CITY OF SUTHERLIN
DOUGLAS COUNTY, OREGON

PREDESIGN REPORT

WASTEWATER SYSTEM IMPROVEMENTS

THIS PROJECT IS FUNDED BY THE OREGON DEPARTMENT OF ENVIRONMENTAL QUALITY CLEAN WATER STATE REVOLVING FUND
AGREEMENT NO. R89540

PROJECT NO. 146.38
May 2016

The Dyer Partnership
Engineers & Planners, Inc.

1330 Teakwood Avenue
Coos Bay, Oregon 97420
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REGISTERED PROFESSIONAL ENGINEER
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JULY 16, 1982
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EXPIRES: 12-31-16

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Section 1 - Introduction

This Predesign Report presents and describes the basis for the proposed design of the Wastewater System Improvements described in the City's Wastewater Facilities Plan Amendment (The Dyer Partnership, 2013). Background information on the City's Wastewater Facilities is summarized in this section.

Technical memoranda are presented in the following sections for each of the process design areas and improvements. The content of these technical memoranda includes such topics as objectives and scope, design criteria, alternatives and recommendations, descriptions, control, schematics and plans and issues to be resolved during detailed design.

- Section 3.1 Influent Screening
- Section 3.2 Influent Pump Station
- Section 3.3 Headworks Grit and Flow Splitting
- Section 3.4 Sequencing Batch Reactor
- Section 3.5 Tertiary Treatment
- Section 3.6 Disinfection
- Section 3.7 Effluent Disposal/Reuse
- Section 3.8 Biosolids Treatment
- Section 3.9 Plant Site Facilities
- Section 3.10 Everett Avenue Pump Station
- Section 4.1 Filter Building
- Section 4.2 Operations Building
- Section 4.3 Geotechnical Considerations
- Section 4.4 New Control Building
- Section 4.5 New Shop Building

The technical memoranda are followed by presentation of a preliminary schedule, a description of operation during construction, a preliminary cost estimate, and a summary of construction documents and specification section headings. The Predesign Report Plan Review Set, bound separately, but incorporated into this report includes a list of preliminary drawings.

The scope of this report includes the improvements referred to in the Wastewater Facilities Plan Amendment, 2013, with the exception of existing collection system expansion.

1.1 Background

The city of Sutherlin's wastewater system was originally constructed in 1956 for a design population of 3,500 people. Prior to this time, treatment consisted of individual septic tank and drain field systems. Due to population growth, it was necessary to construct a new wastewater treatment facility in 1977, on a new site, west of the City.

The Sutherlin wastewater treatment plant (WWTP) was constructed in 1977 as a complete mix, activated sludge, secondary treatment facility. The style of plant is commonly referred to as a donut-type packaged plant, comprised of a central clarifier with aeration and digester chambers around the perimeter of the donut. Constructed between the two treatment units is an operations building, with housing for equipment and supplies related to the WWTP. A second building houses a tertiary filter, disinfection system, and laboratory. The WWTP discharges treated effluent flow to Calapooya Creek in the winter months and to a nearby golf course for irrigation during the summer months. Class B biosolids are land applied for agricultural use at a local farm.

This subsection provides a brief summary of previous reports and documents that pertain to the proposed improvements described in this Predesign Report. Permits and regulatory requirements are included in Section 1.5.

Wastewater Facilities Plan

In 2006 the City entered into a MAO with Oregon Department of Environmental Quality (DEQ) for non-permitted summertime effluent discharge. A Wastewater Facilities Plan Amendment was prepared for the City's wastewater facilities by The Dyer Partnership Engineers and Planners, Inc. to meet the requirements of the MAO. The Plan was completed and submitted to DEQ in November 2013. DEQ approved the Plan in February 2014. Recommended improvements from the 2013 Wastewater Facilities Plan Amendment are as follows:

WWTP

- Install two new mechanical bar screens.
- Construct a new WWTP influent pump station.
- Construct new headworks with grit removal and flow distribution.
- New influent flow metering.
- Replace existing secondary treatment system with new sequencing batch reactors (SBR).
- Replace existing tertiary filter with new tertiary filter system.
- Secure an effluent storage pond by either acquiring an existing facility or by constructing a new pond.
- Convert existing secondary treatment units to biosolids digesters and biosolids holding tanks.
- Add biosolids process facility for dewatering and storage of dried biosolids.
- Construct a new UV disinfection system.

Collection System

- Continue Inflow/Infiltration (I/I) investigation and repair work.
- Sewer system expansion to serve existing and future development within the urban growth boundary.
- Replace the Everett Avenue Pump Station with a new pump station at the same location.
- Install a new force main for the Everett Avenue pump station.

Collection system I/I improvements and expansion are expected to continue annually in the future but are not covered as part of this report. The recommended WWTP improvements are covered in Sections No.'s 3 and 4 and the Everett Avenue pump station and force main recommendations are covered in Section 3.10.

The projected flows for the WWTP from the Facilities Plan are detailed in Table 1.1.1.

TABLE 1.1.1
SUMMARY OF PROJECTED WWTP FLOWS & LOADS

Parameter	Projected 2037*	
Population	11,594	
Base Sewage	0.72 MGD	62 gpcd
Base Infiltration	0.16 MGD	14 gpcd
AAF	1.44 MGD	124 gpcd
MMDWF	1.80 MGD	155 gpcd
MMWWF	2.70 MGD	233 gpcd
ADWF	0.88 MGD	76 gpcd
AWWF	2.01 MGD	173 gpcd
Peak Day	7.00 MGD	604 gpcd
PIF	8.80 MGD	759 gpcd
BOD Avg. Day	2,154 ppd	0.19 ppcd
BOD Max. Month	3,222 ppd	0.28 ppcd
TSS Avg. Day	2,345 ppd	0.20 ppcd
TSS Max. Month	3,180 ppd	0.27 ppcd

(gpcd – gallons per capita per day)
(ppcd – pounds per capita per day)
*Projected is extrapolated from 2008-2012 flows and does not include an allowance for further I/I reduction.

Environmental Report

An Environmental Report for the proposed improvements was completed by CCD Business Development Corporation in conjunction with Land and Water Environmental Services, Inc. in May 2015. Key findings of the report included:

- Land Use
    - The project sites are within the City limits (Everett Avenue Pump Station, Ford's Pond) or UGB (WWTP) and are not located within Exclusive Farm Use zones.

- Floodplains
    - The project sites are not located within a floodplain.
- Wetlands
    - Identification of 0.96 acres of wetlands on the east portion of the WWTP property.
- Historic Properties
    - No historic properties will be affected by the project.
    - The project sites are not eligible for listing in the National Registration of Historic Places.
    - The project sites are in an area generally perceived to have high probability for processing archeological sites and/or buried human remains. The Native American Tribes identified as having a presence in the area are The Cow Creek Band of Umpqua Tribe of Indians, Confederated Tribes of Siletz, and Confederated Tribes of the Grand Ronde.
    - An Inadvertent Discovery Plan will be implemented by the City and followed by the project contractor and subcontractors.
- Biological Resources
    - The project sites are not located within a designated Wild and Scenic River Basin.
    - The Environmental Protection Agency has determined that the project will have no effect on Endangered Species Act (ESA) listed species and will have no adverse effect on designated essential fish habitat.
    - A weed management plan that includes pre and post construction equipment washing, follow-up weed treatment of the construction site, and the installation of silt fencing will be required as part of the construction phase.
    - Implementation of migratory bird best management practices of the Migratory Bird Treaty Act will be required as part of the construction phase if bird habitats or flyways are impacted.
- Coastal Resources
    - The project sites are outside of the Coastal Zone Management Area.
- Socio-Economic/Environmental Justice Issues

  - Air Quality – DEQ will not require a submittal of Notice of Intent to Construct or permit application. If asbestos containing materials are discovered during the project, proper asbestos abatement procedures and work practices must be followed, and procedures to minimize dust emissions must be followed. Include these instructions in the bid documents.
  - Socio-Economic – The project will benefit all populations within the region.
  - Environmental Justice – The project will reduce environmental or possible environmental effect to the area and its people and the City's Mutual Agreement and Order (MAO) will be satisfied.
- Transportation
  - There will be minor changes to traffic patterns during construction, which will be controlled by flaggers.
  - There will be negligible effect on long term traffic conditions in the area.
  - There will be no impact on existing fuel and chemical delivery.
  - Contractors will be required to notify emergency responders if roads are closed.
  - No navigable waterways will be impacted.
  - No impact to air traffic.
- Noise
  - There will be temporary noise level increase during construction; however, the City has a noise ordinance that will be followed by the contractor.
  - There will not be any long term noise level change at the Everett Avenue Pump Station or Wastewater Treatment Plant.

Mixing Zone Study

A mixing zone study was completed by Brown and Caldwell in December 2003. The primary purpose of the report was to satisfy the City's National Pollution Discharge Elimination System (NPDES) permit requirements, which required the City to conduct a mixing zone study and present a report to DEQ by December 31, 2001. The study found that wintertime discharge from the WWTP has the potential to cause ammonia and chlorine toxicity in Calapooya Creek during low stream flow conditions. The study notes that at current chlorine concentrations and low flow conditions, there is insufficient flow in the river to meet water quality standards for chlorine toxicity. Increasing the available dilution by using an engineered diffuser or other means would not alleviate this situation and the City should consider options for reducing or eliminating residual chlorine in the effluent. The study also states that the existing outfall arrangement provides insufficient mixing to meet water quality standards for ammonia toxicity. However, due to less stringent water quality standards for ammonia, the exceedances are not as large as they are for chlorine. As a result a few options for addressing ammonia toxicity are presented in the study and include:

- Redesigning the outfall to improve mixing.
- Consider operational and/or facility improvements to reduce effluent ammonia concentrations.

It should be noted that high ammonia concentrations continued to be an issue and in April, 2012 the City entered into a revised Mutual Agreement and Order (MAO) for ammonia toxicity.

Value Analysis Study

A Wastewater Treatment Facility Value Analysis (VA) Study was completed in October 2014 by Value Management, LLC. The VA study team's objective was to analyze the recommendations in the City's Wastewater Facilities Plan Amendment (WWFP) to ensure the recommendations presented were the best fit for the City. The VA team did not find anything of substance that would change the recommendations of the WWFP. The VA report did highly recommend the treatment of dry weather flows to a Class A reuse standard.

1.2 Description

The City of Sutherlin collects, conveys and provides treatment and disposal of the sewage generated by its residents and commercial users within the City limits. The system does not serve any industrial users. Today, the Sutherlin wastewater system includes approximately twenty-seven miles of gravity collection piping, over two miles of pressure force mains, approximately 700 manholes, five wastewater pump stations, and a wastewater treatment plant providing primary and secondary level wastewater treatment.

Treatment Facilities

Raw wastewater is conveyed to the treatment facility from the outlying subbasins via a 27-inch asbestos-cement (AC) gravity sewer line to a Rotamat mechanical bar screen. It then flows to the influent pump station wet well, located within the operations building. From the influent pump station, flows are lifted to the headworks which include a grit separator, comminutor and Parshall flume. The grit removal system does not perform its function due to an inoperative grit auger and only acts as a debris catcher. Flow through the headworks is split after the Parshall flume and continues by gravity to the north and south donut-type treatment units. Each unit has identical, circular tanks with interior dividing walls that form tanks (or basins) for each process. Each unit has a tank for a contact zone, a stabilization zone, a clarifier, and aerobic digester. The clarifier has a 12 horizontal to 1 vertical sloping bottom leading to a sump and external launder. The tank is 42 feet in diameter and has a side water depth of 11 feet. The north treatment unit includes the irrigation holding reservoir and the south unit includes the chlorine contact tank and filter pump.

At each treatment unit, flow enters the contact tank via a trough into which return flow from the stabilization tank mixes with the raw sewage. The mixed liquor is aerated and then proceeds to the clarifier. Settled sludge underflow enters the return activated sludge (RAS) pump from which pumping to the stabilization tank occurs. A portion of the RAS is pumped to the digester as waste activated sludge (WAS) in order to maintain operational mixed liquor suspended solids concentrations. The RAS in the stabilization tank (also known as the re-aeration tank) is aerated and leaves the tank via the influent mixing trough where it stabilizes the incoming raw sewage. The overflow from both the north and south clarifiers flows to the chlorine contact channel located in the south treatment unit. After detention in the chlorine contact basin, effluent is pumped to the irrigation holding reservoir. The treated wastewater in the irrigation holding reservoir then overflows into a discharge box connected to the 27-inch outfall line which flows to the Calapooya Creek outfall or is pumped again, via the effluent irrigation pumps and an 18-inch force main, to the golf course holding pond for use as recycled irrigation water. The WWTP has a tertiary sand filter; however, the filter is non-functional and has been bypassed

The WAS in the digester is aerated and decanted, the supernatant flow is returned to the influent pump station. Digested biosolids are pumped to tanker trucks and land applied during the dry season. During wet weather, biosolids are hauled to a private biosolids treatment facility.

The plant was originally designed to provide an effluent discharge quality of 95% dry weather removal efficiency for BOD_5 and TSS, and 85% removal efficiency for wet weather flow.

Design data and component specifications for the WWTP are detailed in Tables 1.2.1 and 1.2.2.

TABLE 1.2.1
EXIST. PLANT DESIGN FLOWS AND LOADING

Parameter	Value/Description
Design Population	10,000 people
Design Flow	1.30 MGD
Peak Hourly Flow	4.90 MGD
BOD/TSS Design Loads (mg/l)	220 / 220
BOD/TSS Design Loads (lbs/day)	2,400 / 2,400
Dry Weather Efficiency BOD & TSS Reduction	95%
Wet Weather Efficiency BOD & TSS Reduction	85%

TABLE 1.2.2
EXISTING TREATMENT PLANT COMPONENT DESIGN SPECIFICATIONS

Component	Type	Capacity
Influent Pump Station	Non-clog Vacuum Primed 2 –450 gpm, 7.5 HP & 2 –1250 gpm, 15 HP	3.1 MGD firm 4.9 MGD all pumps on
Influent Flow Meter	Are Vel. Flow Meter – ISCO 4250	+10 MGD
Influent Screen	Lakeside Rotomat 47 S - .25	5.5 MGD
Grit Removal **(non-working)**	Centrifugal Vortex – Peabody Welles 12' w/screw conveyor	6.0 MGD
Grit Washer **(non-working)**	None	N/A
Comminutor **(rebuilt in 2012)**	Worthington, Type C Size 20	4.6 MGD
Influent Parshall Flume	12" throat	10.4 MGD
Aeration Contact Zone	Contact Stabilization – 2 units	170,000 gal. total
Aeration Capacity		85 cfm
Mixer	Mechanical, 15 HP	
Re-aeration Zone	Contact Stabilization – 2 units	398,000 gal. total
Aeration Capacity		170 cfm
Mixer	Mechanical, 30 HP	
Treatment Blowers	3 units	440 cfm, 20 HP each
Secondary Clarifier Zone	2 Units 2,200 ft^2 total surf. Area	228,000 gal. total
Digester	Aerobic Digester – 2 units	199,999 gal. total
Aeration Capacity		185 cfm
Mixing capacity		15 HP
Chlorine Contact Chamber	Single unit	106,000 gal
Chlorinator (2 units)	W&T V-800 Gas w/Vac. Reg.	500 lbs/day each
Chlorine Cylinders	Gas	1-1,200 lb cylinder, 2-150 cylinders
Filter (Not Operational)	Single 530 ft^2 - 5 gpm/ft^2	3.8 MGD
Filter Pumps	Vert. turbine 1 – 450 gpm, 7.5 HP; 2 – 1200 gpm, 20 HP	2.4 MGD firm, 4.1 MGD with all pumps on
Filter Backwash Blower	One - 25 HP	500 cfm
Irrigation Reservoir/Wet well	Holding tank	150,000 gal.
Irrigation Pumps	Vert. turbine 1-450 gpm, 20 HP; 2-1200 gpm, 50 HP	2.4 MGD firm, 4.1 MGD with all pumps on
RAS Pumps	Two pos. displacement, self-priming	520 gpm each
Scum Pumps	Homa Submersible Grinder Pumps	unknown
Decant Return Pumps	Two – Airlift	100 gpm w/20 scfm air
Effluent Flow Meter, Gravity	One - Rectangular Weir, 5 ft	6 MGD @ 1 ft.
Effluent Flow Meter, Irrigation	Two - Propeller Meter	6 MGD each
Outfall – 3200 ft. long	27" AC Pipe W/River Outfall	6.0 MGD @ High Water
Sludge Truck	Tank	3,200 gallons
Generator	Diesel	350 kW

Conveyance System

The collection system was largely constructed in 1956 with a new treatment plant designed for 3,500 people. Prior to this time, wastewater was treated by individual septic tanks and drain fields. Original construction consisted of Orangeburg pipe (OB) possibly without joint seals, concrete pipe (CP) with mortar joints and cast iron (CI) pipe. Construction from the1960s to the 1970s consisted mostly of concrete and asbestos-cement (AC) pipe with rubber gaskets. Since then, sewer construction has consisted primarily of PVC pipe. The majority of the pipe in the collection system is 8-inch. Approximately half of this is either concrete or asbestos-cement piping. Some of the collection system, Oak Hills development, utilizes STEP systems, which is a low head pressure collection system. A 4-inch diameter STEP force main has been constructed in South Calapooia Street. Multiple-house private laterals utilize STEP systems as well. STEP system force mains and laterals discharge to city gravity mains. The City is responsible for maintenance of the STEP systems where more than one STEP service line is connected to the common main line.

The overall hydraulic capacity of the collection system is greater than the peak flow rates, with the exception of the line immediately downstream of the Everett Avenue Pump Station. In peak flow conditions, the force main discharge can cause the receiving line to surcharge. The main trunk line leading to the WWTP has a flow capacity greater than 10 MGD.

Pump Stations

The Sutherlin wastewater conveyance system includes five raw sewage pump stations (Everett Avenue, Church Road, Airport, Page Street and Quail Run) and an influent pump station at the wastewater treatment plant.

Operation information and key design data for each pump station is summarized in Table 1.2.3 and 1.2.4 below.

TABLE 1.2.3
EXISTING PUMP STATION DESIGN DATA

Pump Station	**Everett Avenue**	**Airport**	**Plant Influent**
Location	Front St. & Everett St.	East of Cue Ave. & Landing St.	Sutherlin WWTP
Date Built	1978(1)	1979	1977
Last Upgrade	2011 (added grinder)	2011	1977
Type	Vacuum primed, centrifugal pumps	Duplex Packaged	Quadraplex Vacuum Primed Centrifugal
EPA Classification	I	II	I
Brand	Cornell 4NHTVM5-8 (1ea.) & 6NHGVM-8 (2ea.)	ITT Flygt (2ea.)	
Level Control	Sonic	Transducer	Transducer
Pump Type	Vacuum Primed	Submersible	Vacuum Primed, Non Clog
Pump Installation Year	1978	2011	1977
Motor Size	One 5 HP & Two 15 HP	Two 4 HP	Two 7.5 HP & Two 15 HP
VFD	No	No	No
Rated Flow GPM @ (TDH ft.)	400 Pump 1 @ (24) 1080 Pump 2 & 3 @ (50) 1500 Pump 2 & 3 @ (36)	140 @ (50)	450 Pump 1 & 2 ea @ (37) 1250 Pump #3 & 4 ea @ (35) Pump Sequence # 1 - 450 gpm (0.65 MGD) # 1 &2 - 900 gpm (1.3 MGD) # 1,2 &3 - 2,150 gpm (3 MGD) # 1,2 &4 – 2,950 gpm (4.2 MGD) All on – 3,400 gpm (4.9 MGD)
Flow Monitoring	Yes (Mag Meter)	None	**
Overflow Point	Nearest Manhole	Nearest Manhole	Flow Meter Manhole
Overflow Elevation	**	**	**
Overflow Discharge Stream	Sutherlin Creek	Sutherlin Creek	Cook Creek
Time to Overflow(2)	3 hr 20 min.	50 min.	**
Alarm Type	Protection 1	Protection 1	Protection 1
AUXILIARY POWER			
Type	Kohler	Kohler	Stationary Plant Generator – Onan Diesel
Aux. Power Output	125 kW	25 kW	350 kW
Diesel Fuel Tank Capacity	Natural Gas	N/A uses Nat. Gas	500 gallon Diesel
Run Hours per Tank		N/A	Greater than 48
ELEVATIONS			
Ground	**	**	**
Wet well Floor	18’ deep	20’ deep	377.00

FORCE MAIN	Everett Avenue	Airport	Plant Influent
Force Main Length feet	890	1,290	**
Force main Diameter Inches	10	4	**
Detention Time minutes	21	16	Less than 2
Material	CI	DI	DI
Profile	Ascending	Ascending	Ascending
Discharge Manhole	Central Ave. & Oak St., MH18	South Comstock, MH12	N/A
Condition Discharge MH	Good	Good	Good
Air/Vacuum Release Valve	None	None	None
Sulfide Control	None	None	None

(1) Re-build – original construction 1957
(2) Estimated

TABLE 1.2.4
EXISTING PUMP STATION DESIGN DATA

Pump Station	Quail Run	Church Road	Page Street
STATION			
Location	Quail Run Subdivision	Church Road	Page Street and Taylor
Date Built	2001	2000	2005
Last Upgrade	2002		
Type	Duplex Submersible Wet well	Duplex Submersible Wet well	Triplex Submersible Wet well
EPA Classification	I	I	I
Brand	Flygt C-3085 (2ea.)	Flygt M.P. 3068 (2ea.)	Flygt NP3127 (3ea.)
Level Control	Mercury Switch (float)	Mercury Switch (float)	Ultra Sonic
Pump Type	Submersible	Submersible	Submersible
Pump Installation Year	2001	2000	2005
Motor Size	Two 2.4 HP	Two 2.3 HP	Three 10 HP
VFD	No	No	No
Rated Flow GPM @ (TDH ft.)	150 @ (21)	48 @ (47)	340 @ (60)
Flow Monitoring	None	None	None
Overflow Point	Nearest Manhole	Nearest Manhole	Nearest Manhole
Overflow Elevation	534.00	441.05	499
Overflow Discharge Stream	Sutherlin Creek	Cook Creek	Sutherlin Creek
Time to Overflow(1)			
Alarm Type	Protection 1	Protection 1	Protection 1
AUXILIARY POWER	Quail Run	Church Road	Page Street

Type	Stationary Outside Bldg. – gas powered Olympian	Stationary Outside Bldg. – gas powered Olympian	Stationary Inside Bldg. – gas powered Kohler
Aux. Power Output	16kW	15 kW	100kW
Station Requirement	16 kW		
Diesel Fuel Tank Capacity	N/A uses Nat. Gas	N/A uses Nat. Gas	N/A uses Nat. Gas
Run Hours per Tank	N/A uses Nat. Gas	N/A uses Nat. Gas	N/A uses Nat. Gas
ELEVATIONS			
Ground	534.00	441	499
Wet well Floor	519.50		479
FORCE MAIN			
Force Main Length feet	700	507	3175
Force Main Dia. Inches	4	2-each 2-inch dia.	1-each 6-inch dia. 1-each 10-inch dia.
Detention Time minutes	40	30	180 minutes
Material	PVC	PVC	PVC
Profile	Ascending		Ascending
Discharge Manhole	Quail Run MHY3	Church Road, MH B31	Page Street MHK8
Condition Discharge MH	Excellent	Excellent	Excellent
Air/Vacuum Release Valve	None	None	None
Sulfide Control	None	None	Air Injection

(1) Estimated.

1.3 Present Condition and Deficiencies

The wastewater system is operated under Waste Discharge Permit No. 101993 from the National Pollutant Discharge Elimination System (NPDES), a copy of which is included in Appendix A.

The City entered into a Mutual Agreement and Order (MAO) in October, 2006 with DEQ for non-permitted summertime discharge. MAO No. WQ/M-WR-05-054 (Appendix A) established a schedule and interim compliance level for operating the WWTP while working to correct the system deficiencies. The MAO was amended in April, 2012 to address the City's inability to consistently meet effluent ammonia limits. The City has exceeded the monthly average limit of 7.8 mg/L and the daily maximum limit of 21 mg/L on several occasions.

The WWTP is reaching the end of its design life. Much of the equipment is sound and operable, and the buildings and tanks are structurally sound. There is some surface corrosion of steel components due to age and environment. The biological process provides treatment and experiences minimal upsets.

The hydraulic flow for the plant regularly exceeds the flow capacity of the mechanical screen chamber in the winter, and the plant is operating at capacity for mass loads. The Wastewater Facilities Plan Amendment reviewed each component of the treatment plant for condition, capacity and operability and a summary of recommended improvements can be found in Section 1.4.

The original sewer system was constructed of Orangeburg pipe and concrete pipe with mortar joints. These joints allow significant infiltration. After 1975, concrete and asbestos cement pipe with rubber gaskets were installed; however, flows at the WWTP are still very responsive to the previous 48 hours of rainfall due to continued inflow/infiltration (I/I) problems. A continuing program of manhole rehabilitation is in place. Each year 10 to 20 manholes are repaired or replaced.

The Everett Avenue Pump Station's deficiencies limit capacity within the existing system. Gravity lines immediately downstream of the receiving manhole surcharge during pump operation. In addition, pumping capacity of pump stations and especially that of the Influent Pump Station can be overtaxed due to I/I. The Everett Avenue Pump Station reconstruction would significantly improve the collection system performance.

Specific deficiencies related to this Pre-design Report are as follows:

Collection System

- Everett Avenue Pump Station - Although pump operation has been improved, the pump station is still undersized and during high flow events, the station is unable to pump all of the influent sewage, which has caused overflows in the past. The pumps are relatively old and the City is no longer able to find parts to repair the pumps. Other deficiencies at the pump station include: grease issues, and control and alarm deficiencies. The receiving gravity sewer lines have been known to surcharge during pump operation. Manhole numbers O7, M7, M17 and M18 commonly overflow during periods of high ground water and heavy rain.

WWTP

- The existing mechanical bar screen is inefficient for removal of solids, is undersized for wet weather flows, and needs replacement. The screen is reported to be designed for a flow of up to 5.5 MGD but experiences flows which exceed its capacity due to blockage in the screening equipment. As a result of screen flow capacity, potential screen clogging and exit channel carrying capacity, influent flows bypass the screen and carry debris and trash to the influent pump station.
- The influent pump station pumps are rated to handle the flows up to 4.9 MGD; however, their firm rated capacity (largest pump out of service) is only 3.1 MGD. With instantaneous flows up to 7.3 MGD, the pump station is under capacity. The pump station wet well acts as a settling basin for grit and solids, which increases maintenance efforts at the pump station. Rehabilitation of the pump station at its current location is not possible due to hazardous zone regulations.
- The headworks include a Pista Grit grit removal system which does not perform its function due to an inoperative grit auger. The grit chamber therefore acts as a debris catcher so the Pista Grit paddle motor must be left running to keep grit in suspension, even though the unit does not remove grit from the process.
- The manual bypass bar screen in the headworks has bar spacing too far apart for effective removal of rags and other debris.
- There is inadequate flow control in the headworks splitter box that divides flow to the north and south donut treatment units, making it difficult to maintain a matching biological community in each treatment train.
- The aeration basins are undersized for anticipated year 2037 load requirements.

- Operators experience difficulty in providing adequate dissolved oxygen levels in the aeration basins at times and must divert digester air to the aeration basins when this occurs.
- The existing clarifiers do not remove sludge evenly. In addition, the WAS pumps remove sludge at too high a rate, causing vortexing (or piping) in the center of the sludge blanket.
- Based on the hydraulic retention time (HRT) calculation provided in Wastewater Facilities Plan Amendment and a 2009 average flow of 0.99 MGD, there are only 20 days of detention time in the digesters; therefore, additional storage is required in order to meet a 60-day aeration at 15°C.
- Biosolids land application is not possible year-round so excess biosolids must be held in the digesters and aeration tanks at times.
- The existing digester mixers do not provide adequate mixing so solids are not kept in suspension, resulting in removal problems and a reduction in digester capacity.
- Year round effluent disinfection is achieved by a chlorine gas disinfection system leaving the potential to cause chlorine toxicity in Calapooya Creek. Additionally, chlorine gas is becoming increasingly costly, is a potential hazard when operators and community are exposed to it, and is toxic to aquatic life.
- The tertiary filter is no longer functional and has been bypassed.
- The laboratory lacks adequate space.
- The operations building has a major issue with respect to the pump building space below the pump room floor, which is not readily accessible, safe, or suitable for rehabilitation. The space is excavated below the grade of the surrounding ground and is simply a pit without walls or a floor. With the ground water in this region within three to four feet of the surface, the groundwater in the space cannot be controlled, making access to the valves located there difficult or impossible.
- Lack of storage and available land for recycled water.
- Plant’s inability to meet ammonia limits.
- Dechlorination system is temporary and lacks redundancy.

1.4 Proposed Improvements

The proposed project discussed in this Pre-design Report consists of collection system improvements and a major upgrade of the wastewater treatment plant. These elements are briefly discussed below.

Collection System

- **Replace Everett Avenue Pump Station.** Build a new pump station at a location next to the existing location. The new station will be a packaged station with triplex submersible pumps set on a new concrete wet well. The sewer influent line will be extended from the inlet manhole to the new location and the old station will be abandoned. The effluent force main will be extended from Oak St. to a new discharge manhole (L5) on Miller St.

WWTP

- **Influent Screening.** The existing mechanical bar screen will be replaced with a shaftless spiral screen. A second spiral screen will be added to the adjacent influent channel. An access stairway will be added to the influent screening basin.
- **Replace Influent Pump Station.** Construct a new pump station at a new location on the WWTP site. The pump station will include five variable speed, submersible pumps and a new concrete wet well. The pumps will be sized for projected flows for the year 2037.
- **New Headworks.** The new headworks will consist of installation of grit removal equipment sized to meet projected future loads for the year 2037 and flow splitting and measurement to each SBR basin.
- **New Sequencing Batch Reactor.** The secondary treatment equipment will consist of four sequencing batch reactor (SBR) basins. This equipment will replace the existing aeration basins and clarifier.
- **Conversion of the Existing Donut Plant to Digesters.** The aeration basins in the existing donut plant will be converted to digesters. New blowers with variable frequency drive (VFD) control will be installed to replace the existing blowers, and fine bubble diffusers will be installed to replace the existing diffusers and mechanical mixers. Slide gates, valves, and submersible pumps will be installed to allow transfer of biosolids between basins and to a new dewatering facility.

- **Sludge Dewatering.** A screw press will be installed for sludge dewatering. The press will be installed in the existing filter building and will discharge Class B dewatered biosolids into either a short term storage bay or directly into a spreader truck for hauling.
- **Ultraviolet Effluent Disinfection.** A new ultraviolet (UV) disinfection system will be installed for disinfecting effluent flows.
- **Laboratory Upgrade.** The existing laboratory will be converted to a storage room and laboratory space will be built in the new control building with the equipment necessary to perform the daily and weekly lab tests in-house.
- **Standby Generator.** A second standby generator will be added to the site to accommodate the proposed equipment. The existing standby generator will be replaced.
- **Control Building**. A new building will be constructed to house the standby generator, electrical service and panels, SBR and outer circle aerobic digester blowers, laboratory, and operator control office.
- **Shop Building**. A new vehicle and equipment maintenance building will be constructed on site.
- **Site Utilities**. Potable water, sewer and power services will be extended to serve the new buildings and equipment. A new non-potable water system will be installed.
- **Effluent Disposal**. A second summer month discharge to Ford's Pond will be installed off of the existing effluent line running to the golf course. Automatic valves will divert effluent flow to Ford's Pond when the golf course pond is full. A reuse water tanker filling station will also be provided on site.
- **Operations Building**. All decommissioned equipment within the building will be removed and the areas converted to storage space.
- **Filter Building**. The existing building will be converted to the biosolids dewatering facility with dewatered biosolids storage facility.

Supplemental Projects - To be completed prior to proposed WWTP improvements

- **Disinfection.** Replace the existing chlorine gas disinfection system with a sodium hypochlorite disinfection system.

- **Surcharge Loading**. Place a surcharge load on the SBR site to induce soil settling prior to construction.
- **Building Removal**. Remove existing vehicle storage and shop buildings that will interfere with surcharge loading project and proposed WWTP improvements.

1.5 Effluent Requirements

1.5.1 EPA Reliability Class for the Facility

Reliability of treatment processes depends on proper application of unit loading factors and conservative selection of equipment to ensure long life and minimum maintenance costs. Each unit process should be selected based on its capabilities to effectively treat the waste characteristics for the specific application. Capabilities of the treatment plant operator and the community should also be considered. Processes that require a high degree of manual labor and specialized instrumentation should be avoided in most cases. Redundancy is also a key factor in reliability.

The Environmental Protection Agency (EPA) has developed system design criteria for minimum standards of reliability for wastewater treatment works (1974). The minimum standards are defined into three classes of reliability. The following is a description of these three classes.

- Reliability Class I – Works that discharge into navigable waters that could be permanently or unacceptably damaged by degraded quality effluent for only a few hours. Examples of this class include discharges near drinking water reservoirs, into shellfish waters, or in close proximity to areas used for water contact sports.
- Reliability Class II – Works that discharge into navigable waters that would not be permanently or unacceptably damaged by short-term effluent quality degradations, but could be damaged by continued (on the order of several days) effluent quality degradation. An example of this class is a discharge into recreational waters.
- Reliability Class III – Works not otherwise classified as Reliability Class I or II.

For the City of Sutherlin's WWTP, it is recommended that the plant be designed for Class I Reliability Criteria based on the following:

- The existing system is considered an EPA Reliability Class I facility, and the existing outfall in Calapooya Creek will be used.
- Calapooya Creek is considered waters of the state.
- Plant overflows or upsets will discharge to Calapooya Creek.

The system design criteria for Reliability Class I and II works include backup requirements for the main wastewater treatment system components. In general, unit operations in the main wastewater treatment system shall be designed such that, with the largest flow capacity unit out of service, the hydraulic capacity of the remaining units shall be sufficient to handle 75 and 50 percent of the design wastewater flow to that unit operation for Class I and II, respectively. In addition, there should be system flexibility to enable the wastewater flow to any unit out of service to be distributed to the remaining units in service. Reliability is also discussed in Section 5.6.

1.5.2 Permitted or Required Effluent Quality and Mass Loadings

Umpqua Basin Total Maximum Daily Load (TMDL)

The Umpqua Basin TMDL was issued on October 31, 2006 and was approved by EPA on April 13, 2007. Calapooya Creek is within the Umpqua Basin. This TMDL addresses bacteria, temperature, nutrients, and bio-criteria. Waste Load Allocations (WLAs) for the City of Sutherlin's wastewater treatment plant are summarized in Table 1.5.2.1.

TABLE 1.5.2.1
CITY OF SUTHERLIN WASTE LOAD ALLOCATIONS

Parameter	Applicable Time Period	Waste Load Allocation
E. Coli Bacteria	Year Round	Not to exceed a monthly log mean of 126 organisms per 100ml. No single sample exceeding 406 per 100 ml.
Temperature	May 1 – October 31	$H_{wla} = (0.1)(Q_e + Q_r)C_f$ Where, H_{wla} = heat load WLA, million kcal/day Q_e = effluent flow rate, ft^3/sec Q_r = river flow rate, upstream, ft^3/sec C_f = conversion factor, 2.446 million kcal-s / °C·ft^3·day
Total Phosphorus	May 1 – October 31	Zero. Point sources may, at their option, collect additional data, perform the necessary evaluations and request a portion of the reserve capacity.

National Pollutant Discharge Elimination System (NPDES) Permit

The city of Sutherlin operates its wastewater system under NPDES Waste Discharge Permit No. 101993, issued October 24, 2006 by the Department of Environmental Quality (DEQ). This permit expired September 30, 2011, but has been administratively extended. A copy of the City's NPDES permit is included in Appendix A. A summary of regulatory requirements within the NPDES permit is provided below.

From June 1 through October 31, no discharge is allowed to waters of the State (Outfall 001, Calapooya Creek). During this time, all effluent is required to be disposed of through recycled water reuse (Outfall 002). Prior to land application, recycled wastewater must receive at least Level C treatment. Level C treatment is defined as no more than 240 total coliform organisms per 100 mL in two consecutive samples, and a 7-day median of 23 total coliform organisms per 100 mL.

From November 1 through May 31, discharge must meet the effluent limitations in Table 1.5.2.2. Mass load effluent limits for BOD_5 and TSS are based on weekly average stream flow during November.

TABLE 1.5.2.2
NPDES PERMIT WASTE DISCHARGE LIMITATIONS

Parameter	Ave. Effluent Conc. (mg/L) Monthly	Ave. Effluent Conc. (mg/L) Weekly	Monthly Ave. lb./day	Weekly Ave. lb./day	Daily Max. lb./day
Nov. 1 to Nov. 30					
BOD_5	30	45	440		
TSS	30	45	440		
Steam Flow					
<45 CFS				170	260
45 - 60 CFS				320	480
>60 - 96 CFS				440	660
>96 CFS				660	880
Dec. 1 - May 31					
BOD_5	30	45	560	840	1100
TSS	30	45	560	840	1100
Discharge in May allowed only while daily flow >82 CFS					
Year Round					
E Coli	126 org./100 ml No single sample > 406 org./100 ml.				
pH	6.0 - 9.0				
BOD5 & TSS eff.	85%				
Ammonia-N	21 mg/L daily maximum and 7.8 mg/L monthly average				
Total Chlorine Residual	0.04 mg/L daily maximum and 0.01 mg/L monthly average				

Compliance and Mutual Agreement and Order (MAO)

The existing facility has not been meeting the limits for the discharge restrictions of total residual chlorine and ammonia. Sutherlin and DEQ entered into MAO No. WQ/M-WR-05-054 in 2006 and an amended MAO in 2012. The MAO allows higher interim discharge limits and allows for summer discharge but requires Sutherlin to address the effluent issues.

The City cannot comply with the summertime discharge prohibition (June 1st and October 31st) because the land application system is too small to land apply all recycled water during this time period. The NPDES permit also prohibits discharge when the flow in Calapooya Creek is less than 82 cfs. The City cannot comply with this requirement for the same reasons. To comply with the chlorine limit, the City has installed a temporary dechlorination system. However, this system does not meet DEQ’s requirement for automation, alarms and redundancy. Therefore, a more permanent solution is needed or the elimination of chlorine disinfection during periods of discharge.

Section 2 – General Process Design

2.1 Approach

As previously discussed in Section 1.4, the proposed project consists of improvements to the collection system and the wastewater treatment plant (WWTP). The design for the collection system (Everett Avenue Pump Station) is covered in detail in Section 3, while this section covers the improvements to the WWTP. The WWTP design has been divided into functional categories: Headworks, Sequencing Batch Reactor (SBR), Biosolids Treatment, Disinfection, Effluent Disposal, and Facilities Design. In this section, the general process design for proposed wastewater improvements is presented. Specifically, the following process information will be offered and discussed in this section:

- **Process Design Criteria.** The design criteria include raw sewage characteristics and design population, flows and loads.
- **Hydraulic Profile.** This section provides a hydraulic profile of the WWTP and proposed improvements.
- **Process Schematics for Liquid Stream and Solids Stream.** This section provides process schematics for both the proposed liquid and solids treatment streams.
- **Liquid Treatment.** Topics in this section include a description of the existing liquid treatment facilities and operation at the City's WWTP, regulatory requirements pertaining to raw sewage treatment and handling and proposed design criteria for the new liquid treatment components.
- **Solids Treatment.** Topics in this subsection include a description of the existing sludge facilities and operation, regulatory requirements pertaining to biosolids treatment and handling, estimates of existing and future sludge quantities, and proposed design criteria for the new sludge digesters.
- **Liquid Disposal.** Topics in this subsection include a description of the existing effluent disposal systems, regulatory requirements pertaining to disposal, estimates of existing flows, and proposed design criteria for the new disposal systems.

Additional design data and specific design data on particular elements of the proposed improvements are found in the design memorandums that follow in Section 3. For the upgrade, the design year 2037 was selected to provide 20 years of service life per the Wastewater Facilities Plan. Calculation methods were presented in the Wastewater Facilities Plan Amendment.

2.2 Process Design Criteria

Raw Sewage Characteristics

The existing BOD and TSS influent concentration and loads are summarized in Table 2.2.1. The unit loading factors, pounds per capita per day (ppcd), were based on a sewered population of 7,905 persons in 2012.

TABLE 2.2.1
SUTHERLIN WWTP
INFLUENT CONCENTRATIONS AND LOADS

2008-2012 Data	WET WEATHER				DRY WEATHER			
PARAMETER	Average	Range			Average	Range		
BOD_5								
mg/L	136	30	-	416	229	40	-	432
Ppd	1,553	582	-	5,605	1,394	516	-	2,608
Ppcd	0.20	0.07	-	0.71	0.18	0.07	-	0.33
TSS								
mg/L	146	44	-	774	225	70	-	637
Ppd	1,661	530	-	4,481	1,537	321	-	3,368
Ppcd	0.21	0.07	-	0.61	0.19	.04	-	0.43

The typical composition of untreated domestic wastewater consists of 110 to 400 mg/l BOD and 100 to 350 mg/l TSS. Both BOD and TSS concentrations in Sutherlin's influent wastewater are within the typical characteristics of municipal raw sewage.

The average BOD unit loading to the Sutherlin WWTP ranged from 0.18 to 0.20 pounds per capita day (ppcd) for dry and wet weather respectively. The average TSS unit loading to the WWTP ranged from 0.19 to 0.21 pounds per capita day (ppcd) for dry and wet weather respectively. For design purposes, the unit loading factors for BOD and TSS will be assumed to be 0.20 ppcd, and 0.21 ppcd, respectively.

Design Population, Flows and Loads

The City's existing and projected wastewater flows and loads for the years 2012 and 2037 are summarized in Table 2.2.2. The wastewater flows and loads are based on unit design values and sewered population information presented in previous sections. A summary of the calculation methods utilized to determine these wastewater flows and loads may be found in the City's Wastewater Facilities Plan.

TABLE 2.2.2
EXISTING/PROJECTED WWTP WASTEWATER FLOWS AND LOADS

Parameter	Current 2012		Projected 2037	
Population dry season	7,905		11,594	
	MGD	gpcd	MGD	gpcd
MMDWF	1.23	156	1.80	155
MMWWF	1.70	215	2.70	233
Average Annual Flow	1.05	132	1.44	124
ADWF	0.72	91	.88	76
AWWF	1.37	173	2.01	173
Base Sewage	0.62	78	0.72	62
Base Infiltration	0.11	14	0.16	14
Peak Week	2.94	372	4.07	351
Peak Day	5.57	705	7.00	604
PIF	7.30	923	8.80	759
BOD Avg. Day	1,468 ppd	168 mg/L	2,154 ppd	179 mg/L
BOD Max. Month	2,197 ppd	214 mg/L	3,222 ppd	214 mg/L
TSS Avg. Day	1,599 ppd	183 mg/L	2,345 ppd	195 mg/L
TSS Max. Month	2,168 ppd	211 mg/L	3,180 ppd	211 mg/L

2.3 Hydraulic Profile

A graphic description of the hydraulic profile for the WWTP Site may be found in the 11" x 17" drawing set that accompanies this report. The drawings labeled G6 through G8 show the basis for selected elevations of the specific process designs.

The existing plant elevations were verified during a site survey conducted in 2015. An overall adjustment of approximately 3.5 feet was made to the elevations shown on the record drawings.

The elevations of the proposed improvements are dictated by existing site conditions and the desire to have the facility maintain as low of a profile as possible. The desire to reuse the existing chlorine contact basin and outfall system set the lowest elevation achievable. The hydraulic profile was developed, working upstream from the highest water level in the existing chlorine contact basin, by adding the calculated head loss through each component on the flow path to reach the required minimum elevation of the headworks.

The headworks elevation, placement and configuration were set to allow for mechanical conveyance of captured grit and for gravity flow through each process area.

Total volumes for the SBR basins were based on the projected flows and treatment loads of the influent raw sewage. Basin depths were based on hydraulic flows and settling requirements during decant mode.

2.4 Process Schematics

A graphic description of the liquid and solid stream processing for the proposed plant may be found in the 11” x 17” drawing set that accompanies this report. Flow through the proposed plant is schematically illustrated in the drawing labeled “P100”. More detailed views for each liquid process stream are illustrated in drawing sheets labeled “P700” through “P1100”. The solid stream process diagrams are presented in the “P1200” through “P1300” series sheets.

2.5 Liquid Stream Treatment

The design criteria for the main liquid stream treatment portions of the upgrades are presented in this subsection.

Existing Facilities/Operation

Raw wastewater is conveyed to the treatment facility from the collection system via a 27-inch gravity sewer line to a mechanical bar screen. After screening, raw sewage flows to the Influent Pump Station wet well, where wastewater is pumped to the headworks which include a grit separator, comminutor, and Parshall flume. The grit removal system does not perform its function due to an inoperative grit auger and only acts as a debris catcher. Flow through the headworks is split after the Parshall flume and continues by gravity to the north and south donut-type treatment units. Each unit has identical, circular tanks with interior dividing walls that form tanks (or basins) for each process. Each unit has a tank for a contact zone, a stabilization zone, a clarifier, and aerobic digester. The clarifier has a 12 horizontal to 1 vertical sloping bottom leading to a sump and external launder. The tank is 42 feet in diameter and has a side water depth of 11 feet. The north treatment unit includes the irrigation holding reservoir and the south unit includes the chorine contact tank and filter pump.

At each treatment unit, flow enters the contact tank via a trough into which return flow from the stabilization tank mixes with the raw sewage. The mixed liquor is aerated and then proceeds to the clarifier. Settled sludge underflow enters the return activated sludge (RAS) pump from which pumping to the stabilization tank occurs. A portion of the RAS is pumped to the digester as waste activated sludge (WAS) in order to maintain operational mixed liquor suspended solids concentrations. The RAS in the stabilization tank (also known as the re-aeration tank) is aerated and leaves the tank via the influent mixing trough where it stabilizes the incoming raw sewage.

The overflow from both the north and south clarifiers flows to the chlorine contact channel located in the south treatment unit. After detention in the chlorine contact basin, effluent is pumped to the irrigation holding reservoir. The treated wastewater in the irrigation holding reservoir then overflows into a discharge box connected to the 27-inch outfall line which flows to the Calapooya Creek outfall or is pumped again, via the effluent irrigation pumps and an 18-inch force main, to the golf course holding pond for use as recycled irrigation water. The WWTP has a tertiary sand filter; however, the filter is non-functional and has been bypassed

The WAS in the digester is aerated and decanted, the supernatant flow is returned to the influent pump station. Digested biosolids are pumped to tanker trucks and land applied during the dry season. During wet weather, biosolids are hauled to a private biosolids treatment facility.

The plant was originally designed to provide an effluent discharge quality of 95% dry-weather removal efficiency for BOD_5 and TSS, and 85% removal efficiency for wet weather flow.

Regulatory Requirements

The City of Sutherlin operates its wastewater system under National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. 101993, issued October 24, 2006 by the Department of Environmental Quality (DEQ). This permit expired September 30, 2011, but has been administratively extended. A copy of the City's NPDES permit is included in Appendix A.

Mutual Agreement and Order (MAO)

The existing facility has not been meeting the limits for the discharge restrictions of total residual chlorine and ammonia concentrations and for discharging to Calapooya Creek during periods of when non-discharge is required. Sutherlin and DEQ entered into MAO No. WQ/M-WR-05-054 in 2006, which allows higher interim concentration limits and summer discharge but requires Sutherlin to address these issue. In April 2012 the MAO was amended to address the City's inability to meet the required ammonia discharge concentrations.

Umpqua Basin Total Maximum Daily Load (TMDL)

The Umpqua Basin TMDL was issued on October 31, 2006 and was approved by EPA on April 13, 2007. Calapooya Creek is within the Umpqua Basin. This TMDL addresses bacteria, temperature, nutrients, and bio-criteria. Waste load allocations (WLAs) for the City of Sutherlin's wastewater treatment plant are summarized in Table 1.5.1.2.

DEQ Design Standard

DEQ issued Oregon Standards for Design and Construction of Wastewater Pump Stations in 2001, which is the current version. The EPA Design Criteria for Mechanical, Electric, and Fluid System and Component Reliability was used to determine the minimum number and sizing of components using the guidelines for Reliability Level I facilities.

Other

Wastewater treatment facilities, including pump stations, are also regulated under National Fire Protection Association (NFPA) Regulation 820, Fire Protection in Wastewater Treatment and

Collection Facilities. OSHA Permit Required Confined Spaces Standard 29-CFR 1910.146 limits individual access to spaces that might trap a person or contain noxious atmospheres.

Current Hydraulic Flows

The data used for this report is taken from the Discharge Monitoring Reports (DMRs) for the WWTP. The staff records the influent flow volume and checks the rain gauge at the plant daily. The wastewater is sampled and BOD and TSS tests are run weekly. The data from the DMRs was analyzed in the Facilities Plan, using DEQ guidelines for calculating various flow parameters. The detailed analysis is covered in the Facilities Plan and will not be presented here. A summary table of the flow parameters and loads (2008 - 2012) and for the engineer's original design data for the existing facilities was presented above in Table 2.2.2.

Projected Hydraulic Flows

The increases in base sewage, base dry weather infiltration and wet weather infiltration were calculated using the projected population increase, multiplied by the appropriate factors as detailed in the Wastewater Facilities Plan Amendment. These were added onto the existing average dry weather flow (ADWF), average wet weather flow (AWWF), maximum month dry weather flow (MMDWF), and maximum month wet weather flow (MMWWF) to project the flows for 2037. These flows are listed above in Table 2.2.2.

Proposed Liquid Stream Treatment

The proposed improvements to raw sewage influent treatment include installation of a new influent screen system, influent pump station, headworks, sequencing batch reactor (SBR) basins, tertiary treatment, and ultraviolet (UV) disinfection. Treated effluent will continue to be discharged to Calapooya Creek during the winter months and to the golf course irrigation pond during summer months. A second summer discharge point to Ford's Pond will be added. A non-potable water system will be installed to replace the current use of City water for plant wash down and equipment process water. Process flows through the main components of the proposed system are described below. Detailed information on each component is included in Section 3.

Influent Screen System

All raw sewage influent flow will pass through the influent screening basin where flow will be split to flow through both the west and east channels. Both channels will include a new shaftless screening system. During normal screen operations, coarse solids will be captured on the screen as sewage flows through the basin channels. Screen operation will be controlled by water level in the channel, upstream of the screen. When the captured solids on the screen create enough headloss through the screen to raise the upstream influent surface to a preset level, the screen cleaning cycle will begin. As part of the cleaning cycle, the auger moves solids captured on the screen up to the washer/compactor unit. Accumulated screenings are transported through the unit's compaction and dewatering zone to discharge into a screenings container located at ground level. Liquid from the washer/compactor flows back into the channel. The screens will alternate during average flow conditions and both screens will operate during high flows. A manual bar screen is installed downstream of the automatic screens.

Influent Pump Station

From the influent screen basin, raw sewage will gravity flow to the new influent pump station wet well. The influent pump station will consist of five variable speed, non-clog centrifugal pumps; triplex submersible pumps for winter flow and duplex submersible pumps for summer flow. A separate force main for each pump system will be provided. The influent pump station will discharge directly to the main headworks.

Headworks

The screened wastewater will pass through a vortex type grit removal system at the headworks. Collected grit will be pumped to a grit classifier, located below the headworks. The grit will be washed, dewatered and discharged to a dumpster which will be emptied. Exiting the grit chamber, the flow will pass to the SBR flow splitting box. The flow splitter box allows for hydraulic stabilization and splitting of flow. Flow enters the top of the box and exits out of the bottom via four 12-inch diameter pipes. Each pipe has a magnetic flow meter with isolation valves.

Sequencing Batch Reactors (SBR)

Flow, after metering, will pass to the pre-react basins in one of four continuous flow SBR basins. The SBR basins each will cycle through fill, aerate, settle, and decant modes. The timing for the modes will be offset, so that each basin will decant at different times. In essence during high flow conditions there will be continuous discharge. After treatment and settling, the effluent will discharge to two tertiary filters.

Tertiary Filters

The tertiary disk filter system will include a manually valved bypass line to allow flow around the filters depending on the time of year, which dictate effluent discharge requirements. Summer flows will be filtered to achieve Class A treatment for discharge to the golf course irrigation pond or Ford's Pond. From the tertiary filters, Class A effluent will gravity flow to the UV disinfection system. Winter flows from the SBR basins will bypass the tertiary filters and gravity flow directly to the UV disinfection system.

Ultraviolet (UV) Disinfection System

The UV disinfection system will be located in a single, closed pipe system. Two banks of lamps will be installed in series with multiple lamp racks within each bank. Individual racks can be removed for maintenance while maintaining the rest of the system in service. The lamps will be flow paced by staging banks on and off in response to the output signal from the flow meter on the influent side of the UV system.

Effluent Disposal

During dry weather flows, the finished effluent will be directed from the UV system to the existing chlorine contact basin, where the effluent will be chlorinated prior to being sent to the irrigation tank. Flow in the chlorine contact chambered will be reversed from its existing flow direction in order to utilize the existing 24" line connecting the chlorine contact to the irrigation basin. The water surface in the chlorine contact chamber will be increased by approximately three feet to allow flow to the irrigation chamber via gravity.

During wet weather flows, finished effluent from the UV units will be directed to the irrigation tank. From the irrigation tank, effluent will gravity flow to the existing discharge point on Calapooya Creek, via the existing 27-inch outfall line.

Proposed Liquid Stream Equipment and Basin Sizing Criteria

Each piece of processing equipment was sized to meet the projected loads for the year 2037. A brief description of the sizing criteria is discussed below. Detailed equipment specifications are included in Section 3.

Influent Screen

The influent screen basin is designed to handle above the peak hourly flow (PIF) of 9.0 MGD. Both screens will be sized to pass 6.0 MGD each.

