City of Cashmere

Wastewater Treatment Facility
Operation and Maintenance Manual

Prepared By RH2 Engineering, Inc.

PREFACE

This Operation and Maintenance (O&M) Manual has been prepared in order to guide the City of Cashmere Wastewater Treatment Facility (WWTF) personnel through the basic daily operation of the facility. This manual has been written with the current operational procedures in mind. This manual will evolve throughout the operation of the plant to reflect future operations. It will require periodic updating to stay current with any operational changes. The manual also provides reference to numerous documents in the appendices that are required for plant operation. These too will require periodic updating to stay current with plant operation.

Revision Number	Sections Updated	Revision Date
Original Manual	All	June 2015
Revision No. 1	Appendix F amended Appendices H, I, J, K added	December 2018

PREFACE

PURPOSE OF MANUAL

CHAPTER 1 – OVERVIEW

General and Facility Design Criteria
Manual Contents
Treatment Process Description
Effluent Discharge Criteria
Process Unit Design Summary

CHAPTER 2 – HEADWORKS

OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
Influent Flow and Metering
Screens
Grit Unit, Classification, and Pumping
Flow Splitters
Sampling
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 3 – EQUALIZATION BASIN

OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
Water Quantity or Quality Equalizing Scenarios
Basin
Return Pumping
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 4 – ACTIVATED SLUDGE

OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
Anaerobic and Anoxic Tanks and Mixers
Swing Zone
Aerobic Tanks
Diffused Aeration System, Blowers, and DO
Recycle Pumping System
Surface Wasting System and Waste Activated Sludge (WAS) Pumping
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 5 – SECONDARY CLARIFIERS

OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
Clarifier Flow Splitter
Clarifiers
Return Activated Sludge (RAS) System
Back-up Waste Activated Sludge (WAS) System
Scum Wasting System
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 6 – DISINFECTION AND EFFLUENT FLOW MONITORING
OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
UV Disinfection System
Effluent Flow Metering
Effluent Sampling
Outfall System
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 7 – SOLIDS AND RESIDUALS HANDLING
OVERVIEW
PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
DAF Unit
Aerobic Digesters
Aeration, Blowers, and Mixing System
Belt Filter Press System
Biosolids Hauling
Filtrate and Washwater Evaporation Pond and Pumping
PROCESS MONITORING AND CONTROL
SAFETY

CHAPTER 8 – SUPPORT SYSTEMS
OVERVIEW
COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE
Non-Potable Water Supply System
In-Plant Pump Station
Administration Building
Laboratory
Power Supply
SCADA System

PROCESS MONITORING AND CONTROL
SAFETY

LIST OF ABBREVIATIONS

Abbreviation	Definition
ANSI	American National Standards Institute
AOB	ammonia oxidizing bacteria
ARV	air relief and vacuum valve
BFP	belt filter press
BOD	biochemical dissolved oxygen
City	City of Cashmere
COD	chemical oxygen demand
DAF	dissolved air floatation
DO	dissolved oxygen
DS	digested sludge
EBPR	enchanced biological phosphorus removal
Ecology	Washington State Department of Ecology
EG	emergency generator
EPA	U.S. Environmental Protection Agency
EQ basin	equalizing basin
FLT	filtrate
FOG	fats, oil, grease
FRP	fiberglass reinforced plastic
ft-lb	foot-pounds
GPM	gallons per minute
HDPE	high-density polyethylene
HMI	Human-Machine Interface
HOA	Hand Off Auto
HP	horsepower
HVAC	heating, ventilation, and air conditioning
I/O	operator interface
IPPS	In-plant Pump Station
KVA	kilo-volt amps
kW	Kilo-watts
mA	miliamps
MCC	motor control center
mg/L	milligrams per liter
MGD	million gallons per day
MHz	mega-hertz
ML	mixed liquor
MLSS	mixed liquor suspended solids

MLVSS	mixed liquor volatile suspended solids
MOV	most open valve
MSDS	material safety data sheet
MV	milivolts
NA	not applicable
NOB	nitrite oxidizing bacteria
NPDES	National Pollutant Discharge Elimination System
NPW	non-potable water
O&M	operations and maintenenace
ORP	oxidation reduction potential
OSHA	Occupational Safety and Health Administration
PAO	phosphate accumulating organism
PHA	poly-β-hydroxyalkanoates
PHB	poly-β-hydroxybutyrate
PLC	programmable logic controller
ppd	pounds per day
psi	pounds per square inch
RAS	return activated sludge
rbCOD	readily biodegradable checmical oxygen demand
RS	raw sewage
RTU	remote telemetry units
SCADA	supervisory control and data acquisition
scfm	standard cubic feet per minute
sCOD	soluable chemical oxygen demand
SE	secondary effluent
SF	square feet
SRT	solids retention time
SVI	sludge volume index
TE	treated effluent
TKN	total kjeldahl nitrogen
TS	thickened sludge
TSS	total suspended solids
UV	ultraviolet
VFA	volitile fatty acids
VFD	variable frequency drive
VSS	volatile suspended solids
WAS	waste activated sludge
WEF	Water Environment Federation
WWTF	waste water treatment facility

LIST OF TABLES

1-1 Design Hydraulic Flow Conditions
1-2 Design Loading Conditions
1-3 Design Criteria
2-1 Influent Metering Equipment
2-2 Influent Structure Isolation Valves
2-3 Fine Screen System Equipment Summary
2-4 Grit System Equipment Summary
2-5 Headworks Flow Splitter Equipment Summary
3-1 Equalization Basin Capacity
3-2 EQ Basin Equipment
4-1 Activated Sludge Basin Cells
4-2 Anaerobic and Anoxic Zone Capacity
4-3 Anaerobic and Anoxic Zone Equipment
4-4 Swing Zone Capacity
4-5 Swing Zone Equipment
4-6 Aerobic Tank Capacity
4-7 Aerobic System Components
4-8 Basins Aeration System Components
4-9 Aerobic Zone Air Flow Rates
4-10 Recycle Pumping System Equipment Summary
4-11 Surface Wasting System and WAS Pumping Equipment
5-1 Clarifier Flow Splitter Equipment Summary
5-2 Return Activated Sludge System Pumping Components Equipment
5-3 Waste Activated Sludge System Pumping Components Equipment
6-1 UV Disinfection Equipment
6-2 Effluent Flow Metering Equipment
6-3 Effluent Sampling Equipment
7-1 DAF Unit Equipment
7-2 Aerobic Digester Tank Capacity
7-3 Aerobic Digester Components
7-4 Belt Filter Press System Components
7-5 Evaporation Pond System Components
8-1 Non-Potable Water Supply Components
8-2 In-Plant Pump Station Components
8-3 Wastewater Monitoring During Start-up Commissioning
8-4 Loads Operated on Generator Power

LIST OF FIGURES

1-1 Plant Layout and Yard Piping
1-2 Process Schematic
1-3 Process Design Summary

2-1 Headworks Building
2-2 Influent Structure
2-3 Trash Racks and Manual Bar Screen
2-4 Mechanical Fine Screens
2-5 Grit Removal Equipment
2-6 Headworks Flow Splitter
2-7 Headworks Plan View
3-1 Equalization Basin
3-2 Equalization Pump
4-1 Conceptual Diagram of the EBPR Process
4-2 Activated Sludge Basin #1 Anaerobic, Anoxic and Swing Zones
4-3 Activated Sludge Basin #1 Aerobic Zones
4-4 Basin Aeration System Components
4-5 Surface Wasting System
4-6 Valve Orientation Photos – WAS Pumping to DAF Unit
4-7 Valve Orientation Photos – WAS Pumping to Aerobic Digesters
4-8 Basins Plan View – West End
4-9 Basins Plan View – East End
4-10 Basins Aeration – Blower Room Plan
4-11 WAS Pumping System Plan
5-1 Clarifier Flow Splitter
5-2 Secondary Clarifiers
5-3 Equipment Building Pump Room RAS System
5-4 DAF Unit Bypass Piping and Metering
5-5 Clarifier Scum Collection
5-6 Valve Orientation Photo – Dual Clarifier RAS Pumping to Headworks
5-7 Valve Orientation Photo – RAS Wasting from Clarifier to Digesters
5-8 Secondary Clarifier Plan
5-9 Secondary Clarifier Profile
5-10 RAS Pumping System Plan
6-1 UV Disinfection System
6-2 Effluent Flow Metering Vault
6-3 UV Disinfection and Effluent Flow Metering Plan
7-1 Equipment Building (East Side)
7-2 Solids Handling Building
7-3 Thickening Equipment
7-4 Valve Orientation Photo – TS Pumping to Digesters
7-5 Aerobic Digesters
7-6 Valve Orientation Photo – Digester Feeding
7-7 Solids Handling Blower Room
7-8 Valve Orientation Photo – Digester Blower Flow Configuration
7-9 Valve Orientation Photo – Backup Basin Blower to Digesters

7-10 Solids Handling Thickening Room
7-11 Valve Orientation Photo – Digester Wasting
7-12 Evaporation Pond Pump Station and Mixer
7-13 Valve Orientation Photo – Filtrate to Pond
7-14 Valve Orientation Photo – Filtrate to IPPS
7-15 Thickening System Plan
7-16 Solids Handling Building Plan
7-17 Digester Profile
7-18 Evaporation Pond Plan
8-1 Non-Potable Water Supply
8-2 In-Plant Pump Station
8-3 Administration Building
8-4 Emergency Generator
8-5 Non-Potable Water Pump Station
8-6 In-Plant Pump Station Plan

APPENDICES

Appendix A – Standard Operating Procedures
Appendix B – Material Safety Data Sheets
Appendix C – Equipment Manufacturer O&M Manuals
Appendix D – NPDES Permit and Fact Sheet
Appendix E – Operator Safety
Appendix F – Routine Operation and Maintenance Checklists
Appendix G – Plant Control System O&M Manual
Appendix H – Plantwide Emergency Response Plan
Appendix I – Plant Staffing
Appendix J – Equipment Representation, Suppliers and Spare Parts
Appendix K – Operator Recordkeeping and Lab Forms

CHAPTER 1 – OVERVIEW

General and Facility Design Criteria

The City of Cashmere Wastewater Treatment Facility (WWTF) was constructed to provide adequate wastewater treatment and disposal for the City of Cashmere. The WWTF is capable of treating wastewater flows generated by a design population of 5,034 by 2030. The level of treatment provided assures that the plant effluent is acceptable for discharge to the Wenatchee River and conforms to effluent limitations in the National Pollutant Discharge Elimination System (NPDES) waste discharge permit. It is essential that proper operation and maintenance of the facilities be provided to ensure compliance with all regulatory requirements.

The WWTF is designed for an average day flow of 1.1 million gallons per day (MGD) and a maximum day flow of 2.6 MGD. The peak instantaneous design flow rate is 3.46 MGD. **Table 1-1** presents the design hydraulic flow conditions and **Table 1-2** presents the design loading conditions.

Table 1-1
Design Hydraulic Flow Conditions

	2012	Design 2030
Design Population	3,200	5,034
Design Hydraulic Flow Conditions (MGD)		
Low Flow	0.16	--
Average Annual Flow (AADF)	0.37	1.10
Maximum Month Flow (MMDF)	0.43	1.23
Maximum Week Flow (MWDF)	0.70	1.32
Maximum Day Flow (MWDF)	1.12	2.60
Peak Hour Flow (PHDF)	1.50	3.46
Peak Instantaneous Flow (PIDF)	2.16	3.46

Table 1-2
Design Loading Conditions

		2012	Design 2030
Influent 5-Day Biochemical Oxygen Demand (BOD_5) (ppd)			
	Average Annual	2,002	2,841
	Maximum Month	2,300	5,682
	Maximum Day	6,007	8,523
Influent Total Suspended Solids (TSS) (ppd)			
	Average Annual	873	1,239
	Maximum Month	1,747	2,478
	Maximum Day	2,620	3,717
Influent Total Kjeldahl Nitrogen (TKN) (ppd)			
	Maximum Month	256	631
Influent Carbonaceous Biochemical Oxygen Demand (CBOD) (ppd)			
	Maximum Month	4,370	10,796
Influent Phosphorus (P) (ppd)			
	Maximum Month	38	95

At the end of this chapter, **Figure 1-1** illustrates the plant layout with the yard piping and **Figure 1-2** shows the process schematic.

Manual Contents

This operation and maintenance (O&M) manual is intended to serve as the primary reference book for the WWTF. This manual presents the important technical information on operating and controlling each process component in a simple and straight-forward manner. The operator will use this information to optimize each process.

This O&M manual can provide a training supplement for new personnel and also provide a reference for the experienced operator.

The majority of the technical information related to the WWTF operation is presented in Chapter 2 – Headworks, Chapter 3 – Equalization Basin, Chapter 4 – Activated Sludge, Chapter 5 – Final Clarifiers, Chapter 6 – Disinfection and Effluent Flow Monitoring and Chapter 7 – Solids and Residuals Handling. Chapter 8 presents the WWTF Support systems to include the non-potable water (NPW) supply, In-Plant Pump Station (IPPS), Administration building, Laboratory, power supply and supervisory control and data acquisition (SCADA) systems.

While this O&M manual includes elements of safety for the treatment system equipment and components, it is not an all-inclusive safety manual for the WWTF. Preparation of a comprehensive safety program should be completed and is the responsibility of the City.

Treatment Process Description

The City of Cashmere's WWTF is an activated sludge process and has been designed with a Headworks facility, activated sludge basins, final clarifiers, solids handling facilities and ultraviolet (UV) disinfection.

Figure 1-2 exhibits the process schematic for the treatment facility including bypasses as needed. General operation of the WWTF is described in this section. A detailed description of each individual process is described in **Chapters 2** through **8**.

The City Lift Station pumps the raw wastewater from the City's collection system to the Headworks of the WWTF (**Chapter 2** contains more details). At the WWTF, the wastewater enters the Headworks which meters, samples, and screens the raw wastewater. Influent is conveyed from City Lift Station through 8-inch and 12-inch force mains. These mains are metered using electromagnetic meters. The flow from these two force mains is combined by means of an influent structure. The combined influent is then coarsely screened with two trash racks (one per channel) and then screened with two (one per channel) online mechanical fine screens with an opening width of 0.25 inches. The screens remove rags, plastics, and other inert material before flow passes through to the grit unit. The grit unit allows the settlement of heavy inert solids and grit. The Headworks is also equipped with a refrigerated automatic composite sampler that samples on a frequency based on the influent flow rate received from the influent flow meters.

Following the Headworks, the flow enters a Headworks flow splitter structure to split the flow across the activated sludge basins, or to the equalization basin if necessary. Ecology published the *Wenatchee River Watershed Dissolved Oxygen and pH Total Maximum Daily Load Water Quality Improvement Report (Publication Number 08-10-062)* that sets forth waste loading allocations during the critical period (March through May and July through October) to improve the Wenatchee River watershed. The City is required to meet an effluent phosphorus concentration of 90 micrograms per liter by 2019 (**Appendix D** contains the City's current NPDES permit). Tertiary treatment will be required in the future in order to meet this effluent concentration. It is important to note that the activated sludge process has the flexibility to be modified through minor piping and operational changes to alternate process configurations if needed to maintain optimal biological phosphorus removal if the loading to the WWTF changes in the future.

The activated sludge basins are compartmentalized into Anaerobic, Anoxic, Swing, and Aerobic zones. A description of these zones is included in **Chapter 4**. Mixing is provided by top-mounted mixers and aeration is provided by fine bubble diffusers. In each activated sludge basin, a recycle pump is installed in Aerobic cell 3 (Ox3) in order to recycle a portion of the influent flow to Anoxic cell 1 (AX1). The effluent from the activated sludge basins enters the clarifier flow splitter structure by gravity.

Mixed liquor then flows by gravity through the clarifier flow splitter into two circular secondary clarifiers (**Chapter 5**). The function of the clarifiers is to separate biological solids from the effluent and provide a thickened sludge, part of which is recycled as return activated sludge (RAS) to the Headworks flow splitter. Clarified effluent is then disinfected using UV light (**Chapter 6**) to reduce the number of pathogenic organisms that are present in the wastewater. An effluent composite sampler is located after the UV system. Effluent is discharged to the outfall located in the Wenatchee River.

A portion of the mixed liquor in the activated sludge basins and the RAS from the clarifiers is wasted as Waste Activated Sludge (WAS). WAS is pumped to a dissolved air floatation (DAF) unit for thickening

(**Chapter 7**). The thickened sludge from the DAF unit is pumped to the aerobic digesters. Periodically, the digested sludge is pulled out of the aerobic digesters and injected with polymer before being conveyed to the belt filter press (BFP). The dewatered solids (cake) from the BFP are transferred to a 30-yard dumpster using a cake discharge pump. Periodically, the biosolids are hauled away and land applied for beneficial reuse. The filtrate from the belt filter press is sent to the evaporation pond. The evaporation pond pump station can be used to recycle filtrate to the Headworks.

The facility drains, DAF wastewater, clarifier scum and the evaporation pond overflow are routed to the IPPS (**Chapter 8**) and pumped to the Headworks influent structure to re-enter the treatment train.

Other systems (**Chapter 8**) at the WWTF include the plant SCADA system, the NPW system, the Administration building and Laboratory, and the emergency generator. In addition, the WWTF has an equalization basin (**Chapter 3**) that, if necessary, can be converted to a third activated sludge basin in the future. Equalization can be used for high influent flows or for highly variable influent wastewater strength. The equalization basin contains a submersible pump to pump the equalized wastewater back to the Headworks as needed.

Effluent Discharge Criteria

The Federal Water Pollution Control Act of 1972 requires that any entity discharging wastewater to surface waters must obtain a NPDES Waste Discharge Permit. The NPDES permit is issued for a period of not more than 5 years. The permit contains the effluent limitations, monitoring and reporting requirements, operation and maintenance requirements and procedures for reporting bypass of inadequately treated wastewater. The City discharges to the Wenatchee River.

The effluent limits for the City of Cashmere WWTF are set in the NPDES permit and the current permit should be consulted for further details. The design criteria for the overall treatment process is summarized in **Table 1-3** and may undergo change during the comment and review period for the NPDES permit renewal.

Table 1-3
Design Criteria

FLOW	
Maximum Month	1.23 MGD
Maximum Day	2.60 MGD
Peak Hour	3.46 MGD
ORGANIC LOADING	
Five-Day BOD Maximum Month	5,682 lbs/day
Total Suspended Solids Maximum Month	2,478 lbs/day
Total Kjeldahl Nitrogen Maximum Month	631 lbs/day
EFFLUENT LIMITATIONS	
Monthly Average Five-Day BOD	30 mg/L
Monthly Average Total Suspended Solids	30 mg/L
Monthly Average Fecal Coliform Bacteria	200/100 mL
Temperature	33.0 deg. C
pH Value	6 to 9

Appendix D contains a copy of the current NPDES permit and fact sheet.

Process Unit Design Summary

Design summary of the processes and equipment is presented in **Figure 1-3** at the end of this chapter.

MODIFIED BARDENPHO CONFIGURATION

COMPOSITE SAMPLER
8"
FROM CITY LIFT STATION
10"
FILTRATE FROM POND
INFLUENT STRUCTURE
FINE SCREEN #1
FINE SCREEN #2
MANUAL BAR SCREEN (BACKUP)
BYPASS (NORMALLY CLOSED)
TO HEADWORKS FLOW SPLITTER
VORTEX GRIT REMOVAL
GRIT PUMP
SCREENINGS
GRIT CLASSIFIER
SCREENINGS/GRIT DISPOSAL
FROM EQUALIZATION PUMP
FROM GRIT UNIT
EMERGENCY OVERFLOW
HEADWORKS FLOW SPLITTER
IN-PLANT PUMP STATION (IPPS)
DAF WASTEWATER, BUILDING WASTE, BASIN DRAIN, CLARIFIER SCUM AND POND OVERFLOW
FROM RAS PUMP STATION
AN
AX1
AX2
AX3 SWING ZONE
OX1
OX2
OX3
DO
SURFACE WASTING
ACTIVATED SLUDGE BASIN NO. 1
ACTIVATED SLUDGE BASIN NO. 2
EQUALIZATION BASIN 50,000 GAL
EQUALIZATION BASIN 110,000 GAL
EQUALIZATION BASIN 390,000 GAL
LOW FLOW SUPPLY STATION
FROM CITY WATER SYSTEM
COMPOSITE SAMPLER
TO NON-POTABLE PLUMBING SYSTEM
MECHANICAL SCREEN
HYDROPNEUMATIC BLADDER TANK
UV CHANNEL
TO EXISTING OUTFALL IN WENATCHEE RIVER
FUTURE CHEMICAL PHOSPHORUS REMOVAL PROCESS
NON-POTABLE PUMP STATION
CLARIFIER NO. 1
CLARIFIER NO. 2
CLARIFIER NO. 3 (FUTURE)
CLARIFIER FLOW SPLITTER
TO IPPS
RETURN ACTIVATED SLUDGE (RAS)
TO HEADWORKS FLOW SPLITTER
WAS
RAS #1
BACKUP
RAS #2
RAS #3 (FUTURE)
CLARIFIER NO. 1
CLARIFIER NO. 2
CLARIFIER NO. 3
AERATION BLOWERS
BLOWER #1
BLOWER #2
BLOWER #3
NC
BLOWER #4 (REDUNDANT)
POLYMER FEED
BELT FILTER PRESS
TO STORAGE/HAULING
SOLIDS
CAKE TRANSFER PUMP
FILTRATE OR WASHWATER
TO IPPS
DEWATERED SLUDGE TRANSFER PUMP #1
EVAPORATION POND PUMP STATION
EVAPORATION POND
TO IPPS
AEROBIC DIGESTER #1
AEROBIC DIGESTER #2
ORP
BIOSOLIDS
AEROBIC DIGESTER BLOWER #1
AEROBIC DIGESTER BLOWER #2
WAS FROM BACKUP RAS PUMP
FROM FUTURE SURFACE WASTING
WAS PUMP #1
WAS PUMP #2
WAS PUMP #3 (FUTURE)
NC
THICKENED SLUDGE TRANSFER PUMP #1
THICKENED SLUDGE TRANSFER PUMP #2
THICKENED SLUDGE
DAF WASTEWATER
DAF PROCESS
FLOCCULATOR
TO IPPS

LEGEND

- GRAVITY PROCESS FLOW
- PUMPED PROCESS FLOW
- WASTEWATER
- ACTIVATED SLUDGE
- WASTE ACTIVATED SLUDGE (WAS)
- RETURN ACTIVATED SLUDGE (RAS)
- THICKENED SLUDGE
- CLARIFIED/TREATED EFFLUENT
- FILTRATE
- BIOSOLIDS
- COMPRESSED AIR (CA)
- FUTURE

