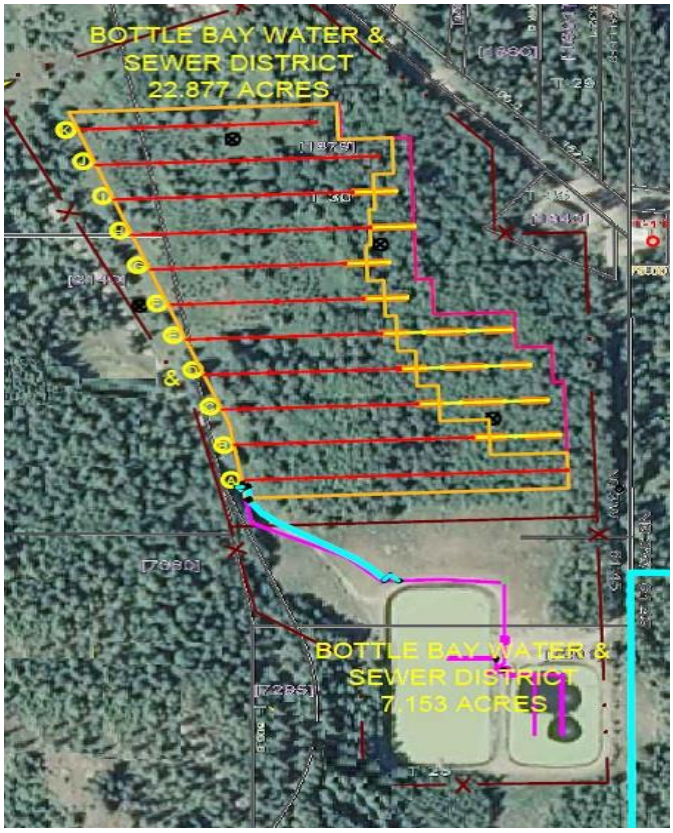
Clean Water State Revolving Fund Green Project Reserve
- Interim -



Bottle Bay RWSD FY15 Wastewater Upgrade Project

SRF Loan #WW1503 (pop. 400 current)

$2,500,000

Interim Green Project Reserve Justification

Business Case GPR Documentation

1. INSTALL NEW FINE BUBBLE DIFFUSED AERATION SYSTEM TO REPLACE COARSE BUBBLE AERATION SYSTEM (Energy Efficiency). Categorical GPR per Section 3.2-2: *projects that achieve a 20% reduction in energy consumption; retrofits to compare existing system to that proposed…New POTW projects or capacity expansion projects should be designed to maximize energy efficiency and should select high efficiency premium motors and equipment where cost effective"* ($24,000).
2. INSTALLS NEW ENERGY-EFFICIENT VFDS (Energy Efficiency). Business Case per GPR 3.2-2: *Use of VFD pumps in a new project where they are cost effective …If a project achieves less than 20% reduction in energy efficiency, then it may be justified using a business case"* ($7,420).
3. REPLACE 33 EXISTING SEPTIC TANKS to assist with minimizing or eliminating I/I (Energy Efficiency). Business Case per GPR 3.5-4: *I/I correction projects that save energy from pumping and reduced treatment costs* ($7,792).

State of Idaho SRF Loan Program
May 2016

1. Treatment Process – Fine Bubble Aeration

Summary

- Bottle Bay Recreational Water & Sewer District (BBRWSD) is constructing improvements to their wastewater facilities including expansion of their existing lagoons, a new fine-bubble aeration system, a new wastewater irrigation pump station, new wastewater land application area, and improvements to their collection system.
- SRF Loan Amount = $2,500,000
- Estimated GPR portion of loan (fine bubble aeration) = 1% ($24,000) (design estimate)
- Annual Energy savings = 10%

Background

- BBRWSD is located on the northwestern end of Lake Pend Oreille on the south side of the lake around Bottle Bay. In 1997 a major expansion and upgrade of the District's sewer facilities was completed to serve a projected build-out within the District's boundary plus an expansion to serve the Sourdough Point area.
- The District utilizes two lagoons for the treatment and storage of septic tank effluent from the collection system. Lagoon #1 aeration is provided by four (4) Air Aqua 966 Turbo-Flo Coarse Bubble Diffuser Aerators mounted in the bottom of the lagoon. The aerators are supplied through 2-inch PVC pipes that run along the lagoon bottom.
- The aeration system is supplied by two (2) 7.5 HP "Roots" AF rotary blowers located in the Blower/Control Building located between the two lagoons.
- The existing aeration system does not allow the full volume of the lagoon to be utilized for storage. The storage volume of the lagoons will also need to be increased by about 4.15 MG to a total of approximately 8.84 MG.

Results

- The existing aeration system will be replaced with a high efficiency fine bubble aeration system, sized for complete mixing of the aerated lagoon.
- Air will be supplied to the system from one air blower that will draw an estimated 3.2 Brake HP during normal operation[1].
- The energy consumed by the existing system averaged 25,740 kW-hr/yr[2].
- The estimated energy consumed by the proposed system will be 23,226 kW-hr/yr[3].
- At $.09/kW-hr x 24hr/da x 365da/yr = $788/yr x 30year life = $24,000 energy savings.

Energy Efficiency Improvements

- The resulting reduction in energy requirements with the new system = 1 – (23,226 ÷ 25,740) = .10 = 10%
- The total system oxygenation efficiency of the proposed system is 1.98 lbs. O_2/HP-hr.

