City of Lewiston Drinking Water Project
SRF Loan #DW2001 (pop. 15,001)
$32,082,661

Preliminary Green Project Reserve Justification[1]

Categorical & Business Case GPR Documentation

1. REPLACES XXXXX LINEAL FEET OF AGING CAST IRON DISTRIBUTION MAINS (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.* ($xxxxxxx).

Business Case GPR Documentation

2. UPDATE PUMP STATIONS AND WITH PREMIUM ENERGY-EFFICIENT PUMPS AND VFDS (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 SCADA SYSTEM TO ENHANCE REMOTE MONITORING (ENERGY EFFICIENCY). GPR Business Case per 3.5-7: *automated and remote control systems (SCADA) that achieve substantial energy savings*. ($xxxxxxx).

4. REPLACEMENT OF CHEMICALLY ENHANCED WATER FILTRATION WITH MEMBRANE FILTRATION. (Innovative). GPR Business Case per 4.5-2a: *Project that significantly reduce or eliminate the use of chemicals in water treatment; and, per 4.5-2b: Treatment technologies or approaches that significantly reduce the volume of residuals, minimize the generation of residuals…"*($xxxxxxx).

5. INSTALLS ENERGY EFFICIENT LIGHTING (Energy Efficiency). (Energy Efficiency). GPR Business Case per Section 3.5-6: "*Upgrade of lighting to energy efficient sources (such as…compact fluorescent, light emitting diode…)".* ($xxxxxxx).

[1] Information in red font—along with all data, including all costs— to be provided by the loan recipient in the GPR Technical Memorandum due at the time of final design approval.

1. DISTRIBUTION MAIN PIPE REPLACEMENT (PRELIMINARY)

Summary

- Replacement of 11,000 feet of older distribution pipe with new PVC pipe eliminates water losses, provides requisite system capacity, and eliminates the loss of xxxxx gallons of water per year, equal to xx% of total system average annual use.
- Loan amount = $32,082,661
- Pipe Replacement portion of loan = xx% ($xxxxxx) (Engineer's Estimate)
- Annual water savings = xx million gallons (MG)

Background

- The City's water distribution system is comprised of a network of thin walled steel, ductile iron, and PVC pipes ranging from 4 to 10 inches in diameter.
- The City's water system utilizes older pipes and joints susceptible to leaks with high pressures.
- Much of the system has been in service for more than 70 years.

Calculated Savings by Eliminating Water Loss

- [describe how water loss was calculated]

Conclusion

- By replacing the xxxx feet of distribution pipe the City expects to conserves xx MGY. Other benefits include reductions in unnecessary O&M expenditures.
- **GPR Costs**: Replacing xxxx feet of 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*[2].

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

2. VARIABLE SPEED PUMPING SYSTEMS (PRELIMINARY)

Summary

- As part of the upgrade project, the City will replace the water system's existing booster station pumps with new premium energy-efficiency pumps and variable frequency drives to meet demand without using elevated gravity storage.
- Loan amount = $32,082,661
- Estimated energy efficient (green) portion of loan = x% ($xxxxx) (design cost estimate)

Background

- The water system currently includes [describe main system components]. X booster pump stations includes xx HP booster pumps. There is xx pressure zones, directly pressurized by booster stations.
- The booster pumps are undersized and have reached the end of their useful life.


Existing Finished Water Pumps

GPR Justification

Motors/VFDs:
To determine the GPR-eligibility of the new premium pumps with VFD controllers, they are compared to the Baseline Standard Practice (BSP), which is a standard Epact motor without VFD (valve throttle).

xx hp Pump

- **Proposed Pumps - no VFD, standard Epact efficiency motor**
  Motor = xx hp; Motor type = Epact efficient (xx%[3])
  Annual Usage = xxxx hours/year
  Energy usage = zzzzzz kW
- **Proposed Pumps - VFD, with premium efficiency motor**
  Motor = xx hp; Motor type = premium efficient = (zz%)
  Annual Usage = xxxx hours/year
  Energy usage = ---- kW
- **Energy Reduction - comparing with VFD to without VFD[4]**
  Energy savings with VFD = X kW = annual savings = $YYY
  = pay-back period of Z year

yy hp Pump

- **Proposed Pumps - no VFD, standard Epact efficiency motor**
  Motor = yy hp; Motor type = Epact efficient (xx%[5])
  Annual Usage = xxxx hours/year
  Energy usage = zzzzzz kW
- **Proposed Pumps - VFD, with premium efficiency motor**
  Motor = yy hp; Motor type = premium efficient = (zz%)
  Annual Usage = xxxx hours/year
  Energy usage = ---- kW
- **Energy Reduction - comparing with VFD to without VFD[6]**
  Energy savings with VFD = X kW = annual savings = $YYY
  = pay-back period of Z year

[3] NEMA
[4] WEG Energy Savings Calculator
[5] NEMA
[6] WEG Energy Savings Calculator

Therefore, for both pumping systems, the premium motors with VFDs are GPR-eligible as the energy savings result in pay-back periods for the system which are less than the useful life of the equipment.

