LTCP City Of Washington Project

Summary

- The green infrastructure used in the City of Washington's project to complete the implementation of their Long Term Control Plan (LTCP) falls into two categories; innovative and energy efficiencies. The innovative component is the use of a constructed wetland for the treatment of combined sewer wet weather overflows. The energy efficiency component is the use of a system of pumps, variable frequency drives (VFD's), a SCADA (**s**upervisory control and data acquisition) system and on-site generators.
- The SRF loan amount for the project was $9,000,000.
- **GPR total: $5,191,400 ($4,737,900 construction/$453,500 engineering) and represents approximately 21% of the total project cost of $25,083,000 ($22,802,000 construction/$2,281,000 engineering).**
- **GPR Environmental Innovation: $4,355,400**
- **GPR Energy Efficient: $836,000**
- The cost listed for the green components does not include the piping for transporting the combined sewer overflows to and from the constructed wetland nor does it include the UV disinfection system located at the outlet of the constructed wetland.

Background

- The City of Washington's collection system is unique in that several of the main interceptors are actually creeks that had been enclosed by large pipes and during wet weather not only convey sewage and runoff from the City proper but also from watersheds beyond the City limits. Estimates to separate the sewers were over $60 million, well beyond the capacity for the citizens to afford. A unique and cost-effective solution was necessary to comply with State regulations for the control and treatment of wet weather flows.
- The approved LTCP was based on capturing the flow from a 1 year, 1-hour (first flush) storm event in a 4 million gallon storage basin and pumping this volume to the wastewater treatment plant after the storm flows were over. A 21 million gallon, 27 acre constructed wetland with ultra-violent disinfection is used to capture and treat the volume generated from a 10 year-1 hour storm (minus the volume of the first flush event).

Results – Innovative GPR Elements

- The constructed wetland system is innovative as it is only the second of its type to be used in the United States for the treatment of combined sewer overflows and is approximately 3.5 times larger than the first system, both of which are in the state of Indiana. The PER showed that the capital cost savings as compared to the next lowest present worth alternative – Chemically Enhanced High Rate Clarification (CEHRC) was approximately $27 million and the difference in annual operation and maintenance costs was over $1.6 million. Additionally by using a constructed wetlands system, no process energy costs are incurred which would be required for comparable components.

- Based on the contractor's schedule of value the total construction cost of the constructed wetlands was $3,933,900 which is approximately 17% of the total construction cost bid of$22,802,000. Engineering costs totaled $421,500.

Results - Energy Efficiency GPR Elements

- Aside from using the constructed wetlands which have no energy requirements for operation, energy use for the system is minimized in several ways by the combination of pumps with variable frequency drives (VFD's), a SCADA (**s**upervisory control and data acquisition) system and on-site generators. The total project cost for the pumps, VFDs, SCADA and generator combinations is $836,000 (Construction cost: $804,000, Design Fees $32,000).

- Pump motors of significant size have been designed with Variable Frequency Drives (VFD's) to reduce demand charges and power consumption. There is 320 total motor horsepower that will operate intermittently at the WWTP, the wet weather storage basin and at the CSO 009 Pump Station that have been equipped with VFD's.

- A spread sheet entitled "City of Washington Pump Electrical Costs" was prepared that summarizes energy use for each pump type. For the calculations, it was assumed that there would be an average of 120 wet weather events per year, the average storm event would be 0.36 inches over a one hour period. Based upon estimated run times per motor, motor horsepower and VFD run time factor, a total annual energy savings of 51% would be realized.

- A SCADA system has been designed into the new wet weather treatment system and wastewater treatment plant that will allow for the most efficient operation of pumps and to together with the VFD's control pump speeds based on flow rates and levels. These features will help optimize system performance and provide for increased efficiency. Additionally the system will allow for automatic and/or remote monitoring and control of the system components from a central location.

- It can be assumed that the additional annual savings in electrical usage due to the installation of SCADA to increase electrical efficiency of the VFD's is 5%. Additionally without the SCADA system the wet weather system would have to be manually controlled during rain events not including manpower costs, the savings of fuel for transport to the various components of the system is conservatively estimated to be $675 annually.

- New on-site emergency generators will be located at both the constructed wetland area to operate the UV disinfection system, at the 009 pump station and the storage basin. The total power draw from these facilities could reach 392,100 KW-HRS. By working with the local electric utility these could be used in periods of peak demand to help reduce peak demands required of the utility.

Conclusion

- The proposed constructed wetland system is considered to be innovative for CSO treatment.

- The proposed VFDs, SCADA system and on-site emergency generators included in the projects will result in an energy savings of approximately 56 %. This portion of the project is categorical for energy efficiency per EPA Guidance for Determining GPR Project Eligibility dated April 21, 2010.

Reference

Business Case Prepared by Bernardin Lockmueller & Associates, Dated 11/18/2010 including Energy Savings Spreadsheet