Drinking Water State Revolving Fund Green Project Reserve

– Preliminary –

Kootenai Water District Drinking Water #1 Upgrade Project

SRF Loan #DW1808 (pop. 300)

$395,000

Preliminary Green Project Reserve Justification[1]

Categorical GPR Documentation

1. REPLACING 276 EXISTING MALFUNCTIONING MANUAL READ WATER METERS WITH NEW RADIO-READ SYSTEMS (Water Efficiency). Categorical GPR per 2.2-3a: …*replacing existing malfunctioning water meters with Automatic Meter Reading (AMR) systems;* also 2.2-9: *Projects that result from a water efficiency assessment such as water audits.* ($98,000).

Business and Categorical GPR Documentation

2. NEW PREMIUM ENERGY-EFFICIENT BOOSTER PUMP AND VFD (Energy Efficiency). Categorical per GPR 3.2-2: *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*; also, per 3.5-9*: VFDs can be justified based upon substantial energy savings* ($xxxxx).
3. INSTALLS NEW DISTRIBUTION SYSTEM PIPING (Water Efficiency). Business Case GPR per 2.4-3: *Efficient water use…reducing the amount of energy required by a drinking water system…therefore, there are also energy and financial savings*; also (Energy Efficiency) Business Case GPR per 3.5-1: *Energy efficient…upgrades;* and, per 3.5-5: *Projects that achieve the remaining increments of energy efficiency.* ($xxxxxxx).
4. INSTALLS ADVANCED FLUORESCENT LIGHTING (Energy Efficiency). Business Case GPR per 3.5-7: *Upgrade of lighting to energy efficient sources such as …compact fluorescent lighting.* ($xxxxx).

Prepared by the State of Idaho SRF Loan Program

July 2018

[1] All costs and text will be updated by the loan recipient's professional engineer in the GPR Technical Memorandum

Categorical

1. EXISTING WATER METER REPLACEMENT[2]

Summary

- Replacing 276 outdated, malfunctioning water meters with a remote-read meter system. In addition to the meter replacement, the overall project also includes transmission line replacement and improvements to the distribution system.
- Loan amount = $395,000
- GPR portion of loan (AMR) = 25% ($98,000) (Preliminary cost estimate)

Background

- Most of the existing water meters were installed 25 years ago, are not radio-read, are malfunctioning, and not reliable.
- Increased water loss, due to leaks and inaccurate readings, are partly attributed to the old meters.

Results

- A water study conducted by the City indicated the water meters may be one source of the 45.2% annual water leakage measured over the past six years.
- Replacement of water meters throughout the district with new ones featuring remote-read technology will allow monthly reading without regard to weather conditions. This will also enable the district to identify leaks sooner and with more accuracy.
- The new remote-read system will include built-in leak detection and backflow detection.

Other Benefits

- Replacing the old meters will increase water efficiency by decreasing the amount of water lost and by providing more accurate water-use information to customers and the system.

Conclusion

- Accurate metering of water consumption is an important conservation measure because providing more accurate water bills sends a strong price signal to customers and will result in more efficient consumption.
- Water leakage and inaccuracy increases with water meter age; therefore, an investment in water meters today will lead to additional water and dollar savings over time. Also, the water savings from the meter replacement will extend the life of the water supply and delay capital expansion projects.
- **GPR Costs**: Replacing malfunctioning water meters with AMR meters = $98,000 (Preliminary Conceptual Cost basis)
- **GPR Justification**: The project is Categorically GPR-eligible (Water Efficiency) per Section 2.2-3a*: replacing existing malfunctioning water meters with Automatic Meter Reading (AMR) systems*[3].

[2] Kootenai WD SRF 2018 LOI and Loan Application
[3] 2010 EPA Guidelines for Determining Project GPR-Eligibility. Attachment 2.

2. New Premium Booster Pump and VFD

Summary

- As part of the upgrade project, the Kootenai Water District #1 will purchase and install a new booster pump equipped with premium energy-efficient motor and VFD.
- Total Loan amount = $395,000
- Estimated energy efficient (green) portion of loan = xx% ($xxxxxx)

Background

- The water system for the Kootenai Water District #1 is supplied by two intake pumps which pump water from Lake Coeur d'Alene into a slow-sand filter water treatment system. After filtration, chlorine is injected and water gravity feeds across the road to a clear well and is then pumped to the distribution system and three reservoirs.
- A new xxHP premium energy-efficient booster pump equipped with a VFD will be installed in the booster pump station to feed finished water to the reservoir.

GPR Justification

Motors/VFDs:

The Baseline Standard Practice for comparison is a standard Epact motor that is not controlled by a VFD[4]. Published operating curves by the pump manufacturer provided VFD efficiency data:

- **Proposed Pump - no VFD, Epact efficiency motor**
  Type: Vertical Turbine Hollow Shaft;
  Motor rating = xx HP; Motor type = Epact efficiency (93.0% assumed at 75% of full load[5])
  % Annual Usage = xx% (average daily operation throughout the year)
  Energy usage = 125,078 kW-hr
- **Proposed Pump - no VFD, with premium efficiency motor**
  Motor rating = 125 HP; Motor type = premium efficiency (95.4% assumed at 75% of full load)
  % Annual Usage = xx% (average daily operation throughout the year)
  Energy usage = 122,076 kW-hr
- **Proposed Pumps - VFD operation with premium efficiency motor**
  Motor rating = 125 HP; Motor type = premium efficiency (95.4% assumed at 75% of full load)
  % Annual Usage = xx% (average daily operation throughout the year);
  Energy usage 98,703 kW-hr
- **Energy Reduction - comparing with VFD to without VFD**
  Energy usage, w/o VFD 122,076 kW-hr
  Energy usage, w/ VFD 98,703 kW-hr
- The premium motor with VFDs result in a 21.1% energy reduction compared to non-VFD, standard Epact efficiency motors