Influent Pump Station

The pump station will consist of two pumping systems; one three pump system for wet weather flows and one two pump system for dry weather flows. The submersible pumps will be installed in a 14-feet x 8-feet, rectangular concrete wet well. The wet weather flow pump system will be designed with a firm capacity (3 pumps operating) of 10.74 MGD. At the AWWF the wet well will have a detention time of 5.2 minutes and force main will have a detention time of 5.0 minutes. The dry weather flow pump system will be designed with a firm capacity (2 pumps operating) of 3.0 MGD. At the ADWF the wet well will have a detention time of 13.9 minutes and force main will have a detention time of 2.2 minutes.

Headworks

All components of the headworks were sized to pass the PIF projected for the plant. A vortex grit concentrator and a bypass channel will both be sized for a peak flow of 9.0 MGD. The splitter box will also handle the PIF as the four outlet pipes that direct flow to the SBR basins will each be sized for flows up to 2.25 MGD. Each of the outlet pipes will have a magnetic flow meter with a flow range of 0.45 to 2.25 MGD.

Secondary Treatment

The SBR is sized to handle the $PDAF_5$ flow of 7.0 MGD, based on the projected flows for a 5-year, 24-hour storm for the year 2037. The basins will operate on four hour cycles during normal operation and on three-hour cycles during storm flows. The treatment capacity is sized to handle the projected maximum month BOD and TSS levels calculated in the Facilities Plan, while producing the required effluent quality. In addition, the SBR basins have been sized to store the difference between the PIF and the PDAF or approximately 75,000 gallons. After the PIF event has passed the stored flows will be released at such a rate to not overload downstream facilities.

Tertiary Treatment

Two rotating disk filters will be utilized as tertiary treatment for treating dry weather flows. The filters will operate in parallel and each filter will be sized to pass the MMDWF of 1.80 MGD.

Disinfection System

The disinfection system is designed to treat the PDAF of 7.0 MGD while treating the effluent to the levels described in Section 1. The anticipated permit disinfection limit is 126 Enterococci colonies per 100 ml on a monthly mean, with no single sample above 406 colonies per 100 ml.

Other design criteria for the disinfection system include the ability to clean the system and to perform maintenance on lamps and ballasts while the system is in operation. Requirements include meeting the minimum dosage at 80% of effective lamp output.

Effluent Disposal

The existing overflow weir and outfall pipeline have are capable of handling the maximum flow at the calculated $PDAF_5$ for the year 2037 of 7.0 MGD. Flows to the creek will continue during the winter discharge period (November 1 to May 31) established by the NPDES permit.

During the summer months (June 1 to October 31) effluent will be disinfected with sodium hypochlorite and passed through the chlorine contact chamber. The contact basin is sized to provide a contact time of 95 minutes at the ADWF of 0.88 MGD and 46 minutes at the

MMDWF of 1.8 MGD. The irrigation pumps that will pump the treated effluent to the golf course irrigation pond or Ford's Pond have a firm capacity of 2.4 MGD.

2.6 Solids Treatment

The design criteria for the solids handling processes are presented and discussed in this subsection including a description of the existing facilities, regulatory requirements, and estimates of current and future sludge quantities. There are two independent solids streams at the wastewater treatment plant, large particles and rock material that will not break down within the scope of biological treatment and sludge. The large particles are removed at the headworks. The waste sludge from the secondary treatment process will undergo a biological treatment process to meet the EPA requirements for a Class B biosolid and then be dewatered to a Class B biosolid cake.

Existing Facilities/Operation

Raw wastewater flows through a mechanical bar screen prior to the influent pump station wet well. Screened debris is mechanically lifted and discharged into a dumpster that is picked up and delivered to a landfill. From the influent pump station wet well, flows are lifted to the headworks which include a grit separator, comminutor and Parshall flume. The grit removal system does not perform its function due to an inoperative grit auger and only acts as a debris catcher.

There are two aeration basins providing a total of 170,000 gallons (22,727 cubic feet) of contact zone and a total of 398,000 gallons (52,208 c.f.) of re-aeration (or stabilization) zone. Preliminary treated sewage from the headworks enters the mixing trough where it is combined with overflow from the stabilization zone. The combined flow is aerated and mixed in the contact tank. The plant operators try to maintain an MLSS of 3500 mg/l in the contact tank. Flow then proceeds to the clarifier. The return activated sludge (RAS) flow is then pumped to the stabilization or re-aeration zone. A small quantity of WAS is diverted to the aerobic digester in order to maintain an optimum MLSS between 6,500-7,500 mg/l. Occasionally the MLSS increases to 8,800 mg/l. The contents of the digester are aerated for a period of time to reduce pathogens and vector attraction of the biosolids, as required under 40 CFR Part 503 regulations.

When each aerobic digester is full, the air is turned off and the contents of the basin are allowed to settle. The supernatant is decanted and returned to the influent pump station. After a particular digester cell has reached the point where settling does not produce an appreciable amount of supernatant, the City stores the liquid biosolids until they can be land applied. Sludge is then pumped to a sludge truck for land application at DEQ approved land application sites during the dry months. The City currently hauls and land applies approximately 1.0 to 1.5 MG of sludge (1.5 to 2.0 % solids) per year. The existing digesters are undersized for the projected loads. If the City has a buildup of biosolids during wet weather months, excess biosolids have to be trucked to a private biosolids treatment facility.

Regulatory Requirements

The primary regulation governing the land application of biosolids treatment and disposal is Part 503 of Title 40 of the Code of Federal Regulations (40CFR503). Biosolids must satisfy the requirements of 40CFR503 for pathogen and vector attraction reduction before it can be land applied. Biosolids, metal and nitrogen contents must also be monitored to determine appropriate application rates. As the City's biosolids land application is within agronomic rates for nitrogen and the trace element concentrations in the biosolids are below Part 503 pollutant concentration limits (see Wastewater Facilities Plan Amendment), the metal and nitrogen content in the biosolids will not be reviewed in this report. The requirements for pathogen reduction Class B biosolids and vector attraction reduction are discussed below.

Pathogen reduction to compliance standards is required for all generated biosolids. The City currently produces and is anticipated to continue generating a Class B biosolid. The City achieves compliance through the use of 40CFR503 Method A1, aerobically digesting the sludge for 60 days at 15°C.

Biosolids destined for land application must meet Part 503 vector attraction requirements. Vectors are defined as organisms, such as insects, birds and rodents that could be attracted to sludge and spread pathogens/disease. The Part 503 regulation contains 12 options for demonstrating reduced vector attraction of sludge to vectors. Of these methods, the City currently utilizes Option No. 1 – Reduction in Volatile Solids Content (by at least 38%), as the means for compliance with the vector attraction reduction. Based on the results from the annual metals sampling and analysis of sludge from 1999 to 2002, the sludge hauled for land application was in compliance with the regulatory concentration limits.

Current Sludge Generation

Based on the hydraulic retention time (HRT) calculation provided in the Wastewater Facilities Plan and on a 2009 average flow of 0.99 MGD, there are only 20 days of detention time provided in the existing digesters. Additional storage is required in order to meet the 60 day aeration at 15°C requirement. The City currently disposes of an average of 1,030,000 gallons of biosolids annually during the dry season by land application.

Projected Sludge Generation and Required Digester Capacity

Production of future quantities of sludge were calculated using the SBR process proposed for the WWTP. Required digester volume was calculated based on the incoming BOD load, temperature, SBR sizing, solids retention times, sludge yield and MLSS concentrations in the waste activated sludge (WAS). The amount of air required for sludge digestion was also evaluated. The following is a summary of the key design parameters that were utilized for this calculation.

A. **BOD Loading –** This parameter was based on the difference between the influent maximum month BOD concentration (214 mg/l) and the required effluent BOD concentration (10 mg/l).

B. **Temperature –** 10°C was utilized as the design temperature. The SBR basins were designed with a range of 10 – 23^{o}C. As the solids time increases with decreasing temperatures, the lower temperature was selected to provide a more conservative design.

C. **Sludge Yield –** The observed sludge yield of 0.78 was used based on the SBR basin design values.

D. **Solids Retention Time –** A solids retention time of 60 days was examined. The 60 day value represents the time needed to comply with Alternative No. 2, Class B, Pathogen Requirements.

E. **WAS and Biosolids for Hauling –** 2,536 lbs/day of solids generated from the SBR basins. This value was selected based on data provided by ITT Sanitaire for the SBR process. A finished biosolids concentration of 2.0 percent was selected. If a higher concentration could be achieved in the finished biosolids, then the overall digester capacity could be reduced.

F. **Air Requirements –** The amount of air needed for mixing (30 SCFM/1,000 cubic feet) and oxidation were calculated. The air requirements for mixing were greater than that for oxidation.

A summary of the design computations for sludge digester volume in the year 2037 is given in Table 2.6.1.

TABLE 2.6.1
SUMMARY OF DESIGN CALCULATIONS
SLUDGE DIGESTER VOLUME

Parameter	Year 2037
Max Month BOD Load, lbs/d	3,222
Residence Time, days	60
Calculated Minimum Digester Volume, gallons	718,800

Based on these calculations, the design digester volume for the year 2037, with 60 days of digester retention time at 2.0% solids, is 718,800gallons. The calculated capacity is based on the projected maximum month BOD load. The total calculated digester combined capacity is 1,047,200 gallons. Converting the existing donut units into eight (8) digesters, each with a 13.5 feet sidewall depth (SWD), will provide adequate space.

Sludge Dewatering

The City presently pumps digested sludge directly from the digesters into the City owned 3,200-gallon tanker truck for beneficial use on pastureland. The sludge averages 2.0% solids and is sprayed from the back of the truck as the truck is driven over the fields. DEQ permits sites totaling approximately 275 acres for year-round application by the City.

DEQ currently requires that facilities have viable long-term options for sludge management. While there have been discussions of future requirements for facilities to have six months of sludge holding capacity, that requirement has not been incorporated directly into the regulations and guidelines. An examination of the current tank capacity proposed for digesters and biosolids holding revealed that there will be adequate capacity for six months storage at the current solids content of 2.0% through the year 2037.

Biosolids disposal was analyzed in the Wastewater Facilities Plan Amendment, with the recommendation to dewater the sludge to reduce handling costs and storage space requirements. The recommended dewatering system was a screw press. The screw press was selected based on the anticipated quantity of sludge, the time required for operation and maintenance, and the desire for an uncomplicated system that could be maintained by onsite personnel. The design capacity is to process a minimum of 55 gpm of 2.0% biosolids, producing 550 dry pounds of dewatered cake per hour. Filtrate from the dewatering process will gravity flow to the existing plant pump station where it will be pumped to the new influent pump station wetwell.

The City will have several options for biosolids disposal when the new plant is completed and biosolids dewatering is available; continue land application of treated biosolids, land application of dewatered biosolids, the disposal of dewatered biosolids using the local sanitary service to haul away, or the City can haul to dewatered biosolids to a Douglas County landfill or a private biosolids treatment facility.

Section 3 – Specific Process Design

Section 2 discussed process design in general terms and presented the new process improvements in relation to existing treatment and future flows and loads. In this section, the discussion continues at a more specific level showing how the processing considerations will be implemented.

The process improvements are subdivided as shown below:

Description	Design Memorandum Number	Process Area[1]
Influent Screening	3.1	600
Influent Pump Station	3.2	700
Headworks Grit and Flow Splitting	3.3	800
Sequencing Batch Reactor (SBR)	3.4	900
Tertiary Treatment	3.5	1000
Disinfection	3.6	1100
Effluent Disposal/Reuse	3.7	1200
Biosolids Treatment	3.8	1300
Plant Site Facilities	3.9	100
Everett Avenue Pump Station	3.10	1400

[1]These numbers represent an indexing system that is used in the project drawings.

The processing areas 100 through 1400 are described in this section by a series of design memorandums. The memorandums are divided into the following subsections:

Purpose and Scope states what the process area does and what it covers.

Associated Sections points the reader to other sections of the report that impact the area.

Process Schematics and Drawings graphically presents drawings of the processing system. Generally, the process schematics are grouped in the project drawing "P" sheets.

Design Criteria describes the specifications, method, procedures, or standards that must be met in developing the system.

System Description leads the reader through the components of the process area.

Instrumentation, Control, and Measurement identifies elements in the design, such as valves and instrumentation that allow measurements, regulation or maintenance of the functions of the process.

Design Issues Yet to be Resolved describes major elements that we foresee in process design that are not fully developed in this report.

Instrument List tabulates the instruments that are shown on the process diagrams.

Design Data summarizes preliminary design parameters.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.1
Subject:	Specific Process Area 600
	INFLUENT SCREENING
Date:	September 29, 2015
Prepared By:	Ryan H. Quigley, P.E.

PURPOSE AND SCOPE

The purpose of the influent screening system is to provide preliminary screening of raw sewage that is gravity fed to the wastewater treatment plant from the City's collection system. The screening is intended to remove large objects, debris, rags, and other heavy solids prior to the treatment plant influent pump station.

The existing intake screen, which has issues with clogging, is reported to be designed for a flow of up to 5.5 MGD but experiences flows which exceed its capacity. The current peak instantaneous flow (PIF) is 7.3 MGD and is expected to reach 8.8 MGD by 2037. Large rain events combined with a mechanical screen that clogs easily, create conditions where water surface elevations can rise above the channel walls in the screen basin.

A replacement screening system that can handle PIF and reduce clogging is recommended for incorporation into the wastewater facility upgrades.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
5.4	Electrical System	Describes electrical components associated with the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P600 for information specific to the influent screening system.

DESIGN CRITERIA

The design of the new influent screening system will meet the following general criteria:

1. A dual screen system that will handle the plant’s future peak instantaneous flow (PIF) of 8.8 MGD, each capable of 6.0 MGD.
2. A mechanically cleaned, fine screen with dewatering capabilities.
3. Incorporation of ultrasonic level sensors.
4. Incorporation of outdoor freeze protection.
5. Basin modifications to accommodate screen system and eliminate confined space restrictions.
6. Provide influent composite sampler to measure quality of incoming raw sewage.
7. Provide manual bar screen after the mechanical screens.

Additionally, other design considerations include: clearance around the equipment and accessibility.

SYSTEM DESCRIPTION

The new influent screening system will utilize the existing mechanical bar screen basin, constructed in 1995, after the original wastewater treatment facility was constructed. The existing basin has two flow through channels but only has one mechanical bar screen installed presently. The improvements to the influent screening basin will consist of three components; removal of the existing mechanical bar screen; installation of two shaftless spiral screening systems in modified channels, and the expansion of the concrete basin to include stairs for access.

Raw sewage enters the screening basin through a 27” diameter concrete pipe via gravity flow. With the current setup, all flow is directed through the west channel, where it is screened by the existing mechanical bar screen. After the improvements are complete, flow will be split to flow through both the west and east channels. Both channels will include a new spiral screening system.

During normal screen operations, coarse solids will be captured on the screen as sewage flows through the basin channels. Screen operation will be controlled by water level in the channel, upstream of the screen. When the captured solids on the screen create enough headloss through the screen to raise the upstream influent surface to a preset level, the screen cleaning cycle will begin. As part of the cleaning cycle, the auger moves solids captured on the screen up to the washer/compactor unit. Accumulated screenings are transported through the unit’s compaction and dewatering zone to discharge into a screenings container located at ground level. Liquid from the washer/compactor flows back into the channel. A typical cycle will run for 30-45 seconds. Additional cycles can be set to run on a timer, to ensure the screen is cleaned periodically regardless of the upstream level. The screens will alternate during average flow conditions and both screens will run during high flows.

A non-potable water supply will be utilized to feed the screen’s intermittent wash system. If non-potable water is used, it will need to pass through a 250 micron screen to keep spray nozzles from plugging. A flow rate of 15 gpm at 60 psi is required at the wash system connection for each screen. The wash system will only operate when the screen is running.

Raw sewage that passes through the screening system continues down the main channel towards the new influent pump station. Influent sampling will take place in the main channel upstream of the mechanical screens. Aluminum slide gates are located upstream and downstream of the screen units and will be maintained, which will allow for dewatering of either of the two channels for maintenance. An ultrasonic level transducer in the upstream channel will monitor and provide level information. Should the water level exceed the pre-set operating level, an alarm condition will initiate. A redundant, backup float will be provided to send an alarm and activate both screens should the ultrasonic level transducer fail.

One automatic influent composite sampler for sampling the raw sewage will be installed at the influent screen basin. The sampler unit will be located at the southeast corner of the basin, at existing grade. A new concrete slab for installation of the sampler and sidewalk access will be installed as part of the structure modifications. The sampler will draw samples at the entrance of the influent screen basin channel prior to the mechanical screen. The samples will be based on a 24-hour composite and samples will be taken on a time or flow paced interval. The signal indicating the sampler when to sample shall come from the programming inside the sampler itself, which directs the sampler to sample at the programmed intervals. The sampler is flow-paced, with the signal coming from the flow meters associated with the influent pump station.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

A. Screening Unit

1. Normal screen operation will be controlled by water level upstream of the screen. When the water level in the channel reaches a preset elevation, auger cleaning and wash system cycle will be initiated. If water levels continue to rise the second screen will be activated. Under low flow conditions, the screens will alternate operation after each cleaning cycle.
2. The level sensor in the upstream channel will monitor and provide level information and activate screen operation.
3. A redundant control float will provide for a second alarm and screen activation.
4. The screening unit will be provided with an outdoor freeze/weather protection system. The system will consist of a self regulating heat trace cable wrapped

around the conveyor tube and insulation and a protective type 304 stainless steel jacket to encase the heat trace cable and the conveyor tube. An ambient temperature thermostat to control the heat trace cable will be housed in the screening unit control panel.

B. Influent Composite Sampler

1. Programming will be provided that will allow the Main Instrument Panel PLC and plant SCADA system to send a signal to the sampler to indicate when the sample should be taken. For flow-paced operation, a signal is returned from the Main Instrument Panel and SCADA system to the automatic sampler.

DESIGN ISSUES YET TO BE RESOLVED

1. Structural design for stairwell to eliminate confined space classification.
2. Wash system water supply.
3. Existing 8” water line relocation to accommodate basin modifications.

INSTRUMENT LIST

Process Area 600: Influent Screening				
1	LSA		Float	Alarm level at Mechanical Screens
2	LSH		Float	High level at Mechanical Screens (Redundant Alarm)
3	FE/FIT		Ultrasonic Liquid Level Transmitter	Liquid level at Mechanical Screens & Influent Sampler

DESIGN DATA

Process Area 600: Influent Screening	
Parameter	Design Value
Screening:	
Type:	Shaftless Spiral Screen
Number:	2
Opening size, inches:	0.25
Capacity (each screen), MGD:	6.0
Motor Hp	2.0
Non-Potable Wash Water	15 gpm at 60 psi (per unit)
Non-Potable Water Screen	250 Micron

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.2
Subject:	Influent Pump Station Design (Process Area 700)
	INFLUENT PUMP STATION
Date:	October 5, 2015
Prepared By:	James Norrington, P.E.

BACKGROUND AND PURPOSE

All of the wastewater flows in Sutherlin's collection system arrive via a 27-inch gravity line to the influent pump station. All flows are screened prior to entering the wet well with the exception of the wastewater that is generated onsite by city staff. The station is located within the wastewater treatment plant and lifts influent to the headworks. The station was originally constructed in 1977 with the upgraded wastewater treatment system. The station is site-built with a deep wet well. The station has 4 non-clog vacuum primed centrifugal pumps. Two of the pumps are 7.5 HP and have a capacity of 450-gpm each. The other two are 15 HP and each have a capacity of 1250-gpm. The maximum pumping capacity of all four pumps is 3,400-gpm (4.9 MGD). Current Peak Wet Weather flows exceed the capacity of the pumps and risk system overflow during a major winter storm. Instantaneous flow is approximately 7.3 MGD. The Influent Pump Station discharges to the headworks.

While the influent pump station appears to be in good physical condition, the pumps are so worn that they are only able to pump approximately 61% of their original rated flow capacity. The WWTP is currently supported by a 350 kW diesel backup power generator, which is adequate to operate the pumps and other critical equipment at the plant.

The existing influent pump station ,located inside the operations building, will need to remain operational during construction of the new treatment facilities and will be decommissioned when the new treatments units, new influent pump station and new force mains become operational.

This section will provide information regarding the general design of a new pump station and force mains constructed just north of the existing screening facility.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.1	Influent Screening	Describes screening of raw sewage prior to entering the Influent Pump Station
3.3	Headworks	Describes grit removal and flow splitting of raw sewage prior to entering the SBR
3.9	Plant Site	Describes the relationship between the SBR and other plant site facilities

SCHEMATICS AND PLANS

The 11” x 17” drawing set that accompanies this report includes plan sheets that illustrate the schematics and plans associated with this pump station improvement project. Refer to drawings P700, which illustrates the new influent pump station process area.

DESIGN CRITERIA

The influent pump station will be designed to meet the following criteria:

A. The Oregon Department of Environmental Quality defines a pump station's capacity as the pumping capacity of the pump station with the largest pump out of service. To meet the flow conditions of the pump station, the pump station must have a capacity of 6,111 gallons per minute (gpm), which is the projected peak instantaneous flow (PIF) as listed in the City of Sutherlin Waste Water Facilities Plan Amendment (Dyer 2013) for the design year 2037. In addition to meeting the future peak flow, the pump station must also be designed to meet a future average dry weather flow (ADWF) of approximately 736-gpm. Variable speed pump drives will be utilized during times of low flows. The pump station's current and projected flows, based on the Wastewater Facilities Plan (Dyer, 2013), are presented below:

	2012 Flow, gpm	**2037 Flow, gpm**
ADWF	500	611
AWWF	952	1,396
$PDAF_5$	3,868	4,861
PIF	5,069	6,111

B. Velocity in the pump discharge piping should be maintained between 3 and 10 fps. Velocities less than 3 fps induce settling of solids within the pipeline, while velocities over 10 fps generate excessive headloss within the pipe.

C. Wet wells should be designed to prevent the accumulation of solids and should provide features that simplify cleaning when needed.

D. A geotechnical investigation of the pump station site, completed by Foundation Engineering, Inc., dated August 5, 2015, covered wet well construction requirements. It is anticipated that an internally-braced sheet pile cofferdam will be the most practical shoring option due to the proximity of existing structures and the need to seal off groundwater intrusion even during summer months. Rock excavation is not anticipated due to very weak sandstone observed at a depth of 22.5 feet which should coincide with the bottom of the wet well footing.

SYSTEM DESCRIPTION

A. Pump Selection

1. The new pump station will consist of three submersible pumps for the peak instantaneous flow (PIF) event of 6,111 gpm and two submersible pumps for the average dry weather flow (ADWF) event of 611 gpm in the year 2037. The hydraulic capacity of the pump station will be sized to handle a peak instantaneous flow of 6,111 gpm, which is the projected peak instantaneous flow in 2037. The three wet-weather pumps will be rated at 45 HP at a speed of 1170 rpm, and be rated to convey 2,037gpm at 44 feet TDH with one large pump in operation and 6,111 gpm at 53 feet TDH with all three large pumps in operation. The two smaller dry-weather pumps will be rated at 20 HP at a speed of 1755 rpm, and be rated to convey 1,250 gpm at 46 feet TDH with one small pump in operation and 2,083 gpm at 54 feet TDH with both small pumps in operation. All pumps will operate on three-phase, 460-volt power. The pumps will be equipped with variable frequency drives (VFDs) to operate the motors at variable speeds depending on the incoming flowrate to the pump station and to allow the pumps to match design flows.

2. The proposed pump configuration of three large pumps and two small pumps was chosen not only to handle their respective flow events, but also for system redundancy. During the PIF event of 6,111 gpm, all large pumps will be operational and will convey 2,037 gpm each. If one large pump fails, the two small pumps will become operational with the two large pumps capable of achieving a total flowrate of 6,638 gpm which exceeds the required flowrate for the PIF event. During the ADWF event of 611 gpm, only one small pump will become operational. If the first pump fails, the second small pump will become operational.

B. Wet Well

1. The wet well will be 8-feet wide by 14-feet long by 20-feet deep to the top of the wet well lid.

2. Based on the wet well dimensions and the pump selection discussed above, the pumps will see a cycle time of 5.2 minutes (12 starts per hour) at the peak instantaneous flow event and 13.9 minutes (5 starts per hour) at the average dry weather flow event.

C. Force Mains

1. The design of the pump station is based on the new force mains that will convey the raw sewage to the new headworks. The new large force main, for the wet-weather flows, will be an 18-inch ductile-iron pipe approximately 390 feet in length and will have a detention time of 5.0 minutes at average wet weather flows. The new small force main, for the dry-weather flows, will be a 10-inch ductile-iron pipe approximately 390 feet in length and will have a detention time of 2.2 minutes at average dry-weather flows. During the dry-weather months, the incoming flows into the pump station will be greatly reduced. This reduction in flows will cause the large force main to sit idle for long periods of time far exceeding the allowable maximum detention times set by DEQ. To avoid the resulting stagnant sewer issue, automatic valves will be installed on each vertical leg of the large pump discharge lines. These drain valves will allow the large force main to be drained in its entirety.

2. The proposed routing of the two parallel force mains will be around the south and west sides of the existing office and filter buildings and will continue north until reaching the new headworks structure. This route was chosen to minimize the numerous potential conflicts between the existing yard piping and utilities between the existing filter building and the existing operations building.

D. Access

1. Vehicle access to the pump station will be from the adjacent existing paved parking lot of the WWTP.

2. Access to the new wet well will be through locking aluminum hatch doors. Each door will be hydraulically assisted for easy opening and closing.

E. Safety

Safety gratings will be provided under the wet well hatches to prevent city personnel from falling into the structure.

F. Overflow

The sewage overflow point for the influent pump station is the upstream manhole located between the existing screening facility and the existing influent pump station. If backup power or equipment were to fail, drainage would eventually flow into the site storm drain system, which discharges to Cook Creek.

G. Potable Water

Potable water is available at the site.

H. Backup Power

The new influent pump station will be fed by the new diesel generator, located in the new control building, during times of power loss.

I. Sanitary Sewer

1. A new 27-inch gravity line will be extended from the existing manhole downstream of the screening facility to the new wet well location. Approximately 25 feet of 27-inch diameter PVC pipe will be installed from this manhole to the new pump station. This new line will be plugged until the end of construction. Once the new facilities are online, the existing pipe between the existing manhole and the existing pump station will be abandoned and the plug will be taken out of the new 27-inch line.

J. Flow Meter

1. A 10-inch and 18-inch, NEMA-6 rated magnetic flow meters will be installed approximately 5-feet aboveground on the vertical portions of the new force mains at the new headworks.

K. Landscaping and Fencing

The site perimeter is currently fenced and will remain fenced once construction is completed. A concrete pad will be placed around the new wet well and valve system to prevent unwanted vegetation from growing in the access areas. Bollards will be placed around the station to prevent vehicle access to the station.

L. The existing influent pump station will be converted to a drain pump station. Submersible centrifugal pumps will replace the existing vacuum prime pump system.

INSTRUMENTATION, CONTROL, AND MEASUREMENT

Control of the pump station will be through a pump control panel installed in the new control building. All alarms and operational data for the pump station will be transmitted to the new plant SCADA system. Control of the wet well level will be through a submersible pressure transducer with mercury float switches for backup.

DESIGN ISSUES YET TO BE RESOLVED

1. New power service coordination
2. Electrical loads
3. Structural components of the new wet well and slab-on-grade around wet well
4. Non-potable water supply system
5. Hoist and trolley system for pump removal

INSTRUMENT LIST

The following table summarizes the instrumentation equipment required at the Influent Pump Station:

PROCESS AREA 700: IPS				
1	LET		Level Transmitter	Indicates level of liquid
2	LSH		Float	High water alarm
3	FE/FIT		Magnetic Flow Meter	Totalized flow 10-inch FM
4	FE/FIT		Magnetic Flow Meter	Totalized flow 18-inch FM
5	PG		Pressure Gauge	Pipe pressure 10-inch FM
6	PG		Pressure Gauge	Pipe pressure 18-inch FM
7	LSL		Float	Redundant pumps off
8	LS ON/OFF		Floats	Backup pump control
9	CSOF		Float	Overflow Alarm

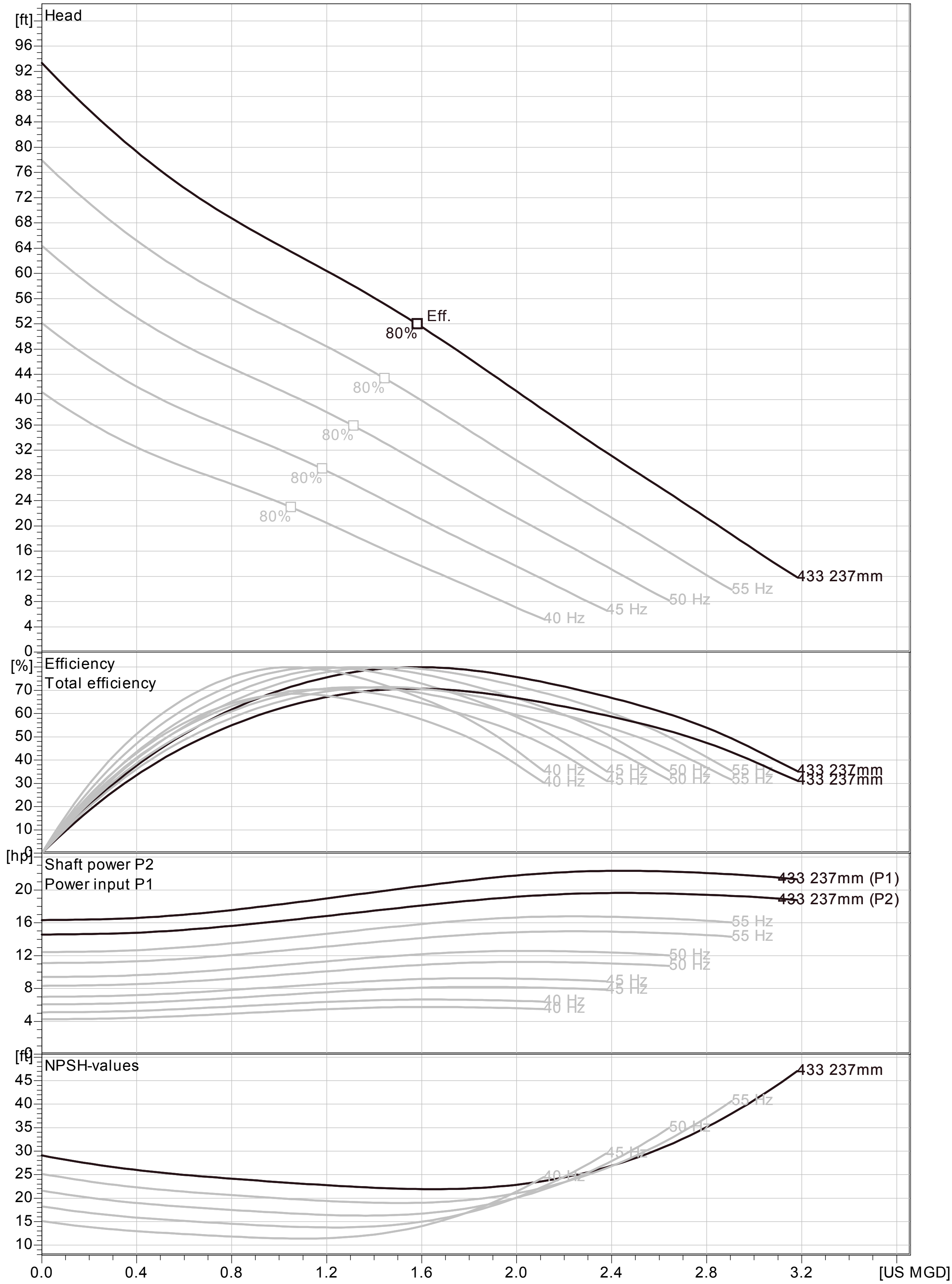
DESIGN DATA

PARAMETER	DESIGN VALUE
PUMP STATION	
Station Type	Pentaplex* Triple Submersible Winter Flow Double Submersible Summer Flow
Pump Type	Variable Speed Non Clog Centrifugal
WET WELL	
Depth	20 Feet (19 feet interior)
Size	8 Feet X 14 Feet Rectangular
Working Volume	2,128 CUFT
Level Control	Pressure Transducer With Float Backup
Overflow Wet Well Elevation	400.2 Feet
Overflow Discharge Point	TBD
Average Time To Overflow	12 Minutes (AWWF)
Auxiliary Power	Plant Standby Generator
Alarm Telemetry	Auto dialer
EPA Class	I

PARAMETER	DESIGN VALUE
WET WEATHER PUMP SYSTEM	
Total Number Of Pumps	3
Pump Horsepower	45 HP Each
One Pump Operating Capacity	4.2 MGD @ 43.7 Feet TDH
Two Pump Operating Capacity	7.76 MGD @ 47.9 Feet TDH
Firm Capacity W/ 3 Pumps Operating	10.44 MGD @ 52.8 Feet TDH
Average Detention Time	5.2 Minutes (AWWF)
DRY WEATHER PUMP SYSTEM	
Total Number Of Pumps	2
Pump Horsepower	20 HP Each
One Pump Operating Capacity	1.81 MGD @ 46.2 Feet TDH
Firm Capacity W/ 2 Pumps Operating	3.0 MGD @ 54.0 Feet TDH
Average Detention Time	13.9 Minutes (ADWF)
WET WEATHER FORCE MAIN	
Length	390 Feet
Type	18 Inch Ductile Iron
Profile	Continuously Ascending
Discharge	WWTP Headworks
Air Release	Yes
Vacuum Release Valves	Yes
Average Detention Times	5.0 Minutes (AWWF)
Sulfide Control	None
DRY WEATHER FORCE MAIN	
Length	390 feet
Type	10 Inch Ductile Iron
Profile	Continuously Ascending
Discharge	WWTP Headworks
Air Release	Yes
Vacuum Release Valves	Yes
Average Detention Times	2.2 Minutes (ADWF)
Sulfide Control	None
ELEVATIONS	
Rim Elevation	400.2 Feet
8 Inch FM Out I.E. (Typ. Of 2)	396.0 Feet
12 Inch FM Out I.E. (Typ. Of 2)	396.0 Feet
Overflow Alarm	394.50 Feet
27 Inch Inlet I.E.	389.08 Feet

PARAMETER	DESIGN VALUE
6” Inlet I.E.	TBD
High Water Level Alarm	389.0 Feet
Dry-weather Pump #1 On:	385.0 Feet
Dry-weather Pump #2 On:	386.0 Feet
Wet-weather Pump #1 On:	387.0 Feet
Wet-weather Pump #2 On:	388.0 Feet
Wet-weather Pump #3 On:	389.0 Feet
All Pumps Off:	382.0 Feet
Low Water Level Alarm:	381.5 Feet
Bottom of Wet well:	380.0 Feet
*	Two 20 HP Pumps Serve As A Redundant Backup For One 45 HP Pump

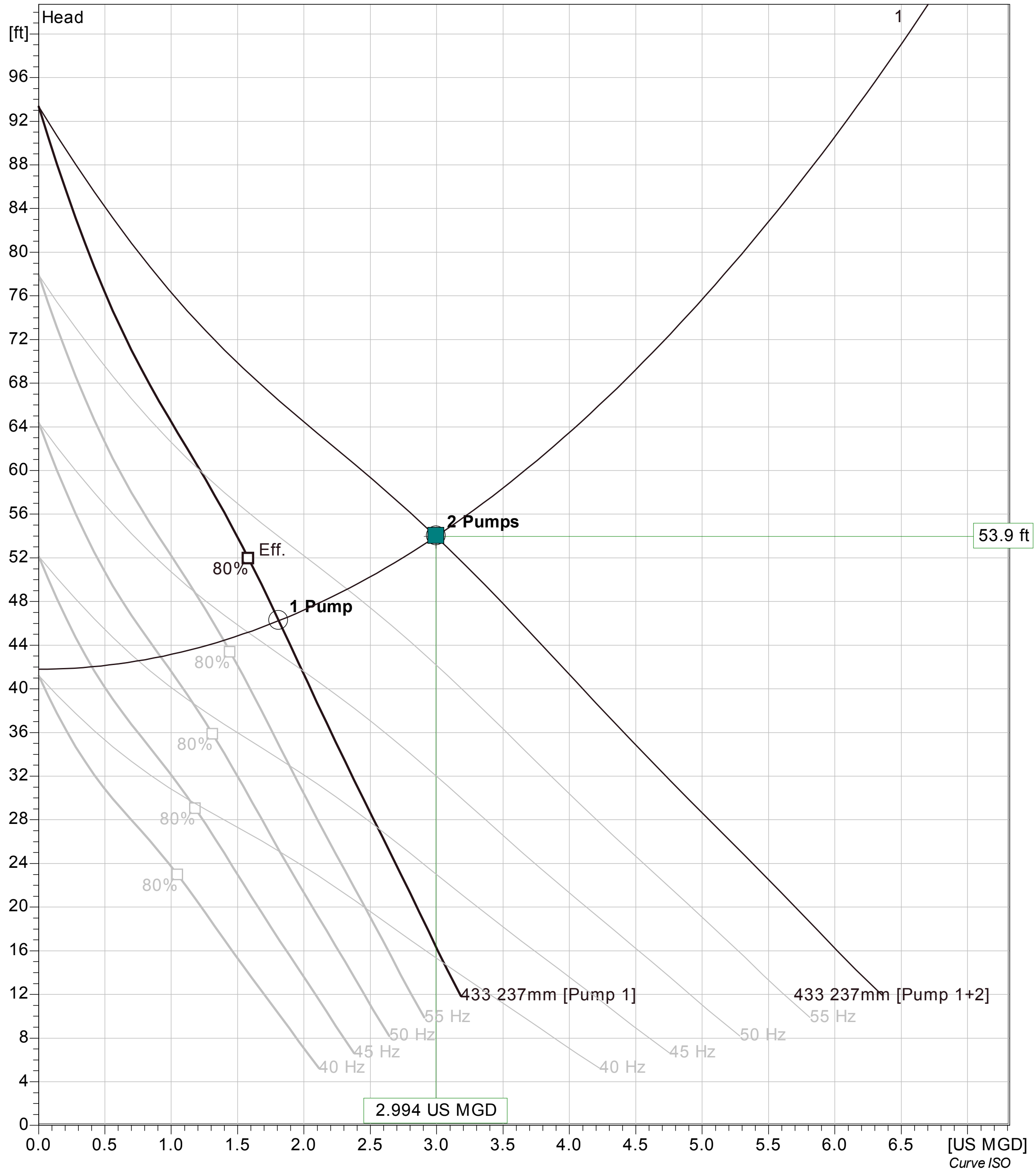
NP 3153 MT 3~ 433
VFD Curve



Project	Project ID	Created by	Created on	Last update
			2015-10-08	

NP 3153 MT 3~ 433

VFD Analysis

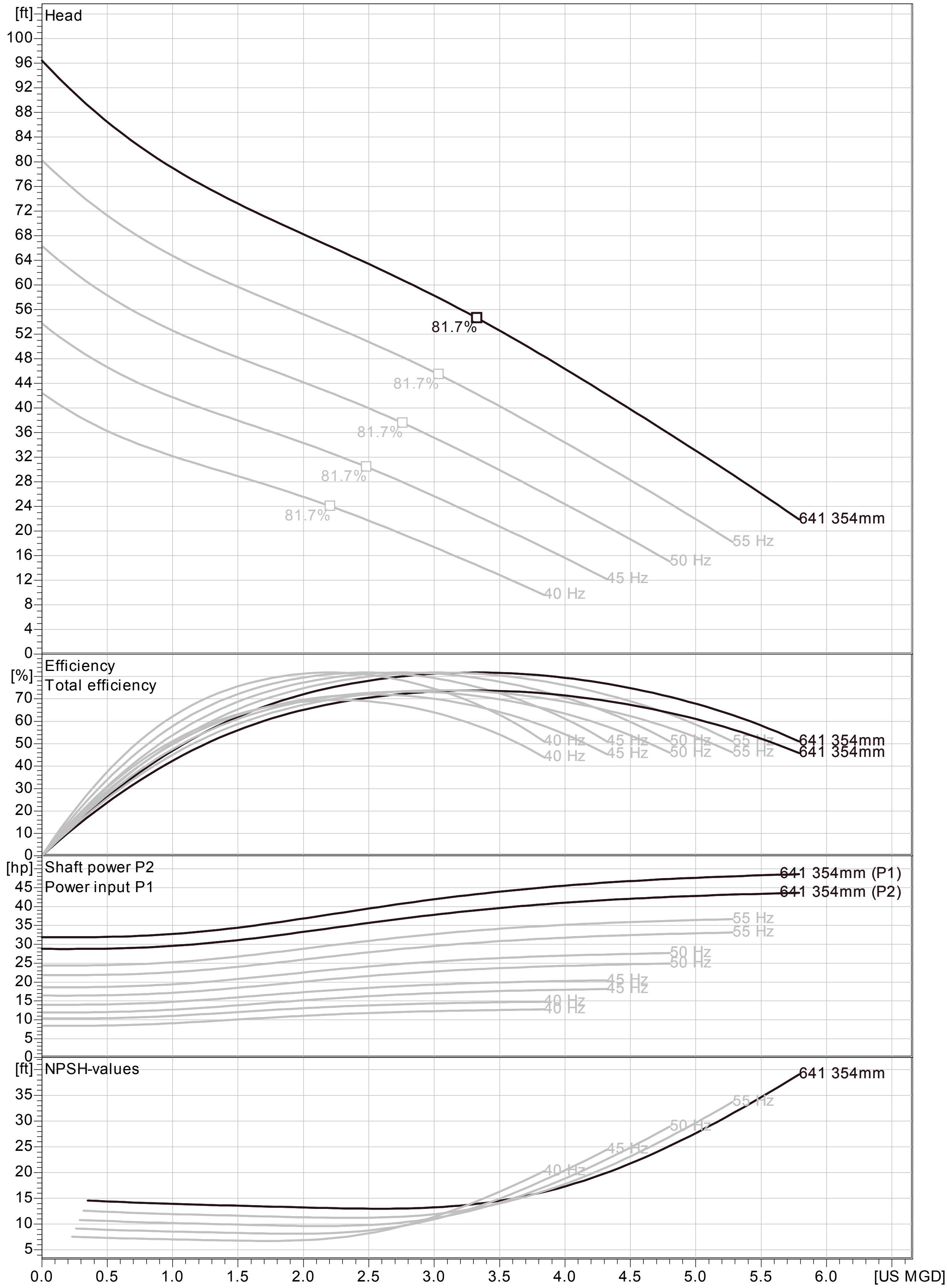


Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
2 / 1	60 Hz	1.5 US MGD	54 ft	17.8 hp	3 US MGD	54 ft	35.6 hp	79.8 %	240 kWh/US MG	22 ft
2 / 1	55 Hz	1.16 US MGD	49.1 ft	13 hp	2.33 US MGD	49.1 ft	26 hp	77.1 %	224 kWh/US MG	19.5 ft
2 / 1	50 Hz	0.789 US MGD	45.2 ft	9.2 hp	1.58 US MGD	45.2 ft	18.4 hp	68.1 %	235 kWh/US MG	17.5 ft
2 / 1	45 Hz	0.376 US MGD	42.6 ft	6.24 hp	0.753 US MGD	42.6 ft	12.5 hp	45.1 %	341 kWh/US MG	16 ft
2 / 1	40 Hz									
1 / 1	60 Hz	1.81 US MGD	46.2 ft	18.7 hp	1.81 US MGD	46.2 ft	18.7 hp	78.6 %	208 kWh/US MG	22.1 ft
1 / 1	55 Hz	1.39 US MGD	44.4 ft	13.6 hp	1.39 US MGD	44.4 ft	13.6 hp	79.9 %	196 kWh/US MG	19 ft
1 / 1	50 Hz	0.92 US MGD	42.9 ft	9.47 hp	0.92 US MGD	42.9 ft	9.47 hp	73.3 %	208 kWh/US MG	17.1 ft
1 / 1	45 Hz	0.403 US MGD	42 ft	6.27 hp	0.403 US MGD	42 ft	6.27 hp	47.4 %	321 kWh/US MG	15.8 ft
1 / 1	40 Hz									

Project	Project ID	Created by	Created on	Last update
			2015-10-08	

NP 3202 MT 3~ 641

VFD Curve



Curve ISO

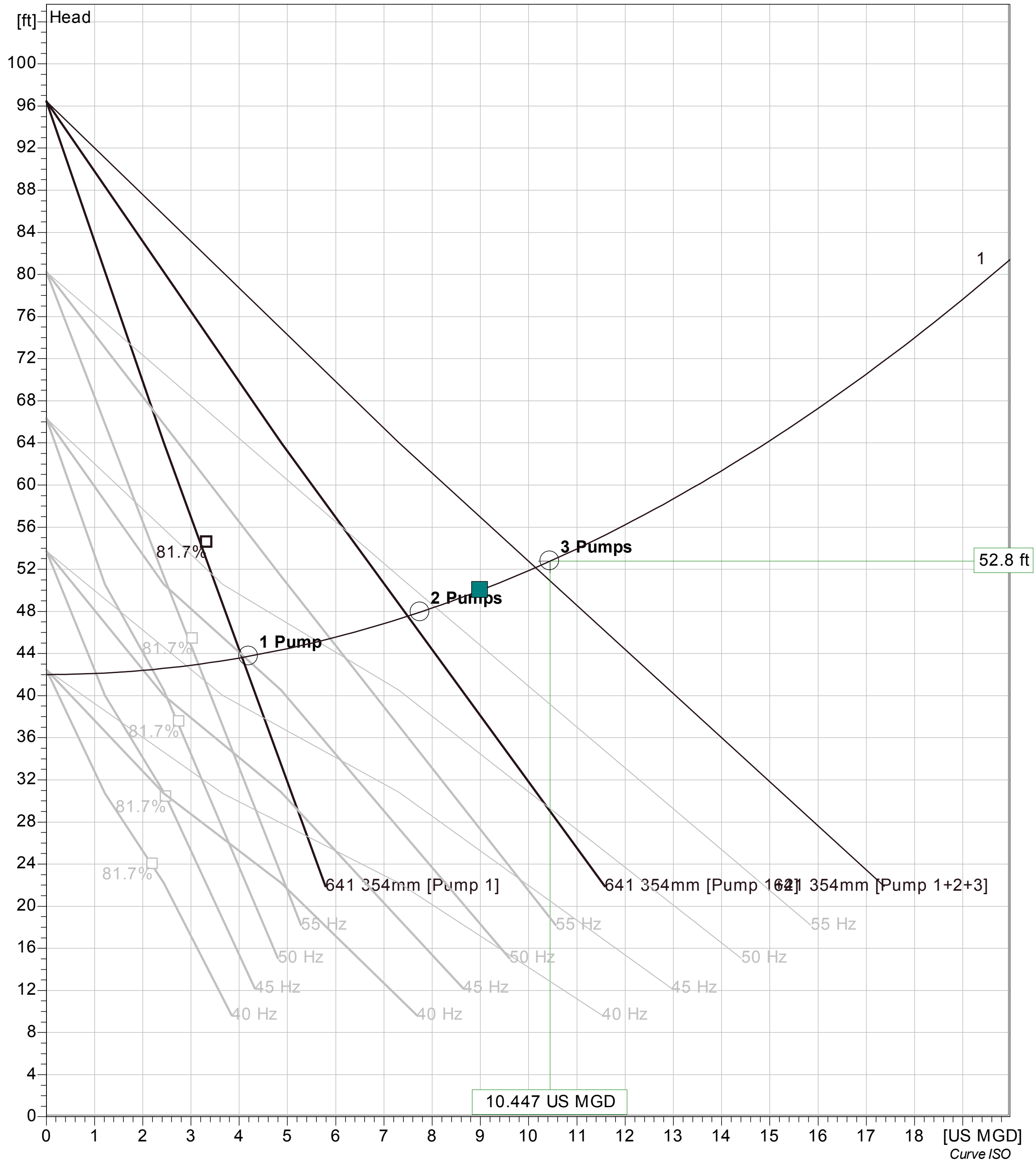
Project	Project ID	Created by	Created on	Last update
			2015-10-08	

xylem
Let's Solve Water

NP 3202 MT 3~ 641

VFD Analysis

FLYGT



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
3 / 1	60 Hz	3.48 US MGD	52.8 ft	39.6 hp	10.4 US MGD	52.8 ft	119 hp	81.6 %	226 kWh/US MG	14.5 ft
3 / 1	55 Hz	2.72 US MGD	48.6 ft	28.7 hp	8.17 US MGD	48.6 ft	86 hp	81.1 %	209 kWh/US MG	11.4 ft
3 / 1	50 Hz	1.88 US MGD	45.1 ft	19.7 hp	5.64 US MGD	45.1 ft	59.1 hp	75.7 %	210 kWh/US MG	9.7 ft
3 / 1	45 Hz	0.888 US MGD	42.7 ft	12.5 hp	2.66 US MGD	42.7 ft	37.5 hp	53.3 %	293 kWh/US MG	8.64 ft
3 / 1	40 Hz	0.0305 US MGD	42 ft	8.4 hp	0.0915 US MGD	42 ft	25.2 hp	2.7 %	6070 kWh/US MG	
2 / 1	60 Hz	3.88 US MGD	47.9 ft	40.7 hp	7.75 US MGD	47.9 ft	81.4 hp	80.2 %	208 kWh/US MG	16.5 ft
2 / 1	55 Hz	3.02 US MGD	45.6 ft	29.6 hp	6.04 US MGD	45.6 ft	59.2 hp	81.7 %	195 kWh/US MG	12 ft
2 / 1	50 Hz	2.06 US MGD	43.7 ft	20.3 hp	4.13 US MGD	43.7 ft	40.6 hp	78 %	199 kWh/US MG	9.65 ft
2 / 1	45 Hz	0.929 US MGD	42.3 ft	12.6 hp	1.86 US MGD	42.3 ft	25.1 hp	55 %	283 kWh/US MG	8.61 ft
2 / 1	40 Hz	0.0305 US MGD	42 ft	8.4 hp	0.0611 US MGD	42 ft	16.8 hp	2.7 %	6070 kWh/US MG	
1 / 1	60 Hz	4.2 US MGD	43.7 ft	41.5 hp	4.2 US MGD	43.7 ft	41.5 hp	77.8 %	196 kWh/US MG	18.9 ft
1 / 1	55 Hz	3.26 US MGD	43 ft	30.2 hp	3.26 US MGD	43 ft	30.2 hp	81.4 %	185 kWh/US MG	12.8 ft
1 / 1	50 Hz	2.21 US MGD	42.5 ft	20.8 hp	2.21 US MGD	42.5 ft	20.8 hp	79.4 %	191 kWh/US MG	9.64 ft
1 / 1	45 Hz	0.958 US MGD	42.1 ft	12.6 hp	0.958 US MGD	42.1 ft	12.6 hp	56.2 %	276 kWh/US MG	8.59 ft
1 / 1	40 Hz	0.0306 US MGD	42 ft	8.4 hp	0.0306 US MGD	42 ft	8.4 hp	2.7 %	6060 kWh/US MG	

Project	Project ID	Created by	Created on	Last update
			2015-10-08	

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.3
Subject:	Specific Process Area 800
	HEADWORKS GRIT / FLOW SPLITTING
Date:	Aug. 31, 2015
Prepared By:	Jamie Norrington, P.E.

PURPOSE AND SCOPE

The purpose of the elevated headworks is to provide additional pre-treatment of raw sewage that is pumped from the influent pump station and a means of flow splitting prior to the sequencing batch reactor. While the screening of the raw sewage occurs at a separate WWTP site location, grit removal will be conducted at the new elevated headworks to complete the pre-treatment process.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
5.4	Electrical	Describes electrical components associated with the process area.
5.5	Instrumentation	Describes instrumentation required for the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P800 for information specific to the influent grit removal system and the flow distribution portion of the headworks.

DESIGN CRITERIA

The design of the new headworks will meet the following general criteria:

1. The system will handle the plant’s future peak instantaneous flow (PIF) of 8.8 MGD.
2. The headworks will include a bypass channel within the elevated structure along with two stop gates to direct flows.
3. The grit system will include a grit chamber utilizing the vortex principle to remove grit and inorganics from the influent stream and a grit classifier to wash and dewater the removed material.
4. Incorporation of outdoor freeze protection.
5. Flow splitting will be accomplished by routing the flow, after grit removal, into a deep rectangular tank. The deep column of liquid will allow for quiescent conditions prior to discharging into four separate pipes near the bottom of the tank. These pipes will then convey the influent flow into one of the four pre-react zones of the SBR.
6. Flow measurement will be accomplished by employing magnetic flow meters on each pipe that feeds the SBR pre-reaction tanks.

Additionally, other design considerations include: clearance around the equipment, accessibility, and basin modifications.

SYSTEM DESCRIPTION

The new headworks will consist of an elevated structure that will receive the influent flow for grit removal and flow splitting and a lower structure that will house the grit classifier/washer and refuse container.

Elevated Headworks

The 10-inch and 18-inch diameter force mains, from the influent pump station, will discharge into a channel within the headworks at the south end of the structure. Screened sewage enters the channel and is directed into the vortex grit removal chamber where the majority of the heavier solids and inorganics settle out. The settled solids will periodically be pumped out to the grit classifier/washer based on the solids loading rate of the incoming screened sewage. The plant non-potable water system will be used to fluidize the solids in the grit chamber during the pumping sequence at a flowrate of 50 g.p.m. In the event of an overflow of the primary channel, the flow will overtop the stop gate at the bypass channel allowing for the influent flow to be directed into the flow splitting tank. A float switch will notify operations personnel of the overflow condition via an alarm.

Influent flow that passes through the grit removal system, or bypass channel, will then cascade into the flow splitting tank. At the bottom of the flow splitting tank, there are four 12-inch diameter pipes which will convey the flow into their respective SBR tanks. These four pipes will each utilize a magnetic flow meter and two manual plug valves. The purpose of the two valves is to provide additional flow throttling, if needed, and to isolate each magnetic meter for maintenance purposes. The flow splitting tank will have a drain line located at the bottom of the tank which will drain back to the influent pump station via an underground pipe.

A non-potable utility station will be located on the upper headworks.