THE HEART OF CASHMERE WASHINGTON

FIGURE 1-2
PROCESS SCHEMATIC
NOT TO SCALE

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.LAYER

	2012	Design 2030
Design Population	3,200	5,034
Design Hydraulic Flow Conditions (mgd)		
Low Flow	0.16	--
Average Annual Flow (AADF)	0.37	1.10
Maximum Month Flow (MMDF)	0.43	1.23
Maximum Week Flow (MWDF)	0.70	1.32
Maximum Day Flow (MWDF)	1.12	2.60
Peak Hour Flow (PHDF)	1.50	3.46
Peak Instantaneous Flow (PIDF)	2.16	3.46
Maximum Hydraulic Capacity (mgd)		
Headworks	3.46	3.46
Activated Sludge Basin (1 Basin)	1.30	1.30
Activated Sludge Basin (2 Basins)	2.60	2.60
Clarifiers (1 Clarifier)	1.24	1.24
Clarifiers (2 Clarifiers)	2.48	2.48
UV Disinfection	2.64	2.64
Residential and Light Commercial Flow (mgd)		
Average Annual	0.37	0.66
Maximum Month	0.43	0.79
Maximum Day	1.12	1.78
Peak Hour	1.50	2.64
Future Commerical/Industrial Flows (mgd)		
Average Annual	0.05	0.44
Maximum Month	0.09	0.82
Maximum Day	0.09	0.82
Peak Hour	0.09	0.82
5-Day Biochemical Oxygen Demand (BOD5)		
Influent BOD5 (ppd)		
Average Annual	2,002	2,841
Maximum Month	2,300	5,682
Maximum Day	6,007	8,523
Total Suspended Solids (TSS)		
Influent TSS (ppd)		
Average Annual	873	1,239
Maximum Month	1,747	2,478
Maximum Day	2,620	3,717
Total Kjeldahl Nitrogen (TKN)		
Influent TKN (ppd)		
Maximum Month	256	631
Chemical Oxygen Demand (COD)		
Influent COD (ppd)		
Maximum Month	4,370	10,796
Phosphorus		
Influent Phosphorus (ppd)		
Maximum Month	38	95
Headworks		
Screening		
Screen Type	Fine	Fine
Number of Screens	2	2
Screen Opening Width (in.)	0.25	0.25
Peak Flow Capacity (mgd) (1 screen)	1.75	1.75
Total Peak Flow Capacity (mgd) (2 screens)	3.5	3.5
Screen Drive Nameplate HP (ea)	1	1
Redundant Screen Type	1 - Bar	1-Bar
Bar Screen Spacing (in.)	0.375	0.375
Size (chamber width , in.)	12	12
Grit Removal		
Type	Vortex	Vortex
Capacity* (mgd)	2.5	2.5
* Unit can pass 3.64 mgd hydraulically, with less removal efficiency		
Minimum Particle Size Removal (at 2.5 mgd)	95% of 100 mesh	95% of 100 mesh
Grit Pump		
Type	Recessed Impeller	Recessed Impeller
Capacity	240 gpm @26' TDH	240 gpm @26' TDH
Nameplate HP	10	10
Grit Classifer Power (hp)	1	1
Equalization Basin		
Equalization 1		
Capacity (gallons)	54,000	54,000
Dimensions (L x W x H) (feet)	18.5/25/18	18.5/25/18
Side Water Depth (feet)	16	16

* Recycle pump will provide both 2012 and 2030 flows, with some modifications to impeller in the future for higher flows.
** RAS pump will provide both 2012 and 2030 flows without modification.
*** Thickened sludge transfer for pump will provide both 2012 and 2030 flows without modification

	2012	Design 2030
Equalization 2		
Capacity (gallons)	110,000	110,000
Dimensions (L x W x H) (feet)	36.6/25/18	36.6/25/18
Side Water Depth (feet)	16	16
Equalization 3		
Capacity (gallons)	380,000	380,000
Dimensions (L x W x H) (feet)	130/25/19	130/25/19
Side Water Depth (feet)	15.5	15.5
Total Equilization Basin Capacity (gallons)	544,000	544,000
EQ Transfer Pump		
Type	Submersible	Submersible
Number	1 Duty, 1 Shelf Spare	1 Duty, 1 Shelf Spare
Capacity	100-500 gpm @ 20.6'	100-500 gpm @ 20.6'
Nameplate HP	5	5
Activated Sludge Basins		
Number	2	2
Capacity per Basin (gallons)	540,000	540,000
Total Volume (gallons)	1,080,000	1,080,000
Side Water Depth (feet)	16	16
Total HRT at AA Flow (hr.)	24	24
Mixed Liquor (mg/L)	3,600	3,600
Total SRT at AA Flow and MM BOD (days)	9	9
SVI Anticipated (max. mL/g)	150	150
Anoxic to Anaerobic Recycle Rate	NA	NA
Aerobic to Anoxic Recycle Rate (of AAF) per Train	300% to 600%	300% to 600%
Waste Sludge Production (@ Maximum Month Loading) (ppd)	1,500	3,000
Sludge Wasting, Normal	Selective wasting from the surface of the mixed liquor	
Sludge Wasting, Alternative	Pump RAS directly to the Aerobic Digester	
Anaerobic Zone (per basin)		
Dimensions (L x W x H) (feet)	18.5/12/18	18.5/12/18
Number of Mixers	1	1
Nameplate HP (ea)	0.75	0.75
Anoxic Zone 1 (per basin)		
Dimensions (L x W x H) (feet)	18.5/12/19	18.5/12/19
Number of Mixers	1	1
Nameplate HP (ea)	0.75	0.75
Anoxic Zones 2 and 3 (per basin)		
Dimensions (L x W x H) (feet)	18/25/18	18/25/18
Number of Mixers	2	2
Nameplate HP (ea)	1.5	1.5
Aerobic Zone (per basin)		
Dimensions (L x W x H) (feet)	42.5/25/18	42.5/25/18
Number of Mixers	1	1
Nameplate HP (ea)	3	3
Recycle Pump		
Type	Submersible	Submersible
Number	2 Duty, 1 Shelf Spare	2 Duty, 1 Shelf Spare
Capacity (ea)	771-1,542	1,140-2,292*
Nameplate HP (ea)	15	15
Blowers		
Type	Positive Displacement	Positive Displacement
Number	3 Duty, 1 Standby	3 Duty, 1 Standby
Capacity (ea)	316-1160 scfm	316-1160 scfm
Nameplate HP (ea)	75	75
Discharge Pressure (psi)	10	10
Oxygen Requirement (per Train)		
Transfer Rate at Peak Loading (lb/hr)	144	380
Transfer Rate at Average Loading (lb/hr)	114	300
Transfer Rate at Minimum Loading (lb/hr)	70	150
Type of Aeration	EPDM fine bubble diffuser grid	EPDM fine bubble diffuser grid
Clarifier		
Number of Clarifiers	1 in operation (2 built)	2
Type	Circular	Circular
Diameter (ft.)	40	40
Side Water Depth (ft.)	14	14
Surface Area (sf)	1,250	2,500

	2012	Design 2030
Overflow Rate (gpd/sf)		
Average Annual Flow	292	440
Maximum Month	347	492
Maximum Hydraulic Capacity	1,000	1,000
RAS Underflow	40% to 100% of AAF	40% to 100% of AAF
RAS Pumps		
Type	Screw Centrifugal	Screw Centrifugal
Number	2 Duty, 1 Standby	2 Duty, 1 Standby
Capacity (ea)	103-257	153-382**
Nameplate HP (ea)	5	5
Disinfection System		
Normal Operation		
Type	UV, Low Pressure, High Output	UV, Low Pressure, High Output
Design Flow (each bank) (mgd)	1.32	1.32
Number of Channels	1	1
Number of UV Banks / Channel	2	2
Lamps per Bank	12	12
Total Number Lamps	24	24
Design Transmittance	65%	65%
Minimum UV Dose (mJ/cm2) at the end of lamp life	40	40
Disinfection Standard		
7 Day Geo Mean	200 FC/100ml	200 FC/100ml
30 Day Geo Mean	100 FC/100ml	100 FC/100ml
Average Month	126 E. Coli Colonies/100ml	126 E. Coli Colonies/100ml
Solids Handling		
lbs TS Solids Per Day of WAS (from Aeration Basins)	1,500	3,000
VS/TS Ratio	0.8	0.8
lbs VS/day (from aeration basins)	1,200	2,400
WAS Concentration (mg/L)	3,600	3,600
WAS to thickener (gpd)	49,960	99,920
WAS to thickener (gpm)	35	69
WAS to thickener (lbs/hr)	63	125
WAS Transfer Pump		
Type	Progressive Cavity	Progressive Cavity
Number	2 Duty	2 Duty
Capacity (ea)	10-35 gpm @ 9.5 psig	10-35 gpm @ 9.5 psig
Nameplate HP (ea)	3	3
Thickening Process		
Type	Dissolved Air Flotation (DAF)	DAF
Capacity		
Hydraulic Loading Rate (gpm/sf)	2	2
Mass Loading Rate (lbs/sf/hr)	2.5	2.5
Free Surface Area (sf)	46	46
Thickend Solids Concentration	4%	4%
Thickened Sludge Transfer Pump		
Type	Progressive Cavity	Progressive Cavity
Number	1 Duty, 1 Standby	1 Duty, 1 Standby
Capacity (ea)	3 gpm @ 10 psig	6 gpm @ 10 psig***
Nameplate HP (ea)	1	1
Dewatering Process		
Type	Belt Filter Press	Belt Filter Press
Type of Sludge	Aerobically Digested	Aerobically Digested
Inlet Consistency	2.5%	2.5%
Maximum Operation Conditions		
Hydraulic Loading Rate	50 gpm @ 2.5% solids	50 gpm @ 2.5% solids
Mass Loading Rate (lbs/hr)	625	625
Dewatered Solids Concentration	16-18%	16-18%
Dewatering Sludge Supply Pump		
Type	Progressive Cavity	Progressive Cavity
Number	1	1
Capacity	40-90 gpm @ 30 psi	40-90 gpm @ 30 psi
Nameplate HP	5	5
Dewatered Cake Solids Transfer Pump		
Type	Progressive Cavity	Progressive Cavity
Number	1	1
Rated Capacity	2-10 gpm @ 50 psi, up to 28% solids	2-10 gpm @ 50 psi, up to 28% solids
Nameplate HP	3	3

	2012	Design 2030
Aerobic Digester		
Number of Digesters	2	2
Type	Concrete	Concrete
Dimensions (L x W x H) (ft)	36/36/22	36/36/22
Side Water Depth (ft.)	20.5	20.5
Volume Required (gallons)	180,000	360,000
SRT at 20 degrees C (days)	40	40
Digester Feed Volume (gpd)	4,496	8,993
Lb. O2/day	960	1,920
Lb O2/lb VSS Destroyed	2	2
VS Destruction (Fraction)	0.4	0.4
Lb. VS Destroyed/Day	480	960
Mixers / Aerators		
Number	2	2
Nameplate HP (ea)	15	15
Blowers (on VFD)		
Type	Positive Displacement	Positive Displacement
Number	2	2
Capacity (ea)	120-400 scfm	120-400 scfm
Nameplate HP (ea)	30	30
Discharge Pressure (psi)	10	10
Type of Aeration System	Invent Mixer / Aerator	Invent Mixer / Aerator
Miscellaneous Construction		
FRP cover	1 per digester	1 per digester
Evaporation Pond		
Number of Basins	1	1
Surface Area (sf)	21,000	21,000
Depth (ft)	5	5
Volume (gallons)	634,000	634,000
Construction	Double Membrane Liner, Leak Detection	Double Membrane Liner, Leak Detection
Filtrate to Lagoon (gallons/day)	4,047	8,094
Mixing		
Type	Aspirating Mixer/Aerator	Aspirating Mixer/Aerator
Number	1	1
Nameplate HP	5	5
Supernatant Transfer Pump		
Type	Self Priming	Self Priming
Number	1	1
Capacity (ea)	30-78 gpm	30-78 gpm
Nameplate HP	3	3
Auxiliary System		
Non-Potable Water Pumps		
Type	Package Booster Station	Package Booster Station
Number	2 Duty, 1 Standby	2 Duty, 1 Standby
Capacity	45-250 gpm @ 80 psi	45-250 gpm @ 80 psi
Nameplate HP, each	10	10
In-Plant Pumps		
Type	Submersible	Submersible
Number	1 Duty, 1 Standby	1 Duty, 1 Standby
Capacity (ea)	150 gpm @ 41' TDH	150 gpm @ 41' TDH
Nameplate HP, each	5	5
Flow Measurement		
Influent (at Headworks)		
Type	Magnetic	Magnetic
Number	2	2
Size (in.)	1-8", 1-10"	1-8", 1-10"
Range (gpm)	150-1,200	150-1,200
Effluent (to River)		
Type	Magnetic	Magnetic
Number	1	1
Size (in.)	12	12
Range (gpm)	150-2,400	150-2,400

FIGURE 1-3
PROCESS DESIGN SUMMARY

CHAPTER 2 – HEADWORKS

*The Headworks plan views are shown in **Figure 2-7** at the end of this chapter.*

OVERVIEW

Influent Conveyance

The Headworks building (**Figure 2-1**) is located on the west end of the Wastewater Treatment Facility (WWTF) and houses the preliminary treatment processes for the WWTF, which include:

- Influent piping and metering;
- Influent sampling;
- Screening;
- Grit removal and classification;
- Flow diversion to the activated sludge basins and equalization (EQ) basin; and
- Electrical power supply and control for the Headworks and basins.

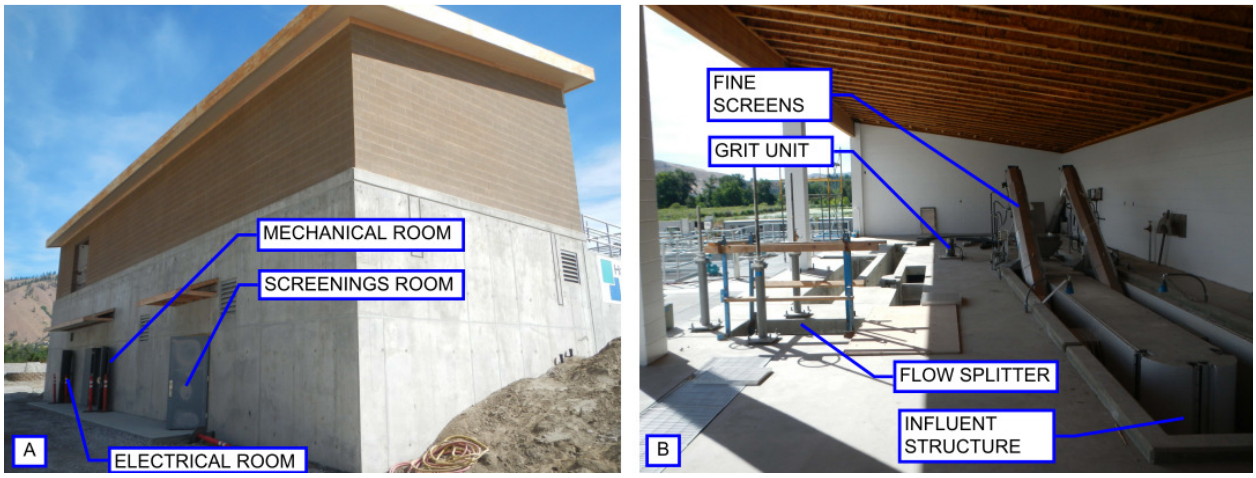


Figure 2-1 – Headworks Building
(A) Headworks Building (South side); (B) Upper Level of Headworks Building

Raw wastewater from the City Lift Station is pumped to the Headworks building through 8-inch and 12-inch buried force mains that are located on the east side of Riverfront Drive. The City Lift Station is located near the southwest corner of Riverfront Drive and Parkhill Street. The 12-inch force main is reduced to a 10-inch pipe under the Headworks building and both force mains (10-inch and 8-inch) lift raw wastewater vertically approximately 17 feet to the Headworks influent structure.

Influent Structure

The influent structure (**Figure 2-2**) is located on the upper floor of the Headworks building. The two force mains from the City Lift Station deliver raw wastewater to the west side of the influent structure. The In-Plant Pump Station (IPPS) also conveys on-site drain waste and raw wastewater through a 6-inch

force main to the east side of the influent structure. Filtrate from the evaporation pond pump station is also delivered to the influent structure through a 2-inch force main. Electromagnetic flow meters measure the quantity of wastewater that is discharged into the influent structure. An automatic refrigerated composite sampler samples the mixed influent prior to any preliminary treatment.

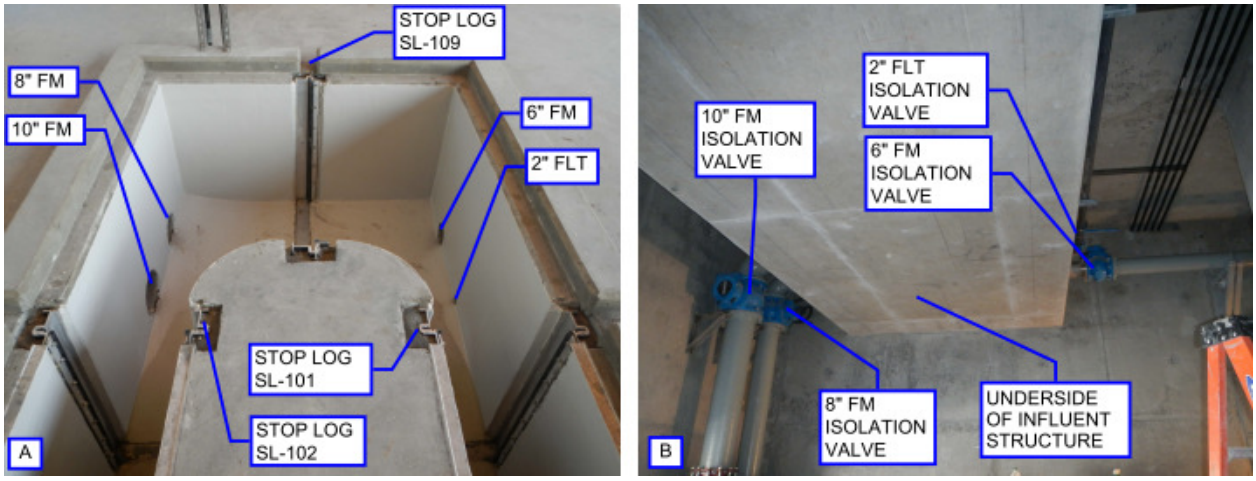


Figure 2-2 – Influent Structure
(A) Influent Structure Viewed from Headworks Upper Level; (B) Influent Structure Viewed from Headworks Mechanical Room

Trash Racks

The raw wastewater flows by gravity from the influent structure through two channels that are 18-inches wide and controlled by stop logs. Each channel contains trash racks directly downstream of the influent structure (**Figure 2-3**). The trash racks retain rags and other large debris prior to the raw wastewater reaching the mechanical fine screens. The operator must manually rake these racks periodically to remove captured material. The operator may choose to remove the trash racks if the downstream mechanical fine screens operate adequately without them.

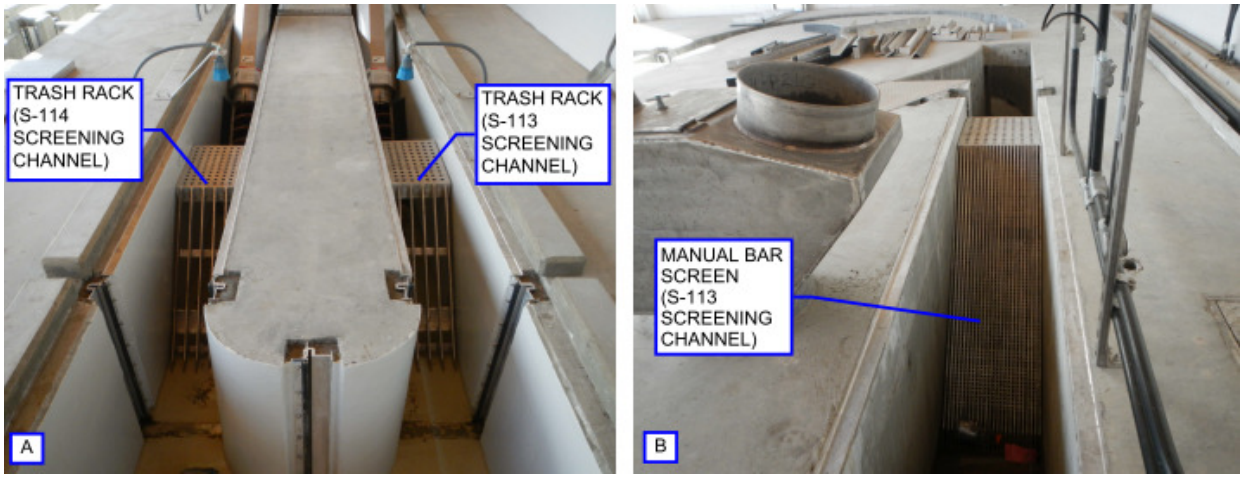


Figure 2-3 – Trash Racks and Manual Bar Screen
(A) Trash Racks; (B) Manual Bar Screen

Mechanical Fine Screens

After passing through the trash racks, the wastewater flows through the Parkson mechanical fine screens that are located in each channel (**Figure 2-4**). The fine screens contain angled spiral assemblies for the removal of screenings upward from the channels. The screenings are washed and compacted in the upper portion of the unit prior to entering the discharge tubes. The tubes combine at a vertical chute which allows the screenings to drop into a roll-away dumpster located in the Screenings room on the lower floor of the Headworks. The dumpster must be periodically emptied by the City's waste collection department for disposal to the county landfill.

The westernmost influent channel contains a manual bar screen located directly downstream of the fine screen. The bar screen serves as a backup fine screen in the event that the mechanical fine screens are taken out of service for maintenance. The bar screen must be manually cleaned and the screenings are disposed of through a vertical chute located next the screen. The chute deposits screenings into a dumpster adjacent to the fine screens disposal dumpster in the Screenings room. The bar screen can be removed by the operator whenever the mechanical fine screens are in normal operation.

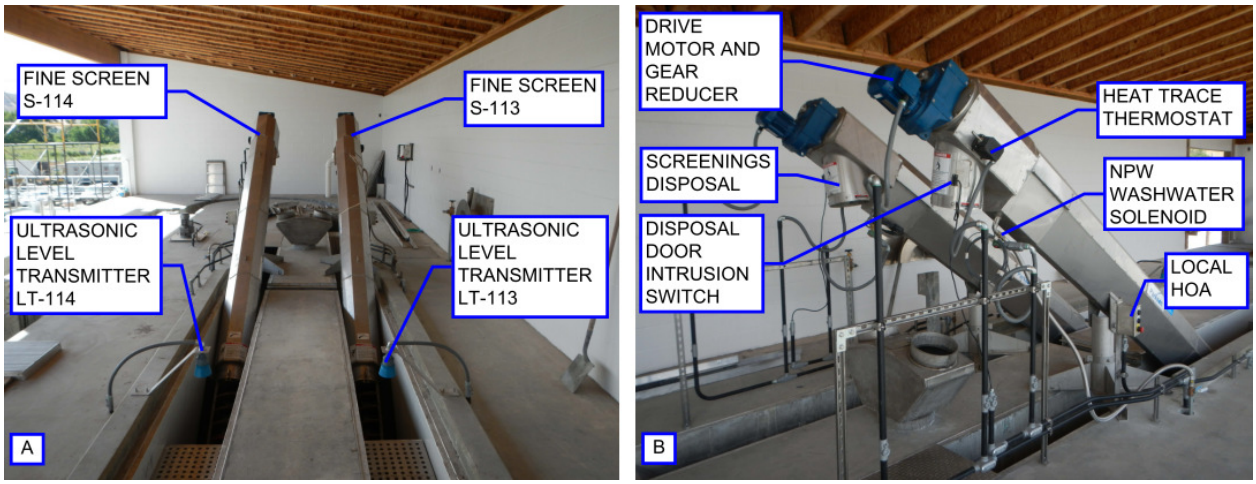


Figure 2-4 – Mechanical Fine Screens

Grit Removal System

The two channels combine downstream of the mechanical fine screens into a single channel that is 18-inches wide and conveys the wastewater to the grit removal system (**Figure 2-5**). The grit removal system consists of the grit unit, pump, and classifier and cyclone. Wastewater flows into the grit chamber which houses the grit unit – a device which circulates the wastewater, allowing grit to gravitate into the lower portion of the chamber, known as the grit hopper. Within the grit chamber, the influent is stirred with impeller blades attached to a shaft driven by a 0.75 HP motor. The shaft extends from the grit chamber to the upper floor of the Headworks building, where the drive motor is located. Grit settles to the bottom of the hopper while effluent flows out the top of the chamber into the channel that leads to the Headworks flow splitter.

