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MEMORANDUM

DATE June 14, 2019

TO Bill Nielson
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FROM Brian Allen, PE

PROJECT NAME Wastewater Treatment Facility Analysis

PROJECT NO. 101.101

BACKGROUND:
The existing Filmore Avenue pump station and Wastewater Treatment Facility's (WWTF) headworks screen, grit removal system, and ultraviolet disinfection (UV) system have been identified by treatment operations staff as needing to be replaced due to old age, lack of reliability, and excessive maintenance and operational difficulties. The Dyer Partnership met with operation staff on November 30, 2018 and again on January 22, 2019 to evaluate and discuss replacement options for the existing headworks screen, and grit removal system. Information gathered from the meetings, Wastewater Facility Plan, and original equipment submittals were used to determine the performance requirements for the replacement equipment. The performance requirements were used to solicit replacement equipment proposals from several vendors. Dyer has provided recommendations on replacement equipment.

Filmore Avenue Pump Station:
The purpose of the Filmore Avenue pump station is to pump all incoming raw wastewater from the municipal collection system to the elevated headworks structure located at the WWTF. Wastewater is pumped from the pump station wet well to the top of the headworks structure through a 12-inch force main.

The Filmore Avenue pump station was built in 1970 and was last updated in1994. The pump station has been identified by treatment operations staff as needing to be replaced due to old age, lack of reliability, and excessive maintenance and operational difficulties.

The Pump Station is equipped with 2 non-clog vertical turbine, variable speed Fairbanks Morse 50-Hp pumps and designed for a maximum flow of 4.8 MDG (3,333 GPM), one pump was rebuilt in 2000 and the other in 2002. In 2019 one of the 50-Hp Fairbanks Morse pumps failed and had to be replaced. There is no back-up power for the pump station but redundant electrical feeds from two different local power grids insures against local disruptions. A wood framed building houses the controls and electrical equipment. The wet-well is controlled by a bubbler

system. Alarm control for the pump station consist of an autodialer and alarm messages recorded at the main control panel of the WWTF. The pumps currently run on a start/stop control strategy after a failed energy efficient test project set the pump controls to vary pump speed to maintain static wet-well level.

The replacement pump station is designed to meet DEQ Pump Station requirements and will require DEQ preliminary approval. The replacement pump station will use a single submersible pump sized to handle the dry weather flows (jockey pump) and three larger submersible pumps sized to handle the peak instantaneous flow with a redundant backup. Table 1 below is a summary of the recommended submersible pumps.

Table 1 – Submersible Pumps

Description	Pump #1	Pump #2	Pump #3	Pump #4 (Jockey Pump)
Model	Flyght - NP 3202 MT 3~641	Flyght - NP 3202 MT 3~641	Flyght - NP 3202 MT 3~641	Flyght - Concertor DP N100-4900
Duty Point	1740 gpm @ 62'	1740 gpm @ 62'	1740 gpm @ 62'	396 gpm @ 41.9'
Horsepower	45 hp	45 hp	45 hp	7.5 hp

The proposed pump station will sit adjacent to the existing pump station and will tie into the existing 12" force main. The existing pump station structure and wet well are inadequate to be used for the proposed new pumps and new controls. A new wet well and control building will be constructed adjacent to the existing pump station control building and wet well. The new wet well will be hydraulically tied in to the existing wet well. Table 2 below is a preliminary cost estimate for the project:

Table 2 – Replacement Pump Station Cost Estimate

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facility & Temp Control	LS	1	$158,500	$158,500
2	Demolition & Site Prep	LS	1	$52,900	$52,900
3	Clearing & Grubbing	LS	1	$52,900	$52,900
4	Temporary Bypass Pumping	LS	1	$84,600	$84,600
5	New Control Building	LS	1	$75,000	$75,000
6	Excavate & Dewater	LS	1	$50,000	$50,000
7	Stabilization Rock Under Wet Well 18" - 20' dia.	CY	50	$55	$2,750
8	Pre-Cast Wet Well Vault	EA	1	$200,000	$200,000
9	Hatch	EA	1	$50,000	$50,000
10	12" Discharge Piping	LF	46	$100	$4,600
11	Discharge Valve Vault	EA	1	$8,000	$8,000
12	12" Check Valves	EA	2	$5,000	$10,000
13	12" Gate Valves	EA	2	$2,800	$5,600
14	12" Fittings	LBS	2400	$5	$12,000
15	20" D.I. Sewer Pipe Extension 18' deep	LF	14	$280	$3,920
16	Force Main Reconnection	LS	1	$1,700	$1,700
17	1 1/2" Air Release Valves	EA	2	$550	$1,100
18	Coatings	LS	1	$1,900	$1,900
19	Bottom Elbows and Rail Supports	EA	3	$6,600	$19,800
20	Sewage Pumps (3-45hp Flyght Np 3202, 1-Flyght Concertor DP N100)	LS	1	$153,860	$153,860

Item	Description	Unit	Quantity	Unit Cost	Total Cost
21	Control Panel	LS	1	$113,300	$113,300
22	Hoist System	LS	1	$100,000	$100,000
23	Electrical Service	LS	1	$50,000	$50,000
24	Pressure Transducer, submersible	LS	1	$3,000	$3,000
25	Alarm equipment and strobe light	LS	1	$50,000	$50,000
26	Misc. Mechanical	LS	1	$50,000	$50,000
27	Final Clean-up	LS	1	$5,500	$5,500
28	Submittals, start-up, training	LS	1	$12,000	$12,000
29	Electrical (Breaker) Panel & Instrumentation	LS	1	$55,000	$55,000
30	New Fencing	LF	100	$175	$17,500
				Construction Cost	**$1,405,430.00**
				Contingency Cost	**$210,820.00**
				Admin/Legal	**$42,170.00**
				Engineering	**$210,820.00**
				DEQ Preliminary Review	**$15,000.00**
				Total Project Cost	**$1,894,240.00**

HEADWORKS SCREEN:
The purpose of the headworks screen is to provide preliminary screening of raw sewage that is pumped into the elevated headworks channel from the City's collection system. The headworks screen removes debris and other non-organic material from the waste stream. The screenings are discharged to a ground level dumpster. The headworks screen has three components; grinder system, screw type screen, and separate washer-compactor.

The existing headworks screen is a grinder drum screen which has problems with debris short circuiting and inadequate flow capacity. The existing headworks screen is near the end of its design life and requires replacement.

The replacement headworks screen is selected to meet DEQ screening requirements of ¼-inch openings, meet hydraulic requirements of 5.0 million gallons per day (MGD), include a dewatered screenings discharge and bagging system, and to fit within the existing headworks channel. The City and Dyer reviewed various types of headworks screens and determined that a hollow shaftless spiral type headworks screen would be the best replacement option. Table 3 is a comparison between a Kusters-Water hollow shaftless spiral headworks screen and a Parkson hollow shaftless spiral headworks screen.

Table 3 – Hollow Shaftless Spiral Headworks Screens

Description	Kusters-Water (ICSS-7/6 crew Screen)	Parkson (Hycor Helisieve)
Type	Hallow Shaftless Spiral	Hallow Shaftless Spiral
Modifications to Existing Facilities	Designed to Fit Existing Channel	May Require Channel Modifications
Screenings Classifier and Compactor	The screenings are discharged from the top of the unit after they have been washed, dewatered, and compacted	The screenings are discharged from the top of the unit after they have been washed, dewatered, and compacted

The construction sequence of the Headworks Screen is below:

The existing headworks screen and channel will be isolated and all wastewater flows will be sent through a manual rake bar screen bypass channel. The manual rake bar screen will be maintained until the flow is diverted back into the headworks screen channel at the end of the project. The existing headworks screen and the upstream grinder will be removed. The new headworks screen will be geometrically sized to fit within the existing headworks channel but some minor modifications are expected. The Contractor will make minor modifications to the concrete headworks channel, grating, and disposal chute as necessary to accommodate installation of the new headworks screen. The new headworks screen, electrical, and controls will then be installed. The new headworks screen controls will be integrated into the City's SCADA system. Upon completion of startup and testing the new headworks screen will be placed into service. Table 4 below is a preliminary cost estimate for replacement of the existing headworks screen. DEQ fees are assumed to be a one-time cost that covers all improvements.

Table 4 – Headworks Screen Cost Estimate

New Headworks Screen					
No.	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Item Cost**
1	Construction Facilities And Temporary Controls	All	LS	$ 25,000	$ 25,000
2	Demolition & Site Preparation	All	LS	$ 20,000	$ 20,000
3	Existing Headworks Modifications	All	LS	$ 10,000	$ 10,000
4	Electrical	All	LS	$ 20,000	$ 20,000
5	Pipe Insulation	All	LS	$ 5,000	$ 5,000
6	New Headworks Screen	All	LS	$ 110,000	$ 110,000
7	Mechanical and Installation	All	LS	$ 30,000	$ 30,000
			Construction Cost		**$ 220,000.00**
			Contingency Cost		**$ 33,750.00**
			Admin		**$ 6,000.00**
			Engineering		**$ 45,000.00**
			DEQ Review Fees		**$ 5,000.00**
			Total Project Cost		**$ 309,750.00**

Kusters-Water is the recommended screen manufacturer because they have a unit that can be designed to fit the existing channel with little modifications. Kusters-Water can be used as a single source supplier for the Grit System and Headworks screen which also make them an ideal candidate.

GRIT REMOVAL SYSTEM:
The purpose of the grit removal system is to provide additional preliminary screening of raw sewage that is pumped into the elevated headworks channel from the City's collection system. The grit removal system removes grit from the waste stream and discharges washed grit into a dumpster at ground level.

The existing grit removal system consists of an aerated grit tank, grit pumping system, grit separator, and grit classifier. The City has recently replaced the existing grit pumping system and does not require any further improvements to the grit pumping system. The aerated grit tank is working as intended and does not require any further improvements. The existing grit separator (cyclone type) and grit classifier (screw classifier) are near the end of their design life and require replacement.

The replacement grit separator and grit classifier have been selected based on system compatibility with the existing grit pumping system, grit capacity, and grit discharge system. The City and Dyer reviewed various types

of grit separators and grit classifiers and determined that the replacement system should be similar to the existing cyclone grit separator and screw classifier grit classifier. Table 5 is a comparison between Kusters-Water and AMWELL grit separator and grit classifier systems.

Table 5 – Grit Separator and Grit Classifier

Description	Kusters-Water (Protechtor Grit Classifier System)	AMWELL (DSCLC)
Type	Cyclone Separator with Shafted Screw Grit Classifier	Cyclone Separator with Screw Grit Classifier
Modifications to Existing Facilities	None, fits within existing facility	None, fits within existing facility
Control System	Including NEMA 4X Control Panel with Motor Starters, Transformers, and Indicator Lights	No control system provided to be provided by 3rd Party

The construction sequence of the Grit Removal System is below:

The grit channel in the existing headworks will be isolated and all wastewater flows will be bypassed during installation of the new grit classifier. The existing grit classifier will be removed and the new grit classifier will be placed and secured in the same location as the existing grit classifier. The new grit classifier will be plumbed into the existing grit system. The existing grit channel will be modified as necessary for installation. The new grit system then will be integrated into the existing SCADA interface. Upon completion of startup and testing the new grit system will be placed into service. Table 6 below is a preliminary cost estimate for replacement of the existing grit separator and grit classifier.

