

# Manganese removal at Clark Public Utilities Paradise Point Water Treatment Plant

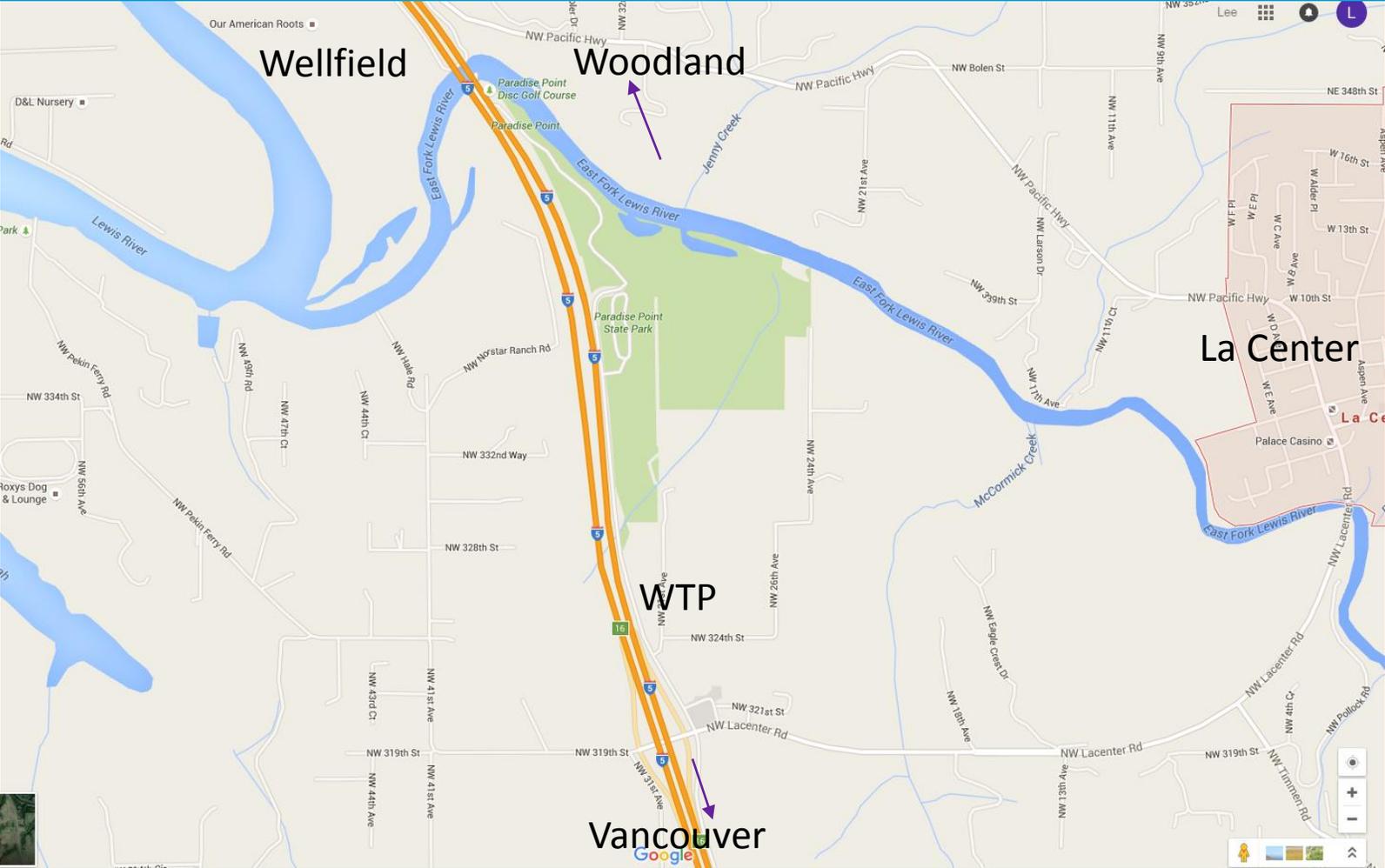
PNWS AWWA Conference

Boise, ID 2016