Lower Headworks

The lower portion of the headworks is sheltered beneath the structure of the upper headworks. The lower headworks consists of a grit washer/classifier to support the function of the grit removal system. The grit washer/classifier will utilize the non-potable water system, at a flowrate of 20 g.p.m., for grit washing and compressed air, at a flowrate of 5 SCFH, for grit aeration. The wash water and overflow from the classifier will drain back to the influent pump station via an underground pipe. A non-potable utility station and air compressor will also be located at the lower headworks.

A. Grit Removal

1. A grit classifier is located in the lower headworks and receives pumped grit from the grit vortex chamber.
2. The pumped grit is introduced into the settling pool of the classifier where the grit particles settle out.
3. Air is introduced into a portion of the grit hopper to aid in organic separation for odor reduction.
4. The settled grit is washed and then dewatered as it is ascends the conveyor screw.
5. At the top of the conveyor screw, the settled grit is discharged through a chute that is positioned directly over a refuse receptacle.
6. Excess liquid from the settling pool is discharged through an underdrain and returned to the influent pump station via an underground pipe.
7. Grit that is deposited in the refuse receptacle in the lower headworks is accessible and available for disposal by the local sanitary hauler.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

A. Grit Removal

1. Normal grit pump operation will be controlled by a timer and will operate at regular timed intervals.
2. The fluidizer vanes will inject non-potable water into the grit chamber while the grit pump is in operation. The flow of non-potable water will be controlled by a solenoid valve to minimize water usage.
3. Aeration air will be supplied by a dedicated air compressor located near the classifier. The compressed air will also be controlled by a solenoid valve.
4. The grit classifier will also run while the grit pump is in operation and will continue to run for several minutes after the grit pump has discontinued pumping.
5. Unit control will be monitored and configured by a manufacturer supplied control panel.

DESIGN ISSUES YET TO BE RESOLVED

1. Structural components of the headworks construction
2. Non-potable water supply system

INSTRUMENT LIST

Process Area 800: Headworks				
1	FE/FIT		Magnetic Flowmeter	Flowrate to SBR pre-reaction zone # 1
2	FE/FIT		Magnetic Flowmeter	Flowrate to SBR pre-reaction zones # 2
3	FE/FIT		Magnetic Flowmeter	Flowrate to SBR pre-reaction zones # 3
4	FE/FIT		Magnetic Flowmeter	Flowrate to SBR pre-reaction zones # 4
5	LSH		Float	High level alarm in headworks channel

DESIGN DATA

PARAMETER	DESIGN VALUE
GRIT REMOVAL	
Type	Vortex Grit Concentrator
Number	One
Peak Flow	12.0 MGD
Grit Pump HP	TBD
GRIT CLASSIFIER	
Type	Shaftless Classifier
Number	One
Drive HP	0.5 HP
Incoming Flowrate	250 GPM @ 6-8 PSI
Pounds Per Hour	TBD
GRIT BASIN	
Volume	TBD

PARAMETER	DESIGN VALUE
FLOW SPLITTING TO SBR	
Type	Concrete Drop Box
Number	One
Outlet Pipe Quantity	Four
Outlet Pipe Size	12 Inch
Flow Range (Per Outlet Pipe)	0.45 MGD to 2.25 MGD
INFLUENT FLOW MEASUREMENT	
Type	Mag Meter
Number	Four
Size	12 Inch
Flow Range	0.45 MGD to 2.25 MGD

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.4
Subject:	Specific Process Area 900
	SEQUENCING BATCH REACTOR
Date:	October 12, 2015
Prepared By:	James Norrington, PE

PURPOSE AND SCOPE

The purpose of the sequencing batch reactor (SBR) is to aerobically stabilize incoming wastewater from the headworks and produce an environmentally safe effluent that will be discharged into Calapooya Creek in the wet months or stored for reuse in the dry months. The SBR must also provide a means for waste sludge removal. Included with the SBR are sufficient controls and equipment to allow for adjustment in process for changing influent wastewater characteristics.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.

3.1	Influent Screening	Describes screening of raw sewage prior to entering the Influent Pump Station
3.2	Influent Pump Station	Describes the Pump Station and Force Mains that convey the raw sewage to the Headworks
3.3	Headworks	Describes grit removal and flow splitting of raw sewage prior to entering the SBR
3.8	Biosolids Treatment	Describes the process area related to the stabilization of waste sludge generated from the SBR
3.9	Plant Site	Describes the relationship between the SBR and other plant site facilities
5.4	Electrical	Describes electrical components associated with the process area.
5.5	Instrumentation	Describes instrumentation required for the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11 x 17 drawing set that accompanies this report. Refer to drawing P900 for information specific to the sequencing batch reactor process area.

DESIGN CRITERIA

The new sequencing batch reactor will be designed to meet the following general criteria:

A. Provide capacity to treat a peak day flow of 7.00 million gallons per day (mgd) with 1.5 feet of freeboard per tank and storage for one hour during a peak instantaneous flow event of 8.80 mgd with 0.73 feet of freeboard per tank.

B. Receive pretreated wastewater from the headworks.

C. Have the flexibility to operate one to four tanks at a time.

D. Provide a means of overflow from all four tanks into the 24-inch effluent line.

E. Provide a means for decanting each tank independently to a level of 6.08 feet below storm high water level.

F. Provide a means of draining each tank independently.

G. Provide a means to transfer waste sludge between tanks or to the aerobic digesters.

H. Aeration System.

   1. Provide fine bubble diffusion to mix and aerate sludge.
   2. Provide submersible mixers for mixing when aeration system is off.
   3. Provide three rotary positive displacement blowers, two duty and one standby. Each duty blower serves two tanks.

I. Provide a sampling port for each tank at ground level.

J. Provide access to each tank from ground level.

K. Controls.

   1. Provide a programmable logic computer (PLC) based system for the automatic operation of equipment and process control. The PLC system shall allow for operator interface and have a centralized control center.
   2. Provide DO probes in each tank to optimize the output of the blowers.
   3. Provide means for manual operation of equipment.
   4. Provide magnetic flow meter for waste sludge pumped to aerobic digesters.
   5. Provide a TSS probe in each tank.
   6. Provide a pressure transducer in each tank to monitor liquid level and floats to activate the storm cycle.

Additionally, other design considerations include: clearance around the equipment, accessibility, lighting and placement of utility stations.

SYSTEM DESCRIPTION

General

The sequencing batch reactor (SBR) will be the main processor in the treatment system. Pretreated raw sewage from the headworks will be split equally between the tanks, under normal conditions or send all the flows to only one tank during low flow conditions or for maintenance purposes. Effluent from the tanks is collected by the variable level weirs and sent to the UV disinfection system year round and then to the chlorine contact chamber during dry weather months or to the irrigation tank during wet weather months.

The design has been based on the continuous feed type SBR. This type of SBR was selected due to the use of minimal equipment, increased flexibility, simplicity, ease of operation and successful performance in previous projects.

The following are the major components of the processing area and are further described below:

1. SBR Tanks
2. Decanters
3. Waste activated sludge (WAS) pumps
4. Submersible mixers.
5. Aeration system.
6. Control System

SBR Tanks

Each of the four concrete SBR basins will consist of a pre-react zone, baffle wall, main basin and common effluent box. Wastewater will enter near the top of the pre-react zone and will travel through the bottom of the baffle wall, horizontally through the main basin to the decanter that will then discharge to the common effluent box.

The common effluent box will have two 14-inch diameter wall spools which direct flow to the 24-inch effluent line. The effluent box will also act as an emergency overflow.

The tanks will also have a common drain line, with inline valves, which can be used to transfer liquid from one tank to the other three or to drain the tanks to the plant influent pump station.

Decanters

The decanters will consist of a thirty foot trough that will act as a traveling weir. A baffle in front of the trough will prohibit scum and floating material from entering the trough. Each trough will discharge to twelve pipes which will be connected to a single pipe that will discharge into the effluent box. Effluent withdrawal and entry into the decanter can be observed at all times.

The decanters will raise and lower based on signals from the control panel located within the new laboratory of the new control building. They can also be operated in a manual mode. The drive motor will sit on top of the walkway. The decanters will rest or park below the wall so that they can also act as an emergency overflow.

Waste Activated Sludge Pumps

Each SBR basin will have a 2.5 hp submersible solids handling WAS pump adjacent to the decanter which will convey sludge to the new aerobic digesters. Each pump will be on a rail system to allow for removal of the pump without having to empty the basin.

The discharge piping will allow the WAS to be pumped to any of aerobic digester cells. The line between the SBR and aerobic digesters will have a 3-inch magnetic flow meter that will record the flows. The flow sensor will be located next to the combined effluent box of basins 3 & 4 and the flow indicator will be located in the main instrument panel in the electrical room.

The on-off operation of the pumps will be controlled via signals from the SBR control panel located in the electrical room of the new control building. There will be a remote switch at the walkway for manual control of the pumps.

Submersible Mixers

Each basin will be equipped with two three horsepower submersible mixers. The mixers will be located on opposite ends of the basin to allow for a race track type flow pattern. The mixers will operate during the aeration cycle when the diffuser system is off. Each mixer will be on a rail system to allow for removal without having to empty the basin.

The on-off operation of the mixers will be controlled via signals from the SBR control panel located in the electrical room of the new control building.

Aeration System

Each basin will have an air diffuser system running along the center of the tank. A fixed air header with laterals anchored to the bottom of the tank with a total of 594 fine bubbler disc diffusers per basin will supply the required oxygen.

An automatic butterfly valve, at each basin, will control the on-off operation of the air. The valves will receive signals from the SBR control panel. The supply pipe for each basin will connect to one of two common air headers that originate at the blower room of the new control building.

Three seventy-five horsepower positive displacement blowers will be used to supply the required air. One blower is dedicated to two basins with the third blower on standby. Each blower will have a variable frequency drive which will match air production to oxygen demand. The blowers will be equipped with check valves, isolation valves, pressure relief valves and temperature sensors and power failure alarms. The SBR control panel, located in the electrical room of the new control building, will control the on-off operation of the blowers. A normally open air flow switch will be installed in each air piping header. If the blowers are called to run and the SBR panel does not receive indication of air flow from the switch, then an alarm will be activated and the blower will be turned off.

SBR Control Panel

The SBR panel will contain a PLC programmable controller. Process adjustments will be made with the HMI panel on the face of the control panel or from the SCADA computer located in the office of the new control building. A modem will provide direct communication with the manufacturer, who will retrieve data and reprogram the controller as required.

The front panel of the controller will have the following indicators:

Decanters:	Raising, lowering and alarm
Air Valves:	Opening, closing and alarm
Waste Activated Sludge Pumps:	Running and alarm
Blowers:	Running and alarm
Treatment Step:	Aeration, settling and decant
Cycle Indicator:	Normal and storm

The controller upon entering an alarm condition will send a signal to the automatic dialer system.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

SBR

The SBR will allow for continuous flow into the basin without hydraulic short-circuiting during decant. That is, wastewater will flow continuously into the pre-react zone and will be directed downward through the openings at the bottom of the baffle wall into the sludge blanket at the bottom of the main basin. The sludge blanket will absorb BOD during clarification and decant. Because of hydraulic forces, the incoming flow will move upward at a very slow rate and will prevent short circuiting during decant.

The pre-react zone will also provide pre-treatment of the wastewater before it enters the main basin. The pre-react zone will contain a high amount of BOD in a small volume which will create a high food to microorganism ratio (F:M). The high ratio will encourage the maximum bio-absorption of food by the microorganisms. In effect, the pre-react zone will act as an organic selector. This organic selection process will help inhibit the filamentous growth that causes sludge bulking.

The SBR process will have three distinct cycles aeration, settling and decant as follows:

Aeration - Air is supplied to the basin and used by the microorganisms to consume the organics.

Settle - Solids-liquid separation occurs. The solids settle to the bottom of the basin leaving the upper water level clear.

Decant - The decanter lowers into the basin and skims off the top liquid level. Sludge wasting occurs during the decant phase.

The normal cycle will be four hours: aeration two-hours, settling one-hour, decant one hour. During storm flows, the cycle will be three hours: aeration 1.5 hours, settling 45 minutes, and decant 45 minutes. A high water level float, which will be located next to the decanter in each basin, will sense the raising water level. If this switch is activated, a signal will be sent to the controller to automatically decrease the cycle duration from the 4 to 3 hour cycle. The shorter cycle will last for one complete rotation or until the flows decrease. The cycles between the basins is illustrated in the table at the end of this process section and is titled “SBR Cycles.”

The above times can be changed to suit particular treatment needs. Changes will be made either manually at the operator interface panel on the control cabinet or by the manufacturer using the modem connection.

Waste activated sludge will be pumped to the aerobic digesters during the decant phase. Waste sludge flow will be measured by means of a three-inch magnetic flow meter on the common waste line from the SBR. The digital indicator will be located in the SBR control panel in the electrical room.

Decanters

The decanter drive will allow the decanter to descend in pulses which will lower the decanter between 0.1 and 0.5 inches at a time. The normal decanter travel time from the top water level to bottom level will be 60 minutes. Because of the variability in plant influent flow rate, the high water level reached may differ from cycle to cycle. Prior to the starting of the decant cycle, if the water level does not reach the top water level, the decanter will be programmed to discharge the inflow for that cycle over the full 60 minute decant cycle. During such an event, the vertical travel speed of the decanter will exceed the stated values while travelling from the top water level, or parked position, down to the actual liquid level.

The decanter control will cause the decanter weir to lower in a manner which results in constant flow. The decanter will have a top and bottom vertical limit differential of 6.9 feet that will be set by two pairs of limit switches for regular and back-up control. The normal top and bottom vertical limit is 6.1 feet. The higher vertical limit is to accommodate storm flow storage. Adjustment of the limit switches will have a corresponding affect on the vertical travel length of the weir.

The rate at which the decanter will raise and lower will be adjusted at the SBR controller. Limit switches will be manually adjusted to change the vertical limits.

A high-level float switch located in each SBR basin will override the decanter control system, activating the storm cycle.

Waste Activated Sludge Pumps

Controls for the pumps will be located in the SBR control panel in the new electrical room. Local-off-auto switches will be provided on the panel. Each pump will also have a remote hand-off-auto switch at the SBR. The run time of the pumps will depend on the mixed liquor concentration in the basin. Times will be adjusted at the SBR control panel.

Submersible Mixers

Controls for the mixers will be located in the SBR control panel in the electrical room. Local-off-auto switches will be provided on the panel. The run time on the mixers will depend on the length of time the diffused air system is off during the aeration cycle. Times will be adjusted at the SBR control panel.

Aeration System

Each basin will have a fixed header non-clog fine bubble diffuser system. Air control will be provided by automatic butterfly control valves. The SBR control panel will control these valves. Only one valve per two basins will be open at a time and at no time will both valves be closed while the blower is on.

The blowers with variable frequency drives will operate based on the set point for dissolved oxygen (DO). Each basin will have a dissolved oxygen meter continually monitoring the level of dissolved oxygen in the mixed liquor. The SBR control panel will receive signals from the DO meters and send signals to the drives.

SBR Control Panel

The SBR control panel will allow the timed sequences of the SBR process to be changed based on changing wastewater characteristics.

Power Failure

If the primary power source is interrupted, the emergency power system will be activated. The entire SBR process will remain operational for the full duration of power loss. An uninterruptable power source (UPS) will be provided to allow for uninterrupted power to the primary control panel during the switching of power sources.

DESIGN ISSUES YET TO BE RESOLVED

- Structural components of the SBR basins.
- Operator-SBR controller interface.
- Mixer size.
- Location of SBR control panel within the electrical room.
- SCADA System

INSTRUMENT LIST

Process Area 900 [Sequencing Batch Reactor]				
SBR Unit No. 1				
1	OE/OIT		DO Meter	Process Control in Anoxic Zone
2	LSH		Float	Storm Cycle Float
3	FE/FIT		Magnetic Flow Meter (One meter for all four basins)	Totalized WAS Flow
4	PI		Pressure Gauge	Discharge pressure on WAS Pump
5	LI		Staff Gauge	Indicates SBR Volume
6	TSS		TSS Probe	Indicates Level Of Total Suspended Solids
7	LET		Level Transmitter	Indicates Level Of Fluid
SBR Unit No. 2				
1	OE/OIT		DO Meter	Process Control in Anoxic Zone
2	LSH		Float	Storm Cycle Float
3	FE/FIT		Magnetic Flow Meter (One meter for all four basins)	Totalized WAS Flow
4	PI		Pressure Gauge	Discharge pressure on WAS Pump
5	LI		Staff Gauge	Indicates SBR Volume
6	TSS		TSS Probe	Indicates Level Of Total Suspended Solids
7	LET		Level Transmitter	Indicates Level Of Fluid
SBR Unit No. 3				
1	OE/OIT		DO Meter	Process Control in Anoxic Zone
2	LSH		Float	Storm Cycle Float
3	FE/FIT		Magnetic Flow Meter (One meter for all four basins)	Totalized WAS Flow
4	PI		Pressure Gauge	Discharge pressure on WAS Pump
5	LI		Staff Gauge	Indicates SBR Volume
6	TSS		TSS Probe	Indicates Level Of Total Suspended Solids
7	LET		Level Transmitter	Indicates Level Of Fluid

SBR Unit No. 4				
1	OE/OIT		DO Meter	Process Control in Anoxic Zone
2	LSH		Float	Storm Cycle Float
3	FE/FIT		Magnetic Flow Meter (One meter for all four basins)	Totalized WAS Flow
4	PI		Pressure Gauge	Discharge pressure on WAS Pump
5	LI		Staff Gauge	Indicates SBR Volume
6	TSS		TSS Probe	Indicates Level Of Total Suspended Solids
7	LET		Level Transmitter	Indicates Level Of Fluid

Aeration Blowers				
1	TIT		Temperature Transmitter	Temperature of Blower No.1
2	TIT		Pressure Transmitter	Temperature of Blower No.2
3	TIT		Temperature Transmitter	Temperature of Blower No. 3
4	PIT		Pressure Transmitter	Discharge pressure on header for basins 1 & 2
5	PIT		Pressure Transmitter	Discharge pressure on header for basins 3 & 4
6	FS		Flow Switch	Aeration Air Flow of header for basins 1 & 2
7	FS		Flow Switch	Aeration Air Flow of header for basins 3 & 4

DESIGN DATA

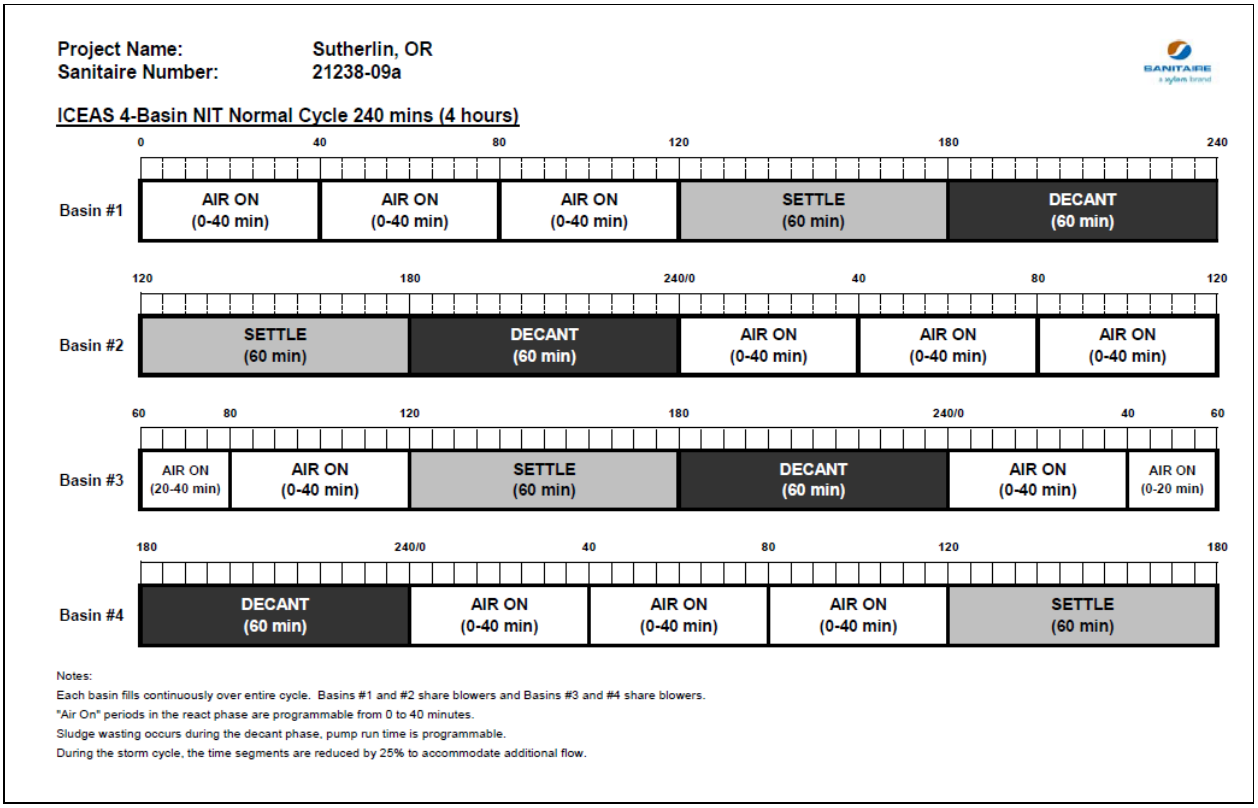
Process Area 900: Sequencing Batch Reactor

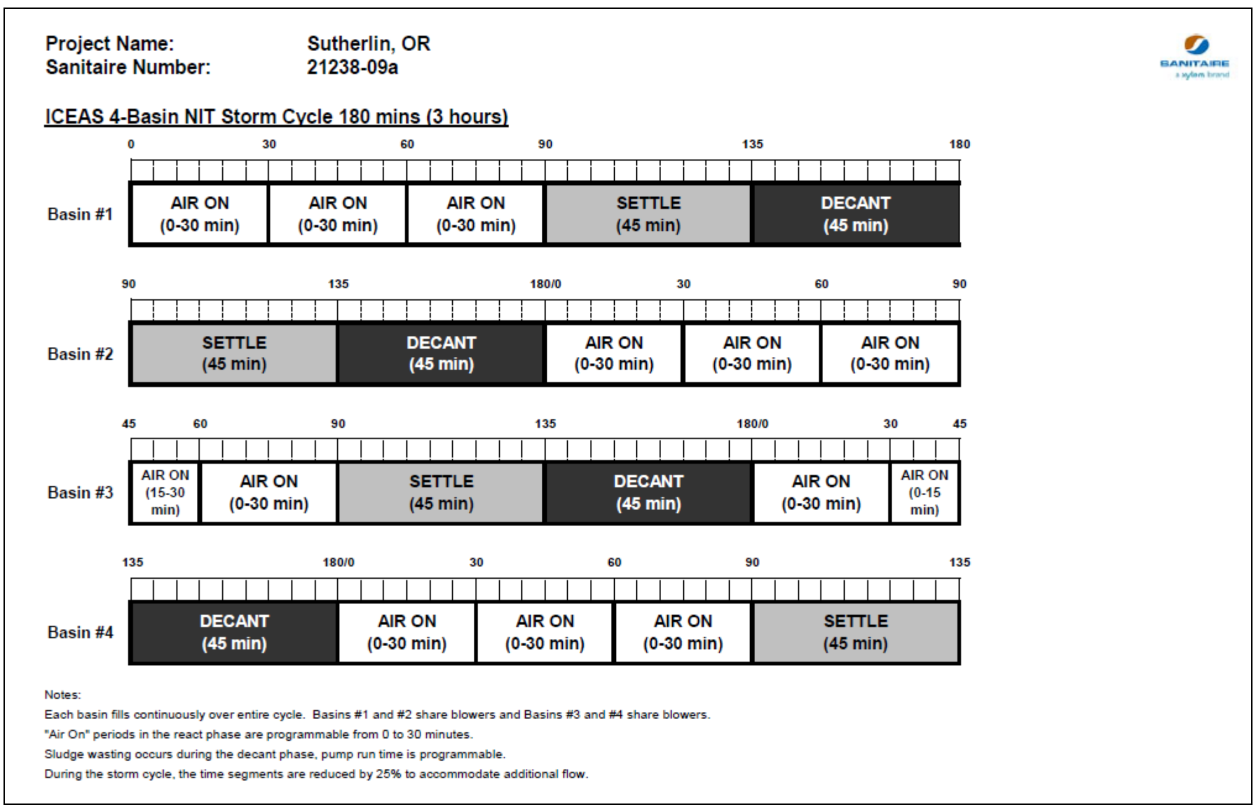
Parameter	Design Value
Influent Quality/Effluent Quality	
BOD, mg/l	214/<10
TSS, mg/l	211<10
Ammonia, mg/l	21<7.8
SBR Basins	
Number	4
Length, feet, each	83.0
Width, feet, each	38.0
Storm High Water Level, feet	18.8
High Water Level, feet	18.0
Low Water Level, feet	11.9
Volume, gallons, each	443,587
Treatment Capacity, MGD, each	2.2
Process Performance @ MMWWF	
F/M, lb BOD/lb MLSS/day	0.046
Sludge Volume Index, mg/l	150
Waste Sludge Produced, lbs/day	3,222
Normal Decant Rate, gpm	3,646
Sludge Age, days	24.9
Aeration System	
Type	Rotary Positive Displacement
Number	3
Horsepower	75
Capacity, scfm @ 8.0 psi	900
Diffusers	594 Fine Bubble Disc per Basin
Mixers	
Type	Submersible
Number, per basin	2
Horsepower	3

DESIGN DATA (continued)

Process Area 900: Sequencing Batch Reactor	
Parameter	**Design Value**
Decanters	
Type	Variable Level
Length, feet per basin	30.0
Normal Decant Rate, gpm	3,646
Peak Decant Rate, gpm	4,861
Waste Sludge Pumps	
Type	Non-clog Centrifugal Submersible
Number	4
Horsepower	2.4
Capacity, gpm	110
WAS Flow Meter	
Type	3-inch Magnetic Flow Sensor
Number	1
Capacity, gpm	0-100, 300 max

SBR CYCLES


Project Name: Sutherlin, OR
Sanitaire Number: 21238-09a
SANITAIRE
a xylem brand
ICEAS 4-Basin NIT Normal Cycle 240 mins (4 hours)
0 40 80 120 180 240
Basin #1
AIR ON (0-40 min)
AIR ON (0-40 min)
AIR ON (0-40 min)
SETTLE (60 min)
DECANT (60 min)
120 180 240/0 40 80 120
Basin #2
SETTLE (60 min)
DECANT (60 min)
AIR ON (0-40 min)
AIR ON (0-40 min)
AIR ON (0-40 min)
60 80 120 180 240/0 40 60
Basin #3
AIR ON (20-40 min)
AIR ON (0-40 min)
SETTLE (60 min)
DECANT (60 min)
AIR ON (0-40 min)
AIR ON (0-20 min)
180 240/0 40 80 120 180
Basin #4
DECANT (60 min)
AIR ON (0-40 min)
AIR ON (0-40 min)
AIR ON (0-40 min)
SETTLE (60 min)
Notes:
Each basin fills continuously over entire cycle. Basins #1 and #2 share blowers and Basins #3 and #4 share blowers.
"Air On" periods in the react phase are programmable from 0 to 40 minutes.
Sludge wasting occurs during the decant phase, pump run time is programmable.
During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.


Project Name: Sutherlin, OR
Sanitaire Number: 21238-09a
SANITAIRE
a xylem brand
ICEAS 4-Basin NIT Storm Cycle 180 mins (3 hours)
0 30 60 90 135 180
Basin #1
AIR ON (0-30 min)
AIR ON (0-30 min)
AIR ON (0-30 min)
SETTLE (45 min)
DECANT (45 min)
90 135 180/0 30 60 90
Basin #2
SETTLE (45 min)
DECANT (45 min)
AIR ON (0-30 min)
AIR ON (0-30 min)
AIR ON (0-30 min)
45 60 90 135 180/0 30 45
Basin #3
AIR ON (15-30 min)
AIR ON (0-30 min)
SETTLE (45 min)
DECANT (45 min)
AIR ON (0-30 min)
AIR ON (0-15 min)
135 180/0 30 60 90 135
Basin #4
DECANT (45 min)
AIR ON (0-30 min)
AIR ON (0-30 min)
AIR ON (0-30 min)
SETTLE (45 min)
Notes:
Each basin fills continuously over entire cycle. Basins #1 and #2 share blowers and Basins #3 and #4 share blowers.
"Air On" periods in the react phase are programmable from 0 to 30 minutes.
Sludge wasting occurs during the decant phase, pump run time is programmable.
During the storm cycle, the time segments are reduced by 25% to accommodate additional flow.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.5
Subject:	Specific Process Area 1000
	TERTIARY TREATMENT
Date:	Nov. 3, 2015
Prepared By:	James Norrington, P.E.

PURPOSE

The purpose of the tertiary filters is to act in conjunction with the UV disinfection system and the sodium hypochlorite disinfection system in order to meet Class A effluent requirements. Class A certified effluent is needed for land application during the summer months, because treated effluent is not allowed to be discharged into Calapooya Creek, which is the permitted discharge point for wet weather discharge.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.4	Sequencing Batch Reactors	Description of the sequencing batch reactors
3.6	Disinfection	Description of the effluent disinfection
5.4	Electrical	Description of electrical components associated with the process area.
5.5	Instrumentation	Description of instrumentation required for the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P1000 for information specific to the disinfection system.

BACKGROUND

Discharge from the Sutherlin WWTP is regulated under an NPDES permit. In order to protect aquatic life, the permit prohibits the discharge of waste that violates water quality standards. In addition, Calapooya Creek is located in the Umpqua Basin, which is water quality limited for several parameters, including temperature (summers), pH (summers), fecal coliform (year-round), ammonia (year-round) and phosphorus (summers). No discharge to waters of the state is allowed between June 1st and October 31st. Calapooya Creek effluent discharge is allowed from November 1st through May 31st. Discharge in May is allowed only when Calapooya Creek flow is over 82 cfs.

During Calapooya Creek low flow periods, effluent is irrigated on approximately 95 acres of the Umpqua Golf & RV resort golf course, located approximately ¾ of a mile east of the WWTP. At the WWTP, effluent is currently disinfected with chlorine gas and then is held in an irrigation tank in Treatment Unit 2. Treated effluent flows directly from the chlorine contact chamber to the irrigation chamber and then is pumped through an 18-inch diameter force main to a holding pond at the golf course.

Due to safety concerns and the cost associated with chlorine gas, the City is currently working towards installing a sodium hypochlorite injection system to treat summertime flows. This system will be online prior to the improvements contained herein.

The NPDES permit requires the effluent to be treated to a minimum level Class B – prior to land application. Rules require that when Class A effluent is spray irrigated, there must be a minimum of 10 feet from the site to the property line. However, the golf course (irrigation site) has a bordering residential community and, therefore, effluent must be treated to level Class A prior to spray irrigation if the irrigation system is not modified. The City also purchased the Ford's Pond property to store excess effluent that cannot be applied to the golf course. Class A will provide greater benefits for recreational use of this area.

In conjunction with UV disinfection and sodium hypochlorite disinfection, a tertiary treatment system is needed to meet Class A effluent requirements.

DESIGN CRITERIA

The design of the new tertiary treatment system will meet the following general criteria:

1. The tertiary treatment system will need to treat the MMDWF of 1.80 MGD.
2. The tertiary treatment system must produce an effluent with less than 5 mg/l TSS for no more than 72 minutes and never over 10mg/l and less than 2 NTU, with the turbidity needing to be recorded hourly.
3. The tertiary treatment system must consist of two units for system redundancy, with one unit having the ability to meet the flow and treatment requirements as stated above.
4. Provide bypass piping around the disc filter units in the event of a plug downstream.
5. Provide a drain line for backwash water and overflow water that will drain back to the Plant Pump Station.
6. Filter media will consist of stainless steel with opening sizes down to 10 microns.
7. The tertiary treatment system will come equipped with a filter level sensor so that the system can automatically initiate a backwash cycle.
8. Provide access to each treatment unit.
9. Filter must be certified to meet California's Title 22 requirements.
10. Each filter will have a dedicated turbidimeter.

SYSTEM DESCRIPTION

The effluent from the SBR flows into the filter units, by gravity, into the center drum. Solids are separated from the water by the stainless steel filter media mounted on the two sides of the discs, which are partially submerged. With this arrangement, the solids are retained within the filter discs while only the clean water flows into a pipe which leads to the UV disinfection system. This allows for effective removal of large solids and floatable material. Maintenance is reduced since there is no accumulation of solids inside of the equipment. During normal operations, the disc remains static until the water level in the inlet channels rise to a specific point, which then automatically initiates the backwash cycle. The filtered effluent provides a perfect source of backwash water, eliminating the need for a separate source of cleaning water or an additional clean water collection tank. Clean water is pumped to the backwash spray header and nozzles, washing solids into the collection trough as the disc rotates. The filter will produce a filtrate with < 5 mg/l TSS and < 2 NTU.

Effluent Flow to the Tertiary Filter System

A 24-inch effluent pipe will convey the secondary effluent from the SBR to the 14-inch inlet pipes that are connected to the tertiary treatment system units during summer months. The tertiary treatment system will be bypassed during the winter months. The bypass system must be initiated manually.

Effluent Discharge

Tertiary effluent will flow into the UV disinfection system via a 24-inch underground pipe.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

A. Secondary Effluent Flow to Tertiary Treatment System

1. Flow will be regulated to the Tertiary Treatment System by adjusting the SBR decant rate through the SBR control panel.
2. An 18-inch flow meter just upstream from the UV disinfection system will relay flow information back to the SBR control panel to verify decant rate.

B. Tertiary Treatment System Controls

1. The Tertiary Treatment System has a System Control Center (SCC), a microprocessor based panel for monitoring and control.
2. The filter level control sensor will send a signal to the SCC. The SCC will initiate the backwash cycle if necessary.

3. The filter level control sensor will send a signal to the SCC which will initiate an alarm in the event that a high level condition or an overflow condition occurs.

DESIGN ISSUES YET TO BE RESOLVED

- Type of slab to be used with equipment (slab-on-grade vs. elevated slab)
- Structural components of the slab to be used
- Placement of Tertiary Treatment System control panel
- Turbidimeter Monitoring Point

DESIGN DATA

Process Area 1000: Tertiary Treatment

Parameter	Design Value
Type	Rotating Disc Filter
Maximum Flow:	1.80 MGD per unit
Number of filters	2
Number of wheels per filter	2
Area per wheel	47.1 sq. ft.
Total area per filter	94.3 sq.ft.
Loading rate at peak, 2 filters	6.63 gpm/sq. ft.
Filter Drive	2.0 HP
Wash Water Pump	5.0 HP
Instantaneous Wash Water Demand	22.0 gpm per unit
Wash water pressure	65 psi max.
Total Reject Backwash Wash Water	0.5 – 1.0 %
Maximum Head Requirement	26.4 inches
Filter Performance Characteristics with 10 mg/l TSS influent	Less than 5 mg/l TSS Less than 2.0 NTU

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.6
Subject:	Specific Process Area 1100
	DISINFECTION
Date:	Nov. 3, 2015
Prepared By:	James Norrington, P.E.

PURPOSE

The purpose of the disinfection system is to disinfect the treated effluent to a standard that meets the Clean Water Act and the limits set forth in the NPDES permit prior to discharge to Calapooya Creek.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.7	Effluent Disposal/Reuse	Description of effluent disposal after the disinfection system.
5.1	Sampling & Metering	Description of effluent metering & sampling.
5.4	Electrical	Description of electrical components associated with the process area.
5.5	Instrumentation	Description of instrumentation required for the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P1100 for information specific to the disinfection system area.

BACKGROUND

Discharge from the Sutherlin WWTP is regulated under an NPDES permit. In order to protect aquatic life, the permit prohibits the discharge of waste that violates water quality standards. In addition, Calapooya Creek is located in the Umpqua Basin, which is water quality limited for several parameters, including temperature (summers), pH (summers), fecal coliform (year-round), ammonia (year-round) and phosphorus (summers). No discharge to waters of the state is allowed between June 1st and October 31st. Calapooya Creek effluent discharge is allowed from November 1st through May 31st . Discharge in May is allowed only when Calapooya Creek flow is over 82 cfs.

During Calapooya Creek low flow periods, effluent is irrigated on approximately 95 acres of the Umpqua Golf & RV Resort golf course, located approximately ¾ of a mile east of the WWTP. At the WWTP, effluent is currently disinfected with chlorine gas and then is held in an irrigation tank in Treatment Unit 2. Treated effluent flows directly from the chlorine contact chamber to the irrigation holding chamber and then is pumped through an 18-inch diameter force main to a holding pond at the golf course.

Due to safety concerns and the cost associated with chlorine gas, the City is currently working towards installing a sodium hypochlorite injection system to treat summertime flows. This system will be online prior to the improvements contained herein.

Since wintertime flows need to be disinfected and that chlorine residual is not allowed in Calapooya Creek because it is within the Umpqua River Basin, an ultraviolet light disinfection system is the most appropriate technology to achieve the disinfection goals. The UV disinfection system will be designed to operate at all times, ensuring that all plant effluent is disinfected regardless of its final destination.

DESIGN CRITERIA

The design of the new disinfection system will meet the following general criteria:

1. The disinfected effluent will have no chlorine residual.
2. The UV system will have a minimum of two banks of UV lights.
3. The system will treat the sequencing batch reactor (SBRs) peak decant rate (7.00 MGD) during a storm mode of operation. Minimum UV dosing at peak decant rates shall be 30 mJ/cm2.
4. With a ultraviolet (UV) bank out of service, the system will handle the SBR's normal decant rate of 3,646 gpm with a UV dose of 30 mJ/cm2 or higher.
5. For Class "A" Effluent (June 1st through October 31$^{st)}$; the treated effluent will have a total coliform (organism) count of less than 2.2 organisms per 100 mL 7-day median, with no sample higher than 23 organisms per 100 mL. One sample taken per day.
6. For permitted effluent (November 1st through May 31st); the treated effluent will have an *E. coli* bacteria count of less than 126 organisms per 100 ml mean average, with no sample higher than 406 organisms per 100 ml.
7. The system shall disinfect with ultraviolet lamps.
8. The system shall be flow paced to reduce energy use when the peak flow is below the design maximum, while still meeting the permit criteria.
9. The system shall have an automatic cleaning function to reduce manual handling of the lamps and tubes.
10. The treated effluent will have an E. coli bacteria count of less than 126 organisms per 100 ml mean average, with no sample higher than 406 organisms per 100 ml.

SYSTEM DESCRIPTION

The disinfection system receives aerobically treated, clarified effluent from the biological treatment units. The disinfection system will deactivate the microorganisms in the treated effluent to prevent the spread of pathogens. The disinfected effluent will then go to either the chlorine contact chamber during dry weather flows or directly into the irrigation basin during wet weather flows.

During dry weather flows, secondary effluent flows from the SBR units through the tertiary filters to the UV disinfection units via a 24-inch pipe. From the UV units, the finished effluent will be directed to the existing chlorine contact basin via a 12-inch pipe, where the effluent will be chlorinated prior to being sent to the irrigation tank.

During wet weather flows, secondary effluent from the SBR units will flow directly to the UV disinfection system via the same 24-inch pipe and the disinfected effluent from the UV unit will be directed to the irrigation tank through an additional 24-inch pipe.

An 18-inch underground pipe with manual valves will provide a means to bypass the disinfection unit for major repair issues.

Effluent Flow to the UV System

An 18-inch effluent flow meter, located prior to the UV unit, will measure the flows to the UV system.

Disinfection System

The new disinfection system will consist of a fully enclosed stainless steel reactor with non-contact UV lamps in a horizontal configuration. Access to the lamps will be through access doors on top of the reactor. The effluent flow meter will be located underground just upstream of the UV system. The UV control panel will be located in the electrical room of the new control building.

Effluent to be treated passes through horizontal fluoropolymer plastic tubes. Banks of UV lamps surround these tubes such that each tube is exposed to the UV light from all sides. UV reflecting alloys form the outer casing and reflect light back into the wastewater stream. Two banks are installed in series within a single reactor, with each bank capable of treating 3.5 MGD or one half of the PDAF event. The UV lamps are a low pressure, high intensity non-amalgam type which generates a UV light wavelength of 254 nm.

Compared to traditional UV systems with quartz sleeves, maintenance of the non-contact UV lamps is minimal with no special tools or cleaning solutions needed which greatly reduces downtime.

The lamps are cooled by an air to water heat exchanger. The non-potable water system will supply the heat exchanger water at a rate of 25-gpm.

An ultrasonic level transducer is used to determine the liquid level within a tank that is mounted between the inlet flange and the reactor. This liquid level is then used to calculate the flowrate of the secondary effluent or tertiary effluent entering the reactor. The UV light intensity is then adjusted to the current flowrate greatly reducing energy consumption while achieving required microorganism deactivation.

Effluent Discharge

Disinfected final effluent will flow either into the existing chlorine contact basin or the existing irrigation basin depending on the time of the year and the flowrate in Calapooya Creek.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

A. Secondary/Tertiary Effluent Flow to UV Reactor

1. An 18-inch secondary/tertiary effluent magnetic flow meter will be installed upstream of the UV reactor to record the secondary effluent flow.
2. A UV system integrated level transducer will be utilized to calculate flow into the reactor.

B. UV System Parameters

1. The UV system has a System Control Center (SCC), a microprocessor based panel for monitoring and control.
2. The level transducer will send a signal to the SCC. The SCC will dim the lamps or turn off one bank to maintain UV output energy proportional to the flow.

3. UV intensity monitors will be installed for each bank of lamps.
4. The SCC will send alarms to the SCADA system for the following conditions: Low Water Level, Lamp Out, Ballast Out, Low UV Intensity, and Module Communication Failure.

DESIGN ISSUES YET TO BE RESOLVED

- Magnetic Flow Meter Selection
- Structural components of the slab-on-grade
- Structural components of the cover over the UV system
- SCADA System

INSTRUMENT LIST

Process Area 1100: Disinfection System				
1	LET		Level Transmitter	Reactor tank water level used by UV Equipment
2	FET/FIT		Magnetic Flow Meter	Totalized flow to the UV System

DESIGN DATA

Process Area 1100: Disinfection	
Parameter	Design Value
UV Disinfection System	
Type	Horizontal
Maximum Flow:	7.00 MGD
UV Dosage	30,000 $\mu Ws/cm^2$
7uuuAssumed UV Transmittance @ 254 nm	65%
Level Control	Ultrasonic Level Control
Number of Banks:	2
Lamps per Bank:	84 (168 total)
Number of UV Intensity Meters	2
Maximum Power Requirement	26.2 kW
Lamp Control	Flow Paced Dimming & Bank Shut Off
Cleaning System	Non-Contact Bulbs
Electrical	480V 3 phase, 28.6 Total kVA
Lamps	
Type	Low Pressure High Output
Length	61-inches
Number:	168
Ballasts	
Type	Electronic
Number	168
Mounting Location	On top of lamp rack
Lamps Per Ballast	1
Reactor	
Type	Stainless Steel
Width	60-inches
Length	17.5-feet
Depth	53-inches
Alarms	Low Water Level

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.7
Subject:	Specific Process Area 1200
	EFFLUENT DISPOSAL/REUSE
Date:	September 17, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE

The purpose of the effluent disposal system is to convey and discharge the treated final effluent in a manner that meets the Clean Water Act and the limits set forth in the City's NPDES permit.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.5	Disinfection	Description of the effluent disinfection
5.1	Sampling & Metering	Description of effluent metering & sampling.
5.4	Electrical	Description of electrical components associated with the process area.
5.5	Instrumentation	Description of instrumentation required for the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P1200 for information specific to the effluent disposal system area.

BACKGROUND

Discharge from the Sutherlin WWTP is regulated under an NPDES permit. In order to protect aquatic life, the permit prohibits the discharge of waste that violates water quality standards. In addition, Calapooya Creek is located in the Umpqua Basin, which is water quality limited for several parameters, including temperature (summers), pH (summers), fecal coliform (year-round), ammonia (year-round) and phosphorus (summers). No discharge to waters of the state is allowed between June 1st and October 31st. Calapooya Creek effluent discharge is allowed from November 1st through May 31st. Discharge in May is allowed only when Calapooya Creek flow is over 82 cfs.

The effluent is conveyed to Calapooya Creek in a 27-inch diameter steel cylinder concrete pipe (CCP). The outfall pipe is approximately 3,200 feet long and flows from the irrigation tank in Treatment Unit No. 2 (at surface elevation 400.50 feet and overflow at 402.50) to the pipe outfall with a pipe invert elevation of approximately 374.50 feet. Creek water elevation may be as high as 395.60 feet. During high creek conditions and water surface elevation at maximum levels within the irrigation basin, the capacity of the outfall exceeds peak daily flow.

During Calapooya Creek low flow periods, effluent is irrigated on approximately 95 acres of the Umpqua Golf & RV Resort Golf Course, located approximately ¾ of a mile east of the WWTP. At the WWTP, effluent is disinfected with chlorine gas and then is held in an irrigation tank in Treatment Unit 2. Treated effluent flows directly from the chlorine contact chamber to the irrigation holding chamber and then is pumped through an 18-inch diameter force main to a holding pond at the golf course. Note that the existing sand filter is non-functional and has been bypassed. The storage capacity of the golf course pond is not adequate in size for the amount of recycled water available. When the golf course ponds are full the irrigation pumps turn off and all excess effluent discharges directly to Calapooya Creek. This is an obvious violation of their NPDES permit.

There are three irrigation pumps used to pump to the golf course. The smallest pump has a rated capacity of 450 gpm; the two larger pumps have a capacity of 1,200 gpm. With the largest pump out of service, the irrigation pumping system has a capacity of 1,650 gpm (2.4 MGD). On/off operation of the irrigation pumps in controlled by level floats in the golf course ponds. A radio telemetry system sends the signal to the wastewater treatment plant from the golf course pond.

The NPDES permit requires the effluent to be treated to a minimum level Class B – prior to land application. Rules require that when Level II effluent is spray irrigated, there must be a minimum of ten feet from the site to the property line. However, the golf course (irrigation site) has a bordering residential community and, therefore, effluent must be treated to level Class A prior to spray irrigation if the irrigation system is not modified.

DESIGN CRITERIA

The design of the new effluent disposal system will meet the following general criteria:

1. The system will handle the plant's peak daily average flow ($PDAF_5$) of 7.0 MGD.
2. The system will eliminate dry weather discharges to Calapooya Creek.
3. Discharge amounts and parameters shall be within the limits of the NPDES permit for the facility.
4. Automatic valves will direct flow to either the golf course or Ford's Pond.
5. Maintain gravity outfall to Calapooya Creek.
6. Provide flow metering to each discharge point.
7. Redundancy will be provided for irrigation pump systems.
8. Provide a recycle water tanker filling station.
9. Provide recycle water connection for future reuse site.

SYSTEM DESCRIPTION

During dry weather flows, secondary effluent flows from the SBR units through the tertiary filters to the UV disinfection units. From the UV units, the finished effluent will be directed the existing chlorine contact basin, where the effluent will be chlorinated prior to being sent to the irrigation tank. Flow in the chlorine contact chambered will be reversed from its existing flow direction in order to utilize the existing 24” line connecting the chlorine contact to the irrigation basin. The water surface in the chlorine contact chamber will be increased by approximately three feet to allow flow to the irrigation chamber via gravity.

During wet weather flows, secondary effluent from the SBR units will flow directly to the UV disinfection system and the finished effluent from the UV units will be directed to the irrigation tank. From the irrigation tank, effluent will gravity flow to the existing discharge point on Calapooya Creek, via the existing 27 inch diameter effluent line.

Disinfection

The proposed primary disinfection to be incorporated as part of the wastewater system improvements is a non-contact UV disinfection system. The UV system will have built in redundancy and be used year round. In addition to the UV system, summer flows that are discharged to the golf course and Ford’s Pond will be treated with 12.5% sodium hypochlorite. A sodium hypochlorite system, being designed for installation in the fall of 2015, will feed sodium hypochlorite to the existing chlorination basin in order to provide Class A treatment and provide better water quality for storage. During summer months, excess Class A recycled water will be stored in an open reservoir, Ford’s Pond. Open storage reservoirs are subject to poor water quality created by algae growth (clogs sprinklers), breeding of vectors, slimes, aesthetically displeasing deposits and odors. Chlorine improves a storage reservoir’s water quality. Since a storage reservoir is required, it is recommended that the sodium hypochlorite system currently being planned be incorporated into the wastewater system upgrades if not constructed prior to the proposed improvements. This system will only be used during dry weather flows.

Irrigation Basin

All finished effluent will be directed to and stored in the existing 150,000 gallon irrigation tank located in Treatment Unit No.2. Treated effluent will flow from the UV disinfection unit during wet weather flow months or the chlorination chamber during dry weather flow months. Finished effluent stored in the irrigation basin will be pumped through the existing 18-inch diameter force main to the holding pond at the golf course or Ford's Pond during the dry weather months or discharged to Calapooya creek via the existing 27" gravity sewer line during the wet weather months. The three existing vertical turbine irrigation pumps will be removed and replaced with pumps of the same capacity. The smallest pump has a rated capacity of 450 gpm; the largest pumps have a capacity of 1,200 gpm.

Effluent

Wet weather gravity effluent to Calapooya Creek will be maintained and discharged per the NPDES permit. Depending on final site layout, the existing 27" effluent line will need to be protected with concrete encasement if it runs under any new structures.

Dry weather pumped effluent will be directed to the golf course holding pond, Ford's Pond or a new re-use tanker truck filling station at the wastewater treatment plant. The storage capacity of the golf course pond is not adequately sized for the amount of recycled water available. Therefore, excess water will be directed to Ford's Pond. A new connection will be made on the existing 18" force main running from the wastewater treatment plant and the golf course. The connection will be made on the south side of Highway 138, at SW Church Road. A new 18" line will be run west from the connection point towards Stearns Lane, where it will turn south up an existing driveway to Ford's Pond. The new connection will include an automatic valve that will be operated based on the water level in the golf course holding pond. When the pond is full, the valve on the line to the golf course will close and the valve on the line to Ford's Pond will open. As demand at the golf course lowers the water level, the valves will operate to direct flow back to the golf course. During winter months, when the City is permitted to discharge to Calapooya Creek, discharge over an existing outlet weir structure at Ford Pond will be exercised to lower water levels to allow for effluent storage during the next dry weather cycle.

Reuse Filling Station

A new re-use tanker truck filling station will be included as part of the wastewater treatment plant improvements. A fill port, fed by a new non-potable water pump system, will be installed. Using the fill port, the City will have the ability to sell reuse water to third parties as need arises.

Effluent Sampling

A new effluent sampler will be installed to collect samples directly from the irrigation basin. The sampler will be a refrigerated composite sampler, installed adjacent to the irrigation basin, in the new UV housing structure. The sampler will be connected to the main instrument panel to flow pace sample collection with effluent flow. The sampler has the capability to sample into 24 discreet bottles in the event that the operator desires to perform time-of-day dependent diagnostics on the effluent treatment system. Sampling intervals will be determined by a new NPDES permit issued for the facility.

Farm Irrigation

An existing 18” force main from the effluent pump station to the north property line, where it is capped, was installed as part of the original wastewater treatment plant construction. While this line is not in use as this time, negotiations are ongoing at the time of this report with regards to sending finished effluent to the neighboring property using the 18” force main.

INSTRUMENTATION, CONTROLS, AND MEASUREMENT

A. Irrigation Basin Reuse Pumps
   1. Level monitoring for the irrigation pumps will be by a pressure transducer mounted in the bottom of the irrigation basin.
   2. The pump control panel will energize the pumps at set points as follows:
      a. Set Point 1: Lead pump on
      b. Set Point 2: First lag pump on
      c. Set Point 3: Second lag pump on
      d. Set Point 4: All pumps off

3. The lead, first lag and second lag pumps will rotate in sequence after each cycle.
4. Each pump will have a plug valve and check valve in-line after the pump.
5. There will be a common air/vacuum release valve located on the common pump header.
6. Alarm set points will include Low Water Alarm, High Water Alarm, and Overflow Alarm.

B. Golf Course/Ford's Pond Valving

1. Automatic, motorized valves will be installed at the force main split between the golf course and Ford's Pond.
2. The existing golf course radio telemetry system will control the operations of the valves.
3. Alarm set points for the golf course holding pond will include Low Water Alarm, High Water Alarm, and Overflow Alarm.

C. Calapooya Creek Discharge

1. Flows to Calapooya Creek will be measured by the flow meter upstream of the UV system.
2. Water depth in the irrigation basin will be monitored by the pressure transducer used for the reuse pumps.
3. Alarm set points will include High Water Alarm and Overflow Alarm.
4. Flows in Calapooya Creek will continue to be monitored weekly using Oregon Water Resources Department's online Near Real Time Hydrographic Data, which provides mean daily and instantaneous flow for the creek.

DESIGN ISSUES YET TO BE RESOLVED

- NPDES permit review.
- Motorized valve selection.
- Telemetry system for Ford's Pond.
- Effluent to neighboring farm.
- Existing 27" effluent line encasement.
- Reuse line location to Ford's Pond review with Oregon Department of Transportation.

