City of Brazil, Indiana

Water System Improvements Project

2010

Green Project Reserve Business Cases

Background

- The Brazil water system includes approximately 80 miles of 18", 16", 12", 10", 8", 6", 4", 3", 2", and ¾" cast iron, PVC and transite mains. The treatment plant processes an average of 2 million gallons per day (MGD) or 735.5 million gallons per year (MGY).
- As part of the City's May 2009 Preliminary Engineering Report, unaccounted for water was determined to be 49.67%, or 365.3 million gallons, for the calendar year 2008. Additionally, there are several areas of the City that experience low pressure and flow.
- Most of the meters in the distribution system are old/outdated.
- Although the water treatment plant has sufficient capacity to meet the average daily demand, technological advances have surpassed the capabilities of the facility's existing monitoring system. The existing system of controls and monitoring of the plant does not provide the standard alarms and monitoring required for a system of this size. The lack of reliable system monitoring, control, and alarm notification requires additional maintenance and reduces the overall reliability and efficiency of the system.

Green Project Reserve Elements

There are three (3) elements of this project that would qualify for green project reserve funding considerations. The planning, design, and construction of these elements represent $2,385,001.90, or 51%, of the $4,670,000.00 total SRF loan for the project.

- Pipe Replacement
  - Installation of approximately 4.5 miles of water main to replace existing mains in the distribution system
  - Estimated annual water savings = 20.6 million gallons (MG)
  - Business case attached

Pipe Replacement Cost

Description/Phase	Cost
Planning & Design	$ 155,045.78
Construction	$ 1,798,207.70
Total	**$ 1,953,253.48**

- Existing Water Meter Replacement
  - Replacement of 1,000 water meters with automatic meter reading equipment
  - Categorical - no business case required

Meter Replacement Cost

Description/Phase	Cost
Planning & Design	$ 21,900.49
Construction	$ 254,000.00
Total	**$ 275,900.49**

- Supervisory Control and Data Acquisition System
  - Installation of a Supervisory Control And Data Acquisition (SCADA) System to improve remote monitory and control the system components from a central location.
  - Estimated Annual energy savings = 1,070 gallons of gasoline, and 13,615 kWh of electricity
  - Estimated Annual labor savings = 2,920 hours
  - Business case attached

SCADA System Cost

Description/Phase	Cost
Planning & Design	$ 12,370.93
Construction	$ 143,477.00
Total	**$ 155,847.93**

PIPE REPLACEMENT

Summary

- Installation of the following distribution system piping to replace existing mains:
  - 8,600 LF of 6-inch main typically along Posey Street, Mechanic Street, McGuire Street, Knight Street and Chicago Avenue;
  - 2,220 LF of 10-inch main typically along Central Avenue and Waterworks Road (north of the Craig Park entrance);
  - 10,930 LF of 12-inch main typically along Whiterock Road, Murphy Avenue, and at the interchange of I-70 and SR59;
  - 1,910 LF of 16-inch main along Craig Park Drive and Waterworks Road (south of the Craig Park entrance);
- Loan Amount = $1,953,253.48
- Green portion of loan = 100%
- Estimated annual water savings = 20.6 million gallons (MG)

Pipe Replacement Cost

Description/Phase	Cost
Planning & Design	$ 155,045.78
Construction	$ 1,798,207.70
Total	**$ 1,953,253.48**

Background

- The water system includes approximately 80 miles of 18", 16", 12", 10", 8", 6", 4", 3", 2", and ¾" cast iron, PVC and transite mains. The treatment plant processes an average of 2 million gallons per day (MGD) or 735.5 million gallons per year (MGY).
- As part of the City's May 2009 Preliminary Engineering Report, unaccounted for water was determined to be 49.67%, or 365.3 million gallons, for the calendar year 2008. Additionally, there are several areas of the City that experience low pressure and flow.
- The project will replace approximately 4.5 miles of the water distribution system with 6-inch to 16-inch PVC pipe.
- 97 water main repairs were made in the system between 1992 and 2008. Six of the 97 repairs were located along the areas scheduled for replacement.

Calculated Water Loss

- If it is assumed the unaccounted for water is uniform throughout the entire 80 miles of the distribution system and 4.5 miles are replaced (5.63% of the total 80 miles), then of the 365.3 MGY unaccounted for approximately 20.6 MGY will be located along the mains to be replaced.