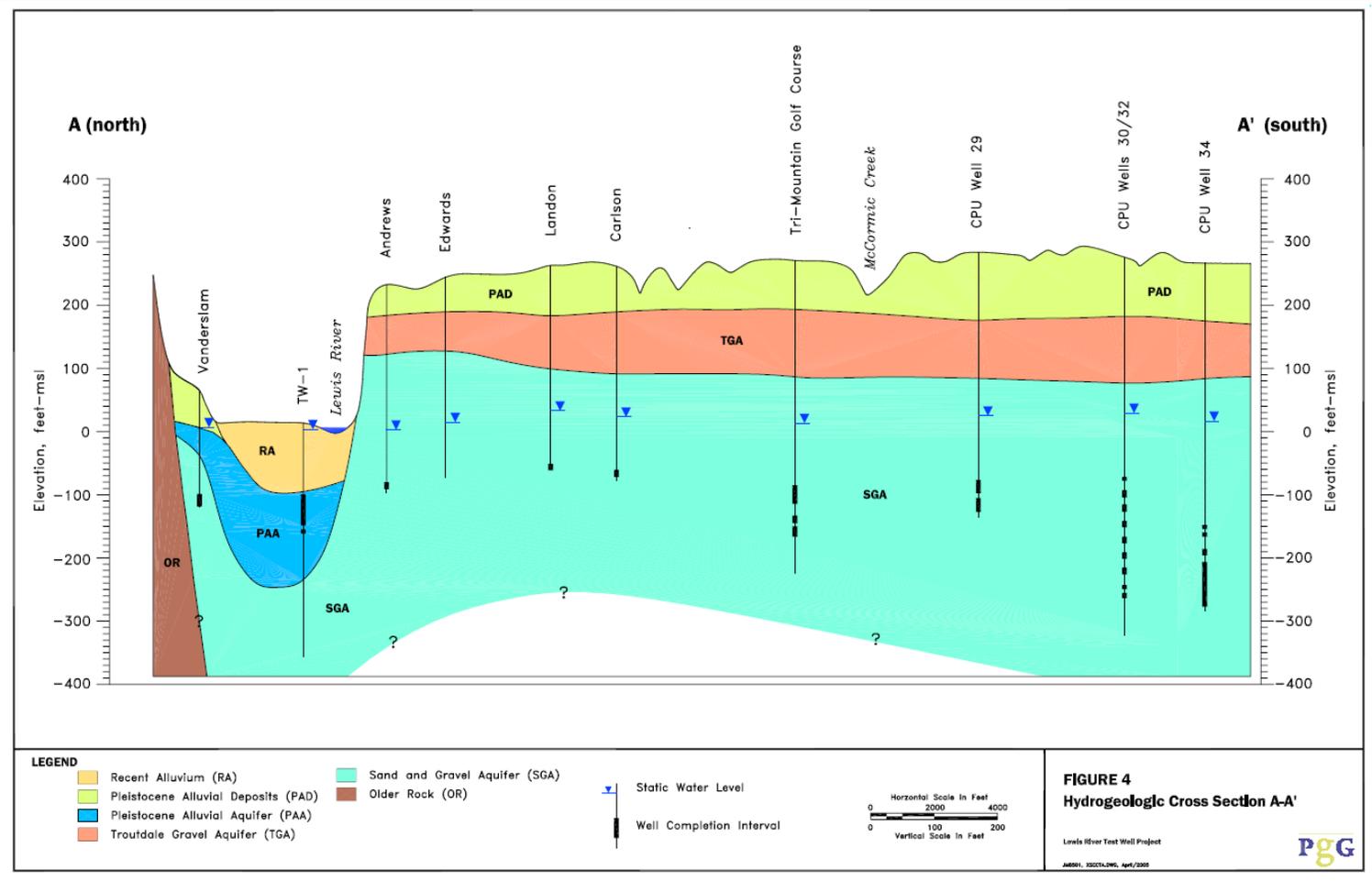


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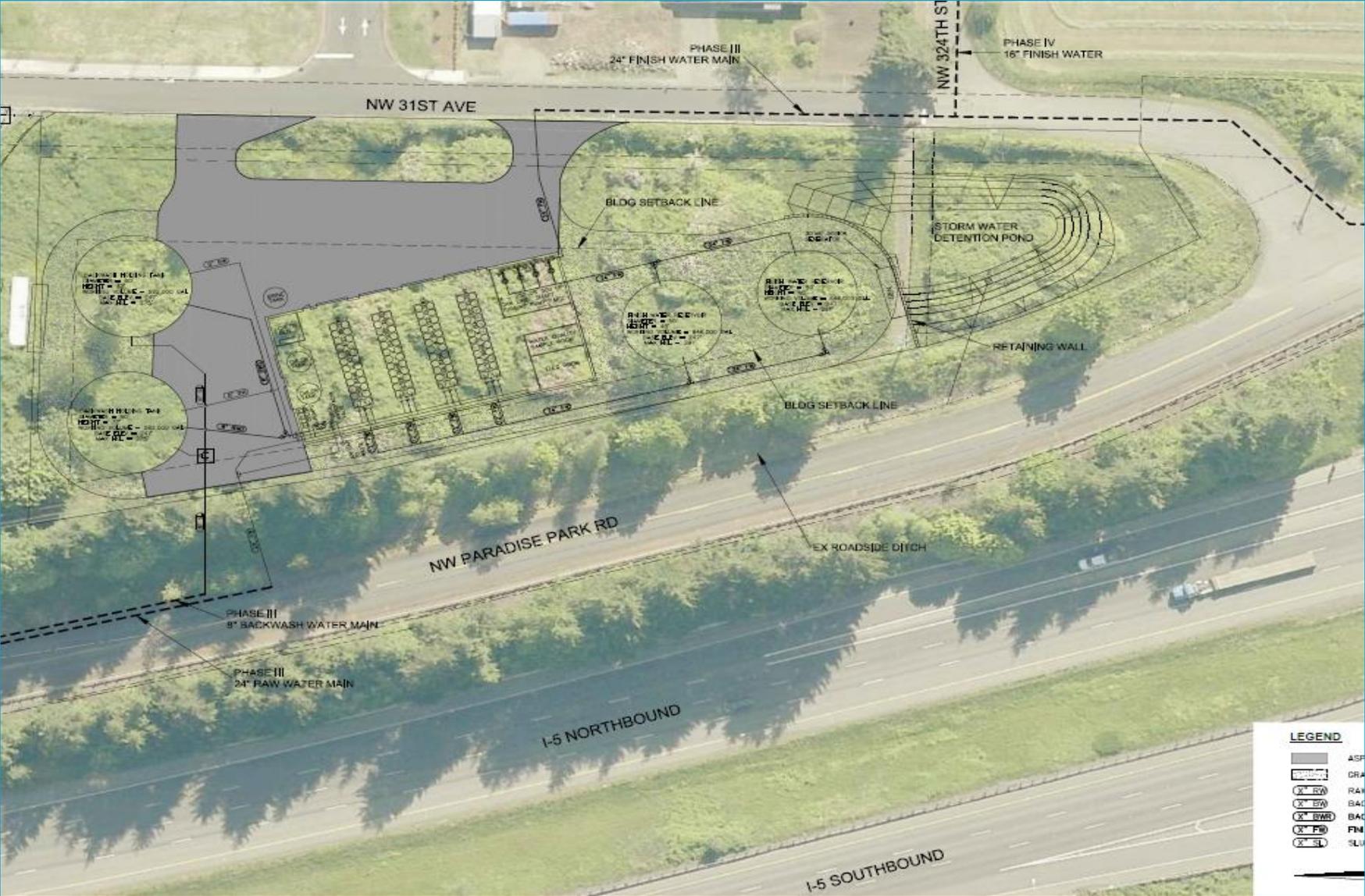
# Paradise Point Water Treatment Plant



