Drinking Water Revolving Fund
Green Project Reserve Qualification Template

Applicant: The Office of the Oakland County Water Resources Commissioner
Project No: 17506
Project Name: 2014 City of Pontiac Water Supply System Improvements

Identify by page number from the project plan, or attach excerpts, where water efficiency or energy efficiency improvement justification is provided or discussed to support the need for the recommended green project reserve component: Pages 6, 8, 12, 13, 14, 17, 19, 20, 21, 22

Please ensure all requested information is provided to enable an assessment by the Michigan Department of Environmental Quality (DEQ) of whether the project or project component can qualify for funding from the green project reserve.

Meter Replacements with Conventional Meters

1. Over the last five years, water lost or unaccounted for in the system has averaged **562,000,000** gallons per year and is **33%** percent of the water produced **(sold)** each year.

2. Identify the source of this information (i.e. water audit, water conservation study, production and billing records): **Billing Records**

3. Identify the portion of the water loss that is likely due to inaccurate meters: **8% of water purchased**

4. The expected reduction in water loss by installing replacement traditional water meters in all or a portion of the system is **181,988,192** gallons per year, reducing the water loss percentage to **17%**.

5. It takes **0.5** kilowatt hours (kWh) of electricity to produce and distribute 1,000 gallons of water. At a cost of $ **0.13** per kWh, the estimated annual electrical cost for the water loss due to inaccurate meters based on the five-year average is $ **9,464**
   Also, the cost to purchase lost water is $324,000 per year.

6. Based on the average cost per year for the loss and the estimated cost of **$ 5,189,023** for replacing the meters, the project will pay for itself in **14.8** ~~months/~~years.

7. Attached all relevant data and calculations that were used to provide answers to these questions.

Water Main Replacement

1. Over the last ~~ten~~ **2.5** years, **188** water main breaks have occurred on the water mains that are proposed for replacement, an average of **0.296** breaks/mile/year.

2. Identify the length, diameter, age and type of pipe to be replaced: **31,542 feet of 6-inch, 8-inch, and 10-inch cast iron pipe ranging in age from 60 to 90 years.**

3. Each break is estimated to result in the average loss of **373,653** gallons of water, calculated to total **28,089,636** gallons/year of water lost for those water mains.

4. Present the data indicating how this is a significant source of water loss in the system and how the pipes proposed for replacement are likely to generate the greatest return in leak reduction. **Water loss is estimated at 33% based on the discrepancy between water purchased and sold, an amount which is excessive. The number of breaks (188) in the last 2.5 years is also excessive. Costs of water loss and repair exceed $10,000 per break assuming only 5% of the water sold is lost due to breaks.**

5. The energy savings from pumping/delivering water through the new water mains versus the old ones is estimated at **158,100** KwH/year.

6. Describe the condition of the replaced mains with respect to friction/head loss etc from tuberculation or other deterioration issues. As appropriate, identify if the soils are corrosive and contributing to the deterioration/breaks or leaks in the mains, and how the replacement mains are designed to address future corrosion: **Previous studies and current hydrant flow tests indicate that the head loss through the areas of older water mains is significant. In some areas the nominal inside diameter has been effectively decreased and the friction loss increased due to significant tuberculation. Water main break reports do not indicate that soil conditions are a concern.**

7. Total projects costs for the water main replacement component of the project are $**6,169,380**.

8. Identify the source of data used for these calculations: **Billing Records and Operations Records from OCWRC and Operations Contractor.**

Submitted by:

Name

Date 4/30/14

Chief Engineer

Title

WRC
WATER RESOURCES COMMISSIONER
Jim Nash

May 21, 2014

Mr. Eric Pocan, Project Manager
Michigan Department of Environmental Quality
Revolving Loan and Operator Certification Section
Water Bureau
P.O. Box 30273
Lansing, Michigan 48328

Re: Oakland County Water Resources Commissioner 2014 Pontiac Drinking Water Revolving Fund Project

Dear Mr. Pocan:

The Oakland County Water Resources Commissioner is hereby submitting the following statements as supplements for consideration of Green Project Reserve Funding for the 2015 Drinking Water Revolving Fund. These statements include A) Green Business Case for Energy Capture at Pontiac Opdyke Water Supply Tank Fill Operations, B) Meter Replacements with Conventional Meters, and C) Water Main Replacement.

