July 10, 2015
Project No. G120448FP1

Mr. Eric Pocan
Project Manager
MDEQ - Revolving Loan Section
Constitution Hall - 4th Floor South
525 West Allegan
Lansing, MI 48933

Re: City of Lansing Clean Water State Revolving Fund (CWSRF) Fiscal Year (FY) 2015
Green Project Reserve (GPR) Letter – Response to Questions

Dear Mr. Pocan:

This letter is in response to your request for additional documentation for the GPR letter dated June 30, 2015, for the Frances Park Pump Station Improvements project. The total project cost has increased to $4,275,000 as shown in the following table. In addition, you requested that GPR Items be related directly to energy savings and not calculated as a pro-rated amount of the total project. The GPR Items have been updated to reflect items directly related to the dry weather pump energy savings. An explanation of each line item is presented below in Table 1.

Table 1 – Total Project Cost and GPR Items

Item	Cost	GPR Items	As Bid
Dry Weather Pumps	$ 112,000	$ 112,000	$ 70,560
Dry Weather Variable Frequency Drives (VFDs)	$ 60,000	$ 60,000	$ 25,358
Wet Weather Pumps	$ 620,000	$ 0	
Wet Weather VFDs	$ 300,000	$ 0	
Process Piping and Valves	$ 677,000	$ 0	
Electrical and Instrumentation	$ 626,000	$ 133,000	$ 36,056
Mechanical	$ 28,000	$ 0	
Demolition and Bypass Pumping	$ 737,000	$ 0	
Structural and Architectural	$ 79,000	$ 0	
General Conditions	$ 324,000	$ 0	
Total Construction Cost	$ 3,563,000	$ 305,000	$ 131,974
Engineering & Contingency	$ 712,000	$ 61,000	$ 0
TOTAL PROJECT COST	$ 4,275,000	$ 366,000	$ 131,974

The energy savings associated with the dry weather pumps were documented in the June 30, 2015 letter. It was demonstrated that by installing more efficient pumps with VFDs, a 20% energy reduction could be achieved saving 48,888 kilowatt hour per year (KW-h/year) and $6,492 per year.

To maximize savings, the pump station must be operated in an efficient manner using instrumentation, controls, and the City's supervisory control and data acquisition (SCADA) system. The instrumentation and controls will allow the system to monitor and report both the flow in million gallons per day (mgd) and the energy used in kilowatts. From this information, the KW/million gallon (MG) will be calculated for various pump speeds and wet well levels. Then pump speed can be optimized to use the least amount of energy per million gallons pumped while still controlling wet well level.

Hydraulic modeling was performed to develop the system head curve and size the dry weather pumps. The system head curve was provided to the pump manufacturer, and preliminary design for various speeds (hertz [Hz]) were provided by the pump manufacturer and are listed in Table 2. As shown, based on the design, at 55 Hz the pumps will use the least amount of energy per million gallons pumped (290 KWh/MG). This result is theoretical and must be validated and the operation adjusted based on the actual pump and system operation once installation is complete. Monitoring the KW/MG also allows early indication of pump wear or approaching failure so that maintenance can be scheduled.

Table 2 – Manufacturers Published Data of Single Pump Performance for Modeled System Curve

Speed (Hz)	Flow (gpm)	Head (feet)	Shaft Power (HP)	Hydraulic Efficiency	Specific Energy (KWh/MG)
60	1,170	71.7	27.1	78.2%	306
55	**858**	**64.8**	**18.9**	**74.4%**	**290**
50	533	59.8	12.8	63.1%	318
45	199	57.1	8.46	33.9%	576

The electrical and instrumentation line item included for the GPR Items constitutes the feedback and controls that allow the energy savings from the VFD to be realized. The electrical and instrumentation includes one of two Motor Control Centers that houses and monitors the power to the VFDs, the flow meter, the pressure transmitters to monitor discharge head, and controls including the programmable logic controller (PLC) and programming.

If you have any questions or require additional information, please contact me at 616-464-3842 or mtparsley@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.

Mark T. Parsley

Cynthia C. Irving, PE

nes
By e-mail and Fed Ex
cc: Mr. Charles Bennett – MDEQ
Mr. Dean Johnson, PE – City of Lansing
Mr. Alec Malvetis, PE – City of Lansing
Mr. Bill Brunner, PE – City of Lansing
Mr. James Smalligan, PE – FTCH
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