

Clean Water State Revolving Fund FY16 Green Project Reserve

- Final GPR -



City of Hagerman Wastewater Facility Project **SRF Loan #WW 1603 (pop. 872)** **\$5,088,905**

Final Green Project Reserve Justification

Business Case GPR Documentation

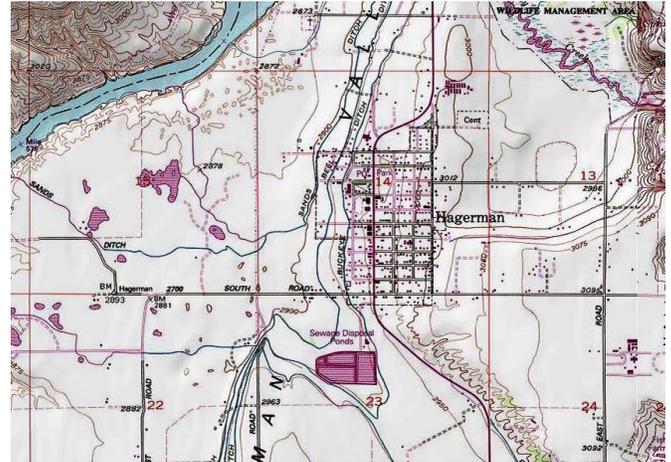
1. TREATED EFFLUENT LAND APPLICATION SYSTEM CONSTRUCTION (Water Efficiency). Categorical per GPR 1.2-10: *Fee simply purchase of land or easements on land that has a direct benefit to water quality; Categorical per GPR 2.2-6: Recycling and water reuse projects...; Business Case per GPR 4.5-8: land application in which feasible alternatives exist (\$4,816,974).*
2. REPLACE TWO EXISTING LIFT STATIONS WITH TWO NEW LIFT STATIONS THAT HAVE PREMIUM ENERGY-EFFICIENT MOTORS (Energy Efficiency). Business Case per GPR 3.2-2 & 3.4.1: *if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case; project must be cost effective...energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset (\$167,000).*
3. INSTALL NEW VERTICAL TURBINE PUMP WITH PREMIUM ENERGY-EFFICIENT MOTOR AND VFD IN REUSE PUMP STATION (Energy Efficiency). Categorical and Business Case per GPR 3.2-2 & 3.4.1: *projects that achieve a 20% reduction in energy consumption; if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case; project must be cost effective...energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset; also, per 3.5-9: VFDs can be justified based upon substantial energy savings (\$100,678).*

Approved by the State of Idaho SRF Loan Program
July 2018

1. LAND APPLICATION SYSTEM

Summary

- The City of Hagerman is upgrading their wastewater treatment facilities, including constructing a new 16.9 million gallon HPDE lined winter storage lagoon, a 940 gpm reuse pump station, chlorine disinfection system, approximately 4,300 lineal feet of piping for the land application site, modifications to four existing pivots, approximately 96 acres of land for slow-rate land application (reuse) and miscellaneous site work. The new reuse system will allow the City to primarily discharge their effluent to the land application system rather than to the Snake River.
- Loan amount = \$5,088,905;
- GPR Costs = Land purchase (\$1,412,500) + reuse system improvements (\$3,404,474) = \$4,816,974 [Final Installed Construction Costs]
- Green portion of loan = 95%



Background¹

- In April 2014, the City of Hagerman received a Notice of Violation from the U.S. EPA for non-compliance with their NPDES permit. The City's treatment lagoons could not meet the ever increasingly stringent permit limits on the Middle Snake River.
- As a result, the City of Hagerman is upgrading their wastewater treatment facilities.
- The new reuse system will allow the City to primarily discharge their effluent to the land application system rather than to the Snake River. This will eliminate non-compliance issues with the NPDES permit.

Land Application System GPR Justification

- The City of Hagerman 2016 Wastewater Facilities Plan reviewed seven alternatives for the wastewater treatment facilities. From an overall cost perspective, one feasible alternative was identified that was less expensive than the proposed land application (reuse) improvements: treatment lagoons with discharge to rapid infiltration (RI) basins.
- The City was unsuccessful in locating a suitable site for RI basins and elected to proceed with the second lowest cost option: land application (reuse).