# Well Profile



# Paradise Point Water Treatment Plant

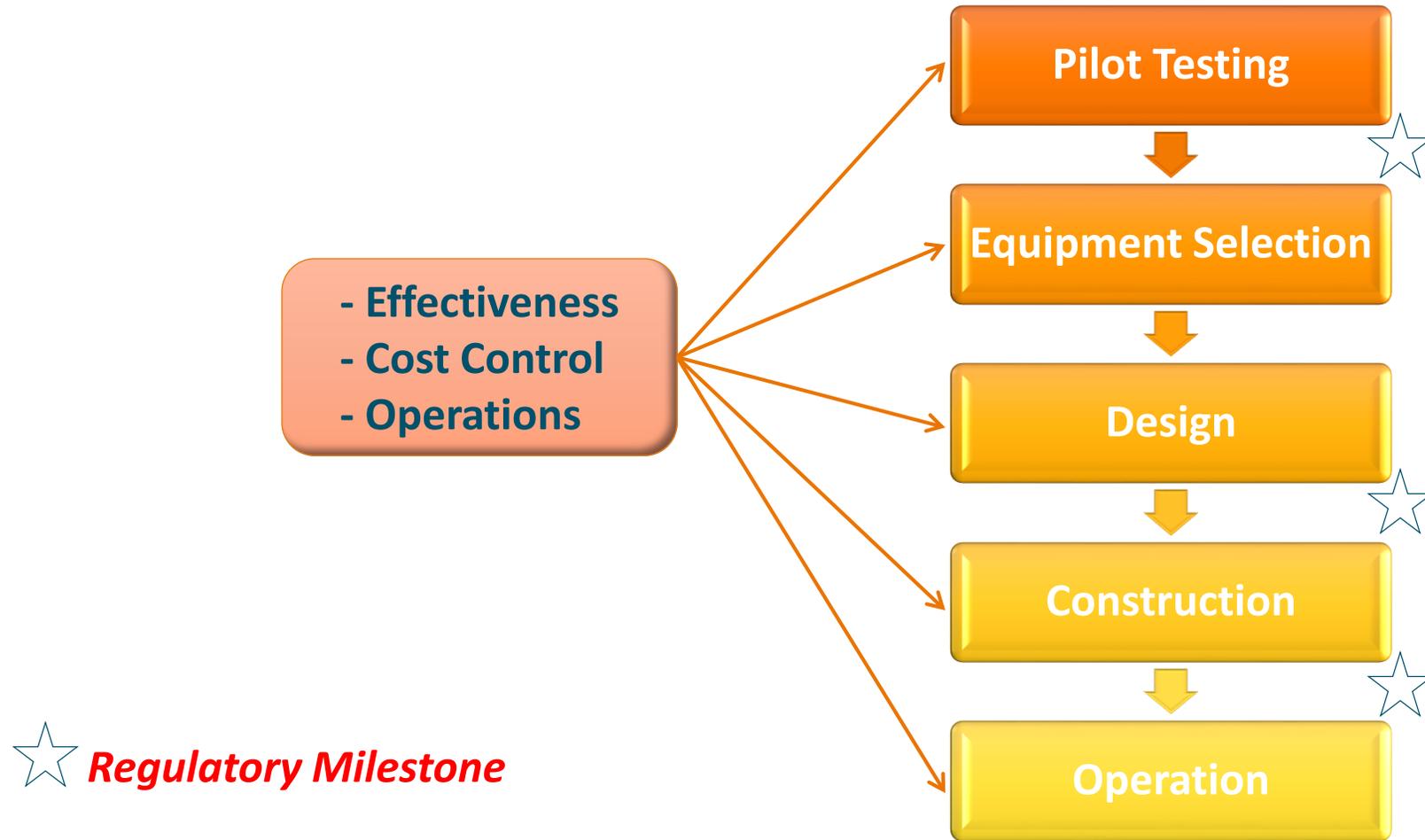


# Paradise Point Water Treatment Plant - Key Issues





# Paradise Point Treatment Plant Approach



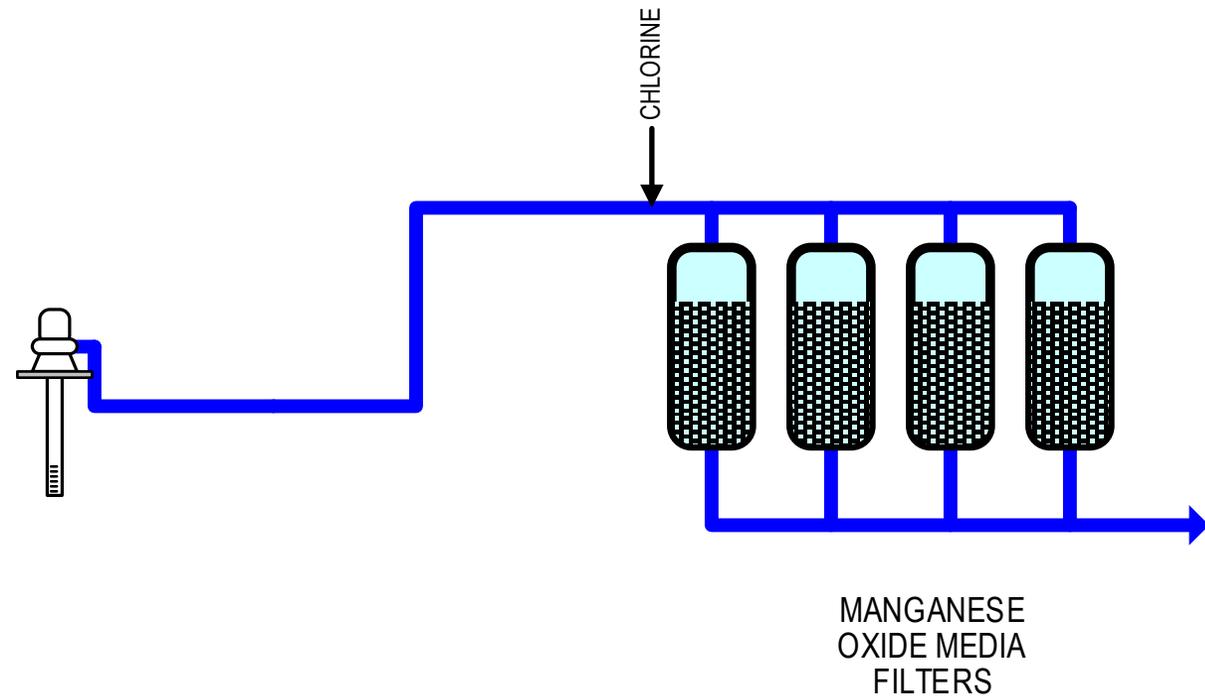
***Proven project approach addresses critical project issues and delivers Clark Public Utilities a best-in-class facility***

# Removal Mechanisms

- Oxidation-precipitation
- Biological Removal
- Ion Exchange
- Adsorption



# Adsorption Schematic



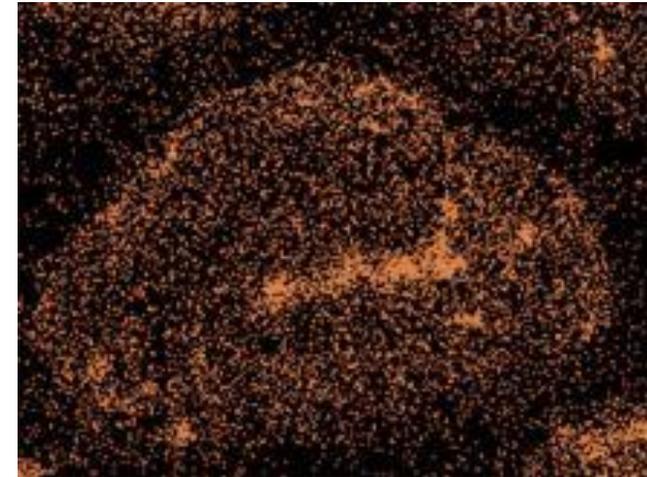
# Manganese Greensand

- Manganese Greensand
  - Zeolite media impregnated with manganese dioxide
  - New Jersey glauconite treated with manganous sulfate and potassium permanganate to get  $MnO_2$  Sites
  - Must be regenerated continuously or periodically
  - 0.09 lb/cu ft of mineral, 0.18 lb/cu ft  $KMnO_4$