The grit and fluid mixture (slurry) that collects on the bottom of the grit hopper is periodically removed. To accomplish this, the grit is "fluffed" using the non-potable water (NPW) flush/fluff system that is

tapped into the bottom of the hopper; the grit pump then removes this slurry via suction using 4-inch piping. The flush/fluff process is controlled by the supervisory control and data acquisition (SCADA) system and occurs prior to each grit pumping period. The grit pump transfers the grit/fluid mixture through 4-inch piping to the grit cyclone and classifier. The cyclone and classifier remove grit from the mixture and deposit it into a third dumpster in the Screenings room. Water removed by the classifier is routed to the building floor drain system which flows by gravity to the IPPS. The grit removal system is designed with a capacity of 2.5 million gallons per day (MGD) at the optimum removal rate but the grit chamber can hydraulically pass the 2030 peak hour flow of 3.46 MGD.

If necessary, the grit unit can be bypassed using the bypass channel that diverts wastewater directly to the Headworks flow splitter. Stop logs (SL-103, -104, -105, -106) are used to accomplish this.

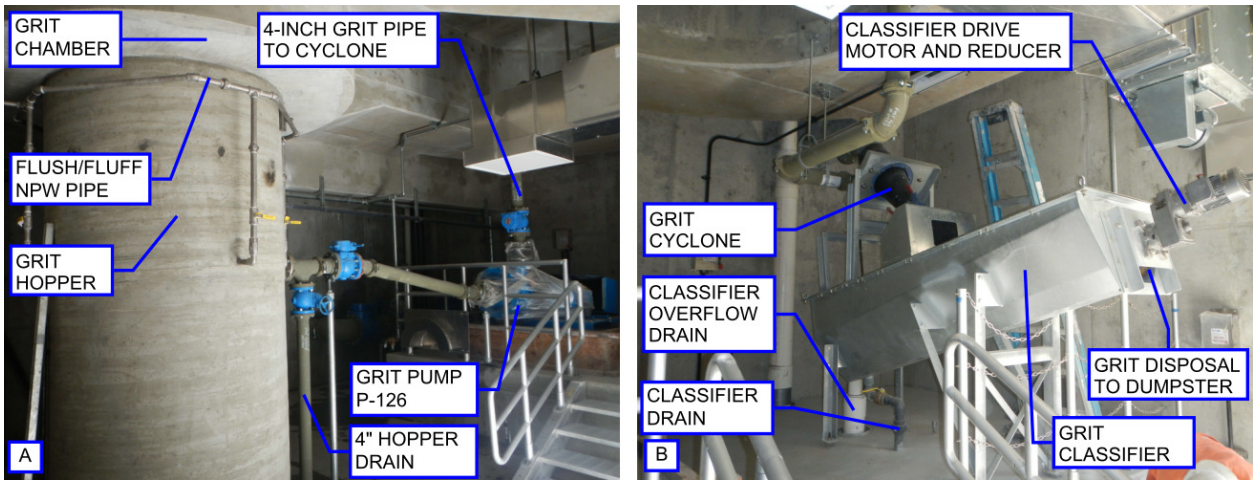


Figure 2-5 – Grit Removal Equipment
(A) Grit Chamber/Hopper and Pump; (B) Grit Cyclone and Classifier

Headworks Flow Splitter

The Headworks flow splitter (**Figure 2-6**) is divided into two chambers. Screened, degritted, raw wastewater enters the east chamber from the surface channel on the upper floor of the Headworks building. Approximately midway down the east chamber, two pipes enter the chamber; one 6-inch raw sewage (RS) pipe on the north side and one 8-inch RS pipe on the south side. Both of these pipes are connected to the EQ basin. The 8-inch RS pipe on the south side has an electromagnetic flow meter (Ft-139) and motor-actuated plug valve located on the lower floor of the Headworks building. During an extended period of high influent flows (exceeding the hydraulic capacity of the operating sludge basin(s)) the SCADA system will open this motor-actuated valve and divert raw wastewater into the EQ basin from the flow splitter. During periods of high influent strength, the operator may manually equalize flow by directing flow to EQ basin through the 8-inch RS pipe. These equalizing scenarios are discussed in depth in **Chapter 3**. When an equalizing event is complete, the EQ basin pump returns sewage to the flow splitter through the 6-inch RS pipe.

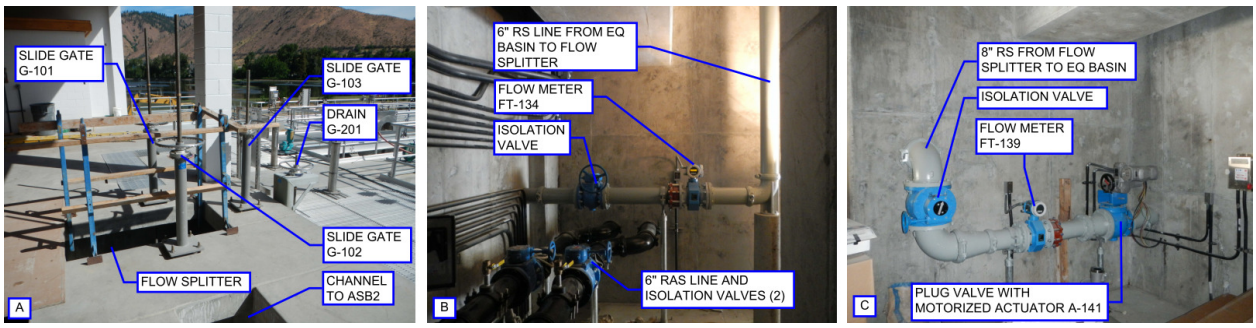


Figure 2-6 – Headworks Flow Splitter
(A) Flow Splitter from Headworks Upper Level; (B) North Side of Flow Splitter in Headworks Mechanical Room; (C) South Side of Flow Splitter in Headworks Mechanical Room

Wastewater flows downward through the bottom of the west chamber of the flow splitter and enters the bottom of the east chamber. Two 6-inch return activated sludge (RAS) pipes penetrate the north side of the east chamber. Raw wastewater flows upwards in this chamber and is mixed with the RAS pumped from the secondary clarifiers. At the top of the second chamber, there are three manually operated weir gates. The north (G-101) and south (G-102) gates control flow to each of the activated sludge basins. When both basins are online, these gates are adjusted to achieve equal flow to each basin. When one basin is offline, its gate is raised to prevent flow from entering it.

The gate on the east side of the flow splitter (G-103) functions as an emergency overflow to the EQ basin. This will normally be set higher than the gates to the online activated sludge basin(s), and will allow overflow in the event of a failure of the SCADA system to divert flows to the EQ basin. A 6-inch drain pipe exists at the bottom of the flow splitter. It is manually controlled for drainage to the EQ basin.

Additional Systems

To supplement the influent preliminary treatment and flow control equipment, the Headworks building contains the following other auxiliary systems:

- Mixed liquor (ML) return system
- RAS piping system
- Filtrate (FLT) system
- NPW system
- Potable water system

A 12-inch ML pipe penetrates both of the north and south exterior walls of the lower level of the Headworks building. These force mains recycle mixed liquor from the end of each activated sludge basin to the mixing chimneys located adjacent to the first anoxic cell of each respective basin (as discussed further in **Chapter 4**). These force mains are metered within the first floor of the Headworks building and contain isolation valves directly upstream of the penetration into the mixing chimneys.

The two 6-inch RAS pipes penetrate the north wall of the lower level of the Headworks. Both pipes contain isolation valves prior to entering the north side of the flow splitter. These pipes return sludge

from the base of the clarifiers via the RAS pumps located in Equipment Building Pump room (**Chapter 5**). Both of these pipes also include air release ports prior to entering the flow splitter; the operator must manually exercise these ports periodically.

The 2-inch filtrate (FLT) pipe penetrates the south wall of the Headworks Screening room and runs to the influent structure. An isolation valve exists on the pipe just prior to the influent structure penetration. The FLT pipe serves to return filtrate from the evaporation pond to the influent structure as discussed in **Chapter 7**. The filtrate pipe includes a drain valve located in the Screenings room, allowing the line to be drained when not in use.

The NPW system within the Headworks is used at the following locations:

- Mechanical room utility station
- Grit chamber flush/fluff system
- Grit room and upper level utility stations
- Grit classifier and mechanical fine screen wash water supply

The potable water system in the Headworks provides water for the following systems:

- Floor drain trap primer system
- Grit room utility sink

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

The Routine Operation and Maintenance Checklists related to the Headworks equipment are located in ***Appendix F.***

Influent Flow and Metering

Description

Total influent to the Headworks channels is metered by the devices listed in **Table 2-1.**

Table 2-1
Influent Metering Equipment

Electromagnetic Flow meter	P&ID Tag	Equipment Type	Location
Plant Influent Flow Meter No. 1 from City Lift Station	Ft-102	8" Electromagnetic Flow Meter	Headworks Mechanical Room
Plant Influent Flow Meter No. 2 from City Lift Station	Ft-106	10" Electromagnetic Flow Meter	Headworks Mechanical Room
Plant Influent Flow Meter No. 3 from IPPS	Ft-110	6" Electromagnetic Flow Meter	Headworks Mechanical Room
Evaporation Pond Pump Station Filtrate Flow Meter	Ft-545	2" Electromagnetic Flow Meter	Evaporation Pond Pump station

Data recorded by these devices is monitored by the SCADA system. Calculated influent flow rates are used to: control the IPPS flow rate; divert flows to the EQ Basin; and control the composite sampler sampling rate.

Isolation valves are located on each influent pipe directly adjacent to the influent structure are listed in **Table 2-2.**

Table 2-2
Influent Structure Isolation Valves

Valve	Valve	Operation	Location
8" Plant Influent from City Lift Station	8" Plug Valve	Manual Chainwheel	Headworks Mechanical Room
10" Plant Influent from City Lift Station	10" Plug Valve	Manual Chainwheel	Headworks Mechanical Room
6" Plant Return from IPPS	6" Plug Valve	Manual Chainwheel	Headworks Mechanical Room
2" Filtrate from Evaporation Pond Pump Station	2" Plug Valve	Manual Handwheel	Headworks Mechanical Room

Normal Operation

During normal operation of the influent structure, flow to the influent structure from all wastewater sources will be monitored by the SCADA system; the flow will be split between the two screening channels. Stop logs SL-101, SL-102, and SL-109 will be adjusted as necessary to control flow across and out of the influent structure. The SCADA system does not control the influent rate from City Lift Station. The IPPS and Filtrate flow rates are controlled by the SCADA system so that the total flow rate to the influent structure will not exceed the 3.46 MGD (2,430 gallons per minute (GPM)) hydraulic capacity of

the Headworks channels (see Evaporation Pond and Pumping in **Chapter 7** and IPPS in **Chapter 8** for further information regarding flow control from these sources).

Alternate Operation

Isolation of either screen channel can be accomplished using stop logs (SL-101, SL-102, SL-107, SL-108, and SL-109) if required for maintenance or during periods of low flow.

Emergency Operation

Emergency operation is expected during an outage of normal power to the WWTF. In this scenario, the emergency generator will only supply power to the essentially-powered devices. The evaporation pond pump station will be off (not an essentially-powered device) and the IPPS will only provide flows to the influent structure from a single essentially-powered pump. Stop logs will need to be adjusted to direct flow to the essentially-powered mechanical fine screen (S-114) (as described in the Mechanical Fine Screens section of this chapter). The influent structure flow meters will be essentially-powered from the Headworks control panel (CP-100) via LP-102 located in MCC-102.

Maintenance and Troubleshooting

During periods when the evaporation pond is not contributing flow to the influent structure, the isolation valve on the 2-inch filtrate (FLT) pipe should be closed at the influent structure and this pipe should be drained. A drain valve is located on this line where it penetrates the south wall of the Screenings room.

Detailed maintenance and troubleshooting procedures related to the influent structure components can be found in the manufacturer's operation and maintenance (O&M) manuals as follows.

- Electromagnetic Flow Meters: **Appendix C, Volume 11**
- Stop Logs: **Appendix C, Volume 5**
- Plug Valves: **Appendix C, Volume 5**

Sampling

Description

The influent automatic refrigerated composite sampler (SMP-117) is located on the north side of the influent structure on the upper level of the Headworks. It samples influent from the low point of the influent structure. The sampler receives influent flow rate data from the SCADA system in order to adjust sampling frequency. Samples are stored within the sampler's refrigerated storage compartment and must be periodically retrieved by the operator.

Normal Operation

Normal operation of the composite sampler requires that the sampling rate be "flow-paced" based on the influent flow rate. The sampler will receive the influent flow rate from the SCADA system. The operator will manually input the flow pacing sampling rate into the local sampler control panel. The SCADA system monitors the operating status of the sampler.

Sampling rates and testing of influent is discussed further in **Chapter 8**.

Alternate Operation

Alternate operation of the composite sampler involves "time-paced" sampling of the Headworks influent. This would likely be necessitated in the event that the Headworks influent flow meters were out of operation, thus creating a situation when flow-paced sampling would not be available. For time-paced operation, the operator must manually input at sampling interval (in minutes) into the local sampler control panel. The sampler will then take samples at this time interval.

Emergency Operation

During an outage of normal power to the WWTF, the composite sampler will remain powered through the Headworks lighting panel (LP-101) located in Motor Control Center (MCC-101).

Maintenance and Troubleshooting

Detailed start-up, operation, maintenance, and troubleshooting information can be found in the manufacturer's O&M manuals as follows.

- Influent Composite Sampler: **Appendix C, Volume 11**

Screens

Description

Trash racks are located directly downstream of the influent structure in both channels. The trash racks contain bars spaced at 3 inches on center to primarily capture rags and other large objects. The trash racks require periodic manual cleaning. The trash racks can be removed if it is determined that the removal does not affect the proper operation of the mechanical fine screens.

After the trash racks, wastewater is routed through the Parkson Hycor Helisieve Mechanical Fine Screens. In the west channel, the fine screen is followed by a manual bar screen that will capture debris that is 3/8 inches or larger in diameter. In the event that fine screen S-114 is take out of service during a period when both channels need to be utilized, the bar screen can be installed into the west channel to serve as a back-up fine screen. The bar screen requires manually cleaning.

The mechanical fine screens and ancillary components are listed in **Table 2-3.**

Table 2-3
Fine Screen System Equipment Summary

Equipment	P&ID Tag	Location
(2) Mechanical Fine Screens	S-113; S-114	Headworks Upper Level
(2) Fine Screen Control Panels	Co-113; Co-114	Headworks Upper Level
(2) Ultrasonic Level Transmitters	Lt-113; Lt-114	Headworks Upper Level
(2) Wash water Solenoid Valves	XV-113; XV-114	Headworks Upper Level
(2) Heat-tracing Thermostats	HT-113; HT-114	Headworks Upper Level
(2) Intrusion Switches	ZS-113; ZS-114	Headworks Upper Level

The fine screen cleaning system operates based on the fluid level upstream of the screen, as measured by each screen's associated ultrasonic level transmitter. As screenings accumulate on the screen basket, the fluid level upstream of the screen rises. At a set fluid depth of 17.5 inches, the motor will start and rotate the spiral brush. Screenings will be removed from the basket and transported up the transport tube. The press zone above the transport tube compacts the screenings, allowing pressate to discharge back to the channel via a drain tube. The screenings are then discharged through a vertical discharge tube to the dumpster located in the Screenings room below.

The mechanical fine screen includes a NPW connection for washing the drain housing to prevent drain plugging. The spray wash cycle will operate based on an operator selected period of time. The NPW connection is insulated and heat traced. The press zone for the screen is also insulated and heat traced and includes a thermostat and intrusion switch for freeze protection.

Each screen has an associated local control panel for operator input that is wall-mounted in the upper level of the Headworks building.

Additional information regarding the operation of the mechanical fine screens can be found in the standard operating procedures located in **Appendix A**.

Normal Operation

Under normal conditions, both screens and associated devices will operate simultaneously. The screens will continuously operate once the influent structure is online. The operator will input control variables for each screen at its respective control panel. Screen operation must be visually inspected by the operator periodically. The SCADA system monitors, but does not control the screens.

Alternate Operation

Alternate operation of the fine screens is expected to occur when usage of a single channel is required. This may be in the event that a screen needs to be taken out of service or during periods of low flow. In this case, flow to either channel can be directed by the using stop logs SL-101, SL-102, SL-107, SL-108, and SL-109. The stop logs shall be configured in a manner that directs normal influent flow to a single fine screen. In the event that influent flow increases, the wastewater will overtop the stop logs and go into the second channel, in which the second fine screen will begin operating.

In the event that both screens are out of service, all flow should be directed through the westernmost channel so that the manual bar screen can be utilized. This screen will require debris to be manually removed until the fine screen is operational.

Physical Hand-Off-Auto (HOA) switches are located adjacent to each fine screen for manual override of the automatic control provided by the screen's local control panel.

Emergency Operation

In the event that normal electrical power is lost, the essentially-powered screen (S-114) and its associated control panel will be supplied power by the emergency generator via MCC-101. The associated ultrasonic level transmitter, solenoid valve for the NPW connection, thermostat and intrusion switch will all remain operational. The non-essential screen, S-113 and associated devices, are only operational when normal electrical power is available.

Maintenance and Troubleshooting

Periodic visual inspection of the screenings devices, especially the ultrasonic level sensors, is critical for proper operation. Any interference will cause the sensors to not operate properly and will cause wastewater to building up behind the screens.

Detailed maintenance and troubleshooting procedures for the screening devices can be found in the manufacturer's O&M manuals as follows.

- Mechanical Fine Screens and Motors: **Appendix C, Volume 2**
  - Internal Heat Trace System
  - Solenoid Valve
  - Ultrasonic Level Sensor
- Stop Logs: **Appendix C, Volume 5**

Grit Unit, Classification, and Pumping

Description

The purpose of the grit system is to remove inorganic grit from the raw wastewater. The grit system is designed to the remove 95 percent of grit greater than 50 mesh, 85 percent of grit greater than 70 mesh size, and 65 percent of grit greater than 100 mesh size.

The interior of the circular grit chamber consists of a 7-foot-diameter upper level and a 3-foot-diameter lower level, known as the grit hopper. The bottom of the grit hopper sits approximately 6 feet 5 inches

below the bottom of the influent channel. The vortex grit unit contains impellers that rotate within the upper grit chamber. Grit settles to the bottom of the chamber, into the hopper section. Periodically, the grit in the grit hopper is removed by the grit pump. To provide efficient removal of the grit within the hopper, the grit is "fluffed" by three NPW nozzles operated by a solenoid valve just prior to the grit pump turning on. This allows the grit to be suspended into the fluid temporarily. The fluff time is set within the SCADA system by the operator. Once the fluff time is complete, grit pumping begins.

The grit/water mixture, known as slurry, is removed by suction from the bottom of the grit chamber through 4-inch glass-lined piping to the grit pump. The slurry flow rate is monitored on the discharge side of the grit pump by an electromagnetic flow meter, Ft-128, as it is pumped up to the inlet of the cyclone. The cyclone separates the water and organics from the inorganic grit. The water and organics are allowed to outfall through the overflow into the building floor drain system. Inorganic grit leaves the bottom of the cyclone and enters the grit classifier. The inclined screw conveyor removes and dewaters the inorganic grit before being discharged to the adjacent dumpster. Weir control of the water level within the classifier allows the operator to adjust the retention time of the slurry and thus control the amount of fines that can be settled out of the mixture.

A portion of the pumped slurry discharges from the 4-inch grit pipe to the influent channel through a 1-inch pipe during each pumping cycle. The 1-inch pipe, located on the ceiling of the grit room between the pump and the classifier, is continuously open and serves to break the siphon created in the grit pipe after each pumping cycle. Operators should monitor this line to ensure that it does not clog and flush the line out with non-potable water as necessary.

The grit cyclone and classifier is also plumbed with a NPW wash water connection.

Additional information regarding the operation of the grit removal equipment can be found in the standard operating procedures located in **Appendix A**.

The grit removal system and ancillary components are listed in **Table 2-4.**

Table 2-4
Grit System Equipment Summary

Equipment	P&ID Tag	Location
Grit Unit Drive Mechanism	GR-120	Headworks Upper Level
Grit Pump No. 1	P-126	Headworks Screening Room
Grit Classifier	GCL-129	Headworks Screening Room
Solenoid Valve – Flush Water	XV-118	Headworks Screening Room
Solenoid Valve – Grit Classifier Wash Water	XV-130	Headworks Screening Room
Flow Meter	Ft-128	Headworks Screening Room

Normal Operation

During normal operation, the grit removal system will receive the total influent flow from the SCADA system. The grit unit drive mechanism will continuously operate. The grit pump to run at operator-specified intervals, producing a continuous flow rate of approximately 240 gpm to the grit cyclone. The pump will supply slurry to the cyclone at an inlet pressure of 7-10 psi. The SCADA system will call the NPW flush/fluff solenoid to open for an operator-specified time period before the grit pump turns on. The SCADA system will also call the classifier to turn on and the wash water solenoid will open when the grit pump is called to run.

Alternate Operation

The grit equipment is controlled by the SCADA system and does not have a local control panel. Local physical HOA switches exist for each piece of grit equipment. Manual operation of the grit system can be accomplished via the HOA switches located in the following locations:

- Vortex grit unit – south side of south stairway wall on upper level
- Grit pump – south grit room wall on lower level
- Grit cyclone and classifier – south grit room wall on lower level

The grit removal unit can also be bypassed if needed for maintenance. In this instance, the bypass channel on the upper level of the Headworks is used by operating stop logs SL-103, SL-104, SL-105, and SL-106. Wastewater will be diverted directly to the Headworks flow splitter.

Draining of the classifier is expected to occur periodically for cleaning and debris removal. The bottom of classifier is tapped with a 2-inch drain line connected to the building floor drain system and isolated by a ball valve. The operator may open this valve to drain and flush the classifier to the IPPS.

