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2023 LCA Pretreatment Plant Master Plan

03/27/2023 LCA Board of Directors Meeting

Agenda

- Plant Background Information
- Scope of Master Plan
- Key Findings
- Recommendations
- Q&A

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Plant Background Info

LCA Pretreatment Plant (PTP)



- Commissioned in 1990
- Treats high-strength wastewater (WW) from commercial & industrial customers and residential properties
- High-rate treatment process, uses High Purity Oxygen
- Design flow capacity: 5.75 million gallons per day (MGD)
- Design load capacity: 76,500 pounds per day (lbs/d) BOD5
 - Load-based design capacity is <u>equivalent to a 60-MGD</u> <u>municipal WWTP</u>
 - Kline's Island WWTP = 40 MGD / 70,000 lbs/d BOD5
- PTP's effluent discharges into an interceptor system and conveyed downstream for final treatment at Kline's Island WWTP

FLOW AND LOAD COMPOSITION TO PTP





22%

Compostion of WW LOADS to PTP

BBC 21 commercials & industrials Haulers Others (including residential)

12%

BBC 21 commercials & industrials Haulers Others (including residential)

- Boston Beer Company (BBC) 31% of flow / 65% of load
- Commercial & Industrial 34% of flow / 22% of load
- Hauler Waste 3 % of flow / 12% of load
- All others 32% of flow / 2% of load



Scope of Master Plan

Scope of Work

- Task 1 Flow and Load Projection Refinement
- Task 2 Regulatory Review
- Task 3 PTP Capacity Evaluation, Improvement Recommendations
- Task 4 Renewal and Replacement Needs
- Task 5 On-site Cogeneration / Combined Heat and Power (CHP)
- Task 6 Recommendations / Implementation Plan

Task 1 - Flow and Load Projection Refinement



Methodology to Develop Future Flow and Loads to PTP

Marons 2053

Methodology to Develop Future Flow and Loads to PTP



Future Flows vs. Original Design

Future Loadings vs. Original Design

Task 2 – Regulatory Review

Regulatory Review

Permits/Agreements:

- Industrial Pretreatment Permit (not PADEP regulated)
- Effluent limits: 25 mg/L for BOD5 and 25 mg/L for TSS (LCA-Jacobs Operating Agreement)
- Industrial Stormwater Discharge PADEP
- Air PADEP : NO_x and SO₂, multiple sources
- Biosolid Residuals: General Permit for Beneficial use of Wastewater Treatment Residuals

Future Regulations (State and Federal):

- Air: No proposed rulemaking changes
- Effluent / Biosolids:
 - **PFOS and PFOA limits**
 - o 1,4-dioxane

Recommendations

• Monitoring for emerging contaminants of concern

Task 3 – PTP Capacity Evaluation, Improvement Recommendations



Recommended Alternative



Benefits to LCA

- Fewer treatment trains
- Handles fluctuations in commercial flows
- 200% lower oxygen demand
- Reduced biosolids production
- Lower capital and operating costs
- More flexible and easier to construct
- Construct in phases

Phased Capital Improvement Plan



Phased Approach

- Phase 1: BBC Pretreatment System, needed now to:
 - Free up plant capacity
 - Replace Oxygen plant
- Phase 2: Treats 2030 Flows / Loads
 - o Adds additional capacity
 - o Can be phased based on refined growth projections
- Phase 3: Treat 2050 Flows / Loads
 - o Assess performance
 - o Construct improvements only if needed

Task 4 – Renewal and Replacement Needs (Capital Improvements)

Renewal and Replacement Needs (Capital Improvements)

- Condition Assessment: Buildings / HVAC / Odor Control / Process Equip. / Electrical / Oxygen Plant
- Assumes an expansion is not undertaken (PTP remains as-built)



Renewal and Replacement Needs (Capital Improvements)

- Main Findings:
 - PTP is >30 years old, useful life of mechanical and treatment equipment is 30 years
 - Electrical System is >30 years old, parts hard to find and equipment is becoming obsolete
 - o Cryogenic Oxygen Generation Plant, requires increased level of improvements and maintenance
 - until replaced with new facility
 - Aeration treatment trains cannot be removed from service for internal inspections and repairs
 - Secondary clarifiers cannot be removed from service for recommended rehabilitation work
 - o Many Improvements are included in the plant expansion project

Renewal and Replacement Needs (Capital Improvements/CIP)

Implementation of R&R/CIP is planned in phases:

- Immediate Improvements (0-5 Years): 9 projects
- Mid-term Improvements (6 10 years): 8 projects
- Long-term Improvements (11 25 years): 4 projects
- Lifecycle Replacement (25+ years): 3 projects



Task 5 – On-site Cogeneration / Combined Heat and Power (CHP)

On-Site Cogeneration / Combined Heat and Power (CHP)



- CHP:
 - o "Burn" digester biogas in diesel engine vs. flaring
 - o Generate electricity for PTP (less Utility Power)
 - Generate hot water for digester heating (less Utility Gas)
- Feasibility analysis:
 - Biogas production rates
 - Construction Costs
 - o Power and Natural Gas Utility Annual Savings
- Results: Not financially beneficial to LCA
 - Savings in Utility Costs Outweighed by Capital and O&M Costs
- Recommendation: Improvements to burn digester gas in the
 - digester heating boiler



1) Plant Expansion (Alt. B)

- Eliminate sub-projects that overlap with LCA's ongoing improvement work
- Reduce scope of improvements for a hauled-waste receiving station
- Proceed with phased approach to implementation
- Includes many R&R / CIP projects
- o Replace Oxygen plant
- New Electrical Main Switchgear and Unit Substation

LCA Pre-Treatment Wastewater Facility 60.00 50.00 40.00 30.00 20.00 10.00 0.00 OARER Plant and All Deck secondary settinentation Primary sedmentation Heathouts Screening How Equivation Basins Odor Control Git Renoval Biosolids Risk Score

Risk Assessment – Prioritizes CIP

<u>2) R&R / CIP</u>

- Eliminate sub-projects that overlap with LCA's ongoing improvement work
- Defer comprehensive electrical system replacement to plant expansion projects
- Eliminate / Defer Oxygen plant
 replacement
- Eliminate projects included in plant expansion work
- o Phase projects over time



CRYOGENIC OXYGEN PLANT ASSESSMENT

8 July 2022

- 3) Additional PTP R&R Budget
- Increase in R&R budget at PTP commensurate with recommendations, risk rankings, and condition assessments.
- Cryogenic Oxygen Plant implement improvements and repairs until new plant is constructed with plant expansion Phase 1
- Electrical System testing and evaluations to identify repairs, purchase spare parts, set-up contingency fund

Planning-Level Cost Estimates

- Plant Expansion (Alt. B)
 ▶ \$222 M
- 2) R&R / CIP Projects
 ▶ \$25.5 M
- 3) Additional PTP R&R Budget
 - > \$1.6 M /yr –thru 2035
- Costs are planning-level and include construction contractor markups, contingency, engineering, permitting, and commissioning.
- Cost estimates are +50%/-30% (per AACE International)



Next Steps:

- Electrical System Study to coordinate equipment replacements that are based on condition assessments, and phased with the plant expansion to maximize cost savings, reduce risk, and increase safety
- Confirm future flows / loads and cost-sharing concepts with Boston Beer Corporation and other key stakeholders
- Develop the plant expansion design and identify opportunities to reduce capital costs and maximize energy efficiency
- Evaluate opportunities to segregate additional commercial flows for pretreatment
- o Evaluate alternative methods for Pure Oxygen generation

Thank you!

- LCA and LCA Staff
- PTP Operations Management and Staff



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