

Vergennes Wastewater Infrastructure Improvements

Wastewater Treatment Facility Recommended Plan and Overall Update



Overview



- Introduction
- Review of Wastewater Treatment Facility Alternatives
- Selection of Recommended WWTF Alternative
- Update on Long Term Control Plan: Wastewater Collection and Conveyance
- Updates on Funding
- Next Steps



Introduction



- April 2021 – Initiated Work on the Long Term Control Plan and Wastewater Treatment Facility Preliminary Engineering Report Amendment
- Long Term Control Plan – Focused on improvements to eliminate sanitary sewer overflow (SSO) at MacDonough Pump Station
- Wastewater Treatment Facility Preliminary Engineering Report Amendment – Fully develop the recommended alternative and identify the opinion of probable cost for the WWTF upgrade



WWTF Upgrade Alternatives



The 2020 Phase 3 Interim Preliminary Engineering Report (PER) prepared by Tata & Howard included an analysis of life-cycle costs for the biological treatment alternatives which included the following options:

- Sequencing Batch Reactor (SBR)
- Rotating Biological Contactor (RBC)
- Trickling Filter (TF)
- Membrane Bioreactor (MBR)
- Moving Bed Biological Reactor (MBBR)
- Super Primary (Aerated) Lagoon

Super Primary Lagoon was selected as the recommended alternative



WWTF Upgrade Alternatives



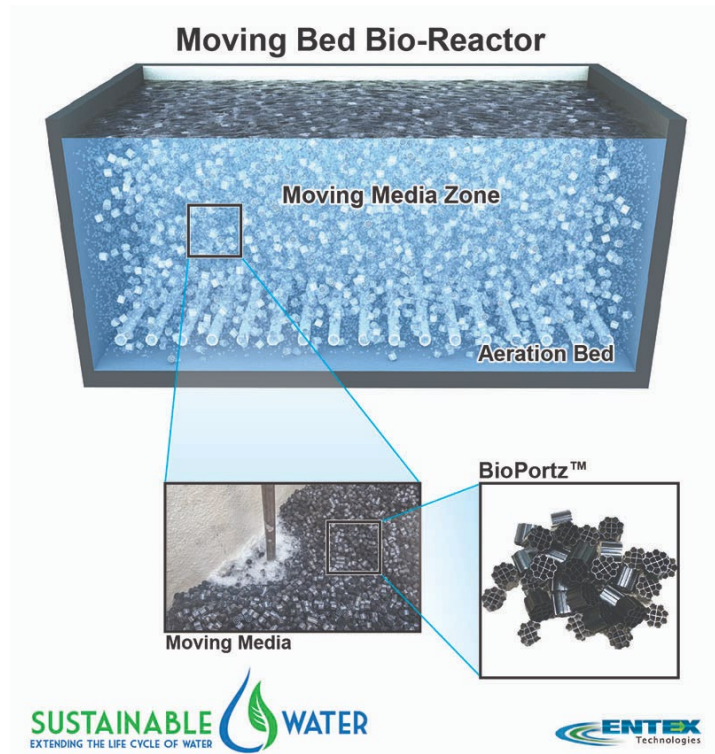
Hoyle Tanner tasked with developing the selected aerated lagoon alternative. Initial findings:

- The existing aerated lagoons cannot meet the effluent design criteria without adding additional processes.
- A Moving Bed Bioreactor (MBBR) is recommended ahead of the lagoons to increase BOD (organic material) removal capacity.
- Settling between the aerated lagoons and polishing filters is recommended for improved solids and phosphorus removal.
- Existing peak hydraulic design is frequently exceeded. Therefore, the headworks, intermediate pumping and chlorine contact tanks are undersized and do not meet Vermont design requirements.

➤ Aerated lagoon appears to be have a higher construction than anticipated.



WWTF Upgrade Alternatives

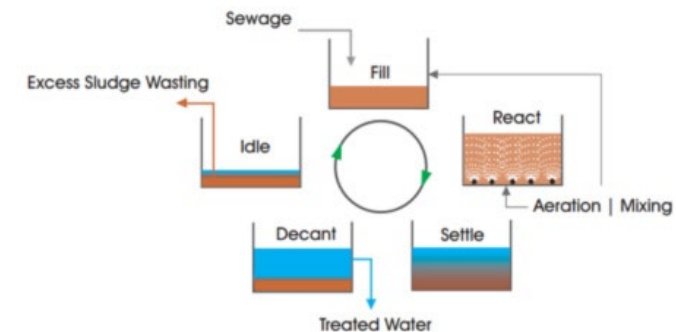


WWTF Upgrade Alternatives

Hoyle Tanner recommended comparing the aerated lagoon alternative with a sequencing batch reactor (SBR) alternative.

A SBR process provides batch technology with all phases of treatment accomplished in a single reactor tank. The SBR system features time-managed operation and control of aerobic, anoxic and anaerobic processes within each reactor including some equalization and clarification. The potential phases of SBR operation are as follows:

- **Mixed Fill:** Influent wastewater flows into the SBR tank and mixing is provided. **Aerated Fill (React Fill):** Influent flow continues into the SBR tank under mixed and aerated conditions. BOD removal would occur under aerobic conditions as well as nitrification of influent ammonia.
- **Aeration (React):** Influent flow is terminated creating true batch conditions. Mixing and aeration continue providing continuing BOD removal and nitrification of influent ammonia.
- **Settle:** Mixing and aeration are terminated. Solids separation occurs as denser solids sink leaving clarified mixed liquor at the surface.
- **Decant/Sludge Waste:** Mixing and aeration remain off. Subsurface decanting of clarified effluent occurs. Sludge wasting also occurs near the end of the cycle.



