

Dunkirk Water System Improvements

Summary

- This project involves the construction of improvements at the existing Water Treatment Plant (WTP) which will significantly reduce the frequency of filter backwashing and its associated energy costs. Improvements in the distribution system include replacement of approximately 5,000 lineal feet of water main and installation of 86 new meter pits and connections.
- Estimated Loan Amount: \$1,633,602
- **GPR portion of the loan is \$832,765: \$691,852 for construction based on bid pricing and \$140,913 for planning and design engineering.**
- GPR Energy Efficiency : \$199,930 (\$166,100 for construction and \$33,830 for engineering)
- GPR Water Efficiency: \$632,835 (\$525,752 for construction and \$107,083 for design).
- The green components accumulate to 42% of the total project cost.

Background

- The existing WTP incorporated ozone treatment. This process has failed and the plant has difficulty in meeting their water quality treatment standards. To meet the standards, the plant presently backwashes the filters three times per day which utilizes a large amount of water. A conventional treatment process is being constructed to alleviate the need for the excessive backwashing and to reduce the iron content in the water delivered to the distribution system. The plant design includes energy efficient components.
- The existing distribution system experiences water main breaks on a frequent basis. The mains have also been shown to contain large amounts of iron buildup in the mains. Valves have failed due to lack of exercising of the valves and the iron buildup in the system. Approximately 5,000 feet of 2, 4 and 6-inch diameter water main will be replaced with new 8-inch PVC water main.

Water Efficiency Discussion

- The new water mains will replace mains that presently leak and have frequent breaks. Single event breakages have indicated the water loss can be from 20,000 to 96,000 gallons. From historic records, the annual water loss from leakage and water main breaks approximate 18 million gallons per year. The annual revenue loss from the water loss in the system is approximately \$273,600, of which, approximately \$5,000 is related to electrical power costs. The distribution system improvements include in this project are estimated to eliminate approximately 25 – 30 percent of the leaking lines, or approximately 5 million gallons per year. The annual revenue savings with the project is estimated to be \$76,000, of which approximately \$1,400 is associated with energy costs. The water distribution system capital cost is \$344,352.
- The new WTP will eliminate the need for the excessive backwashing required with the present water treatment process. It is estimated that the improvements will reduce the backwash volume by approximately 10 million gallons per year. The annual revenue savings with the reduced backwashing is \$152,000, of which approximately \$2,800 is associated with energy costs. The water treatment plant components considered to contribute to water efficiency is \$181,400.

Energy Efficiency Discussion

- Energy efficiency is related to the water efficiency components as discussed earlier. At the WTP, there is also energy efficiency related to electrical components of the design. The electrical components include the high service pumps which have high efficiency motors and VFD's; the plant controls including the SCADA system which allow for more efficient control over the filter operation as well as control to allow for pump soft starts; and a standby generator will allow for operation of the plant during power outages and will allow for operation of the generator during peak periods to reduce the power factor at the plant. It is estimated that the combined energy savings with the new filters, high service pumps, VFD's, controls/SCADA equipment, and WTP generator will be approximately \$4,500 annually or a 12 to 15% reduction in energy costs.
- The total energy savings with the distribution system improvements and WTP improvements is estimated to be \$5,900.
- The capital cost for the energy efficient components at the WTP, excluding the filter system which is included as water efficiency, is \$166,500.

Conclusions

- Water efficiency is achieved with the replacement of water mains and service connections along with the change in the water treatment process to a conventional filtration system. The estimated reduction in water with these improvements is 15 million gallons per year.
- Energy efficiency is realized with the water efficiencies as well as the addition of high efficient high service pumps with VFD's, new controls and SCADA system, and standby generator at the WTP. The annual energy savings is estimated to be \$5,900.
- Other benefits to the proposed improvements are reduced chlorination usage and costs, reduction of manpower demand for water main repairs, improved water quality delivered to the distribution system with the reduced iron concentration in the finished water.

Reference

Business Case for City of Dunkirk, Water System Improvements, prepared by The Schneider Corporation, January 2011