A. Green Business Case for Energy Capture at Pontiac Opdyke Water Supply Tank Fill Operations

The Oakland County Water Resources Commissioner is proposing to install a hydro turbine in the fill lines of the Pontiac Opdyke Ground Water Tanks. This turbine would capture the energy currently wasted in the fill operations. The current fill operation consists of a cone valve throttling flow in the tanks. The pressure supplied to Pontiac from DWSD is approximately 127 feet of head above grade level. The elevation required to fill the tanks are approximately 22 feet above grade level. Given an average flow of 6.27 MGD, at a turbine efficiency of 67%, a generator efficiency of 90%, and a control system efficiency of 95%, the proposed turbine system could capture 35 KW and an Energy Recovery of 294,840 Kilowatt Hours per year.

To take full advantage of the system energy savings, a net metering system with the power supplier is recommended. At $0.13 KWH, the annual net meter energy savings is $38,329 per year.

Costs of the System have been estimated to as high as $900,000. Even at the highest estimate the payback period is approximately 20 years.

The proposed system is intended to capture 294,840 Kilowatt Hours per year that is already being supplied. Therefore the system is well within the guidelines of the Energy Efficiency of the Green Project Reserve Guidelines.

B. Meter Replacements with Conventional Meters

1. Over the last five years, water lost or unaccounted for in the system has averaged **562,000,000** gallons per year and is **25%** percent of the water produced **(purchased)** each year.

Year	Start Date	End Date	Water Sold (mcf)	Water Purchased (mcf)
2013	1/1/2013	12/31/2013	228,955	304,084
Volume Lost in 2013 (mcf)				75,128
Volume Lost in 2013 (MG)				562
Percentage Water Loss in 2013				25%

$$304084\ mcf - 288955\ mcf = 75128\ mcf$$

$$75128\ mcf * 1000\frac{cf}{mcf} * 7.481\frac{gal}{cf} = 562000000\ gal = \mathbf{562\ MG}$$

$$\frac{75128\ mcf}{304084\ mcf} = 0.247 = \mathbf{25\%}$$

2. Identify the source of this information (i.e. water audit, water conservation study, production and billing records): **Billing Records**

3. Identify the portion of the water loss that is likely due to inaccurate meters: **8% of Water Purchased**

4. The expected reduction in water loss by installing replacement traditional water meters in all or a portion of the system is **181,988,192** gallons per year, reducing the water loss percentage to **17%**.

Water Purchased from DWSD in 2013	304,084	Mcf
Estimated Residential Meter Water Loss	8.00 %	
Volume Lost due to Meters	24,327	Mcf
Volume Lost due to Meters	**181,988,192**	**Gallons**

$$304084 Mcf * 8\% = 24327 Mcf$$

$$24327\ Mcf * 1000\frac{cf}{Mcf} * 7.481\frac{gal}{cf} = \mathbf{181,988,192\ gal}$$

$$25\% - 8\% = \mathbf{17\%}$$

5. It takes **0.5** kilowatt hours (kWh) of electricity to produce and distribute 1,000 gallons of water. At a cost of **$0.13** per kWh, the estimated annual electrical cost for the water loss due to inaccurate meters based on the five-year average is **$9,464.00**. **Also, the cost to purchase lost water is $324,000**

per year.

Assuming a conversion factor of 0.188498 kW/1000 gpm*ft and the City's system at a 150' head. Note: Only 80% of the City's water is pumped. (The pump is located at the Opdyke station.)

$$\frac{0.188498\ kW}{1000\ gpm * ft} * 150\ ft * \frac{hr}{60min} = \frac{\mathbf{0.5\ kWh}}{\mathbf{1000\ gal}}$$

$$\frac{0.5\ kWH}{1000\ gal} * \frac{\$0.13}{kWh} * 182000000\ \frac{Gallons\ Lost}{Year} * 80\% = {}^{\$9464}/_{year}$$

6. Based on the average cost per year for the loss and the estimated cost of **$5,189,023** for replacing the meters, the project will pay for itself in **14.8** years.