Emergency Operation

The grit unit and grit pump are considered essentially-powered devices. The emergency generator is sized to run these if necessary during an outage of normal electrical power. During any power outage, the grit unit will operate continuously, powered via MCC-101. During a short-duration power outage, grit removal from the hopper will not likely be necessary. However, during an extended outage, the operator may need to run the grit pump and classifier to remove grit built up in the hopper. The classifier is not essentially-powered and thus the operator must ensure that the generator has the available capacity to run this device. The classifier will only add a small load of approximately 1.74 kilo-volt amps (KVA) to the generator. The grit pump and classifier are powered via MCC-101.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the grit removal system can be found in the manufacturer's O&M manuals as follows.

- Vortex Grit Unit and Classifier/Cyclone: **Appendix C, Volume 2**
- Grit Pump (Recessed Impeller Pump): **Appendix C, Volume 2**

- Electromagnetic Flow Meter: **Appendix C, Volume 11**
- Plug Valves: **Appendix C, Volume 5**

Flow Splitter

Description

The Headworks flow splitter splits WWTF influent flows between the two activated sludge basins and the EQ basin. The primary flow path to each basin from the flow splitter is over a weir gate. Flow can also be diverted to, and returned from, the EQ basin through 6- and 8-inch piping.

The Headworks flow splitter components are listed in **Table 2-5.**

Table 2-5
Headworks Flow Splitter Equipment Summary

Equipment	Tag	Normal Operation
Slide Gate	G-101	Manual control of flow to Activated Sludge Basin #1 Allows flow over the gate height of 760.93’
Slide Gate	G-102	Manual control of flow to Activated Sludge Basin #2 Allows flow over the gate height of 760.93’
Slide Gate	G-103	Manual control of emergency overflow to the EQ basin – Allows flow over the gate height of 761.50’
Drain Valve	G-201	Flow splitter drain to EQ basin – normally closed
Flow Meter	Ft-134	Return flow from EQ basin
Flow Meter	Ft-139	Raw wastewater to EQ basin
Motorized Valve Actuator	A-141	Controls wastewater flow to the EQ basin through 8-inch RS pipe

Normal Operation

Under normal conditions, the Headworks flow splitter will direct flow to either or both of the activated sludge basins. Flow through the splitter will be manually controlled based on weir gate elevations shown in **Table 2-5**.

Additional information regarding the operation of the flow splitter can be found in the standard operating procedures located in **Appendix A**.

Alternate Operation

The primary alternate operation of the Headworks flow splitter will be to direct a portion of the influent flow to the EQ basin. The purpose of this operation will be to either equalize high influent flow rates or to equalize high strength influent. Both of these scenarios are also discussed further in **Chapter 3**.

The WWTF influent flow rate is also monitored by the SCADA system. When the SCADA system records an extended period of influent flow above the hydraulic capacity of the operating activated sludge basin(s), it will divert influent the excess flows to the EQ basin through the 8-inch RS line. In the event that the SCADA system does not divert flows, the fluid level in the flow splitter may rise to an elevation of 761.50 feet. At this elevation, wastewater will overtop gate G-103 and discharge to the EQ basin.

During events of high influent strength, the dissolved oxygen (DO) levels within the basin aerobic cells will decrease. A DO level below the target setpoint the first Aerobic cell will cause a SCADA system alarm. If the DO level cannot be raised through Swing zone aeration (**Chapter 4**), the operator will make the decision to divert a portion of the influent wastewater from the flow splitter to the EQ basin. In this case, the operator would prompt the SCADA system to begin diverting the operator-selected flow rate to the EQ basin through the 8-inch RS line. If no operator decision is made and DO levels remain below the target setpoints, the SCADA system will automatically begin diversion to the EQ basin**.**

Return of the wastewater from the EQ basin to the Headworks flow splitter is discussed in **Chapter 3**.

Emergency Operation

During an outage of normal electrical power to the WWTF, the operator must direct flow to the essentially-powered Activated Sludge Basin No. 1 by manually closing the slide gate to the non-essential activated sludge basin. Flows can also be diverted to the EQ basin during the emergency event. The SCADA system will divert the portion of the influent flows that exceed the capacity of a single activated sludge basin to the EQ basin through the 8-inch RS line from the flow splitter if a power outage occurs.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the flow splitter components can be found in the manufacturer's O&M manuals as follows.

- Slide Gates: **Appendix C, Volume 5**
- Plug Valves: **Appendix C, Volume 5**
- Motorized Valve Actuators: **Appendix C, Volume 5**
- Electromagnetic Flow Meters: **Appendix C, Volume 11**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Influent System
  - Fine Screen System
  - Grit Removal System
  - Headworks (Flow Splitter and Equalization Basin) System

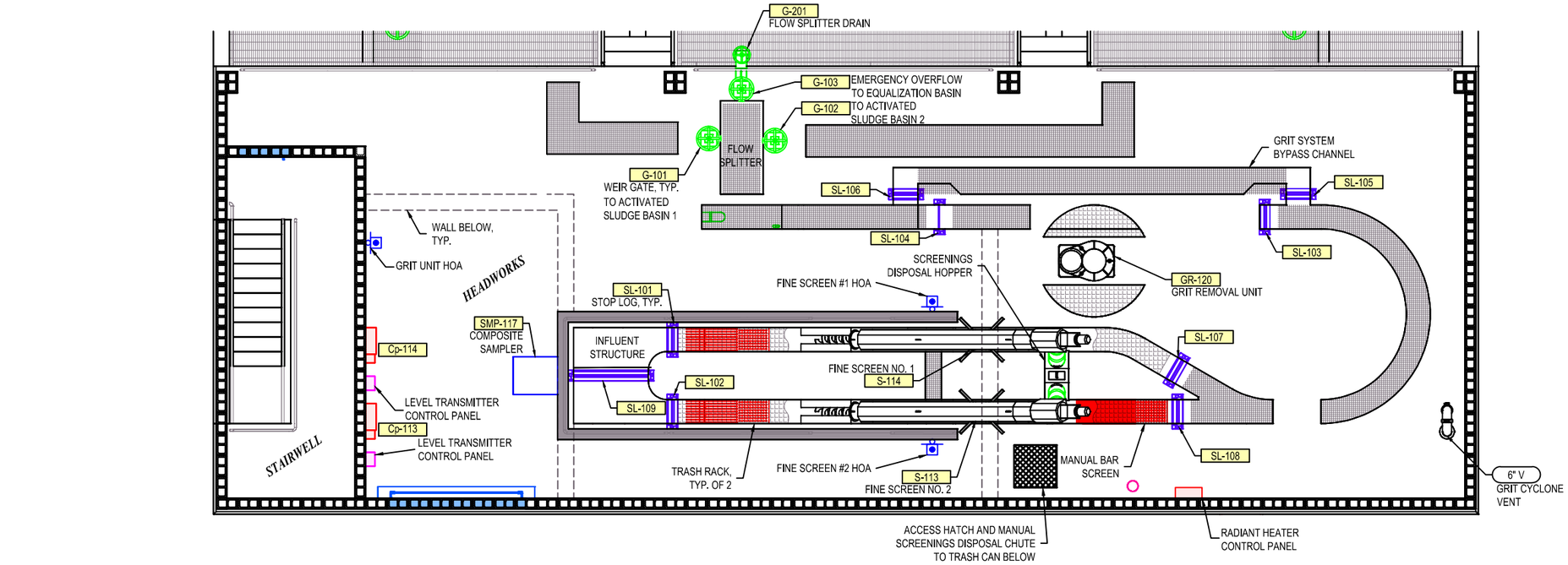
- *Standard Instrumentation and Equipment Descriptions*
  - Across the Line Starter
  - Composite Sampler
  - Flow Meter
  - Level Switch
  - Level Transmitter
  - Motor Actuated Valve
  - Solenoid Operated Valve
  - Variable Frequency Drive

SAFETY

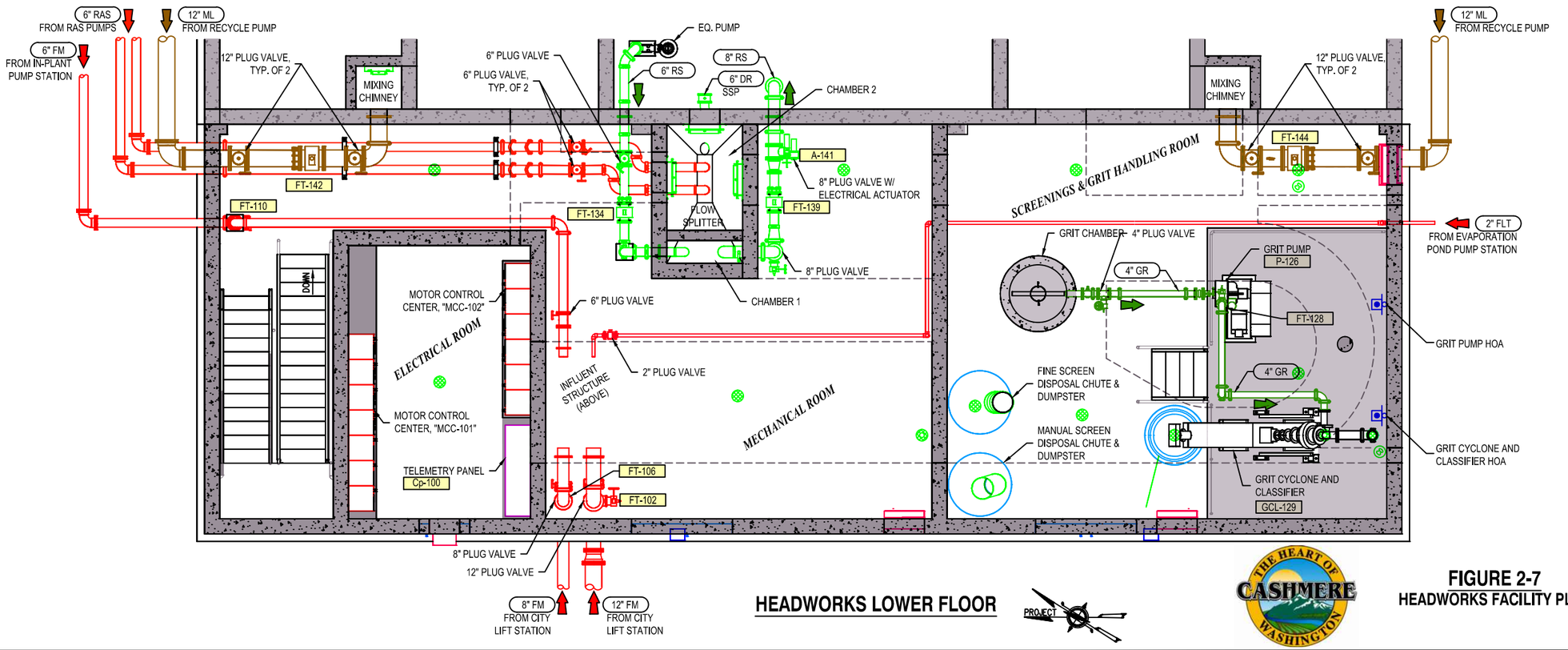
The primary safety concerns related to operation of the Headworks are as follows:

- Biological Hazards
- Fall Prevention
- Open Water Safety
- Gas Exposure
- Confined Space
- Electrical Hazards
- Personal Protective Measures
- Screening Devices
- Grit Separation Devices

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to Headworks facilities can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 2.2.



HEADWORKS UPPER FLOOR



HEADWORKS LOWER FLOOR

THE HEART OF CASHMERE WASHINGTON

FIGURE 2-7
HEADWORKS FACILITY PLAN

RH2 ENGINEERS PLANNERS SCIENTISTS

CHAPTER 3 – EQUALIZATION BASIN

Figure 4-8 *and* ***Figure 4-9*** *at the end of* ***Chapter 4*** *include the plan views of the activated sludge and equalization basins.*

OVERVIEW

Water Quantity or Quality Equalizing Scenarios

When needed, the equalization basin (EQ) basin provides equalizing storage of screened and degritted wastewater from the Headworks. During periods in which one activated sludge basin is in operation, the EQ basin may be utilized to provide storage in lieu of starting up the second activated sludge basin. The EQ basin may also be used during periods when both trains are in operation. It is anticipated that equalization of influent flows will be necessary in two scenarios:

- High water quantity events (high influent flow rates) – likely to occur during large storm events.
- Low water quality events (high influent strength) – likely to occur during increased discharge from fruit processing plants in the area.

Diversion to the EQ basin from the Headworks flow splitter (**Chapter 2**) can be accomplished by two methods: overflow into the EQ basin via manual slide gate G-103 or metered flow via the 8-inch raw sewage (RS) pipe on the south side of the Headworks flow splitter.

Water Quantity Equalization

Periods of high influent flow rates will be monitored by the plant supervisory control and data acquisition (SCADA) system using the electromagnetic flow meters on the influent pipes (**Chapter 2**). The SCADA system can operate the 8-inch RS plug valve using the motorized actuator A-141. The SCADA system can control the quantity of flow from the Headworks flow splitter to the EQ basin. This diverted wastewater can be stored in the EQ basin until the peak influent flow passes. Wastewater can also back up within the flow splitter during an emergency condition. The wastewater will rise within the flow splitter until it overtops gate G-103. Gate G-103 is set at a height of 761.50 feet. The wastewater that overtops the gate will overflow into the EQ basin and will not be metered.

Water Quality Equalization

The SCADA system will alert the operator of decreasing dissolved oxygen (DO) values as measured by the DO probes installed in the activated sludge basins. Low DO values may indicate increased influent wastewater strength. If the operator cannot mitigate the DO levels within the basins through other methods (**Chapter 4**), an operator-selected diversion of wastewater from the flow splitter to the EQ basin can be initiated through the SCADA system.

Basin

The EQ basin (**Figure 3-1**) is the center train between Activated Sludge Basins No. 1 and 2. The EQ basin is broken into three cells; EQ1, EQ2, and EQ3. Each cell progressively increases in size. Once EQ1 fills, the wastewater will overtop the basin partition wall in order to fill EQ2, and consecutively overtop to EQ3. It is anticipated that most equalization events will only require the usage of EQ1. The compartmented EQ basin provides the option of capturing short periods of increased influent flowrate or influent strength without utilizing the entire EQ structure.

The EQ basin was designed to be identical in size to the activated sludge basins so that the basin can be converted to a third process train as the City grows. The east end of EQ3 contains a surface wasting collection box and effluent launder identical to the east side of both activated sludge basins. In a future expansion of the Wastewater Treatment Facility (WWTF), these structures may be equipped to allow the EQ basin to function as a third activated sludge train.

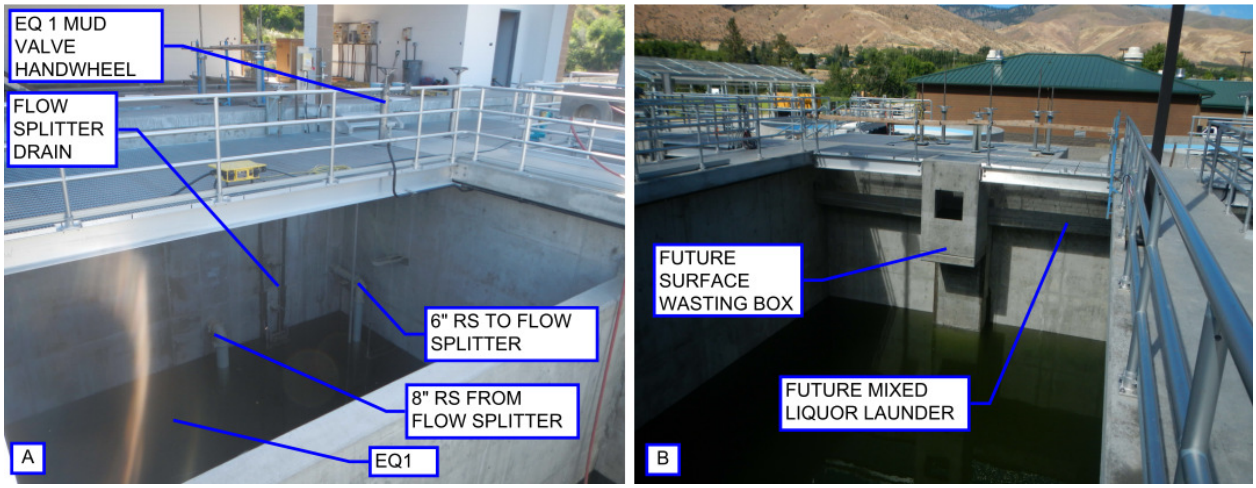


Figure 3-1 – Equalization Basin
(A) EQ 1; (B) EQ 3 and Future Activated Sludge Basin Structures

Return Pumping

The EQ pump P-245 (**Figure 3-2**) located in EQ1 is used to pump the wastewater stored in the EQ basin back to the Headworks flow splitter. The EQ pump can be both manually controlled and automatically controlled by the SCADA system. EQ2 and EQ3 will drain in succession back to EQ1 through low-head check valves installed at the base of the basin partition walls. Floor drains in EQ1 and EQ3 (controlled by mud valves) provide the option of draining the EQ basin to the IPPS. These drains will be utilized during washdown or to remove remaining sewage from the basin after utilizing the EQ pump.

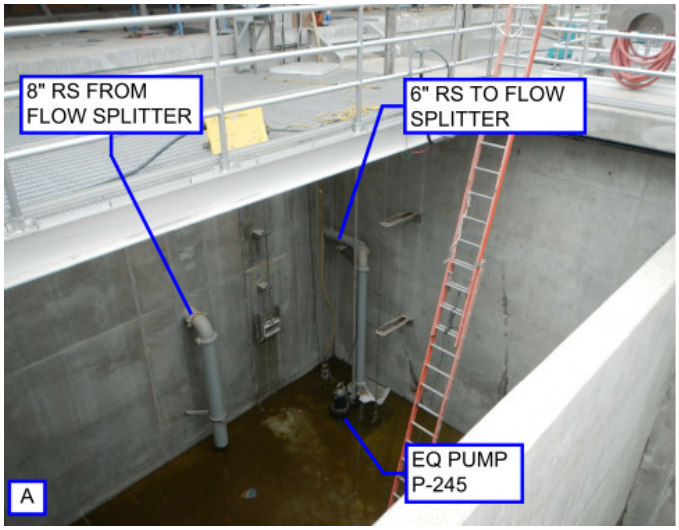


Figure 3-2 – Equalization Pump

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

The Routine Operations and Maintenance Checklist related to the EQ basin equipment is located in ***Appendix F.***

Water Quantity and Quality Equalizing Scenarios

Water Quantity Equalization

The water quantity scenario for flow equalization occurs when the Headworks flow splitter influent flowrate is higher than the treatment capacity of the online activated sludge basin(s).

The wastewater influent to the flow splitter is generated from the following sources and is monitored by the plant SCADA system:

- Plant Influent Flow Meter 1 (10-inch Meter Ft-102 from City Lift Station)
- Plant Influent Flow Meter 2 (8-inch Meter Ft-106 from City Lift Station)
- Plant Influent Flow Meter 3 (6-inch Meter Ft-110 from IPPS)
- Evaporation Pond Pump Discharge Flow Meter
- Equalization Basin Effluent Flow meter
- Clarifier No. 1 return activated sludge (RAS) Flow Meter
- Clarifier No. 2 RAS Flow Meter
- Equalization Basin Influent Flow meter

Each activated sludge basin has a hydraulic capacity of 1.3 million gallons per day (MGD) (900 gallons per minute (GPM)); with both basins operating, the capacity is doubled to 2.6 MGD (1,800 GPM).

In the event that the SCADA system calculates the flow splitter influent flow rate to be higher than the activated sludge basin(s) treatment capacity, flows will be automatically diverted to the EQ basin through the 8-inch RS line after an operator-adjustable delay period. The SCADA system will divert the surplus flow rate (current flow splitter influent flow rate less the online basin(s) treatment capacity) to the EQ basin by modulating the 8-inch RS plug valve via the motorized actuator. Feedback on flow rate will be provided to the SCADA system from the 8-inch RS flowmeter Ft-139. Once the flow splitter influent rate drops below the operating activated sludge basin(s) treatment capacity, the SCADA system will stop diverting flow to the EQ basin and begin returning wastewater via the EQ basin pump as discussed in the Return Pumping section of this chapter.

Water Quality Equalization

Equalizing influent flows due to decreased influent water quality will be determined based on the DO levels measured in the aerobic zone of the activated sludge basin(s) (**Chapter 4**). If DO levels cannot be maintained at the target levels by increasing aeration rates or aeration of the Swing zone (**Chapter 4**), equalization of influent flow may be required. In this scenario, DO levels below the target setpoint for the first aerobic cell will cause a SCADA system alarm. The operator will then make the decision to begin equalizing a set flow rate through the 8-inch RS line. If the operator does not divert the influent wastewater and DO levels do not rise, the SCADA system will automatically begin diverting wastewater to the EQ basin.

Description

The dimensions of the EQ basin are identical to one activated sludge basin. The EQ basin is divided into three cells with increasing storage capacities shown in **Table 3-1** (denoted from nearest to furthest from Headworks).

Table 3-1
Equalization Basin Capacity

Cell Name	Cell Denotation	Storage Size (L x W x H)	Storage Capacity (gal)
Equalization Cell #1	EQ1	18’-6” x 25’ x 18’	54,000
Equalization Cell #2	EQ2	36’-8” x 25’ x 18’	110,000
Equalization Cell #3	EQ3	130’-0” x 25’ x 18’	380,000
Total Capacity			544,000

Normal Operation

Normal operation of the EQ basin will consist of utilizing the basin to store excess raw wastewater during periods of high influent flow rates or high influent strength. The quantity of storage utilized will vary depending on the magnitude and length of time of the event requiring flow equalization. Once equalizing storage is no longer required, the EQ basin return pump will return wastewater to the Headworks flow splitter. Draining of the EQ cells will require washdown from the non-potable water (NPW) utility stations located on the basin catwalks.

Additional information regarding the operation of the EQ basin can be found in the standard operating procedures located in **Appendix A**.

Alternate Operation

No alternate operation of the EQ basin has been considered at this time.

Emergency Operation

An outage of normal power to the treatment plant may necessitate usage of the EQ basin. This scenario would occur in the event that the essentially-powered Activated Sludge Basin No. 1 could not treat the full influent flow to the plant. In this event, the SCADA system would divert raw wastewater to the EQ basin via the 8-inch RS line on the south side of the flow splitter. If the SCADA system failed to divert the wastewater, it would overflow to the EQ basin through slide gate G-103. Equalized wastewater would only be returned to the activated sludge basins via the EQ pump once normal power is returned to the plant.

Maintenance and Troubleshooting

Cleaning of the EQ basin will be required after each equalizing event. The operator will utilize the NPW utility stations on the basin catwalks to spray down the basin walls and floor. Mud valves in the basin floor will allow wash water to flow by gravity to the IPPS.

Detailed maintenance and troubleshooting procedures for the EQ basin components can be found in the manufacturer's operation and maintenance (O&M) manuals as follows:

- Slide Gates: **Appendix C, Volume 5**

Return Pumping

Description

The EQ pump located in EQ1 is a 4.7 HP ABS submersible pump Model XFP100E-CB1. The pump discharges to a 6-inch RS pipe that discharges to the north side of the Headworks flow splitter.