INSTRUMENT LIST

Process Area 1200: Effluent Disposal System				
1	FE/FIT		Magnetic Flow Meter @ UV System	Totalized and instantaneous Flow to Chlorine Contact Chamber/Irrigation Chamber
2	FE/FIT		Magnetic Flow Meter	Effluent flow – Irrigation Pumps
3	LET		Ultrasonic Liquid Level Transmitter	Irrigation tank level, pump control and overflow alarm
4	LSH		Float	Irrigation tank high water level
5	LSL		Float	Irrigation tank low water level
6	LET		Ultrasonic Liquid Level Transmitter	Golf Course pond level, valve control and overflow alarm
7	LSL		Float	Golf Course low water level
8	LSH		Float	Golf Course high water level

DESIGN DATA

Process Area 1200: Effluent Disposal	
Parameter	Design Value
Total Flows	
$PDAF_5$:	7.00 MGD
MMWWF	2.70 MGD
MMDWF	1.80 MGD
Outfall to Calapooya Creek	
Size	27 Inch
Length	3,200 Feet
Metering	Magnetic flow meter
Discharge Point	Near Rochester Bridge
Disinfection	UV to meet NPDES permit
Maximum Flow	7.0 MGD
Creek Flow Monitoring	Oregon Water Resources Department Near Real Time Hydrographic Data Website Station 14320700
Minimum Creek Flow for Discharge	82 CFS

Irrigation Tank Pumps	
Station/Pump Type:	Triplex Vertical Turbine/Variable Speed
Pump Capacity, each:	Pumps #1 & #2 – 1,200 gpm Pump #3 – 450 gpm
Pump HP, each:	Pumps #1 & #2 - 50 HP Pump #3 – 20 HP
Level Control Type:	Pressure Transducer with Floats for backup
Overflow Discharge Point:	Metered discharge line to Calapooya Creek
Auxiliary Power Type:	Stand by diesel generator
Alarm Telemetry:	SCADA
FORCE MAIN	
Number:	1
Length:	6,500 feet to Golf Course 1,200 feet to Ford’s Pond
Size & Type:	18-inch Ductile Iron
Profile:	Ascending
Existing Discharge:	Golf Course Holding Pond
Proposed Additional Discharge:	Ford’s Pond
Average Detention Times:	NA
Sulfide Control:	NA
ELEVATIONS	
Irrigation tank surface elevation:	400.5 feet
Irrigation tank outlet invert:	393.0 feet
Irrigation tank overflow:	402.5 feet
Calapooya outfall invert:	374.5 feet
Ford’s Pond surface elevation:	409.0 feet
Golf Course Pond surface elevation:	470.0 feet

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.8
Subject:	Specific Process Area 1300
	BIOSOLIDS TREATMENT
Date:	August 29, 2015
Prepared By:	Ryan Quigley, PE

PURPOSE AND SCOPE

The objectives of the biosolids treatment process area are the following:

1. Provide adequate aerobic digester space and air to process the waste sludge from the activated sludge process to a Class B biosolid.
2. Provide the ability to transfer biosolids within the various digester tanks.
3. Thicken stabilizing biosolids by automatic decanting.
4. Provide a means of removing biosolids for disposal.
5. Provide a means of dewatering biosolids.

In general, the project will convert the existing donut plant as follows; convert the existing contact tanks, stabilization tanks, and clarifiers in the donut treatment units to aerobic digesters, rehabilitate the existing aerobic digesters, and convert the existing RAS sumps into biosolids transfer basins. Maintain the existing chlorine contact basin and irrigation tank for continued use. Add new blowers for aeration and a screw press for biosolids dewatering to reduce handling costs.

The scope of the process area is new biosolids treatment improvements at the existing plant site. The components in the process area include the following:

1. Aerobic digesters/biosolids holding tanks
2. Biosolids transfer pumps and metering
3. Blowers and fine bubble diffusers
4. New exposed, buried and submerged air piping
5. Biosolids screw press
6. Instrumentation and controls

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that relate to this section:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation of biosolids storage area in relation to other components of the project
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid stream.
2.6	Solids Treatment	Development of the biosolids volume that is generated at the treatment plant
4.1	Filter Building	Description of modifications to the existing filter building
4.2	Operations Building	Description of modifications to the existing operations building

PROCESS SCHMATICS AND PLANS

A graphic description of the process may be found in the 11” x 17” drawing set that accompanies this report. Please refer to the P1300 series drawings included in the process section.

DESIGN CRITERIA

The biosolids handling system will be designed to meet the following general criteria:

1. Aerobic Digesters/Biosolids Holding Tanks
    a. Provide adequate tank volume to allow 60 days residence time for the projected biosolids loading for the year 2037.
    b. Provide the ability to sequentially fill digesters without pumping.

c. Provide adequate air distribution to accomplish mixing and aerobic digestion to a stabilized sludge within the design residence time.

d. Provide the ability to decant supernatent after settling from any digester.

e. Provide the ability to discharge WAS from the SBRs to any of the digester basin.

f. Provide the ability to transfer biosolids from any basin to another.

g. Provide a staff gauge for each basin.

h. Provide a dissolved oxygen probe for each basin.

i. Provide a pressure transducer for each basin.

j. Provide motorized telescoping valves for each basin.

k. Provide slide gates for each basin.

2. Biosolids Transfer Basins

a. Provide two biosolids transfer basins using the existing RAS pump sumps.

b. Have the ability to receive biosolids in the biosolids transfer basin from any digester within the same donut structure.

c. Have the ability to transfer biosolids to any of the digesters, in either donut structure, or to a tanker truck, via one of two biosolids pumps.

d. Have the ability to transfer biosolids to the biosolids dewatering unit via one of two rotary lobe pumps.

e. Have a discharge pump capacity that will transfer biosolids from any digester basin at 300 gpm.

f. Provide magnetic flow meters on all pumping systems.

3. Biosolids Dewatering

a. Provide a screw press for dewatering 2% stabilized biosolids at a design rate of 55 gpm, with the ability to dewater stabilized biosolids from 0.75% to 4% solids at a maximum rate of 147 gpm and a minimum rate of 27 gpm.

   b. Have the ability to store and distribute the solids into the bed of a standard ten-yard capacity spreader truck for disposal or covered storage area.
   c. Have the ability to capture pressate and wash water for return to the liquid stream.
   d. Provide a covered solids storage area.

4. Aeration Blowers
   a. Provide adequate air to meet the needs of the digesters and to prevent odors.
   b. Provide two blower systems; one to handle the six (6) outer digesters and a second to handle the two (2) inner digesters.
   c. Provide a redundant blower for each blower system.
   d. Provide interconnecting piping so that each blower system can serve any digesters within its system.
   e. Be able to take any one blower out of service and be able to operate and provide adequate air to the biosolids using another blower within that system.
   f. Provide energy efficient motors with variable frequency drives.
   g. Replace mud valves on all digesters drain lines to the existing wet well.
   h. Provide dissolved oxygen probes for cells #2 and #4 in each unit.

5. Controls
   a. Provide manual or level based automatic control for operation of biosolids transfer pumps.
   b. Provide manual or level based automatic control for operation of dewatering screw press feed pumps.
   c. Provide manual control of decant system.
   d. Provide a low level pump shut off for the biosolids transfer pumps.
   e. Provide dissolved oxygen loop control to regulate air supply to digesters.

SYSTEM DESCRIPTION

Digesters

The existing donut plant treatment units will be converted to a configuration of four digester cells each. The existing basin walls will be kept, with minor modifications to provide openings for biosolids transfer within the cells. The sump in the center tanks, originally the clarifiers, will be filled to allow for air diffusor installation.

A 3” waste activated sludge (WAS) line will be installed from the SBRs to supply WAS to each of the eight digester basins. The 3” ductile iron line will be buried adjacent to the structures, with feed lines for the outer units running up and over the exterior walls. The inner unit will be served by a line run over the outer wall and affixed to the wall separating Digesters No. 1 and No. 2.

Staff gauges will be added to each basin for calculating biosolids volume. Telescoping valves with motorized actuators will be added to each of the eight digester cells to allow for decanting supernatant. Decanters will be connected to a drain header that will direct supernatant to the influent pump station. The header will be a buried pipeline, installed adjacent to the digesters.

Under normal operation the basins will be aerated. The air piping serving the existing center clarifier basins will be kept and utilized. Three 20 Hp blowers will be installed in the existing blower room and be connected to the existing 6” air piping. New 6” drop down air pipes, into the center basins will be installed. New fine bubble diffusers will be installed at the bottom of the basin. Three 50 Hp blowers will be installed in the new control building and will serve the outer digesters. New 6” header piping with 6” drop down legs will be installed from the new blower room to each outer basin. The existing sock diffusers and mechanical mixers will be removed and new fine bubble diffusers will be installed in each of the outer basins.

The digester cells will be set to operate sequentially, although the operator may choose to operate the cells individually. Waste sludge from the SBR will be deposited in the center digester cell during the wasting cycle of the SBR process, via a 3" WAS line. The WAS line will have an outlet into each basin so that the operator has the ability to utilize any basin. When the cell is full, part of the mixed biosolids will overflow through stop gates set into the top of the basin wall into Cell No. 2. This process continues with the overflow of biosolids continuing sequentially to Cell No. 3 and then to Cell No. 4.

Periodically the operator will turn the air off to all and allow for settlement. After the solids have settled, the telescoping valve will automatically be lowered to allow the liquid supernatent to drain back to the influent pump station. The rate of the valve lowers will be set by the operator. The air will then be turned back on. Biosolids in Cell No. 4 will reach a point where minimal settling occurs when the air is turned off. The biosolids will then be gravity fed to the biosolids transfer station and pumped to the dewatering screw press or tanker truck loading station.

Biosolids Transfer Basin

The existing return activated sludge (RAS) basin in both of the existing donut structures will be converted to a biosolids transfer basin. Slide gates and piping in the bottom of each basin will be installed to allow gravity flow of biosolids from that cell to the biosolids transfer basin in that donut structure. Two transfer pumps in each biosolids transfer basin will pump to a buried biosolids header, installed adjacent to the existing structures. Lateral piping from the header will go to each digester cell and the tanker truck loading station. Either biosolids transfer basin will be able to pump to any of the eight digester basins. The transfer pump will be sized to empty a digester cell at rate of 300 gpm and the variable speed dewatering pump will be sized for the feed rate of the dewatering press.

To operate the biosolids transfer basin, the operator will select which digester will be emptied and open the plug valve on the interconnecting piping. All valves will be closed. The valve on the header corresponding to the basin to receive the biosolids will be opened.

The transfer pump will be switched to auto position on the control panel, to be located in the existing operations building. When the operator has transferred the desired amount of biosolids the pump will be manually turned off.

A low level float switch in the transfer basin will turn off the pump if fluid levels drop below minimum liquid levels.

In addition to the two submersible pumps in each biosolids transfer basin, the basin will be equipped with rotary lobe pumps. The rotary lobe pumps will be used to pump biosolids to the dewatering screw press. Dewatering operation will be identical to the transfer operations. The operator will select which digester will be emptied and the plug valve on the interconnecting piping. The rotary lobe pumps will be equipped with VFDs and the operator will be able to control the pump speed and on/off status at the control panel in the operations building or at the dewatering screw press to meet the required feed rate for the dewatering screw press.

Chlorine Contact & Irrigation Holding Chambers

The existing chlorine contact and irrigation holding chambers will be maintained and used to treat and dispose of reuse water. The existing chlorine contact chamber will be used to chlorinate reuse water prior to the irrigation holding chamber. Flow in the contact chambered will be reversed in order to utilize the existing 24” line connecting the two chambers. After flowing through the contact chamber, reuse water will enter the 24” line and flow to the irrigation chamber via gravity. An existing section of the clarifier wall will be filed to prevent the potential of short circuiting of biosolids. The existing pumps in the irrigation holding chamber will be used to pump reuse water to the golf course, Ford’s Pond and a new reuse filling station. Note that the chlorine contact chamber will not be used during wet weather flow months.

Blowers/Fine Bubble Diffusers

Three new 50 hp blowers and three new 20 hp blowers with VFD controls will be installed. Each group of blowers will have two duty blowers and one standby blower. The 20 hp blowers will be designated for use in the inner digester zones and the 50 hp blowers for use with the outer ring digesters.

The 20 hp blowers will be installed in the existing blower room and be connected to the existing 6” blower line. New 6” drop down legs will be installed and the existing drop legs removed and plugged. Access modifications will be made to the existing full wall louvers for removal of the existing blowers, installation of the new blowers, and future maintenance access. The 50 hp blowers will be housed in the new control building, to be constructed to the north of the existing donut units. A new 6” main blower line with 6” drop legs to each of the outer basins will be installed.

A preliminary layout of the fine bubble diffusers for the existing tanks is included at the end of this section.

Biosolids Dewatering

The biosolids dewatering system is provided to reduce the disposal costs of the finished biosolids product. The dewatering system consists of a polymer injection system, a screw press with a screw conveyor. The dewatering equipment will be housed in the existing filter building. The control center for the dewatering equipment will be housed within the same building. The existing filter unit will be removed from the filter building and the floor will be raised approximately six feet to elevation 402.00 feet, prior to installation.

To operate the biosolids dewatering equipment, the operator will fill the biosolids transfer basin as described above. The dewatering screw press feed pump will feed biosolids to the screw press with the polymer solution injected into the biosolids line. The resulting cake will be delivered to a new holding area to the north of and adjacent to the existing filter building or to a spreader truck for land application. A new concrete slab and a roof system will be constructed for the holding area. Pressate from the unit and wash water will be collected in drains under the press and gravity flow to the existing influent pump station wet well where it will be pumped to the new influent pump station.

Based on an average waste biosolids production of 1,572,768 gallons/year from 2009-2014, they City will have to operate the screw press approximately 700 hours per year.

Disposal

The City currently applies the treated biosolids from the digesters for soil enhancement on agricultural land. The City utilizes a 3,200-gallon truck which spreads the biosolids directly on four sites: the Reddekopp site (80 acres), the Rust site (80 acres), the Williams site (80 acres) and the Crouch site (35 acres). In addition, during wet weather months, biosolids are hauled to a private facility (Heard Farm).

The City will have several options for biosolids disposal when the new plant is completed and biosolids dewatering is available; continue land application of treated biosolids, land application of dewatered biosolids, the disposal of dewatered biosolids using the local sanitary service to haul away, or the City can haul to dewatered biosolids to a Douglas County landfill or Heard Farm.

INSTRUMENTATION, CONTROLS, AND MEASUREMENTS

A. The biosolids transfer pumps will have a common control panel that contains starters, motor protection, meters, and operators. Controls are as follows:

   HAND/OFF/AUTO switch at the control panel will control the process. In HAND, the selected pump will operate continuously. In OFF the pumps will not run. AUTO will shut the pumping cycle off when signaled by a full level in the receiving basin, a low transfer basin level or low flow.

B. The pumps will be controlled by a pressure transducer and floats.

C. The pump header will have a pressure gauge.

D. Each pump system will have a magnetic flow meter to record biosolids being transferred.

E. Valves for selecting the destination for the biosolids will be manually operated.

F. The digester basins will have a high level float that will send an alarm and will shut off the pump transferring into that basin.

G. A staff gauge level indicator mounted in each basin will measure depth of biosolids in the tank for calculating volume.

H. The blowers in each system will have a common control panel that contains starters, motor protection, meters, and operators. The blowers will be rotary positive and have variable speed drives. HAND/OFF/AUTO switches at the control panel will control the blowers. In HAND, the blowers will operate continuously but the operator will be able to manually adjust the speed of the blowers to match air requirements. In OFF the blowers will not run. AUTOMATIC will operate under the protection of pressure and temperature sensors. A common alarm will be provided. Dissolved oxygen probes in cells #2 and #4 in each unit will provide signals to the blowers to adjust blower speed to meet the air requirements in the basins.

I. Telescoping valves will be installed in each basin to work as decanters. When the operator is ready to decant a basin, the valve will be manually adjusted to decant to the desired liquid level. Supernatant will gravity flow to the influent pump station. The staff gauge in the digesters tank will indicate decant volume.

J. The dewatering screw press control panel will contain starters, motor protection, meters, and operators. Controls are as follows:

   1. HAND/OFF/AUTO switch at the control panel will control the process. In HAND, the press will operate continuously. In OFF the press will not run. In AUTO the press will run continuously unless signaled by other biosolids dewatering controls to shut off.

   2. A liquid polymer feed unit will blend bulk polymer with non-potable water from the plants non-potable water system. The solution will be introduced to the digested biosolids stream upstream from the flocculation tank supplied

with the screw press. The feed unit will be interconnected with the biosolids dewatering control panel.

K. The biosolids dewatering screw press feed pumps will have a common control panel that contains starters, motor protection, meters, and operators. Controls are as follows:

HAND/OFF/AUTO switch at the control panel will control the process. In HAND, the selected pump will operate continuously. In OFF the pumps will not run. In AUTO the pumps will run continuously unless signaled by other biosolids dewatering controls to shut off.

DESIGN ISSUES YET TO BE RESOLVED

- Polymer feed requirements.
- Equipment selection for spreading cake on agricultural site.
- Pipe supports.
- Existing blower room louver modifications.
- Biosolids dewatering press feed pump sizing.
- Final digester sidewall depth and blower sizing per final depth.

INSTRUMENT LIST

Process Area 900: Biosolids Treatment				
No.	Instrument Tag [1]		Description	Purpose
Digesters				
1	LI		Staff Gauge	Cell N1 Volume
2	LSH		Float	Cell N1 High Level alarm
3	LI		Staff Gauge	Cell N2 Volume
4	LSH		Float	Cell N2 High Level alarm
5	LI		Staff Gauge	Cell N3 Volume
6	LSH		Float	Cell N3 High Level alarm

7	LI		Staff Gauge	Cell N4 Volume
8	LSH		Float	Cell N4 High Level alarm
9	LI		Staff Gauge	Cell S1 Volume
10	LSH		Float	Cell S1 High Level alarm
11	LI		Staff Gauge	Cell S2 Volume
12	LSH		Float	Cell S2 High Level alarm
13	LI		Staff Gauge	Cell S3 Volume
14	LSH		Float	Cell S3 High Level alarm
15	LI		Staff Gauge	Cell S4 Volume
16	LSH		Float	Cell S4 High Level alarm
17	OE/OIT		DO Meter	Process Control in Cell N2
18	OE/OIT		DO Meter	Process Control in Cell N4
19	OE/OIT		DO Meter	Process Control in Cell S2
20	OE/OIT		DO Meter	Process Control in Cell S4
Biosolids Transfer Pump Station (North)				
1	LT		Level Transducer	Pump operation and alarm conditions in Transfer Pump Basin
2	LSH		Float	High Level in Biosolids PS Wet Well
3	LSL		Float	Low Level in Biosolids PS Wet Well
4	PI		Pressure Gauge	Pump Header Discharge Pressure
Biosolids Transfer Pump Station (South)				
1	LT		Level Transducer	Pump operation and alarm conditions in Transfer Pump Basin
2	LSH		Float	High Level in Biosolids PS Wet Well
3	LSL		Float	Low Level in Biosolids PS Wet Well
4	PI		Pressure Gauge	Pump Header Discharge Pressure
Blowers (Exterior Basins – Cells N1, S1, N2, S2, N3 & S3)				
1	PIT		Pressure Transmitter	Discharge pressure on Blower No.1
2	TIT		Temperature Transmitter	Temperature of Blower No. 1

3	PIT		Pressure Transmitter	Discharge pressure on Blower No.2
4	TIT		Temperature Transmitter	Temperature of Blower No. 2
5	PIT		Pressure Transmitter	Discharge pressure on Blower No. 3
6	TIT		Temperature Transmitter	Temperature of Blower No. 3
7	FS		Air Flow Transmitter	Air flow in Header North
8	FS		Air Flow Transmitter	Air flow in Header South
Blowers (Interior Basins – Cells N4 & S4)				
9	PIT		Pressure Transmitter	Discharge pressure on Blower No.4
10	TIT		Temperature Transmitter	Temperature of Blower No. 4
11	PIT		Pressure Transmitter	Discharge pressure on Blower No.5
12	TIT		Temperature Transmitter	Temperature of Blower No. 5
13	PIT		Pressure Transmitter	Discharge pressure on Blower No.6
14	TIT		Temperature Transmitter	Temperature of Blower No. 6
15	FS		Air Flow Transmitter	Air flow in Header North
16	FS		Air Flow Transmitter	Air flow in Header South

(1) Instrument tag designation will be used during final design

DESIGN DATA

Process Area 900: Biosolids Treatment	
Parameter	Design Value
Digesters	
Basin 1N/1S Capacity @ 13.5’ SWD	95,900 gallons
Basin 2N/2S Capacity @ 13.5’ SWD	191,900 gallons
Basin 3N/3S Capacity @ 13.5’ SWD	95,900 gallons
Basin 4N/4S Capacity @ 13.5’ SWD	139,900 gallons
Digester Freeboard	2.0 feet
Basin 1N/1S Air Requirement	385 SCFM
Basin 2N/2S Air Requirement	770 SCFM
Basin 3N/3S Air Requirement	385 SCFM
Basin 4N/4S Air Requirement	561 SCFM
Decanter Type	4-inch Telescoping Valves
Biosolids Transfer Basins	
Basin Volume	37,310 gallons
Pump Type	Submersible Non-clog
Number of Pumps	4
Capacity Biosolids Transfer Pump	288 gpm @ 24.8 feet TDH
Hp Biosolids Transfer Pump	5
Blowers Type	Rotary Positive Displacement
Speed	Variable
Number	6 total
Decibel Level Outside of Sound Enclosure	80 dB
Interior Digester Basins - Power	3 @ 20 HP each
Interior Digester Basins - Capacity	457 SCFM @ 4.9 psi
Exterior Digester Basins - Power	3 @ 50 HP each
Exterior Digester Basins - Capacity	1,565 SCFM @ 5.03 psi

Biosolids Dewatering Press Feed Pumps	
Pump Type	Rotary Lobe
Number of Pumps	2
Capacity Biosolids Transfer Pump	150 gpm @ 25 feet TDH
Hp Biosolids Transfer Pump	TBD
Biosolids Dewatering Press	
Type	Screw Press
Motor Size	5 HP
Capacity	55 gpm @ 2% solids
Cake Solids Content	12-16%
Size	550 lbs/hr (6.6 tons/day)
Polymer Feed Pump Capacity	To be determined
Polymer Feed Pump Hp	To be determined

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.9
Subject:	Process Area 100
	PLANT SITE FACILITIES
Date:	September 25, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE AND SCOPE

This section provides information regarding the physical nature and general layout of the existing wastewater treatment plant site and site modifications required for the planned wastewater system improvements. Items of discussion include the following:

1. Site Description
2. Site Access
3. Site Drainage
4. Yard Piping
5. Plant Utilities
6. Landscaping and Fencing
7. Design Issues Yet to be Resolved

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to this section:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
3.0	Specific Process Design	Describes new processes areas to be located on the existing plant site.
5.4	Electrical	Describes modifications to the existing plant electrical systems.

PLANS

The 11” x 17” drawing set that accompanies this report includes plan sheets that illustrate the layout of the existing treatment plant and modifications to the existing site as a result of the improvements associated with the wastewater system improvement project. The C100 series drawings illustrate the planned improvements intended for the existing site.

SITE DESCRIPTION

Existing

The existing treatment plant site is located off of Stearns lane, approximately 900 feet north of Highway 138. A chain link fence surrounds the facility; there is a double wide swinging gate on the west side of the property that provides access from Stearns Lane. A paved access roadway connects the paved plant parking/access area to Stearns Lane. The lay of the land is characterized by a gentle slope to the west.

The existing wastewater treatment plant property is approximately 5.7 acres (500’ x 500’), excluding the access roadway. Of the 5.7 acres, the existing wastewater treatment plant takes up an area of 2.5 acres. This area is fully fenced and is a combination of treatment buildings, pavement, and lawn areas. A two acre section to the north and east of the existing treatment facility has been left undeveloped for future expansion.

The Sutherlin wastewater treatment plant was constructed in 1977 as a complete mix, activated sludge, secondary treatment facility. The style of plant is commonly referred to as a donut-type packaged plant, comprised of a central clarifier with aeration and digester chambers around the perimeter of the donut. Constructed between the two treatment units is a combination control building and housing for equipment and supplies related to the wastewater treatment plant. A second structure to the west of the donut units houses a sand filter, gas chlorine disinfection system, and laboratory. An addition to this building, which included offices, meeting/break room, and storage was completed in 2000. In 1995, a rotary drum screen and ISCO flow meter were installed. Other improvements include the replacement of RAS and sludge pumps.

Improvements

The planned improvements for the treatment site include modifying the existing mechanical screening facility and the construction of a sequencing batch reactor (SBR) facility with an associated headworks. In conjunction with the construction of the SBR, additional new facilities to be constructed on the existing site include an influent pump station, tertiary filter, ultraviolet disinfection system, a dewatered biosolids storage facility, a new control/electrical building and an equipment shop.

Modifications to the existing structures will be required to complete all of the planned improvements to the existing treatment plant. The planned modifications include: converting the existing donut plants to aerobic digesters, adding access stairs to the influent screening structure, and raising the floor level in the existing filter building to accommodate a biosolids dewatering screw press. The new construction will require that the two existing garage buildings be removed.

A 1/3 acre portion of the 2 acre undeveloped area will be used for the new control building and equipment shop. The development of this area, located to the north of the donut units, will require the removal of an excavation stockpile that was left over from the original wastewater treatment plant construction. The existing fence on the east property line will have to be removed for this work and rerouted to enclose the new structures.

Limitations and Constraints

Site constraints regarding new construction include the requirement to meet specific elevations in the existing digesters and effluent discharge line, providing sufficient vehicle clearance between new and existing structures, routing underground conduits and piping in such a manner as to avoid existing underground utilities, and geotechnical concerns.

A geotechnical investigation of the wastewater treatment plant site, completed by Foundation Engineering, Inc., dated August 5, 2015, revealed construction concerns in two specific areas; the SBR site and the influent pump station site. The SBR site was found to have soft silts underlying a ten feet section of stiff to very stiff clay. The analysis discussed in the study indicates a total settlement of six to seven inches could occur due to SBR basin loads and that a preload or surcharge could be placed over the planned SBR location to induce settlement prior to construction. Preloading consists of placing imported fill weighing as much as the anticipated SBR, while a surcharge involves placing fill weighing more than the anticipated SRB load. The surcharge would induce the settlement more quickly relative to the preload, thereby reducing the length of time the fill would need to be in place. At the time of this report, the City is working on plans to place a surcharge load on the site in the spring of 2016.

The influent pump station will require an excavation depth of 18 to 20 feet. Due to poor soil conditions and the presence of year round groundwater, the study notes that an open excavation will not be practical. Full depth shoring and dewatering will be required, even during summer construction. The bottom of the excavation will likely extend to within two to four feet of the bedrock surface (found at 22 feet below the surface), providing limited, if any, fixity of the sheet pile tips. As a result, internal bracing will be required. A tied-back shoring system is not recommended at this site due to the soft and/or loose soil conditions below seven feet and the elevated water table, and minimal penetration of the sheet pile tips.

SITE ACCESS

Access to the plant site will be maintained through gates located on the west side of the plant, via an existing 24’ wide paved access road from Stearns Lane. The asphalt access is in poor shape and in need of repaving. Reconstruction of the roadway will be completed toward the end of the overall project. Along with the roadway reconstruction, the concrete curbed bulb-out, next to the entrance gate, will be removed and the area paved to better accommodate truck traffic into the site.

Additional paved accesses will be provided to the grit removal equipment located on the west side of the SBR units, around the new influent pump station, and a looped 14 feet wide access road around the existing digester units. A new paved parking area will be provided to serve the new control building and equipment shop.

Operator access around the new facility will consist of concrete sidewalks and aluminum stairways and gratings. Concrete walkways will be constructed for access to equipment installed at finished grade including; the influent pump station, new influent screen stairway, influent sampler, and the UV disinfection system. Walking on and around the SBR will require the installation of two stairways; one on the west side that will also access the headworks and one on the east side that will also access the tertiary filters. Walkways and handrails at the top of the SBR tank walls and aluminum grating over open channels and basins will be provided. Handrails will also be included for the elevated tertiary filter slab.

SITE DRAINAGE

On-site drainage is currently collected in catch basins that discharge to Cook Creek, running to the west along the south property line of the wastewater treatment plant property. These existing catch basins will be utilized as part of the remodel and will not be impacted. The flap valves at the discharge points in Cook Creek will be replaced with new pinch valves. New construction will require the installation of catch basins or area drains, tied to the existing system, in the paved area adjacent to the new SBR basins, control building, equipment shop and UV disinfection system. Roof drains from each of the new structures will be connected to the expanded drainage system. Area drains located next to the process equipment will be connected to drain lines that will discharge to the new or existing influent pump station wet wells.

The area to the east of the existing donut treatment units will be impacted by the construction of the new 14 feet wide looped access roadway. As a result, this new construction will include a drainage swale along the east side of the new plant, and the installation of new catch basins and storm drain pipe.

YARD PIPING

Yard piping, which is buried piping outside of structures and within the treatment plant fence, includes: aeration piping, waste activated sludge (WAS) piping, tank drain lines, potable water system piping, non-potable water (NPW) piping, sanitary sewer lines and laterals, storm drain piping, gravity outfall line to Calapooya Creek and the neighboring farm, and effluent force main to the golf course and Ford's Pond. The referenced plans, specifically drawing C102, graphically illustrate the yard piping layout. Section 5.2 provides general descriptions of the piping systems.

The majority of the existing piping will be undisturbed and left in place. Terminal points in unused existing piping will be securely plugged before abandonment. Any existing piping that sits under new structures will be protected with a concrete slurry.

PLANT UTILITIES

Sanitary Sewer

Currently, an existing manhole located 25 feet west of the existing operations building receives sanitary flow from the existing filter building. From this manhole, raw sewage flows to the existing influent wet well before being pumped to the plant headworks. A second manhole on the 27" influent sewer main, located just upstream of the influent screen structure, receives sanitary flow from the building expansion that was completed in 2000. Flow from this manhole flows through the screens and to the influent wet well.

The manhole located west of the operations building will continue to serve as the discharge point for the filter building but will also serve as the discharge point for the new electrical/control and shop buildings. A new 8" sewer line will be extended from this manhole approximately 200 feet to the north, where new laterals will extend to serve the new buildings.

Potable Water

The treatment plant site receives potable water from the City distribution system. An 8" AC water line extends from Highway 138 to the plant site within a 20 foot wide utility easement. The utility easement also covers the 27" influent raw sewage line. The water line runs to a pressure reducing valve vault, located north of the existing influent screen basin. This vault will have to be relocated due to conflicts with the new influent pump station. The existing potable water connection will remain; however, additional piping will be placed as required to provide potable water to the new control building, equipment shop and other site locations as required.

Non-potable Water

Non-potable water (NPW) will be used from the existing irrigation holding tank. A NPW pump station will be constructed with the irrigation tank serving as the wet well. NPW will be pumped from the storage reservoir to locations around the plant site.

The NPW pump station will have a single control panel with starters, motor protection, meters, operators, and two redundant submersible pumps. The demand for NPW will be intermittent and variable. Consequently, control will be based on pressure provided by a hydropneumatic pressure tank. Water level in the irrigation holding tank will be indicated by a level transducer and NPW usage will be monitored by means of a magnetic flow meter.

There will be approximately fifteen utility stations located around the site; these utility stations will be used for a variety of wash down operations and will deliver water with a pressure between 65 and 75 psi. Additional NPW will be required for the operation of the influent screens, grit removal system, a re-use tanker loading station, and operations regarding sludge handling and dewatering. Distribution piping for the NPW system will range in size from 1” to 3” and will be either HDPE or PVC pipe.

Telephone

The existing communications system will be modified as required to meet the requirements of the new facility.

Power

A new electrical service and stand by generator will be provided for all of the new facilities, while the existing power service and distribution system will be used for the existing facilities. Modifications to the existing distribution system will be made as necessary and the existing standby generator will be replaced. Refer to Section 5.4 Electrical for information specific to this topic.

LANDSCAPING AND FENCING

Since the majority of the existing site will be impacted by new construction, landscaping on and around the site will be at a minimum. Any open, unimproved areas will be seeded with grass and planted with small shrubs. Drainage swales will also be seeded and maintained as grassy swales.

Upon completion of the treatment plant improvements, a new chain link fence will be erected along the west property line. Existing fencing damaged during construction will be replaced and new fencing will be provided to ensure total site enclosure. A new automatic gate will be installed at the entrance to the plant facility.

DESIGN ISSUES YET TO BE RESOLVED

- Location of construction stockpiles and waste piles.
- On-site excavation and disposal quantities.
- Non-potable water system routing.
- New storm drain system layout and sizing.
- Sewer system extension invert elevations.

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	3.10
Subject:	Pump Station Design (Process Area 1400)
	EVERETT AVENUE PUMP STATION
Date:	October 8, 2015
Prepared By:	Ryan H. Quigley, P.E.

BACKGROUND AND PURPOSE

This station is located in the southwest corner of Subbasin N near the intersection of Front Street and Everett Street. The pump station collects flows from Subbasin N through Subbasin Z and transmits flows to Subbasin M through a 10-inch diameter, 890-feet long CI pressure main. The pump station handles half of the total wastewater flows for the City of Sutherlin.

The pump station was evaluated in the Everett Avenue Pump Station and Force Main Evaluation Study (Dyer 2010) and it was recommended that a new pump station be constructed directly adjacent to the existing pump station. This recommendation was based on pump maintenance and capacity issues discussed in this section.

The pump station was reconstructed in 1978 and additional improvements were completed in 2012 as the Everett Avenue Pump Station – Phase 1 Improvements project. The 2012 improvements included; the installation of a channel grinder inside a new combined influent manhole and the installation of a new effluent flow meter. The 2012 improvements, specifically the grinder installation, made significant improvements to the maintenance issues at the pump station. Prior to this work, weekly maintenance at the pump station was required to return clogged pumps back to service.

The pump station is supported by a 125 kW Kohler generator with a 150 amp breaker for current use and a 400 amp breaker for future use; it is located outside, just north of the building.

Flow data collected since the installation of the flow meter show that Pump No. 1 has a capacity of ±800 gpm and Pumps No 2 & 3 have capacities of ±1,250 gpm each. Although pump operation has been improved, the pump station is still undersized and during high flow events, the station is unable to pump all of the influent sewage, which has caused overflows in the past. Furthermore, the pumps are relatively old and the City is no longer able to find parts to repair the pumps.

Other deficiencies at the pump station include; old vacuum canisters that are no longer supported, grease issues, and control and alarm deficiencies. The receiving gravity sewer lines have been known to surcharge during pump operation. Manhole numbers O7, M7, M17 and M18 commonly overflow during periods of high ground water and heavy rain. These overflows have been documented in correspondence to DEQ. To address these and the above capacity issues, this section will provide information regarding the general design of a new pump station constructed adjacent to the existing Everett Avenue Pump Station.

SCHEMATICS AND PLANS

The 11” x 17” drawing set that accompanies this report includes plan sheets that illustrate the schematics and plans associated with this pump station improvement project. Refer to the 1400 series drawings which illustrate the new Everett Avenue Pump Station.

DESIGN CRITERIA

Everett Avenue Pump Station will be designed to meet the following criteria:

A. The Oregon Department of Environmental Quality defines a pump station’s capacity as the pumping capacity of the pump station with the largest pump out of service. To meet the flow conditions of the pump station, the pump station must have a capacity of 2,430 gallons per minute (gpm), which is the half of the projected peak day average flow ($PDAF_5$) as listed in the City of Sutherlin Waste Water Facilities Plan

Amendment (Dyer 2013) for the design year 2037. In addition to meeting the peak flows, the pump station must also be designed to handle 250 gpm, which is one half of the City's average dry weather flows (ADWF) of 500 gpm. Variable speed pump drives will be utilized during times of low flows. The pump station's current and projected flows, based on the Wastewater Facilities Plan (Dyer, 2013) are presented below:

Pump Station Flow, gpm	
2012 ADWF	250
2012 AWWF	476
2012 $PDAF_5$	1,934
2012 PIF	2,535
2037 ADWF	368
2037 AWWF	698
2037 $PDAF_5$	2,430
2037 PIF	3,055

B. Velocity in the pump discharge piping should be maintained between 3 and 10 fps. Velocities less than 3 fps induce settling of solids within the pipeline, while velocities over 10 fps generate excessive headloss within the pipe. The capacity of the downstream gravity sewer should be sized to meet the pump capacity without surcharging.

C. Wet wells should be designed to prevent the accumulation of solids and should provide features that simplify cleaning when needed.

D. A geotechnical investigation of the pump station site, completed by Foundation Engineering, Inc., dated August 5, 2015, covered wet well construction requirements. It is anticipate open cuts will not be practical due to the presence of existing structures and pavements. A slide rail or other internally braced shoring system will be necessary and should be practical at the site. Rock excavation will also be required as there is a presence of strong to very strong sandstone from ±12.5 feet to the bottom of the wet well excavation (estimated to be ±18 to 20 feet deep).

SYSTEM DESCRIPTION

A. Pump Selection

1. The new pump station will be a triplex submersible pump station. The hydraulic capacity of the pump station will be sized to handle a peak flow of 2,430 gpm, which are the projected peak daily flows at the pump station in 2037. The pumps at the station will be rated at 60 HP, operate at 1770 rpm, and be rated to move 1,925 gpm at 68 feet TDH with one pump in operation and 2,500 gpm at 98 feet TDH with two pumps in operation. The pumps will operate on three-phase, 480-volt power. The pumps will be equipped with variable frequency drives (VFDs) to operate the motors at variable speeds depending on the incoming flowrate to the pump station. Head loss calculations and pump curves at located at the end of this section.
2. With the pump station sized to meet peak daily flows, the flow difference between the peak daily flow and the peak instantaneous flows will be stored in the collection system. The difference in the peak instantaneous flow of 3,055 gpm and peak daily flow of 2,430 is 625 gpm. Basin O, adjacent to the pump station, has approximately 48,000 gallons of available storage in the 15-inch sewer mains. This provides 76 minutes of storage during peak instantaneous flow conditions.

B. Wet Well

1. The wet well will be 10 feet in diameter and 21 feet deep.
2. Based on the 10 feet diameter wet well and the pump selection discussed above, the pumps will see a cycle times of 70 minutes (< 1 start per hour) at peak daily flow and 9 minutes (7 starts per hour) at average dry weather flow.

C. Force Main

1. The design of the pump station is based on the extension of the existing effluent force main, which will change the discharge point from manhole M18 on Oak St. to manhole L5 on Miller St. The new force main will utilize 750 lineal feet of the existing 10-inch diameter cast iron force main and ±2,750 linear feet of new 12-inch diameter ductile iron pipe. The 12-inch pipe will be connected to the existing 10-inch cast iron line at the intersection of Oak St

and Central Ave. and be installed to the manhole on Miller St. At the current ADWF of 250 gpm at the pump station, the detention time in the force main will be 77 minutes and at the 2037 ADWF of 368 gpm at the pump station the detention time will be 52 minutes.

2. The proposed routing in Central Ave. was reviewed on site with Oregon Department of Transportation (ODOT) on September 9, 2015. ODOT's representative (Dave Wells, Permit Specialist) agreed that installing the force main in the east bound lane, 4"-6" north of the existing curb would be acceptable to them. The existing asphalt is in poor condition but the installation will require a 12-inch asphalt tee cut, providing an overall patch width of approximately 54 inches. No other requirements or potential problems where noted by ODOT at the time of the meeting.

D. Access

1. Vehicle access to the pump station will be through the existing gate, off of Everett Avenue. The existing fence will be expanded to enclose the new wet well and valve vault.

2. Access to the new wet well and valve vault will be through locking aluminum hatch doors. Each door will be hydraulically assisted for easy opening and closing. A concrete pad and curb will be placed around the valve vault and wet well to provide spill protection from the surrounding gravel areas.

E. Safety

Safety gratings will be provided under the wet well hatch to prevent workers from falling into the structure.

F. Overflow

The sewage overflow point for the Everett Avenue Pump Station is the manhole located on Valley Court. If backup power or equipment were to fail, drainage would eventually flow into the City's storm drain system, which discharges to Sutherlin Creek.

G. Potable Water

Potable water is available at the site. The water service for site is located in the alley, north of the site.

H. Backup Power

A 125 kW Kohler generator with a 150 amp breaker for current use and a 400 amp breaker for future use was installed in 2013. The generator is located outside, just north of the building. The generator is fueled via a natural gas service on the site and has an automatic transfer switch. The existing generator will be evaluated for use with the new pump station.

I. Sanitary Sewer

1. A new 18-inch gravity line will be extended from the grinder manhole, adjacent to Everett Avenue, to the new wet well location. Approximately ten feet of 18-inch diameter PVC pipe was installed from this manhole, at the time of its construction, for use by the new pump station. A concrete slurry fill was placed in the channel of the future 18-inch stub and will have to be removed. The gravity line from this manhole to the existing station will be demolished and the channel within the manhole filled.
2. A 12-inch diameter force main will be extended from the new pump station and connected to the existing 10-inch force main located in the alley, just north of the site.

J. Flow Meter

1. A 10-inch, NEMA-6 rated magnetic flow meter was installed as part of the Everett Ave. Pump Station Improvements – Phase 1 project. The meter was installed in a vault, approximately 10 feet north of the existing pump building. Because of its location, near the building and adjacent to the generator, it will be difficult and costly to route the new force main through this location.
2. The existing flow meter will be removed and reinstalled in the new 12-inch force main section between the new pump station and connection point in the alley. The meter will be housed in a new water-tight, pre-cast concrete vault with traffic rated lid and access hatch.

K. Landscaping and Fencing

The site is currently part of a graveled parking area. A concrete pad along with additional crushed rock will be placed around the new wet well and valve vault to prevent unwanted vegetation from growing in the access areas. A curb will be placed around the station to prevent vehicle access to the station. The fencing will be expanded to enclose the new pump station wet well and vault.

INSTRUMENTATION, CONTROL, AND MEASUREMENT

Control of the pump station will be through a pump control panel installed in the existing Everett Ave. Pump Station building. All alarms and operational data for the pump station will be transmitted to the City's SCADA system. Control of the wet well level will be through a submersible pressure transducer with mercury float switches for backup.

DESIGN ISSUES YET TO BE RESOLVED

1. New power service coordination
2. Electrical loads
3. Property acquisition
4. Flow meter installation or relocation
5. Odor control at pump station
6. Hydrogen Sulfide control
7. Evaluate size of 12-inch force main and replacement of a portion of the 10-inch force main.

DESIGN DATA

Parameter	Design Value
Station/Pump Type:	Triplex Submersible/Variable Speed Non-Clog
Pump Capacity:	1,925 gpm @ 68 feet TDH (one pump running) 2,500 gpm @ 98 feet TDH (two pumps running)
Pump HP, each	60 HP
Level Control Type:	Pressure Transducer with Floats for backup
Overflow Manhole, Elevation:	Valley Court MH, 512 feet
Overflow Discharge Point:	Sutherlin Creek
Average Time to Overflow - 2012:	36 min. @ ADWF; 19 min. @ AWWF
Average Time to Overflow - 2037:	24 min. @ ADWF; 13 min. @ AWWF
AUXILIARY POWER	
Type:	Connection for existing generator
Output:	125 kW
Fuel:	Natural Gas Service
Alarm Telemetry:	SCADA
EPA Class:	I

EXISTING FORCE MAIN	
Length:	920 feet
Type:	10-inch cast iron (Existing)
Profile:	Continuously Ascending
Discharge:	Manhole M18 – east end of alley at Oak St.
Air Release/Vacuum Release Valves:	None/None
Average Detention Times:	15.0 min. @ 2012 ADWF; 10.2 min @ 2037 ADWF
Sulfide Control:	None
PROPOSED FORCE MAIN	
Length:	750 feet (exist. 10-inch) / 2,750 (new 12-inch)
Type:	10-inch cast iron (existing) / 12-inch D.I. (new)
Profile:	Ascending to a high point near Pine St. (522.03’), then descending to a low point near Ash St. (517.39’), then ascending to a second high point at Miller St. (525.14’), and then descending down Miller St. to Manhole L5 (515.0’).
Discharge:	Manhole L5 – Miller St.
Air Release/Vacuum Release Valves:	At pump station
Average Detention Times:	76.8 min. @ 2012 ADWF; 52.2 min @ 2037 ADWF
Sulfide Control:	None
WET WELL	
Depth:	21 feet
Inside Diameter:	10 feet
Average Detention Time - 2012:	11.5 minutes with ADWF; 6.2 minutes with AWWF
Average Detention Time - 2037:	7.8 minutes with ADWF; 4.1 minutes with AWWF
Average Pump Cycle Time	70.3 min @ 2012 PDAF (1,934 gpm) 9.4 min @ 2012 ADWF (250 gpm)
ELEVATIONS	
Top of Wet Well:	516.0 feet
Overflow Alarm:	511.5 feet
I.E. Existing Gravity Sewer in Grinder Manhole:	501.92 feet
Existing Force Main I.E.:	512.0 feet
HWL Alarm:	501.7 feet
Lag Pump On:	500.9 feet
Lead Pump On:	499.9 feet
All Pumps Off:	496.9 feet
LWL Alarm:	496.4 feet
Bottom of Wet Well:	495.0 feet

City of Sutherlin
Everett Ave. Pump Station - 146.38
Total Dynamic Head for new 12" Force Main
July 23, 2015

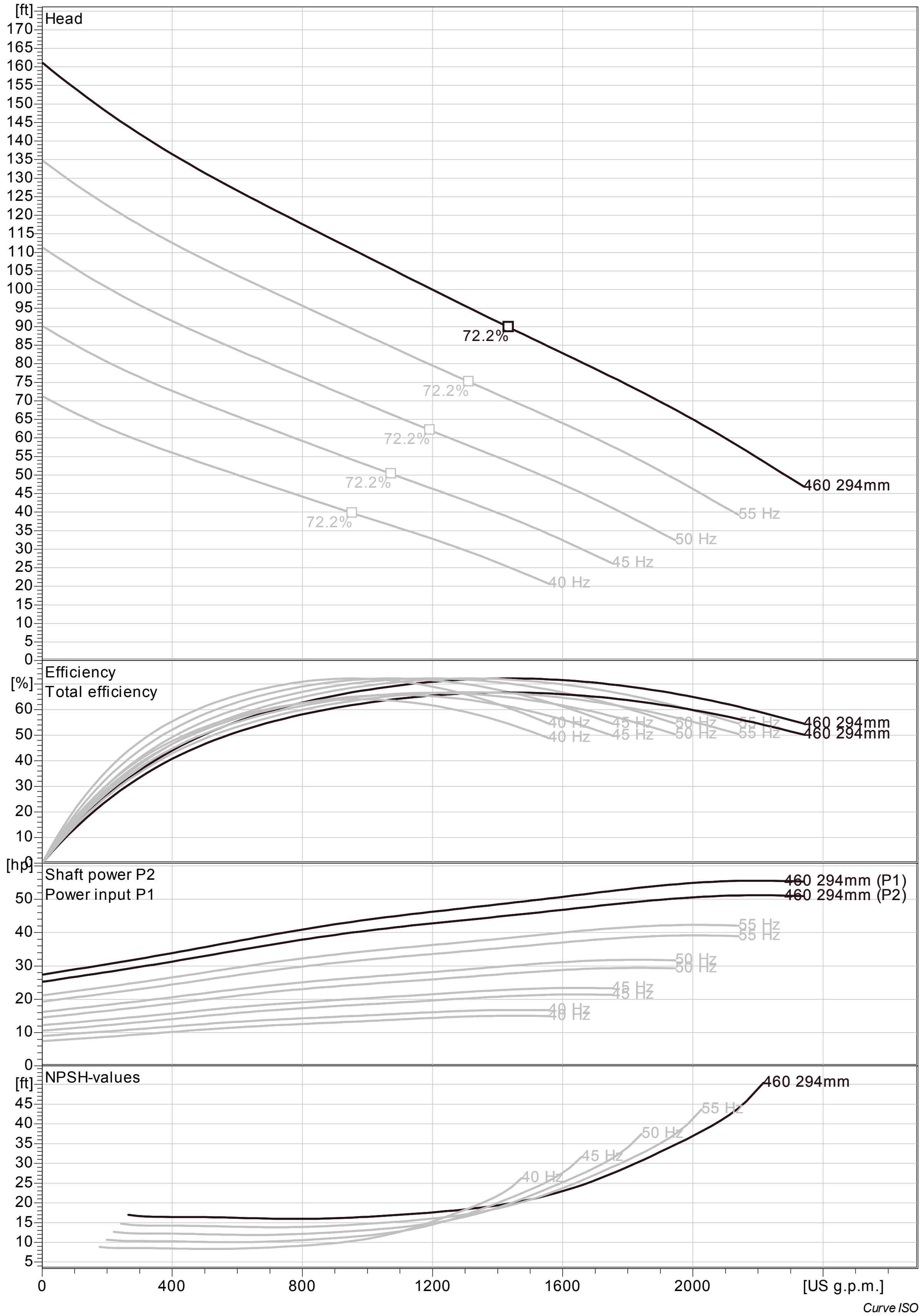
Flow		Velocity		Static Head (ft)	Pipe Friction loss		TDH (ft)
gpm	cfs	10" Line (fps)	12" Line (fps)		10" (ft)	12" (ft)	
500	1.11	2.04	1.42	24.0	2.1	1.7	27.8
600	1.34	2.45	1.70	24.0	2.9	2.4	29.3
700	1.56	2.86	1.99	24.0	3.9	3.1	31.0
800	1.78	3.27	2.27	24.0	4.9	4.0	33.0
900	2.01	3.68	2.55	24.0	6.2	5.0	35.1
1,000	2.23	4.09	2.84	24.0	7.5	6.1	37.5
1,100	2.45	4.50	3.12	24.0	8.9	7.2	40.1
1,200	2.67	4.90	3.41	24.0	10.5	8.5	43.0
1,300	2.90	5.31	3.69	24.0	12.1	9.8	46.0
1,400	3.12	5.72	3.97	24.0	13.9	11.3	49.2
1,500	3.34	6.13	4.26	24.0	15.8	12.8	52.7
1,600	3.56	6.54	4.54	24.0	17.8	14.4	56.3
1,700	3.79	6.95	4.83	24.0	20.0	16.2	60.1
1,800	4.01	7.36	5.11	24.0	22.2	18.0	64.1
1,900	4.23	7.77	5.39	24.0	24.5	19.9	68.4
2,000	4.46	8.17	5.68	24.0	27.0	21.8	72.8
2,100	4.68	8.58	5.96	24.0	29.5	23.9	77.4
2,200	4.90	8.99	6.24	24.0	32.2	26.0	82.2
2,300	5.12	9.40	6.53	24.0	34.9	28.3	87.2
2,400	5.35	9.81	6.81	24.0	37.8	30.6	92.4
2,500	5.57	10.22	7.10	24.0	40.7	33.0	97.7

Existing Force Main Segment Everett to Oak	
Pipe Diameter (in)	10
Roughness Coefficient	100
Pipe Length (ft)	750

New Force Main Segment Oak to Miller	
Pipe Diameter (in)	12
Roughness Coefficient	140
Pipe Length (ft)	2,750

NP 3202 HT 3~ 460

VFD Curve

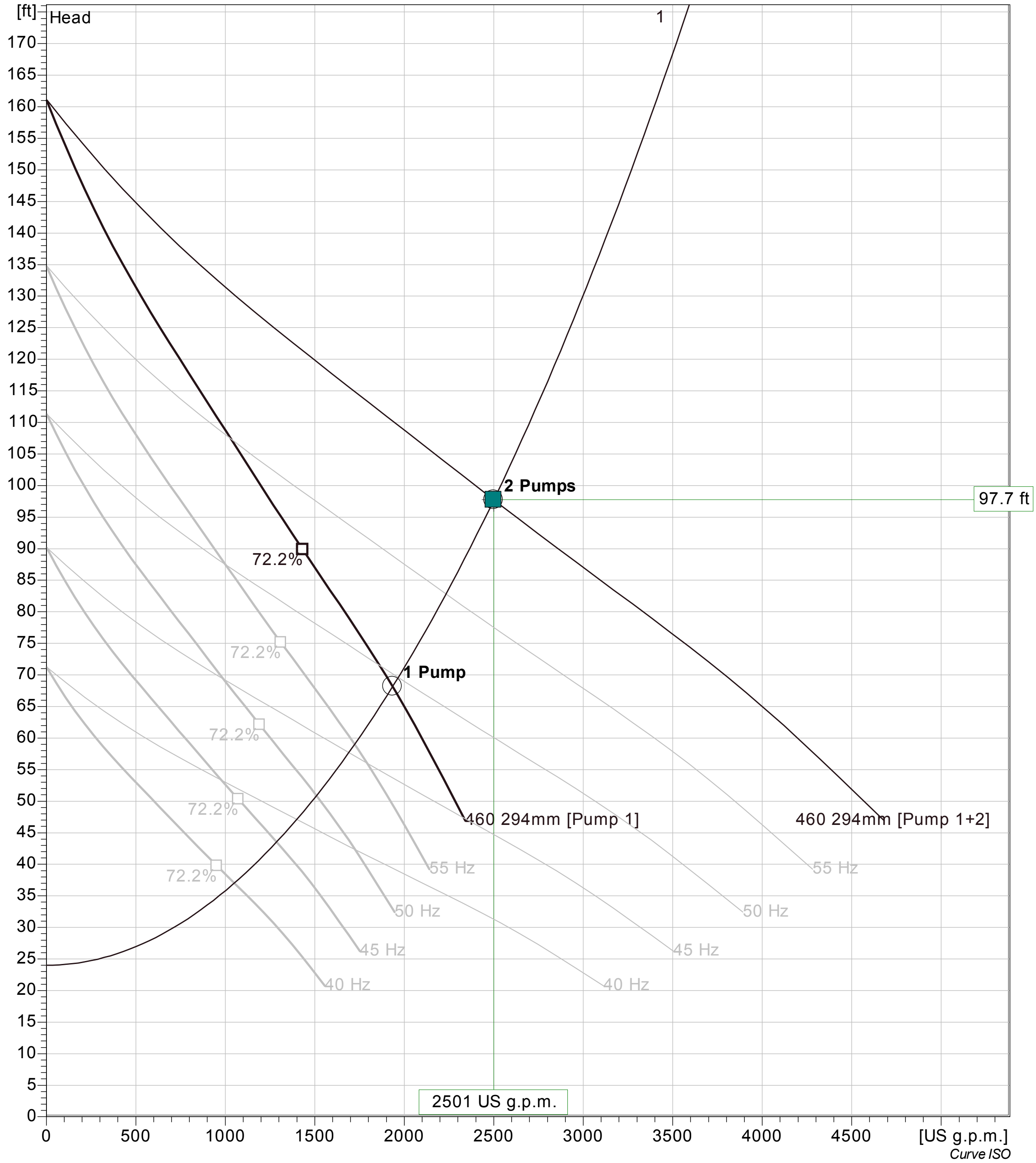


Project	Project ID	Created by	Created on	Last update
			2015-07-28	

Let's Solve Water

NP 3202 HT 3~ 460

VFD Analysis



Pumps running /System	Frequency	Flow	Head	Shaft power	Flow	Head	Shaft power	Hyd eff.	Specific energy	NPSHre
2 / 1	60 Hz	1250 US g.p.m.	97.7 ft	43.3 hp	2500 US g.p.m.	97.7 ft	86.6 hp	71.4 %	465 kWh/US MG	18 ft
2 / 1	55 Hz	1120 US g.p.m.	82.8 ft	32.9 hp	2230 US g.p.m.	82.8 ft	65.8 hp	71.1 %	396 kWh/US MG	15.4 ft
2 / 1	50 Hz	983 US g.p.m.	69.6 ft	24.5 hp	1970 US g.p.m.	69.6 ft	49 hp	70.7 %	336 kWh/US MG	13 ft
2 / 1	45 Hz	845 US g.p.m.	57.7 ft	17.6 hp	1690 US g.p.m.	57.7 ft	35.2 hp	70 %	286 kWh/US MG	10.8 ft
2 / 1	40 Hz	700 US g.p.m.	47.1 ft	12.1 hp	1400 US g.p.m.	47.1 ft	24.3 hp	68.8 %	245 kWh/US MG	8.71 ft
1 / 1	60 Hz	1930 US g.p.m.	68.1 ft	50.1 hp	1930 US g.p.m.	68.1 ft	50.1 hp	66.5 %	348 kWh/US MG	34.3 ft
1 / 1	55 Hz	1720 US g.p.m.	59 ft	38 hp	1720 US g.p.m.	59 ft	38 hp	67.6 %	297 kWh/US MG	28 ft
1 / 1	50 Hz	1510 US g.p.m.	50.9 ft	28.2 hp	1510 US g.p.m.	50.9 ft	28.2 hp	68.8 %	253 kWh/US MG	22.1 ft
1 / 1	45 Hz	1290 US g.p.m.	43.5 ft	20.2 hp	1290 US g.p.m.	43.5 ft	20.2 hp	70.3 %	216 kWh/US MG	16.6 ft
1 / 1	40 Hz	1050 US g.p.m.	37 ft	13.7 hp	1050 US g.p.m.	37 ft	13.7 hp	71.7 %	187 kWh/US MG	11.7 ft

Project	Project ID	Created by	Created on	Last update
			2015-07-28	

Section 4 – Facilities Design

This section discusses the findings of the geotechnical investigation, rehabilitation of the existing filter building and operations building and the new control building and shop building. These facilities and geotechnical report, shown in the table below, are described in design memorandums that follow.