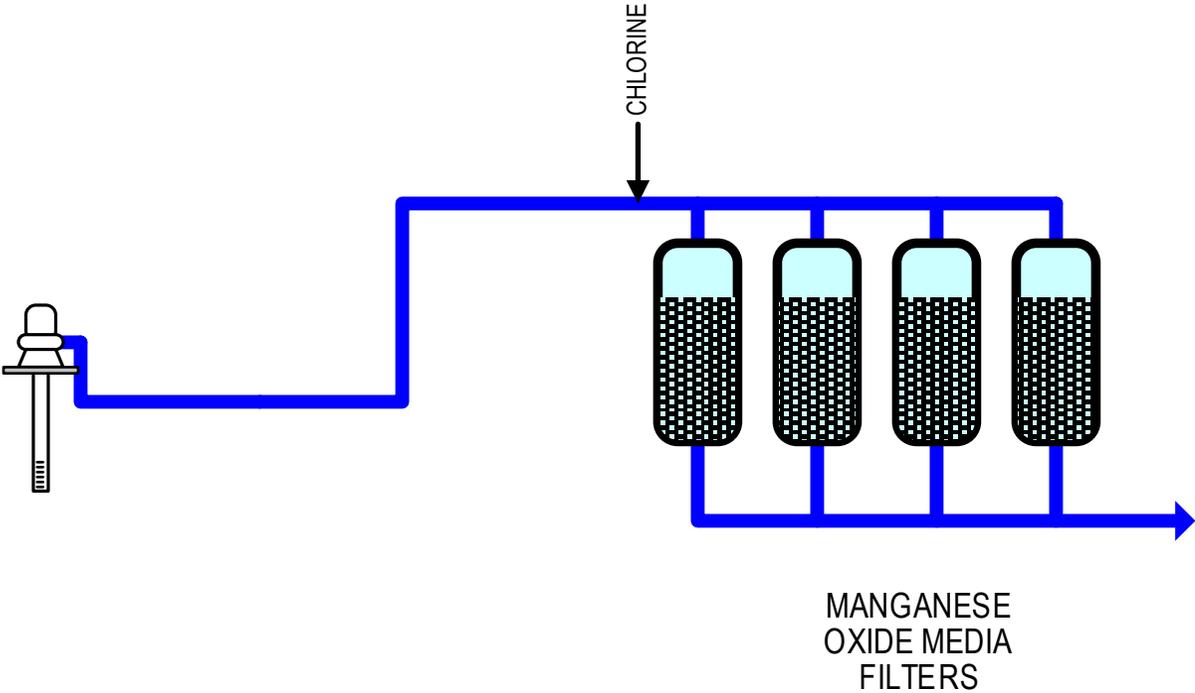
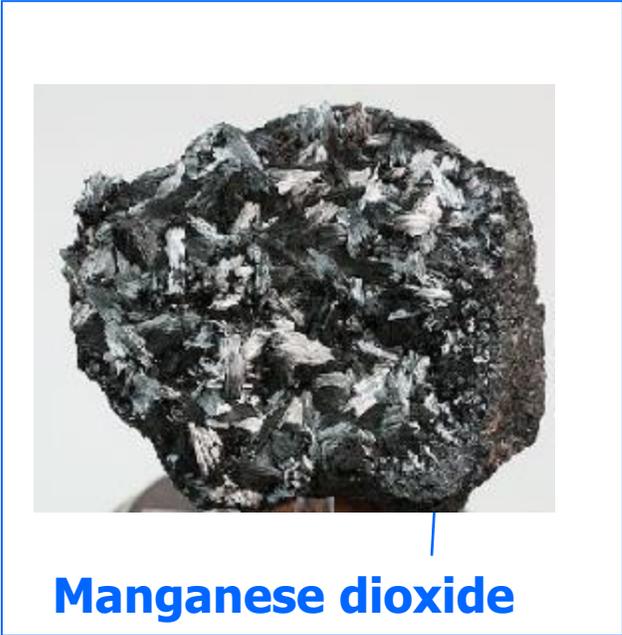


# Other Oxide - Based Media

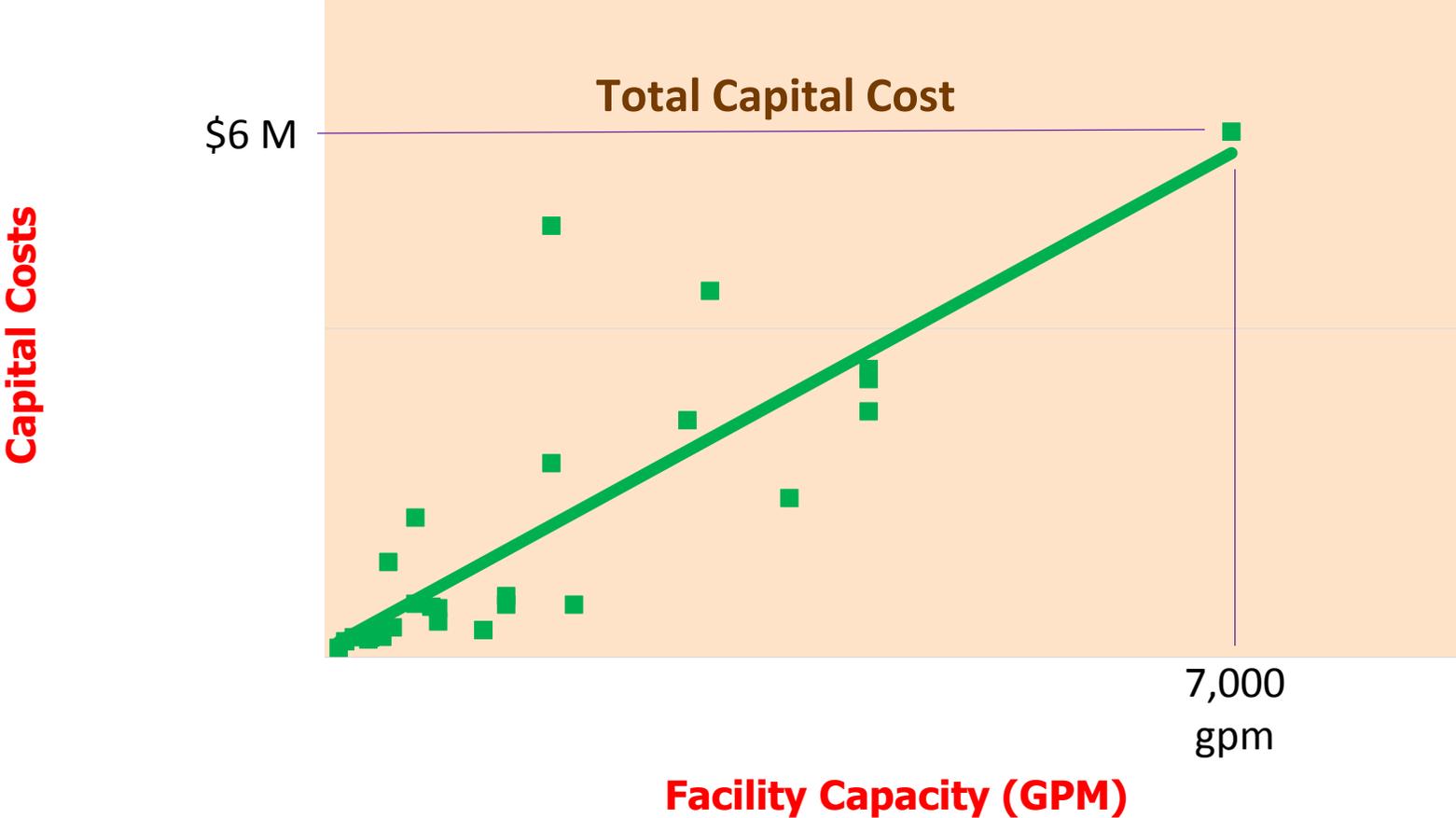
- BIRM
- Oxide coated sand
  - Higher adsorptive capacity than greensand
- Pyrolusite
  - Manganese dioxide mineral
  - (3x adsorption capacity)



