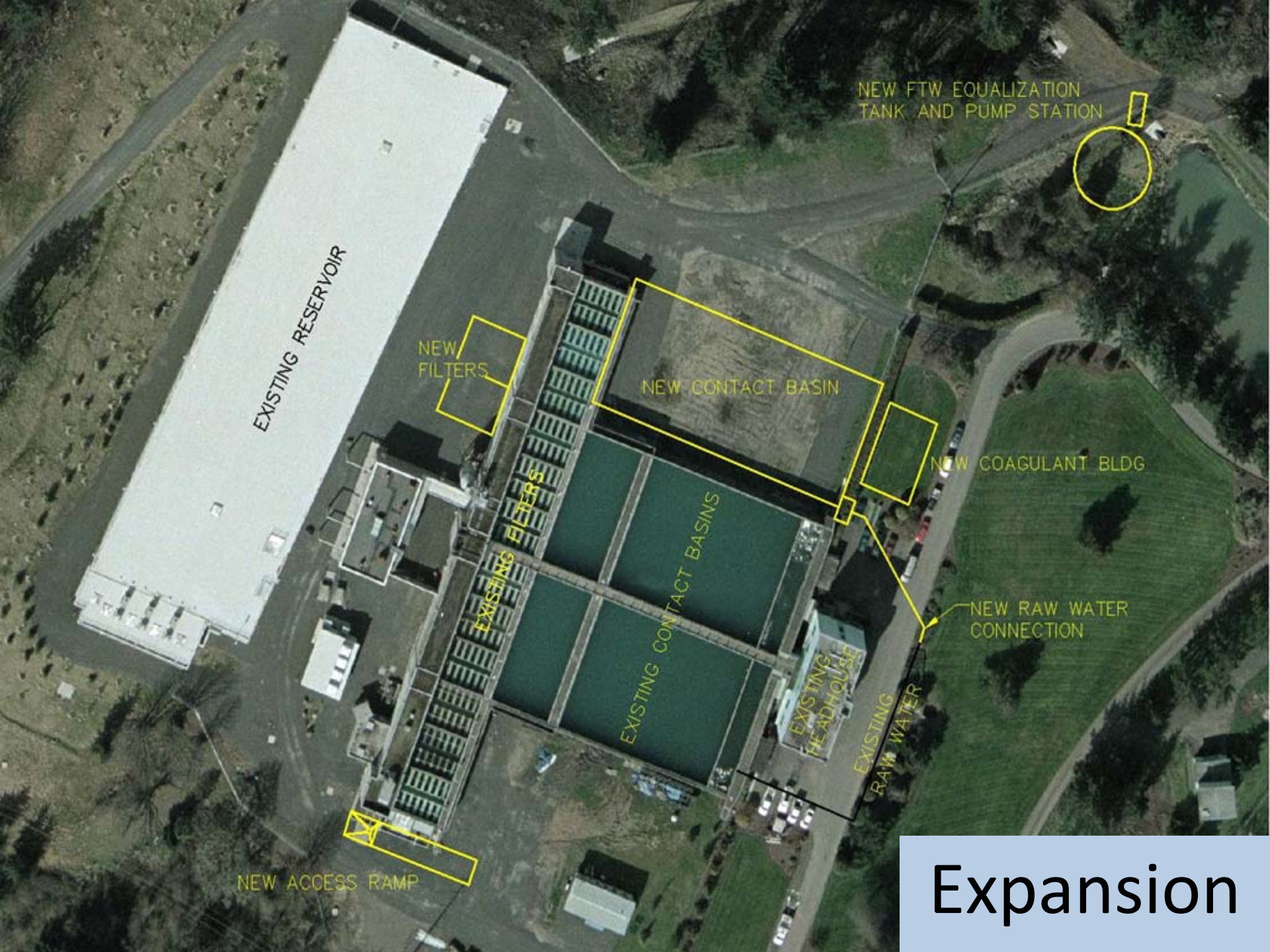
Need For Expansion

- Highest average 3 day max demand
  - 68.8 MGD in 1998
  - 65.3 MGD in 2003
- Existing filtration plant capacity
  - raw water – 72 MGD
  - finished water – 68 MGD