Description	Design Memorandum Number	Process Number[1]
Filter Building	4.1	200
Operations Building	4.2	300
Geotechnical Considerations	4.3	
New Control Building	4.4	400
New Shop Building	4.5	500

[1]These numbers represent an indexing system that is used in the project drawings.

PREDESIGN REPORT MEMORANDUM	
Project:	City of Sutherlin
	Wastewater System Improvements
Section:	4.1
Subject:	Specific Process Area 200
	FILTER BUILDING
Date:	October 15, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE

The existing filter building will be modified to house a new biosolids dewatering screw press.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.6	Disinfection	Description of the effluent disinfection
3.8	Biosolids Treatment	Description of biosolids treatment and dewatering.
4.4	New Control Building	Description of the layout and use of the new control building.
5.4	Electrical	Description of electrical components associated with the process area.

PROCESS SCHEMATICS AND PLANS

A graphic description of the process may be found in the 11" x 17" drawing set that accompanies this report. Refer to drawing D200 for information specific to the filter building modifications.

BACKGROUND

The main filter building is in good condition and comprises the chlorine gas system, tertiary filter, laboratory, and locker room. The original building is approximately 3,500 sq. ft. The building was expanded by approximately 1,000 sq. ft. in 2000 to include offices, a meeting/break room, and another restroom. The building has multiple finished floor levels; ±396.0 for the filter room and basement area, ±405.5 for the laboratory and chlorinator room, ±402.5 for the gaseous chlorine cylinder room, and ±402.0 for the building expansion. The surrounding finished grade is at elevation ±401.5. The laboratory and locker room floor are connected by an open walkway that overlooks the filter room.

The chlorine gas system utilizes two rooms in the southeast corner of the building. The gaseous chlorine canisters are stored in a 144 sq. ft. room adjacent to a 90 sq. ft. chlorinator room. At the time of this report, the City is in the design phase of a project to replace the gas chlorine system with a sodium hypochlorite disinfection system. The new disinfection system will be housed in the same two rooms and will be utilized for disinfection during year round operation of the existing plant and during summer month flows after the plant upgrades are completed.

The filter level of the building consists of an approximately 1,800 sq. ft. area that houses the existing tertiary filter and an approximately 700 sq. ft. area that extends below the laboratory and chlorine disinfection rooms. The area beneath the laboratory and chlorine rooms houses an air compressor, building water heater, and influent potable water connection and backflow preventer. The existing filter is a 26-feet diameter steel tank with three cells of sand filter media. The filter is no longer functional and is not currently in use. All of the filter piping and appurtenances remain intact. The filter is feed by a 16-inch ductile iron line from the filter pumps located in the Operations building. The influent line runs to an elevated splitter box where flow splits to the three filter cells. An 18-inch effluent ductile iron line runs from the filter to the existing irrigation tank. A 20-inch backwash drain line runs from the filter to the existing influent wet well at a constant 1.3% slope. A 6-inch blower line runs from the blowers located in the existing operations building to the filter.

The existing laboratory is approximately 350 sq. ft. Along with the laboratory area, the room houses a desk with plant SCADA computer and electrical panels. The laboratory is functional for the existing plant but lacks adequate space and is need of upgrading.

The locker room is approximately 150 sq. ft. and consists of a shower, toilet, sink and locker area with four lockers and a bench. The locker room is functional and can be used without any necessary upgrades.

SYSTEM DESCRIPTION

With modifications, the filter building will be utilized during the operation of the new wastewater treatment plant. The modifications include the moving the existing laboratory to the new control building to free up needed storage space and altering the existing filter area to accommodate a new biosolids dewatering screw press.

In order to use the existing filter area for biosolids dewatering, the filter, splitter box, and above grade piping will be removed and the floor level in the filter area will be raised by approximately six feet, to elevation ±402.00. The additional floor height brings the floor up to match the surrounding exterior grade and is necessary to accommodate the dewatered biosolid discharge conveyor system and to provide a new equipment access from outside of the building.

All other building functions will be unchanged.

<u>New Floor Slab</u>

Raising the existing floor slab requires the construction of a concrete retaining wall between the basement area beneath the laboratory level and the open filter area. Compacted crushed rock will be placed between the retaining wall and the concrete filter area walls to within 8 inches of the finished floor elevation and a new 8-inch, reinforced concrete floor slab will be installed on top of the crushed rock. New staircases will be constructed from the open walkway on the laboratory level to the new filter area floor and from the filter area to the basement area below the laboratory.

Piping

The existing 20" diameter backwash drain line will be used to drain pressate and wash water back to the existing influent pump station wet well. All other existing piping not used will be abandoned in place by cutting and capping with concrete below finished grade.

Digested Biosolid Cake Discharge

Dewatered biosolid cake will be delivered by the screw press conveyor system to a new holding area to the north of and adjacent to the existing filter building. Two discharge bays will be provided; one for short term storage of the cake and the second for discharge into a dumpster or spreader truck. The bays will consist of a new 8 inch concrete slab at the existing finished grade of ±401.5. A roof system to protect the cake from weather and to support the conveyor system will be constructed over the new slab.

Access

A new overhead door will be installed in the building's exterior wall on the west side of the filter area. The door will provide access for the installation of the new screw press equipment and maintenance access to the equipment during operation.

Water Service

The new screw press requires a potable water service for the polymer makedown system. The existing potable water system within the filter building will be tapped and a new service line installed to the equipment connection point.

Laboratory

A laboratory will be constructed in the new control building. The new lab will be sized and equipped to meet the needs of the new facility. Any usable equipment will be relocated to the new laboratory. The existing laboratory space will be used as a storage room.

Disinfection

At the time of this report, the City is in the design phase of a project to replace the existing gas chlorine disinfection system with a sodium hypochlorite disinfection system. The new disinfection system will be housed in the same two rooms in the filter building and will be utilized for disinfection during summer month flows.

DESIGN ISSUES YET TO BE RESOLVED

- Dewatering screw press layout.
- Structural design of new floor slab and access.
- Structural design of new overhead door installation.
- Structural design of roof system for dewatered biosolids storage area.
- Lab equipment to be relocated.
- Electrical service for new dewatering equipment.
- Potable water service materials and routing.

PREDESIGN REPORT MEMORANDUM	
Project:	City of Sutherlin Wastewater System Improvements
Section:	4.2
Subject:	Specific Process Area 300 **OPERATIONS BUILDING**
Date:	October 15, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE

The existing operations building will be modified to house new irrigation pumps, inner circle aerobic digester blower systems, and a new plant pump station.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.3	Headworks Grit and Flow Splitting	Description of the grit removal and flow splitting systems
3.8	Biosolids Treatment	Description of biosolids treatment and dewatering.
4.4	New Control Building	Description of the layout and use of the new control building.
5.4	Electrical	Description of electrical components associated with the process area.

PROCESS SCHEMATICS AND PLANS

Refer to drawing D300 for information specific to the operations building modifications.

BACKGROUND

The existing operations building sits between the two existing donut treatment units. The building is in good condition and includes pump, blower, and generator rooms on the main level, which is approximately 1,930 sq. ft. and has a finished floor elevation of ±404.5. Above the main level is the plant headworks and grit separator at approximate elevation ±413.70. Below the main level is the influent pump station wet well, which has a bottom floor elevation of approximately ±381.5. The main floor elevation matches the top of wall elevation of the donut treatment units and access to walkways over the units is provided from several doors in the building.

The west area of the pump room is approximately 600 sq. ft. and houses the plant's four influent pumps. The east area of the pump room is approximately 700 sq. ft. and houses the two scum pumps, three tertiary filter feed pumps, two return activated sludge (RAS) pumps, three golf course irrigation feed pumps, associated piping and valving, all related control and electrical panels and two waste activated sludge (WAS) pumps.

The 320 sq. ft. blower room contains three blowers that provide air to the donut treatment units and the tertiary filter. However, the tertiary filter is no longer in operation and does not require the air service. To the south of the blower room is the 320 sq. ft. generator room, which houses one diesel, standby generator rated for 350 kW. Access to the blower and generator rooms is limited to one three foot wide man door to each room. This makes maintenance access difficult and requires the operators to remove the exterior wall louvers to take in or remove large pieces of equipment. The louvers are large, heavy, and difficult to remove.

The headworks listed above are an open channel system that includes a grit removal system, comminutor, removable bar screens, Parshall flume, and splitter box. The grit removal system does not perform its function due to an inoperative grit auger and only acts as a debris catcher. The motor is left running to keep grit in suspension, even though the unit does not remove grit from the process. From the grit removal system, raw sewage flows through the comminutor and bar screen to the Parshall flume. A manual bypass channel around the comminutor includes a second bar screen but the screen has bar spacing too far apart for effective removal of rags and other debris. Influent flow is measured at the Parshall flume before a flow splitter directs flow to the two treatment units. There is inadequate flow control to either of the treatment units making it difficult to maintain a matching biological community in each treatment train.

The building does have a major issue with respect to the pump building space below the pump room floor, which is not readily accessible, safe or suitable for rehabilitation. A large number of valves and the pump suction and discharge pipes are located in this crawl space, which is only accessible through a 3-foot by 3-foot side access door. The space is excavated below the grade of the surrounding ground and is simply a pit without walls or a floor. With the ground water in this region within three to four feet of the surface, the groundwater in the space cannot be controlled. This makes access to valves difficult or impossible as some of the valves are typically submerged and the area is classified as a confined space. Plant crews have rigged board catwalks to get to some of the valves but electrical or heavy equipment cannot be brought into the space. This area presents one of the greatest challenges to the continued use of pumps in their present location and configuration.

SYSTEM DESCRIPTION

The operations building will be used during operation of the upgraded treatment facility. The building will not be altered structurally but process equipment will be removed or replaced.

<u>Pumps</u>

The existing influent, scum, filter feed, and RAS pumps and all associated piping and valving will be removed. Abandoned pipes will be cut at floor level and filled with concrete. Concrete pump and equipment pads will be removed to provide a smooth finished floor in the pump area.

The existing irrigation pumps consist of three vertical turbine pumps; one 20 HP pump rated for 450 gpm and two 50 HP pumps rated for 1,200 gpm. These pumps will be replaced with pumps of similar size and capacity and continue to pump reuse water to the golf course and include and a new discharge point at Ford's Pond.

Blower Room

The existing blowers will be removed and replaced with blowers sized to feed the two inner aerobic digester basins. The new blowers will utilize the existing 6-inch air piping that runs to each donut unit. The blower line that feeds the existing sand filter in the filter building will be abandoned in place. Additionally, equipment access will be improved to the blower room by replacing the existing wall louvers with hinged louvers for easier access with one person. Modifications to the blower room will not be made until the new treatment facility is placed on line.

Generator Room

The existing generator will be removed and replaced for standby power for the equipment located in the operations building. Equipment access will be improved to the generator room by replacing the existing wall louvers with hinged louvers for easier access with one person. Modifications to the generator room will not be made until the new treatment facility is placed on line.

Headworks

The equipment associated with the existing headworks will be abandoned in place. The new headworks will be installed in conjunction with the new SBR construction.

Access

Access into the building and from the building to the walkways above the aerobic digesters will be maintained.

Plant Pump Station

The existing influent pumps, which pump wastewater from the current influent wet well to the current headworks, will be removed and replaced with a submersible pump system that will deliver sewage and other waste streams from the existing influent wet well to the new influent pump station wet well.

DESIGN ISSUES YET TO BE RESOLVED

- Electrical modifications.
- Selection of irrigation pumps.
- Headworks equipment removal.
- Crawl space piping removal.
- Blower/Generator room louver modification design.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin Wastewater System Improvements
Section:	4.3
Subject:	Process Area 100 **GEOTECHNICAL CONSIDERATIONS**
Date:	October 26, 2015
Prepared By:	Ryan Quigley, P.E.

INTRODUCTION

During late May 2015, Foundation Engineering, Inc. conducted field explorations of the Wastewater Treatment Plant (WWTP) and Everett Avenue Pump Station project sites.

In August 2015, our office received a Geotechnical Report and Seismic Hazard Study discussing the field investigation, analysis, geotechnical design criteria, and construction recommendations. This section summarizes major points of the report.

The areas of discussion are the following:

1. Site conditions.
2. Subsurface conditions.
3. Geotechnical design and construction recommendations.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to this section:

Section	Title	Remarks
3.9	Plant Site Facilities	Presentation of the physical layout of the Treatment Plant site.
3.10	Everett Avenue Pump Station	Presentation of the physical layout of the Everett Avenue Pump Station site.

PLANS AND SCHEMATICS

The 11” x 17” drawing set that accompanies this report contains a graphic description of the plant site. Please refer to the drawing labeled C100 in the drawing set for the WWTP and the drawing labeled D and M1400 for the Everett Avenue Pump Station.

SITE AND SUBSURFACE CONDITIONS

Plant Site

The existing WWTP property is approximately 5.7 acres. Of the 5.7 acres, the existing wastewater treatment plant takes up an area of 2.5 acres. This area is fully fenced and is a combination of treatment buildings, pavement, and lawn areas. A 2-acre section to the north and east of the existing treatment facility has been left undeveloped for future expansion. The lay of the land is characterized by a gentle slope to the west, with surface elevations ranging from 399.0 to 401.0.

Three exploratory boreholes (BH-1 through BH-3) were completed at the WWTP site on May 18 and 19, 2015. The borings were drilled using a CME-55, truck-mounted drill rig with mud-rotary drilling techniques. Following completion of BH-2, BH-2b was drilled adjacent to BH-2 to recover an additional Shelby tube sample from ±13 to 15 feet for consolidation testing. In addition to the boreholes, four test pits (TP-1 through TP-4) were dug using a track-mounted excavator on May 20, 2015. The borings and test pits are summarized as follows:

A. BH1 – Located near southeast corner of the proposed SBR basins. BH1 was drilled to a depth of 27.8 feet and encountered medium stiff to stiff, high plasticity clay to ±9 to 10 feet. The clay is underlain by soft, medium to high plasticity clayey silt to ±12 feet, followed by very soft sandy silt to very loose silty sand. Medium dense gravel was encountered at ±17 feet. The gravel is underlain by a thin layer of residual soils (very stiff to hard clayey silt), followed by weak (R2) sandstone of the Tenmile Formation from ±25 feet (±El. 375.0) to ±27.8 feet (±El.372.3, the bottom of the boring).

B. BH2 – Located near the center of the proposed SBR basins. BH2 was drilled to a depth of 25.8 feet and encountered medium stiff to stiff, high plasticity clay to ±9 to 10 feet. The clay is underlain by soft, medium to high plasticity clayey silt to ±12 feet, followed by very soft sandy silt to very loose silty sand. Loose to very loose sandy gravel to gravelly sand was encountered from ±20.5 to 22.0 feet. The gravels are underlain by weak (R2) sandstone from ±22 feet (±El. 377.5) to ±25.3 feet (±El. 374.2, the bottom of the boring).

C. BH3 – Located at the proposed influent pump station. BH3 was drilled to a depth of 30 feet and encountered stiff, high plasticity clay to ±7 feet. The clay is underlain by soft sandy silt to ±10.5 feet, followed by very loose silty sand to ±15.5 feet. Medium dense sand with trace to some silt was encountered from ±15.5 to 18 feet. The sand is underlain by medium dense sandy gravel to ±22.5 feet. Bedrock consisting of very weak to weak (R1 to R2) interbedded siltstone and weak (R2) sandstone of the Tenmile Formation was encountered from ±25.0 feet (±El. 375.1) to ±30.0 feet (±El. 370.1, the limits of exploration).

D. TP1 – Located at the south end of the proposed SBR basins. TP1 was dug to a depth of 8.5 feet and encountered ±1.5 to 2 feet of fill followed by stiff to very stiff, high plasticity clay. The clay extended to the bottom of the excavation, becoming medium to high plasticity with some sand below ±7 feet.

E. TP2 – Located at the east end of the proposed SBR basins. TP2 was dug to a depth of 9 feet and encountered stiff to very stiff high plasticity clay to the bottom of the excavation.

F. TP3 – Located at the center of the proposed SBR basins. TP3 was dug to a depth of 12 feet and encountered stiff to very stiff high plasticity clay to a depth of 10 feet, very stiff, low to medium plasticity silt with some sand between 10 and 11.5 feet, followed by soft to medium stiff sandy silt to the bottom of the excavation.

G. TP4 – Located near the proposed ultraviolet (UV) System. TP4 was dug to a depth of 11.5 feet and encountered ±1.5 to 2 feet of fill followed by stiff to very stiff, high plasticity clay. The clay extended to ±11 feet and is underlain by soft to medium stiff, medium to high plasticity clayey silt extending to the bottom of the excavation.

During the field investigation in late summer, groundwater was found approximately 7.5 to 9.5 feet below the surface.

Everett Avenue Pump Station Site

This pump station is located near the intersection of Front Street and Everett Avenue. The site houses the existing pump station building and wet well below and an exterior standby generator. The site is fully fenced and consists mostly of a crushed rock surface. The ground surface is relatively flat at an elevation of approximately 514.0. The proposed pump station will be constructed directly west of the existing pump station building.

One boring (BH-4) at the proposed pump station was completed on May 19, 2015 using the same CME-55, truck-mounted drill rig. The boring is summarized as follows:

A. BH4 – Located adjacent to the existing Everett Avenue Pump Station building. BH4 was drilled to a depth of 30 feet. The ground surface is covered with ±6 inches of crushed rock (parking lot fill). The fill is underlain by medium stiff, medium to high plasticity clay to ±5 feet, followed by medium stiff to stiff, high plasticity clayey silt with some sand to ±7 feet. The clayey silt is underlain by dense to very dense sandy gravel to ±12.5 feet. Weak (R2) sandstone and interbeds of very weak to weak (R1 to R2) siltstone extend from ±12.5 to 30 feet.

DESIGN AND CONSTRUCTION RECOMMENDATIONS

The following general recommendations were made for the proposed structures:

A. Settlement

1. Total settlement of ±6 to 7 inches could occur due to SBR basin loads. Preload or surcharge loading is recommended for the SBR basin location. A surcharge load in the SBR basin area at 23-feet in total height would induce the bulk of the anticipated settlement in ±3-6 months. Detailed site preparation and fill requirements for the preloading can be found in the geotechnical report. At the time of this report, the City is planning to place a surcharge load for the SBR basins in the spring of 2016.

2. The foundation loads for the UV facility is expected to be relatively light. This structure is expected to be underlain by stiff to very stiff clay. Therefore, the total and differential settlement of the foundations should be less than 1-inch. These values are predicated on the site preparation and foundation design recommendations provided in the geotechnical report.

B. Shoring and Dewatering

1. An excavation depth of ±18 to 20 feet is anticipated for the construction of the influent pump station wet well. An open excavation will not be practical due to the soft ground conditions below ±7 feet and the presence of loose sand and an elevated ground water level. Therefore, it should be assumed full-depth shoring and dewatering will be required and the most practical shoring option will be an internally-braced sheet pile cofferdam.
2. Open cuts will not be practical at the Everett Avenue Pump Station site due to the presence of existing structures and pavements. A slide rail or other internally braced shoring system should be practical at this site. Contractors should be aware of the presence of strong to very strong sandstone from ±12.5 feet to the bottom of the wet well excavation (estimated to be ±18 to 20 feet deep).
3. Lateral earth pressures for shoring design, using an average moist unit weight of 100 pcf at the WWTP and 130 pcf at the Everett Avenue site, are detailed in the geotechnical report.

C. Lateral Earth Pressure (Permanent Structures)

1. For purposes of design, ground water at the WWTP site is assumed to extend to the ground surface. Therefore, structures should be designed for an equivalent fluid density of 86.5 pcf (i.e., 24.1 pcf due to the buoyant weight of the backfill plus a hydrostatic fluid density of 62.4 pcf).
2. At the Everett Avenue Pump Station site, the walls of the pump station should be designed for lateral earth pressures calculated using an equivalent fluid density of 46.5 pcf to represent at-rest lateral earth pressures above the water

table (assumed to be ± 4 feet deep). Below that depth, an equivalent fluid density of 86.5 pcf should be assumed.

D. Overexcavation

1. At the WWTP site, overexcavation of unsuitable soils would need to extend to the surface of the sandy gravel, which is relatively deep (±17 to 20.5 feet). The overlying clays will be inherently difficult to moisture-condition and recompact, and would not be suitable for replacement as structural fill beneath the SBR. Therefore, the overexcavation option would require importing a large amount of granular fill, which may be cost-prohibitive. The excavation would also need to extend below the ground water level, so dewatering would present an additional challenge.

E. Deep Foundations

1. The sandy gravel (±20 to 25 feet below the ground surface) would provide a suitable bearing stratum for deep foundations to bypass the compressible soils.

F. Construction Timing

1. During wet weather, elevated ground water levels are anticipated at the WWTP site. This condition increases the risk of caving or sloughing during excavation and increases the difficulty of dewatering. Furthermore, the surficial soils are susceptible to softening if exposed to rainfall. Therefore, it is recommend completing the site grading work and wet well excavation during dry weather (i.e., typically July through mid-September).

G. Reuse of Excavated Materials

1. The soils at the WWTP site consist of plastic clays to a depth of ±9 to 10 feet. That material is not suitable as foundation soils, and should not be reused beneath pavements, slabs or other settlement-sensitive structures. It is recommend that any clay generated from excavations at the WWTP site be hauled from the site or used solely in landscaped areas.

H. Expansive Soils

1. Atterberg Limits tests indicate the near surface soils have a Liquid Limit of 62 and a Plasticity Index (PI) of 32. These limits correspond to a high plasticity clay (CH) designation according to the Unified Soil Classification System.

CH clays are typically associated with a relatively high risk of swelling and shrinking due to seasonal changes in moisture content.

2. The proposed SBR basins typically have a relatively thick, reinforced base slab and will usually be filled with water. Therefore, it is not anticipated there will be a significant impact to the SBR due to potential subgrade movement.
3. The influent pump station will extend well below the plastic clay and should not be adversely impacted by the clay.
4. The UV system is a small, relatively rigid structure and should not be particularly susceptible to soil movement.
5. Partial mitigation consisting of the removal of two feet of clay and the construction of thickened granular pads below reinforced concrete slabs for expansive soils is recommended.

I. Material Specifications and General Earthwork

1. Select fill as specified in the geotechnical report should consist of 1 or ¾-inch minus, clean (i.e., less than 5% passing the #200 U.S. Sieve), well-graded, angular, crushed gravel or rock.
2. Stabilization rock should consist of 3-inch, clean, open-graded, angular, crushed gravel or rock, jaw run, or rip rap.
3. Coarse site fill should consist of ±1½ to 3-inch minus, clean, well-graded, angular, crushed gravel or rock.
4. Controlled low strength material (CLSM) should consist of highly flowable lean concrete with a 28-day unconfined compressive strength in the range of 100 to 200 psi.
5. Separation geotextile should have mean average roll value (MARV) strength and hydraulic properties (geotextile for separation) with a permittivity greater than 0.05 sec.-1 and an AOS less than 0.6 mm, meeting the requirements of an AASHTO M 288-06 Class 2 woven geotextile.
6. Compact all subgrade and imported fill to 95% relative compaction, unless specified otherwise. The maximum dry density of ASTM D 698 should be used as the standard for estimating the relative compaction. Place and compact all fill in loose lifts not exceeding 12 inches.

7. Trenching at the WWTP site will typically encounter relatively stiff clays to ±9 to 10 feet. Soft or loose soils should be anticipated in deeper trenches. If the trenching extends into those soils, the bottom of the excavation will likely require a separation geotextile and stabilization rock (in particular during wet weather). If infiltration is present, trenches should be pumped dry prior to placing the backfill.

K. General Site Grading, Haul Road and Staging Areas

1. Strip the site to remove any vegetation, sod or roots. Haul all strippings from the site. Existing base rock, if approved by a Geotechnical Engineer representative, may be left in place. Any plastic clay generated from site grading should be hauled from the site or used only in landscaped areas.
2. Compact all of the stripped ground surface subgrades.
3. Use select fill as building pad fill and as structural fill beneath footings and slabs and compact in lifts.
4. Provide at least 2 feet of granular fill and a separation geotextile in any areas subject to heavy construction or truck traffic or to be used for staging. The granular fill may consist of select fill or 18 inches of Stabilization Rock capped with at least 6 inches of select fill.
5. Proof-roll the finished fill surfaces using a fully loaded dump truck or an approved construction vehicle. Overexcavate any soft area or areas of rutting or pumping and replace with additional select fill or stabilization rock.

L. Specific Facility Design and Construction

1. SBR Basins
   a. Provide a minimum width of 24 inches for all continuous perimeter footings and isolated spread footings. The requirement of a minimum footing width does not apply to a thickened slab edge. Place the base of all footings at least 12 inches below the finished grade.
   b. Design the SBR footings using a presumptive allowable bearing pressure of 3,000 psf. Select fill placed beneath the foundations should extend a minimum of 12 inches below and 12 inches outside the edges of the footings.

c. Assume the new foundations could experience ±1 inch of total post-construction settlement. This estimate assumes the site will be preloaded/surcharged as recommended above and that all of the primary settlement will occur prior to basin construction. The estimated post-construction settlement reflects only secondary compression of the foundation soils over a period of 30 years.

d. Use a modulus of subgrade reaction, ks, of 150 pci, for the SBR base slab design. Reinforce the floor slab to reduce cracking and warping. Rebar, instead of wire mesh, is recommended.

e. Design the structure using the seismic parameters provided in the geotechnical report.

2. UV Facility

a. Strip the site to remove any vegetation, sod or roots from beneath all foundation areas. Haul all strippings from the site.

b. Excavate to the design subgrade elevation and compact the subgrade.

c. Place a vapor barrier or a woven geotextile over the compacted subgrade. Cover the vapor barrier or geotextile with at least 24 inches of compacted select fill.

d. Excavate for footings using an excavator or backhoe with a smooth-edged bucket to limit soil disturbance. Provide at least 12 inches of select fill beneath all footings.

e. Use an allowable bearing capacity of 3,000 psf for footing design.

f. Assume a total settlement of ±1 inch and a potential differential settlement of ±½ inch (due to expansive soils).

g. Use a modulus of subgrade reaction of ks, of 150 pci, for the floor slab design. Use a thick base slab reinforced with top and bottom steel to help resist differential settlement and reduce potential cracking and warping.

3. Influent Pump Station

a. Design the temporary shoring for the pump station using the lateral loads discussed in the geotechnical report. The shoring system should be designed by an experienced engineer licensed in the State of Oregon. A nominal water table depth of six feet was assumed for design. Prior to construction, the contractor should measure the water level in the BH-3 piezometer to confirm the ground water depth.

b. Provide a relatively water-tight cofferdam for the wet well construction. The cofferdam should be able to prevent sustained ground water flow through the side walls and any loss of ground due to internal piping of the sands. An internally-braced sheet pile cofferdam is recommended. A slide rail or solider pile and lagging systems are not recommended due to concerns with possible piping of the external soil.

c. Contractors should anticipate potentially slow, difficult driving when dense gravels are present and minimal penetration once they encounter bedrock (sandstone and siltstone). For planning purposes it is recommend that it be assumed the sheet pile tips will not penetrate the bedrock more than 12 inches. The contractors bidding on the project should include a contingency for difficult driving in the cost estimate.

d. If the sheet piles cannot provide a dry excavation, additional external dewatering wells, internal well points or other dewatering systems may be required to maintain a water level at least two feet below the bottom of the excavation.

e. The sheet pile tips should be driven into the bedrock to the extent practical to help seal the bottom of the cofferdam and reduce ground water infiltration.

f. Install dewatering wells, well points, deep sumps or a combination thereof as needed to allow continuous pumping of ground water until the entire structure is backfilled and capable of withstanding the hydrostatic pressures. The dewatering should maintain the ground water level at least two feet below the bottom of the excavation. If there is any evidence of seepage or internal piping of soil into the cofferdam or ground loss around its perimeter, excavation inside the shoring system should be discontinued until the dewatering system is improved.

g. Excavate the pump station footprint to the planned subgrade elevation. The final excavation should be completed using an excavator equipped with a smooth-edged bucket to minimize disturbance. Any loose, disturbed, or softened bedrock should be removed. It may not be practical to trim the bottom of the excavation to a level surface. If needed, the rock may be left as an irregular surface and CSLM may be used to level the bottom of the excavation.

h. Once the pump station structure is completed, backfill the sides of the pump station excavation with select fill or CSLM. Select fill, if used as backfill, should be placed in 12-inch thick maximum lifts and compacted with a jumping-jack type compactor. A hoe-pack style compactor should only be used with extreme caution to avoid overstressing the structure. Sheet piles should be extracted in a manner that will not lift or loosen the backfill.

i. The base of the wet well should be designed to resist a buoyant pressure of ±1,125 psf.

j. Design the pump station for the lateral and hydrostatic uplift pressures discussed and seismic parameters discussed in the geotechnical report.

4. Miscellaneous Structures and Lightly Loaded Slabs

a. Design the foundations and floor slabs using a bearing pressure of 3,000 psf and a modulus of subgrade reaction of 150 pci, respectively.

b. Over-excavate under all foundations and slabs at least two feet and cover the subgrade with a vapor barrier or separation geotextile. Place at least 24 inches of select fill or coarse site fill capped by at least 6 inches of select fill.

c. Reinforce the slabs to resist deflection or warping.

5. Everett Avenue Pump Station

a. Design the temporary shoring for the pump station using the lateral loads discussed in the geotechnical report. The shoring system should be designed by an experienced engineer licensed in the State of Oregon. A nominal water table depth of eight feet was assumed for design. Prior to construction, the contractor should measure the water level in the BH-4 piezometer to confirm the ground water depth.

b. Provide a relatively water-tight cofferdam for the wet well construction. The cofferdam should be able to prevent sustained ground water flow through the side walls and any loss of ground due to internal piping. An internally-braced sheet pile cofferdam is recommended, due to its proximity to the existing City's facility. However, a rail system or a soldier pile and timber lagging system may be practical if they can prevent internal piping or ground loss around its exterior.

c. If a sheet pile cofferdam is planned, contractors should anticipate potentially slow, difficult driving through dense gravels below ±7 feet, and minimal penetration once they encounter bedrock (sandstone) at ±12.5 feet. The tips of the sheets should be driven into the siltstone to the extent practical to help seal the bottom of the cofferdam and reduce ground water infiltration.

d. Install dewatering wells, well points, deep sumps or a combination thereof as needed to allow continuous pumping of ground water until the entire structure is backfilled and capable of withstanding the hydrostatic pressures. The dewatering should maintain the ground water level at least two feet below the bottom of the excavation. If there is any evidence of seepage or internal piping of soil into the cofferdam or ground loss around its perimeter, excavation inside the shoring system should be discontinued until the dewatering system is improved.

e. Excavate the pump station footprint to the planned subgrade elevation. If practical, the final excavation should be completed using an excavator equipped with a smooth-edged bucket to minimize disturbance. Any loose, disturbed, or softened bedrock should be removed. It may not be practical to trim the bottom of the excavation to a level surface. If needed, the rock may be left as an irregular surface and CSLM may be used to level the bottom of the excavation.

f. Once the pump station structure is completed, backfill the sides of the pump station excavations with select fill or CSLM. Select fill, if used as backfill, should be placed in 12-inch thick maximum lifts and compacted with a jumping-jack type compactor. A hoe-pack style compactor should only be used with extreme caution to avoid overstressing the structure. Sheet piles, lagging or shoring panels should be extracted in a manner that will not lift or loosen the backfill.

g. Design the pump station for the lateral and hydrostatic uplift pressures discussed in the geotechnical report. The base of the wet well should be designed to resist a buoyant pressure of ±875 psf.

h. Design the structure using the seismic parameters provided in the geotechnical report.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	4.4
Subject:	Specific Process Area 400
	NEW CONTROL BUILDING
Date:	October 15, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE AND SCOPE

The objectives of constructing a new control building are to provide space for the following:

1. Adequately sized laboratory.
2. Additional office space.
3. Plant SCADA operations.
4. Motor control centers (MCCs) and programmable logic controllers (PLCs).
5. New standby generator.
6. Sequencing Batch Reactor (SBR) blowers.
7. Aerobic digester blowers (outer circle).

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are related to the specific process area:

Section	Title	Remarks
2.3	Hydraulic Profile	Graphic representation illustrating relationship between process areas and site elevations.
2.4	Process Schematics	Graphic representation of the process area in relation to the liquid and solids stream.
3.4	Sequencing Batch Reactor (SBR)	Description of the SBR equipment and process.
3.8	Biosolids Treatment	Description of biosolids treatment and dewatering.
4.1	Filter Building	Description of the modifications required for the existing filter building.

4.2	Operations Building	Description of the modifications required for the existing operations building.
5.4	Electrical	Description of electrical components associated with the process area.

PROCESS SCHEMATICS AND PLANS

Refer to drawing A400 series for the proposed control building plan and elevation views.

BACKGROUND

There are two existing buildings on the wastewater treatment plant site; the 4,500 sq. ft. filter building that comprises the chlorine gas system, tertiary filter, laboratory, locker room, offices and a meeting/break room, and the operations building which includes a pump, blower, and generator rooms, and a grit removal system. The existing buildings will be modified and used as discussed in their respective report sections, but they do not provide adequate room to accommodate all of the space requirements associated with the plant upgrades. Additionally, the existing laboratory lacks adequate space and needs upgrading.

SYSTEM DESCRIPTION

A new 3,000 square foot control building will be constructed on the north side of the wastewater treatment plant property. The new stick-built building will house a laboratory, office, plant control area, locker room, laundry room, electrical room, generator room, and blower room and restroom.

<u>Laboratory</u>

The new 600 sq. ft. laboratory will be double the size of the existing laboratory in order to meet the needs of the new facility. Laboratory construction will include the installation of built in counter tops with under counter storage, overhead cabinets, potable water sinks, an island counter work space, and a SCADA computer work station. The laboratory will also include the installation of the following equipment:

1. Fume hood
2. Auxiliary air hood

3. Vented acid storage base cabinet
4. Worktop
5. Dishwasher
6. BOD refrigerator
7. Chemical refrigerator
8. Miscellaneous testing equipment

The existing laboratory space in the filter building will be converted to a storage room. Any usable equipment will be relocated to the new laboratory.

Laundry

A laundry room with washer, dryer and sink will be constructed adjacent to the laboratory. The laundry room will also house the building's hot water heater.

Office

A 480 sq. ft. office will be provided adjacent to the new laboratory. The office will include a built in operator work station.

Electrical Room

The electrical room will be 540 sq. ft. and house the electrical panels, MCCs, and PLCs, for the new plant equipment, as well as telecommunication and networking equipment. A 4'-0" single door will be provided for maintenance access from the front exterior of the building. A 3'-0" door will provide access from the rear exterior of the building.

Generator Room

The 480 sq. ft. generator room will accommodate a new standby generator. The diesel generator will be sized to provide backup power to the new treatment equipment. An exterior wall louver will be provided on the backside (north) of the building. An overhead door for maintenance access from the exterior will be installed on the front side of the building. There will also be a pig tail installed on the exterior of the building to facilitate connection of a portable, stand-by generator if the main generator fails.

Blower Room

The blower room, located on the west side of the building, will be 900 sq. ft. The room is sized to house three SBR blowers and three blowers that will serve the six aerobic digester tanks on the outer rings of both donut units. The blowers will be installed with sound enclosures designed for a maximum of 80 dB three feet outside of the enclosures. An exterior wall louver will be provided on the backside (north) of the building for make up air. An overhead door for maintenance access from the exterior will be installed on the front side of the building.

Access

Each room will be accessible via exterior doors and interior doors will connect each room with the adjacent room.

A paved parking area, which will be shared with the new shop building, will be constructed on the front (south) side of the building.

DESIGN ISSUES YET TO BE RESOLVED

- Structural design of new building.
- Building electrical, mechanical, and plumbing requirements.
- Electrical room layout.
- Blower piping layout.
- Laboratory equipment specifications.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	4.5
Subject:	Specific Process Area 500
	SHOP BUILDING
Date:	October 19, 2015
Prepared By:	Ryan Quigley, P.E.

PURPOSE AND SCOPE

The objectives of constructing a new control building are to provide space for the following:

1. Equipment maintenance and storage.
2. Vehicle maintenance and storage.

PROCESS SCHEMATICS AND PLANS

Refer to drawing A500 for the proposed control building plan and elevation views.

BACKGROUND

Two existing shop buildings currently used for vehicle storage and equipment maintenance will be removed prior to the wastewater plant upgrades. An open, three bay vehicle building sits in the location of the new SBR units and will need to be removed to accommodate the planned surcharge loading required prior to SBR construction. The second closed bay shop conflicts with the access to the new control and shop buildings.

SYSTEM DESCRIPTION

A new 3,200 sq. ft. shop building will be constructed on the north side of the wastewater treatment plant property, adjacent to the new control building and the north donut treatment unit. The new metal building will include two open bays on the south side of the building and a closed bay shop area on the north side of the building. The enclosed shop will be approximately 1,600 sq. ft. and each of the open bays will be approximately 800 sq. ft. All three bays will include concrete finished floors.

Access

The closed bay shop will have a large overhead door for vehicle access from the exterior. Man doors for access to the exterior and between the enclosed shop and open bays will be provided.

A paved parking area, which will be shared with the control building, will be constructed on the front side (west) of the building.

DESIGN ISSUES YET TO BE RESOLVED

- Structural design of new building.
- Building electrical, mechanical, and plumbing requirements.
- Interior finishes.

Section 5 – General Systems

This section discusses design systems that are project wide in nature, that is, they span all process areas. These general systems, shown in the table below, are described in design memorandums that follow.

Description	Design Memorandum Number
Sampling and Metering	5.1
Piping	5.2
Coatings	5.3
Electrical	5.4
Instrumentation	5.5
Reliability	5.6

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	5.1
Subject:	General Systems
	SAMPLING AND METERING
Date:	November 2015
Prepared By:	Brian Allen, E.I.T.

Sampling

Influent and effluent liquid streams will be representatively sampled for permit reporting and process control.

Influent sampling will be accomplished with a 24-hour composite, flow-paced sampler. The influent sampler will be located on a concrete pad adjacent to the existing influent screening station. The influent sampler intake suction tube will be placed in the main channel of the influent screening station. The influent sampler will purge its intake line back into the main channel of the influent screening station. The influent sampler can be time based or flow paced based on signals from the magnetic flow meters on the influent pump station force mains.

Effluent will be sampled with a 24-hour composite, flow-paced sampler from signals received from the magnetic flow meter upstream of the ultraviolet disinfection unit. The effluent sampler will be located on a concrete pad adjacent to the ultraviolet disinfection station. The effluent sampler will receive samples from a sampling port located on the ultraviolet disinfection unit. The influent sampler will purge its intake line into the site sewer collection system.

Metering

The table on the following page lists instruments that will be used in the liquid and solid stream to monitor quality and quantity of treatment.

Metering Instruments				
Instrument	**Purpose**	**Process Area**	**Quantity**	**Location**
Potable Water Flow Meter	Totalized Water Usage	100	1	Water Service Connection
Sonic Transducer with Backup Float	Influent Screening Station Liquid Level	600	1/4	Influent Screening Station
Pressure Transducer with Backup Floats	Influent Pump Station Pump Start/Stop and Alarms	700	1/4	Influent Pump Station
Magnetic Flow Meter	Totalized Flow from the 18" Force Main from the Influent Pump Station	700	1	Headworks
Magnetic Flow Meter	Totalized Flow from the 10" Force Main from the Influent Pump Station	700	1	Headworks
Liquid Level Float	High Water Alarm	800	1	Headworks
Magnetic Flow Meter	Totalized Flow from the 12" Raw Sewage Lines From the SBR	800	4	Headworks
DO Meter	Process Control	900	4	SBR
TSS Meter	Process Control	900	4	SBR
Pressure Transducer with Backup Floats	Water Depth / Storm Mode	900	4/8	SBR
Magnetic Flow Meter	Totalized Flow for the SBR WAS Lines	900	4	SBR
Ultrasonic Liquid Level Transmitter	Depth of Flow in the Tertiary Filter	1000	2	Tertiary Filter
Pressure Transducer	Depth of Flow in the UV Disinfection Unit	1100	1	UV Disinfection
Magnetic Flow Meter	Totalized Flow from the 24" Secondary Tertiary Effluent Line from the SBR/Tertiary Filter to the UV Disinfection Unit	1100	1	UV Disinfection

Metering Instruments				
Instrument	**Purpose**	**Process Area**	**Quantity**	**Location**
Ultrasonic Liquid Level Transmitter with Backup Float	Depth of Flow in Irrigation Tank	1200	1/1	Effluent Disposal - Reuse
Magnetic Flow Meter	Totalized Flow in the Line to Biosolids Dewatering Unit	1200	1	Biosolids Treatment
Magnetic Flow Meter	Totalized Flow in the 18" Reuse Force Main	1200	1	Effluent Disposal - Reuse
Magnetic Flow Meter	Totalized Flow in the Non-Potable Water Force Main	1300	1	Biosolids Treatment
Ultrasonic Liquid Level Transmitter	Liquid Level in the Aerobic Digester Tanks	1300	11/11	Biosolids Treatment

DESIGN ISSUES YET TO BE RESOLVED

- Effluent Sampling Out of the UV Disinfection Unit.
- Magnetic Flow Meter Sizing.
- Location of Turbidimeter For Class A Monitoring
- Biosolids Dewatering Pumps with Built In Meter

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	5.2
Subject:	General Systems
	PIPING
Date:	November 2015
Prepared By:	Brian Allen, E.I.T.

Pipe Identification

A. New, exposed piping, both interior and exterior, will be identified by plastic coding markers with flow arrows. Legend markers and directional arrows will be located at: each side of walls, floors and ceilings, at one side of each piece of equipment, at piping intersections, and at approximately 50-foot centers.

B. Plastic tape will be used above buried piping. A single line of tape will be installed 2.5 feet above the centerline of buried pipe.

C. Magnetic tracer tape will be used with all buried non-ferrous, plastic and reinforced thermosetting resin pipe. The tape will be buried 12 to 18-inches below ground.

D. Stainless steel tags with the specified valve number stamped in 1/4-inch high letters will be installed on valve flanges in a position visible from floor level.

Pipe Testing

All piping will be tested. Aeration air system will be tested with air; however, the majority of the pipe systems, which are liquid systems, will be tested with water. Test pressures will be determined during design or as specified by the Uniform Pluming Code (UPC) or Department of Environmental Quality (DEQ).

Description

The following systems are used or encountered during project design:

Symbol	Service	Usage or Fluid Description
A	Aeration Air	Aeration air for mixing and stabilization
BW	Backwash	Backwash water from Tertiary Filter
D	Drain	Drain from equipment or plumbing
DB	Digested Biosolids	Biosolids transfer and flow to the screw press
FE	Final Effluent	Disinfected discharge from the UV Disinfection system
G	Grit	Grit slurry from grit removal system
HW	Hot Water	Plumbing at site buildings
NPW	Non-Potable Water	Water from the non-potable water system
OF	Over Flow	Secondary flow outlet to prevent uncontrolled overflows when the main outlet is plugged for the following processes: Headworks, UV Disinfection, Tertiary Filters
RS	Raw Sewage	Influent to treatment plant
RW	Reuse Water	Class A reuse water
SE	Secondary Effluent	Effluent leaving SBR that has been treated, but not disinfected
SN	Supernatant	Decanted liquid from the digesters
SS	Sanitary Sewer	Waste line from the treatment site buildings
STD	Storm Drain	Storm drain line used for rain water and spillage
TD	Tank Drain	Drain from bottom of tanks
TE	Tertiary Effluent	Effluent leaving the tertiary filter system but not disinfected
TW	Tempered Water	Water conditioned for the emergency shower
V	Vent	Vent line used for equipment or plumbing at site buildings
WAS	Waste Activated Sludge	Sludge from the SBR that is pumped to the digesters
W	City Water	Potable water

Systems Description

The table on the following page describes the material, joints, and valves used in piping systems in this project.

PIPING SYSTEMS

Symbol	Service	Diameter	**Exposed** (or submerged with appropriate coating)				**Buried**			
			Material	**Joint**	**Fittings**	**Valves**	**Material**	**Joint**	**Fittings**	**Valves**
A	Aeration Air from Blowers to SBR/Digesters	All	Stainless Steel	Welded/Flanged	Stainless Steel	Butterfly	Welded Steel	Flanged, Grouted, Welded	Welded Steel	None
	Aeration Air inside SBR/Digesters	All	PVC, Sch. 80	Solvent Welded	PVC, Sch. 80	None	-----	-----	-----	-----
BW	Back Wash	All	PVC, Sch. 80	Solvent Welded	PVC, Sch. 80	Eccentric Plug	PVC, C900	Bell & Spigot	Ductile/Cast Iron	Eccentric Plug
D	Drain	3" and smaller	PVC, Sch. 80	Solvent Welded	PVC, Sch. 80	Eccentric Plug	PVC, Sch. 80	Solvent Welded	PVC	None
		4" and larger	Ductile Iron	Flanged / Groove	Ductile Iron	Eccentric Plug	PVC, C900	Bell & Spigot	Ductile/Cast Iron	None
DB	Digested Biosolids	6"	Ductile Iron	Flanged / Groove	Ductile Iron	Eccentric Plug	PVC, C900	Bell & Spigot	Ductile/Cast Iron	None
DS	Digested Sludge	All	PVC, Sch. 80	Solvent Welded / Flanged / PVC, Sch. 80	PVC, Sch. 80	Eccentric Plug	PVC, C900	Bell & Spigot	Ductile/Cast Iron	Eccentric Plug
SE	Secondary Effluent	All	Ductile Iron	Flanged	Ductile/Cast Iron	Eccentric Plug	Ductile Iron	Mechanical	Ductile/Cast Iron	Eccentric Plug
FE	Final Effluent	All	Ductile Iron	Flanged	Ductile/Cast Iron	Eccentric Plug	Ductile Iron	Mechanical	Ductile/Cast Iron	Eccentric Plug
G	Grit Slurry	All	PVC, Sch. 80	Solvent Welded / Flanged / PVC, Sch. 80	PVC, Sch. 80	Eccentric Plug	-----	-----	-----	-----
HW	Hot Water	All	Copper Tube	Solder/Threaded/Flanged	Wrought Copper / Bronze	Ball	-----	-----	Mechanical Joint	-----
NPW	Non-Potable Water	All	SS / PVC, Sch. 80	Threaded / Flanged / Solvent Welded	SS / PVC, Sch. 80	Ball	PVC, C900	Bell & Spigot	PVC	Gate
RS	Raw Sewage	All	Ductile Iron	Flanged	Ductile Iron	Eccentric Plug	Ductile Iron / PVC, C900	Mechanical	Ductile/Cast Iron	Eccentric Plug
RW	Reuse Water	All	Ductile Iron	Flanged	Ductile Iron	Eccentric Plug	Ductile Iron / PVC, C900	Mechanical	Ductile/Cast Iron	Eccentric Plug
SD	Sanitary Drain	3" and smaller	PVC, Sch. 80	Threaded / Solvent Welded	PVC, Sch. 80	None				
		4" and larger	Cast Iron Soil Pipe	Hubless	Cast Iron	None	PVC	Mechanical / Bell & Spigot	Ductile/Cast Iron	None
SN	Supernatant	All	Ductile Iron	Flanged / Groove	Ductile Iron	Telescoping	Ductile Iron	Mechanical	Ductile/Cast Iron	Eccentric Plug
STD	Storm Drain	All	-----	-----	-----	-----	PVC	Bell & Spigot	PVC	None
TE	Tertiary Effluent	All	Ductile Iron	Flanged	Ductile/Cast Iron	Eccentric Plug	Ductile Iron	Mechanical	Ductile/Cast Iron	Eccentric Plug
TD	Tank Drain	All	Ductile Iron	Flanged / Groove	Ductile Iron	Eccentric Plug	Ductile Iron	Mechanical	Ductile/Cast Iron	Mud
TW	Tempered Water	All	Copper Tube	Solder / Threaded / Flanged	Wrought Copper / Bronze	Ball	K Copper Tube	Threaded/Flanged	Wrought Copper / Bronze	Gate
V	Vent	3" and smaller	PVC, Sch. 80	Threaded / Solvent Welded	PVC, Sch. 80	None	PVC	Solvent Welded	PVC	None
		4" and larger	Cast Iron Soil Pipe	Hubless	Cast Iron	None	PVC	Mechanical / Solvent Welded	Ductile/Cast Iron	None
WAS	Waste Activated Sludge	All	PVC, Sch. 80	Flanged / Solvent Welded	PVC, Sch. 80	Eccentric Plug	PVC, Sch. 80	Mechanical	PVC, Sch. 80	Eccentric Plug
W	City Water	2" and smaller	Copper Tube	Solder / Threaded / Flanged	Wrought Copper / Bronze	Ball	PVC, Sch. 80	Mechanical	PVC, Sch. 80	Ball / Gate

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	5.3
Subject:	General Systems
	COATINGS
Date:	November 2015
Prepared By:	

Description

This section discusses coatings used in the project. This includes metal, wood, plastics and cementitious surfaces on new improvements and modified or damaged existing components.

Four general coating systems will be used in addition to grease, buried pipe encasements and moisture barriers. Four general coating systems are shown below:

1. **Epoxy** of varying thickness, depending upon the application, is the basic metal surface coating.
2. **Urethane** is used as an overcoat for epoxy that is exposed to sunlight.
3. **Polyamidoamine epoxy** is used for immersed metals.
4. **Latex** is used for exposed plastic conduits and building surfaces that are not shop coated.

COATING SCHEDULE

The following pages relate surfaces to the coating system.

Equipment and Ferrous Metals (in general)		
	Interior	Epoxy
	Exterior	Urethane
	Submerged/Immersed	Polyamidoamine epoxy
Non-Ferrous Metals (in general)		
	Interior and exterior	Uncoated
Piping and Conduit		
	Immersed cast iron or steel piping, and appurtenant hangers and supports	Polyamidoamine epoxy
	PVC and CPVC piping (and conduit) exposed to direct sunlight	Latex
	Interior, exposed piping valves, appurtenances, hangers, clamps and supports	Epoxy
	Exterior, exposed piping valves, appurtenances, hangers, clamps and supports	Urethane
Cementitious Surfaces		
	Exterior (in general)	Uncoated
	Interior	Latex
	Equipment Building walls, Headworks, Water Bearing Tanks, Wet Wells	Moisture coated
Wood Surfaces		
	Interior/Exterior	Latex
Door and Door Frames		
	Steel	
	Interior	Epoxy
	Exterior	Urethane
	Aluminum	Shop-Coated
Handrails, Gratings, Floor Plates and Hatches		
	Interior and exterior	Uncoated
Aluminum or Stainless Steel Flashing, Light Standards, Supports and Louvers		
	Interior and exterior	Uncoated
Slide, Sluice and Stop Gates		
	Aluminum or stainless steel	Uncoated
	Ferrous	Shop coated
	Operators	Urethane

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin Wastewater System Improvements
Section:	5.4
Subject:	General Systems **ELECTRICAL**
Date:	November 25, 2015
Prepared By:	Ryan Quigley, P.E. Gregg Scholz, P.E. – R&W Engineering, Inc.

INTRODUCTION

This section describes the electrical system used at the wastewater treatment plant site (Plant Site) and the Everett Avenue Pump Station. Discussion of reliability components of the electrical system and each particular process area in relation to the standby power system is found in Section 5.6 (Reliability).

The areas of discussion in this section include the following:

1. Electrical Power Service and Distribution
2. Emergency Standby Power
3. Control System

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report.