Conclusion

- The VFD premium pumps are GPR-eligible as the cost savings as compared to the BSP result in pay-back periods which are less than the useful life of the equipment.
- **GRP Costs Identified:**

xx-HP VFD pump = $xxxx ea x 1 = $ xxxx
yy-HP VFD pump @ $15,000 ea x 1 = $xxxxx
Total = $zzzzzz

- **GPR Justification**: The Pump/VFD system is Categorically GPR eligible (Energy Efficiency) per Section 3.2-2 page 9[7]: *Projects that achieve a 20% reduction in energy consumption; are categorically eligible for GPR; 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.*

[7] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility

3. SCADA SYSTEM UPGRADES (PRELIMINARY)

Summary

- The City will install a new SCADA system to allow centralized monitoring and control of all water system components, including xx wells, yy booster stations, storage reservoir, and treatment plant. The City's wastewater treatment system will be incorporated into the system to allow operations staff to monitor and control both systems using a single interface.
- Major water system parameters monitored include, pumps/wells in operation, system pressure, flow rates, operating setpoints, totalized water production, storage level and volume, well pumping level, and equipment and intrusion alarms.
- System will allow plotting operating trends, data collection/recording, and remote operator control and monitoring.
- Loan amount = $32,082,661
- Estimated energy efficiency (green) portion of loan = xx% ($xxxxx) (design estimate)
- Estimated annual energy and labor savings = $xxxxx per year.

Background

- The current electrical controls are insufficient to meet the monitoring and operational requirements of the water system.
- The SCADA system will allow centralized control of local PLCs at the booster station, Well 4, and the new Well 5.
- The central SCADA computer will be located at the City's maintenance shop/wastewater treatment plant area.

GPR Justification

- Remote SCADA monitoring saves labor costs: x man-hour per day, $yy/hour = $zzzzzz per year in labor costs.
- Useful life of system = yy years
- Payback period = X years

Conclusion

- Total SCADA savings would be approximately $zzzzzz per year in labor and energy costs = payback of X years, which is less than the useful life of the system. Therefore SCADA costs are GPR-eligible by 3.5-7.
- **GPR Costs Identified**: SCADA = $xxxxxx (engineering estimate)
- **GPR Justification**: SCADA system costs are GPR-eligible by a Business Case per 3.5-7: *automated and remote control systems (SCADA) that achieve substantial energy savings.*

4. MEMBRANE FILTRATION SYSTEM (PRELIMINARY)[8]

Summary

- A new water treatment plant will be constructed to replace the existing conventional dual media filtration plant. The new treatment process will be a microfiltration/ultrafiltration pressure membrane system.
- The new process will significantly reduce the use of chemicals, chemical residuals, and the amount of product water required for backwashing.
- Loan amount = $32,082,661
- Water savings (green) portion of loan = zz% ($xxxxxxx) (Engineer's estimate)
- Reduction in chemical use = zz%

Background

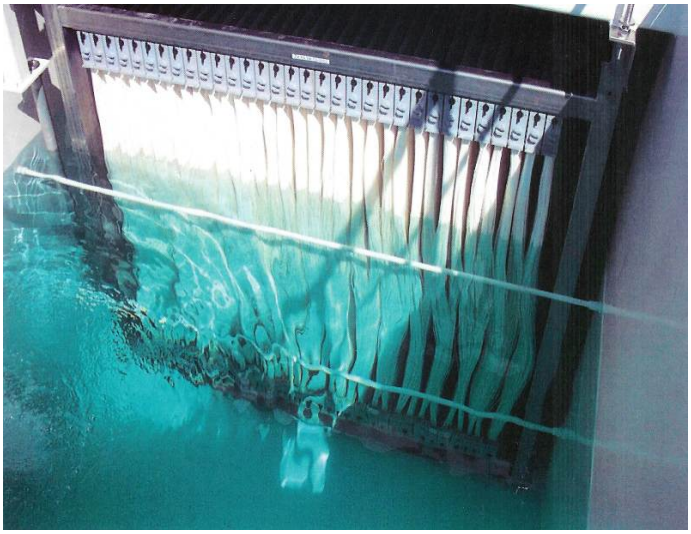
- The existing water treatment plant was constructed in 1953. The conventional treatment process consists of chemical addition, rapid mixing, flocculation, sedimentation, dual media filtration, and chlorine disinfection.
- The City currently uses a total of $xxxx/year of these treatment chemicals:
  - Liquid Alum (zzzz gal) = $yyyyy
  - Solid Alum (zzzz lb.) = $xxxx
  - Soda Ash (zzzz lb.) = $zzzzz
  - Polymer (zz gal) = $XX

Results

- A facility plan identified two potential treatment options to replace the existing plant: conventional filtration and pressure membrane filtration.

  Conventional Filtration Plants:
  - Chemical use for coagulation/flocculation can be quite high depending on water source.

  Membrane Plant:
  - In the absence of moderate to severe contamination, much lower operator costs;
  - Higher quality product water than a conventional filtration plant;
  - Minimal use of chemicals required (small quantity for cleaning etc.).



