Clean Water State Revolving Fund Green Project Reserve
- Final -

City of Rigby Wastewater System Project

SRF Loan #WW 1899-25 (pop. 2,998)

$13,000,000

Final Green Project Reserve Justification

Categorical GPR Documentation

1. PERFORMS AN ENERGY-EFFICIENCY STUDY AS PART OF A CAPITAL IMPROVEMENT PLAN (Energy Efficiency). Categorical GPR per 3.2-4: *…energy management planning* ($50,000).

2. ENERGY-SAVINGS UPGRADE OF MAIN LIFT STATION AND PRESSURE SEWER LINES (Energy Efficiency). Categorical GPR per 3.5-4: *projects that are cost effective* ($590,570)

Business Case GPR Documentation

3. RENOVATION OF GRAVITY WASTEWATER COLLECTION SYSTEM EXPERIENCING EXCESSIVE I/I (Energy Efficiency). Business Case GPR per 3.5-4: *I/I correction projects that save energy from pumping …and are cost effective.* ($1,926,050)

4. INSTALLS SCADA FOR REMOTE MONITORING/CONTROL (Energy Efficiency). Business Case GPR per 3.5-8: *SCADA systems can be justified based on substantial energy savings* ($217,000).

State of Idaho SRF Loan Program
June 2015

1. Energy Efficiency Study & C.I.P.

Summary

- Development of a Capital Improvement Plan based on an energy-efficiency study of the City's wastewater system, including video inspection of the City's wastewater collection system.
- Estimated loan amount = $10,650,000
- Estimated GPR portion of loan ≅ .4% ($50,000)[1]

Conclusion

- The system study and subsequent development of a Capital Improvement Plan for energy-efficiency qualify as Categorically GPR-eligible as 'energy management planning'.
- **GPR Costs**: Energy efficiency study = $50,000
- **GPR Justification**: The system study and Capital Improvement Plan for energy-efficiency is GPR-eligible per Section 3.2-4[2] (Energy Efficient): *POTW energy planning, including energy assessments, energy audits, optimization studies…which are reasonably expected to result in a capital project are eligible.*

[1] 2/15/11 Correspondence with M. Jaglowski, PE, Project Manager, Keller Engineers

[2] Attachment 2. April 21, 2010 EPA Guidance for Determining GPR Eligibility for FY11 SRF Projects, p.9

2. UPGRADE OF WASTEWATER TRANSFER SYSTEM

Summary

- Upgrade of electronics and pumps at the main lift station to enable the VFD to operate in variable frequency mode and replacing 7,725 feet of pressure main from the main lift station to the wastewater treatment plant for energy-saving hydraulic efficiency.
- Estimated loan amount = $13,000,000
- Estimated GPR portion of loan = 4.5% ($917,000)[3]

Background[4]

- During this period the City's wastewater treatment plant measures a daily average influent flow of approximately 1.7 MGD and peak daily flows of 2.1 MGD.
- The plant measures a dry weather daily average wastewater flow of 0.35 MGD.
- The main lift station contains two 88 HP submersible pumps which are approximately 8 years old.
- Each pump is connected to a VFD; one drive is currently operational while the other is off line. The non-operational pump and drive do not have a grinder blade installed.
- The existing pressure main is a reinforced concrete pressure pipe that has been in service over 20 years.
- The estimated roughness coefficient ("C") of the concrete pressure pipe is 100.
- The hydraulic head loss at full flow is approximately .55 psi pressure drop per 100 linear feet of line length = equivalent of 48.4 psi loss through the 7,725 foot length of the pressure main.
- The pumps when operating at full flow would have to overcome the 48.4 psi before any wastewater is delivered to the treatment plant.

Energy Efficiency Improvements

- A new tri-pump system was installed with 40 HP pumps controlled by new VFD's that are connected to the SCADA system. Upgrade costs were $260,000.
- The designed pressure main is targeted to be 12-inch PVC AWWA C-900 pressure class pipe which will have a roughness coefficient of 160. The hydraulic head loss for the new pipe will be approximately 18.5 psi loss through the length of the pipe.
- With the combination of the new pressure main, three (3) new 40 HP pumps and VFD's, and the SCADA connection to help control the lift station, the expected saving in electrical power usage approaches approximately 35% under historical costs.

Conclusion

- The project would result in a more energy efficient operation = 35 % of the energy requirement of historical costs.
- **GPR Costs**:

  7,725' 12" HDPE = $330,570
  New Pumps/VFDs = $260,000
  Total = $590,570

- **GPR Justification**: The replacement of the wastewater pressure transfer system as recommended in the Capital Improvement Plan is Categorically GPR-eligible per Section 3.2-2[5]: *projects that achieve a 20% reduction in energy consumption*.

[3] 10/25/13; 12/5/11; 3/1/11Correspondence with M. Jaglowski P.E., Keller Associates
[4] 10/25/13; 9/29/11 Correspondence with M. Jaglowski P.E., Keller Associates
[5] Attachment 2. EPA Guidance for Determining GPR Eligibility for FY11 SRF Projects, p.9

3. RENOVATION OF GRAVITY WASTEWATER COLLECTION SYSTEM

Summary

- Renovation of the City's gravity wastewater collection system to reduce excessive inflow and infiltration (I/I).
- Estimated loan amount = $13,000,000
- Estimated energy efficient (green) portion of loan = 15% ($1,926,050)

Background[6]

- The irrigation season and high groundwater levels in the study area extend for approximately 5 months, from June 1 through October 30.
- During this period the City's wastewater treatment plant (WWTP) measures a daily average influent flow of approximately 1.7 MGD (= 255 MG over 5 months); the plant measures a dry weather daily average wastewater flow of 0.35 MGD (= 52 MG). Therefore I/I volume during this 5 month period = 203 MG.
- An energy efficiency study of the City's wastewater system resulted in the development of a Capital Improvement Plan (C.I.P.). A video inspection of the entire collection system revealed that 63,000 lineal feet of wastewater collection lines are located in the area most greatly affected by seasonal groundwater intrusion.
- The C.I.P. recommended replacement of 21,300 lineal feet of the most dilapidated gravity mains as part of Phase 1 and Phase 2, which would reduce the total infiltration of groundwater by an estimated 30% (= 61 MG).

