

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: File

FROM: Izabel Hartman

DATE: July 28, 2015

SUBJECT: State Revolving Fund Project No. 5611-01
Charter Township of Kinross
Green Project Reserve (GPR) Funding Cost Calculation

The purpose of this memo is to document the cost calculations for the green project reserve funding for the Charter Township of Kinross, SRF Project No. 5611-01. The total loan amount is \$7,325,000. The portion of the project that qualifies as green is the anaerobic digestion system improvements, makeup air unit, high efficiency boiler system, and LED light fixtures (total cost of construction \$4,670,000). The total construction cost for the entire SRF project is \$5,598,000. In order to determine the percentage of non-construction costs associated with the green portion of the project, a proration was applied, as shown below:

$$4,670,000 / 5,598,000 = 0.8342$$

$$7,325,000 \times 0.8342 = 6,110,515$$

The total eligible amount of green project reserve funding for this project comes to \$6,110,515.

The principal forgiveness amount is set at \$1,000,000 for projects in the range of \$4M to \$10M of total GPR amount.

Kinross Charter Township, Chippewa County
SRF Project No. 5611-01
Summary of Components Qualifying for Green Project Reserve
May 2014

Summary

The WWTP and collection system was originally constructed in the early 1950s to serve the Kincheloe Air Force Base which was inactivated in the late 1970s and converted to a residential community. Excess wastewater treatment capacity, and other available infrastructure, were offered to and accepted by the Michigan Department of Corrections to support prison operations. By 1982, approximately 500 prisoners were housed in the Kinross Correctional Facility, bringing the population served to approximately 1600 people. The affordable (former) base housing became popular and the residential population has doubled.

An improvements project in 1989 upgraded the collection system and WWTP to serve the newly constructed Chippewa and Hiawatha Temporary correctional facilities. In 1994, another improvements project was completed to automate the preliminary treatment system and double the secondary treatment capacity.

The anaerobic digester equipment, installed in 1960s, has reached the end of its useful life. Makeup air units in the headworks and clarifier buildings have reached the end of their useful life. The proposed SRF project will equip the plant to operate successfully for the next 20 years.

The Recommended Alternative incorporates several Green Project Reserve (GPR) components that will provide environmental benefits beyond those typically achieved at wastewater treatment facilities. The Recommended Alternative is in keeping with the City's commitment to provide continued reliable wastewater service while pursuing innovative, environmentally attractive, and cost effective technologies. The City and the Department of Public Works embrace environmental Best Management Practices that surpass ordinary utility practices and further the goals of the Clean Water Act.

The total pre-design budgetary estimate of probable costs for the GPR eligible components totals \$7,144,500 including non-construction costs. Refer to the attached cost estimate for a breakdown of the GPR components.

Background

The Kinross WWTP serves the Kinross Township. The plant has a rated capacity of 2.0 mgd. Currently, the WWTP includes screening, grit removal, primary clarification, trickling filters, secondary clarification, chlorination and dechlorination. Solids processing includes anaerobic digestion followed by storage in the sludge holding tank.

Proposed improvements include rehabilitating three lift stations, replacing the standby generators at three lift stations, replacing the influent screen, valve replacement and concrete repair in the clarifier building, trickling filter and final pumps replacement, makeup air unit replacements, rehabilitation of the anaerobic digestion system and miscellaneous improvements.

GPR Classification

The anaerobic digestion portion of the project qualifies for GPR funding under 3.2-2 Energy Efficient Categorical Projects that result in a 20% energy savings.

The biogas combined heat and power (CHP) system qualifies under 3.2-1 Energy Efficient Renewable Energy Categorical project.

The makeup air unit replacement qualifies under 3.2-2 Energy Efficient Categorical Projects that result in a 20% energy savings.

Confirmation

Anaerobic Digester

The WWTP's anaerobic digester is currently heated with biogas gas, and when that runs low, natural gas. The natural gas usage averages approximately 1200 ccf/month. The proposed project will generate biogas at a rate of 17,000 ccf/month. Accordingly, biogas will replace natural gas for heating the digester.

In order to accomplish the anticipated biogas production rate, the anaerobic digestion system needs to operate efficiently. Stringy, fibrous materials not removed from the influent flow agglomerate in mixed tanks such as the anaerobic digester. The agglomerated materials cause plugging and "ragging" in pipes, valves and equipment reducing the anaerobic digester mixing and heating systems ability maintain efficient operation. Biogas production is adversely impacted by poor digester mixing and heating to the point where natural gas is needed to supplement biogas for digester heating. Influent screening minimizes the potential for stringy materials to agglomerate in the digester piping. The influent screening is an important component of the anaerobic digestion system.

The anaerobic digester rehabilitation will reduce natural gas usage by 90%, therefore it qualifies under 3.2-2 Energy Efficient Categorical Projects.

Combined Heat and Power

The combined heat and power (CHP) portion of Recommended Alternative includes an electric generator configured to operate on biogas, a biogas compression skid, and piping to route biogas to the CHP unit. The electricity from the generator will be fed into the utility grid. Heat from the generator engine will be captured and used to heat the digester and the clarifier building. The digester boiler will supplement heat recovered from the generator and will be the standby heat source for when the generator is out-of-service for maintenance.

CHP qualifies as a Categorical Project renewable energy project component that will utilize biogas to provide power to the publically owned treatment works (POTW).

Makeup Air Units

The headworks and clarifier buildings are equipped with direct fire makeup air units (MAUs) that heat outside air that enters the building and is expelled to the outside environment minutes later. The MAUs are fueled by natural gas and no heat is recovered from the exhaust air.

The proposed work includes replacing each MAU with a unit equipped with an energy recovery ventilator (ERV). The ERV preheats the outside makeup air using heat from the exhaust air stream. The ERV is able to recover 70% of the heat from the exhaust air and the MAU natural gas consumption is reduced by the same percentage. The replacement MAU/ERV units will reduce natural gas usage by 70%; therefore it qualifies under 3.2-2 Energy Efficient Categorical Projects.

High Efficiency Boiler System

A boiler in the clarifier building provides heat for the control building and standby heat for the clarifier building. The boiler averages 40,000 ccf/year of natural gas usage. An energy analysis determined that replacing the boiler with a 90%+ high efficiency boiler controlled by an appropriate energy management system for Control Building space heating would reduce natural gas by 2243 ccf/year, a 5% energy savings.

The estimated project cost for the high efficiency boiler is \$20,200, and the annual energy savings is estimated to be \$1724/year. The payback period is 11.7 years for equipment with an ASHRAE estimated service life of 24 years. The proposed energy efficiency upgrade will reduce energy consumption and has a favorable payback period.

Explosion-Proof LED Light Fixtures

The clarifier building lighting consists of 9 fixtures containing 175W metal halide lamps. Eight of the fixtures operate an estimated 3380 hour/year, the ninth fixture operates 8760 hours/year. The Headworks building lighting consists of 5 fixtures with 175W metal halide lamps that operate 3380 hours/year. The proposed upgrade consists of replacing the fixtures with 26W LED fixtures. The proposed fixture use 85% less energy than the units they replace, so they qualify under 3.2-2 Energy Efficient Categorical Projects.

Conclusion

Energy efficiency is the use of improved technologies and practices to reduce the energy consumption of water quality projects, use energy in a more efficient way, and/or produce/utilize renewable energy. The proposed work items identified herein have demonstrated ability to reduce energy consumption, use energy in a more efficient way, increase water efficiency, and produce renewable energy.