Expansion

- Principal Components
  - New contact basin
  - Two additional filters – finished water capacity to 80.5 mgd
  - New alum and filter aid polymer systems
  - Filter to waste separation


Pre-Expansion


NEW FTW EQUALIZATION
TANK AND PUMP STATION
EXISTING RESERVOIR
NEW
FILTERS
NEW CONTACT BASIN
NEW COAGULANT BLDG
EXISTING FILTERS
EXISTING CONTACT BASINS
NEW RAW WATER
CONNECTION
EXISTING
HEADHOUSE
EXISTING
RAW WATER
NEW ACCESS RAMP

Expansion

Expansion

Contact Basin

Volume: 2 MG

Depth: 16 ft

Contact Basin

Access, Washdown Improvements

Rapid Mixers

Replaced Existing Static Mixers

Rapid Mixers

Vertical - Variable Speed

Filters N7, N8

Filters N7, N8

933 square feet each
12 inches sand
28 inches anthracite
Declining rate operation

Filters N7, N8

Filters N7, N8

- New pipe gallery
- Electric valve actuators
- Standardized pipe/instrument configuration

Chemical System Upgrades

Replaced Alum System

Chemical System Upgrades

New Alum Building

Chemical System Upgrades

New Alum Building

Chemical System Upgrades

New Alum Feed System

Chemical System Upgrades

Replaced Filter Aid Polymer System

Chemical System Upgrades

New Filter Aid Polymer Mixer

Chemical System Upgrades

New Polymer Day Tanks

Filter to Waste Recycle

- Reduced Hydraulic Loading on Pond System and Outfall Volume

Filter to Waste Recycle

- Required extensive work in pipe gallery

Filter-to-Waste Recycle

New Equalization Tank & Pump Station

Backwash Pump Replacement

- Existing constant speed pump had reached its useful life

Backwash Pump Replacement

- Purchased two horizontal mixed flow pumps.
- Variable speed operation

Backwash Pump

Dual Purpose: Backwash and Backup to Finished Water Pumps

Plant Pump Upgrade

Existing constant speed pumps operated near shutoff

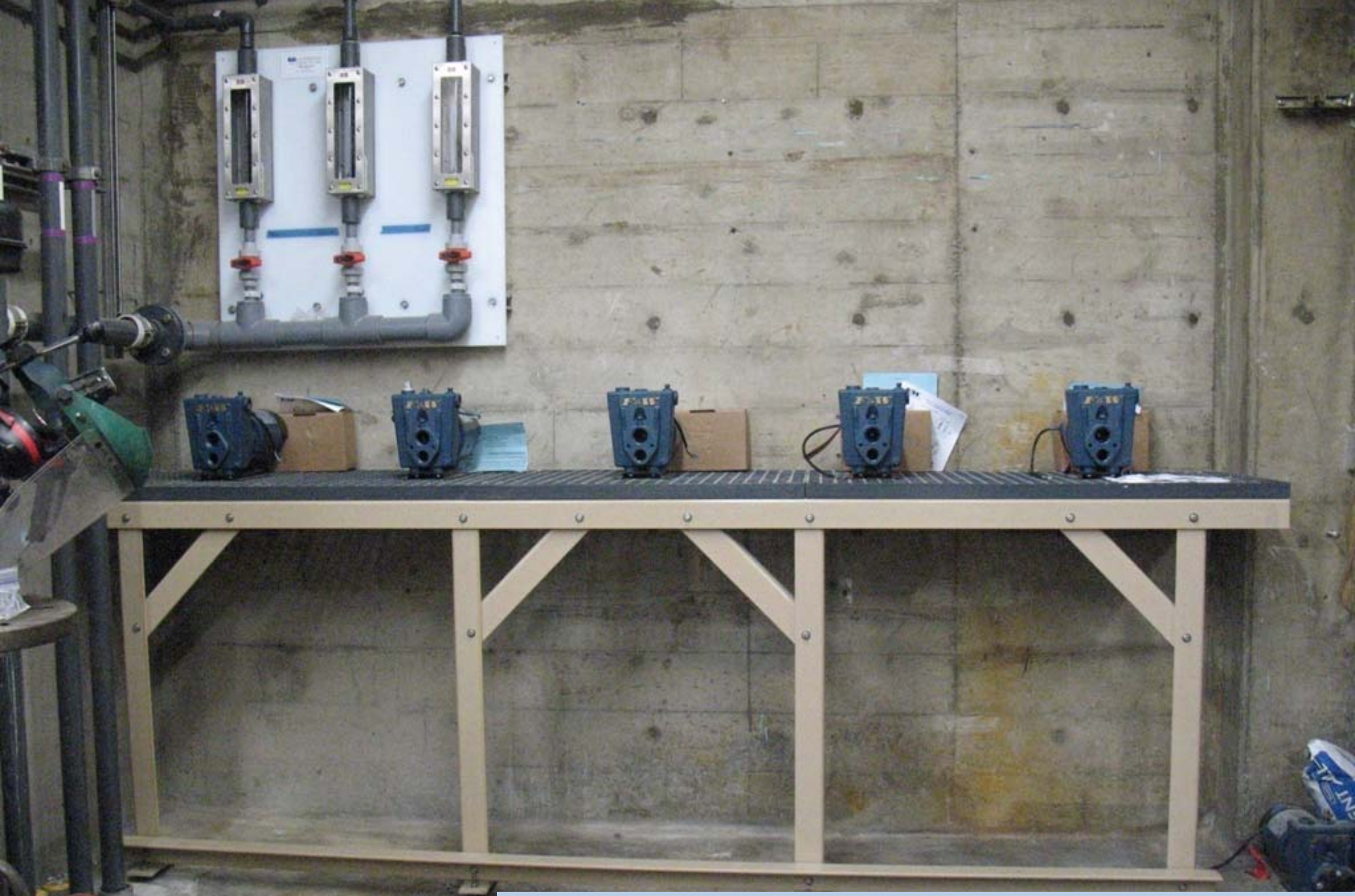
Plant Pump Upgrade

New variable speed pumps matched demand

Pump Energy Savings

- Backwash Pump
  - 56% Reduction in Energy Use
  - State Tax Credit, EWEB Incentives
- Plant Water Pumps
  - 30% Reduction in Energy Use
  - EWEB Incentives

Sample Pump Upgrade



Sample Pump Upgrade

SANITARY SE
MILTON ROY
Streaming Current Detector
SC4200
RAIN DIAL

SCM Upgrade

CHEMTRAC
STREAMING CURRENT SENSOR
DURA-TRAC™
CHEMTRAC
Streaming Current Monitor
SCM2500