WWTF Upgrade Alternatives



Comparison of Non-Monetary Factors

Non-Economic Factor	Aerated Lagoon	SBR
Ability to meet potential future nitrogen removal limits	Limited ability without significant upgrade.	Upgrade not required unless very low total nitrogen (TN) limits are required. Can meet year-round ammonia removal requirements without modifications.
Sludge production	Creates somewhat less sludge, although in-lagoon sludge removal options are more operator intensive. Provisions for regular maintenance removal of sludge in the existing lagoons is recommended.	Produces somewhat more sludge. Sludge handling is part of regular operations. Regular hauling will be required.
Complexity of process	With the addition of two new process elements (MBBR & secondary clarification), the aerated lagoon likely has more complexity. Additionally, settling lagoon effluent for TP and solids removal can be challenging.	Since the SBR controls operate the equalization, biological treatment, clarification, and aerated sludge holding, this process is likely simpler to operate than the aerated lagoon alternative.



WWTF Upgrade Alternatives



Comparison of Opinions of Probable Construction Costs

Item	Aerated Lagoon Alternative	SBR Alternative
New Headworks Building, Fine Screening, Grit Removal, Influent Flow Measurement	\$ 1,538,000	\$ 1,538,000
Biological Process		
Aerated Lagoon (MBBR, Aerated Lagoon, Blowers, Lagoon Effluent Pumping, Secondary Clarification, Continuous Up-flow Filtration, Sludge Storage, Chemical Feed)	\$ 8,895,000	-
SBR (Intermediate Pumping, Pre-EQ, SBR, Post-EQ, Cloth Media Filters, Sludge Storage, Chemical Feed)	-	\$ 6,593,000
Chlorine Contact Tank Expansion	\$ 385,000	\$ 385,000
Partial Total Capital Cost Subtotal⁴	\$ 10,818,000	\$ 8,516,000
30% Contingency	\$ 3,245,000	\$ 2,555,000
Total Construction Cost for Comparison	\$ 14,063,000	\$ 11,071,000

Notes:

1. ENR Construction Cost Index = 12,237, July 2021.
2. Construction costs are inclusive of Contractor's overhead & profit, mobilization/demobilization, and bonds.
3. Construction costs do not include engineering services, legal and administrative costs.
4. As this was developed at a feasibility level for decision making as to which alternative should be developed for the PER Amendment, several costs were not included that would be common for either alternative including Operations Building, SCADA, removal of the solar array installation, fence replacement, pavement/site improvements, upgrades to the electrical service, and implementation of a back-up generator.



WWTF Upgrade Selection of Alternative



Recommend proceeding with SBR as the recommended alternative:

- More flexible to meet future permit limits
- Less complex operations for overall operations and sludge removal
- Lower capital cost
- Similar operation and maintenance (O&M) costs assuming regular sludge removal and handling required for aerated lagoon, similar energy is required for both alternatives

Questions?

➤ Identify City Council's Recommended Alternative



- Long Term Control Plan – Focused on Elimination of the Sanitary Sewer Overflow
 - Develop short-term (5-yr) and long-term (20-yr) project list to reduce/mitigate SSO discharges and identify opinions of probable costs
 - Identify measures to address and prevent recurrent instances of sewage backup or discharges of raw wastewater onto the ground
 - Develop a financing plan to design and implement recommended SSO controls including a summary of outside funding sources to leverage the City's funds

- 30% Report Draft Submitted August 10, 2021

Funding Updates



Things to keep in mind with preliminary opinions of probable cost:

- Preliminary engineering has largely not been initiated, except for the WWTF upgrade
- Less predictable environment for estimating future materials pricing
- Less predictable environment for future contractor demand impacts on construction costs

➤ Results in Conservative Approach to Develop Opinions of Probable Cost



Funding Updates



Wastewater Treatment Facility Upgrade	MacDonough Pump Station Upgrade	Collection System/Stormwater Improvements	Total
Preliminary Total Project Cost			
\$15-18M	\$3-5M	\$7-9M	\$25-32M
Potential Grant/Subsidy Sources			
CWSRF Pollution Control Grant: \$1.5M	Congressionally Directed Spending: \$3M	CWSRF ARPA: \$10M allocated to DEC to assist municipalities to design and construct projects to reduce or eliminate wet weather sewer overflows. \$1M	
CWSRF WISPr Floodplain Restoration: \$700,000		Lake Champlain Environmental Assistance Program (Section 542): \$500,000	
USDA Rural Development: \$2-4M			
Preliminary Total Project Cost Less Grant/Subsidy			
\$10.8-11.8M	\$0-2M	\$5.5-7.5M	\$16.3-21.3M
Additional Grant/Subsidy Likely: Vermont Legislature has additional ARPA funds to allocate in next budget + Potential Federal Infrastructure Bill			



- USDA RD requests commitment to holding a bond vote before the end of 2021
- Accelerating Collection System Improvements to be ready for “first come, first serve” CWSRF construction funding for CSO/SSO Communities
 - Complete Preliminary Design and Environmental Report
 - Initiate Final Design
 - Complete Bond Vote
- Accelerating MacDonough Pump Station Upgrade as needed to meet Congressionally Directed Spending requirements

Next Steps



- CWSRF Planning Loan for Preliminary Design and Final Design for Collection System Improvements
- CWSRF Planning Loan for WWTF Upgrade Design Phase
- Discuss bond vote by end of 2021



Questions

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