Conclusion

- By replacing the 4.5 miles of pipe the system anticipates conserving approximately 20.6 MGY.
- The operating cost per unit of consumption is $0.70 per 100 cubic feet. Therefore, the cost savings of conserving 20.6 MGY of water is estimated at $19,300 per year.
- Additional benefits include reductions in unnecessary pumping and operation and maintenance expenditures, and eliminating potential health hazards associated with waterborne pathogens entering the water distribution system.

EXISTING WATER METER REPLACEMENT

Summary

- Replacement of 1,000 water meters with automatic meter reading equipment – Categorical, No Business Case Required
- Loan Amount = $275,900.49
- Green portion of loan = 100%

Meter Replacement Cost

Description/Phase	Cost
Planning & Design	$ 21,900.49
Construction	$ 254,000.00
Total	**$ 275,900.49**

SUPERVISORY CONTROL AND DATA ACQUISITION SYSTEM

Summary

- Installation of a Supervisory Control And Data Acquisition (SCADA) System to improve remote monitory and control the system components from a central location.
- Loan Amount = $155,847.93
- Green portion of loan = 100%
- Estimated annual energy savings = 1,070 gallons of gasoline, and 13,615 kWh of electricity
- Estimated annual labor savings = 2,920 hours

SCADA System Cost

Description/Phase	Cost
Planning & Design	$ 12,370.93
Construction	$ 143,477.00
Total	**$ 155,847.93**

Background

- Although the water treatment plant has sufficient capacity to meet the average daily demand, technological advances have surpassed the capabilities of the facility's existing monitoring system. The existing system of controls and monitoring of the plant does not provide the standard alarms and monitoring required for a system of this size. The lack of reliable system monitoring, control, and alarm notification requires additional maintenance and reduces the overall reliability and efficiency of the system.

Results

- The new SCADA System with high speed data radios will allow the City to monitor and operate the following linked sites:
  - Wellfield (four existing wells, plus new well)
  - Water Plant (two – 900,000 gallon ground storage tanks and high service pumps)
  - Craig Park Tank (750,000 gallon elevated water tank)
  - I-70/SR-59 Tank (250,000 gallon elevated water tank)
  - Booster Station

Benefits

- The SCADA System will allow the City to operate their wells in such a manner to minimize impacts to the aquifer and allow distribution of the demands to be rotated among their five active wells.
- The SCADA System will allow the City to operate all of their wells, booster station, and tank levels from a remote location (water plant or possibly from a remote computer). The wells are over 4.5 miles from the water treatment plant; the booster station approximately 5 miles from the plant; the tank at Craig Park approximately 4.5 miles from the plant; and the tank at I-70/SR-59 approximately 8 miles from the plant. Assuming one round trip from each location is avoided per day (44 miles per day) and company vehicles get 15 miles per gallon, then approximately 1,070 gallons of gasoline are saved annually. Assuming a gasoline cost of $2.60/gallon, the estimated savings will be $2,782 per year. This reduces the overall operations and maintenance costs for the town, reduces the carbon footprint of the water system and maximizes the City personnel's time.
- The Water Treatment Plant is monitored 24 hours per day. With the installation of a SCADA system, it may be possible to reduce the amount of manpower required at the plant. It is anticipated that the 3rd

shift will be relocated thus saving 8 hours of manpower per day, which equates to 2,920 hours per year. At $20/hour, the resulted savings are $58,400 per year.

- The SCADA System will allow the high service pumps at the water plant to be used more efficiently, since they will be controlled automatically rather than manually. The estimated savings in pump run time is 30 minutes per day. The primary pump is 100 hp, therefore at 0.746 kW per 1hp, the SCADA will save an estimated 13,615 kWh per year in electricity. The resulted savings, at $0.08 per kWh, is $1,090 per year.

Conclusion

- By installing a SCADA system, the City will be able to save approximately 1,070 gallons of fuel per year, reduce wear and tear on City vehicles, reduce the required manpower at the treatment plant by approximately 2,920 hours, and save approximately 13,615 kWh of electricity per year.
- The estimated cost savings of the project total $62,272 per year based on the following: $2,782 per year in gasoline, $58,400 per year in manpower, and $1,090 per year in electricity.