SCM Upgrade

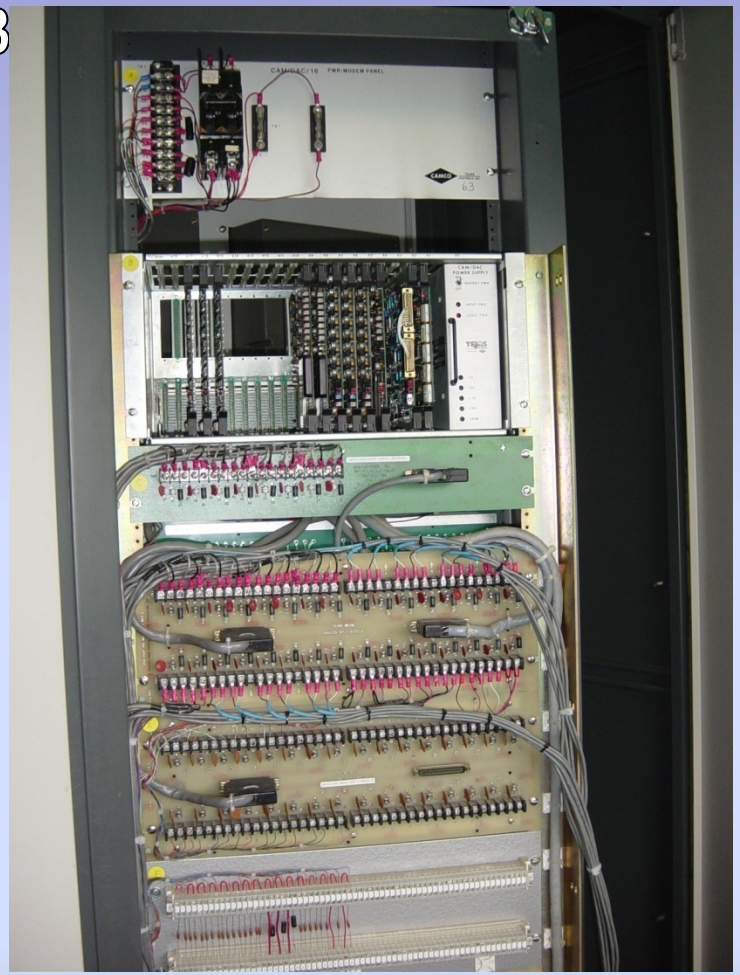
Instrumentation Upgrades

- Goals
  - Migrate from RTU to PLC-based control systems
  - Standardize
  - Simplify controls
  - Automate select systems
  - Compartmentalize controls
  - Network and integrate instruments
  - Document everything
  - Reduce wiring complexity – eliminate unused equipment