# High Rate Iron and Manganese Removal



# Cost-Effective Designs



*Design innovation and experience provides  
Clark Public Utilities cost-effective plant design and operations*

# Pilot Testing



## Test Processes

- Tests Multiple Media
- Allows Competitive Bidding

## Avoid Pitfalls

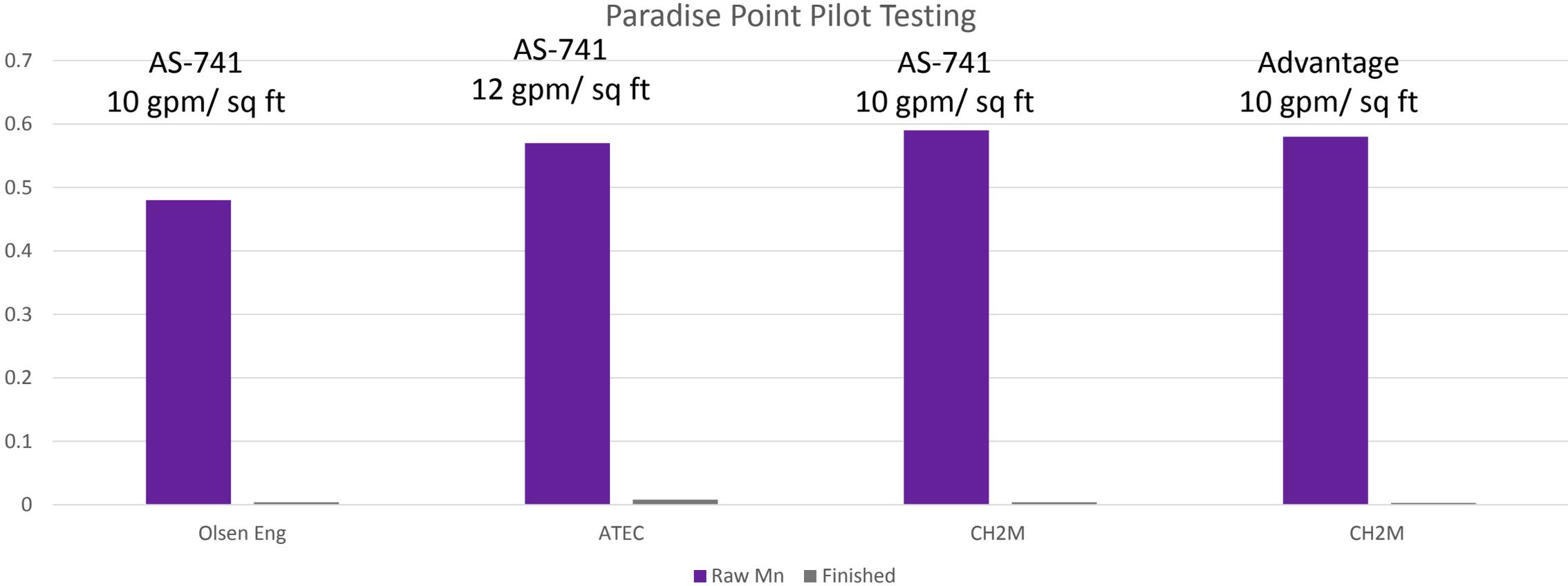
- Silica Adsorption
- Tastes and Odors

## Maximize Loading Rates

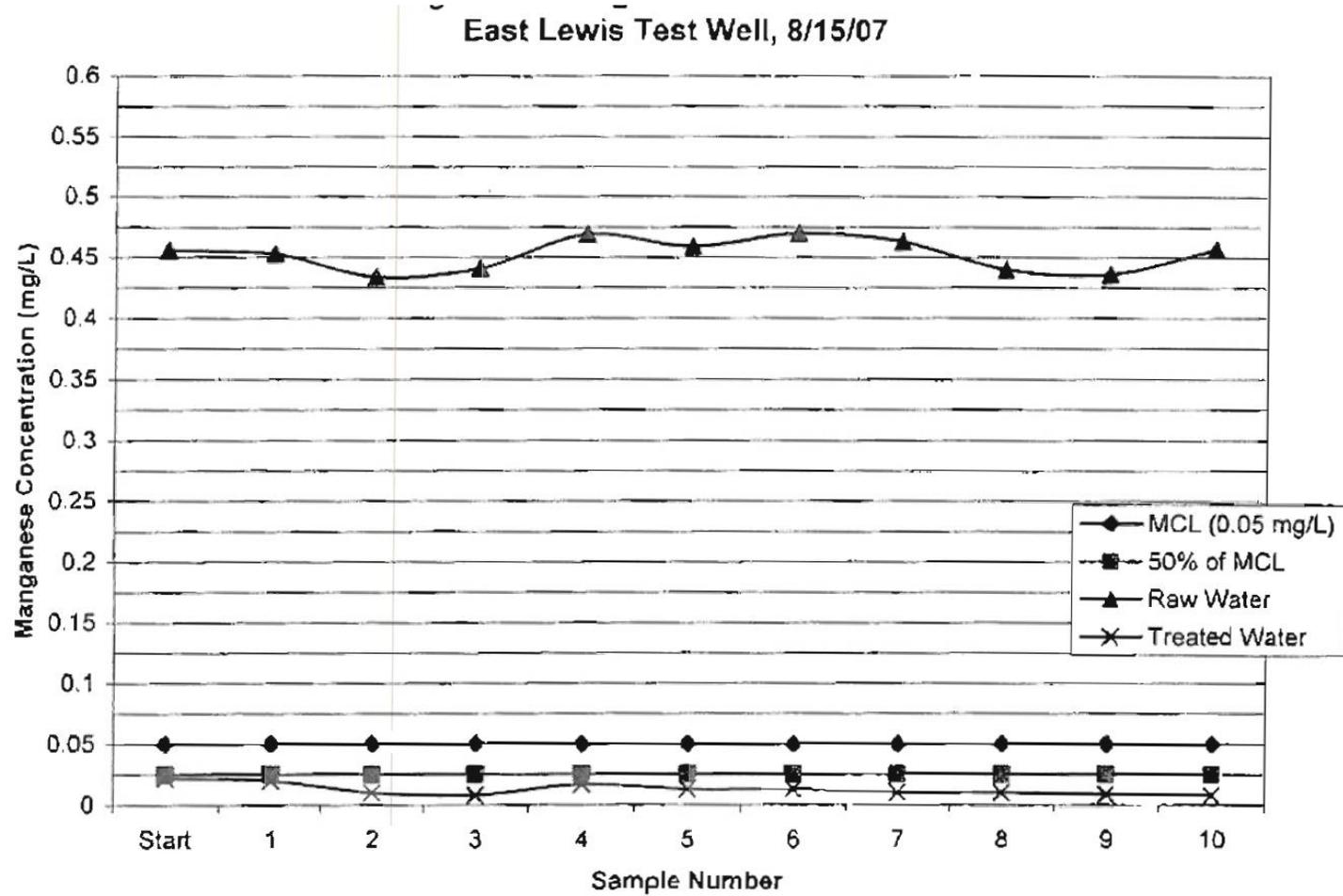
- High Rate: 8 to 15 gpm/sq ft

***Pilot testing results in effective treatment, demonstrates operational ease, and provides cost savings opportunities***