Section	Title	Remarks
3.9	Plant Site Facilities Design	Overview of the modifications to the existing treatment plant site
3.10	Everett Avenue Pump Station	Discussion of preliminary the pump station design
5.6	Reliability	Discussion of the electrical system with respect to component reliability issues

WASTEWATER TREATMENT PLANT SITE

Existing Utility Service

The Waste Water Treatment Plant is supplied with a 480 V, 3 phase, 3 wire electrical service from Douglas Electric Cooperative. The utility overhead primary feeds three transformers mounted on an H frame structure outside the fence at the southeast corner of the treatment plant site. The utility meter is located on this pole structure.

The existing service entrance conductors are 4-250 kcmil aluminum conductors per phase in 4-2 inch conduits routed underground from the transformer pole structure to the motor control center in the Operations Building. The motor control center, built in 1979, has an 800 ampere rated main circuit breaker and a split bus to feed the treatment plant loads.

The MCC bus split is connected to the transfer switch and standby generator. All loads downstream of the bus split are provided with electrical power from the generator through the transfer switch if the utility supply fails.

The serving utility provided data from the period of November 2014 through October 2015. This data shows that the maximum demand used at the treatment plant is 284.48 kW. This value can be used during design of the new facilities to determine the capability of additional loads on the original service.

Existing Standby Power

The existing standby generator is a Cummins Power unit that is rated 360 kW at 480 V, 3 phase. The engine operates on diesel from a day tank and outdoor storage tank. The generator system is old and should be considered for replacement.

The existing transfer switch is also old and needs to be replaced. The existing conductors between the transfer switch and the MCC are in good condition but will need to be evaluated for reuse during design.

Existing Control System

The existing plant control system was installed with the original plant construction and is old. A new control system should be considered during the plant upgrade design. There are limited monitoring systems, alarms that are not operating, and most process equipment is controlled by manual switches and pilot lights. Most of the original process recording equipment has been removed or is inoperable.

Proposed Utility Service

Douglas Electric Cooperative has determined that their distribution system in the area around the treatment plant is adequate to serve the proposed plant addition. During the design phase work will be coordinated with Douglas Electric to determine the best location for a new transformer. The representative from Douglas Electric Coop has stated that the City will need to file an application and pay an application fee to start the process of developing the additional service to the treatment plant.

The utility can supply a pad mounted transformer that is sized for the new loads. The transformer will be located near the proposed control building electrical room. This new transformer will supply a second metered service to the plant site. Loads for the new plant process will be balanced between the existing and new electrical services during design based on the size, service capacity, and location.

The proposed new electrical distribution will likely consist of the following components:

1. Utility metering cabinet.
2. Main service switchboard.
    a. Main disconnect.
    b. Automatic transfer switch.
    c. Distribution circuit breakers for building panels.
    d. Distribution breakers for variable speed drive.
    e. Circuit breaker for motor control center.
3. Motor Control Center and process control panels for motor starters and smaller VFDs.

4. Step down transformers for 120 volt loads.
5. Panel boards for HVAC and equipment loads.
6. Circuit breaker panels for lights and other small loads.

Sizing of the additional electrical service will be determined during the design phase.

Proposed Standby Power

A new diesel powered standby generator will be designed to provide back-up power to the second service. Preliminary sizing with the proposed loads and expected diversity calculates to require a generator that is in the 600 – 750 kW range. This size range is based on assumptions as to which loads are required to start in sequence. Final size can be determined during the design phase.

Because of the age of the existing standby generator, it is recommended that it be replaced with a new unit. During preliminary design we will determine which of the loads can be added to the existing electrical service and therefore powered by the replacement generator. This new generator will likely be the same size as the existing or slightly smaller in the 300 kW size range.

Fuel tank location and sizes will be determined during the design phase. Generators in this size range are most economical when powered by diesel engines.

Proposed Control System

The proposed treatment plant processes will be controlled by a number of different manufacturers packaged systems. The new plant-wide control system should consist of a network of process controllers all coordinated to communicate with the plant supervisory control and data acquisition (SCADA) system.

Each independent process will be controlled locally by the manufacturer provided programmable logic controller (PLC) that is designed to operate the specific process. Local operator interface can be provided by switches, pilot lights and/or operator touch screen consoles as needed for effective local control. Plant processes that are not manufacturer specific, such as effluent irrigation will be controlled by the plant PLC system. The chart below shows a breakdown of processes with proposed control system.

Process	**Plant PLC**	**MFR. PLC**
Influent screening		1
Influent pump station		2
Existing wet well pumps	A	
Headworks screening		3
SBR		4
Filter		5
UV disinfection		6
Biosolids pumping	B	
Dewatering screw press		7
Digester blowers	B	
Effluent pumping	A	

Notes:

1. Manufacturer PLC numbers indicate expected independent process.
2. Plant PLC letters indicate expected area split for plant PLC network.

The master SCADA terminal will operate on a desktop computer and provide complete plant control, monitoring, and alarming. The SCADA system will also communicate with pump stations and valve control stations outside of the plant site. During the design phase the project team will determine the best method for communication with remote sites.
Online access will be provided through the master SCADA terminal. This will allow operator interface through password protected logins to monitor and control the plant process.

EVERETT AVENUE PUMP STATION

The Everett Pump Station is served by Pacificorp (PP & L) with a 120/240 V, 3 phase, 4 wire electrical service. The service is provided by three transformers mounted on a pole in the alley north of the pump station property and enters the pump station building through an underground conduit to the flush mounted meter base on the north exterior wall.

The existing electrical distribution consists of a motor control center (MCC) and transfer switch. The 400 A, 240 V 3 phase transfer switch was added in 2013 and is in new condition. This switch will not be useable with a new 480 V service that is sized for the proposed pumps. The City can consider reusing this switch at another facility.

The existing MCC is original equipment installed when the pump station was constructed. This is old and must be replaced with a distribution system that is rated for the 480 V service.

Existing Standby Power

The existing generator is a natural gas power standby unit installed in the yard north of the pump station building. The gas supply is metered near the generator pad. The generator is rated 125 kW, presently connected as a 240 V, 3 phase source.

Proposed Electrical Service

The existing 240 V service will need to be replaced to accommodate the new larger pumps. A new service from Pacificorp has been determined to be feasible at the pump station site. Pacificorp will determine the best location for transformer and pole drop to accommodate a new 480 V, 3-phase, 400 A rated electrical services at the station.

The new distribution system will need to include utility metering cabinet, meter base, main circuit breaker, 480 V rated transfer switch, distribution panel and variable speed controllers for each pump.

A stepdown transformer and 120/240 V panel will provide service for lights, receptacles and other miscellaneous loads at the pump station site.

Proposed Standby Power

The existing generator is not adequate to start and operate two of the proposed sewage pumps simultaneously. During the design phase this generator will be evaluated to determine if it can be configured to provide 480 V service. Sizing calculation will be run to determine if at least one of the proposed 60 HP pumps can be started and operated successfully to meet current flow conditions. It may be possible to operate two pumps on a slightly reduced speed while on generator power.

If it is determined that the existing generator is not useable, a new diesel engine driven generator will be designed to operate two duty pumps. This generator will be supplied with a skid mounted fuel tank and weatherproof, sound attenuating outdoor enclosure. The fuel tank will be sized to provide a minimum of 24 hours of run time at full load.

Proposed Control System

The pump station wet well level will be monitored by a submerged pressure transducer and controller. The controller will provide signals to each pump variable speed drive to control pump start, stop, and operating speed. Float will also be provided for the backup control system. Alarms from the pump station will be transmitted by fiber optics using a communications method determined to interface with the SCADA system designed at the treatment plant.

SUMMARY

The overall electrical and control system design will comply with the 2014 National Electrical Code (NEC) and State of Oregon Department of Environmental Quality (DEQ) Standards for Waste Water Projects. Areas within the plant will be designated as hazardous based on National Fire Protection Association (NFPA) Standard 820, latest edition.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin Wastewater System Improvements
Section:	5.5
Subject:	General Systems **INSTRUMENTATION**
Date:	November, 2015
Prepared By:	Steve Major, P.E.

GENERAL

This section describes the instrumentation system that will be used for process measurement, control, and recording. A preliminary list of instruments used in this project is included at the end of each process section listed in Section 3.

Instrumentation design is based on one shift per day operation of the plant. Location of the supervising and main operational area will be at the laboratory in the new control building.

Electrically driven process equipment will be controlled from dedicated equipment panels. In general, instruments that control the equipment, such as a float and pressure sensor, will be connected to the panel. Local control panels, which form a distributed control network throughout the plant, will supervise the panels. All process equipment control panels will have at least one common alarm signal that reports to the plant control system network.

Each local control panel will have a programmable logic controller (PLC) that will perform the calculations on derived flow measurements, and provide an operator interface to change some equipment processing parameters, such as the flow rate to the disinfection equipment. In addition, the local control panel in the electrical room of the new control building will contain the autodialer and modem.

ASSOCIATED SECTIONS

The following table directs the reader to sections of the report that are associated with this section:

Section	Title	Remarks
4.0	Facilities Design	Overview of the modifications to the existing treatment plant site.
5.4	Electrical	Overview of the plant electrical system

SCHEMATICS AND PLANS

A graphic description of the main control panel network may be found in the 11” x 17” drawing set that accompanies this report. Refer to drawing P4.

CONTROLLING AND MONITORING PROCESS AREAS

The following methods will control and monitor the individual process areas:

A. Hand/off/automatic switches will allow equipment to be operated manually or automatically. “Hand” and “Off” are manual controls and “Auto” releases manual control for automatic operation that is particular to the equipment use.

B. The majority of the new equipment will have dedicated control panels. The control panels will contain motor starters, variable frequency drives, bypass starters, programmable logic controller, etc. for automatically and locally starting and supervising the equipment. Each panel will have terminals and input/output blocks for interconnection with other equipment and controlling devices, such as, level, flow, and pressure instruments.

C. All control panels will have (at least) a common alarm terminal. The alarm terminals will be connected to the main control panel.

D. The main control panel will be a free standing panel that resides in the electrical room of the new control building and includes a programmable logic controller (PLC), an input/output rack, an operator interface, autodialer, modem, and an uninterruptible power supply. The panel will contain indicators for all flow meters and will provide a terminal point for instruments not directly associated with another control panel. In addition, the PLC will interlock equipment and provide calculating or decision making capabilities.

CONTROL SYSTEM SUPPORT

The controls for each individual process area will be supported by the following methods:

A. The programmed control systems for the new process areas, that is, equipment control panels and the site control panels, will have erasable programmable read-only memory (EPROM) that will retain the program through power loss.

B. Individual systems will each have an uninterruptible power supply.

C. Common alarms, if electro-mechanical, will fail in the closed position.

D. Automatically controlled equipment will allow manual control, that is, “hand/off/automatic” or “on/off” switches.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	5.6
Subject:	General Systems
	RELIABILITY
Date:	November 2015
Prepared By:	Brian Allen, E.I.T.

General

This memorandum discusses the design criteria of the wastewater plant improvements with respect to those reliability standards and is subdivided as listed below:

1. Locations and Expansion
2. Piping
3. Component Maintenance and Repair
4. Component Reliability
5. Electrical System

The wastewater treatment plant components and process areas will be designed using Environmental Protection Agency (EPA) Reliability Class I standards. Component reliability is discussed later in this Memorandum.

Location and Expansion

A. The existing wastewater treatment plant is situated outside of the 100-year flood plain. The new treatment plant upgrades will be situated outside of the 100-year flood plain.

B. The north east corner of the existing site will be cleared and used as the location for the new maintenance building. The existing maintenance buildings and shops will be demolished and removed to make space for the new SBR.

Piping

A. In general, piping will be designed to allow for adequate passage of design flows and maintaining cleansing velocities. Isolation valves, cleanouts, and takedown fittings will be installed to facilitate pipe maintenance.

B. Sludge conveyance pipe systems will be made for flushing and mechanical cleanout of sludge to prevent blockages.

Component Maintenance and Repair

A. Sufficient space will be designed around each component to allow for maintenance of the equipment.

B. Isolation valves will be provided in piping systems to allow the equipment to be removed without taking a basin or redundant component out of service.

C. Interior equipment positions will have large access doors to allow interior equipment to be removed and replaced. Skid mounted equipment and blowers will be designed for trundle movement through the doors.

D. All submersible pumps and mixers will be rail mounted and the top of the wet well will have provisions for a davit type crane.

E. On site non-potable water system will be available for flushing and wash down of equipment.

Component Reliability

A. Influent Screening Facility (Process Area 600)

   1. Shaftless Screw Screening Equipment

      a. Equipment Reliability

         The influent screening facility will have two screening units in parallel operation. Both units will be in continuous operation with the option of isolating either unit from influent flow for maintenance and repairs. Each unit will have enough capacity to screen the maximum monthly wet weather flow and therefore the ability to adequately screen influent with one unit out of operation.

      b. Emergency Power (Loss of Normal Power)

The influent screening facility will be connected to the existing emergency standby generator system.

B. Influent Pump Station (Process Area 700)

1. Pumps

a. Equipment Reliability

The influent pump station has three high capacity duty pumps (2.93 MGD per pump) and two low capacity jockey pumps (1.5 MGD per pump). The pump station is sized to handle the 20-year projected peak instantaneous flow (8.8 MGD) with one of the three high capacity duty pumps out of service. The two jockey pumps together have the same pump capacity as one duty pump and therefore they serve as a redundant backup for the pump system.

b. Emergency Power (Loss of Normal Power)

The influent pump station will be connected to the new emergency standby generator system.

C. Headworks Grit and Flow Splitting (Process Area 800)

1. Grit Removal

a. Equipment Reliability

Grit removal consists of a vortex grit basin with grit classifier. A pump removes settled grit from the bottom of the basin and transfers the material to the classifier. Neither the grit chamber nor the classifiers are redundant. The headworks screen and grit removal system will have a bypass to allow for maintenance of the grit removal system.

b. Emergency Power (Loss of Normal Power)

The grit removal system will be connected to the new emergency standby generator system.

D. Sequencing Batch Reactor (Process Area 900)

1. Sequencing Batch Reactor

a. Equipment Reliability

The SBR will have four identical basins containing a decanter, waste activated sludge (WAS) pump, mixer and instrumentation. During normal operations any one of the four basins can be temporarily taken out of service. Each basin is sized for one quarter of the 20-year projected peak daily flow.

b. Emergency Power (Loss of Normal Power)

The SBR system will be connected to the new emergency standby generator system.

2. Aeration Blowers

a. Equipment Reliability

Three 75 horsepower aeration blowers will be installed. Two blowers have the capacity to service all four SBR basins. The third aeration blower serves as a redundant backup. Any of the aeration blowers can send air to any tank.

b. Emergency Power (Loss of Normal Power)

The aeration blowers will be connected to the new emergency standby generator system.

3. Air Diffusers

a. Equipment Reliability

Each basin has a single air diffuser system that is controlled with a single automatic air valve. The valves can be manually activated if the air actuator malfunctions.

E. Tertiary Treatment (Process Area 1000)

1. Rotating Disk Filter

a. Equipment Reliability

Two rotating disk filters will service summertime flows (June 1st to October 31st). Each filter is capable of handling the maximum monthly dry weather flow (1.8 MGD) and therefore if one of the filters malfunctions then the other will be capable of handling 100% of the design flow.

b. Emergency Power (Loss of Normal Power)

The tertiary filter system will be connected to new emergency standby generator system.

F. Disinfection (Process Area 1100)

1. Disinfection Equipment

a. Equipment Reliability

One ultraviolet disinfection unit will service the secondary effluent leaving the SBR or tertiary effluent from the tertiary filters. The disinfection unit is capable of treating the peak decant flow rate while the SBR is operating in storm mode (7.0 MGD). There is a piped bypass system that will allow the disinfection unit to be taken out of service. If required the hypo chloride system can provide backup disinfection during wet weather flows.

b. Emergency Power (Loss of Normal Power)

The ultraviolet disinfection unit is connected to new emergency standby generator system.

G. Effluent Disposal/Reuse (Process Area 1200)

1. Calapooya Creek (November 1st to May 31st, pending creek flows)

a. Equipment Reliability

Effluent disposal to Calapooya Creek can occur when creek flows exceed minimum flow requirements. During low creek flows effluent will be discharged to the golf course or Ford's pond. Effluent is conveyed to Calapooya Creek through an existing gravity system.

b. Emergency Power (Loss of Normal Power)

Not applicable.

2. Golf Course Pond (June 1st – October 31st)

a. Equipment Reliability

Effluent disposal to the golf course pond is intended for dry weather flows. Effluent is conveyed to the golf course pond by an 18-inch diameter force main utilizing two 50 horsepower and one 20 horsepower vertical turbine pumps. One of the two 50 horsepower pumps acts as a redundant backup. If the golf course pond is unable to receive effluent then all effluent will be directed to Ford's Pond.

b. Emergency Power (Loss of Normal Power)

The 50 horsepower pumps will be connected to the existing standby emergency generator system.

3. Ford's Pond (June 1st – October 31st).

a. Equipment Reliability

Effluent disposal to Ford's Pond is intended for dry weather flows Effluent is conveyed to Ford's Pond by an 18-inch diameter force main utilizing one 20 horsepower pump. If Ford's Pond is unable to receive effluent then all effluent will be directed to the golf course's pond.

b. Emergency Power (Loss of Normal Power)

The 20 horsepower pump will be connected to the existing emergency standby generator system

4. Reuse Fill Station

a. Equipment Reliability

Effluent disposal to the re-use fill station is supplementary to the other sources of effluent disposal. One 20 horsepower pump supplies final effluent to a vehicle mounted tank for offsite use. The re-use fill station is not a critical component of the disposal system and therefore no redundancy or backup pumps are utilized.

b. Emergency Power (Loss of Normal Power)

Not applicable.

H. Biosolids Treatment (Process Area 1300)

1. North/South Aerobic Digester

a. Equipment Reliability (Liquid Sludge Holding Tanks)

There are four liquid sludge holding / aerobic digestion tanks in each of the north/south tank systems. The tanks are outfitted with a drain, telescoping decanter, sludge transfer pipework, WAS pipework, and aeration equipment. The decanter and drain act as redundant systems for removing liquid and sludge from the tanks. The WAS pipework is a 3-inch diameter force main from the SBR which discharges into each tank. The WAS system is discussed in subsection "5.6.D - Sequencing Batch Reactor (Process Area 900)". The sludge transfer system and pipework is a way to move biosolids from any one liquid biosolids holding tank to any other liquid biosolids holding tank within the north and south tank systems. The biosolids transfer system is mentioned in subsection "5.6.H.1.c – Biosolids Treatment". Each of the liquid biosolids holding tanks contain aeration equipment, which receives pressurized air from a combination of six blowers. There are three blowers that service the interior liquid biosolids holding tanks and three blowers that service the exterior biosolids holding tanks. The interior and exterior blower systems only operate two of their three blowers. The third blower of both systems is a redundant backup.

b. Equipment Reliability (Irrigation Tank)

The irrigation tank located within the north aerobic digester tank system is outfitted with a tank drain, two 50 horsepower reuse pumps, and one 20 horsepower reuse pump, and a weir structure that serves as the inlet to the outfall pipe. The drain, reuse pumps, telescoping decanter, and outfall act as redundant systems for removing liquid from the irrigation tank. Only one of the two 50 horsepower pumps is required to convey final effluent to the effluent disposal system, the second pump acts as a redundant backup. The 20 horsepower pump is used for the reuse fill station and Ford's pond. The larger pumps can also be used for this function.

c. Equipment Reliability (Biosolids Transfer Tank)

The north and south biosolids transfer tanks are outfitted with two 5 horsepower pumps that operate as part of the biosolids transfer system. Only one of the 5 horsepower pumps in each tank is required to achieve design flows, the second pump serves as a redundant backup.

d. Equipment Reliability (Chlorine Contact Tank)

The chlorine contact tank is located within the south aerobic digester tank system and is outfitted with a tank drain and weir outlet. The normal operation for flow is to travel over the outlet weir and then to the irrigation tank. The drain acts as redundant systems for removing liquid and sludge from the chlorine contact tank.

e. Emergency Power (Loss of Normal Power)

The two pump systems will be connected to new existing standby emergency generator system.

2. Biosolids Dewatering

a. Equipment Reliability

Liquid sludge is conveyed to the biosolids screw press dewatering unit through a 6-inch diameter force main utilizing one pump located in the south biosolids transfer tank. The dewatered sludge will be temporarily stockpiled onsite until ready for offsite disposal. The sludge dewatering equipment does not play a critical role in the liquid stream process and can be temporarily taken out of service. The one biosolids feed pump will not be connected to the existing standby emergency generator system.

I. Everett Avenue Pump Station (Process Area 1400)

a. Equipment Reliability

The Everett Ave. Pump Station has three high capacity duty pumps (1.8 MGD per pump, with two pumps running). The pump station is sized to handle the 20-year peak day average flow (3.6 MGD) with one of the three high capacity duty pumps out of service. The third pump serves as a redundant backup for the pump system.

b. Emergency Power (Loss of Normal Power)
The Everett Avenue Pump Station will be connected to a standby emergency generator system.

Electrical System

A. Motor Control

1. New motor controls will be individually distributed to dedicated control panels for the specific process.
2. Power will be divided and distributed to the individual control panels by a main switchboard. The feeding circuits will have breaker settings coordinated with the panel and allow individual disruption and resetting without causing fault in other panels.
3. The condition of the power, voltage, surge and phase will be monitored at the main breaker compartment of the switchboard and at individual control panels.
4. In general, control panels will be clustered inside the electrical room. Remote stations for equipment control will be in enclosures rated for the environment, such as explosion-proof, NEMA 4x, etc.
5. The influent screening facility, grit removal, UV disinfection, and tertiary filter panels will have field mounted control panels adjacent to the equipment.
6. Remote stations for equipment control will be in enclosures rated for the environment, such as explosion-proof, NEMA 4x, etc.

B. Automatic Control

a. Automatically controlled equipment will have manual control for starting and stopping (HAND/OFF/AUTO switches).
b. Modulating devices, such as variable frequency drives, will have bypass starters and manual settings.

c. All equipment will be designed to restart in the control position designated before a power outage.

C. Alarms

1. Each control panel will have at least one common alarm that is connected to the alarm system. Local alarms will be annunciated through either flashing lights or audible signals. Alarms will also activate the auto-dialer system to notify operating personnel.

D. Emergency Power

1. A new generator will be installed in the new control building. The generator will have an automatic transfer switch and 24-hour capacity diesel fuel tank. The generator will be sized to operate all equipment required for emergency plant operation for the new facilities. The existing standby generator will be replaced. The generator will power all equipment associated with the north and south aerobic digesters and filter building.
2. The sequencing batch reactor (SBR) programmable logic controller (PLC) panel will have an uninterruptible power supply with duration to bridge any outages that may occur during transfer.

DESIGN ISSUES YET TO BE RESOLVED

- Non potable site source pump and pipe system
- Existing wet well pump and pipe system

Section 6 – Implementation

This section discusses design system implementation on a project wide basis. The implementation sections are shown in the table below and described in the corresponding sections.

Description	Design Memorandum Number
Schedule	6.1
Operations During Construction	6.2
Construction Documents	6.3
Cost Estimates	6.4

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	6.1
Subject:	Implementation
	SCHEDULE
Date:	November 2015
Prepared By:	Steve Major, PE

Description

This section discusses the construction schedule consisting of a list of times at which tasks, events, and actions are intended to take place. A graphical schedule is located at the end of this section

Associated Sections

The following table directs the reader to sections of the report that are related to this section:

Section	Title	Remarks
6.2	Operation During Construction	Describes phasing of the project.
6.3	Contract Documents	A list of the specifications required for construction.
6.4	Cost Estimate	Describes and breaks down the costs associated with given tasks.

Schedule

<u>Phase 1, Design, Permits, and Pre Load</u>

This phase involves completing the Pre-Design Report and Final Design for submission for submission to DEQ for approval, permits, and preload of the SBR area. The applications for regulatory permits such as the National Pollutant Discharge Elimination System (NPDES) permit, and the joint Department of State Lands/Corps of Engineers fill and removal permit are part of this phase. The preload of the SBR site must also be completed during final design to allow for the required settling prior to the start of the construction phase. Work completed in this phase is scheduled for completion by April, 2017.

Phase 2, New Treatment Facility

This phase includes construction of the new control building, shop building, modifications to the existing screening facility, new influent pump station, headworks, SBR, tertiary treatment, and ultra violet disinfection facility. All of the new facilities must be made fully operational prior to taking the existing facility offline. Work in Phase 2 is expected to be completed by June, 2018.

Phase 3, Rehabilitation to the Existing Treatment Facility

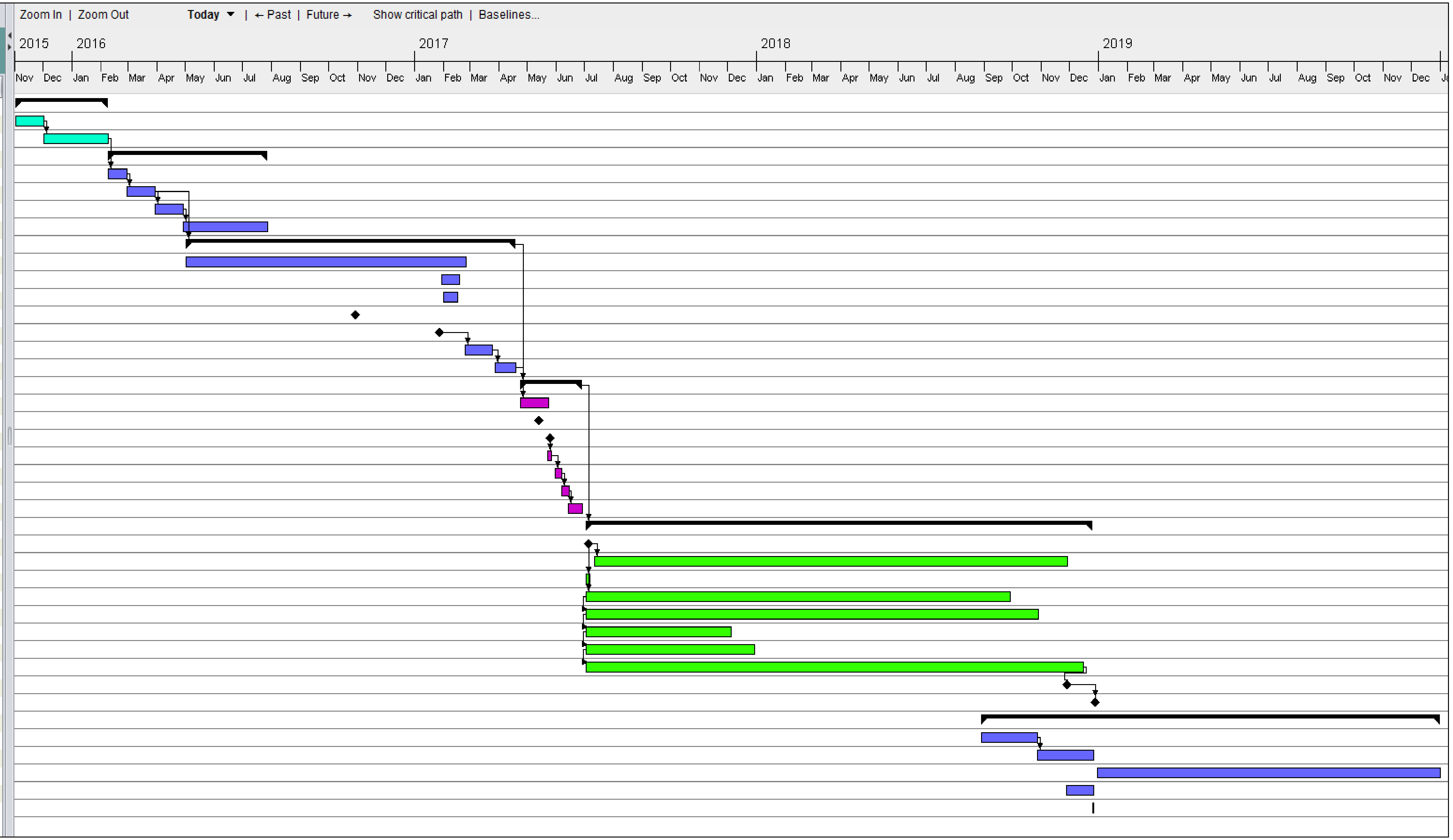
This phase includes rehabilitation of the Everett Avenue pump station, modifications to the existing filter building for the biosolids dewatering facility, modifications to the operations building, the existing operations building, site civil activities, and construction of the biosolids storage facility. Work in phase 3 is expected to be completed by December, 2018.

Phase 4, Performance Evaluation Period

All new facilities must go through a performance evaluation phase to ensure all equipment and processes are operational as specified. This evaluation period lasts for 12 months after final completion of the project or December, 2019.

Gantt Chart

Name	Duration	Begin ...	End date
Pre-Design Report	99	11/2/15	2/8/16
Submit to DEQ	30	11/2/15	12/1/15
DEQ Review	69	12/2/15	2/8/16
Pre-Load Phase	170	2/9/16	7/27/16
Design	20	2/9/16	2/28/16
Bidding	30	2/29/16	3/29/16
Construction	30	3/30/16	4/28/16
Load Phase	90	4/29/16	7/27/16
Consruction Documents	352	5/2/16	4/18/17
Prepare Final Drawings...	299	5/2/16	2/24/17
Develope Bidding Docu...	19	1/30/17	2/17/17
Prepare Final Construct...	15	2/1/17	2/15/17
60 Percent Design Revi...	0	10/27/16	10/27/16
90 Percent Design Revi...	0	1/25/17	1/25/17
Submittal and DEQ Rev...	29	2/24/17	3/24/17
Submit Final Copies of ...	22	3/28/17	4/18/17
Bidding	66	4/24/17	6/28/17
Advertising for Bid	30	4/24/17	5/23/17
Pre-bid Conference at t...	0	5/11/17	5/11/17
Open Bids	0	5/23/17	5/23/17
Evaluate Bids	4	5/23/17	5/26/17
Issue Notice of Intent to...	7	5/31/17	6/6/17
Issue Notice of Award a...	8	6/7/17	6/14/17
Contracts/Bonds	15	6/14/17	6/28/17
Construction Management	541	7/3/17	12/25/18
Pre-Construction Meeting	0	7/3/17	7/3/17
Weekly Onsite Meeting	505	7/12/17	11/28/18
Provide Consruction St...	4	7/3/17	7/6/17
Issue Clarifications of t...	453	7/3/17	9/28/18
Recommend Change ...	483	7/3/17	10/28/18
Review Contractors Su...	155	7/3/17	12/4/17
Review and Process M...	180	7/3/17	12/29/17
Inspection	531	7/3/17	12/15/18
Substantial Completion...	0	11/26/18	11/26/18
Final Completion Inspe...	0	12/26/18	12/26/18
Miscellaneous Tasks	490	8/29/18	12/31/19
Draft O & M	60	8/29/18	10/27/18
Final O & M	60	10/28/18	12/26/18
Equipment Testing for ...	366	12/31/18	12/31/19
Training Through the E...	29	11/28/18	12/26/18
Record Drawings	1	12/26/18	12/26/18



P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	6.2
Subject:	Implementation
	OPERATIONS DURING CONSTRUCTION
Date:	November 2015
Prepared By:	Brian Allen, E.I.T.

Description

This section discusses the construction sequencing and methods to provide continuous operations of existing treatment systems while constructing new treatment systems.

Associated Sections

The following table directs the reader to sections of the report that are related to this section:

Section	Title	Remarks
6.1	Schedule	A plan for carrying out the processes and procedures of construction by lists of intended events and times.
6.3	Contract Documents	A list of the specifications required for construction.

<u>Electric Supply</u>

The existing standby emergency generator may be used to provide power during any electrical service relocation or power outages. A new electric service will be installed and operational for the new treatment system components prior to modification of the existing service panels. The two systems will be totally separate. After the new system is operational the existing standby emergency generator will be removed and replaced with a new diesel generator.

<u>Water Service</u>

Water service to the existing facilities and treatment system will not be changed. Additional water lines will be constructed to service the new shop and control buildings. A new non-potable water system will service all new equipment needs.

<u>Storm Water</u>

The existing site storm water drains and drainage ditches will be left in place until near the end of the project when site grading takes place. During site regrading new catch basins will be installed and storm water currently collected and discharged off site will remain in operation. New areas will drain to the existing system.

<u>Telephone</u>

The main telephone service will remain in the existing filter building. Telephone line extensions will be run to the control building and maintenance building.

<u>Treatment Liquid Stream</u>

New liquid stream construction will generally be independent of existing wastewater treatment plant operations except for modifications to the existing screening facility. The screening facility will remain in operation during the modifications. One new screening unit will be installed and made operational prior to removing and replacing the existing screening unit. Modifications to the existing digesters will take place on a chamber by chamber basis after the new liquid stream process has been tested and placed online. Digester modifications can take place during dry weather conditions when expected flows are minimal. New aeration equipment and piping will be installed prior to the chamber modifications and left in place un-operational until the new treatment plant is online. Once the new treatment plant is online the existing blowers, aeration equipment, clarifiers, piping and electrical gear will be removed on a chamber by chamber basis. After the modifications are complete the chamber will be placed into service. Flows to the chlorine contact chamber will be redirected to the irrigation tank during basin modifications. Modifications to the irrigation tank can be completed without taking the basin offline. All incoming flow will be diverted to the new influent pump station after all of the new liquid stream treatment equipment has been tested and place into service.

Solids Treatment

The solids treatment capacity will be reduced during modifications to the existing digesters. The reduction in capacity could be offset by utilizing the new dewatering equipment. The new dewatering equipment will be connected to the new WAS force main and sludge will be dewatered and stored onsite, if required. The City will remove sludge and grit from the existing units prior to the contractor starting the conversion. The donut plant will be converted to aerobic digesters after startup of the new SBR plant. The SBR plant will not require wasting of sludge during the first two months of operation, allowing time to complete the modifications to the new aerobic digesters. If the digester conversion requires additional time, then the WAS could be pumped to an unused SBR basin, if available, dewatered or hauled to a private biosolids treatment facility.

Operations

The existing laboratory and operation building will remain in operation throughout construction of the new control building, laboratory and shop facilities. The new control building, laboratory and shop facilities will be completed and operational along with the new treatment plant before the existing control system is taken offline. The existing shop buildings are going to be demolished prior to the start of the project and do not serve a critical role in the treatment process. Effluent quality is expected to remain at pre-construction levels through completion of the improvements, and then improve when the new liquid stream system is commissioned.

The primary reasons for potential construction related impact to present wastewater quality are the following:

A. Interruption of the existing digester operation during the chamber modifications.

B. Connection of the raw sewage line to the new influent pump station.

PREDESIGN REPORT MEMORANDUM

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	6.3
Subject:	Implementation
	CONSTRUCTION DOCUMENTS
Date:	November 2015
Prepared By:	Brian Allen, E.I.T.

Description

This section discusses the construction documents that will be prepared for bidding in accordance with standard Engineers Joint Contract Document Committee (EJCDC) format. Major components of the bid package along with a list of specification sections are shown on the following pages. A preliminary list of drawings is included on Sheet G1 in the "Predesign Review Set" that accompanies this report.

Volume 1 – Bidding Documents

100 Advertisement for Bids
200 Instruction to Bidders
400 Bid Forms
410 Bid
430 Supplements to Bid Forms
431 Bid Bond
435 First-Tier Subcontractor Disclosure Form
450 Representations and Certifications
451 Bidder's Prequalification Form
460 Agency Required Supplements
461 Non-Collusion Affidavit
462 Equal Employment Opportunity Contract Compliance Notice
469 Responsibility Affidavit
480 CWSRF Insert & Forms
495 Sample Forms
496 Notice of Intent to Award
497 Notice of Award

Volume 2 – Contract Documents

Contract Forms and Conditions

Division 1—General Requirements

1380 Photographs & Videotaping
1430 Testing & Training
1501 Temporary Controls
1510 Temporary Utilities
1550 Mobilization & Demobilization
1580 Project Identification Signs
1590 Field Office, Equipment, and Services
1605 Shipment, Protection and Storage
1620 Record Drawings
1660 Performance and Operational Testing
1710 Final Cleanup & Restoration
1900 Seismic Design Requirements
1990 Reference Forms

Division 2—Sitework

2000 Index
2050 Demolition & Abandonment
2100 Site Preparation
2140 Control of Water
2150 Shoring & Bracing
2160 Sewer Bypass Pumping
2200 Earthwork for Structures & Embankments
2221 Trench Excavation
2222 Earthwork for Pipelines & Conduits
2446 Automatic Entrance Gate System
2310 Boring, Tunneling and Jacking
2510 Asphalt Concrete Pavement
2525 Curbs and Gutters
2527 Sidewalk, Driveway Approaches and Handicap Ramps
2545 Surface Removal and Replacement
2570 Geotextile Fabric
2571 Nonwoven Geotextile Fabric
2605 Manholes and Cleanouts
2721 Catch Basins and Area Drains
2728 Ditching
2830 Chain Link Fence and Gates
2900 Landscaping

Division 3—Concrete

3000 Index
3100 Concrete Formwork

3200	Concrete Reinforcement
3300	Cast-In-Place Concrete
3301	Concrete Testing, Sampling, & Inspection
3360	Concrete Floor Finish
3480	Precast Concrete
3600	Grout

Division 4—Masonry

4000	Index
4100	Mortar and Grout
4200	Unit Masonry

Division 5—Metals

5000	Index
5100	Structural Metals
5405	Cold-Formed Metal Framing
5501	Anchor Bolts and Fasteners
5505	Miscellaneous Metalwork
5515	Ladder
5520	Handrails & Railings
5530	Grating, Trench Covers, & Cover Plates
5550	Stairs & Safety Stair Treads
5910	Hot-Dip Zinc Coating

Division 6—Wood and Plastics

6000	Index
6100	Rough Carpentry
6092	Prefabricated Wood Trusses
6180	Glue Laminated Beams
6200	Finish Carpentry and Millwork
6400	Prefinished Cabinets

Division 7—Thermal and Moisture Protection

7000	Index
7100	Waterproofing and Moisture Proofing
7200	Insulation
7410	Metal Roofing
7466	Fiber Cement Siding
7520	Metal Siding
7600	Flashing and Sheet Metal
7630	Gutters & Downspouts

7900 Joint Sealers (Caulking & Sealants)

Division 8—Doors and Windows

8000 Index
8100 Steel Doors and Frames
8330 Aluminum Hatches
8331 Water Tight Aluminum Hatch
8333 Aluminum Roll-up Doors
8360 Sectional Doors
8400 Doors & Windows
8520 Vinyl Windows
8710 Finish Hardware
8800 Glass and Glazing
8900 Louvers & Dampers

Division 9—Finishes

9000 Index
9250 Gypsum Drywall
9690 Rubber Base
9900 Coatings
9914 Tape Coating System

Division 10—Specialties

10000 Index
10050 Architectural Specialties
10100 Markerboards
10200 Toilet Room Accessories
10400 Signs
10520 Fire Extinguishers
10650 Lockers

Division 11—Equipment

11000 Index
11001 Equipment
11060 Electric Motors
11100 Slide Gates
11101 Stop Gates
11107 Control Gate
11122 Influent Screening Equipment
11123 Manual Bar Screens
11146 Vortex Grit Removal Equipment

15895 Flexible Ductwork
15903 Diffusers, Grilles, and Registers
15910 Ductwork Accessories
15944 Louvers
15950 HVAC Controls
15990 HVAC Systems, Testing, Adjusting, and Balancing

Division 16—Electrical Work

16000 Index
16000 General Electrical Requirements
16001 Commissioning
16005 Starting and Adjusting
16010 Operation and Maintenance Data
16015 Demonstration and Training
16030 Testing
16040 Identification
16050 Basic Electrical Materials and Methods
16057 Electrical Systems Analysis
16110 Raceways
16112 Manholes and Handholes
16120 600 Volt Wire and Cable
16122 Signal and Data Cables
16140 Wiring Devices
16150 Safety and Disconnect Switches
16155 Individual Motor Starters
16160 Cabinets and Enclosures
16170 Grounding
16232 Packaged Diesel Generator
16281 Over Current Protection Devices
16311 Low Voltage Switchboards
16405 Electrical Service
16420 Motor Controls Centers
16431 Short Circuit and Coordination Report
16441 Safety Switches
16460 Dry-Type Transformers
16470 Panelboards
16483 Variable Frequency Drives
16500 Lighting Fixtures
16701 General Communications
16720 Life Safety System
16740 Telephone and Computer Data Provisions

Division 17—Instrumentation

P R E D E S I G N   R E P O R T   M E M O R A N D U M

Project:	City of Sutherlin
	Wastewater System Improvements
Section:	6.4
Subject:	Implementation
	COST ESTIMATE
Date:	November 2015
Prepared By:	Ryan Quigley, P.E.

Construction Cost

Our office estimated the construction cost for the preliminary design of the wastewater system improvement project. Based on the level of detail developed during preliminary design, we made our best judgment based on our experience with similar projects. In the table below, we compare the preliminary estimate with our opinion of construction cost shown in the facilities plan. Detailed cost estimates are included within Appendix C.

Process Areas	2013 Facilities Plan Amendment Preliminary Estimate	2015 Preliminary Design Estimate
Process Area 100: Plant Facilities	$ 723,000	$ 1,010,044
Process Area 200: Exist. Filter Building	Building modifications included in Process Area 1301 (Dewatering)	
Process Area 300: Exist. Operations Building	Not Included	$ 24,530
Process Area 400: Control Building	$ 555,000	$ 604,800
Process Area 500: Maintenance Shop Building	Not Included	$ 214,400
Process Area 600: Influent Screening Facility	$ 526,000	$ 461,244
Process Area 700: Influent Pump Station	$ 816,000	$ 1,169,530
Process Area 800: Headworks	$ 721,000	$ 935,506
Process Area 900: Sequencing Batch Reactors	$ 4,487,000	$ 4,760,269
Process Area 1000: Tertiary Treatment	$ 1,004,000	$ 726,503
Process Area 1100: UV Disinfection	$ 529,000	$ 790,686
Process Area 1200: Effluent Disposal (Reuse)	$ 742,000	$ 292,015

Process Area 1300: Biosolids Treatment	$	775,000	$	1,256,417
Process Area 1301: Biosolids (Dewatering)	$	1,160,000	$	1,086,278
Process Area 1400: Everett Avenue Pump Station	$	643,800	$	880,019
Process Area 1401: Everett Avenue Pump Station – Force Main[1]	$	750,000	$	585,497
SBR Pre-load		Not Included	$	427,369
Miscellaneous (Generator, Spreader Truck, TV Monitoring)	$	380,000	$	380,000
Construction (Total)	**$**	**13,811,800**	**$**	**15,605,107**

1. Added after completion of WWFP.

The construction cost based on preliminary design has increased approximately $ 2.07 million over the amount shown in the facilities plan with modifications made following recommendations in the environmental report. The following discusses some of the probable causes of the project cost increases:

A. Process Area 100: Plant Facilities
   - More extensive yard piping than was identified at the facilities planning level.
   - Increase in the asphalt paving area.
   - Difficulty level expected due to existing utilities on site.
   - Total reconstruction of access road.

B. Process Area 300: Existing Operations Building
   - Added cost for removing all unnecessary pumps and piping in the existing building.

C. Process Area 400: Control Building
   - Cost of adding a laboratory to the control building.

D. Process Area 500: Maintenance Shop Building.
   - Added cost of constructing a maintenance shop on the treatment plant site.

E. Process Area 700: Influent Pump Station
   - Geotechnical investigation indicated a more costly shoring and dewatering system would be required due to poor soil conditions.
   - An increase in pipe and valve costs.

F. Process Area 800: Headworks

- Increase in concrete quantities for construction of elevated headworks.
- Increase in costs for higher efficiency grit removal equipment.

G. Process Area 900: Sequencing Batch Reactors

- Poor soil conditions discovered during geotechnical investigation requiring the removal of pre-load material and additional structural fill.
- Inclusion of ground level, interior access.

H. Process Area 1100: UV Disinfection

- Increase in UV Disinfection equipment cost.
- Increase in quantities of piping and valves.
- Addition of roof structure over UV Disinfection area.

I. Process Area 1300: Biosolids Treatment

- Increase in blower and aeration equipment costs.
- Increased piping quantities for ability to transfer biosolids between basins.
- Inclusion of dewatering screw press feed pumps.
- Added dewatered biosolids storage facility.

J. Process Area 1400: Everett Avenue Pump Station.

- Larger pumps based on revised force main layout.

K SBR Basin pre-load:

- Added cost of hauling in material to pre-load the SBR construction area per recommendations of the geotechnical investigation.

Total Project Cost

The current total project cost is shown below in comparison to the one presented in the facilities plan. The total project cost based on preliminary design is approximately $479,000 more than the amount shown in the facilities plan.

Description	2013 Facilities Plan Amendment Preliminary Estimate	2015 Preliminary Design Estimate
Construction (Total)	$ 12,668,000	$ 14,139,600
Engineering Design & Bidding	$ 1,267,000	$ 1,267,000
Engineering Construction Services	$ 1,267,000	$ 1,267,000
Value Engineering	$ 85,000	$ 85,000
Environmental Report	$ 45,000	$ 16,500
Contingency	$ 1,900,000	$ 993,000
Legal/Administration	$ 75,000	$ 35,000
Land Acquisition & Easements	$ 3,000,000	$ 3,000,000
Permits & DEQ Review Fee	$ 10,000	$ 10,000
Everett Avenue Pump Station	$ 925,000	$ 1,144,000
Everett Avenue Pump Station Force Main[1]	$ 1,000,000	$ 763,000
Total Project Cost	**$ 22,242,000**	**$ 22,721,000**

1. Added to project after completion of WWFP

Contingency

The contingency amount shown is approximately 15 percent of the 2013 facilities plan estimated total of construction. We recommend that the contingency remain a minimum of 7 percent based on the additive uncertainties shown below:

A. Increased level of design in structures and piping
B. Completion of process and instrumentation concepts
C. Confidence level of type and size of equipment
D. Items not shown or involved at this level of design
E. Engineer’s opinions of cost based on lump sum pricing compared to the contractor’s detailed unit pricing and firm equipment costs.
F. Indirect costs of construction in the contractor’s bid price
G. Uncertainties of materials and labor resources
I. Probability of differing site conditions during construction at the existing plant, namely, hidden utilities, condition of existing equipment and structures, and disposal of sludge and grit
J. Operation of the existing plant during construction.

APPENDIX A - PERMITS

A

NPDES Permit

Mutual Agreement and Order (MAO)

MAO for Everett Avenue Pump Station Force Main

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
Western Region – Salem Office
750 Front Street NE, Suite 120, Salem, OR 97301-1039
Telephone: (503) 378-8240

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:
Sutherlin, City of
126 E. Central
Sutherlin, OR 97479

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Wastewater	001	R.M. 9.8
Reclaimed Water Reuse	002	Irrigation

FACILITY TYPE AND LOCATION:
Activated Sludge – Extended Aeration Package Plant
City of Sutherlin
4601Stearns Lane, Sutherlin, OR 97479
Treatment System Class: Level III
Collection System Class: Level II

RECEIVING STREAM INFORMATION:
Basin: Umpqua
Sub-Basin: Umpqua
Receiving Stream: Calapooya Creek
LLID: 1234686433656 - 9.8 - D
County: Douglas

EPA REFERENCE NO: OR-002084-2
Issued in response to Application No. 979880 received September 15, 2005. This permit is issued based on the land use findings in the permit record.

John W Blanchard for
John J. Ruscigno, Water Quality Manager
Western Region North

October 24, 2006
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Page

Unless specifically authorized by this permit, by another NPDES or WPCF permit, or by Oregon Administrative Rule, any other direct or indirect discharge of waste is prohibited, including discharge to waters of the state or an underground injection control system.

SCHEDULE A

Waste Discharge Limitations not to be exceeded after permit issuance.

a. Treated Effluent Outfall 001

(1) June 1 - October 31: No discharge to waters of the State (unless approved in writing by the Department)

(2) November 1 - November 30:

- The weekly and daily mass load limitations that follow are based on stream flow in Calapooya Creek measured from the stream gauge near the Rochester Bridge in Sutherlin (See Notes 1 and 2):

Parameter	Stream Flow	Average Effluent Concentrations Monthly Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5 and TSS	<45 cfs	30 mg/L 45 mg/L	440	170	260
BOD_5 and TSS	45 cfs-60 cfs	30 mg/L 45 mg/L	440	320	480
BOD_5 and TSS	>60 cfs-96 cfs	30 mg/L 45 mg/L	440	440	660
BOD_5 and TSS	> 96 cfs	30 mg/L 45 mg/L	440	660	880

December 1- May 31: Discharge in May allowed only while the daily flow in Calapooya Creek exceeds 82 cfs:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
BOD_5	30 mg/L	45 mg/L	560	840	1100
TSS	30 mg/L	45 mg/L	560	840	1100

* Average dry weather design flow to the facility equals 1.3 MGD. Winter mass load limits based upon average wet weather design flow of the facility equaling 2.22 MGD. The daily mass load limit is suspended on any day in which the flow to the treatment facility exceeds 2.6 MGD (twice the design average dry weather flow).

(3)

Other parameters (November – May)	Limitations
E. coli Bacteria	Shall not exceed 126 organisms per 100 mL monthly geometric mean. No single sample shall exceed 406 organisms per 100 mL. (See Note 3)
pH	Shall be within the range of 6.0 – 9.0
BOD_5 and TSS Removal Efficiency	Shall not be less than 85% monthly average for BOD_5 and 85% monthly for TSS.
Ammonia-N	Shall not exceed 21 mg/L daily maximum and 7.8 mg/L monthly average.
Total Chlorine Residual	Shall not exceed 0.04 mg/L daily maximum and 0.01 mg/L monthly average (See Note 4)

(4) No wastes may be discharged or activities conducted that cause or contribute to a violation of water quality standards in OAR 340-041 applicable to the Umpqua basin except as provided for in OAR 340-045-0080 and the following regulatory mixing zone:

The allowable mixing zone is that portion of Calapooya Creek contained within a band extending out no more than 1/2 the stream width and extending from a point ten (10) feet upstream of the outfall to a point thirty (30) feet downstream from the outfall. The Zone of Immediate Dilution (ZID) shall be defined as that portion of the allowable mixing zone that is within three (3) feet of the point of discharge.

(5) Raw sewage discharges are prohibited to waters of the State except as allowed Schedule F, Section B, Condition 6 of this permit. If an overflow occurs between May 22 and June 1, and if the permittee demonstrates to the Department's satisfaction that no increase in risk to beneficial uses occurred because of the overflow, no violation will be triggered if the storm associated with the overflow was greater than the one-in-five-year, 24-hour duration storm.

b. Reclaimed Wastewater Outfall 002

(1) No discharge to state waters is permitted. All reclaimed water shall be distributed on land, for dissipation by evapotranspiration and controlled seepage by following sound irrigation practices so as to prevent:

a. Prolonged ponding of treated reclaimed water on the ground surface;

b. Surface runoff or subsurface drainage through drainage tile;

c. The creation of odors, fly and mosquito breeding or other nuisance conditions;

d. The overloading of land with nutrients, organics, or other pollutant parameters; and,

e. Impairment of existing or potential beneficial uses of groundwater.

(2) Prior to land application of the reclaimed water, it shall receive at least level II treatment as defined in OAR 340-055 to:

Reduce Total Coliform to 240 organisms per 100 mL in two consecutive samples, and a 7-day median of 23 organisms per 100 mL.

(3) Irrigation shall conform to the irrigation management plan approved by the Department.

c. No activities shall be conducted that could cause an adverse impact on existing or potential beneficial uses of groundwater. All wastewater and process related residuals shall be managed and disposed in a manner that will prevent a violation of the Groundwater Quality Protection Rules (OAR 340-040).

NOTES:

1. Stream flow shall be a weekly average of daily values in Calapooya Creek as measured at the former USGS stream gage that is located near the Rochester Bridge in Sutherlin.

2. Calapooya Creek is water quality limited for fecal coliform bacteria and dissolved oxygen during the period of discharge. This permit may be reopened to include any Waste Load Allocation (WLA), best management practice or any other condition required by the Total Maximum Daily Load (TMDL) for this water body.

3. If a single sample exceeds 406 organisms per 100 mL, then five consecutive re-samples may be taken at four-hour intervals beginning within 28 hours after the original sample was taken. If the log mean of the five re-samples is less than or equal to 126 organisms per 100 mL, a violation shall not be triggered.

4. When the total residual chlorine limitation is lower than 0.10 mg/L, the Department will use 0.10 mg/L as the compliance evaluation level (i.e. daily maximum concentrations below 0.10 mg/L will be considered in compliance with the limitations).

SCHEDULE B

Minimum Monitoring and Reporting Requirements (unless otherwise approved in writing by the Department).

The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this permit. When possible, the permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

The facility influent grab and composite samples and measurements are taken from the influent chamber between the grit chamber and the influent screen

Item or Parameter	Minimum Frequency	Type of Sample
BOD_5	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab

b. Treated Effluent Outfall 001

The facility effluent grab and composite samples and measurements are taken from the effluent chlorine contact chamber.