The EQ basin devices are listed in **Table 3-2**.

Table 3-2
EQ Basin Equipment

Equipment	P&ID Tag	Location
Submersible Pump	P-245	EQ Basin EQ1
Level Sensor, Float-style	Ls-246	EQ Basin EQ1
Level Sensor, Float-style	Ls-247	EQ Basin EQ1

Normal Operation

During normal operation, the SCADA system will call the EQ basin pump to recycle stored wastewater from EQ1 to the Headworks flow splitter once the need for flow equalization has ended. Return pumping will not occur until the operator-adjustable delay period is complete. The delay period will ensure that the return pumping does not begin prematurely.

The rate of discharge from the EQ pump will be equal to the difference between the treatment capacity of the online activated sludge basin(s) and the Headworks flow splitter influent flow rate. The SCADA system will control the EQ pump's discharge rate using its variable frequency drive (VFD) located in the motor control center (MCC-101). The SCADA system will monitor the discharge rate via the 6-inch RS flowmeter Ft-134. The EQ pump can produce a discharge rate between 100 to 500 GPM.

Low and high level float sensors are located in EQ1. These sensors are monitored by the SCADA system to prevent dry running the EQ pump or over-filling the basin. The float elevations are easily adjustable by the operator.

After return pumping, the operator will have to drain the remaining wastewater from EQ1 to the IPPS using the mud valve in EQ1.

Alternate Operation

An alternate, manual operation of the EQ basin pumping system can occur by using the physical hand-off-auto (HOA) switch located on the catwalk above EQ1. Placing the HOA in "HAND" mode will allow the operator to manually operate the EQ pump. Placing the HOA back to "AUTO" will allow the SCADA system to control the EQ pump.

Emergency Operation

The emergency generator is not sized to operate the EQ pump during an outage of normal power to the plant. Thus, during a power outage, the EQ basin could only return raw wastewater to activated sludge train by opening mud valves and allowing wastewater to drain to the In-Plant Pump Station (IPPS) and thus be pumped back to the Headworks influent structure. Return of wastewater from the EQ basin is not expected to occur during a power outage.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the EQ basin return pumping system can be found in the manufacturer's O&M manuals as follows:

- Submersible Pump: **Appendix C, Volume 2**
- Level Sensor, Float-style: **Appendix C, Volume 11**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Influent System
  - Headworks (Flow Splitter and Equalization Basin) System

- *Standard Instrumentation and Equipment Descriptions*
  - Flow Meter
  - Level Switch
  - Motor Actuated Valve
  - Variable Frequency Drive

SAFETY

The primary safety concerns related to operation of the basins are as follows:

- Biological Hazards
- Fall Prevention
- Open Water Safety
- Gas Exposure
- Confined Space
- Electrical Hazards
- Personal Protective Measures

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to aeration basins can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 2.3.3.

CHAPTER 4 – ACTIVATED SLUDGE BASINS

Figure 4-8 *through* ***Figure 4-11*** *at the end of this chapter include the plan views of the basins, Equipment Building Blower room, and WAS pumping system in the Equipment Building Pump room.*

OVERVIEW

The activated sludge basins are designed to achieve enhanced biological phosphorus removal (EBPR) in wastewater treatment. This is accomplished by providing conditions in the activated sludge system which encourage the growth of phosphate accumulating organisms (PAOs). PAOs are heterotrophic bacteria that occur naturally in the environment and in aerobic activated sludge. The growth of PAOs is enhanced (i.e., selected for) by cycling the activated sludge mixed liquor (ML) between anaerobic and aerobic conditions.

Under aerobic conditions (i.e., when dissolved oxygen is present), PAOs obtain energy from stored food and uptake large amounts of phosphorus into their cells, which they store as polyphosphates. These polyphosphates contain high-energy bonds and function like a cellular energy reserve. Under anaerobic conditions (i.e., in the absence of oxygen), PAOs can break the polyphosphate bonds and use the resulting energy to uptake easily biodegradable compounds, especially short chain volatile fatty acids (VFAs). PAOs polymerize and store the VFAs in their cells as cellular food storage products known as poly-β-hydroxyalkanoates (PHAs), of which the most common is poly-β-hydroxy-butyrate (PHB). When oxygen becomes available again in the aerobic zones, they can metabolize the PHAs to generate energy and uptake phosphorus (in the form of phosphate) and store the excess amount as polyphosphates. See **Figure 4-1** shows a conceptual diagram of what is taking place in an EBPR system. (Refer to the U.S. Environmental Protection Agency (EPA) *Nutrient Control Manual* EPA/600/R-10/100, August 2010 and *Wastewater Engineering: Treatment and Resource Recovery*, Metcalf & Eddy, Fifth Edition, 2014, for additional information.)

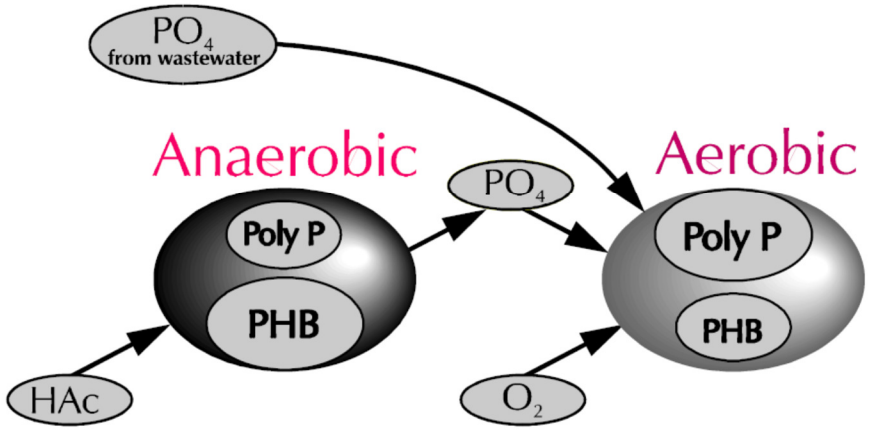


Figure 4-1 – Conceptual Diagram of the EBPR Process

The plant contains two identical activated sludge basins, each with the capacity to treat 1.3 million gallons per day (MGD) of influent. The basins are broken down into the following zones: anaerobic, anoxic, swing, and aerobic zones. The zones are further broken into the following cells, as detailed in **Table 4-1**.

Table 4-1
Activated Sludge Basin Cells

Zone	Number of Cells	Cell Denotation
Anaerobic	1	AN
Anoxic	3	Ax1, Ax2, Ax3*
Aerobic	3	Ox1, Ox2, Ox3

*Ax3 is the Swing zone which can be operated in either Anoxic or Aerobic modes

Plant influent is mixed with Return Activated Sludge (RAS) from the clarifiers in the Headworks flow splitter. Wastewater enters the anaerobic zone, and then flows to the subsequent anoxic and aerobic zones. The wastewater flows over the wall between each cell. A portion of the mixed liquor is recycled from the final aerobic cell (Ox3) to mix with the effluent from the anaerobic zone within the first anoxic cell (Ax1). Sludge wasting continuously occurs from the activated sludge basins via the surface wasting collection system in Ox3. The Waste Activated Sludge (WAS) is pumped from the collection box in Ox3 to the solids handling system, which is described further in **Chapter 7**. Floating material on the surface of each cell travels to Ox3 where it is also collected by the surface wasting system. Mixed liquor outfalls from Ox3 and is conveyed to the secondary clarifiers.

Anaerobic Zone

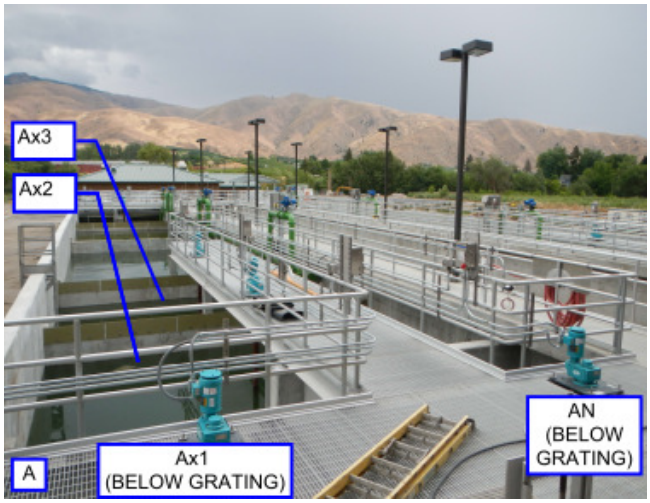


Figure 4-2 – Activated Sludge Basin #1 Anaerobic, Anoxic and Swing Zones

An anaerobic zone (the AN cell) is required as the first stage of an EBPR process (refer to the EPA *Nutrient Control Design Manual* for additional information). The AN cell (**Figure 4-2**) receives wastewater from the Headworks flow splitter through a concrete channel. The wastewater enters the top of the cell and is continuously mixed by the top-entering tank mixer, thus keeping all constituents in suspension. Effluent leaves the AN cell over the top of the partition wall into the adjacent mixing chimney at the start of the Anoxic zone.

In order for EBPR to work effectively it is very important that both oxygen and nitrate are excluded from the anaerobic zone. The anoxic and aerobic zones located downstream of the anaerobic zone are designed to nitrify and denitrify so that the levels of nitrate in the RAS returned to the anaerobic zone are low. The internal recycle from Ox3 to Ax1 is necessary to achieve the denitrification. If significant amounts of oxygen or nitrate do enter the anaerobic zone, it can be detrimental in several ways, as described below.

When dissolved oxygen (DO) is present in the anaerobic zone, heterotrophic aerobic organisms can use the oxygen as the electron acceptor and will compete with the PAOs for VFAs. Consequently, less VFA storage occurs which means that less phosphate uptake occurs in the subsequent anoxic and aerobic zones. Moreover, if oxygen is available, PAOs can metabolize VFAs completely and use the energy and carbon obtained for growth instead of storing VFAs using energy from polyphosphate bonds and for subsequent phosphate uptake.

Nitrates can also be used as an electron acceptor by facultative (denitrifying) heterotrophs, which include some PAOs. The presence of nitrate in the anaerobic zone will deplete the amount of VFAs available to PAOs, just as the presence of DO does. Nitrates can also inhibit fermentation of readily biodegradable chemical oxygen demand (rbCOD) and reduce the production of VFAs because most of the fermenting microorganisms are facultative and can use nitrate as an electron acceptor to fully oxidize the non-VFA rbCOD instead of producing VFAs as the end product.

Oxygen can be inadvertently added back to the anaerobic zone through recycle flows such as the RAS and by backmixing from inadequately baffled aerobic zones. Nitrates can be introduced to the anaerobic zone by the RAS, by mixed liquor recycles from anoxic zones, by backmixing from inadequately baffled anoxic zones, and by plant recycles such as supernatant from sludge handling facilities. Significant nitrate interference of EBPR is much more common than DO interference. Care should be taken to limit nitrate introduction into the anaerobic zone at the City of Cashmere (City) Wastewater Treatment Facility (WWTF) and at EBPR plants in general.

Anoxic Zones

The first anoxic cell (Ax1) houses the mixing chimney, which allows effluent from the AN cell to mix with recycled mixed liquor (from Ox3) entering the middle of the chimney. The mixture flows out the bottom of the chimney into cell Ax1. This cell contains a top-entering mixer. Mixed liquor overtops the partition wall from Ax1 to flow into Ax2. Cell Ax2 is twice the size of Ax1 and contains a continuously-operating top-entering mixer as well. Flow overtops the partition wall from Ax2 to flow into the swing zone (Ax3).

Nitrate is recycled from Ox3 to Ax1 via the mixed liquor recycle system. In the absence of oxygen, the bacteria use nitrate as the electron acceptor for carbonaceous BOD removal. The nitrates are reduced to gaseous nitrogen in the denitrification process. The nitrate reduction can be carried out by the PAOs using storage products (PHAs) produced in the anaerobic zone or by other heterotrophic bacteria using soluble BOD remaining in the effluent from the anaerobic zone. Denitrification recovers some of the alkalinity consumed in the downstream nitrification process occurring in the aerobic zone, where nitrification is the oxidation of ammonia to nitrate. The anaerobic zone effluent and the recycle stream from Ox3 are rapidly and thoroughly mixed to avoid short circuiting and to optimize process performance. As noted above, all three anoxic cells have top entry mixers to maintain the reactor contents in suspension (See section 3.4 of Metcalf/Eddy for further mixing equipment details).

Nitrate reduction in wastewater systems occurs through assimilation and denitrification. In assimilatory nitrate reduction, nitrate is reduced to ammonia and assimilated for cell synthesis. In denitrification, bacteria use nitrate as an electron acceptor in the absence of oxygen to oxidize an organic or inorganic electron donor. Nitrate is reduced to nitrite, to nitric oxide, to nitrous oxide, and to nitrogen gas in a four-step process shown in **Equation 1**:

$$NO_3^- \rightarrow NO_2^- \rightarrow NO \rightarrow N_2O \rightarrow N_2 \qquad \textbf{Equation 1}$$

Equation 2, the overall reaction, shows glucose as the electron donor. Most denitrifying bacteria require a reduced carbon substrate such as glucose, acetate, or methanol. The carbon source as represented by the chemical oxygen demand (COD) of the wastewater is often a limiting factor in achieving biological nitrogen and phosphorous removal.

$$C_6H_{12}O_6 + 4.8NO_3^- + 4.8H^+ \rightarrow 6CO_2 + 2.4N_2 + 8.4H_2O \qquad \textbf{Equation 2}$$

The rate of denitrification (R_{DN}) is dependent on temperature and DO concentration, where K is the temperature correction coefficient, which is commonly assumed to be 1.09. (Randall et al., 1992)

$$R_{DN(T)} = R_{DN(20)} \times K^{(T-20)} \times (1 - DO) \qquad \textbf{Equation 3}$$

Equation 3 shows that the rate of denitrification decreases linearly from 0 to 1 milligrams per liter (mg/L) of DO. At DO levels of 1 mg/L and above the rate of denitrification becomes negligible.

Swing Zone

To maximize flexibility for the activated sludge process, the third anoxic cell (Ax3) is designed as a swing zone. It may be operated in either anoxic or aerobic modes depending on influent nutrient loading. Cell Ax3 contains both a top-entering mixer and fine bubble air diffusers at the bottom of the cell. This cell contains the largest density of diffusers of the aerated cells. The hydraulic profile upstream and within Ax3 is controlled by adjustable weirs on the partition walls on either side of Ax3. Mixed liquor overtops this weir to flow into the first aerobic cell, Ox1.

Aeration of the swing zone is recommended during periods of very high soluble BOD loading. Under these conditions, the capacity of the PAOs in the anaerobic zone and the denitrifying bacteria in the anoxic zones using the available nitrate from the recycle stream, may be insufficient to take up all of the soluble influent BOD. If some soluble BOD carries over into the first aerobic cell, it could lead to conditions which promote filamentous bacteria growth.

The operational strategy will be to aerate at the maximum rate possible in Ax3 during the high-BOD loading events. However, the normal operation of this cell will be for Ax3 to operate in anoxic mode.

Aerobic Zones

The aerobic zone (**Figure 4-3**) consists of cells Ox1, Ox2, and Ox3; all of these cells contain air diffusion equipment. Cell Ox3 also contains a top-entering tank mixer to give the operators flexibility in the amount of air added to this cell. During low loading periods, aeration to this cell may be decreased to avoid overshooting the DO setpoint for the cell (discussed further in the Diffused Aeration System section of this chapter). In the event that the aeration level in Ox3 falls below the level required to maintain mixing, the mixer in this cell can be selected to run. Ox3 also includes the surface wasting collection system, recycle pumping system, and mixed liquor outfall system to the secondary clarifiers.

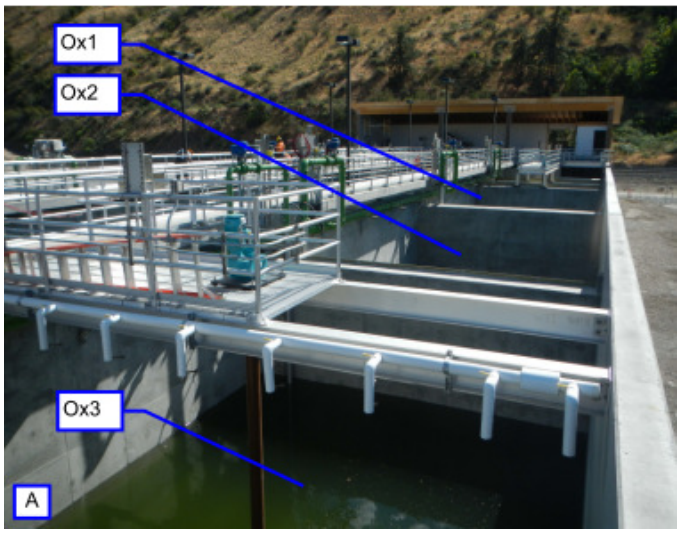


Figure 4-3 – Activated Sludge Basin #1 Aerobic Zone

The biological processes taking place in the aerobic zone include:

- Conversion of ammonia to nitrate by the ammonia oxidizing bacteria (AOBs) and the nitrite oxidizing bacteria (NOBs) where this process in generally referred to as nitrification.
- The phosphorus accumulating organisms (PAOs) utilize the food reserves taken up in the anaerobic zone to take up phosphorus and store it as polyphosphates
- Heterotrophic bacteria will take up any remaining soluble BOD which enters the aerobic zone.
- DO monitoring by plant Supervisory Control and Data Acquisition (SCADA) system and aeration strategy (Refer to the EPA *Nutrient Control Manual* EPA/600/R-10/100, August 2010 and *Wastewater Engineering: Treatment and Resource Recovery*, Metcalf & Eddy, Fifth Edition, 2014, for additional information.)

Nitrification is the oxidation of ammonia to nitrate catalyzed by bacteria and is a key part of global nitrogen cycling. In the first step of nitrification, chemolithoautotrophic AOB transform ammonia to nitrite. Nitrite is subsequently oxidized to nitrate by the NOB.

The generally accepted energy yielding two-step oxidation of ammonia to nitrate is as shown in **Equations 4** and **5**. It had long been assumed that *Nitrosomonas* spp., were responsible for oxidizing ammonia to nitrite (**Equation 4**) and that *Nitrobacter* spp., were responsible for oxidizing nitrite to nitrate:

$$2NH_4^+ + 3O_2 \rightarrow 2NO_2^- + 4H^+ + 2H_2O \qquad \textbf{Equation 4}$$

$$2NO_2^- + O_2 \rightarrow 2NO_3^- \qquad \textbf{Equation 5}$$

Where the total reaction is:

$$NH_4^+ + 2O_2 \rightarrow NO_3^- + 2H^+ + H_2O \qquad \textbf{Equation 6}$$

However, recently is has been determined using molecular detection methods that *Nitrospira*-like bacteria, not *Nitrobacter* spp., have been observed to be the dominant nitrite oxidizers, both in most full-scale wastewater treatment plants and in laboratory scale reactors. The total reaction (**Equation 6**) shows that 4.57 g O_2 is required per g-NH_4^+-N oxidized, but when the nitrogen used for cell syntheses is included, the oxygen requirement is 4.3 g O_2/g-NH_4^+-N oxidized to nitrate (Randall et al. 1992). Temperature, DO concentration, and ammonia nitrogen concentration all affect nitrification rates. The actual growth rate of nitrifiers (μ_N) can be expressed as a function of ammonia and DO by a Monod kinetic equation:

$$\mu_N = \mu_{Nmax} \times [(NH_4^+\text{-}N)/(K_N + NH_4^+\text{-}N)] \times [(DO)/(K_O + DO)] \qquad \textbf{Equation 7}$$

At very low DO levels the term $[(DO)/(K_O + DO)]$ approaches zero and no nitrification will occur. Under long periods of low DO conditions, the nitrifiers will be lost from the system.

As noted previously, organic carbon in the wastewater to be treated is critical for driving biological denitrification and EBPR. Sufficient organic carbon in the form of readily rbCOD is necessary for denitrifying bacteria to carry out denitrification. To achieve EBPR as depicted in **Figure 4.1**, it is necessary to provide the PAO with adequate supply of rbCOD in form of VFA and appropriate anaerobic conditions free of nitrates. Thus, there is a competition for the available rbCOD between PAOs and denitrifying bacteria. When influent wastewater has a lower concentration of organic carbon the nutrient removal efficiency decreases or an external carbon needs to be added. However, some PAOs are also able to denitrify and can take up phosphorus in the anoxic zone or the aerobic zone. In this way, some of the available carbon in the wastewater can be used for both denitrification and phosphorus removal.

The mechanism of anaerobic phosphate release of denitrifying PAOs is the same as that of PAOs which can only use oxygen. As depicted in **Figure 4.1**, external organic substrate is taken up and converted to PHA as cell energy. Phosphorus is taken up under aerobic conditions by aerobic PAOs as shown in the figure, but uptake can also occur under anoxic conditions by denitrifying PAOs.

Additional information regarding the ENBR process can be found in the standard operating procedures located in **Appendix A**.

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

*The Routine Operation and Maintenance Checklist related to the activated sludge basin components is located in **Appendix F.***

The activated sludge basins will be operated in either singular or parallel scenarios throughout the life of the WWTF. Discussion of normal and alternate operation of the systems below assumes one online activated sludge basin; operational techniques will be mirrored in both basins during periods of parallel operation.

Anaerobic and Anoxic Zones and Mixers

Description

The anaerobic and anoxic zones (cells AN, Ax1, and Ax2) contain Invent top-entering tank mixers. The mixer shaft and body are suspended from the catwalk above each cell. The motor, gear reducer, electrical disconnect and Hand-Off-Auto (HOA) switch for each mixer is accessible on the catwalk grating.

Mixed liquor flow through the anaerobic and anoxic zones is over-the-wall. Surface wasting leaves the top of the chimney through a manually operated slide gate. The AN cell houses a floor drain and mud valve that can be utilized to drain the AN, Ax1, Ax2, and Ax3 cells to the IPPS. At the base of the partition walls between these cells there are 6-inch drain blockouts that allow the cells to drain back to the AN cell. The mud valve are manually operated from the catwalk above the AN cell.

The anaerobic and anoxic cells are sized as shown in **Table 4-2**.

Table 4-2
Anaerobic and Anoxic Zone Capacity*

Cell Name	Cell Denotation	Storage Size (L x W x H)	Storage Capacity (gal)	Mixer (HP)	Aeration
Anaerobic Cell	AN	18'-6" x 12' x 18'	29,900	Yes (.75)	No
Anoxic Cell 1	Ax1	18'-6" x 12' x 18'	29,900	Yes (.75)	No
Anoxic Cell 2	Ax2	17'-8" x 25' x 18'	59,500	Yes (1.5)	No

*Cell names, sizes, mixing and aeration equipment are identical for both activated sludge basins.

The Anaerobic and Anoxic zones contain the equipment listed in **Table 4-3**.