- Idaho communities with pressure membrane filtration plants commonly experience 95% - 98% recovery of feed water, especially in the Northern part of Idaho (main contaminants of concern being turbidity/suspended solids[9]);

[8] City of Lewiston Facility Plan, 2018
[9] 2011 Orofino GPR TM

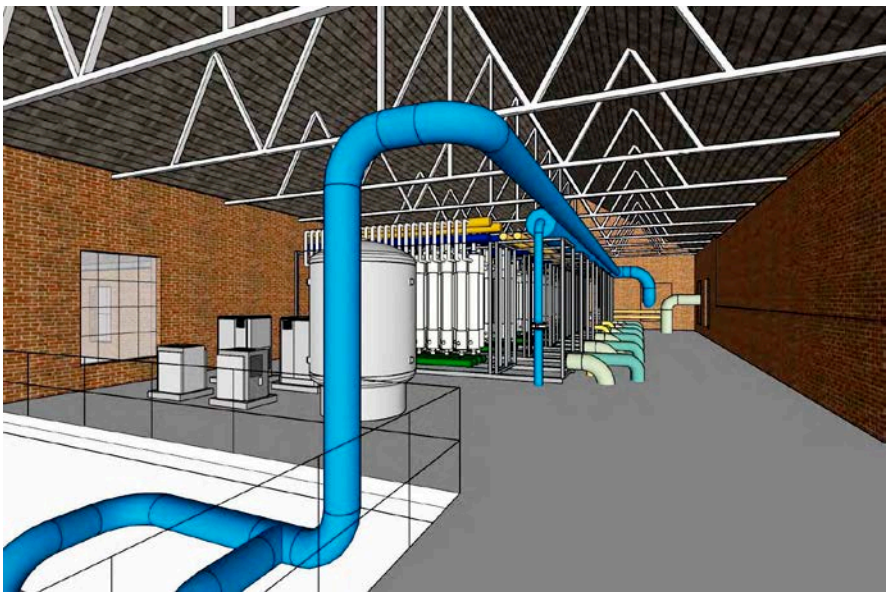
- Usually compressed air and a small amount of water is used for backwash (typically 2% to 5% of finished water is used in backwash);
- Very few chemicals are used with membrane filtration plants in Idaho as compared to rapid sand filtration or direct filtration.

Benefits

- Membrane filtration reduces the amount of chemicals required in the treatment process by over 90%.
- The lower water requirement for backwashing and wasting results in a much smaller quantity of residuals for disposal.
- The lower backwashing rate results in less withdrawal of raw water from the source, thus conserving a valuable resource.

Conclusion

- The pressure membrane system was chosen over the conventional filtration system because of the higher quality of finished water produced, the need for less chemicals, the much smaller quantity of residuals resulting from the process, and the much lower product water requirements for backwashing.
- Valuable resources are conserved by reducing the amount of water withdrawn from the river source as well as increasing the amount of finished water available for public use.
- The project results in a more energy efficient operation = 35 % of the energy requirement of historical costs.
- **GPR Costs**: pressure membrane system = $xxxxxx (Engineer's estimate)
- **GPR Justification**[10]: The process is Business Case GPR-eligible (Innovative) per Section 4/ 4.5-2a: *technology that significantly reduces the use of chemicals*, and by (4.5-2b): *technology that reduces volume of residuals or amount of chemical in residuals.* Also GPR-eligible (Water Efficient) per Section 2.2-13: *internal plant water reuse*.



[10] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. p.21,22

5. Energy Efficient Lighting (Preliminary)

Summary

- The design will incorporate high efficiency fluorescent lighting for interior lighting. T8 and/or T5 fixtures with high efficiency electronic ballasts will be used for most applications and T5HO fixtures for any high bay applications.
- Loan amount = $32,082,661
- Categorical energy efficient (green) portion of loan ≅ x% ($yyyyyy) (design estimate)

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.[11]
- LED lighting is approximately 58 percent more energy efficient that typical high pressure sodium lighting for relatively the same light output.[12]
- The design will incorporate lighting control at each booster station, where applicable, in the form of dual technology occupancy sensors. Lighting control for building exterior and site lighting will be provided in the form of programmable lighting control panel(s) with timer and photocell inputs.

Conclusion

- **GPR Costs: (Preliminary Costs)**

Equipment Name	Cost
Fluorescent Lighting	$xxxxx
LED Lighting	$xxxxx
Lighting Controls	$xxxxx
∴ **Total =**	**$xxxxxx**

- **GPR Justification:** Advanced fluorescent lighting is GPR-eligible by a Business Case per 3.5-6[13]: *Upgrade of POTW lighting to energy efficient sources such as …compact fluorescent*.

[11] National Lighting Product Information Program, *Lighting Answers*, Volume 1 Issue 1, April 1993.
[12] Global Green Energy, *ROI Analysis - 250W high pressure sodium vs. EcoBright 120W LED street light*, accessed via http://www.gg-energy.com/
[13] Attachment 2. April 21, 2010 EPA Guidance for Determining Project Eligibility. Page 20.