

Drinking Water State Revolving Fund Green Project Reserve

- Interim -



Willowbrook Estates Drinking Water Project SRF Loan #DW1902 (pop. 100) \$650,000

Interim Green Project Reserve Justification

Categorical GPR Documentation

1. INSTALL 25 NEW WATER METERS (Water Efficiency). Categorical GPR per 2.2-2: *Installing any type of water meter in previously unmetered areas.* (\$25,000).

Categorical & Business Case GPR Documentation

2. REPLACES 25 AGING AND FOULED SERVICE LINES (Water Efficiency). Categorical GPR per 2.4-1: *Projects that result from a water efficiency-related assessment; Business Case 2.4-4: Proper water infrastructure management should address where water losses could be occurring...fix them...replacing aging infrastructure.* (\$143,000).
3. INSTALLS PREMIUM ENERGY-EFFICIENT WELL PUMPS/VFD CONTROLLER (Energy Efficiency). Business Case GPR per 3.5-1: *Energy-efficient ...new pumping systems...including VFDs* (\$30,000).
4. INSTALLS ADVANCED FLUORESCENT LIGHTING (Energy Efficiency). GPR Business Case per 3.5-6: *Upgrade of lighting to energy-efficient sources (such as...compact fluorescent, light-emitting (LED) diode...).* (\$2,500)

1. NEW WATER METERS¹

Summary

- The Willowbrook Estates Homeowners Association (HOA) plans to install 25 new water meters as part of their FY19 project to upgrade their drinking water system. In addition to the new meters, the overall project also includes a new well and well pump, LED lighting, and service line replacement.
- Loan amount = \$650,000
- GPR portion of loan = \$25,000 (4%)

Background

- The population serviced by the Willowbrook Estates HOA is approximately 100 people via approximately 25 active individual connections. The average daily demand (ADD) per connection is estimated at 300gpd.
- Because the water system is not metered at individual connections, the HOA currently charges a flat fee for all users. Therefore, there is no financial incentive for system users to conserve water. The HOA is also unable to accurately track water usage and cannot properly assess system efficiency or leakage.

Results

- The new AMR system will include built-in leak detection and backflow detection.
- Installing meters will increase water efficiency by enabling water-use rate based customer charging and by providing more accurate water-use information to customers.
- Water efficiency will be increased by decreasing the amount of water lost.



Conclusion

- An investment in water meters today will lead to additional water and dollar savings over time. Also, the water savings from the meter installation will extend the life of the water supply.
- Providing a structured water-rate based on usage provides an incentive for system users to conserve water. Installing water meters will allow the Estates to more accurately track water loss and leakage.
- **GPR Costs:** Installing 25 new water meters = \$25,000
- **GPR Justification:** The project is Categorical GPR-eligible (Water Efficiency) per Section 2.2-2: *Installing any type of water meter in previously unmetered areas.*

¹ Mike Woodworth, Senior Project Manager, Mountain Waterworks, 1-8-2019
State of Idaho SRF Loan Program

2. SERVICE LINE REPLACEMENT

Summary

- Willowbrook Estates HOA plans to replace all the community's service lines. Replacement of the lines will eliminate water losses, conserve energy, protect public health, and provide requisite system capacity.
- Loan amount = \$650,000
- GPR-eligible portion of Service Line Replacement Costs = \$143,000 (22%)

Background

- The water distribution system is comprised of a network of 2-inch and 4-inch PVC and AC pipe.
- The entire water system, from the water sources to the distribution system, has become infested with aggressive iron-reducing bacteria, resulting in reduced water pressure and system reliability.
- Much of the system has been in service for more than 40 years.



Results

- All the pipe in the water system, including the wells, has become clogged with slime from profligate growth of iron-reducing bacteria. This effectively reduces pipe diameters, increasing pipe friction leading to increased energy required for pumping, and the inability of the system wells, pumps, and pipes to meet system demand.
- For example, due to the clogging effects of iron-reducing bacteria, it was found that the diameter of the 1.25-inch service line at Lot 21 has been reduced to approximately 0.4 inches using a friction factor of 90. This is typical of service lines throughout the Willowbrook Estates HOA water system.
- The HOA has elected to replace all the service lines in the community.

Conclusion

- By replacing the existing outdated galvanized service lines, the HOA anticipates future reductions in unnecessary O&M expenditures, eliminating potential health hazards, and conserving energy and water.
- **GPR Costs:** Replacing all service connections = \$143,000
GPR-eligible portion of \$143,000 = energy savings + water conservation cost savings
- **GPR Justification:** The project is Categorically GPR-eligible (Water Efficiency) per Section 2.4-1: *Projects that result from a water efficiency-related assessment...*; also GPR-eligible (Water Efficiency) per a Business Case by 2.4-4: *Proper water infrastructure management should address where water losses could be occurring...fix them...replacing aging infrastructure².*

² Attachment 2. EPA Guidelines for Determining FY11 Project GPR-Eligibility.
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3. NEW PREMIUM ENERGY EFFICIENT PUMP & VFD