Table 4-3
Anaerobic and Anoxic Zone Equipment

Equipment	P&ID Tags	Location
Top Entering Tank Mixers	M-205, M-206, M-207 M-225, M-226, M-227	Basins Activated Sludge Basins

Normal Operation

During normal operation, the operator will set the activated sludge basin(s) to run. Once this occurs, the SCADA system will call tank mixers in AN, Ax1, and Ax2 to run continually as long as the activated sludge basin(s) is operating. The mixer speed is constant and the mixer motors are not run off of variable frequency drives (VFDs). Mixed liquor is continuously recycled and mixed with the incoming influent in Ax1. Mixed liquor recycle rates are discussed further in the Recycle Pumping System section.

Alternate Operation

The mixer can be operated manually by turning the HOA switch to "HAND". The HOA for each mixer is located adjacent to the mixer motor on the catwalk. The operator can turn the HOA back to "AUTO" to allow the mixer to be controlled by the SCADA system.

Emergency Operation

The anaerobic and anoxic zone components of the Activated Sludge Basin No. 1 are essentially-powered devices by default and as such, will be powered by the emergency generator (EG) during an outage of normal power to the plant. In the event that the Activated Sludge Basin No. 1 reaches its capacity during a power outage, the equalization basin (EQ basin) will be utilized to store influent flow. The EG is not sized to operate the second activated sludge basin equipment.

The operator may choose within the SCADA system to make Activated Sludge Basin No. 2 the essentially-powered train if necessary.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the anaerobic and anoxic zone components can be found in the manufacturer's operation and maintenance (O&M) manual as shown below:

- Top Entering Tank Mixers: **Appendix C, Volume 2**
- Slide Gates: **Appendix C, Volume 5**

Swing Zone

Description

The third anoxic cell (Ax3) is designed as a swing zone containing both a mixer and air diffusion equipment. Ax3 can either be operated in an anoxic or aerobic mode. The Ax3 cell can be drained back to Ax2 and successively to the AN cell via the 6-inch drain blockouts at the partition wall bases. The hydraulic profile upstream of and within Ax3 is controlled by an adjustable weir at the top of the partition walls on either side of Ax3. The upstream weir is set at an elevation of 760.37 feet and the downstream weir is set to 760.23 feet.

The swing zone is sized as shown in **Table 4-4**.

Table 4-4
Swing Zone Capacity*

Cell Name	Cell Denotation	Storage Size (L x W x H)	Storage Capacity (gal)	Mixer (Hp)	Aeration
Anoxic (Swing) Cell 3	Ax3	18' x 25' x 18'	60,600	Yes (1.5)	Yes

*Cell names, sizes, mixing, and aeration equipment are identical for both activated sludge basins.

The swing zone contains the equipment listed in **Table 4-5**.

Table 4-5
Swing Zone Equipment

Equipment	P&ID Tags	Location
Top Entering Tank Mixers	M-208, M-228	Basins Activated Sludge Basins
6-inch Aeration Header Butterfly Valve and Motorized Actuator	A-209, A-229	Basins Activated Sludge Basins
Air Flow Meter	Ft-210, Ft-230	Basins Activated Sludge Basins
Aeration Diffusers	None	Basins Activated Sludge Basins

Normal Operation

The swing zone will normally be operated in anoxic mode. During typical operation, the operator will manually make this selection remotely through the SCADA system. Anoxic mode includes continuous mixing by the tank mixer and no aeration. The SCADA system will continuously operate the swing zone in anoxic mode until the operation of this zone in aerobic mode is necessitated.

Alternate Operation

The necessitation for switching the swing zone from anoxic to aerobic mode will occur during high BOD loading events to the activated sludge basin(s) as measured by the DO levels in Ox1. In the event that the aerobic zone aeration cannot maintain the required DO level in Ox1, the SCADA system will prompt the operator to switch the swing zone mode to aerobic. The SCADA system can also automatically change the swing zone to aerobic mode if DO levels do not rise in the aerobic zone.

Operating the swing zone in aerobic mode will be considered the primary alternate operational mode. During aerobic mode operation, the operator will typically want to aerate at as high of rate possible within the swing zone until the high loading period subsides. As such, the rate of aeration will likely be high enough to provide mixing of the constituents and thus the mixer will not be in operation. Aeration rates for mixing are discussed further in the Diffused Aeration section.

No DO monitoring is installed in the swing zone. Air flow rates into this cell will be controlled by a modulating motor-actuated butterfly valve on the aeration dropleg identical to the other aerobic cells.

Emergency Operation

The swing zone components of Activated Sludge Basin No. 1 are essentially-powered devices by default and as such, will be powered by the EG during an outage of normal power to the plant. In the event that the Activated Sludge Basin No. 1 reaches its capacity during a power outage, the EQ basin will be utilized to store influent flow due to the lack of EG capacity to operate the second activated sludge basin.

The operator may choose within the SCADA system to make Activated Sludge Basin No. 2 the essentially powered train if necessary.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the swing zone components can be found in the manufacturer's O&Ms as shown below:

- Top Entering Tank Mixers: **Appendix C, Volume 2**
- Air Diffusion Equipment: **Appendix C, Volume 3**
- Air Flow Meter: **Appendix C, Volume 11**

Aerobic Zones

Description

The aerobic zone consists of cells Ox1, Ox2, and Ox3. Each of these cells contains air diffusion equipment. Only the final aerobic cell, Ox3, contains a top entering tank mixer. Ox3 also contains a submersible pump for recycling the mixed liquor and a surface wasting system for WAS collection, both discussed in their respective sections of this chapter. Cell Ox3 also contains a launder system over which mixed liquor flows to the clarifiers. The launder weirs are set to an elevation of 760.20 feet.

The three Aerobic cells are sized as shown in **Table 4-6**.

Table 4-6
Aerobic Tank Capacity*

Cell Name	Cell Denotation	Storage Size (L x W x H)	Storage Capacity (gal)	Mixer (Hp)	Aeration
Aerobic Cell 1	Ox1	42'-8" x 25' x 18'	143,700	No	Yes
Aerobic Cell 2	Ox2	42'-6" x 25' x 18'	143,100	No	Yes
Aerobic Cell 3	Ox3	43'-0" x 25' x 18'	144,800	Yes (3)	Yes

*Cell names, sizes, mixing, and aeration equipment are identical for both activated sludge basins.

The Aerobic zone contains the equipment listed in **Table 4-7**.

Table 4-7
Aerobic System Components

Equipment	Quantity	P&ID Tags	Location
Top Entering Tank Mixers	Ox1 (0) Ox2 (0) Ox3 (1)	None None M-224, M-244	Basins Activated Sludge Basins
Aeration Dropleg Butterfly Valve and Motorized Actuator	Ax3 (1) 6-inch Ox1 (1) 8-inch Ox2 (1) 6-inch Ox3 (1) 4-inch	A-209, A-229 A-211, A-231 A-213, A-233 A-215, A-235	Basins Activated Sludge Basins
Air Flow Meter	Ax3 (1) Ox1 (1) Ox2 (1) Ox3 (1)	Ft-210, Ft-230 Ft-212, Ft-232 Ft-214, Ft-234 Ft-216, Ft-236	Basins Activated Sludge Basins
Aeration Diffusers (# of Diffuser Heads)	Ax3 (192) Ox1 (456) Ox2 (180) Ox3 (126)	None None None	Basins Activated Sludge Basins
DO Sensors	Ox1 (1) Ox2 (1) Ox3 (1)	DO-220, DO-240 DO-221, DO-241 DO-222, DO-241	Basins Activated Sludge Basins

Normal Operation

During normal operation, the SCADA system will aerate the aerobic zone based on the aeration operational mode (discussed in the Diffused Aeration System section) for the online activated sludge basin(s). The aeration system will aim to maintain the target DO levels for each cell. DO levels within each cell will be measured by DO probes and monitored by the SCADA system. Air flow to each cell will be controlled by modulating valves (discussed in detail in the Diffused Aeration System section). During normal operation, air flow rates in Ox3 will be high enough to maintain mixing of the constituents without utilizing the tank mixer.

Alternate Operation

Alternate operation of the aerobic zone occurs when DO levels in the basins rise to a point that the SCADA system will lower the aeration rate to below the required mixing rate for Ox3 mixing rates discussed in the Diffused Aeration System section of this chapter. In this instance, the SCADA system will automatically turn on the tank mixer in order to avoid settling of constituents within Ox3.

The operator may manually adjust aeration levels within the SCADA system as well as turn the Ox3 mixer on and off. Manual override of the SCADA system for the Ox3 mixer can occur at the HOA adjacent to the mixer motor on the basin catwalk.

Emergency Operation

The aerobic zone components of Activated Sludge Basin No. 1 are essentially-powered devices by default and as such, will be powered by the EG during an outage of normal power to the plant. In the event that the Activated Sludge Basin No. 1 reaches its capacity during a power outage, the EQ basin will be utilized to store influent flow due to the lack of EG capacity to operate the second activated sludge basin.

The operator may choose within the SCADA system to make Activated Sludge Basin No. 2 the essentially powered train if necessary.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the aerobic zone components can be found in the manufacturer's O&M manual as shown below:

- Top Entering Tank Mixers: **Appendix C, Volume 2**
- Dissolved Oxygen Sensor: **Appendix C, Volume 11**
- Air Diffusion Equipment: **Appendix C, Volume 3**
- Air Flow Meter: **Appendix C, Volume 11**
- Slide Gate: **Appendix C, Volume 5**
- Motorized Gate Actuator: **Appendix C, Volume 5**

Diffused Aeration System, Blowers, and Dissolved Oxygen

Description

Fine bubble aeration is necessary for oxygen uptake by the microorganisms within the activated sludge basins. The basin aeration system includes four 75 HP Aerzen rotary positive displacement blowers located within the Equipment Building Blower room, associated piping, valves and appurtenances, and the fine bubble diffusion equipment within basin cells Ax3, Ox1, Ox2, and Ox3 (**Figure 4-4**). Normal operation will not require usage of more than three blowers. The fourth blower functions as a backup blower for either the activated sludge basins or the aerobic digesters. Operation of blowers will be rotated automatically by the SCADA system to achieve even run times for each blower. The blower piping is outfitted with a blower relief discharge that is located in the Equipment Building Blower room. A pressure sensor is located just downstream of the blowers on the aeration header in the Blower room. Sensors monitor DO levels within each of the aerobic cells of the basins.

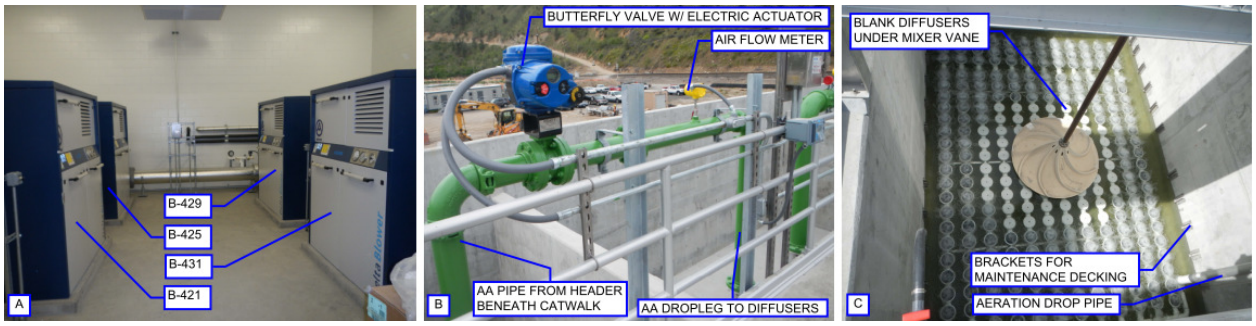


Figure 4-4 – Basin Aeration System Components
(A) Equipment Building Blower Room; (B) Basin Aeration Dropleg; (C) Ax3 Aeration Diffusers

Table 4-8
Basin Aeration System Components

Equipment	P&ID Tags	Location
Rotary Positive Displacement Blower	B-421, B-425, B-429, B-433	Equipment Building Blower Room
Electric Butterfly Valve Actuators	A-209, A-211, A-213, A-215 A-229, A-231, A-233, A-235	Basins Activated Sludge Basins
DO Sensors	Dox-220, Dox-221, Dox-222, Dox-240, Dox-241, Dox-242	Basins Activated Sludge Basins
Pressure Transmitter	Pt-454	Equipment Building Blower Room
Air Flow Meters	Ft-210, Ft-212, Ft-214, Ft-216 Ft-230, Ft-232, Ft-234, Ft-236	Basins Activated Sludge Basins
Relief Discharge Valve Actuator	A-453	Equipment Building Blower Room

Air flow into the aeration system will be controlled by the most-open-valve (MOV) control loop as discussed in the Process Monitoring and Control section of this chapter. This control loop monitors two system variables:

- System pressure measured at the blower header in the Equipment Building Blower room
- DO levels measured in each aerobic cell of the basins

The MOV loop utilizes two system mechanisms for controlling these variables:

- Butterfly valves on the aerobic cell aeration droplegs are throttled via motorized actuators to control air flow rate into each cell
- Blower motor speed is controlled by VFDs to vary air flow into the entire system

An individual aeration dropleg pipe exists along the basin catwalk above each of cells Ax3, Ox1, Ox2, and Ox3. Motorized valve actuators along these droplegs serve to modulate the valves in order to control air flow into each aerobic zone, thus maintaining the target DO level as measured by the DO probe in each

of cells Ox1, Ox2, and Ox3. Air flow meters installed on each aeration dropleg are used by the SCADA system to ensure that the maximum air flow rate into each cell is not exceeded. The maximum and minimum air flow rates as well as the target DO range for each cell is presented in **Table 4-9**.

Table 4-9
Aerobic Zone Air Flow Rates

Zone	Minimum Air Flow Flux Rate (scfm)	Minimum Air Flow Rate for Mixing (scfm)	Maximum Air Flow Rate (scfm)	Target DO Levels
Activated Sludge Basins Ax3	None*	None*	660.0	Not measured
Activated Sludge Basins Ox1	225	127.5	1040.0	2.0 mg/L
Activated Sludge Basins Ox2	110	127.5	410.0	2.0 mg/L
Activated Sludge Basins Ox3	80	123.0**	270.0	2.0 mg/L

* No minimum rate is required for Ax3 – this zone will frequently have no aeration to serve as an anoxic zone. Whenever aeration is not being provided to Ax3, the tank mixer must be operating.
** Air flow rate can fall below this rate if the Ox3 mixer is operating.

The minimum airflow rate into each cell is the larger of either the minimum air flow flux rate or the minimum air flow rate required for mixing. The minimum flux rate is based on the minimum air flow required to keep the diffuser heads from fouling. The minimum mixing rate is the air flow rate required to provide continuous mixing of wastewater within each cell. The following cells contain mixers and thus can have air flow rates below the mixing rate:

- Cell Ax3 has no minimum required air flow rate – aeration to this cell will be frequently turned off for anoxic operation. The mixer must operate to provide mixing in Ax3 whenever the aeration is turned off.
- Cell Ox3 contains a tank mixer, which allows air flow to this cell to fall below the required rate for mixing (123.0 scfm) as long as the tank mixer is operating. Periodically, DO rates in the aerobic zone may be high enough to justify either lowering or turning off aeration to Ox3. Whenever aeration to this cell falls below 123.0 scfm, the SCADA system will call the Ox3 mixer to run.

The air flow rate into each cell will be controlled by the position of each dropleg valve. Modulating valve positions will in turn alter the system pressure. The SCADA system will monitor the discharge header pressure via the pressure transmitter located in the blower room. The SCADA system controls the VFDs associated with each blower to vary blower speeds or start/stop blowers as necessary. A MOV setpoint of 75 to 95 percent for all header valves will be used with the goal of minimizing system headlosses.

As a failsafe mechanism, a blower relief discharge is installed in the Blower room. In the event that system pressures increase while a single blower is operating, the motor-actuated butterfly valve will open allowing air to discharge from the system.

Additional information regarding the operation of the aeration system can be found in the standard operating procedures located in **Appendix A**.

Normal Operation – DO Control Mode

Normal operation of the aeration system is considered to be "DO control mode." In this mode, the SCADA system will seek to maintain the target DO level for each cell as listed in **Table 4-9**. The SCADA system will receive feedback from the DO sensor in each cell as well as from the system header pressure transmitter in order to modulate aeration dropleg valves and vary blower speed with the goal of efficiently maintaining the target DO levels.

Alternate Operation – Flow Control Mode

Alternate operation of the aeration system will include the "flow control mode." This mode will be necessitated in the event that one or more DO probes fail in the basins. In this mode, the SCADA system will maintain air flow rates to each cell between the minimum and maximum flow rates listed in **Table 4-9** by monitoring air flow through each cell aeration dropleg. During start-up of the plant, testing of the flow control mode will occur. The goal of this testing will be to determine the approximate air flow rates required to maintain the target DO levels in each cell. These air flow rates will serve as the "fall-back" rates of aeration used should Flow Control Mode be necessitated.

Alternate Operation – Valve Position Mode

A second alternate operational mode of the aeration system is the "valve position mode." This mode may be necessitated if one or more air flow meters and one or more DO probes fail within the basins. In this mode, the SCADA system will set the aeration dropleg valves to a fixed position while maintaining a header pressure by changing blower speeds, or starting/stopping blowers. During start-up of the plant, testing of the valve position mode will occur. The goal of this testing will be determine a system pressure and valve positions that maintain air flow within the allowed range to each cell with the goal of maintaining the target DO level for each cell.

Alternate Operation – Air Bumping Mode

For 20 to 30 minutes per week, the SCADA system will automatically "bump" the air flow rate through the diffusers in the online basin(s). The rate of air flow will be increased to 3 scfm. This air flow bump is recommended by Xylem as a method of cleansing the diffuser heads in order to prevent premature fouling of the membranes.

Alternate Operation – Offline Basin Maintenance Mode

In the event that a basin is taken offline, it should be filled with non-potable water using the basin utility stations to a level of 2 feet above the diffuser heads. This is recommended by the diffuser manufacturer to maintain the life of the diffuser membranes. The offline basin should then be put into the operator-selected "maintenance mode." During this mode, the SCADA system will periodically open the aeration header butterfly valves to allow air into the diffusers for a short period to combat fouling of the membranes. It is recommended to add chlorine to the non-potable water to prevent algal growth if the basin is expected to be offline for an extended period of time.

Emergency Operation

The emergency generator is sized to power one of the basin aeration blowers during a period of normal power outage to the plant. The single blower should provide adequate capacity to meet the aeration requirements for a single activated sludge basin. In the event that the essentially powered basin reaches its treatment capacity during a power outage and DO levels begin to fall, the EQ basin may need to be utilized due to the lack of generator capacity to operate the second activated sludge basin components.

Maintenance and Troubleshooting

The primary operational concern for the aeration system is the clogging or fouling of the fine bubble air diffusion membranes. Over time, membranes become clogged while submerged in wastewater, thus decreasing air diffusion efficiency. Yearly draining of tanks and washdown of diffusers is required as described in further detail in the manufacturer's O&M manuals.

Moisture buildup in the aeration grids is also an operational concern for the aeration system. Each cell contains a purge assembly that is extended from the submerged diffusor grid up to the basin catwalk. The operator must manually purge water from the aeration grid in each cell by opening the purge line ball valve at the catwalk. This operation should occur at least weekly.

Visual inspection during the operation of the aerated basins will help the operator examine the air diffusion characteristics for the diffuser grid. Fine bubbles should be present homogenously throughout the aerated cells. Course bubbles can indicate improper diffuser operation or potentially a leak from the grid piping.

Detailed maintenance and troubleshooting procedures related to the aeration system can be found in the manufacturer's O&M manuals as shown below:

- Rotary Positive Displacement Blowers: **Appendix C, Volume 3**
- Aeration Diffusion Equipment: **Appendix C, Volume 3**
- Butterfly Valves: **Appendix C, Volume 5**
- Motorized Valve Actuators: **Appendix C, Volume 5**
- Air Flow Meter: **Appendix C, Volume 11**
- Pressure Transmitter: **Appendix C, Volume 11**
- Dissolved Oxygen Sensor: **Appendix C, Volume 11**

Recycle Pumping System

Description

The basin recycle pumping system returns activated sludge from cell Ox3 to the mixing chimney in Ax1. The pumping system consists of a 28 horsepower (HP) ABS submersible pump located in cell Ox3 of each activated sludge basin. These pumps recycle mixed liquor through 12-inch ML piping to the mixing chimneys. The electromagnetic flowmeters and plug valves (located on either side of the meter) for the

ML pipes are located on the lower level of the Headworks building just before discharging to the mixing chimney.

The recycle pumping system equipment is listed in **Table 4-10**.

Table 4-10
Recycle Pumping System Equipment Summary

Equipment	P&ID Tags	Location
Submersible Recycle Pumps	P-218, P-238	Basins Activated Sludge Basins
Electromagnetic Flowmeter	Ft-142, Ft-144	Headworks Mechanical Room / Screenings Room
Plug Valves	NA	Headworks Mechanical Room / Screenings Room

The two operational modes of the recycle pumping system are "percent of influent mode" and "fixed flow mode."

Normal Operation

During normal operation of each online basin, each basin's recycle pump will be continuously operated by the plant SCADA system using the percent of influent flow mode of operation. During this mode, the pumps will produce a flowrate equal to the operator-selected percentage of influent flow to recycle. If both basins are operating, this percentage is evenly split by the SCADA system between the two pumps. If a single basin is operating, the full recycle amount is recycled by a single pump. The flow rate produced by these pumps will be controlled by VFDs and will be between 771 and 1,500 GPM as monitored by the electromagnetic flowmeter on each line.

The internal recycle rate is adjusted to optimize the removal of nitrate in activated sludge treatment process flow train. This is important to minimize the return of nitrate to the anaerobic zone via the RAS flow from the clarifiers. Generally, the higher the recycle ratio the higher will be the nitrate removal. However as the recycle rates increase the incremental benefits become smaller at the higher rates. The optimal rate may vary under different loading conditions and these optimal rates will have to be determined through operating experience and plant monitoring data.

Alternate Operation

As an alternate form of the recycle pump operation, a manual fixed flow mode of operation can occur. In this case, the operator will set a specific flow rate to be recycled by each pump between 771 and 1,500 GPM. The SCADA system will maintain this flowrate for each pump until the operational mode is returned to the percent of influent flow mode.

For a period of 10 minutes a day, the SCADA system will call the recycle pump(s) for each online basin to be operated at 1,500 GPM. This operation will be considered a "maintenance mode." This increased

flowrate will help remove settled solids from the ML piping. It is recommended that the operator visually inspect the operation of the recycle pump during this period of increased flowrate. The operator may alter the time of day, run time length, or flowrate for this mode.

Emergency Operation

During an outage of normal power to the plant, the recycle pump in Activated Sludge Basin No. 1 is considered the essentially-powered recycle pump by default and as such, it will remain powered via the emergency generator.