# Pilot Testing

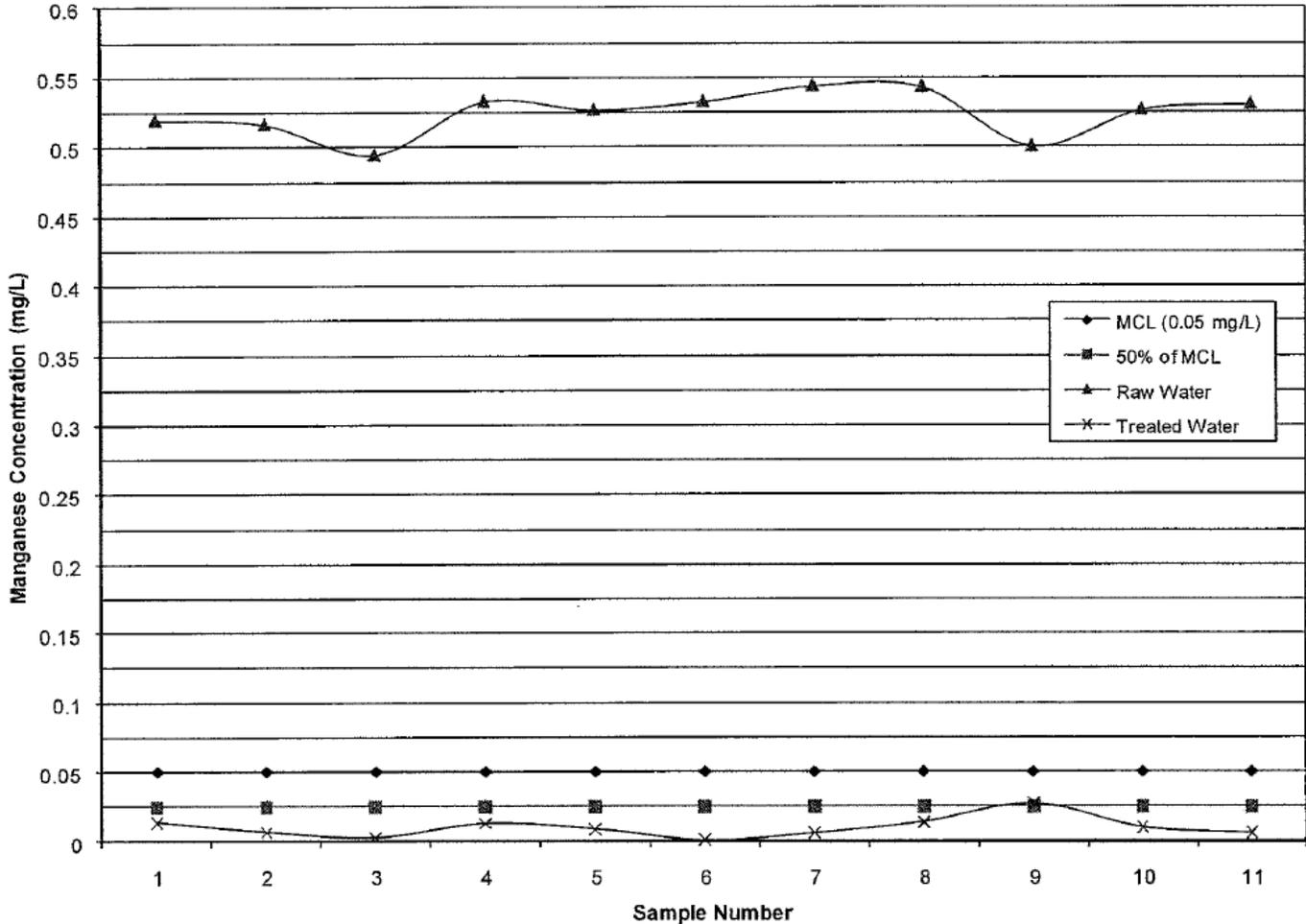


# Pilot Test - 2007



# Pilot Test 2011

Figure 5  
Paradise Point Well No. 1 Pilot Test Results - Manganese

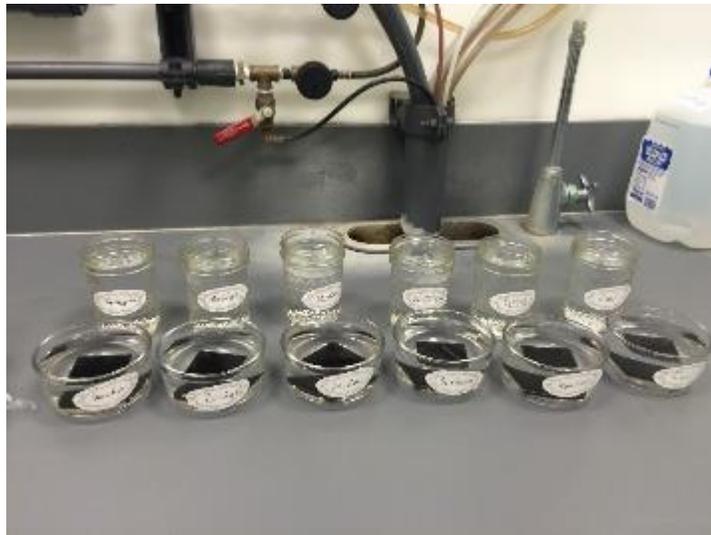


# Pilot Testing

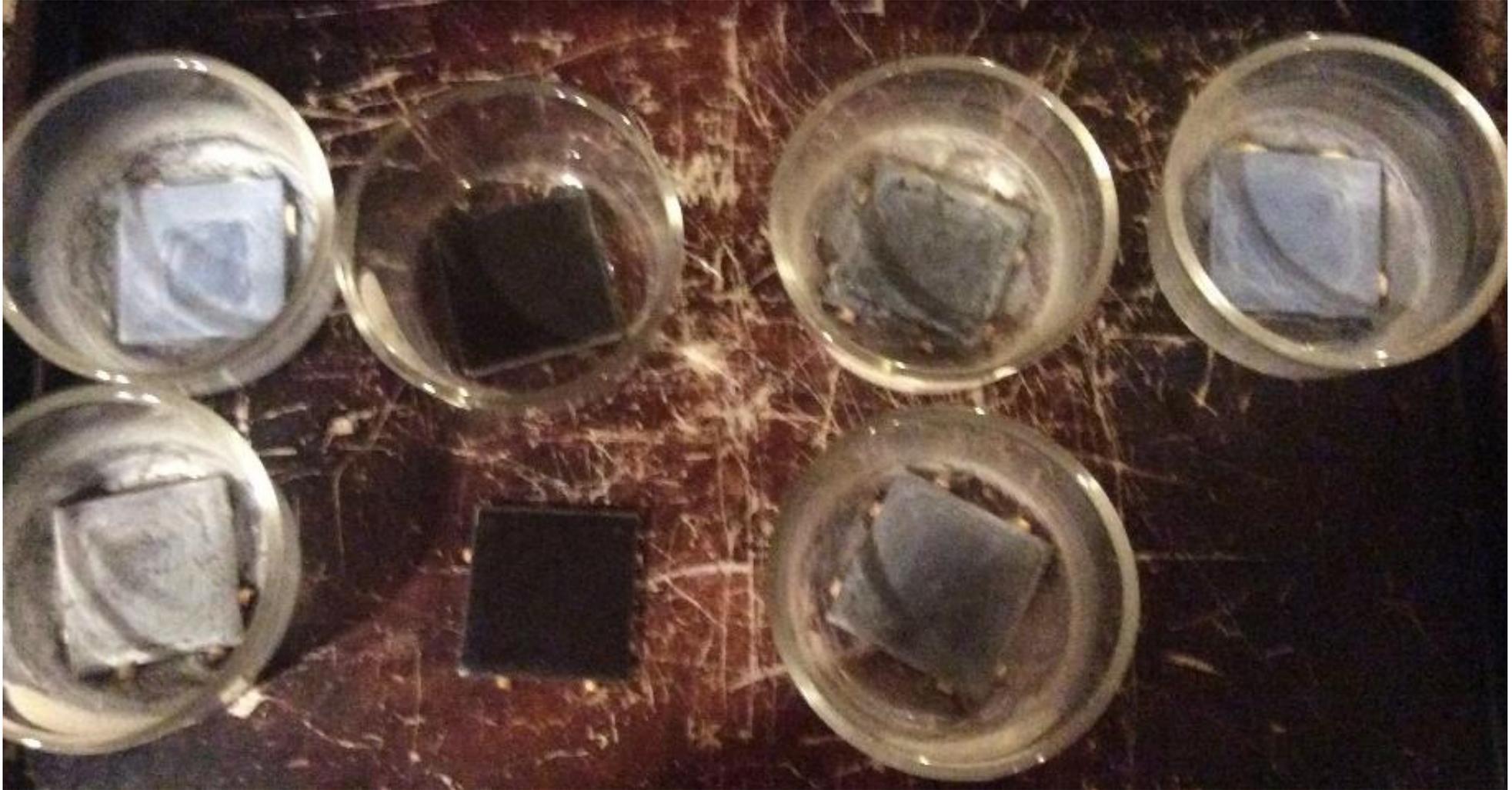


- Manganese Removal
- Low Iron
- Chlorine Dose 2 mg/L
- Silica Not Adsorbed

- AS-741 and Advantage Media Tested
- Loading rates up to 12 gpm/sq ft were successful
- Settling was slow
- Silica did not stick to glassware/tiles