Results[7]

Cost Effectiveness

- To determine the overall cost effectiveness and energy savings of the selected alternative, it is compared to the Best Practicable Alternative (BPA). For I/I projects, the standard BPA consists of equalization of influent flow, followed by provision for additional downstream treatment of the increased wastewater I/I volume. The stored, equalized I/I volume would subsequently be transferred by metered pumping to the WWTP for treatment.
- The pipe replacement option is cost effective as the BPA is more expensive and energy intensive. Capital costs: (i) BPA = 61MG/31MG x $2,452,750 = $4,826,380; (ii) Collection system piping replacement = $3,697,750.

Energy Savings

- Existing pump station: reducing system I/I by 30% results in a direct reduction in energy consumption of 30% by the existing lift station during the months of high groundwater levels, for the 40 year life of the project = (61MG/31MG**)** x **$**41,320 = **$81,370**.
- BPA: the selected alternative avoids pumping wastewater for 40 years from the equalization basin to the WWTP. The 40-year O&M pumping costs = (61MG/31MG) x $937,460 = **$1,844,680**.

Conclusion

- The 30% reduction in the quantity of wastewater resulting from the elimination of I/I in the collection system makes the project GPR-eligible since it saves costs from less pumping, reduced treatment of wastewater. The I/I correction project is also cost effective, incurring less capital cost than the BPA.
- **GPR Costs**: GPR-eligible savings compared to the BPA = $81,370 + $1,844,680 = $1,926,050
  ∴ GPR-eligible costs = **$1,926,050** (replacing 21,300 feet of sewer [phases 1 & 2])
- **GPR Justification**: The prioritized replacement of gravity sewer lines by the City as recommended in the Capital Improvement Plan is GPR-eligible by a Business Case per Section 3.5-4[8] (Energy Efficient): *Infiltration/Inflow (I/I) correction projects that save energy from pumping and reduced treatment costs and are cost effective*.

[6] 10/25/13 & 12/5/11 Correspondence with M. Jaglowski, PE, Project Manager, Keller Associates
[7] City of Cascade FY12 GPR Justification; development of the standard BPA for I/I analyses (@ $2,452,750 for 31MG).

4. SCADA CONTROL TECHNOLOGY

Summary

- Energy efficiency results from the remote electronic sensing and control of the treatment plant and lift stations.
- Estimated loan amount = $13,000,000
- Estimated energy efficiency (green) portion of loan ≅ 2% ($217,000)
- Estimated annual energy savings $95,000 per year.

Background/ Results[9]

- The SCADA system is part of the project both at the plant and for the lift station.
- FEED PUMPS: The feed pumps to the plant will be controlled through a PLC (programmable logic controller which is part of the SCADA system) that is both tied to a level sensor and VFD's (variable frequency drives) on the pumps. The SCADA PLC on the feed pumps and VFDs will significantly reduce feed pump cycling, thereby greatly reducing energy consumption.
- TREATMENT PLANT: The aeration system will be tied to dissolved oxygen levels in the aeration tanks and aeration header through PLC's; these control the mixer and aeration blower speed through VFDs. Thus, SCADA optimizes and controls tank oxygen levels.
- UV DISINFECTION: The SCADA system controls the UV system through flow PLC monitoring. The UV lights in the UV disinfection system are turned on or off based upon the rate of flow passing by the UV lamps.
- PLANT: Through a computer based Graphical User Interface (GUI) program the plant's processes will be monitored and observed remotely. The SCADA GUI will save energy through reduced travel to and from the plant.

Energy Efficiency Improvements

- FEED PUMPS: For the feed pumps it is estimated 10% reduction of power use over a typical float / on-off system. Utilizing 15 HP feed pumps would save approximately $5,000 per year.
- TREATMENT PLANT: Optimizing the air supplied saves significant energy: 150 HP blower @ 20% savings = $20,000 per year.
- UV DISINFECTION: SCADA monitoring/ control of UV light cycling = $3,000 savings per year
- PLANT: Remote SCADA control saves labor and travel costs = 1 person one trip per day at 10 miles per day = $65,000 per year in labor costs; travel cost @ $0.51 per mile = $2,000 per year = total saving of $67,000/yr.

Conclusion

- Total SCADA savings would be around $95,000 per year in energy and labor costs = payback of 1.3 years. therefore SCADA system costs are GPR-eligible by 3.5-8.
- **GPR Costs:** SCADA = $217,000
- **GPR Justification:** SCADA system costs are GPR-eligible by a Business Case per 3.5-8[10]: *SCADA systems can be justified based on substantial energy savings.*

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[8] Attachment 2. April 21, 2010 EPA Guidance for Determining GPR Eligibility for FY11 SRF Projects, P.10
[9] 10/25/13 & 9/29/11 Correspondence with M. Jaglowski, PE, Project Manager, Keller Associates
[10] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 10.