The operator may choose within the SCADA system to make Activated Sludge Basin No. 2 the essentially powered train if necessary, in which case this basin's recycle pump will remain powered during an outage.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the Recycle Pump system components can be found in the manufacturer's O&M manuals as shown below:

- Submersible Pumps: **Appendix C, Volume 2**
- Electromagnetic Flowmeter: **Appendix C, Volume 11**
- Plug Valves: **Appendix C, Volume 5**

Surface Wasting System and Waste Activated Sludge (WAS) Pumping

Description

Surface wasting in the basins serves as the primary method for wasting of solids from the activated sludge process. Wasting in the basins removes mixed liquor continuously at a fixed rate. Wasting also removes floating sludge and foam by allowing the floating material to flow freely across the basin surface to the surface wasting collection system. The collection system is located at the east end of the basins in cell Ox3.

The surface wasting collection system consists of a scum baffle, non-potable water (NPW) sprayers and surface wasting collection box located in both Ox3 cells. The collection box contains a weir gate with a motorized actuator and an ultrasonic level transmitter. The weir gate elevation is modulated by the SCADA system to maintain a fixed fluid level in the collection box. The liquid removed from the basin collection boxes, or WAS, flows through 4-inch piping to the Monoflo progressive cavity WAS pumps located in the Equipment Building Pump room (**Figure 4-5**). The WAS pumps transfer the WAS to the Dissolved Air Flotation (DAF) unit in the Equipment Building Thickening room.

Floating sludge and foam within the basins is separated from the mixed liquor effluent by a scum baffle. The NPW spray bar directs the floating sludge and foam into the waste collection box. A single sprayer inside the collection box further directs WAS flow into the 4-inch WAS piping.

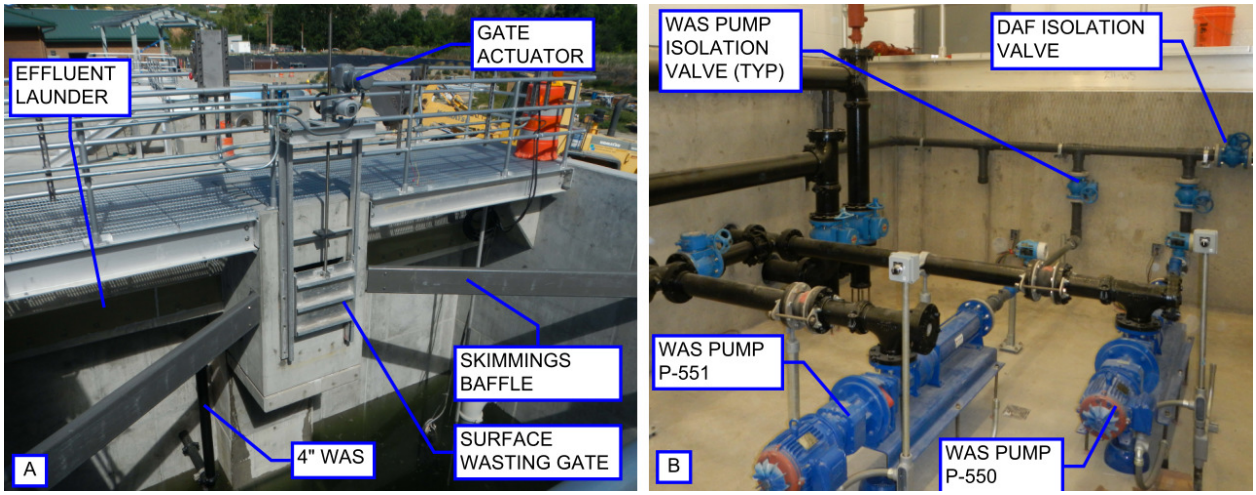


Figure 4-5 – Surface Wasting System
(A) Surface Wasting Collection System; (B) WAS Pumping System

The equipment related to the surface wasting and WAS pumping system is listed in **Table 4-11**.

Table 4-11
Surface Wasting System and WAS Pumping Equipment

Equipment	P&ID Tags	Location
WAS Pumps	P-550, P-551	Equipment Building Pump Room
Level Sensor – Ultrasonic	Lt-217, Lt-237	Basins Activated Sludge Basins
Electric Slide Gate Actuators	A-217, A-237	Basins Activated Sludge Basins
Electromagnetic Flowmeter	Ft-512, Ft-513, Ft-405, Ft-447	Equipment Building Pump Room

Normal Operation

During normal operation of the surface wasting system, the operator manually sets a wasting rate for the WAS pumps based on the desired solids retention time (SRT). The SRT (in days) is simply the wasting rate divided by the volume of the operating aeration basins. In order to optimize phosphorus removal, the SRT should be maintained at a level which is no higher than needed to achieve nitrification. SRTs which are longer than necessary to achieve nitrification may reduce the efficiency or EBPR. The design SRT for the City's WWTF is approximately 10 days. The optimal SRT for EBPR may vary based on loading conditions and could be a little lower or a little higher that 10 days. The optimal SRTs for different conditions will have to be determined through operating experience and plant monitoring data.

The manually-set target flow rate (16 to 35 GPM) for each of the WAS pumps will be achieved by the VFDs controlling the speed of each pump. The SCADA system will adjust the speed of the VFDs based on

the flow measured by the electromagnetic flowmeters Ft-512 and Ft-513 on the discharge side of each WAS pump.

The modulating weir gate at the front of the wasting collection box has an operating band between 760.25 and 760.50 feet. The SCADA system will control to the weir gate to maintain an operator-selected fluid elevation in the collection box. The fluid level in the collection box will be measured by an ultrasonic level transmitter which is monitored by the plant SCADA system.

In the Equipment Building Pump room, the WAS pumps discharge to a common 3-inch header pipe on the north wall of the Pump room. This header can be manually manipulated to transfer WAS either to the DAF unit (**Chapter 7**), or directly to the aerobic digesters. During normal operation, the header will be used to transfer WAS to the DAF unit as shown in **Figure 4-6.**

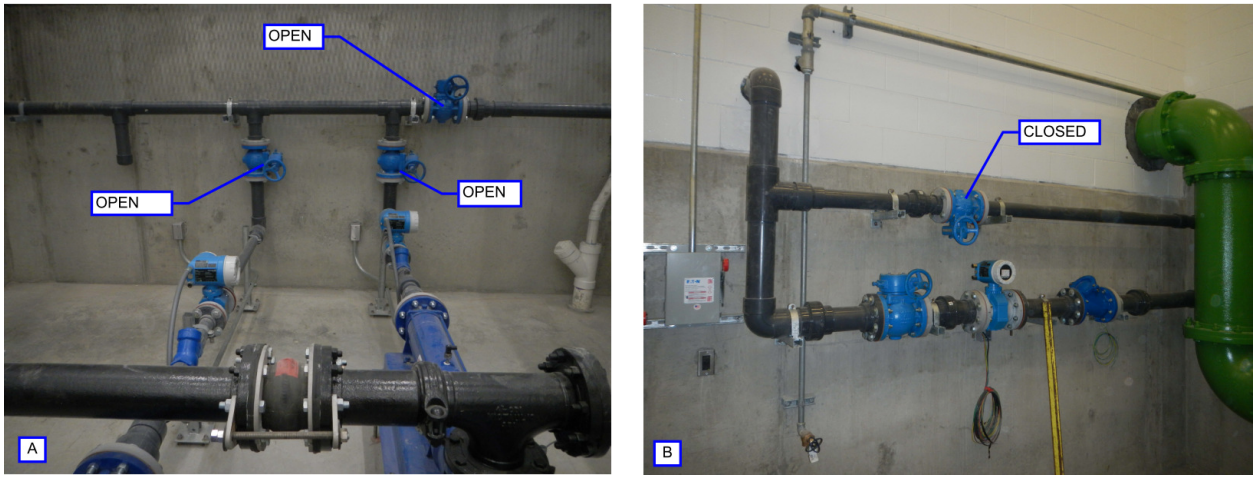


Figure 4-6 – Valve Orientation Photos – Manual valve orientation for WAS transfer from the WAS pumps to the DAF unit. (A) North wall of Pump room; (B) East wall of Pump room

Alternate Operation - Continuous Wasting to Digesters

As an alternate form of operation, the WAS pumping system can pump WAS directly to the digesters, bypassing the DAF unit. This occurs when the DAF unit is offline for maintenance. WAS pumping to the digesters will be accomplished at an operator-selected flowrate of 16 to 35 GPM per pump. The WAS flowrate to the digesters will be monitored by electromagnetic flowmeter Ft-447. To initiate this form of operation, the operator must realign the WAS header valves as shown in **Figure 4-7**.

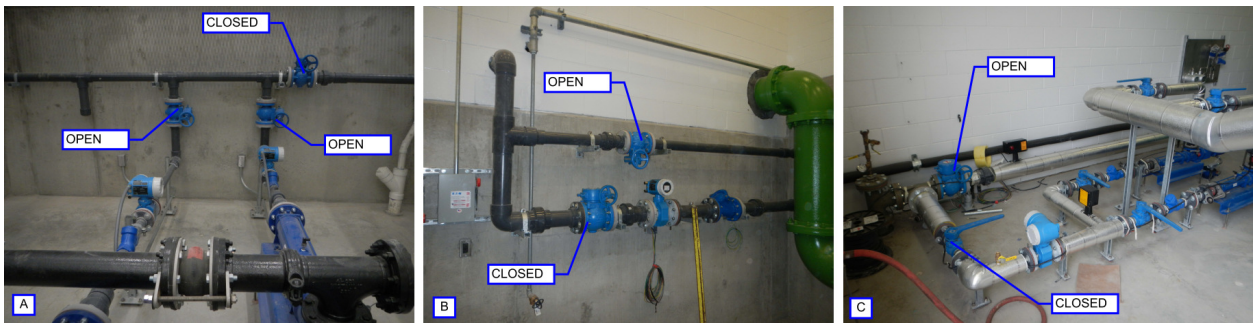


Figure 4-7 – Valve Orientation Photos – Manual valve orientation for WAS transfer from the WAS pumps to the aerobic digesters. (A) North wall of Pump room; (B) East wall of Pump room; (C) Southeast corner of Thickening room

For a period of 10 minutes a day, the SCADA system will call the WAS pump(s) for each online basin to be operated at 35 GPM. This operation will be considered a "maintenance mode." This increased flowrate will help remove settled solids from the WAS piping. It is recommended that the operator visually inspect the operation of the recycle pump during this period of increased flowrate. The operator may alter the time of day, run time length, or flowrate for this mode.

Emergency Operation

The surface wasting systems are not considered essentially powered components in the event of an outage of normal power to the plant. As such, the EG is not sized to run either of the WAS pumps while the full load of essentially-powered devices are in use. In the event that surface wasting is required during an outage of normal power to the plant, a WAS pump may be used if sufficient generator load capacity is available (i.e., aeration to the basins is decreased during surface wasting).

The ultrasonic level transducer in the basins also serves to detect an extreme high-level event for fluid in the basins. This situation may occur if the effluent piping from the activated sludge basin(s) became plugged. In this scenario, the activated sludge basin(s) would backup and outfall to the EQ basin by flow through the wall blockout at 761.00 feet. In the extreme scenario in which the EQ basin was completely full, the basins as a whole may be in danger of overtopping. The ultrasonic level transducers within either surface wasting collection box would alert the SCADA system of this danger.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the surface wasting and WAS pumping components can be found in the manufacturer's O&M manuals as shown below:

- WAS Pumps: **Appendix C, Volume 1**
- Motorized Actuator for Slide Gate: **Appendix C, Volume 5**
- Electromagnetic Flowmeter: **Appendix C, Volume 11**
- Slide Gates: **Appendix C, Volume 5**
- Ultrasonic Level Transducer: **Appendix C, Volume 11**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Activated Sludge Basin 1 System
  - Activate Sludge Basin 2 System
  - Aeration System

- *Standard Instrumentation and Equipment Descriptions*
  - Across the Line Starter
  - Air Flow Meter
  - Dissolved Oxygen Sensor
  - Flow Meter
  - Level Transmitter
  - Motor Actuated Gate
  - Motor Actuated Valve
  - Pressure Switch
  - Pressure Transmitter
  - Solenoid Operated Valve
  - Variable Frequency Drive

SAFETY

The primary safety concerns related to operation of the activated sludge basins are as follows:

- Biological Hazards
- Fall Prevention
- Open Water Safety
- Gas Exposure
- Confined Space
- Electrical Hazards
- Personal Protective Measures

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to Aeration Basins can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 2.3.3.

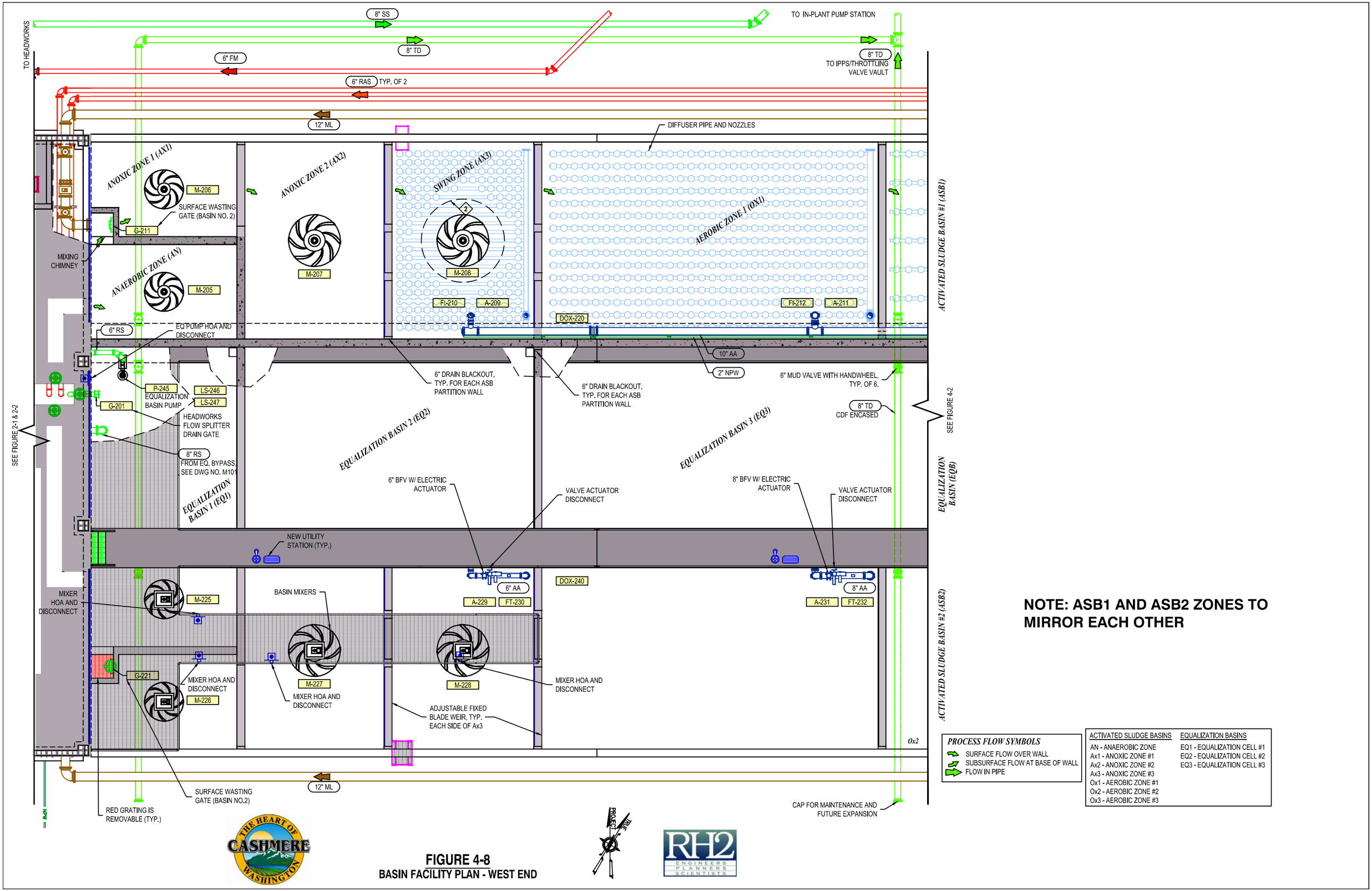


FIGURE 4-8
BASIN FACILITY PLAN - WEST END

8" TD
TO IPPS

6" RAS TYP. OF 2

12" ML

4-FOOT HIGH FIBERGLASS BAFFLE, TYP. OF 2.

P-218
RECYCLE
PUMP NO. 1

BASIN
EFFLUENT
LAUNDER

LT-217

6" RAS
FROM EQUIPMENT
BUILDING

ACTIVATED SLUDGE BASIN #1 (ASB1)

AEROBIC ZONE 2 (OX2)

AEROBIC ZONE 3 (OX3)

M-209

A-217

G-217

AEROBIC ZONE 3
SURFACE WASTING
GATE (BASIN NO. 1)

18" ML

10" AA

2" NPW

DOX-221

Ft-214

A-213

DOX-222

SEE FIGURE 4-1

G-301

G-304

18" ML
TO CLARIFIER NO. 1

SEE GATE TABLE
BELOW FOR GATE
DESCRIPTIONS

G-303

G-305

G-306

G-302

4" WAS
TYP. OF 2, TO
EQUIPMENT BUILDING

14" AA
FROM EQUIPMENT
BUILDING

CLARIFIER FLOW
SPLITTER

CLARIFIER FLOW
SPLITTER

EQUALIZATION
BASIN (EQB)

VALVE ACTUATOR
DISCONNECT

4" BFV W/ ELECTRIC
ACTUATOR

VALVE ACTUATOR
DISCONNECT

6" BFV W/ ELECTRIC
ACTUATOR

NPW UTILITY
STATION (TYP.)

EQ3

2" NPW

DOX-241

6" AA

A-233

FT-234

4" AA

A-235

FT-236

DOX-242

4" NPW
FROM NON-POTABLE
PUMP STATION

½" NPW SPRAY
BAR AT SCUM
BOX

A-237

G-227

LT-237

MIXER HOA AND
DISCONNECT

GATE ACTUATOR HOA
AND DISCONNECT
SURFACE WASTING
BAFFLE

SURFACE WASTING SCUM BOX

M-229

1½" NPW SPRAYER BAR WITH
NOZZLES AT 3'-0" O.C.

P-228
RECYCLE PUMP NO. 2

ACTIVATED SLUDGE BASIN #2 (ASB2)

Ox1

Ox2

Ox3

RED GRATING IS
REMOVABLE (TYP.)

RECYCLE PUMP HOA
AND DISCONNECT

NOTE: ASB1 AND ASB2 ZONES TO MIRROR EACH OTHER

GATE TABLE

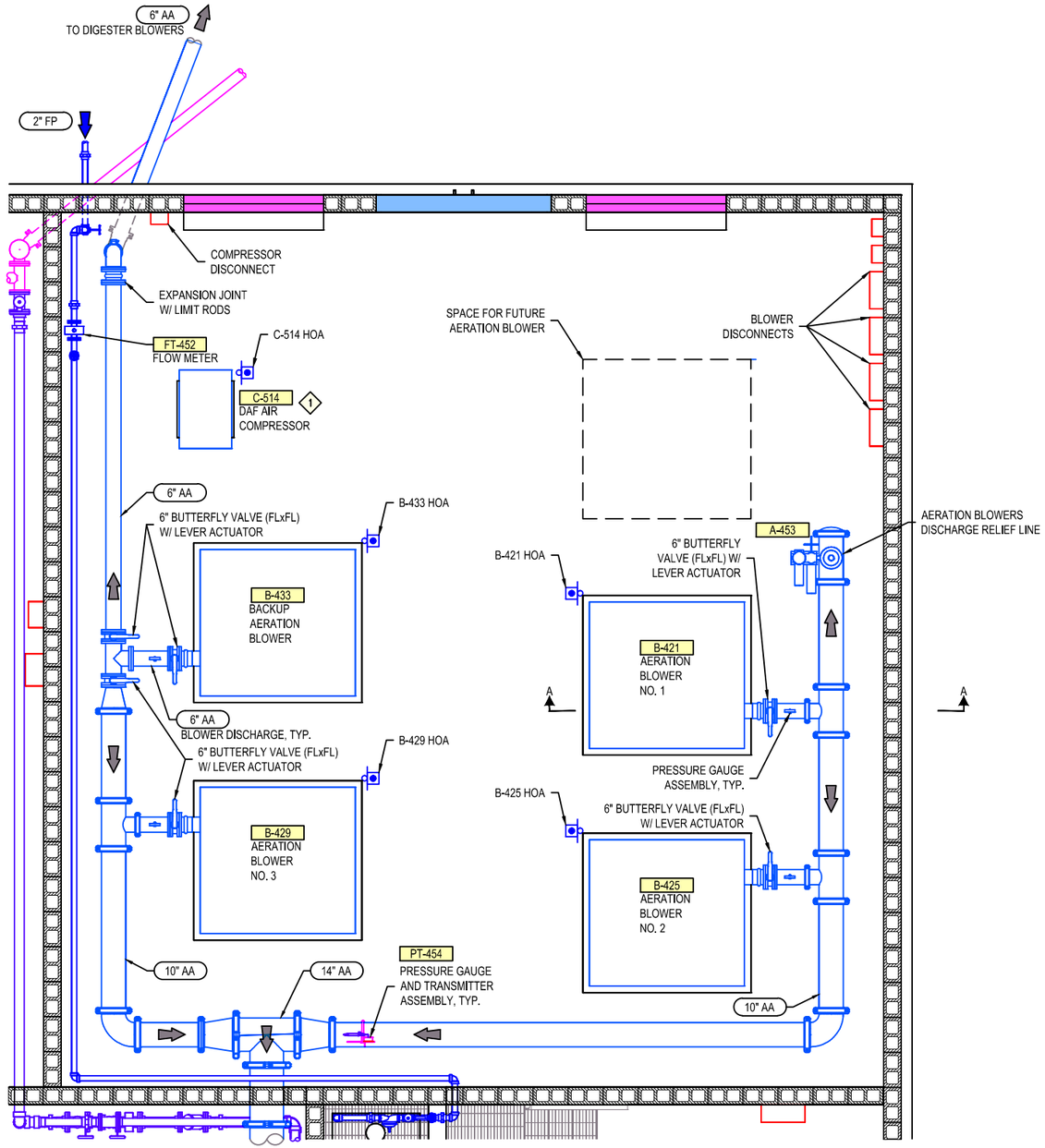
GATE NO.	GATE
G-301	AERATION BASIN NO. 1 EFFLUENT GATE
G-304	CLARIFIER NO. 1 INFLUENT GATE
G-303	FUTURE AERATION BASIN NO. 3 EFFLUENT GATE
G-305	CLARIFIER NO. 2 INFLUENT GATE
G-306	FUTURE CLARIFIER NO. 3 INFLUENT GATE
G-302	AERATION BASIN NO. 2 EFFLUENT GATE