# Evaporation & Residual Scale



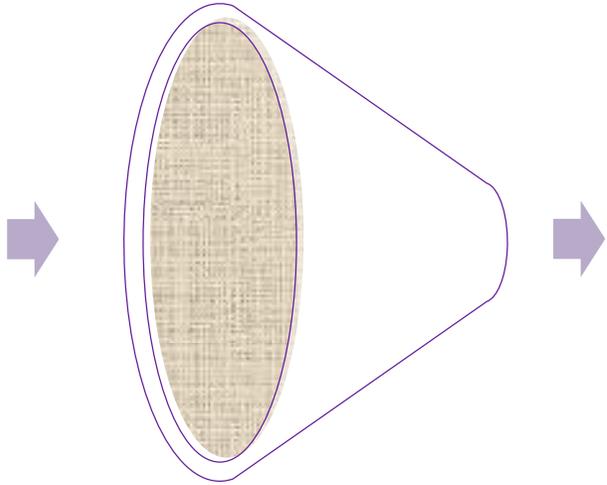
# Residual Scale – after dishwashing



# Equipment Selection

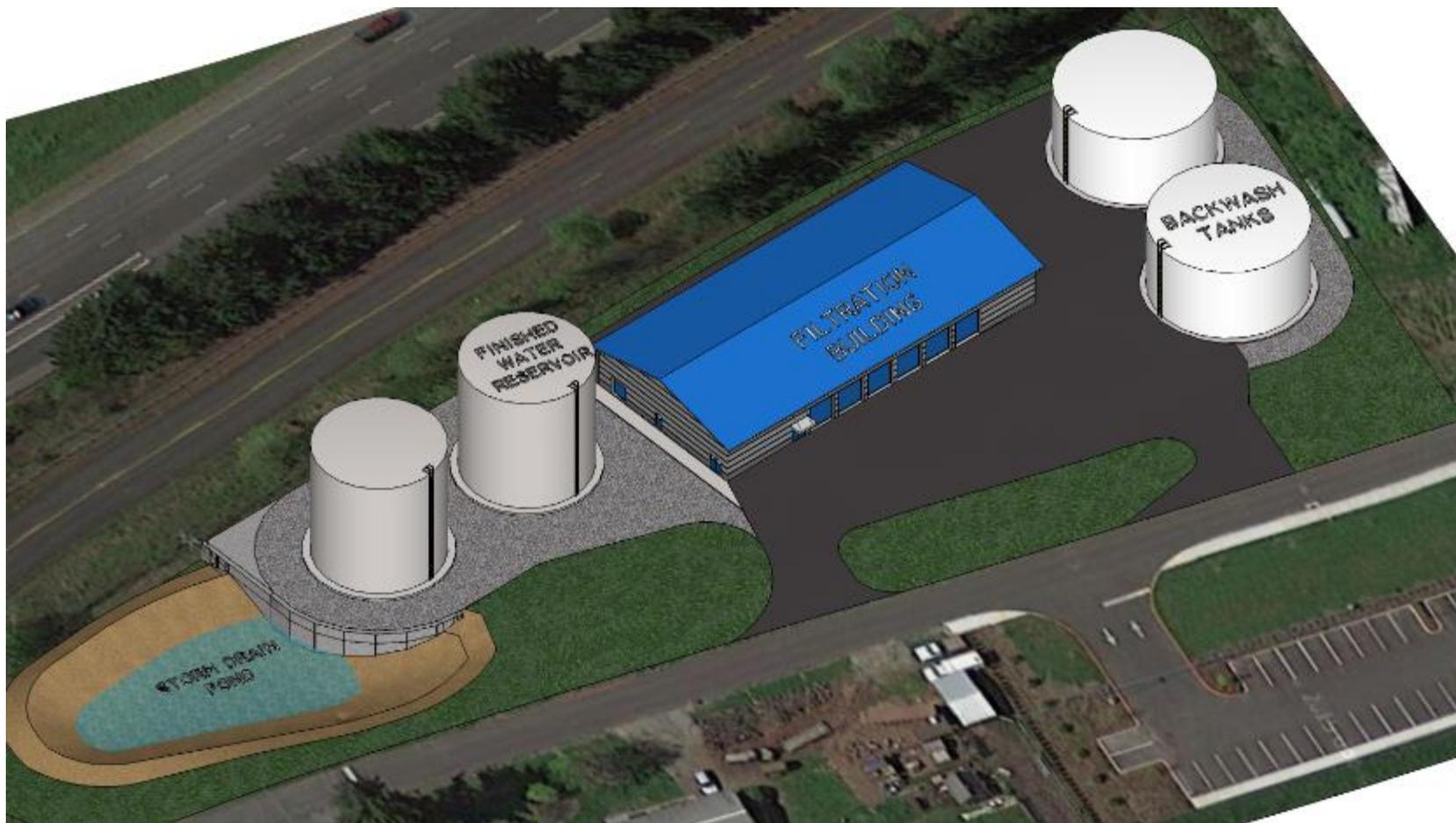


ATEC	Roberts
H&T	Layne
Tonka	Yardney
Pureflow	Others



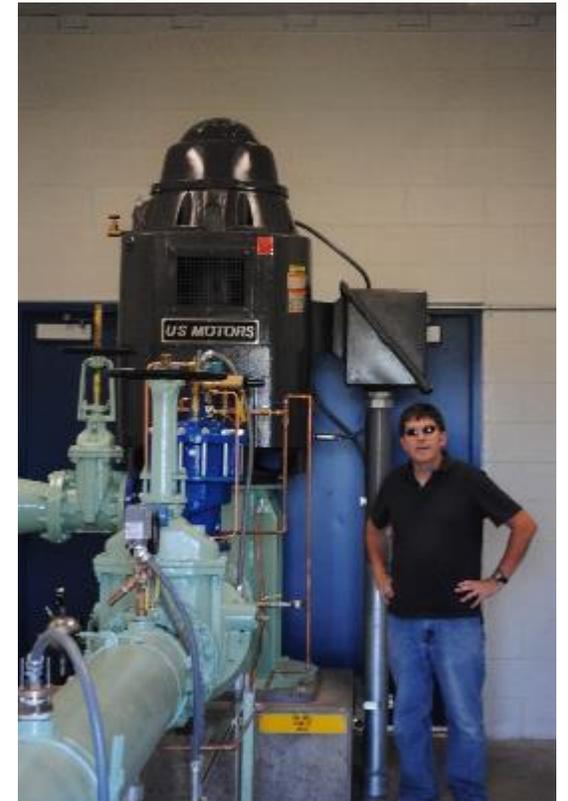
***Vendor experience results in performance specs that increase treatment effectiveness and reduce costs***

# Compact Site Design



***Experienced design minimizes the facility footprint and saves capital costs***

# Treatment Building



***Accommodating varied building styles  
minimizes the impact to surrounding neighborhood***

# Simplified Operations

- Automatic backwash – no pumps, simple control
- Minimizes wastewater