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annual	Verification
pH	3/Week	Grab
Temperature	3/week	Grab
BOD_5	2/Week	Composite
TSS	2/Week	Composite
E. coli	2/Week	Grab (See Note 1)
Ammonia (NH3-N)	Once every 2 Weeks	Composite
Total Chlorine Residual	Daily	Grab
Quantity Chlorine Used	Daily	Measurement
Pounds Discharged (BOD_5 and TSS)	Weekly	Calculation
Average Percent Removed (BOD_5 and TSS)	Monthly	Calculation
Dissolved Oxygen	Once every 2 Weeks	Grab
Toxics:		
Metals (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, and Zn), Cyanide, Total Phenolic Compounds and Hardness	Semi-annually	24-hour Composite (See Note 2 and 3)
Organic Priority Pollutants	(See Note 4)	24-hour Composite
Whole Effluent Toxicity (See Note 5)	Annually	Acute and Chronic

c. Biosolids Management

Item or Parameter	Minimum Frequency	Type of Sample
Sludge analysis including: Total Solids (% dry wt.) Volatile solids (% dry wt.) Biosolids nitrogen for: NH_3-N; NO_3-N; & TKN (% dry wt.) Phosphorus (% dry wt.) Potassium (% dry wt.) pH (standard units) Sludge metals content for: As, Cd, Cu, Hg, Mo, Ni, Pb, Se & Zn, measured as total in mg/kg	Annually	Composite sample to be representative of the product to be land applied from the Digester withdrawal line (See Note 6)
Solids pumped from treatment system	Each Occurrence	Date, volume (gallons), percent solids, hauler, transfer point
Record of locations where biosolids are applied on each DEQ approved site. (Site location maps to be maintained at treatment facility for review upon request by DEQ)	Each Occurrence	Date, volume & locations where sludges were applied recorded on site location map.
Record of % volatile solids reduction accomplished through stabilization	Monthly when land applying	Calculation (See Note 7)
Record of digestion days (mean cell residence time)	Monthly when land applying	Calculation (See Note 8)
Daily Minimum Sludge Temperature	Daily when land applying	Record

d. Reclaimed Wastewater Outfall 002

Item or Parameter	Minimum Frequency	Type of Sample
Quantity Irrigated (inches/acre)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
Quantity Chlorine Used	Daily	Measurement
Total Chlorine Residual	Daily	Grab
pH	2/Week	Grab
Total Coliform	1/Week	Grab
Nutrients (TKN, NO_2+NO_3-N, NH_3, Total Phosphorus)	Quarterly	Grab

e. Receiving Stream (Calapooya Creek)

Item or Parameter	Minimum Frequency	Type of Sample
Metals (Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, and Zn), and cyanide.	Semi-annually (See Note 9)	24-hour Composite

2. **Reporting Procedures**

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the appropriate Department' office by the 15th day of the following month.

b. State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this permit.

c. Monitoring reports shall also include a record of the quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

3. **Report Submittals**

a. The permittee shall have in place a program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by February 1 each year which details sewer collection maintenance activities that reduce inflow and infiltration. The report shall state those activities that have been done in the previous year and those activities planned for the following year.

b. For any year in which biosolids are land applied, a report shall be submitted to the Department by February 19 of the following year that describes solids handling activities for the previous year and includes, but is not limited to, the required information outlined in OAR 340-050-0035(6)(a)-(e).

c. By no later than January 15 of each year, the permittee shall submit to the Department an annual report describing the effectiveness of the reclaimed water system to comply with approved reclaimed water use plan, the rules of Division 55, and the limitations and conditions of this permit applicable to reuse of reclaimed water.

NOTES:

1. *E. coli* monitoring must be conducted according to any of the following test procedures as specified in **Standard Methods for the Examination of Water and Wastewater, 19th Edition,** or according to any test procedure that has been authorized and approved in writing by the Director or an authorized representative:

Method	Reference	Page	Method Number
mTEC agar, MF	Standard Methods, 18^{th} Edition	9-29	9213 D
NA-MUG, MF	Standard Methods, 19^{th} Edition	9-63	9222 G
Chromogenic Substrate, MPN	Standard Methods, 19^{th} Edition	9-65	9223 B
Colilert QT	Idexx Laboratories, Inc.		

2. For two years after permit issuance, monitoring for metals, cyanide, total phenolic compounds and hardness must be conducted on the effluent at the specified frequency. Monitoring for arsenic must be conducted in accordance with EPA Method 1632 with a practical quantification level (PQL) of 5 ng/L or less. Monitoring for cadmium, silver and thallium must be conducted using a method with a PQL of 0.1 µg/L or lower. Monitoring for lead must be conducted using a method with a PQL of 0.2 µg/L or lower. Monitoring for mercury must be conducted in accordance with EPA Method 1631E with a method detection limit of 5 ng/L. Monitoring for all other toxic parameters must be performed using a method capable of achieving the PQLs in Appendix B, Table 8 of the Department's Internal Management Directive for conducting a Reasonable

Potential Analysis for Toxic Pollutants. Changes in monitoring methods or PQLs must be approved in writing by the Department. Effluent TSS must be monitored simultaneously. For all tests, the method detection limit and method reporting limit must be reported along with the sample result. After two years of monitoring, monitoring of the effluent may be eliminated unless otherwise notified in writing by the Department. The Department will review the data and may require additional monitoring for specific pollutants of concern or reopen the permit to incorporate permit limits.

3. For effluent cyanide samples, at least six discrete grab samples must be collected over the operating day. Each aliquot must not be less than 100 mL and must be collected and composited into a larger container which has been preserved with sodium hydroxide for cyanide samples to insure sample integrity.

4. The permittee must perform testing for organic pollutants as required in Part D of EPA Form 2A. The testing includes all pollutants included under volatile organic, acid extractable and base-neutral compounds. The monitoring needs to be conducted using EPA Methods 624 for volatile organic compounds, EPA Method 625 for semi-volatile organic compounds and Polycyclic Aromatic Hydrocarbons, and EPA Method 608 for pesticides. Three scans are required during the 4 ½ years after permit issuance. Two of the three scans must be performed no fewer than 4 months and no more than eight months apart. The effluent samples must be 24-hour daily composites, except where sampling volatile compounds. In this case, six discrete samples (not less than 40 mL) collected over the operating day are acceptable. The permittee must take special precautions in compositing the individual grab samples for the volatile organics to insure sample integrity (i.e. no exposure to the outside air). Alternately, the discrete samples collected for volatiles may be analyzed separately and averaged.

5. Beginning no later than calendar year 2007, the permittee must conduct Whole Effluent Toxicity (WET) testing for a period of four years in accordance with the frequency specified above. If the WET tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further WET testing will be required during this permit cycle. Note that four WET test results will be required along with the next NPDES permit renewal application.

6. Composite samples from the digester withdrawal line shall consist of at least four aliquots of equal volume collected over an 8 hour period and combined.

   Inorganic pollutant monitoring must be conducted according to <u>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</u>, Second Edition (1982) with Updates I and II and third Edition (1986) with Revision I.

7. Calculation of the % volatile solids reduction is to be based on comparison of a representative grab sample of total and volatile solids entering each digester (a weighted blend of the secondary clarifier solids) and a representative composite sample of solids exiting each digester withdrawal line (as defined in Note 7 above).

8. The days of digestion shall be calculated by dividing the digester volume (one-tme measurement, gallons) by the volumetric flow rate through the digester (measured on a continuous basis in gpd).

9. For the first two years after permit issuance, the permittee shall perform metals monitoring in Calapooya Creek on a semi-annual basis for the pollutants listed. After all monitoring is complete, the Department will perform a new RPA to determine if the discharge has the potential to cause or contribute to an excursion above the state water quality criteria. If there is a reasonable potential, then the Department may modify the permit as necessary to include the proper permit limits. If no reasonable potential exists, then the monitoring requirement will be discontinued for the remainder of the permit period.

SCHEDULE C

Compliance Schedules and Conditions

1. By no later than January 21, 2007, the permittee must submit to the Department a report which either identifies known sewage overflow locations and a plan for estimating the frequency, duration and quantity of sewage overflowing, or confirms that there are no overflow points. The report must also provide a schedule to eliminate the overflow(s), if any.

2. The permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than fourteen days following any lapsed compliance date, the permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he/she determines good and valid cause resulting from events over which the permittee has little or no control.

SCHEDULE D

Special Conditions

1. All biosolids shall be managed in accordance with the current, DEQ approved biosolids management plan, and the site authorization letters issued by the DEQ. Any changes in solids management activities that significantly differ from operations specified under the approved plan require the prior written approval of the DEQ.

   All new biosolids application sites shall meet the site selection criteria set forth in OAR 340-050-0070 and must be located within Douglas County. All currently approved sites are located in Douglas County. No new public notice is required for the continued use of these currently approved sites. Property owners adjacent to any newly approved application sites shall be notified, in writing or by any method approved by DEQ, of the proposed activity prior to the start of application. For proposed new application sites that are deemed by the DEQ to be sensitive with respect to residential housing, runoff potential or threat to groundwater, an opportunity for public comment shall be provided in accordance with OAR 340-050-0030.

2. This permit may be modified to incorporate any applicable standard for biosolids use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for biosolids use or disposal is more stringent than any requirements for biosolids use or disposal in the permit, or controls a pollutant or practice not limited in this permit.

3. **Whole Effluent Toxicity Testing**

   a. The permittee must conduct whole effluent toxicity (WET) tests as specified in Schedule B of this permit.

   b. WET tests may be dual end-point tests, only for the fish tests, in which both acute and chronic end-points can be determined from the results of a single chronic test (the acute end-point must be based upon a 48-hour time period).

   c. Acute Toxicity Testing - Organisms and Protocols

      (1) The permittee must conduct 48-hour static renewal tests with the *Ceriodaphnia dubia* (water flea) and the *Pimephales promelas* (fathead minnow).

      (2) The presence of acute toxicity will be determined as specified in **Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms**, Fourth Edition, EPA/600/4-90/027F, August 1993.

      (3) An acute WET test will be considered to show toxicity if there is a statistically significant difference in survival between the control and 100 percent effluent, unless the permit specifically provides for a Zone of Immediate Dilution (ZID) for toxicity. If the permit specifies such a ZID, acute toxicity will be indicated when a statistically significant difference in survival occurs at dilutions greater than that which is found to occur at the edge of the ZID.

   d. Chronic Toxicity Testing - Organisms and Protocols

      (1) The permittee must conduct tests with: *Ceriodaphnia dubia* (water flea) for reproduction and survival test endpoint, *Pimephales promelas* (fathead minnow) for growth and survival test endpoint, and *Raphidocelis subcapitata* (green alga formerly known as *Selanastrum capricornutum*) for growth test endpoint.

(2) The presence of chronic toxicity must be estimated as specified in **Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms**, Third Edition, EPA/600/4-91/002, July 1994.

(3) A chronic WET test will be considered to show toxicity if a statistically significant difference in survival, growth, or reproduction occurs at dilutions greater than that which is known to occur at the edge of the mixing zone. If there is no dilution data for the edge of the mixing zone, any chronic WET test that shows a statistically significant effect in 100 percent effluent as compared to the control will be considered to show toxicity.

e. Quality Assurance

(1) Quality assurance criteria, statistical analyses and data reporting for the WET tests must be in accordance with the EPA documents stated in this condition and the Department's **Whole Effluent Toxicity Testing Guidance Document**, January 1993.

f. Evaluation of Causes and Exceedances

(1) If toxicity is shown, as defined in sections c.(3) or d.(3) of this permit condition, another toxicity test using the same species and Department approved methodology must be conducted within two weeks, unless otherwise approved by the Department. If the second test also indicates toxicity, the permittee must follow the procedure described in section f.(2) of this permit condition.

(2) If two consecutive WET test results indicate acute and/or chronic toxicity, as defined in sections c.(3) or d.(3) of this permit condition, the permittee must evaluate the source of the toxicity and submit a plan and time schedule for demonstrating compliance with water quality standards. Upon approval by the Department, the permittee must implement the plan until compliance has been achieved. Evaluations must be completed and plans submitted to the Department within 6 months unless otherwise approved in writing by the Department.

g. Reporting

(1) Along with the test results, the permittee must include: 1) the dates of sample collection and initiation of each toxicity test; 2) the type of production; and 3) the flow rate at the time of sample collection. Effluent at the time of sampling for WET testing should include samples of required parameters stated under Schedule B, condition 1. of this permit.

(2) The permittee must make available to the Department, on request, the written standard operating procedures they, or the laboratory performing the WET tests, are using for all toxicity tests required by the Department.

h. Reopener

(1) If WET testing indicates acute and/or chronic toxicity, the Department may reopen and modify this permit to include new limitations and/or conditions as determined by the Department to be appropriate, and in accordance with procedures outlined in Oregon Administrative Rules, Chapter 340, Division 45.

4. The permittee shall meet the requirements for use of reclaimed water under Division 55, including the following:

   a. All reclaimed water shall be managed in accordance with the approved Reclaimed Water Use Plan. No substantial changes shall be made in the approved plan without written approval of the Department.

   b. No reclaimed water shall be released by the permittee to another person, as defined in Oregon Revised Statute (ORS) 468.005, for use unless there is a valid contract between the permittee and that person that meets the requirements of OAR 340-055-0015(9).

   c. The permittee shall notify the Department within 24 hours if it is determined that the treated effluent is being used in a manner not in compliance with OAR 340-055. When the Department offices are not open, the permittee shall report the incident of noncompliance to the Oregon Emergency Response System (Telephone Number 1-800-452-0311).

   d. No reclaimed water shall be made available to a person proposing to recycle unless that person certifies in writing that they have read and understand the provisions in these rules. This written certification shall be kept on file by the sewage treatment system owner and be made available to the Department for inspection.

5. Unless otherwise approved in writing by the Department, a deep-rooted, permanent grass cover shall be maintained on the land irrigation area at all times. Grass shall be periodically cut and removed to ensure maximum evapotranspiration and nutrient capture.

6. The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

   a. The permittee shall have its wastewater system supervised by one or more operators who are certified in a classification <u>and</u> grade level (equal to or greater) that corresponds with the classification (collection and/or treatment) of the system to be supervised as specified on page one of this permit.

Note: **A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.**

   b. The permittee's wastewater system may not be without supervision (as required by Special Condition 6.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified in the proper classification <u>and</u> at grade level I or higher.

   c. The permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

   d. The permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation. The notice shall be filed with the Water Quality Division, Operator Certification Program, 400 East Scenic Drive, Suite 307, The Dalles, OR 97058. This requirement is in addition to the reporting requirements contained under Schedule B of this permit.

e. Upon written request, the Department may grant the permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as required by 6.b. above.

7. The permittee shall not be required to perform a hydrogeologic characterization or groundwater monitoring during the term of this permit provided:

   a. The facilities are operated in accordance with the permit conditions, and;

   b. There are no adverse groundwater quality impacts (complaints or other indirect evidence) resulting from the facility's operation.

   If warranted, at permit renewal the Department may evaluate the need for a full assessment of the facilities impact on groundwater quality.

8. The permittee shall notify the appropriate DEQ Office in accordance with the response times noted in the General Conditions of this permit, of any malfunction so that corrective action can be coordinated between the permittee and the Department.

SCHEDULE F
NPDES GENERAL CONDITIONS – DOMESTIC FACILITIES

SECTION A. STANDARD CONDITIONS

1. Duty to Comply with Permit
The permittee must comply with all conditions of this permit. Failure to comply with any permit condition is a violation of the Clean Water Act, Oregon Revised Statutes (ORS) 468B.025, and 40 Code of Federal Regulations (CFR) Section 122.41(a), and grounds for an enforcement action. Failure to comply is also grounds for the Department to modify, revoke, or deny renewal of a permit.

2. Penalties for Water Pollution and Permit Condition Violations
ORS 468.140 allows the Department to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit. Additionally 40 CFR 122.41 (A) provides that any person who violates any permit condition, term, or requirement may be subject to a federal civil penalty not to exceed $25,000 per day for each violation.

Under ORS 468.943 and 40 CFR 122.41(a), unlawful water pollution, if committed by a person with criminal negligence, is punishable by a fine of up to $25,000 imprisonment for not more than one year, or both. Each day on which a violation occurs or continues is a separately punishable offense.

Under ORS 468.946, a person who knowingly discharges, places, or causes to be placed any waste into the waters of the state or in a location where the waste is likely to escape into the waters of the state is subject to a Class B felony punishable by a fine not to exceed $200,000 and up to 10 years in prison. Additionally, under 40 CFR 122.41(a) any person who knowingly discharges, places, or causes to be placed any waste into the waters of the state or in a location where the waste is likely to escape into the waters of the state is subject to a federal civil penalty not to exceed $100,000, and up to 6 years in prison.

3. Duty to Mitigate
The permittee must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit that has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee must correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application must be submitted at least 180 days before the expiration date of this permit.

The Department may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions
This permit may be modified, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute
b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts
c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge
d. The permittee is identified as a Designated Management Agency or allocated a wasteload under a Total Maximum Daily Load (TMDL)
e. New information or regulations
f. Modification of compliance schedules
g. Requirements of permit reopener conditions
h. Correction of technical mistakes made in determining permit conditions
i. Determination that the permitted activity endangers human health or the environment
j. Other causes as specified in 40 CFR 122.62, 122.64, and 124.5

The filing of a request by the permittee for a permit modification, revocation or reissuance, termination, or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants
The permittee must comply with any applicable effluent standards or prohibitions established under Oregon Administrative Rules (OAR) 340-041-0033 for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights and Other Legal Requirements
The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege, or authorize any injury to persons or property or invasion of any other private rights, or any infringement of federal, tribal, state, or local laws or regulations.

8. Permit References
Except for effluent standards or prohibitions established under OAR 340-041-0033 for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

9. Permit Fees
The permittee must pay the fees required by Oregon Administrative Rules.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance
The permittee must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems that are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Need to Halt or Reduce Activity Not a Defense
For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee must, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It is not a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions
(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation or the diversion is due to nonuse of nonessential treatment units or processes at the treatment facility.
(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes that causes them to become inoperable, or substantial and permanent loss of natural resources that can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.
(1) Bypass is prohibited unless:
(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;
(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass that occurred during normal periods of equipment downtime or preventative maintenance; and
(c) The permittee submitted notices and requests as required under General Condition B.3.c.
(2) The Department may approve an anticipated bypass, after considering its adverse effects and any alternatives to bypassing, when the Department determines that it will meet the three conditions listed above in General Condition B.3.b.(1).

c. Notice and request for bypass.
(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, a written notice must be submitted to the Department at least ten days before the date of the bypass.
(2) Unanticipated bypass. The permittee must submit notice of an unanticipated bypass as required in General Condition D.5.

4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of General Condition B.4.c are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:
(1) An upset occurred and that the permittee can identify the causes(s) of the upset;
(2) The permitted facility was at the time being properly operated;
(3) The permittee submitted notice of the upset as required in General Condition D.5, hereof (24-hour notice); and
(4) The permittee complied with any remedial measures required under General Condition A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Upset
For purposes of this permit, A Single Operational Upset that leads to simultaneous violations of more than one pollutant parameter will be treated as a single violation. A single operational upset is an exceptional incident that causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational upset does not include Clean Water Act violations involving discharge without a NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational upset is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions
(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.
(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.
(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of storm related overflows. Storm related overflows of raw sewage are prohibited to waters of the State. However, the Environmental Quality Commission (EQC) recognizes that it is impossible to design and construct a conveyance system that will prevent overflows under all storm conditions. The State of Oregon has determined that all wastewater conveyance systems should be designed to transport storm events up to a specific size to the treatment facility. Therefore, such storm related overflows will not be considered a violation of this permit if:
(1) The permittee has conveyance and treatment facilities adequate to prevent overflows except during a storm event greater than the one-in-five-year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten-year, 24-hour duration storm from May 22 through October 31. However, overflows during a storm event less than the one-in-five-year, 24-hour duration storm from November 1 through May 21 are also not permit violations if, the permittee had separate sanitary and storm sewers on January 10, 1996, had experienced sanitary sewer overflows due to inflow and infiltration problems, and has submitted an acceptable plan to the Department to address these sanitary sewer overflows by January 1, 2010;
(2) The permittee has provided the highest and best practicable treatment and/or control of wastes, activities, and flows and has properly operated the conveyance and treatment facilities in compliance with General Condition B.1.;
(3) The permittee has minimized the potential environmental and public health impacts from the overflow; and
(4) The permittee has properly maintained the capacity of the conveyance system.

c. Prohibition of other overflows. All overflows other than stormwater-related overflows (discussed in Schedule F, Section B, Condition 6.b.) are prohibited unless:
(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage;
(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and
(3) The overflows are the result of an upset as defined in General Condition B.4. and meeting all requirements of this condition.

d. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

e. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in General Condition D.5. Reports concerning storm related overflows must include information about the amount and intensity of the rainfall event causing the overflow.

7. Public Notification of Effluent Violation or Overflow
If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee must take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances
Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must be disposed of in such a manner as to prevent any pollutant from entering waters of the state, causing nuisance conditions, or creating a public health hazard.

ECTION C. MONITORING AND RECORDS

Representative Sampling
Sampling and measurements taken as required herein must be representative of the volume and nature of the monitored discharge. All samples must be taken at the monitoring points specified in this permit, and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points may not be changed without notification to and the approval of the Department.

Flow Measurements
Appropriate flow measurement devices and methods consistent with accepted scientific practices must be selected and used to ensure the accuracy and reliability of measurements of the volume of monitored discharges. The devices must be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected must be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

Monitoring Procedures
Monitoring must be conducted according to test procedures approved under 40 CFR part 136, unless other test procedures have been specified in this permit.

Penalties of Tampering
The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit may, upon conviction, be punished by a fine of not more than $10,000 per violation, imprisonment for not more than two years, or both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years, or both.

Reporting of Monitoring Results
Monitoring results must be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports must be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

Additional Monitoring by the Permittee
If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR part 136 or as specified in this permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the Discharge Monitoring Report. Such increased frequency must also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value must be recorded unless otherwise specified in this permit.

Averaging of Measurements
Calculations for all limitations that require averaging of measurements must utilize an arithmetic mean, except for bacteria which shall be averaged as specified in this permit.

Retention of Records
Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five years (or longer as required by 40 CFR part 503). The permittee must retain records of all monitoring information, including: all calibration, maintenance records, all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit for a period of at least 3 years from the date of the sample, measurement, report, or application. This period may be extended by request of the Department at any time.

Records Contents

Records of monitoring information must include:
a. The date, exact place, time, and methods of sampling or measurements;
b. The individual(s) who performed the sampling or measurements;
c. The date(s) analyses were performed;
d. The individual(s) who performed the analyses;
e. The analytical techniques or methods used; and
f. The results of such analyses.

0. Inspection and Entry

The permittee must allow the Department representative upon the presentation of credentials to:
a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and
d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

ECTION D. REPORTING REQUIREMENTS

Planned Changes
The permittee must comply with OAR chapter 340, division 52, "Review of Plans and Specifications" and 40 CFR Section 122.41(l) (1). Except where exempted under OAR chapter 340, division 52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers may be commenced until the plans and

specifications are submitted to and approved by the Department. The permittee must give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance
The permittee must give advance notice to the Department of any planned changes in the permitted facility or activity that may result in noncompliance with permit requirements.

3. Transfers
This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit may be transferred to a third party without prior written approval from the Department. The Department may require modification, revocation, and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act (see 40 CFR Section 122.61; in some cases, modification or revocation and reissuance is mandatory).. The permittee must notify the Department when a transfer of property interest takes place.

4. Compliance Schedule
Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date. Any reports of noncompliance must include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting
The permittee must report any noncompliance that may endanger health or the environment. Any information must be provided orally (by telephone) within 24 hours, unless otherwise specified in this permit, from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office must be called. Outside of normal business hours, the Department must be contacted at 1-800-452-0311 (Oregon Emergency Response System).

A written submission must also be provided within 5 days of the time the permittee becomes aware of the circumstances. Pursuant to ORS 468.959 (3) (a), if the permittee is establishing an affirmative defense of upset or bypass to any offense under ORS 468.922 to 468.946, delivered written notice must be made to the Department or other agency with regulatory jurisdiction within 4 (four) calendar days of the time the permittee becomes aware of the circumstances. The written submission must contain:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. The estimated time noncompliance is expected to continue if it has not been corrected;
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance; and
e. Public notification steps taken, pursuant to General Condition B.7

The following must be included as information that must be reported within 24 hours under this paragraph:

f. Any unanticipated bypass that exceeds any effluent limitation in this permit;
g. Any upset that exceeds any effluent limitation in this permit;
h. Violation of maximum daily discharge limitation for any of the pollutants listed by the Department in this permit; and
i. Any noncompliance that may endanger human health or the environment.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance
The permittee must report all instances of noncompliance not reported under General Condition D.4 or D.5, at the time monitoring reports are submitted. The reports must contain:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. The estimated time noncompliance is expected to continue if it has not been corrected; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information
The permittee must furnish to the Department within a reasonable time any information that the Department may request to determine compliance with this permit. The permittee must also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it has failed to submit any relevant facts or has submitted incorrect information in a permit application or any report to the Department, it must promptly submit such facts or information.

8. Signatory Requirements
All applications, reports or information submitted to the Department must be signed and certified in accordance with 40 CFR Section 122.22.

9. Falsification of Information
Under ORS 468.953, any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance, is subject to a Class C felony punishable by a fine not to exceed $100,000 per violation and up to 5 years in prison. Additionally, according to 40 CFR 122.41(k)(2), any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a

federal civil penalty not to exceed $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

0. Changes to Indirect Dischargers

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;
b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.
c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

ECTION E. DEFINITIONS

BOD means five-day biochemical oxygen demand.
CBOD means five day carbonaceous biochemical oxygen demand
TSS means total suspended solids.
"Bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and E. coli bacteria.
FC means fecal coliform bacteria.
Total residual chlorine means combined chlorine forms plus free residual chlorine
Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR Section 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR Chapter 340, Division 41.
mg/l means milligrams per liter.
kg means kilograms.
0. *m^3/d* means cubic meters per day.
1. *MGD* means million gallons per day.
2. 24-hour *Composite sample* means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow. The sample must be collected and stored in accordance with 40 CFR part 136.
3. *Grab sample* means an individual discrete sample collected over a period of time not to exceed 15 minutes.
4. *Quarter* means January through March, April through June, July through September, or October through December.
5. *Month* means calendar month.
6. *Week* means a calendar week of Sunday through Saturday.
7. *POTW* means a publicly owned treatment works.

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: CITY OF SUTHERLIN, Permittee	))))))	MUTUAL AGREEMENT AND ORDER NO. WQ/M-WR-05-054 DOUGLAS COUNTY

WHEREAS:

1. On January 22, 2001, the Department of Environmental Quality (Department or DEQ) issued National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Number 101993 (Permit) to City of Sutherlin (Permittee). The Permit authorizes the Permittee to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewaters to the Calapooya Creek, waters of the state, during winter months of the year, and to irrigate the Oak Hill Golf Course during late spring through early fall months in conformance with the requirements, limitations and conditions set forth in the Permit. The Permit expires on December 31, 2005.

2. Condition 1.a.(1) of Schedule A of the Permit prohibits discharge of treated wastewater to waters of the state from June 1 through October 31 of each year.

3. During the time period the permit has been in effect, Permittee has allowed reclaimed water from the Oak Hill Golf Course irrigation storage ponds to discharge to Cook Creek, which is a point not authorized by the permit. This release of treated effluent to waters of the state has resulted in a Class I Notice of Noncompliance being issued to the City of Sutherlin.

4. DEQ and the Permittee recognize that the Permittee does not have to sufficient land with sufficient water storage capacity to irrigate the amounts of reclaimed water necessary to keep the storage ponds from overflowing. Until new or modified facilities are constructed and put into full operation, Permittee will continue to violate the permit conditions at times.

5. Permittee presently is capable of treating its effluent so as to meet the following effluent limitations, measured as specified in the Permit:

Outfall 001 (Calapooya Creek)

(1) June 1 – October 31: Shall minimize discharge by utilizing the reclaimed water system to the maximum extent possible. When discharging, shall comply with the following interim limits:

Parameter	Average Effluent Concentrations		Monthly* Average lb/day	Weekly* Average lb/day	Daily* Maximum lbs
	Monthly	Weekly			
BOD_5	30 mg/L	45 mg/L	120	220	350
TSS	30 mg/L	45 mg/L	120	220	350

* Average dry weather design flow to the facility equals 0.7 MGD.

(2) Permittee shall comply with all other permit limitations including the year-round parameters and Outfall 002 (Reclaimed Water Reuse) requirements.

6. The Department and Permittee recognize that the Environmental Quality Commission has the power to impose a civil penalty and to issue an abatement order for violations of conditions of the Permit. Therefore, pursuant to ORS 183.415(5), the Department and Permittee wish to settle those past violations referred to in Paragraph 3 and to limit and resolve the future violations referred to in Paragraph 4 in advance by this Mutual Agreement and Order (MAO).

7. This MAO is not intended to settle any violation of any interim effluent limitations set forth in Paragraph 5 above. Furthermore, this MAO is not intended to limit, in any way, the Department's right to proceed against Permittee in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

8. The Environmental Quality Commission shall issue a final order:

A. Requiring Permittee to comply with the following schedule:

(1) By no later than May 1, 2006, Permittee shall submit an Inflow Infiltration (I/I) Study for Department review. This I/I Study must identify areas of excessive I/I in the sanitary sewer collection system and propose a plan and schedule to correct the collection system deficiencies. The I/I Study must also identify all inflow sources and propose a plan to eliminate these sources.

(2) By no later than December 1, 2006, Permittee shall submit a draft Wastewater Facilities Plan for Department review. This plan must conform to the requirements of the Clean Water Act State Revolving Fund and contain a schedule for the required improvements. Improvements to the reclaimed water system must be given highest priority and may be scheduled ahead of other improvements.

(3) By no later than 6 months after receiving comments on the draft facilities plan, Permittee shall submit a revised final plan in compliance with DEQ comments.

(4) By no later than 9 months after Department approval of the Wastewater Facilities Plan, Permittee shall complete funding arrangements for the treatment plant upgrades. Permittee shall notify the Department no later than 8 months after Department approval of the facilities plan if funding schedule can not be met.

(5) By no later than 12 months after Department approval of the facilities plan, Permittee shall complete and submit to the Department pre-design engineering report and a draft revised Reclaimed Water Use Plan for Department review.

(6) By no later than 6 months after Department approval of the pre-design engineering report, Permittee shall submit to the Department, final engineering plans and specifications for providing wastewater control facilities as needed to assure that the Permittee can continuously comply with permit conditions and all other applicable water quality standards.

(7) By no later than 14 months following approval of final plans and specifications, Permittee shall complete construction of the plan upgrades and implement the

Reclaimed Water Use Plan.

B. Requiring Permittee to meet the interim effluent limitations set forth in Paragraph 5 above until implementation of the reclaimed water plan required by paragraph 8.A.4. above.

C. Requiring Permittee, should Permittee fail to comply with the above schedule, to cease allowing new connections to Permittee's sewage collection system upon written requirement of the Department.

D. Requiring Permittee, upon receipt of a written Penalty Demand Notice from the Department, to pay the following civil penalties:

(1) $250 for each day of each violation of the compliance schedule set forth in Paragraph 8A.

(2) $100 for each violation of each daily or weekly average waste discharge limitation set forth in Paragraph 5.

(3) $500 for each violation of each monthly average waste discharge limitation set forth in Paragraph 5.

9. If any event occurs that is beyond Permittee's reasonable control and that causes or may cause a delay or deviation in performance of the requirements of this MAO, Permittee shall immediately notify the Department verbally of the cause of delay or deviation and its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Permittee proposes to carry out such measures. Permittee shall confirm in writing this information within five (5) working days of the onset of the event. It is Permittee's responsibility in the written notification to demonstrate to the Department's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of Permittee. If Permittee so demonstrates, the Department shall extend times of performance of related activities under this MAO as appropriate. Circumstances or events beyond Permittee's control include, but are not limited to, acts of nature,

unforeseen strikes, work stoppages, fires, explosion, riot, sabotage, or war. Increased cost of performance or consultant's failure to provide timely reports may not be considered circumstances beyond Permittee's control.

10. Regarding the violations set forth in Paragraphs 3 and 4 above, which are expressly settled herein without penalty, Permittee and the Department hereby waive any and all of their rights to any and all notices, hearing, judicial review, and to service of a copy of the final order herein. The Department reserves the right to enforce this order through appropriate administrative and judicial proceedings.

11. Regarding the schedule set forth in Paragraph 8A above, Permittee acknowledges that Permittee is responsible for complying with that schedule regardless of the availability of any federal or state grant monies.

12. The terms of this MAO may be amended by the mutual agreement of the Department and Permittee.

13. The Department may amend the compliance schedule and conditions in this MAO upon finding that such modification is necessary because of changed circumstances or to protect public health and the environment. The Department shall provide Permittee a minimum of thirty (30) days written notice prior to issuing an Amended Order modifying any compliance schedules or conditions. If Permittee contests the Amended Order, the applicable procedures for conduct of contested cases in such matters shall apply.

14. This MAO shall be binding on the parties and their respective successors, agents, and assigns. The undersigned representative of each party certifies that he or she is fully authorized to execute and bind such party to this MAO. No change in ownership or corporate or partnership status relating to the facility shall in any way alter Permittee's obligations under this MAO, unless otherwise approved in writing by DEQ.

15. All reports, notices and other communications required under or relating to this MAO should be directed to Paul Kennedy, DEQ Roseburg Regional Office, 725 SE Main Street,

Roseburg, Oregon 97470, phone number (541) 440-3338 x. 228. The contact person for Permittee shall be Mike Gray, 126 East Central, Sutherlin OR 97479 phone number (541) 459-3542.

16. Permittee acknowledges that it has actual notice of the contents and requirements of the MAO and that failure to fulfill any of the requirements hereof would constitute a violation of this MAO and subject Permittee to payment of civil penalties pursuant to Paragraph 8D above.

17. Any stipulated civil penalty imposed pursuant to Paragraph 8D shall be due upon written demand. Stipulated civil penalties shall be paid by check or money order made payable to the "Oregon State Treasurer" and sent to: Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204. Within 21 days of receipt of a "Demand for Payment of Stipulated Civil Penalty" Notice from the Department, Permittee may request a hearing to contest the Demand Notice. At any such hearing, the issue shall be limited to Permittee's compliance or non-compliance with this MAO. The amount of each stipulated civil penalty for each violation and/or day of violation is established in advance by this MAO and shall not be a contestable issue.

18. Providing Permittee has paid in full all stipulated civil penalties pursuant to Paragraph 17 above, this MAO shall terminate 60 days after Permittee demonstrates full compliance with the requirements of the schedule set forth in Paragraph 8A above.

PERMITTEE

OCT 24 2006

Date

Arthur J. Schmidt
City Manager, City of Sutherlin

DEPARTMENT OF ENVIRONMENTAL QUALITY

OCT 2 4 2006

Date

Kerri L. Nelson, Western Region Administrator

FINAL ORDER

IT IS SO ORDERED:

ENVIRONMENTAL QUALITY COMMISSION

OCT 2 4 2006

Date

Kerri L. Nelson, Western Region Administrator
Department of Environmental Quality
Pursuant to OAR 340-11-136(1)

Oregon
John A. Kitzhaber, MD, Governor

Department of Environmental Quality
Headquarters
811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
FAX (503) 229-6124
TTY: 711

April 17, 2012

City of Sutherlin
c/o Brian Elliott, Wastewater Division Supervisor
126 E. Central Avenue
Sutherlin, OR 97479

Re: Amendment
Mutual Agreement and Order
No. WQ/M-WR-05-054

Dear Mr. Elliott:

Please find enclosed a fully executed Amendment to the referenced Mutual Agreement and Order. If you have any questions, please contact me at 503-229-5950.

Thank you for your cooperation.

Sincerely,

Jeff Bachman
Office of Compliance and Enforcement

Enclosure
cc: Jon Gasik, Western Region, Medford Office, DEQ

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF: CITY OF SUTHERLIN, Wastewater Treatment Facility Permittee.	))))))	AMENDMENT NO. 1 MUTUAL AGREEMENT AND ORDER NO. WQ/M-WR-05-054 DOUGLAS COUNTY

WHEREAS:

1. On October 24, 2006, the Department of Environmental Quality (DEQ) and Permittee entered into Mutual Agreement and Order (MAO) No. WQ/M-WR-05-054.

2. Paragraph 12 of MAO states: "The terms of this MAO may be amended by the mutual agreement of the Department and Permittee."

3. Also on October 24, 2006, DEQ renewed permittee's National Pollutant Discharge Elimination System Permit No. 101993. The renewed permit contained new daily and monthly average effluent limits on ammonia. In the permit evaluation report, DEQ stated:

> "A file review of effluent monitoring data shows that the ammonia concentrations do not regularly exceed these limits. The permittee should be able to meet these limits with proper operation and maintenance and the Department considers these limits to be protective of the water quality standard for Ammonia-N."

For this reason, no compliance schedule for ammonia was provided in the permit. Since that time the City has properly operated and maintained the system and yet is unable to consistently meet the ammonia limits. The City has exceeded the monthly average limit of 7.8 mg/L on the following occasions:

Month	Reported Value
January 2006	10.2
February 2006	8.8
March 2006	8.6
April 2006	8.7
May 2006	13.2
June 2006	19.2

July 2006	25.5
August 2006	11.3
September 2006	17.8
October 2006	8.8
July 2007	8.2
August 2007	9.8
September 2007	8.4
February 2008	10
March 2008	11.2
July 2008	11.4
August 2008	10.9
September 2008	12.0
October 2008	8.9
April 2009	8.6
May 2009	8.6
June 2009	19.0
July 2009	24.5
August 2009	22.5
September 2009	14.5
March 2010	8.4
April 2010	11.5
June 2010	8.0
July 2010	13.0
August 2010	12.8
September 2010	8.5
January 2011	9.2
February 2011	9.9
May 2011	8.5
June 2011	9.6
July 2011	14.0
August 2011	19.0
September	26.0
October 2011	19.0
November 2011	15.5
December 2011	12.8

The City has exceeded the daily maximum limit of 21 mg/L on the following occasions:

Date	Reported Value
July 10, 2006	22.9 mg/L
July 24, 2006	28.1 mg/L
August 8, 2006	22.1 mg/L
September 4, 2006	25 mg/L
June 29, 2009	23 mg/L
July 29, 2009	29 mg/L
August 10, 2009	25 mg/L
September 5, 2011	22 mg/L
September 19, 2011	30 mg/L

4. DEQ and the Permittee recognize that until new or modified facilities are constructed and put into full operation, Permittee will continue to violate the ammonia limit at times.

5. Permittee presently is capable of treating its effluent so as to meet the following effluent limitations, measured as specified in the Permit:

Pollutant	Limitation
Ammonia-N	Shall not exceed 30 mg/L daily maximum concentration.
Ammonia-N	Shall not exceed 27 mg/L monthly average concentration.

NOW THEREFORE, pursuant to ORS 183.415(5), the Department and Permittee wish to settle those past violations referred to in Paragraph 3 and to limit and resolve the future violations referred to in Paragraph 4 in advance by this amendment to MAO No. WQ/M-WR-05-054.

5. Paragraph 5 of MAO No. WQ/M-WR-05-054 is amended to include the interim ammonia limits in Paragraph 5 above.

6. Paragraph 8.A. is amended to add milestone 7 as follows: "By no later than fifteen (15) months after initiation of operation of the new facilities, Permittee must submit a report summarizing the performance testing conducted during the first twelve (12) months of operation and an evaluation of whether the actual performance meets expectations. If needed, the report must also include a list of recommended performance improvements."

7. Paragraph 15 is replaced with the following: "All reports, notices and other communications required under or relating to this MAO should be directed to DEQ Eugene Regional Office, 165 East 7th Avenue, Suite 100, Eugene, OR 97401, phone number (541) 687-7331. The contact for Permittee is the City Manager, 126 East Central, Sutherlin OR 97479 phone number (541) 459-3542."

7. Paragraph 18 is replaced with the following: "This MAO will terminate the day after the final task in Paragraph 7 is completed. However, Permittee remains liable for stipulated penalties

for any violations of the MAO occurring during the period the MAO was in effect and demanded pursuant to Paragraph 15."

9. The past violations listed in Paragraph 3 above and the potential future violations referred to in Paragraph 4 above are resolved without penalty.

10. All other terms and conditions of MAO No. WQ/M-WR-05-054 remain unchanged.

PERMITTEE

4/4/2012
Date

Ron Garzini, City Manager interim
City of Sutherlin, Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY and
ENVIRONMENTAL QUALITY COMMISSION

4/13/12
Date

Leah E. Koss, Manager
Office of Compliance and Enforcement
on behalf of DEQ pursuant to OAR 340-012-0170
on behalf of the EQC pursuant to OAR 340-011-0505

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION

OF THE STATE OF OREGON

IN THE MATTER OF:	)	MUTUAL AGREEMENT
	)	AND ORDER
CITY OF SUTHERLIN,	)	NO. WQ/M-WR-16-027
Permittee.	)	DOUGLAS COUNTY
	)	

WHEREAS:

1. On October 24, 2006, the Department of Environmental Quality (Department or DEQ) issued National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Number 101993 (Permit) to City of Sutherlin (Permittee). The Permit authorizes the Permittee to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewaters into Calapooya Creek, waters of the state, in conformance with the requirements, limitations and conditions set forth in the Permit. The Permit expiration date is September 30, 2011, but the Permit remains in force as Permittee made timely application for renewal.

2. Condition 6.b. of Schedule F Section B of the Permit does not allow sanitary sewer overflows (SSOs), except during a storm event greater than the one-in-five year, 24-hour duration storm from November 1 through May 21 and except during a storm event greater than the one-in-ten year, 24-hour duration storm from May 22 through October 31. SSOs also violate Oregon Revised Statutes (ORS) 468B.025(1)(a) and may violate ORS 468B.025(1)(b).

3. Permittee violated the Permit, ORS 468B.025(1)(a) and .025(1(b) as follows: Storm-related SSOs occurred on February 14, 2014; March 28, 2014; March 29, 2014; February 6, 2015; and February 7, 2015.

4. DEQ and the Permittee recognize that the sewage collection system has inadequate capacity and until the sewage collection system is modified, Permittee may, when storms occur, continue to violate the permit and statutory prohibitions against SSOs .

5. The Department and Permittee recognize that the Environmental Quality

Commission has the authority to impose a civil penalty and to issue an abatement order for violations of conditions of the Permit. Therefore, pursuant to ORS 183.415(5), the Department and Permittee wish to settle those past violations referred to in Paragraph 3 and to limit and resolve the future violations referred to in Paragraph 4 (unless caused negligently, willfully or intentionally) in advance by this Mutual Agreement and Order (MAO).

6. The U.S. Environmental Protection Agency appropriately delegated the federal NPDES permitting program to the Department, making the Department the primary administrator and enforcer of the NPDES permits. The Department believes that this MAO furthers the goals of the NPDES permitting program by ensuring progress towards compliance and is consistent with the Department's goal of protecting human health and the environment. However, the Department and Permittee recognize that this MAO does not eliminate the possibility of additional enforcement of Permit requirements by the U.S. Environmental Protection Agency or citizens under the federal citizen suit provisions.

7. This MAO is not intended to limit, in any way, the Department's right to proceed against Permittee in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

8. The Environmental Quality Commission shall issue a final order:

A. Requiring Permittee to comply with the following compliance order:

(1) By no later than November 1, 2016, Permittee must submit draft construction documents for a new force main for the Everett Street pump station as outlined in Permittee's pre-design report dated November 30, 2015 prepared by Dyer Partnership Engineers & Planners Inc. This new force main will discharge pumped sewage at a location downstream of the manholes that overflow during storm events.

(2) Within 90 days of receiving DEQ comments on the draft plans, Permittee must submit final construction documents, revised to be consistent with any DEQ comments, for a new force main for the Everett Street pump station that address DEQ comments.

By no later than November 1, 2017, Permittee must complete construction of the new force main for the Everett Street pump station.

B. Requiring permittee to make all reasonable efforts to prevent SSOs.

C. Requiring Permittee, upon receipt of a written Penalty Demand Notice from the Department, to pay the following civil penalties: $600 for each day of violation of the compliance order set forth in Paragraph 8A.

9. If any event occurs that is beyond Permittee's reasonable control and that causes or may cause a delay or deviation in performance of the requirements of this MAO, Permittee shall immediately notify the Department verbally of the cause of delay or deviation and its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Permittee proposes to carry out such measures. Permittee shall confirm in writing this information within five (5) working days of the onset of the event. It is Permittee's responsibility in the written notification to demonstrate to the Department's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of Permittee. If Permittee so demonstrates, the Department shall extend times of performance of related activities under this MAO as appropriate. Circumstances or events beyond Permittee's control include, but are not limited to, acts of nature, unforeseen strikes, work stoppages, fires, explosion, riot, sabotage, or war. Increased cost of performance or a consultant's failure to provide timely reports are not considered circumstances beyond Permittee's control.

10. The violations set forth in Paragraphs 3 are expressly settled herein without penalty. The violations in Paragraph 4 are expressly settled herein without penalty, unless caused negligently, willfully or intentionally.

11. Permittee and the Department hereby waive any and all of their rights to any and all notices, hearing, judicial review, and to service of a copy of the final order herein. The

Department reserves the right to enforce this order through appropriate administrative and judicial proceedings.

12. Regarding the order set forth in Paragraph 8A above, Permittee acknowledges that Permittee is responsible for complying with that order regardless of the availability of any federal or state grant monies.

13. The terms of this MAO may be amended by mutual agreement of the Department and Permittee.

14. The Department may amend the compliance order and conditions in this MAO upon finding that such modification is necessary because of changed circumstances or to protect public health and the environment. The Department shall provide Permittee a minimum of thirty (30) days written notice prior to issuing an Amended MAO. If Permittee contests the Amended MAO, the applicable procedures for conduct of contested cases in such matters shall apply.

15. This MAO shall be binding on the parties and their respective successors, agents, and assigns. The undersigned representative of each party certifies that he or she is fully authorized to execute and bind such party to this MAO. No change in ownership or corporate or partnership status relating to the facility shall in any way alter Permittee's obligations under this MAO, unless otherwise approved in writing by DEQ.

16. All reports, notices and other communications required under or relating to this MAO should be directed to Paul Kennedy, DEQ Western Region Eugene Regional Office, 165 E. 7th Avenue, Suite 100, Eugene, Oregon 97401, phone number (541) 687-7439. The contact person for Permittee is Jerry Gillham, City Manager, City of Sutherlin, 126 E. Central Avenue, Sutherlin, Oregon, phone number (541) 459-2856.

17. Permittee acknowledges that it has actual notice of the contents and requirements of this MAO and that failure to fulfill any of the requirements hereof will constitute a violation of this MAO and subject Permittee to payment of civil penalties pursuant to Paragraph 8.E above.

18. Any stipulated civil penalty imposed pursuant to Paragraph 8.C shall be due upon

written demand. Stipulated civil penalties shall be paid by check or money order made payable to the "Oregon State Treasurer" and sent to: Business Office, Department of Environmental Quality, 811 S.W. Sixth Avenue, Portland, Oregon 97204. Within 21 days of receipt of a "Demand for Payment of Stipulated Civil Penalty" Notice from the Department, Permittee may request a hearing to contest the Demand Notice. At any such hearing, the issue shall be limited to Permittee's compliance or non-compliance with this MAO. The amount of each stipulated civil penalty for each violation and/or day of violation is established in advance by this MAO and shall not be a contestable issue.

19. This MAO shall terminate at the end of the day on the date the final compliance task in Paragraph 8A above is to be completed. However, Permittee remains liable for stipulated penalties for any violations of the MAO occurring during the period the MAO was in effect and demanded pursuant to Paragraph 18.

PERMITTEE

2/5/16
Date

Jerry Gillham
Jerry Gillham City Manager

DEPARTMENT OF ENVIRONMENTAL QUALITY

2/11/16
Date

Leah Feldon
Leah Feldon, Manager
Office of Compliance and Enforcement

FINAL ORDER

IT IS SO ORDERED:

ENVIRONMENTAL QUALITY COMMISSION

2/11/16
Date

Leah Felden
Leah Feldon, Manager
Office of Compliance and Enforcement
on behalf of DEQ pursuant to OAR 340-012-0170
on behalf of the EQC pursuant to OAR 340-011-0505

APPENDIX B – GLOSSARY

B

Glossary

Glossary

The terms used in this study are defined below.

Definitions

Anaerobic Digestion – the decomposition of organic material by bacteria in an environment without oxygen.

Average Dry Weather Flow (ADWF) - the average flow measured during a dry weather season, usually May 1 to October 31, and during low groundwater levels that occur on a daily basis. During periods of little or no precipitation, wastewater flow is composed primarily of sanitary sewage, commercial and/or industrial wastes. Base infiltration may be present.

Average Wet Weather Flow (AWWF) – the average flow measured during the wet season, usually November 1st to April 30th. This value may be utilized as a basis for higher winter mass load limits.

Base Infiltration - water that enters the sewage system from the surrounding soil during periods of low groundwater levels.

Biochemical Oxygen Demand (BOD) - a measure of wastewater strength in terms of the quantity of oxygen required for biological oxidation of the organic matter contained in wastewater. The BOD loading imposed on a treatment plant influences both the type and degree of treatment, which must be provided to produce the required effluent quality. All references to BOD in this report are with respect to five-day BOD and 20° Celsius.

Discharge Monitoring Report (DMR) – the standard form required by the Oregon Department of Environmental Quality (DEQ) for the recording and reporting of influent and effluent volumes and characteristics along with other data pertaining to the wastewater system.

Excessive Infiltration and Inflow (I/I) - portion of infiltration and/or inflow which can be removed from the sewage system through rehabilitation at less cost than continuing to transport and treat that portion of I/I.

Industrial Wastes - waterborne wastes produced as the result of manufacturing or processing operations.

Infiltration - water that enters the sewage system from the surrounding soil. Common points of entry include broken pipe and defective joints in pipe and manhole walls. Although generally limited to sewers laid below the normal groundwater level, infiltration also occurs as a result of rain or irrigation water soaking into the ground and entering mains, manholes, and even shallow house sewer laterals with defective joints or other faults.

Inflow - water that enters the sewage system from surface runoff. Inflow may enter the sewer system through manhole covers, exposed broken pipes and defective pipe joints, cross connections between storm sewers and sanitary sewers, and illegal connections of roof and area drains.

Lateral - sewer pipe that connects the private sewer user's facility to the public sewer lines. Laterals are usually the responsibility of the property owner from their facility to the property line.

Maximum Monthly Dry Weather Flow (MMDWF) - the monthly average flow that has only twenty-percent probability of being experienced during May to October in any given year. In other words, this flow represents the wettest dry weather season monthly average flow that is anticipated to have a five-year recurrence interval. For western Oregon, May is usually the month, which has the highest dry weather flow.

Maximum Monthly Wet Weather Flow (MMWWF) - the monthly average flow that has only twenty-percent probability of being experienced during November to April in any given year. This flow represents the wettest wet season monthly average flow that is anticipated to have a five-year recurrence interval. For western Oregon, January is usually the month that has the highest wet weather flow.

Non-excessive Infiltration – "The quantity of flow which is less than 120 gallons per capita per day (domestic base flow and infiltration) or the quantity of infiltration which cannot be economically and effectively eliminated from a sewer system as determined in a cost-effective analysis" (40 CFR 35.2005, US Office of Federal Register 1999).

Non-excessive Inflow – "The maximum total flow rate during storm events which does not result in chronic operational problems related to hydraulic overloading of the treatment works or which does not result in a total flow of more than 275 gallons per capita per day (domestic base flow plus infiltration plus inflow). Chronic operational problems may include surcharging, backups, bypasses, and overflows" (40 CFR 35.2005, US Office of Federal Register 1999).

Peak Daily Average Flow ($PDAF_5$) - the highest 24-hour flow measured during a 5-year storm during conditions of high ground water. A 24-hour 5-year storm for Gold Beach has 5.5 inches of rain.

Peak Instantaneous Flow (PIF) - the highest hourly flow measured during wet weather. The addition of increased I/I during periods of high groundwater levels and rainfall may produce flows several times greater than the ADWF. This value determines the hydraulic capacity of major process units, sewers, channels, and pumps.

pH - a logarithmic measure of hydrogen ion concentration. The pH scale ranges from 0 to 14. A pH of 7 is considered to be neutral. Substances with a pH of less that 7 are acidic; substances with a pH greater than 7 are basic.

Rain Induced Infiltration - portion of infiltration due to leakage of percolating rainwater into collection system defects that lie near the ground surface.

Residual - the amount of chlorine in mg/L left in treated effluent at discharge.

Sanitary Sewage - waterborne wastes principally derived from the sanitary conveniences of residences, business establishments, and institutions.

Total Suspended Solids (TSS) - a measure of the quantity of suspended material contained in the wastewater. The quantity of TSS removed during treatment influences the sizing of sludge handling and disposal processes, as well as the effectiveness of disinfection with chlorine.

Wastewater - total fluid flow in a sewerage system. Wastewater may include sanitary sewage, industrial wastes, and infiltration and inflow (I/I).