Table 6 – Grit System Cost Estimate

New Grit Classifier System					
No.	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Item Cost**
1	Construction Facilities And Temporary Controls	All	LS	$ 25,000	$ 25,000
2	Demolition & Site Preparation	All	LS	$ 20,000	$ 20,000
3	Electrical	All	LS	$ 15,000	$ 15,000
4	New Grit Classifier and Grit Seperator	All	LS	$ 125,000	$ 125,000
5	Mechanical and Installation	All	LS	$ 15,000	$ 15,000
			Construction Cost		**$ 200,000.00**
			Contingency Cost		**$ 30,000.00**
			Admin/Legal		**$ 6,000.00**
			Engineering		**$ 40,000.00**
			Total Project Cost		**$ 276,000.00**

Kuster's-Water is the recommended manufacturer because a single supplier for both the grit and headworks screen equipment will allow for better pricing. AMWELL did not provide information for a representative in Oregon which would make service difficult.

ULTRAVIOLET DISINFECTION SYSTEM:
The purpose of the Ultraviolet (UV) system is to disinfect the wastewater after the primary treatment and before it is discharged. UV disinfection works by deactivating microorganisms so that they cannot reproduce. Coupled with the short life cycle that microorganisms live, UV disinfection is an effective way to treat wastewater.

The existing UV system consists of two in-channel disinfection units with in-channel flow and disinfection monitoring. The existing UV system was installed in 2007. The controls system and control logic was provided by Spectral Innovations now Purgo Envirotech. The UV system's controls are not functioning and the operational staff must run the UV system in manual mode. In manual mode, the UV system is not able to run efficiently, output signals, or receive control commands. Replacement or modification of the control system is required for a proper functioning UV system.

The City's integrator of record is The Automation Group (TAG). TAG was contacted and they recommended a system diagnosis and most likely a control system replacement. TAG recommended setting up a phone call with Purgo Envirotech to assist in the diagnosis. Purgo Envirotech was contacted to coordinate a phone call but they required a $2,500 retainer to be payed prior to any services. The $2,500 retainer would be used for Purgo Envirotech to research the existing system and prepare for a phone call. The City, TAG, and Dyer have previously had bad experiences with services from Purgo Envirotech. It is not recommended to pay a retainer to Purgo Envirotech for a diagnostic assistance phone call. It is recommended that the City continue coordination with TAG and perform diagnostics of the UV control system without the contracted services of Purgo Envirotech.

TAG's 4 phase approach for completing this project is below:

Phase 1 – Discovery Evaluation 2-day
Phase 2 – Design with Pricing
Phase 3 – Build Panel and Program PLC/HMI System
Phase 4 – Install/Startup

The project's timeline would take approximately 4-5 months for TAG to complete once initiated. This work would include the 4 phases listed above. The new controls for the UV system could most likely be sequenced so the second UV channel could be used while one's controls are getting integrated. This would help allow the treatment process to work while one of the UV systems is getting worked on. Table 7 below is a preliminary cost estimate for the project:

Table 7 – UV System Cost Estimate

UV System Controls					
No.	**Description**	**Quantity**	**Unit**	**Unit Cost**	**Item Cost**
1	Construction Facilities And Temporary Controls	All	LS	$ 6,000	$ 6,000
2	Demolition & Site Preparation	All	LS	$ 4,000	$ 4,000
3	Electrical	All	LS	$ 10,000	$ 10,000
4	New UV System Controls	All	LS	$ 35,000	$ 35,000
5	Installation/Programming	All	LS	$ 15,000	$ 15,000
6	Startup	All	LS	$ 4,000	$ 4,000
			Construction Cost		**$ 74,000.00**
			Contingency Cost		**$ 11,100.00**
			Diagnosis (TAG)		**$ 2,400.00**
			Admin/Legal		**$ 2,220.00**
			Engineering		**$ 12,400.00**
			Total Project Cost		**$ 102,120.00**