*Filters*



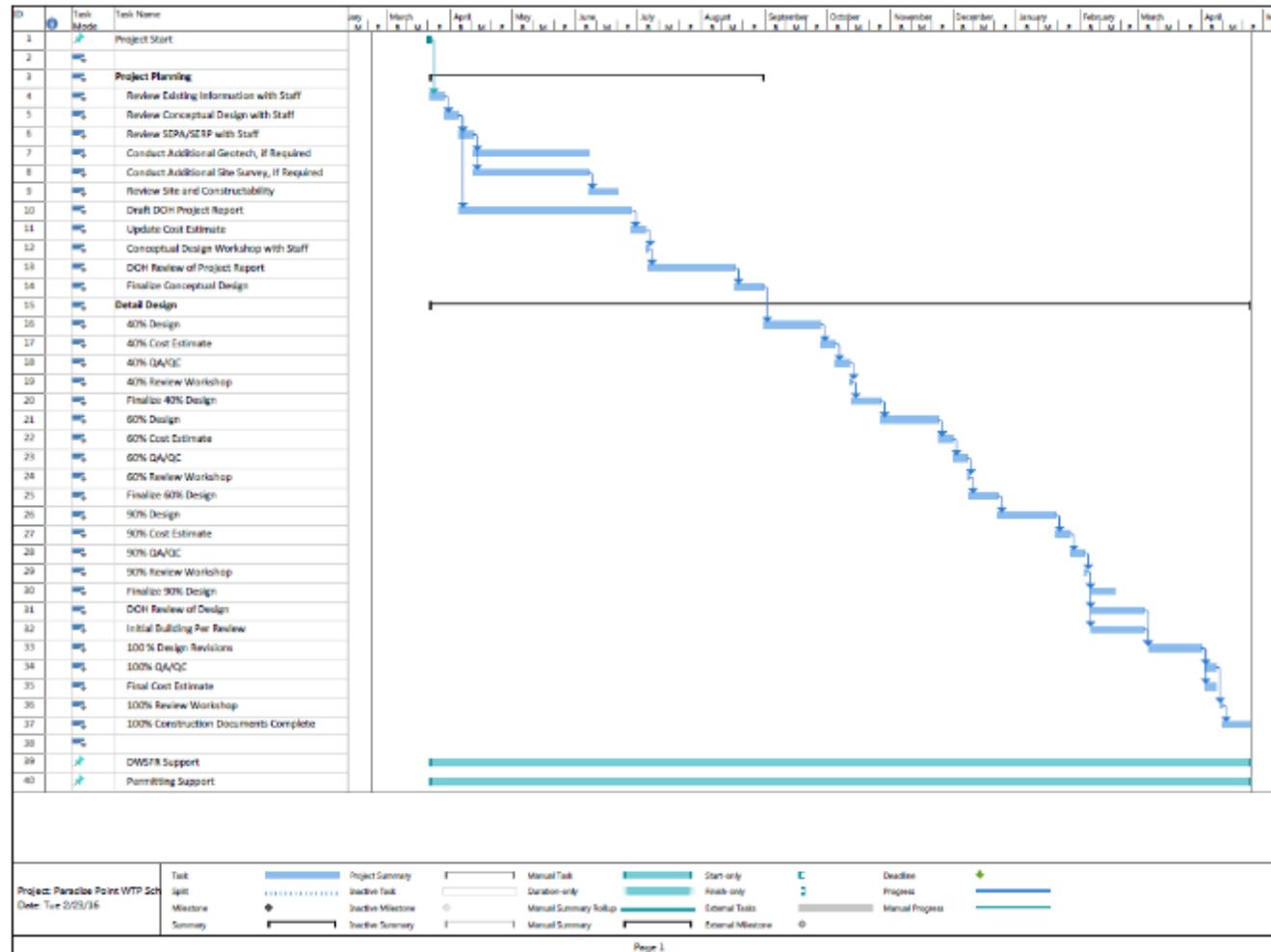
***Automated backwash and low chemical use  
simplify O&M time and costs***

# Backwash Water Handling



***Operations play a key role in selecting the best residuals handling method***

# Project Schedule



**Thorough project understanding and frequent communication means Clark Public Utilities' schedule will be met**

# Paradise Point Water Treatment Plant - Outcomes



- Control Costs
- Effective System
- Easy to Operate
- State Approval
- Schedule Met

***CH2M HILL's treatment plant experience brings peace of mind and keeps Clark Public Utilities a best-in-class utility***



PNWS AWWA

Boise ID

May 6, 2016

# Paradise Point Water Treatment Plant