7. Attached all relevant data and calculations that were used to provide answers to these questions.

C. Water Main Replacement

1. Over the last **2.5** years **188** water main breaks have occurred on the water mains that are proposed for replacement, an average of **0.296** breaks/mile/year.

$$\frac{188\ breaks}{254\ miles * 2.5\ years} = \mathbf{0.296\ breaks\ per\ mile\ per\ year}$$

2. Identify the length, diameter, age and type of pipe to be replaced: **31,542 feet of 6-inch, 8-inch, and 10-inch cast iron pipe ranging in age from 60 to 90 years.**

3. Each break is estimated to result in the average loss of **373,653** gallons of water, calculated to total **28,098,636** gallons/year of water lost for those water mains.

Total Annual Volume of Water Lost	75,128 Mcf
Water Loss Attributable to Water Main Breaks	5%
Total Water Loss Attributable to Water Main	3,756 Mcf
Total Water Loss Attributable to Water Main	28,098,636 Gal

$$75128\ Mcf * 5\% = 3756\ Mcf$$

$$3756\ Mcf * 1000\frac{cf}{Mcf} * 7.481\frac{gal}{cf} = \mathbf{28,098,636\ gal}$$

$$\frac{188\ breaks}{2.5\ years} = 75.2\frac{breaks}{year}$$

$$\frac{28,098,636\ Gallons}{year} * \frac{year}{75.2\ breaks} = \mathbf{373,653\frac{Gallons}{break}}$$

4. Present the data indicating how this is a significant source of water loss in the system and how the pipes proposed for replacement are likely to generate the greatest return in leak reduction. **Water loss is estimated at 25% of water produced based on the discrepancy between water**

purchased and sold, an amount which is excessive. The number of breaks (188) in the last 2.5 years is also excessive. Costs of water loss and repair exceed $10,000 per break assuming only 5% of the water sold is lost due to breaks.

$$3{,}756\ Mcf\ Lost\ due\ to\ Breaks * \frac{\$13.30}{MCf} charged\ by\ DWSD > \$10{,}000$$

5. The energy savings from pumping/delivering water through the new water mains versus the old ones is estimated at **158,100** KwH/year.

Head loss is a function of the factor of friction in the pipe. New water mains are assumed to result in a 25% increased head in this calculation – from 120 feet of head to 150 feet. The typical rate is also assumed to be 8000 gpm where the pumps are variable speed drives and operating at less than 350 Hp. Note: This calculation uses the assumption that the Opdyke pump is only running 40% of the time.

$$(\Delta\text{head*flow}) * \frac{0.000188KW}{gpm * ft} * \frac{8760hours}{year} * 33\% = \frac{kWhr}{year}$$

$$30ft * 8000gpm * \frac{0.000188KW}{gpm * ft} * \frac{8760hours}{year} * 40\% = \mathbf{158,100}\frac{\mathbf{kWh}}{\mathbf{year}}$$

6. Describe the condition of the replaced mains with respect to friction/head loss etc from tuberculation or other deterioration issues. As appropriate, identify if the soils are corrosive and contributing to the deterioration/breaks or leaks in the mains, and how the replacement mains are designed to address future corrosion:

Previous studies and current hydrant flow tests indicate that the head loss through the areas of older water mains is significant. In some areas the nominal inside diameter has been effectively decreased and the friction loss increased due to significant tuberculation. Water main break reports do not indicate that soil conditions are a concern.

7. Total projects costs for the water main replacement component of the project are $**6,169,380**.

8. Identify the source of data used for these calculations: **Billing Records and Operations Records from OCWRC and Operations Contractor.**

Please contact me at our office for further questions.

Thank you,

Very truly yours,

Sid Lockhart, P.E.
Chief Engineer