Abbreviations

ADWF - Average dry weather flow

AWWF - Average wet weather flow

BOD - Biochemical oxygen demand

DEQ - Oregon State Department of Environmental Quality

DMR - Discharge monitoring report

EQ - Equalization Basin

FOG - Fats, oils and grease present in wastewater

GPCD - Gallons per capita per day

GPM - Gallons per minute

I/I - Infiltration and Inflow

MAO - Mutual Agreement and Order

MGD - Million gallons per day

mg/l - Milligrams per liter

MMDWF - Maximum monthly dry weather flow

MMWWF - Maximum monthly wet weather flow

NPDES - National Pollutant Discharge Elimination System

PDAF - Peak daily average flow

PIF - Peak instantaneous flow

PPCD - Pounds per capita per day

SBR - Sequencing Batch Reactor

SFO - Stipulation and Final Order

CWSRF - Clean Water State Revolving Fund

TMDL - Total maximum daily load

TSS - Total suspended solids

UV - Ultraviolet disinfection system

WLO - Waste load allocation

WWTP - Wastewater treatment plant

Instrumentation Abbreviations

FE/FIT - Flow element/flow indicator transmitter
FS - Flow switch
LET - Level transmitter
LI - Level indicator
LSA - Level sensor alarm
LSH - Level sensor high
LSL - Level sensor low
OE/OIT - Oxygen element/oxygen indicator transmitter
PI - Pressure indicator
PIT - Pressure indicator transmitter
TIT – Temperature indicator transmitter

APPENDIX C – COST ESTIMATES

C

Cost Estimates

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
4-May-2016
Cost Estimate Summary

Item	Component	Construction
1	Influent Screening	$461,244
2	Influent Pump Station	$1,169,530
3	Headworks	$935,506
4	SBR Basins	$4,760,269
5	Tertiary Treatment	$726,503
6	UV Disinfection	$790,686
7	Digesters	$1,256,417
8	Biosolids Dewatering	$1,086,278
9	Reuse Effluent	$292,015
10	Non-Potable Water System	$89,628
11	Storm Sewer	$16,890
12	Site Piping	$347,442
13	Site Work & Paving	$505,684
14	SBR Site Pre-Load	$427,369
15	Fencing	$50,400
16	Control Building	$604,800
17	Maintenace Shop	$214,400
18	Operations Building Demolition	$24,530
19	Misellaaneous Equipment	$380,000
	Wastewater Treatment Facility Subtotal	**$14,139,591**
20	Everett Avenue Pump Station	$880,019
21	Everett Avenue Pump Station Force Main	$585,497
	Pump Station & Force Main Subtotal	**$1,465,516**
	Total Construction Cost	**$15,605,107**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Influent Screening

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$55,342	$55,400
2	Demolition & Site Preparation	LS	All	$36,894	$36,900
3	Spiral Screen	EA	2	$ 97,500.00	$195,000
4	New Grating	SF	200	$30	$6,000
5	Influent Sampler	EA	1	$15,000	$15,000
6	Excavation and Backfill	LS	ALL	$ 1,783	$1,783
7	Access Stairway	LS	ALL	$ 21,661	$21,661
8	Concrete - Flatwork	SF	275	$15	$4,125
9	Waterline Relocation	LS	ALL	$ 51,000	$51,000
10	Miscellaneous piping	LS	ALL	$ 500.00	$500
11	Trolly and Hoist System	LS	ALL	$12,000	$12,000
12	Coatings	SF	875	$15	$13,125
13	Electrical	LS	ALL	$ 29,250.00	$29,250
14	Control & Telemetry	LS	ALL	$ 19,500.00	$19,500

Construction Subtotal	**$461,244**

Cost Breakdowns - Influent Screening

Screen Installation & minor basin modifications

Equipment Cost	Markup/Installation	Total Cost
$ 75,000.00	1.2	$ 90,000.00
	Channel/Basin Modifications	$ 7,500.00
		$ 97,500.00

Excavation and Backfill

Excavation							
Length	Width	Depth	CF	CY	$/CY		Total
25	8	5	1000	37.0	$ 25.00		$ 925.93
Crushed Rock Base & Fill							
Length	Width	Depth	CF	CY	Tons	$/ton	
23	7	0.5	80.5	3.0	5.7	$ 20.00	$ 113.89
35	3	5	525	19.4	37.1	$ 20.00	$ 742.78
							$ 1,782.60

Access Stairs

	Length	Width	Depth	CF	CY	Unit Price	
Wall	30	1	10	300	11.1	$ 1,000	$ 11,111.11
Stairs/Landings					4.5	$ 1,000	$ 4,500.00
Footings					4.3	$ 1,000	$ 4,250.00
Sawcutting	26					$ 50	$ 1,300.00
Handrails	20					$ 25	$ 500.00
							$ 21,661.11

Waterline Relocation

Fittings	Qty	Unit	Unit Price	Cost
8" Tee	1	Ea	$ 500	$ 500
8" Valve	2	Ea	$ 1,400	$ 2,800
8" x 6" FH Tee	1	Ea	$ 600	$ 600
8" x 4" Reducer	1	Ea	$ 500	$ 500
Fitting Markup/Install				$ 1,100
			Subtotal	**$ 5,500**
FH Assembly	1	Ea	$ 5,000	$ 5,000
4" PRV Station	1	Ea	$ 25,000	$ 25,000
8" D.I.	100	LF	$ 80	$ 8,000
6" D.I.	50	LF	$ 60	$ 3,000
4" D.I.	50	LF	$ 40	$ 2,000
4" Conn. To Exist.	1	Ea	$ 2,500	$ 2,500
			Total	**$ 51,000**

Misc. Piping	Qty	Unit	Unit Price	Markup/Install	Cost
Non-Potable Water Piping (2")	40	LF	$ 10.00	1.25	$ 500.00
					$ 500.00

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Influent Pump Station

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 115,036	$ 115,036
2	Site Preparation	LS	All	$ 95,863	$ 95,863
3	Shoring & Dewatering	LS	All	$ 215,000	$ 215,000
4	Foundation Stabilization	CY	15	$ 100	$ 1,500
5	Excavation	CY	407	$ 40	$ 16,296
6	Wet Well Concrete Structure	CY	74	$ 1,000	$ 74,000
7	Wet Well Hatch	LS	All	$ 16,560	$ 16,560
8	Dry Weather Duplex Pump System	LS	All	$ 67,200	$ 67,200
9	Wet Weather Triplex Pump System	LS	All	$ 160,800	$ 160,800
10	Effluent Piping & Valves (Dry Weather)	LS	All	$ 31,982	$ 31,982
11	Effluent Piping & Valves (Wet Weather)	LS	All	$ 114,431	$ 114,431
12	Existing Wet Well Pump Installation	LS	All	$ 36,000	$ 36,000
12	Control Panel	LS	All	$ 21,600	$ 21,600
13	Disconnect Panel	LS	All	$ 28,800	$ 28,800
14	Level Control (Transducers & Floats)	LS	All	$ 10,000	$ 10,000
15	Roof with Crane System	SF	750	$ 90	$ 67,500
16	Electrical	LS	All	$ 61,562	$ 61,562
17	Lighting	LS	All	$ 20,521	$ 20,521
18	Coatings	SF	992	$ 15	$ 14,880

Construction Subtotal $ 1,169,530
Construction Subtotal $ 1,169,530

Cost Breakdowns - Influent Pump Station

Pump Systems

Equipment	Qty.	Equipment Cost	subtotal	Markup/Install	Total
Dry Weather Pumps	2	$ 28,000	$ 56,000	1.2	**$ 67,200**
Wet Weather Pumps	3	$ 44,667	$ 134,000	1.2	**$ 160,800**
Control Panel	1	$ 18,000	$ 18,000	1.2	**$ 21,600**
Disconnect Panel	1	$ 24,000	$ 24,000	1.2	**$ 28,800**
Existing Wet Well Pumps	2	$ 15,000	$ 30,000	1.2	**$ 36,000**
Access Hatch	3	$ 4,600	$ 13,800	1.2	**$ 16,560**

Excavation	L	W	D	Vol (CF)	Vol (CY)
Wetwell	25	20	22	11000	**407**

Interior Coating Area	L	D	Qty.	Area
Long Walls	14	20	2	560
Short Walls	8	20	2	320
Base	8	14	1	112
				992

Effluent Piping & Valves (Dry Weather)	QTY	Unit	Unit Price	Markup/Install	Cost
6" x 8" Reducer (Flg x Flg)	2	EA	$ 335	1.15	$ 771
8" x 17.5' DI Spool (Flg x PE)	2	EA	$ 1,800	1.15	$ 4,140
8" FCA	2	EA	$ 400	1.15	$ 920
8" 90 D Bend (Flg x Flg)	4	EA	$ 510	1.15	$ 2,346
8" x 4' DI Spool (Flg x PE)	4	EA	$ 485	1.15	$ 2,231
8" 90 D Bend (MJ x MJ)	2	EA	$ 215	1.15	$ 495
8" Check Valve	2	EA	$ 1,850	1.15	$ 4,255
8" Plug Valve	2	EA	$ 1,520	1.15	$ 3,496
10" x 8" Wye	2	EA	$ 1,950	1.15	$ 4,485
10" Blind Flange	1	EA	$ 255	1.15	$ 293
10" Wafer Style Pressure Sensor	1	EA	$ 2,400	1.15	$ 2,760
10" x 24" DI Spool (Flg x Flg)	1	EA	$ 525	1.15	$ 604
10" Dismanteling Joint	1	EA	$ 1,500	1.15	$ 1,725
Air Release Valve	1	EA	$ 600	1.15	$ 690
10" 90 D Bend (Flg x Flg)	1	EA	$ 965	1.15	$ 1,110
10" x 4' DI Spool (Flg x PE)	1	EA	$ 480	1.15	$ 552
10" 90 D Bend (MJ x MJ)	1	EA	$ 965	1.15	$ 1,110
					$ 31,982

Effluent Piping & Valves (Wet Weather)	QTY	Unit	Unit Price	Markup/Install	Cost
8" x 12" Reducer (Flg x Flg)	3	EA	$ 895	1.15	$ 3,088
12" x 17.5' DI Spool (Flg x PE)	3	EA	$ 2,900	1.15	$ 10,005
12" FCA	3	EA	$ 720	1.15	$ 2,484
12" 90 D Bend (Flg x Flg)	6	EA	$ 1,380	1.15	$ 9,522
12" x 6' DI Spool (Flg x PE)	6	EA	$ 1,230	1.15	$ 8,487
12" 90 D Bend (MJ x MJ)	3	EA	$ 540	1.15	$ 1,863
12" Check Valve	3	EA	$ 4,400	1.15	$ 15,180
12" Plug Valve	3	EA	$ 3,350	1.15	$ 11,558
18" x 12" Wye	3	EA	$ 8,200	1.15	$ 28,290
18" Blind Flange	1	EA	$ 990	1.15	$ 1,139
18" Wafer Style Pressure Sensor	1	EA	$ 6,310	1.15	$ 7,257
18" x 3' DI Spool (Flg x Flg)	1	EA	$ 1,440	1.15	$ 1,656
18" Dismanteling Joint	1	EA	$ 3,600	1.15	$ 4,140
Air Release Valve	1	EA	$ 600	1.15	$ 690
18" 90 D Bend (Flg x Flg)	1	EA	$ 4,710	1.15	$ 5,417
18" x 4' DI Spool (Flg x PE)	1	EA	$ 1,500	1.15	$ 1,725
18" 90 D Bend (MJ x MJ)	1	EA	$ 1,680	1.15	$ 1,932
					$ 114,431

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Headworks

Item	Description	Unit	Quantity	Unit Cost		Total Cost	
1	Const. Facilities & Temporary Controls	LS	All	$	100,300	$	100,300
2	10" Force main (above grade piping)	LS	All	$	6,500	$	6,500
3	18" Force main (above grade piping)	LS	All	$	5,523	$	5,523
4	10" Flow Meter	LS	All	$	5,108	$	5,108
5	18" Flow Meter	LS	All	$	8,250	$	8,250
6	Vortex Grit Removal Equipment	LS	All	$	192,000	$	192,000
7	Grit Classifier Equipment	LS	All	$	48,000	$	48,000
8	Concrete Slab	CY	28	$	800	$	22,400
9	Concrete Walls	CY	45	$	1,000	$	45,000
10	Concrete Platform (suspended)	CY	245	$	1,200	$	294,000
11	Stop Gates	2	Each	$	4,500	$	4,500
12	12" Piping & Valves	LS	All	$	79,302	$	79,302
13	12" Flow Meters	EA	4	$	5,459	$	21,835
14	Stairway	LF	10	$	400	$	4,000
15	Aluminum Grating	SF	100	$	45	$	4,500
16	Handrailing	LF	80	$	60	$	4,800
17	Chute & Dumpster	LS	All	$	3,000	$	3,000
18	Miscellaneous Piping	LS	All	$	1,250	$	1,250
19	Electrical	LS	All	$	36,000	$	36,000
20	Lighting	LS	All	$	12,000	$	12,000
21	Instrumentation, Controls & Telemetry	LS	All	$	24,000	$	24,000
22	Coatings	SF	883	$	15	$	13,238

Construction Subtotal	**$**	**935,506**

Cost Breakdowns - Headworks

Equipment	Equipment Price	Markup/Install	Total
Vortex Grit Removal Equipment	$ 160,000.00	1.2	**$ 192,000.00**
Grit Classifier Equipment	$ 40,000.00	1.2	**$ 48,000.00**
10" Flow Meter	$ 4,257.00	1.2	**$ 5,108.40**
12" Flow Meter	$ 4,549.00	1.2	**$ 5,458.80**
18" Flow Meter	$ 6,875.00	1.2	**$ 8,250.00**

18" Above Grade Piping	Material Price	Markup/Install	Total
17'-6" DI Spool (Flg x Flg)	$ 5,556.00	1.15	$ 6,389.40
6' DI Spool (Flg x Flg)	$ 2,630.00	1.15	$ 3,024.50
1' DI Spool (Flg x Flg)	$ 986.00	1.15	$ 1,133.90
18" 90 Deg Bend (Flg x Flg)	$ 1,700.00	1.15	$ 1,955.00
			$ 12,502.80

10" Above Grade Piping	Material Price	Markup/Install	Total
17'-6" DI Spool (Flg x Flg)	$ 2,346.00	1.15	$ 2,697.90
6' DI Spool (Flg x Flg)	$ 1,080.00	1.15	$ 1,242.00
1' DI Spool (Flg x Flg)	$ 402.00	1.15	$ 462.30
10" 90 Deg Bend (Flg x Flg)	$ 975.00	1.15	$ 1,121.25
			$ 5,523.45

12" Piping & Valves	Price	Qty	Markup/Install	Total
12" Plug Valve	$ 3,350.00	8	1.15	$ 30,820.00
12" 90 Deg Bend (Flgd)	$ 1,380.00	8	1.15	$ 12,696.00
12" 45 Deg Bend (Flgd)	$ 1,150.00	4	1.15	$ 5,290.00
12" x 12" Pipe Spool (Flg x PE)	$ 351.00	8	1.15	$ 3,229.20
12" x 1.5' Pipe Spool (Flg x Flg)	$ 612.00	2	1.15	$ 1,407.60
12" x 2' Pipe Spool (Flg x Flg)	$ 682.00	4	1.15	$ 3,137.20
12" x 3.5' Pipe Spool (Flg x Flg)	$ 894.00	2	1.15	$ 2,056.20
12" x 4' Pipe Spool (Flg x Flg)	$ 988.00	6	1.15	$ 6,817.20
12" x 16.5' Pipe Spool (Flg x Flg)	$ 2,935.00	2	1.15	$ 6,750.50
12" x 17.5' Pipe Spool (Flg x Flg)	$ 3,086.00	2	1.15	$ 7,097.80
				$ 79,301.70

Coatings - Surface Area	L (ft.)	D/W (ft.)	Area (SF)
Influent Channel - Walls	30	3	90
Influent Channel - Base	12	4	48
Bypass Channel - Walls	25	3	75
Bypass Channel - Base	12.5	3	37.5
Splitter Box - Walls	24	25	600
Splitter Box - Base	8	4	32
			882.5

Misc. Piping	Qty	Unit	Unit Price	Markup/Install	Total
Non-Potable Water Piping (2")	100	LF	$ 10.00	1.25	$ 1,250.00

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
4-May-16
Sequencing Batch Reactors

Item	Description	Unit	Quantity	Unit Cost		Total Cost	
1	Const. Facilities & Temporary Controls	LS	All	$	539,700	$	539,700
2	Preload Removal	CY	17,000	$	10	$	170,000
3	Excavation	CY	2,078	$	15	$	31,167
4	Geotextile Fabric	SY	1,800	$	1	$	1,800
5	Structural Backfill	CY	693	$	20	$	13,852
6	Concrete Walls	CY	996	$	1,000	$	996,000
7	Concrete Bottom Slab	CY	1,079	$	800	$	863,200
8	Walkway Concrete Slab	CY	110	$	1,200	$	132,000
9	Manwway Access Ports	EA	4	$	30,000	$	120,000
10	Pre-react Zone Access Ports	EA	4	$	5,000	$	20,000
11	SBR Equipment	LS	All	$	1,500,400	$	1,500,400
12	Misc. Piping & Valves	LS	All	$	47,921	$	47,921
13	WAS Flow Meter	EA	1	$	3,480	$	3,480
14	Blower Piping	LS	All	$	19,550	$	19,550
15	Handrails	LF	1,850	$	60	$	111,000
16	Stairways	LF	80	$	400	$	32,000
17	Safety Equipment	LS	All	$	10,000	$	10,000
18	Electrical	LS	All	$	75,020	$	78,000
19	Lighting	LS	All	$	30,008	$	31,200
20	Instrumentation, Controls & Telemetry	LS	All	$	37,510	$	39,000

Construction Subtotal	**$**	**4,760,269**

Cost Breakdowns - SBR Basins

Equipment	Equipment Price	Markup/Install	Total
SBR Equipment	$ 1,250,000.00	1.2	**$ 1,500,000.00**
WAS Flow Meter	$ 2,900.00	1.2	**$ 3,480.00**

Excavation & Backfill	L (ft)	W (ft)	D (ft)	Vol (CF)	Vol (CY)
SBR - Excavation	170	110	3	56100	**2078**
SBR - Structural Backfill	170	110	1	18700	**693**

Misc. Piping	Qty	Unit	Unit Price	Markup/Install	Total
WAS Piping (3")	250	LF	$ 15.00	1.15	$ 4,312.50
Non-Potable Water Piping (2")	250	LF	$ 10.00	1.15	$ 2,875.00
24" DI Effluent to 24x14 Tees at Filter					
24" x 17.5' Spool (Flg x Flg)	4	EA	$ 7,605.00	1.15	$ 34,983.00
24" x 24" Spool (Flg x PE)	4	EA	$ 1,250.00	1.15	$ 5,750.00
					$ 47,920.50

Blower Piping					
6" Stainless Steel Blower Piping	200	LF	$ 85.00	1.15	**$ 19,550.00**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Tertiary Filter

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$77,839.59	$ 77,840
2	Structural Backfill	CY	150	$ 35	$ 5,250
3	Concrete Structure	CY	50	$ 1,000	$ 50,000
4	Disk Filter	LS	All	$ 348,000	$ 348,000
5	Influent/Bypass Piping & Valves	LS	All	$ 105,035	$ 105,035
6	Effluent Piping & Valves	LS	All	$ 20,068	$ 20,068
7	Backwash Piping	LS	All	$ 11,351	$ 11,351
8	Miscellaneous Piping	LS	All	$ 460	$ 460
9	Electrical	LS	All	$ 52,200	$ 52,200
10	Lighting	LS	All	$ 8,700	$ 8,700
11	Instrumentation, Controls (NEMA 4X Enclosure) & Telemetry	LS	All	$ 34,800	$ 34,800
12	Handrailing	LF	80	$ 60	$ 4,800
13	Stairways	LF	20	$ 400	$ 8,000
				Construction Subtotal	**$ 726,503**

Cost Breakdowns - Tertiary Filter

Equipment	Equipment Price	Markup/Install	Total
Tertiary Filter Equipment	$ 290,000.00	1.2	**$ 348,000.00**

Influent Piping	QTY	Unit	Unit Price	Markup/Install	Cost
24" x 14" Tee	2	EA	$ 9,000	1.15	$ 20,700
24" x 7.5' Spool (Flg x Flg)	2	EA	$ 3,500	1.15	$ 8,050
14" Plug Valve	2	EA	$ 4,450	1.15	$ 10,235
14" x 6.5' Spool (Flg x Flg)	2	EA	$ 2,100	1.15	$ 4,830
14" 90 D Bend	2	EA	$ 2,735	1.15	$ 6,291
14" x 12" Spool (Flg x Flg)	2	EA	$ 750	1.15	$ 1,725
24" x 24" Tee	1	EA	$ 10,325	1.15	$ 11,874
24" Plug Valve	1	EA	$ 18,500	1.15	$ 21,275
24" x 6' Spool (Flg x PE)	1	EA	$ 3,050	1.15	$ 3,508
24" 90 D Bend (MJ x MJ)	1	EA	$ 3,215	1.15	$ 3,697
24" Buried DI Piping	20	LF	$ 350	1.15	$ 8,050
24" x 24" Tee (MJ x MJ)	1	EA	$ 4,175	1.15	$ 4,801
					$ 105,035

Effluent Piping	QTY	Unit	Unit Price	Markup/Install	Cost
10" 90 D Bend (Flg x Flg)	4	EA	$ 370	1.15	$ 1,702
10" x 1.5' Spool (Flg x Flg)	2	EA	$ 470	1.15	$ 1,081
10" Plug Valve	2	EA	$ 2,500	1.15	$ 5,750
10" x 8.5' DI Spool (Flg x PE)	2	EA	$ 1,160	1.15	$ 2,668
10" 90 D Bend (MJ x MJ)	2	EA	$ 370	1.15	$ 851
10" x 7' DI Spool (PE x PE)	2	EA	$ 885	1.15	$ 2,036
24" x 10" Tee (MJ x MJ)	2	EA	$ 2,600	1.15	$ 5,980
Remainder of Buried Piping Covered in Site Piping					**$ 20,068**

Backwash Piping	QTY	Unit	Unit Price	Markup/Install	Cost
10" 90 D Bend (Flg x Flg)	2	EA	$ 965	1.15	$ 2,220
10" Plug Valve	2	EA	$ 2,500	1.15	$ 5,750
10" x 9' DI Spool (PE x PE)	2	EA	$ 1,100	1.15	$ 2,530
10" 90 D Bend (MJ x MJ)	2	EA	$ 370	1.15	$ 851
Remainder of Buried Piping Covered in Site Piping					**$ 11,351**

Misc. Piping	Qty	Unit	Unit Price	Markup/Install	Cost
Non-Potable Water Piping (2")	40	LF	$ 10.00	1.15	$ 460.00
					$ 460.00

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
UV Disinfection

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 84,716	$ 84,716
3	Excavation	CY	30	$ 15	$ 450
4	Concrete Slab	CY	26	$ 800	$ 20,800
5	Structural Backfill	CY	150	$ 35	$ 5,250
7	UV Shelter	LS	All	$ 48,000	$ 48,000
8	UV Equipment	LS	All	$ 330,000	$ 330,000
9	Piping & Valves	LS	All	$ 178,759	$ 178,759
10	Flow Meter	LS	All	$ 8,250	$ 8,250
11	Effluent Sampler	LS	All	$ 15,000	$ 15,000
12	Miscellaneous Piping	LS	All	$ 460	$ 460
13	Electrical	LS	All	$ 49,500	$ 49,500
14	Lighting	LS	All	$ 16,500	$ 16,500
15	Instrumentation, Controls & Telemetry	LS	All	$ 33,000	$ 33,000

Construction Subtotal	**$ 790,686**

Cost Breakdowns - UV Disinfection

Equipment	Equipment Price	Markup/Install	Total
UV Equipment	$ 275,000	1.2	$ 330,000
18" Flow Meter	$ 6,875	1.2	$ 8,250

Piping & Valves

Influent Piping	QTY	Unit	Unit Price	Markup/Install	Cost
24" x 24" Tee	1	EA	$ 10,325	1.15	$ 11,874
24" Plug Valve	1	EA	$ 18,500	1.15	$ 21,275
24" x 24" Spool (Flg x PE)	1	EA	$ 1,250	1.15	$ 1,438
24" 90 D Bend (MJ x MJ)	1	EA	$ 3,215	1.15	$ 3,697
24" Dismanteling Joint	1	EA	$ 6,000	1.15	$ 6,900
					$ 45,184

Effluent Piping	QTY	Unit	Unit Price	Markup/Install	Cost
24" x 24" Tee	1	EA	$ 10,325	1.15	$ 11,874
24" Plug Valve	2	EA	$ 18,500	1.15	$ 42,550
24" x 24" Spool (Flg x PE)	1	EA	$ 1,250	1.15	$ 1,438
24" 90 D Bend (MJ x MJ)	1	EA	$ 3,213	1.15	$ 3,695
24" x 24" Tee (MJ x MJ)	1	EA	$ 4,175	1.15	$ 4,801
24" Dismanteling Joint	1	EA	$ 6,000	1.15	$ 6,900
12" Plug Valve	1	EA	$ 3,350	1.15	$ 3,853
24" x 12" Reducer	1	EA	$ 5,000	1.15	$ 5,750
					$ 80,860

Bypass Piping	QTY	Unit	Unit Price	Markup/Install	Cost
18" x 24" Reducer (Flg x Flg)	2	EA	$ 5,000	1.15	$ 11,500
18" Plug Valve	2	EA	$ 7,700	1.15	$ 17,710
18" x 24" DI Spool (Flg x Flg)	2	EA	$ 1,210	1.15	$ 2,783
18" 90 D Bend (Flg x Flg)	2	EA	$ 4,710	1.15	$ 10,833
18" x 13' DI Spool (Flg x Flg)	2	EA	$ 4,300	1.15	$ 9,890
Remainder of Buried Piping Covered in site piping					**$ 52,716**

Piping & Valve Total	**$ 178,759**

Misc. Piping	Qty	Unit	Unit Price	Markup/Install	Cost
Non-Potable Water Piping (2")	40	LF	$ 10	1.15	$ 460
					$ 460

	Qty	Unit	Unit Price		Cost
Shelter	800	SF	$ 60		**$ 48,000**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Digester Conversion

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 125,700	$ 125,700
2	Demolition & Site Preparation	LS	All	$ 83,800	$ 83,800
3	Wall Modifications	LS	All	$ 9,500	$ 9,500
4	Biosolids Transfer Pumps	LS	All	$ 43,488	$ 43,488
5	6" Biosolids Transfer Piping (Above Grade)	LS	All	$ 31,809	$ 31,809
6	8" Drain Piping to Biosolids Pump Basin (In Basin)	LS	All	$ 74,612	$ 74,612
7	4" Manual Telescoping Decanters	EA	8	$ 5,400	$ 43,200
8	4" Supernatant Drain Line (In Basins)	LS	All	$ 16,756	$ 16,756
9	3" Influent WAS Piping (Above Grade)	LS	All	$ 20,551	$ 20,551
10	Mud Valve Replacement	EA	15	$ 1,140	$ 17,100
11	Inner Circle Basin Concrete Bottom	LS	All	$ 44,658	$ 44,658
12	Inner Circle Blowers	EA	3	$ 42,000	$ 126,000
13	Inner Circle Blower Line Modificaitons	LS	All	$ 15,094	$ 15,094
14	Outer Circle Blowers	EA	3	$ 66,000	$ 198,000
15	Outer Circle Blower Lines	LS	All	$ 103,155	$ 103,155
16	Aeration Equipment	LS	All	$ 144,000	$ 144,000
17	Dewatering Press Feed Pump Skid	LS	All	$ 60,000	$ 60,000
18	Electrical	LS	All	$ 61,872	$ 61,872
19	Controls & Telemetry	LS	All	$ 37,123	$ 37,123

Construction Subtotal	**$ 1,256,417**

Cost Breakdowns - Digester Conversion

Equipment	Equipment Price	Qty.	Markup/Install	Cost
Manual Decanters	$ 4,500.00	1	1.2	**$ 5,400.00**
50 HP Blowers	$ 55,000.00	1	1.2	**$ 66,000.00**
20 HP Blowers	$ 35,000.00	1	1.2	**$ 42,000.00**
Aeration Equipment	$ 60,000.00	2	1.2	**$ 144,000.00**
Dewatering Screw Press Feed	$ 25,000.00	2	1.2	**$ 60,000.00**
Biosolids Transfer Pump System	$ 18,120.00	2	1.2	**$ 43,488.00**

Mud Valve Replacement (each)	Material Price	Qty.	Markup/Install	Cost
Valves	$ 650.00	1	1.2	$ 780.00
Extended Operators	$ 300.00	1	1.2	$ 360.00
				$ 1,140.00

Wall Modifications	Qty.	Unit	Unit Price	Cost
Saw Cutting		LS	$ 1,500.00	$ 1,500.00
Concrete	10	CY	$ 800.00	$ 8,000.00
				$ 9,500.00

Biosolids Transfer Piping	QTY	Unit	Unit Price	Markup/Install	Cost
6" 90 D Bend (MJ x MJ)	8	EA	$ 145.00	1.15	$ 1,334.00
6" x 8' DI Spool (Flg x PE)	8	EA	$ 660.00	1.15	$ 6,072.00
6" Plug Valve	8	EA	$ 1,000.00	1.15	$ 9,200.00
6" 90 D Bend (Flg x Flg)	16	EA	$ 280.00	1.15	$ 5,152.00
6" x 24" DI Spool (Flg x PE)	8	EA	$ 230.00	1.15	$ 2,116.00
6" x 24" DI Spool (Flg x Flg)	3	EA	$ 300.00	1.15	$ 1,035.00
6" FCA	4	EA	$ 250.00	1.15	$ 1,150.00
6" x 6' DI Spool (Flg x PE)	4	EA	$ 550.00	1.15	$ 2,530.00
6" x 17.5' DI Spool (Flg x Flg)	2	EA	$ 1,400.00	1.15	$ 3,220.00
Remainder of Buried Piping Covered in site piping					**$ 31,809.00**

8" Drain To Transfer Basin	QTY	Unit	Unit Price	Markup/Install	Cost
8" Plug Valve	10	EA	$ 1,520.00	1.15	$ 17,480.00
8" 90 D Bend (Flg x Flg)	4	EA	$ 510.00	1.15	$ 2,346.00
8" 11.25 D Bend (Flg x Flg)	20	EA	$ 155.00	1.15	$ 3,565.00
8" Tee (Flgd)	8	EA	$ 985.00	1.15	$ 9,062.00
8" x 13' (Flg x Flg)	26	EA	$ 1,410.00	1.15	$ 42,159.00
					$ 74,612.00

4" Supernatant	QTY	Unit	Unit Price	Markup/Install	Cost
4" FCA	8	EA	$ 170.00	1.15	$ 1,564.00
4" x 10' DI Spool (Flg x PE)	8	EA	$ 615.00	1.15	$ 5,658.00
4" 90 D Bend (Flg x Flg)	8	EA	$ 170.00	1.15	$ 1,564.00
4" x 7' DI Spool (Flg x PE)	10	EA	$ 495.00	1.15	$ 5,692.50
4" x 17.5' DI Spool (PE x PE)	2	EA	$ 990.00	1.15	$ 2,277.00
					$ 16,755.50

WAS Inlet Piping	QTY	Unit	Unit Price	Markup/Install	Cost
3" 90 D Bend (MJ x MJ)	8	EA	$ 90.00	1.15	$ 828.00
3" x 8' DI Spool (Flg x PE)	8	EA	$ 600.00	1.15	$ 5,520.00
3" Plug Valve	8	EA	$ 370.00	1.15	$ 3,404.00
3" 90 D Bend (Flg x Flg)	16	EA	$ 130.00	1.15	$ 2,392.00
3" x 24" DI Spool (Flg x PE)	8	EA	$ 190.00	1.15	$ 1,748.00
3" x 24" DI Spool (Flg x Flg)	3	EA	$ 240.00	1.15	$ 828.00
3" FCA	4	EA	$ 150.00	1.15	$ 690.00
3" x 6' DI Spool (Flg x PE)	4	EA	$ 465.00	1.15	$ 2,139.00
3" x 17.5' DI Spool (Flg x Flg)	2	EA	$ 1,305.00	1.15	$ 3,001.50
Remainder of Buried Piping Covered in Site Piping					**$ 20,550.50**

Concrete Quantity	Volume (CF)	Volume (CY	$/CY	Total Cost
Center Basin Concrete Fill (Both Basins)	2412	89	$ 500.00	**$ 44,657.78**

Blower Piping (Outer Basins)	Qty.	Unit	Unit Price	Markup/Install	Cost
8" Stainless Steel Blower Piping (Outer Basins)	400	LF	$ 195.00	1.15	$ 89,700.00
Valving					$ 13,455.00
					$ 103,155.00

Blower Piping (Inner Basins)	Qty.	Unit	Unit Price	Markup/Install	Cost
6" Stainless Steel Blower Piping (Inner Basins)	100	LF	$ 75.00	1.15	$ 8,625.00
Valving					$ 4,312.50
Connections to Existing					$ 2,156.25
					$ 15,093.75

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Biosolids Dewatering

Item	Description	Unit	Quantity	Unit Cost		Total Cost	
1	Const. Facilities & Temporary Controls	LS	All	$	108,628	$	108,628
2	Demolition & Site Preparation	LS	All	$	72,419	$	72,419
3	Structural Fill of Basement	CY	320	$	60	$	19,200
4	Concrete Slab, Floor & Ret. Wall	CY	55	$	1,000	$	55,407
5	Aluminum Stairway	LF	15	$	400	$	6,000
6	Overhead Door Access	LS	All	$	20,000	$	20,000
7	20" Drain Line Connection	LS	All	$	5,000	$	5,000
8	Screw press	LS	All	$	448,800	$	448,800
9	Conveyor System	LS	All	$	67,320	$	67,320
10	Misc. Piping	LS	All	$	15,000	$	15,000
11	Biosolids Cake Storage/Loading Structure	LS	All	$	139,475	$	139,475
12	Electrical	LS	All	$	77,418	$	77,418
13	Instrumentation, Controls & Telemetry	LS	All	$	51,612	$	51,612
				Construction Subtotal		**$**	**1,086,278**

Cost Breakdowns - Biosolids Dewatering

Equipment	Equipment Price	Markup/Install	Total
Screw Press Equipment	$ 374,000.00	1.2	**$ 448,800.00**

Building Modifications	L (ft)	W (ft)	Area (SF)		
Filter Area	42	40	1680		
	D (ft)	Vol (CF)	Vol (CY)		
Structural Fill	5	8400	**311.1**		
	D (in)	D (ft)	Vol (CF)	Vol (CY)	
Slab	8	0.667	1,120	41.5	
	L (ft)	H (ft)	D (ft)	Vol (CF)	Vol (CY)
Ret. Wall	40	6	1	240	8.9
				Concrete Total	**55.4**

Cake Storage/Loading	L (ft)	W (ft)	Area (SF)				
Pit Storage	30	18	540				
Truck Loading	30	18	540				
	D (ft)	Vol (CF)	Vol (CY)	$/CY	Total		
Excavation (Pit Storage)	2	1080	40.0	$ 50	**$ 2,000**		
Excavation (Truck Loading	1	540	20.0	$ 50	**$ 1,000**		
Base Rock	1	1080	40.0	$ 75	**$ 3,000**		
Concrete Slab	0.67	723.6	26.8	$ 800	**$ 21,440**		
	L (ft)	H (ft)	W (ft)	Vol (CF)	Vol (CY)	$/CY	Total
Walls	78	8	0.67	418.08	15.5	$ 1,000	**$ 15,484**
Curb	48	2	1.67	160.32	5.9	$ 800	**$ 4,750**

Roof Structure			
	Area (SF)	$/SF	Total
	1080	$ 85.00	$ 91,800.00

Cake Storage/Loading Total	**$ 139,474.67**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Reuse Effluent

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 31,287	$ 31,287
2	Reuse Pump Replacement	LS	All	$ 67,200	$ 67,200
3	Force Main Connection	LS	All	$ 29,837	$ 29,837
4	12" Forcemain to Ford's Pond (Bored)	LF	500	$ 150	$ 75,000
5	Reuse Tanker Filling Station	LS	All	$ 6,141	$ 6,141
6	Flow Meter Replacement	LS	All	$ 15,750	$ 15,750
7	Ford's Pond Influent Flow Control	LS	All	$ 25,000	$ 25,000
8	Golf Course Pond Influent Flow Control	LS	All	$ 25,000	$ 25,000
9	Electrical	LS	All	$ 10,080	$ 10,080
10	Instrumentation, Controls & Telemetry	LS	All	$ 6,720	$ 6,720

Construction Subtotal	**$ 292,015**

Cost Breakdowns - Reuse Effluent

Equipment	Equipment Price	Markup/Install	Total
Pump No. 1	$ 14,000	1.2	$ 16,800
Pump No. 2	$ 21,000	1.2	$ 25,200
Pump No. 3	$ 21,000	1.2	$ 25,200
			$ 67,200

Flow Meter Replacement	Equipment Price	Markup/Install	Total
18" Mag Meter	$ 6,875	1.2	$ 8,250
Remove Existing			$ 2,500
Misc. Piping Modifications			$ 5,000
			$ 15,750

Force Main Connection	Qty.	Unit	Unit Price	Markup/Install	Cost
18" Tee (flgd)	1	Ea	$ 7,055.00	1.15	$ 8,113.25
18" x 12" Reducer (flgd)	1	Ea	$ 3,000.00	1.15	$ 3,450.00
12" Plug Valve	1	Ea	$ 2,850.00	1.15	$ 3,277.50
18" Plug Valve	1	Ea	$ 6,830.00	1.15	$ 7,854.50
18" FCA	1	Ea	$ 2,010.00	1.15	$ 2,311.50
18" Ductile Iron	20	LF	$ 100.00	1.15	$ 2,300.00
Reinforced Coupler	1	Ea	$ 2,200.00	1.15	$ 2,530.00
					$ 29,836.75

Reuse Filling Station	Qty.	Unit	Unit Price	Markup/Install	Cost
4" DI Piping & Fittings	50	LF	$ 80.00	1.15	$ 4,600.00
4" Plug Valve	2	Ea	$ 670.00	1.15	$ 1,541.00
					$ 6,141.00

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15

Non-potable Water System

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 9,603	$ 9,603
2	Pumps & Skid	LS	All	$ 36,000	$ 37,500
3	500 Gallon Pressure Tank	LS	All	$ 17,100	$ 17,100
4	Utility Stations (Hose Bibs)	EA	20	$ 750	$ 15,000
5	Electrical	LS	All	$ 5,625	$ 5,625
6	Instrumentation, Controls & Telemetry	LS	All	$ 3,750	$ 3,750
7	Coatings	SF	105	$ 10	$ 1,050

Construction Subtotal	**$ 89,628**

Cost Breakdowns - Non-Potable Water System

Equipment	Equipment Price	Markup/Install	Total
Pump Skid	$ 30,000	1.2	**$ 36,000**
528 Gallon Tank	$ 14,250	1.2	**$ 17,100**

Coatings	Diameter		Height		Surface Area
Tank Surface Area	In	ft.	In.	ft.	
	48	4	97	8	105.0

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Strom Drainage

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 1,689	$ 1,689
2	Demolition & Site Preparation	LS	All	$ 1,126	$ 1,126
3	Catch Basin	EA	4	$ 1,200	$ 4,800
4	Drainage Swale	LF	225	$ 25	$ 5,625
5	Cook Creek Discharge Pinch Valves	EA	2	$ 1,450	$ 2,900
6	Clean-outs	EA	15	$ 750	$ 750

* Underground storm piping included in site piping estimate

Construction Subtotal $ 16,890

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Site Piping

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Facilities	LS	All	$ 37,225.96	$ 37,226
3	27" F769 PVC - Influent Screening to IPS	LF	25	$ 96	$ 2,396
4	18" Ductile Iron - IPS to Headworks	LF	340	$ 127	$ 43,319
5	10" Ductile Iron - IPS to Headworks	LF	350	$ 72	$ 25,068
6	24" Ductile Iron - Tertiary Filter to UV	LF	110	$ 168	$ 18,431
7	24" Ductile Iron - UV to Irrigation Basin	LF	20	$ 168	$ 3,351
8	12" Ductile Iron - UV to Chlorine Contact Basin	LF	110	$ 84	$ 9,253
9	6" Wrapped Steel - Blower to SBR	LF	385	$ 60	$ 22,992
10	8" Wrapped Steel - Blower to Digesters	LF	650	$ 77	$ 50,359
11	8" 3034 PVC Storm Drain Line	LF	800	$ 38	$ 30,792
12	4" Control Building Drain Line	LF	100	$ 29	$ 2,869
13	4" SBR Drain Line	LF	15	$ 29	$ 430
14	4" Headworks Drain Line	LF	155	$ 29	$ 4,447
15	4" Biosolids Storage Drain Line	LF	35	$ 29	$ 1,004
16	3" WAS Line - SBR to Digesters	LF	550	$ 35	$ 19,083
17	6" Biosolids Transfer Line	LF	470	$ 43	$ 19,999
18	8" Digester Supernatant Drain Line	LF	510	$ 54	$ 27,313
19	4" Non-Potable Water Lines	LF	750	$ 39	$ 29,109

Construction Subtotal $ 347,442

Cost Breakdowns - Site Piping

Piping Materail	Pipe Cost ($/ft.)	Excavation & Backfill ($/ft)	Markup/Install	Total
27" F769 PVC - Influent Screening to IPS	$ 58.33	$ 25.00	1.15	**$ 95.83**
18" Ductile Iron - IPS to Headworks	$ 85.79	$ 25.00	1.15	**$ 127.41**
10" Ductile Iron - IPS to Headworks	$ 40.28	$ 22.00	1.15	**$ 71.62**
24" Ductile Iron - Tertiary Filter to UV	$ 120.70	$ 25.00	1.15	**$ 167.56**
24" Ductile Iron - UV to Irrigation Basin	$ 120.70	$ 25.00	1.15	**$ 167.56**
12" Ductile Iron - UV to Chlorine Contact Basin	$ 51.15	$ 22.00	1.15	**$ 84.12**
6" Wrapped Steel - Blower to SBR	$ 29.93	$ 22.00	1.15	**$ 59.72**
8" Wrapped Steel - Blower to Digesters	$ 45.37	$ 22.00	1.15	**$ 77.48**
8" 3034 PVC Storm Drain Line	$ 11.47	$ 22.00	1.15	**$ 38.49**
4" Control Building Drain Line	$ 2.95	$ 22.00	1.15	**$ 28.69**
4" SBR Drain Line	$ 2.95	$ 22.00	1.15	**$ 28.69**
4" Headworks Drain Line	$ 2.95	$ 22.00	1.15	**$ 28.69**
4" Biosolids Storage Drain Line	$ 2.95	$ 22.00	1.15	**$ 28.69**
3" WAS Line - SBR to Digesters	$ 8.17	$ 22.00	1.15	**$ 34.70**
6" Biosolids Transfer Line	$ 15.00	$ 22.00	1.15	**$ 42.55**
8" Digester Supernatant Drain Line	$ 24.57	$ 22.00	1.15	**$ 53.56**
4" Non-Potable Water Lines	$ 11.75	$ 22.00	1.15	**$ 38.81**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Site Grading & Paving

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Site Preperation	LS	ALL	$ 65,958.75	$ 65,959
Access Road					
2	Excavation	CY	880	$ 15.00	$ 13,200
3	Geotextile Fabric	SY	1,760	$ 1.00	$ 1,760
4	Asphalt	TON	670	$ 100.00	$ 67,000
5	Base & Shoulder Rock	TON	1,240	$ 20.00	$ 24,800
6	Culvert Replacement	LF	60	$ 25.00	$ 1,500
WWTP Site - Existing Site Paving Area					
7	Excavation	CY	1,110	$ 15.00	$ 16,650
8	Geotextile Fabric	SY	2,210	$ 1.00	$ 2,210
9	Asphalt	TON	840	$ 100.00	$ 84,000
10	Base & Shoulder Rock	TON	2,500	$ 20.00	$ 50,000
WWTP Site - New Site Paving Areas					
10	Excavation	CY	1,465	$ 15.00	$ 21,975
11	Geotextile Fabric	SY	1,930	$ 1.00	$ 1,930
12	Asphalt	TON	1,110	$ 100.00	$ 111,000
13	Base & Shoulder Rock	TON	1,960	$ 20.00	$ 39,200
14	Sidewalk	SF	500	$ 6.00	$ 3,000
15	Curbing	LF	100	$ 15.00	$ 1,500

Construction Subtotal	**$ 505,684**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
SBR Pre-Load

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Site Preperation	LS	ALL	$ 45,790	$ 45,790
2	Site Stripping	SF	15,700	$ 0.50	$ 7,850
3	Eco-Blocks	EA	150	$ 100.00	$ 15,000
4	Pre-Load Materail	CY	17,000	$ 15.00	$ 255,000
5	Settling Plates	EA	3	$ 1,500	$ 4,500
6	Ford's Pond Dike Road	LS	All	$ 79,230	$ 79,230
7	Minor Access Road Repairs	LS	All	$ 20,000	$ 20,000

Construction Subtotal $ 427,369

Cost Breakdowns - SBR Pre-Load

	L (ft.)	W (ft)	Rock Depth (ft)	Rock Vol. (CY)	Tons	$/Ton	Total Cost
Ford's Pond Access Road	4000	12	1	1778	3396	20	$ 67,911
Fill Area	80	20	5	296	566	20	$ 11,319
							$ 79,230

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Fencing

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Site Preperation	LS	All	$ 5,400	$ 5,400
2	Demolition of existing fence	LS	250	$ 20	$ 5,000
3	Fencing	LF	400	$ 60	$ 24,000
4	Automatic Entry Gate	EA	1	$ 15,000	$ 15,000
5	Man gates	EA	2	$ 500	$ 1,000

Construction Subtotal $ 50,400

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Control Building

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Site Preparation	LS	ALL	$28,800.00	$ 28,800
2	Building	SF	3,200	$ 180	$ 576,000

Construction Subtotal	**$ 604,800**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Maintenance Shop

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Site Preparation	LS	ALL	$ 6,400.00	$ 6,400
2	Open Bay	SF	1,600	$ 50.00	$ 80,000
3	Closed Bay	SF	1,600	$ 80	$ 128,000

Construction Subtotal	**$ 214,400**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15

Operations Building Demolition

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Reuse Pump Removal (Generator Room)	LS	ALL	$ 2,400	$ 2,400
2	RAS Pump Removal	LS	ALL	$ 3,200	$ 3,200
3	Scum Pump Removal	LS	ALL	$ 3,200	$ 3,200
4	Filter Pump Removal	LS	ALL	$ 2,400	$ 2,400
5	Flow Splitter - Plug and Abandon	LS	ALL	$ 1,600	$ 1,600
6	Communutor Removal	LS	ALL	$ 800	$ 800
7	Influent Pump Removal	LS	ALL	$ 3,200	$ 3,200
8	Grit Removal System Removal	LS	ALL	$ 2,400	$ 2,400
9	Concrete Floor Modifications	LS	ALL	$ 5,330	$ 5,330

Construction Subtotal $ 24,530

Cost Breakdowns - Operations Building Demolition

Demo No.	Process Area	Qty	Unit	Unit Price	Cost	
4	Reuse Pumps	16	Hrs.	$ 100.00	$ 1,600.00	
	Piping	8	Hrs.	$ 100.00	$ 800.00	**$2,400.00**
5 & 6	RAS Pumps	16	Hrs.	$ 100.00	$ 1,600.00	
	Piping	16	Hrs.	$ 100.00	$ 1,600.00	**$3,200.00**
7	Scum Pumps	8	Hrs.	$ 100.00	$ 800.00	
	Piping	24	Hrs.	$ 100.00	$ 2,400.00	**$3,200.00**
8	Filter Pumps	16	Hrs.	$ 100.00	$ 1,600.00	
	Piping	8	Hrs.	$ 100.00	$ 800.00	**$2,400.00**
9	Flow Splitter	16	Hrs.	$ 100.00	**$ 1,600.00**	
10	Cominutor	8	Hrs.	$ 100.00	**$ 800.00**	
11	Influent Pumps	16	Hrs.	$ 100.00	$ 1,600.00	
	Piping	16	Hrs.	$ 100.00	$ 1,600.00	**$3,200.00**
12	Grit System Removal	24	Hrs.	$ 100.00	**$ 2,400.00**	
	Concrete Removal	40	Hrs.	$ 102.00	$ 4,080.00	
	Concrete	5	CY	$ 250.00	$ 1,250.00	**$5,330.00**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Miscellaneous Equipment

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	TV Monitoring Equipment	LS	ALL	$ 40,000.00	$ 40,000
2	Standby Generator	LS	ALL	$ 190,000.00	$ 190,000
3	Spreader Truck	LS	ALL	$ 150,000.00	$ 150,000

Construction Subtotal	**$ 380,000**

City of Sutherlin
WWTP Pre-Design Report - Cost Estimate
25-Nov-15
Everett Avenue Pump Station

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Temporary Controls	LS	All	$ 88,000	$88,000
2	Demolition & Site Preparation	LS	All	$ 58,700	$58,700
3	Excavation	LS	All	$ 45,307	$45,307
4	18" Gravity Influent	LF	30	$ 120	$3,600
5	Influent Manhole	LS	All	$ 5,000	$5,000
6	New Wet Well	LS	All	$ 64,276	$64,276
7	Submersible Triplex PS	LS	All	$ 147,600	$147,600
8	Effluent Valve Vault (Piping & Valves)	LS	All	$ 69,081	$69,081
9	Meter Relocation	LS	All	$ 15,580	$15,580
10	12' Effluent Force Main	LF	40	$ 150	$6,000
11	New 460 V Power Service	LS	All	$ 25,000	$25,000
12	Concrete Slab	LS	All	$ 5,000	$5,000
13	Misc. Piping & Utility Station	LS	All	$ 5,000	$5,000
14	Jib Crane	LS	All	$ 15,000	$15,000
15	New Fencing & Gate	LS	All	$ 9,000	$9,000
16	Land Acquisition	LS	All	$ 150,000	$150,000
17	Electrical	LS	All	$ 60,000	$60,000
18	Instrumentation & Controls	LS	All	$ 72,875	$72,875
19	Telemetry	LS	All	$ 35,000	$35,000

Construction Subtotal	$880,019

Cost Breakdowns - Everett Avenue Pump Station

Equipment	Equipment Price	Qty	Markup/Install	Total
60 HP submersible pump	$ 41,000	3	1.2	$ 147,600

Excavation	L (ft)	W (ft)	D (ft)	Vol (CF)	Vol (CY)	$/CY	Cost
Wetwell (general)	14	14	10	1,960	72.6	$ 25.00	$ 1,814.81
Wetwell (rock)	14	14	12	2,352	87.1	$ 200.00	$ 17,422.22
Wetwell Shoring/Dewatering							$ 25,000.00
Valve Vault	15	10	5	750	27.8	$ 25.00	$ 694.44
FM between Vaults	10	3	5	150	5.6	$ 26.00	$ 144.44
Meter Vault	10	5	5	250	9.3	$ 25.00	$ 231.48
							$ 45,307.41

Wetwell	Diameter	Area	Depth	Vol (CF)	Vol (CY)	$/CY	Cost
Base Slab	14	153.86	2	307.7	11.4	$ 1,200.00	$ 13,676.44
Walls (outside dim)	12	113.04					
Walls (inside dim)	10	78.5					
		34.54	20	690.8	25.6	$ 1,200.00	$ 30,702.22
Cover Slab	14	153.86	2	307.7	11.4	$ 1,000.00	$ 11,397.04
Hatch							$ 6,000.00
Influent Deflector							$ 2,500.00
							$ 64,275.70

Effluent Piping & Vault	Qty	Unit	Unit Cost	Cost
6x10 Reducer	3	EA	$ 550.00	$ 1,650.00
10" Vertical DI (10" x 15')	3	EA	$ 2,000.00	$ 6,000.00
10" FCA	6	EA	$ 600.00	$ 3,600.00
10" 90 Elbow	3	EA	$ 975.00	$ 2,925.00
10" Horz DI (10" x 10')	3	EA	$ 1,415.00	$ 4,245.00
10" Flg Swing Check	3	EA	$ 2,900.00	$ 8,700.00
10' Plug Valve	3	EA	$ 2,500.00	$ 7,500.00
10" Cross	1	EA	$ 2,000.00	$ 2,000.00
10" x 12" Reducer	1	EA	$ 1,100.00	$ 1,100.00
10" Wye	1	EA	$ 2,000.00	$ 2,000.00
12" 45	1	EA	$ 1,200.00	$ 1,200.00
12" Blind Flange	1	EA	$ 300.00	$ 300.00
Pressure Gauge	1	EA	$ 500.00	$ 500.00
12" Pipe Spool	2	LF	$ 1,000.00	$ 2,000.00
12" Plug Valve	1	EA	$ 3,350.00	$ 3,350.00
12" DI	10	LF	$ 75.00	$ 750.00
12" FCA	1	EA	$ 750.00	$ 750.00
Pipe Supports	6	EA	$ 250.00	$ 1,500.00
Vault	1	EA	$ 10,000.00	$ 10,000.00
			Subtotal	$ 60,070.00
			Mark-up/Install	$ 9,010.50
			Total	**$ 69,080.50**

Meter Relocation	Qty	Unit	Unit Cost	Cost
12" FCA	2	EA	$ 750.00	$ 1,500.00
10" x 12" Reducer	2	LF	$ 1,100.00	$ 2,200.00
Pipe Supports	2	EA	$ 250.00	$ 500.00
Vault	1	EA	$ 5,000.00	$ 5,000.00
			Mark-up/Install	$ 1,380.00
Meter Relocate	1	LS	$ 5,000.00	$ 5,000.00
				$ 15,580.00

Concrete Slab	Area (SF)	Depth	Vol (CF)	Vol (CY)	$/CY	Cost
Concrete	450	0.5	225	8.3	500	$ 4,166.67
Crushed Rock Base	450	1	450	16.7	50	$ 833.33
						$ 5,000.00

Controls	$ 58,300.00	1.25	$ 72,875.00

Smartrun Controls (3 total)
Pump Control Panel
Communications
Disconnect Panel w/meltric plug
Level sensors and assocaited equipment

City of Sutherlin
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Everett Avenue Pump Station Force Main

Item	Description	Unit	Quantity	Unit Cost	Total Cost
1	Const. Facilities & Mobilization	LS	All	$ 53,227	$53,227
3	Connection to Existing FM	LS	All	$ 11,270	$11,270
4	12" D.I. Forcemain	LF	2,800	$ 170	$476,000
5	Connection to MH L5	LS	All	$ 10,000	$10,000
6	Traffic Control	LS	All	$ 35,000	$35,000

Construction Subtotal	$585,497

Cost Breakdowns - Everett Avenue Pump Station Forcemain

Force Main	L (ft)	$/ft	Cost
12" DI	2800	$ 62.50	$ 175,000.00
Ex & CR Backfill	2800	$ 75.00	$ 210,000.00

	L	W	D	Tons	$/Ton	Total	$/ft
Trench Restoration	2800	5	6	577.5	$ 120.00	$69,300.00	$ 24.75

	ARV	Valves	Total	$/ft
Misc.	$ 2,500.00	$ 10,000.00	$ 12,500.00	$ 4.46

Total ($/ft)	**$ 166.71**

Forcemain Connection	Qty.	Unit	Unit Price	Markup/Install	Cost
10" x 12" Reducer (flgd)	1	Ea	$ 1,200.00	1.15	$ 1,380.00
12" Plug Valve	1	Ea	$ 3,400.00	1.15	$ 3,910.00
12" FCA	2	Ea	$ 900.00	1.15	$ 2,070.00
12" Ductile Iron	20	LF	$ 110.00	1.15	$ 2,530.00
12" Reinforced Coupling	1	Ea	$ 1,200.00	1.15	$ 1,380.00
					$ 11,270.00