Land Application System Benefits

- Discharging the effluent to the land application system will beneficially reuse the water, nitrogen, and phosphorus to grow crops.
- Discharging the effluent to the land application system will eliminate the discharge of BOD, TSS, phosphorus and bacterial to a the water-quality impaired Middle Snake River.
- The land application (reuse) system will eliminate non-compliance events currently experienced with the City's NPDES permit.

¹ City of Hagerman Wastewater Facilities Plan, JUB Engineers, May 2016

Conclusion

- The treated slow-rate land application (reuse) system was chosen over other alternatives.
- **GPR Costs Identified:** Land purchase (\$1,412,500) + reuse system improvements (\$3,404,474) = \$4,816,974 [Final Costs]
- **GPR Justification:** Categorical GPR per Section 1.2-10: *Fee simply purchase of land or easements on land that has a direct benefit to water quality*; Categorical GPR per Section 2.2-6: *Recycling and water reuse projects...*; per Business Case GPR per Section 4.5-8: *land application in which feasible alternatives exist* (\$4,816,974).

2. NEW LS PUMPS W/ PREMIUM EFFICIENCY MOTORS

Summary

- Lift Stations 1 and 2 were constructed in 1977 and are severely deteriorated, resulting in unreliable service and frequent maintenance. They are also incapable of meeting current regulations.
- This project includes replacing the two lift stations with new wet-well mounted duplex sewer lift stations and back-up generators. Lift Station 1 will have a capacity of 550 gpm. Lift Station 2 will have a capacity of 200 gpm. The project also included approximately 1,000 LF of 8-inch gravity sewer and 6-inch pressure sewer mains, including a boring beneath the Sands Ditch.
- The pumps in both lift stations will be equipped with a premium efficiency motors to conserve energy and enhance operability.
- Loan amount = \$5,088,905;
- GPR Costs: Lift Station 1 pumps and motors (\$86,000) + Lift Station 2 pumps and motors (\$81,000) = \$167,000 [Final Costs]
- Green portion of loan = 3.3%

Energy Efficiency Improvements²

- This project includes replacing two existing lift stations with two new wet-well mounted duplex sewer lift stations. Lift Station 1 will have a capacity of 550 gpm. Lift Station 2 will have a capacity of 200 gpm.
- The pumps in both lift stations will be equipped with a premium efficiency motors to conserve energy and enhance operability.

GPR Justification

- **Lift Station #1 Premium Efficiency Motors**
 - Each pump has a premium efficiency 7.5 hp motor (92.0% efficient) at an additional cost of approximately \$250 each (\$500 total for the pump station). Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors³.
 - A standard efficiency 7.5 hp motor has an efficiency of approximately 85.5%.
 - Each of the pumps are designed to discharge the 20-year peak hour flow (550 gpm). Using the average of the average day flows over the 20-year design period, it is estimated that the pumps will run approximately 21% of the year (refer to the calculations in **Appendix A**).
 - An energy savings of approximately 596 KWH per year will be realized, which equates to a cost savings of \$48 per year assuming \$0.08/KWH (refer to the calculations in **Appendix A**).
 - At \$48 per year of energy savings using a premium efficiency motor, the payback period for the cost differential between a standard and premium efficiency motors (\$500) is 10.5 years, which is less than the 20-year useful life of the pump/motor (refer to the calculations in **Appendix A**).
- **Lift Station #2 Premium Efficiency Motors**
 - Each pump has a premium efficiency 20 hp motor (93.0% efficient) at an additional cost of approximately \$400 each (\$800 total for the pump station). Standard efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors⁴.
 - A standard efficiency 20 hp motor has an efficiency of approximately 87%.

² Preliminary - Design specs will be used to calculate energy efficiencies in the GPR Technical Memorandum.

³ Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

⁴ Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

- Each of the pumps are designed to discharge the 20-year peak hour flow (191 gpm). Using the average of the average day flows over the 20-year design period, it is estimated that the pumps will run approximately 9% of the year (refer to the calculations in **Appendix A**).
- An energy savings of approximately 609 KWH per year will be realized, which equates to a cost savings of \$49 per year assuming \$0.08/KWH (refer to the calculations in **Appendix A**).
- At \$49 per year of energy savings using a premium efficiency motor, the payback period for the cost differential between an Epaft and premium efficiency motors (\$800) is 16.4 years, which is less than the 20-year useful life of the pump/motor (refer to the calculations in **Appendix A**).