Summary

- Willowbrook Estates will install a new replacement well for their potable water system including a new premium energy-efficient pump, and equipped with a variable frequency drive (VFD). They will also install a new premium energy-efficient pump in their primary well.
- Loan amount = \$650,000
- Estimated energy efficiency (green) portion of loan = \$30,000 (5%)

Background

- The community is supplied by two groundwater sources, Well #1 (North Well) and Well #2 (South Well). Both wells provide water directly to the system in a single pressure zone using hydro-pneumatic tanks for low water usage periods.
- Well #2 is the primary water source and Well #1 is the backup well.
- In May of 2015, the pump motor in Well # 2 (primary source) unexpectedly failed, leaving the community to rely on Well # 1 (back-up) as the sole source for water. With water demand being greater than the well pump could supply, the motor for the Well No. 1 pump faulted, resulting in depressurization of the distribution system. This occurred three separate times in May 2015, creating a potential risk of contamination within the system.

Calculated Cost Effectiveness of Improvements³

Motors/VFDs:

The Baseline Standard Practice (BSD) for comparison is a standard motor not controlled by a VFD⁴.

- **BSD: Existing Pump - no VFD**
Standard efficiency (60% assumed)
Motor rating = 5 hp
% Annual Usage = 70% (average daily operation throughout the year)
Energy usage = 38,120 kW-hr
- **Proposed Pump - no VFD, with premium efficiency motor**
Efficiency = (80.0%)
Motor rating = 7.5 hp
% Annual Usage = 40% (average daily operation throughout the year)
Energy usage = 24,510 kW-hr
- **Proposed Pump - VFD operation with premium efficiency motor**
Efficiency = (80.0%)
Motor rating = 7.5 hp
% Annual Usage = 50% (average daily operation throughout the year, assume average operation at 75% full power)
Energy usage = 22,970 kW-hr
- **Energy Reduction – comparing existing pump to new premium pump**



³WEG Electric Motor Payback Tool, energy cost @ \$0.10/kWh.

⁴NYS Energy Research and Development Authority, Energy Evaluation Memorandum, Village of Greenport WWTP Upgrade 8-2009.
State of Idaho SRF Loan Program

Energy usage, existing = 38,120 kW-hr
Energy usage, new premium pump = 24,510 kW-hr

- **Energy Reduction - comparing premium pump with VFD to premium pump without VFD**
Energy usage, w/o VFD = 24,510 kW-hr
Energy usage, w/ VFD = 22,970 kW-hr
- Replacing the old pump with a new premium pump results in an approximate 37% energy reduction.
- The premium motor with VFD results in an approximate 6% energy reduction compared to non-VFD operation.

Conclusion

- The combined annual energy savings for utilizing premium pump and VFD is estimated to be 15,150 kWh/year per motor/VFD system - corresponding to an energy reduction of approximately 40% when compared to the Baseline Standard Practice.
- The energy-efficient pumps/VFDs are categorically GPR eligible as they achieve greater than 20% reduction in energy consumption and are cost-effective with a payback period of 20 years, assuming power cost of \$0.10 per kWh.
- **GRP Costs Identified:**
Well VFD (\$9,500) + Pump & Motor (\$20,500) = **Total = \$30,000**
- **GPR Justification:**
The Pump/VFD system is Categorically GPR eligible (Energy Efficiency) per Section 3.2-2 page 9⁵: *Projects that achieve a 20% reduction in energy consumption are categorically eligible for GPR; also, per 3.5-9: VFDs can be justified based upon substantial energy savings.*

⁵ Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility
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4. Energy Efficient LIGHTING

Summary

- Energy efficiency from the installation of advanced fluorescent lighting in the interior of the well site pump house buildings.
- Energy efficiency from the installation of light-emitting diode (LED) lighting at the exterior of the well site pump house buildings.
- Loan amount = \$650,000
- Estimated energy efficiency (green) portion of loan = \$2,500 (0.4%)
- Estimated annual energy savings = \$100 per year.

Background/ Results⁶

- The lighting system is part of the project at the well site pump house building upgrades.

Energy Efficiency Improvements

- Energy-efficient T-8 magnetic fluorescent lighting is approximately 28% more energy efficient than standard T-12 magnetic fluorescent lighting for relatively the same light output.
- LED lighting is approximately 58% more energy-efficient than typical high-pressure sodium lighting for relatively the same light output.



Conclusion

- **GPR Costs:**
Advanced Fluorescent Lighting = \$ 0
LED Lighting = \$ 2,500
Total = \$ 2,500
- **GPR Justification:** Advanced fluorescent lighting and LED lighting is GPR-eligible by a Business Case per 3.5-7: *Upgrade of Control Building lighting to energy-efficient sources such ascompact fluorescent, light-emitting diode (LED).*

⁶ 1-8-19 Per M Woodworth, Project Manager, Mountain Waterworks State of Idaho SRF Loan Program