Instrumentation - Progress Made

RTU Replacement

RTU-63



PLC-63

Instrumentation - Progress Made

Standardization - Networking

- Filter Instrumentation

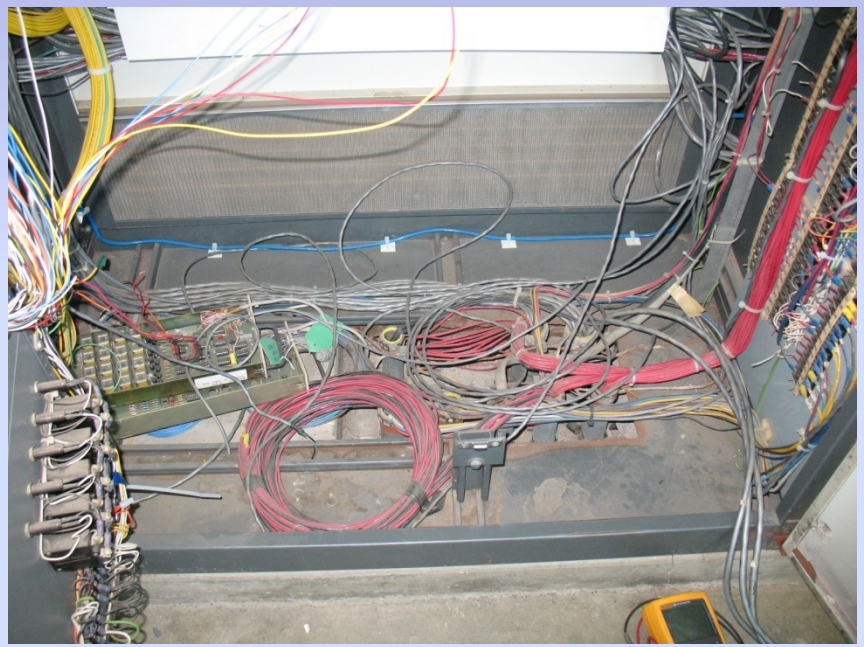
Standard panels with backup power

Instruments networked into PLC and SCADA

Instrumentation - Progress Made

Wiring Cleanup & Documentation

BEFORE



AFTER

A few items we got rid of

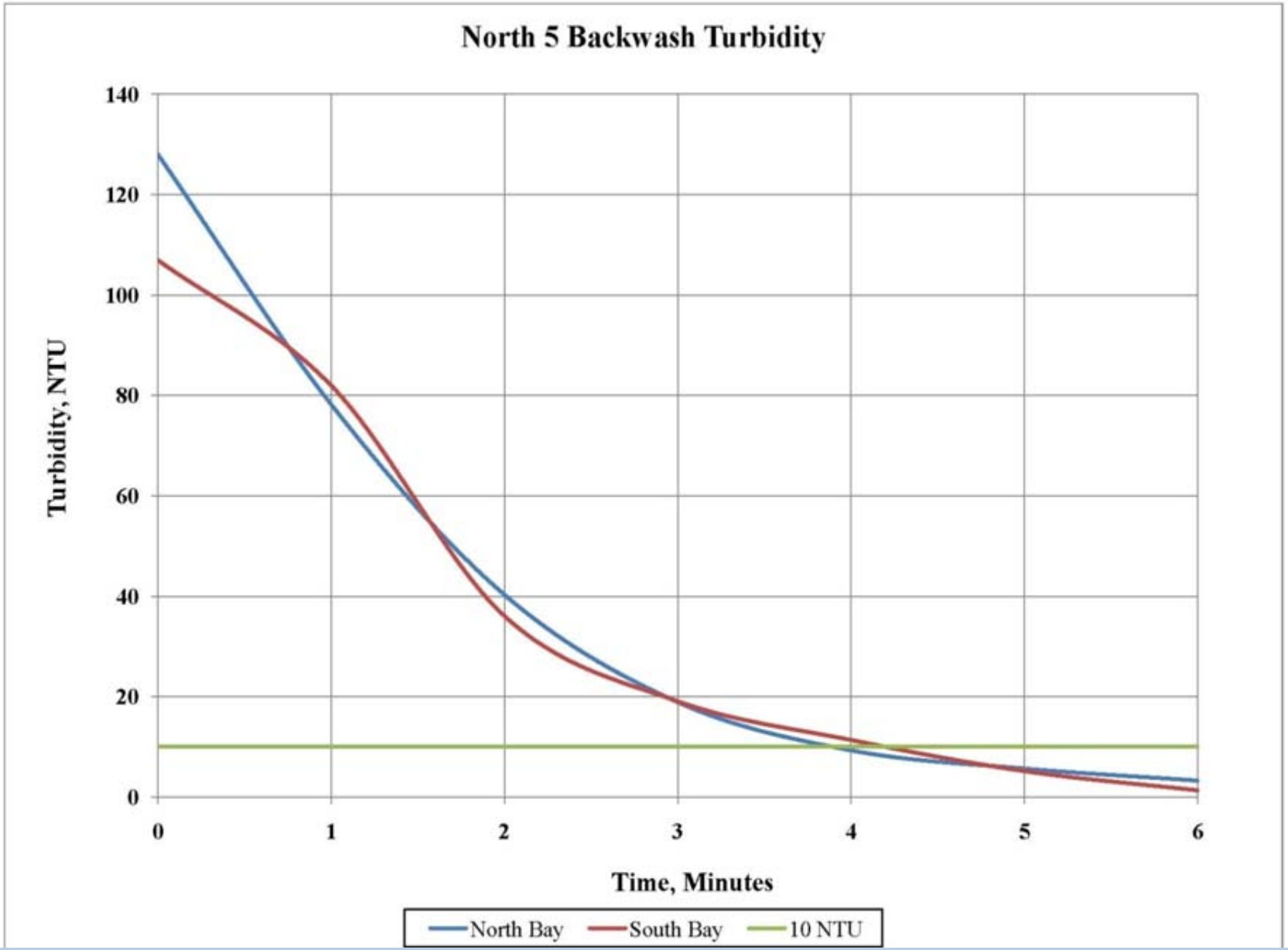
A few items we got rid of

Financial

- How We Are Paying For It
  - Commissioners Committed to Infrastructure Upgrades
  - Rate Increases (9%, 9%, 17%, 18%, 7% - last five years)
- What It Cost
  - Expansion $12,000,000
  - Other Concurrent Projects - $2,000,000
  - $1,000,000 to $2,000,000 per year for next several years

Operations Staff Efforts Filter Optimization

- A Work in Progress
- Data Collection
  - Date, alum dose, turbidity, Unit Filter Run Volume, Temp, BW Flow
  - SCADA Modifications to Facilitate Data Collection
- Generated unit filter run volume (UFRV) graphs and turbidity profiles for each filter



Filter Optimization

Profile Helped Reduce BW Time

Filter Optimization

- Made core sampler and began measuring media profile during filter maintenance
- Made bed expansion tool and began experimenting with BW flow rate at different water temperatures

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What's Next? Filter Upgrades

What's Next?
More Cleanup

Questions?