Conclusion

- The combined annual energy savings for utilizing premium pumps and VFDs is estimated to be $xxxxx kWh/year - corresponding to an energy reduction of 21.1% when compared to the Baseline Standard Practice.
- **GRP Costs Identified**:
  Booster Station Pump/VFD = **$xxxxxx**
- **GPR Justification**:
  The Pump/VFD system is Categorically GPR eligible (Energy Efficiency) per Section 3.2-2 page 9[6]: *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.*

[4] NYS Energy Research and Development Authority, Energy Evaluation Memorandum, Village of Greenport WWTP Upgrade 8-2009.
[5] http://www.copper.org/environment/sustainable-energy/electric-motors/education/motor_text.html
[6] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility

3. DISTRIBUTION PIPE REPLACEMENT

Summary

- The project will replace older distribution pipe in order to provide requisite system capacity and to eliminate the loss of 28 million gallons of water per year (MGY), equal to 45% of total system average annual use.
- Loan amount = $395,000
- Pipe Replacement portion of loan = xx% ($xxxxxx)

Background

- Based on the District records over the past 5 years, the district has lost up to 45% of the water it has produced. This is due to inadequate metering and distribution system leaks.
- The total amount of water leakage was determined using a water balance around production metered records compared to metered usage between 2011 and 2016 (refer Table 1).
- Much of the system has been in service for more than 45years.

Table 1. Water Usage (In Thousand Gallons)

Year	Produced	Billed	Difference	% Loss
2011	57,164	32,941	24,223	42%
2012	55,144	29,300	25,844	47%
2013	57,265	31,057	26,208	46%
2014	57,381	31,092	26,289	46%
2015	72,933	42,123	30,810	42%
2016	67,069	34,437	32,632	49%
Totals	366,956	200,950	166,006	45%

Calculated Savings by Eliminating Water Loss

- The results of this analysis show that on average, approximately 28 MGY is unaccounted for (45% of the water entering the distribution system). Replacing the old distribution pipe will conserve most of this water.
- If the District were to eliminate the leaks in the system, the potential annual costs savings to the district are shown in Table 2. These savings are just in the reduction of power costs and do not include water treatment costs (i.e. filtration and disinfection, operation maintenance and depreciation).
- This shows average annual cost savings of $14,177 would have be realized with the proposed project
- Over the 40-year life of the project this would result in over $500,000 in savings.

Table 2. Annual Power Billing

Year	Annual Billing	Cost Savings
2011	$ 30,639.00	$ 12,868.38
2012	$ 29,323.00	$ 13,781.81
2013	$ 25,921.00	$ 11,923.66
2014	$ 29,758.00	$ 13,688.68
2015	$ 36,987.00	$ 15,534.54
2016	$ 35,238.00	$ 17,266.62

Conclusion

- Replacing old distribution pipe is cost-effective through the savings realized by conserving at least 28 MGY, or 45% of the water currently produced. Other benefits include reductions in unnecessary O&M expenditures, and eliminating potential health hazards associated with waterborne pathogens entering the water distribution system.
- **GPR Costs**: Replacing distribution piping = $xxxxxx
- **GPR Justification**:
  The project is Categorically GPR-eligible (Water Efficiency) per Section 2.4-1: *Projects that result from a water efficiency related assessment such as water audits*; 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 infrastructure*[7].

[7] Attachment 2. EPA Guidelines for Determining FY11 Project GPR-Eligibility.

4. ADVANCED FLUORESCENT LIGHTING

Summary

- Energy efficiency from the installation of advanced fluorescent lighting in all indoor spaces, high efficiency discharge lighting-high efficiency LED lighting for use in outdoor areas with lighting controls.
- Total Loan amount = $395,000
- Categorical energy efficient (green) portion of loan = x% ($xx)

Energy Efficiency Improvements

- Energy efficient T-8 magnetic fluorescent lighting is approximately 28 percent more energy efficient than standard T-12 magnetic fluorescent lighting for relatively the same light output. [8]
- LED lighting is approximately 58 percent more energy efficient that typical high pressure sodium lighting for relatively the same light output.[9]
- Outdoor lighting will be controlled with photocells. The instant ON capability of LED allow for motion sensing which provides potential for greater control over on-OFF cycles.

Conclusion

- **GPR Costs**:

Equipment Name	Cost
Interior/Exterior Lighting and Controls	$xx
Estimated Total	**$**xx

- **GPR Justification**: Advanced fluorescent lighting is GPR-eligible by a Business Case per 3.5-7[10]: *Upgrade of POTW lighting to energy efficient sources such as …compact fluorescent*.

[8] National Lighting Product Information Program, *Lighting Answers*, Volume 1 Issue 1, April 1993.
[9] Global Green Energy, *ROI Analysis - 250W high pressure sodium vs. EcoBright 120W LED street light*, accessed via http://www.gg-energy.com/
[10] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 10.