Conclusion

- The premium efficiency motors for the Lift Station 1 are GPR-eligible since the motor payback period (10.5 years) is less than the useful life of the pumps/motors (20 years).
- The premium efficiency motors for the Lift Station 2 are GPR-eligible since the motor payback period (16.4 years) is less than the useful life of the pumps/motors (20 years).
- **GRP Costs Identified:** Lift Station 1 premium efficiency pumps and motors (\$86,000) + Lift Station 2 premium efficiency pumps and motors (\$81,000) = \$167,000. [Final Costs]
- **GPR Justification:** Business Case per GPR 3.2-2 & 3.4.1: *if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case; project must be cost effective...energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset (\$167,000).*

3. NEW PREMIUM EFFICIENCY MOTOR IN REUSE PUMP

Summary

- As part of the land application (reuse) system improvements, a new reuse pump station will be constructed with a vertical turbine pump. The pump will be equipped with a premium efficiency motor and variable frequency drive (VFD) to conserve energy and enhance operability. The pump will be used to delivery treated effluent from the new storage lagoon to the land application site to irrigate crops.
- Loan amount = \$5,088,905;
- GPR Costs: Vertical turbine pump and motor (75 hp) = \$100,678 (Final Cost)
- Green portion of loan = 2%

Energy Efficiency Improvements⁵

- The reuse pump will be equipped with a premium efficiency motor and VFD to conserve energy and enhance operability. The pump will be used to delivery treated effluent from the new storage lagoon to the land application site to irrigate crops.

GPR Justification

- **Premium Efficiency Motors**
 - The vertical turbine pump has a premium efficiency 75 hp motor (95.4% efficient) at an additional cost of approximately \$850. Epack efficiency motors are typically 15 to 30 percent lower in cost than premium efficient motors⁶.
 - An Epack efficiency 75 hp motor has an efficiency of approximately 92% at 75% of full load.
 - If the effluent reuse pump runs for 3,864 hours per year, an energy savings of approximately 6,245 KWH per year will be realized, which equates to a cost savings of \$500 per year assuming \$0.08/KWH (refer to the calculations in **Appendix A**).
 - At \$500 per year of energy savings using a premium efficiency motor, the payback period for the cost differential between a standard and premium efficiency motor (\$850) is 1.7 years, which is less than the 20-year useful life of the pump/motor (refer to the calculations in **Appendix A**).
- **Variable Frequency Drive (VFD)**
 - VFD efficiency data were determined by published operating curves by the pump manufacturer (refer to **Appendix B**).
 - The combined annual energy savings for utilizing a VFD with a premium efficiency motor is estimated to be 53,152 KWH per year, corresponding to a cost savings of \$4,242 per year assuming \$0.08/KWH (refer to the calculations in **Appendix A**). This equates to an energy reduction of 30%. This assumes that the average pumping rate with a VFD will be reduced from the peak rate of 940 gpm for the pump to an average of 660 gpm to more closely match the reuse irrigation system.

Conclusion

- The premium efficiency motor and VFD for the reuse pump station is GPR-eligible since the motor payback period (1.7 years) is less than the useful life of the pump/motor (20 years) and the

⁵ Design specs will be used to calculate energy efficiencies in the GPR Technical Memorandum.

⁶ Page V. Energy Efficient Motor Selection Handbook, Washington State Energy Office

combined premium efficiency motor and VFD achieve greater than 20% reduction in energy consumption.

- **GRP Costs Identified** New premium energy efficient pump/motor and VFD = \$100,678. (Installed)
- **GPR Justification:** Categorical and Business Case per GPR 3.2-2 & 3.4.1: *projects that achieve a 20% reduction in energy consumption; if a project achieves less than a 20% reduction in energy efficiency, then it may be justified using a business case; project must be cost effective...energy savings and payback on capital and operation and maintenance costs [must] not exceed the useful life of the asset; also, per 3.5-9: VFDs can be justified based upon substantial energy savings (\$87,546).*