Conclusion

- By replacing the current system with a fine bubble diffusion aeration system, Bottle Bay will provide complete mixing and aeration of the lagoon while reducing energy requirements by 10%.
- **GPR Costs:** $24,000.
- **GPR Justification:** GPR-eligible using a Business Case (Energy Efficiency) per Section 3.2-2[4]: *if a project achieves less than a 20% reduction in energy efficiency it may be justified using a business Case.*

[1] ADS Literature
[2] Avista billing records.
[3] Aeration Supplier calculation.
[4] Attachment 2. April 2010 EPA Guidance for Determining Project Eligibility.

2. ENERGY EFFICIENT VFDs[5]

Summary

- BBRWSD is constructing improvements to their wastewater facilities including a new wastewater irrigation pump station, and new effluent transfer pump.
- Estimated loan amount = $2,500,000
- Estimated GPR portion of loan = 0.3% ($7,420) (design estimate)

Background

- The effluent irrigation system will include variable frequency drive (VFD) pumps to maximize pumping efficiency.

Calculated Energy Efficiency Improvements

Transfer Pump Motor:

- The calculated constant speed transfer pump will consume approximately 4367 Kw-hr per year, a transfer pump with VFD will consume approximately 3245 Kw-hr per year.
- The calculated annual power savings is 1122 KwH. The 26% reduction in energy consumption is calculated by dividing 3245 KwH by the existing power consumption of 4367 KwH. The annual cost savings is calculated by multiplying the 1122 KwH by $0.09 per KwH = $101/yr.

Irrigation Pump Motor:

- The calculated constant speed irrigation pump will consume approximately 18,381 Kw-hr per year, a transfer pump with VFD will consume approximately 15,035 Kw-hr per year.
- The calculated annual power savings is 3,346 KwH. The 18% reduction in energy consumption is calculated by dividing 15,035 KwH by the existing power consumption of 18,381 KwH. The annual cost savings is calculated by multiplying the 3,346 KwH by $0.09 per KwH = $301/yr.

Combined Cost Savings

- The combined cost savings of $402/year will have an 18 year payback period.

Conclusion

- The project would result in a more energy efficient operation = 20% of the energy requirement of the existing motors.
- **GPR Costs**:

New VFDs =		$5,920
Application Software	=	$1,500
	Total =	$7,420

- **GPR Justification**: The installation of VFDs is GPR-eligible per Section 3.2-2[6]: *Use of VFD pumps in a new project where they are cost effective…If a project achieves less than 20% reduction in energy efficiency, then it may be justified using a business case.*

[5] April 2016, Interim GPR Justification, T-O Engineers.
[6] Attachment 2. EPA Guidance for Determining GPR Eligibility for FY12 SRF Projects

3. INFLOW/INFILTRATION REDUCTION

Summary

- BBRWSD is constructing improvements to their wastewater facilities including improvements to their collection system.
- Estimated loan amount = $2,500,000
- Estimated GPR portion of loan (Septic tank repair) = 1% ($7,792) (Design estimate)

Background[7]

- The Collection System consists of a Septic Tank Effluent Pump (STEP) system with pressurized collection mains running up to the main lift station near the District's Operations Building. The main lift station then pumps the wastewater up to the storage lagoons.
- The wastewater STEP system requires power for individual effluent pumps at each connection. The District also has a main lift station that receives flow from the STEP system.
- Approximately 33 septic tanks currently connected to the system are over 30 years old and deteriorated. These tanks are a significant source of I/I.

Results

- Replacement of the septic tanks which are sources of I/I will take place with this project.
- During the spring, lake level and groundwater levels increase in portions of the service area. High groundwater typically extends for approximately 4 months, from March through June
- Replacement of the old deteriorated septic tanks will eliminate sources of I/I. This will result in lower energy consumption throughout the wastewater collection system through less pumping at individual septic tanks and main lift stations. Approximately 33 tanks will be replaced.

Calculated Energy Efficiency Improvements

- The total influent wastewater measured in 2012 was 3,906,705 gallons. From 2012 to 2015 there were 8 septic tanks replaced; in 2015 the total measured influent was reduced to 3,600,023 gallons.
- Based on experience and observation, approximately half of the flow reduction was due to elimination of septic tank I/I with the 8 septic tank replacements. Therefore the total reduction in flow due to septic tank replacements is estimated to be ½*(3,906,705-3,600,023)/(3,906,705) = .04 or 4%.
- Therefore the flow reduction per tank replaced = 4% ÷ 8 tanks = 0.5% per tank.
- For this project, where 33 septic tanks are proposed to be replaced, the reduction in flow = 16% (33 replacements x 0.5% per replacement), which would correspond to a 16% reduction in electricity usage by pumps.
- Before improvements, the annual power use of the lift station was13,528 kWH/yr: so, (0.16)(13,528kWH/yr) ($0.09/kWH)(40yrs) = $7,792.00 of GPR-eligible cost savings.

Conclusion

- It is estimated that collection system I/I from individual septic tanks would amount to 16% of the total annual wastewater flow.
- **GPR Costs**: Power savings for 33 Septic Tank Replacements = $7,792
- **GPR Justification**: The replacement of septic tanks is GPR-eligible by a Business Case per Section 3.5-3[8] *Projects that cost effectively eliminate pumps or pumping stations*; and per Section 3.5-4 (Energy Efficient): *I/I correction projects that save energy from pumping …and are cost effective.*

[7] April 2016, Interim GPR Justification, T-O Engineers
[8] Attachment 2. April 21, 2010 EPA Guidance for Determining GPR Eligibility for FY11 SRF Projects, P.10