THE HEART OF CASHMERE WASHINGTON

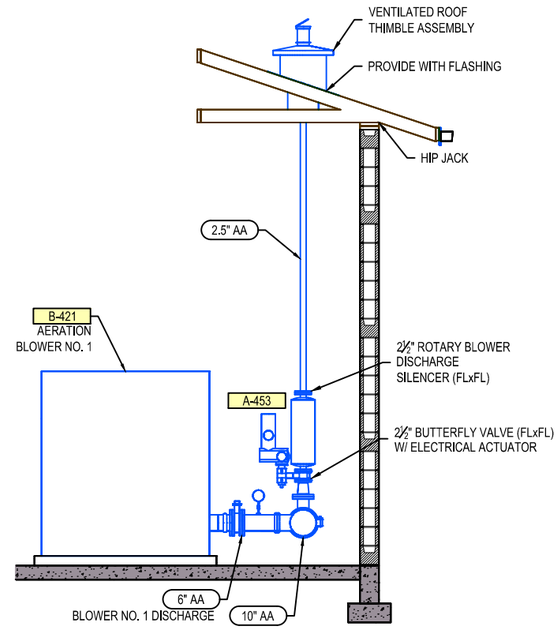
FIGURE 4-9
BASIN FACILITY PLAN - EAST END

PROJECT NO. 1

RH2 ENGINEERS PLANNERS SCIENTISTS



BLOWER ROOM - PARTIAL PLAN

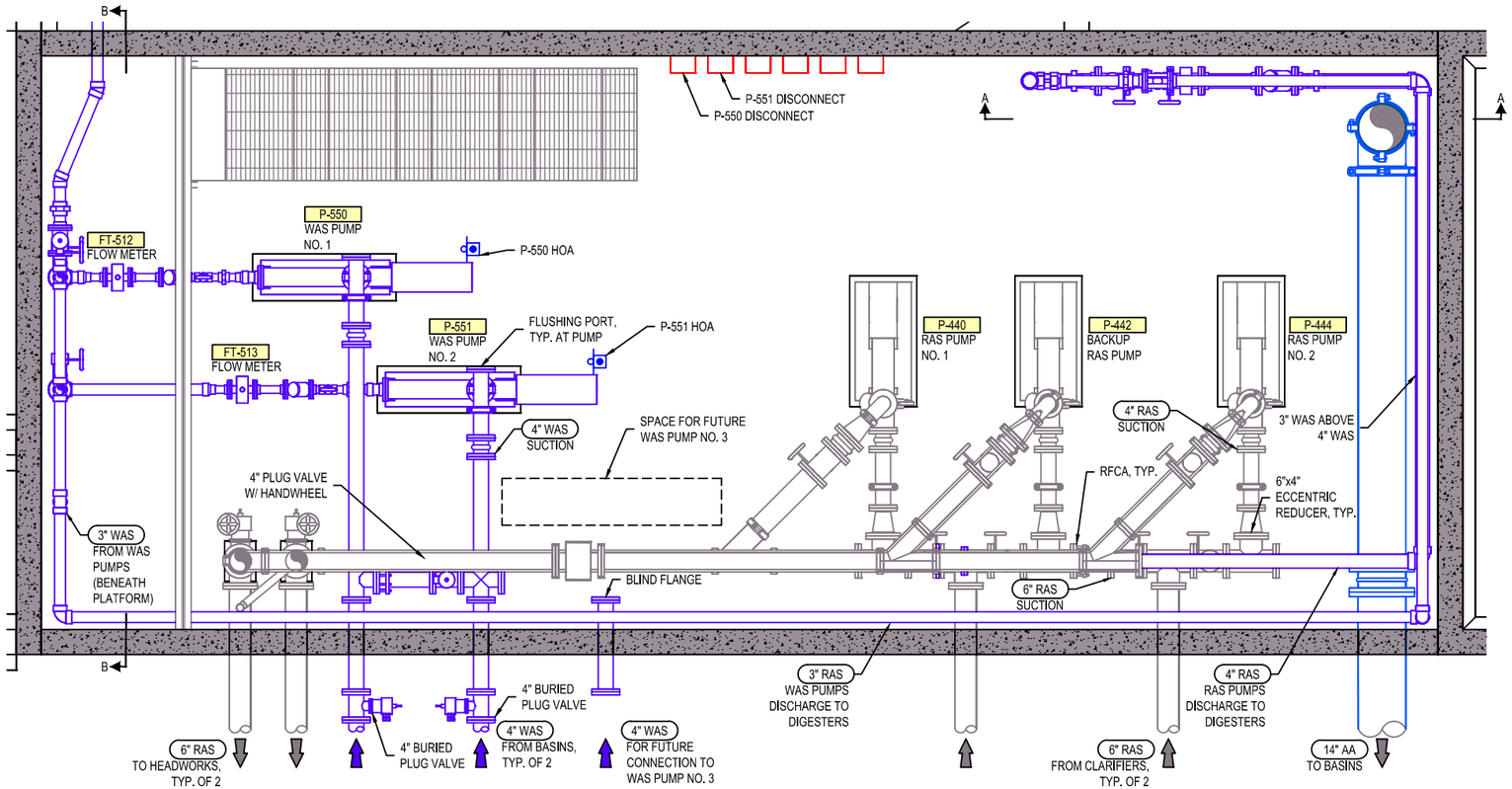


SECTION A-A

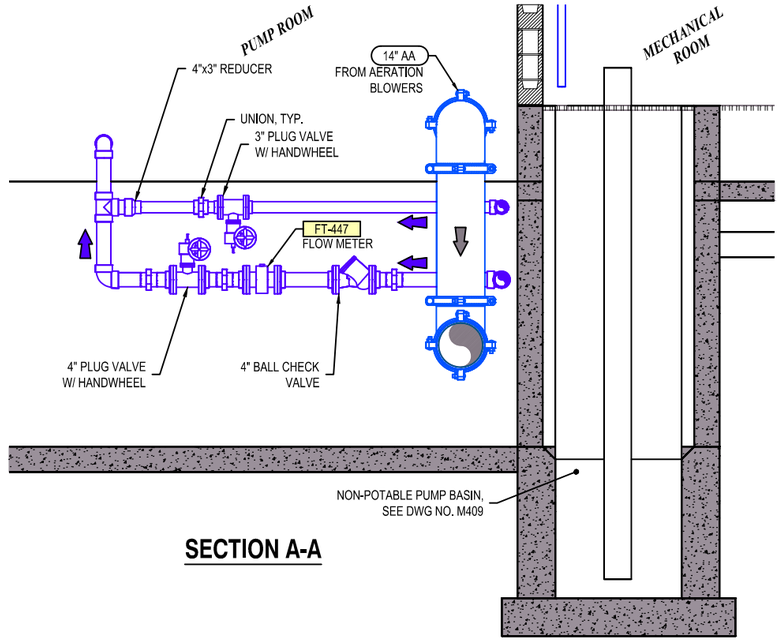
3/8" = 1'-0"

PROJECT

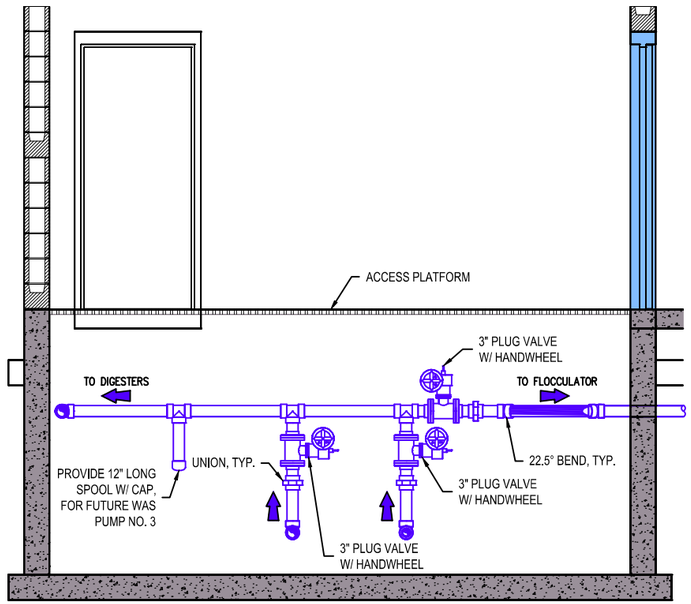
FIGURE 4-10
BASINS AERATION - BLOWER ROOM PLAN



WAS PUMPING SYSTEM
PUMP ROOM PARTIAL PLAN @ ELEVATION 751.25'



SECTION A-A



SECTION B-B

FIGURE 4-11
WAS PUMPING SYSTEM PLAN

CHAPTER 5 – SECONDARY CLARIFIERS

Figures 5-8 *and* ***5-9*** *at the end of this chapter include the plan and profile views for the clarifiers.* ***Figure 5-10*** *includes the plan view of Equipment Building Pump room Return Activated Sludge (RAS) pumping system.*

OVERVIEW

Mixed liquor (ML) from the activated sludge basins flows to the clarifier flow splitter and is then diverted to one or both of the secondary clarifiers through 18-inch ML piping. The flow rate to the clarifiers is equal to the influent wastewater plus the RAS flow rate, less the surface wasting rate in the basins. The two 40-foot clarifiers thicken the activated sludge by separating the solids from the liquid effluent. Gravitational force settles the flocculated sludge colonies to the bottom of the clarifiers, where it is removed by the RAS pumping system. The RAS is pumped back to the beginning of the activated sludge basin(s) or can alternatively be pumped into the solids handling stream. The lower density sludge (scum) is wasted from the clarifier surface to the scum wasting system. Clarified effluent outfalls from the top of the clarifiers and flows to the ultraviolet (UV) disinfection system via the 16-inch secondary effluent (SE) piping.

The clarifiers receive mixed liquor influent through the 18-inch ML pipes that are routed to the base of the clarifier mechanism's center column. Influent to the clarifier is dispersed from the mechanism's center column through energy dissipating inlets into the flocculating feedwell. The clarifier drive, mounted above the mechanism on the clarifier catwalk, turns the mechanism to collect settled sludge from the bottom of the tank and skim the scum from the water surface. Effluent leaves the clarifiers by flowing over the v-notch weir into the effluent launders.

Clarifier Flow Splitter

The clarifier flow splitter (**Figure 5-1**) is located east of the activated sludge basins. It receives mixed liquor from both activated sludge basin effluent launders via 18-inch ML pipes that enter the base of the structure's wall. The equalization basin (EQ basin) is also outfitted to discharge to the flow splitter in the event that the EQ basin is converted to a third process basin. Flow into and out of the clarifier flow splitter is controlled by manually operated weir gates. The flow splitter is designed to split flows between the two clarifiers as well as to a third future clarifier in the event that one is constructed. Mixed liquor flows out of the base of the flow splitter through 18-inch ML pipes.

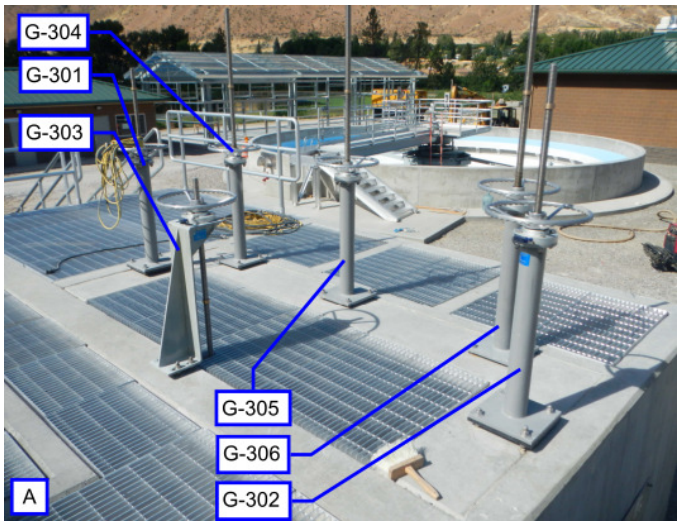


Figure 5-1 – Clarifier Flow Splitter

Clarifiers

The two (2) 40-ft diameter clarifier tanks have a side water depth of approximately 14 feet and a surface area of approximately 1,250 square feet (SF). The tanks contain a floor sloped to center to facilitate withdrawal of sludge. Within the tanks, the Envirodyne clarifier mechanisms (**Figure 5-2**) consist of the following integral components:

- Drive mechanism, gear box, and drive cage
- Center column and flocculating feedwell containing LA-EDI Type II inlets
- Sludge withdrawal system consisting of scraper arms, blades and sludge withdrawal ring
- Skimmings arm and skimmings box

The clarifier tanks have the following ancillary components:

- Stamford density current baffle
- Scum baffle, effluent sawtooth weirs, launder trough and drop structure
- Scum piping and concrete sump for scum
- Non-potable water (NPW) spray bar
- Hydrostatic pressure wall relief valves

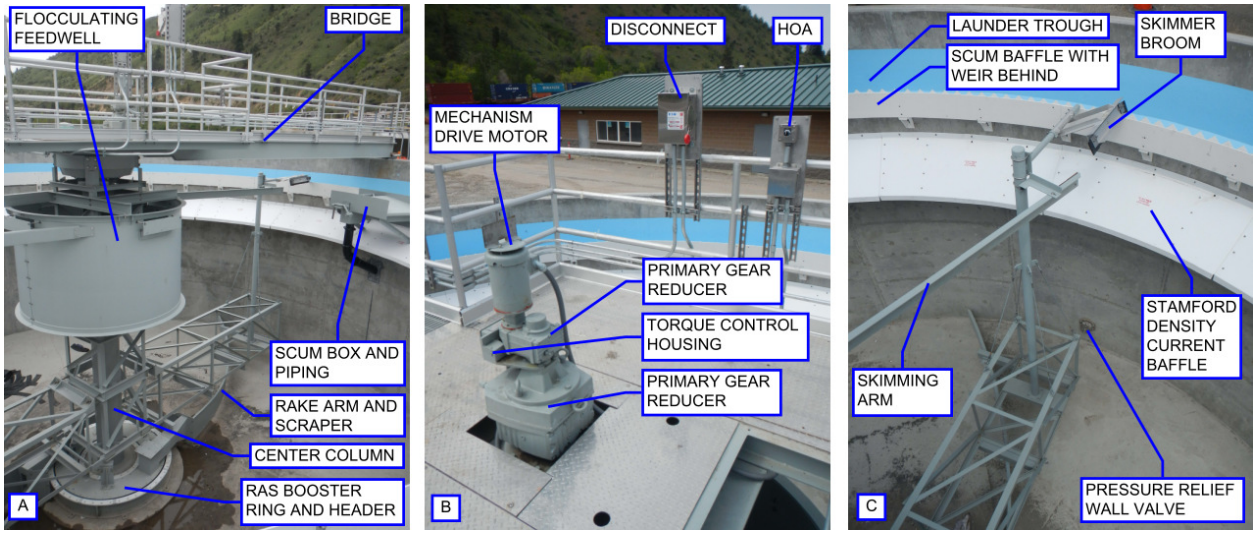


Figure 5-2 – Secondary Clarifiers
(A) Clarifier Mechanism; (B) Clarifier Bridge; (C) Skimming Device and Launder Trough

Each of these systems is described in further detail within each of the following process component sections.

Return Activated Sludge System

RAS is settled to the bottom of the clarifiers and is collected by means of the clarifier mechanism's integral scraper and sludge withdrawal ring. Three RAS pumps (**Figure 5-3**) in the Equipment Building Pump room remove RAS via 6-inch piping from the sludge withdrawal ring at the base of the clarifier mechanism. The RAS piping system within the Pump room allows for sludge to either be returned to the head of the activated sludge basins (via the Headworks flow splitter) or be diverted to the solids handling stream as discussed in the waste activated sludge (WAS) system section of this chapter.

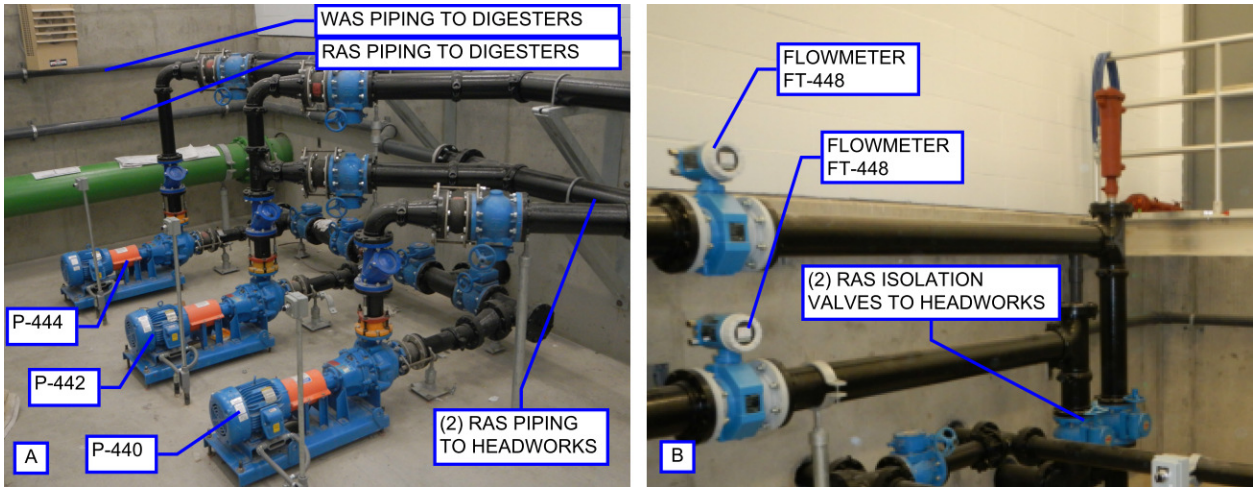


Figure 5-3 – Equipment Building Pump Room RAS System
(A) RAS Pumping System; (B) RAS Metering

Waste Activated Sludge System

An alternate process orientation of the RAS pumping system allows the wasting of sludge from the bottom of the clarifiers directly to the WAS stream. Within the Equipment Building Pump room, the valves on the RAS header can be manually configured to divert flow from returning to the Headworks, and instead send it to the aerobic digesters thus bypassing the dissolved air floatation (DAF) thickening process (**Figure 5-4**).

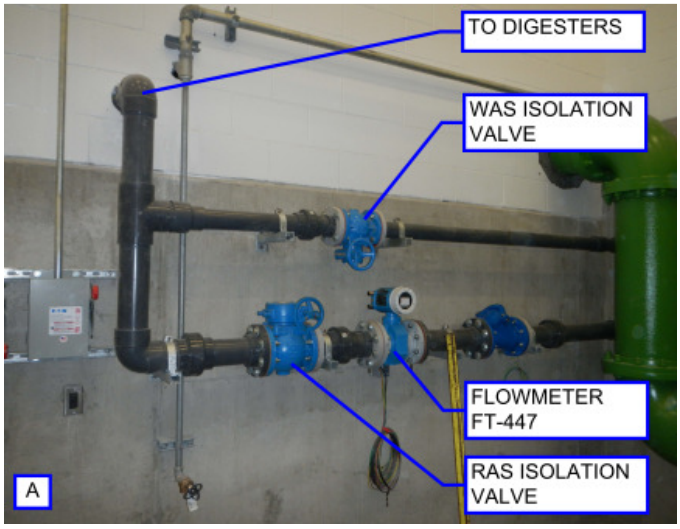


Figure 5-4 – DAF Unit Bypass Piping and Metering

Scum Wasting System

Scum wasting off the water surface of the clarifiers is achieved with the clarifier mechanism's skimmer assembly, scum baffle, and scum wasting box. The skimming arm rotates with the clarifier mechanism, removing scum from the water surface. The scum baffle provides a barrier to keep surface scum from leaving the clarifiers with the over-weir effluent flow. Scum collected by skimmer assembly is directed to the skimmings box by the NPW spray water. Skimmings outfall to concrete sumps adjacent to each clarifier (**Figure 5-5**) and flow by gravity to the In-plant Pump Station (IPPS).

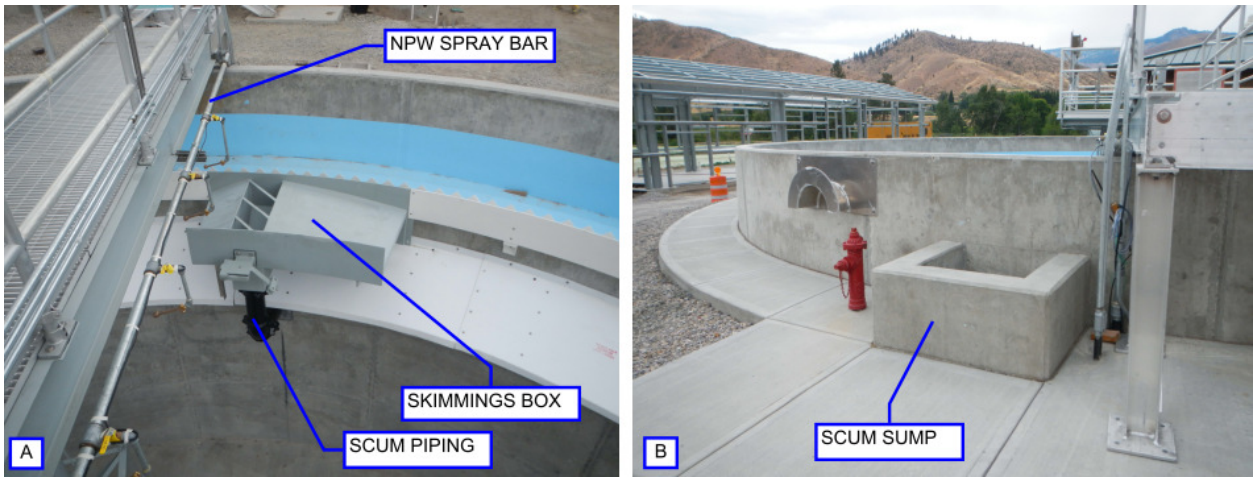


Figure 5-5 – Clarifier Scum Collection
(A) Skimmings Box; (B) Scum Sump

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

The Routine Operations and Maintenance Checklist related to the secondary clarifiers are located in ***Appendix F.***

Clarifier Flow Splitter

Description

The clarifier flow splitter will be used to direct ML from one or both activated sludge basins to one or both clarifiers depending on the quantity of influent flow to the Wastewater Treatment Facility (WWTF). If influent flow rates are above the basin hydraulic capacity of 1.30 million gallons per day (MGD), both clarifiers and both basins are needed. Each clarifier has a hydraulic capacity of 1.24 MGD.

One compartment of the clarifier flow splitter receives the mixed from both of the activated sludge basins and the EQ basin. The mixed liquor is then equally split between the three partitions of the flow splitter; each flow splitter partition flows to a designated clarifier (two current and one future).

The clarifier flow splitter components are listed in **Table 5-1.**

Table 5-1
Clarifier Flow Splitter Equipment Summary

Equipment	P&ID Tag	Operation
Slide Gate	G-301	Manual control of flow from Activated Sludge Basin #1 to the clarifier splitter. Allows flow beneath the gate when open.
Slide Gate	G-302	Manual control of flow from Activated Sludge Basin #2 to the clarifier splitter. Allows flow beneath the gate when open.
Slide Gate	G-303	Manual control of flow from EQ basin to the clarifier splitter. Closed until EQ basin is converted to 3rd activated sludge basin.
Slide Gate	G-304	Manual control of flow from the clarifier splitter to clarifier #1. Allows flow over the gate; height set at 759.00'.
Slide Gate	G-305	Manual control of flow from the clarifier splitter to clarifier #2. Allows flow over the gate; height set at 759.00'.
Slide Gate	G-306	Manual control of flow the clarifier splitter to the future clarifier. Closed until future clarifier is constructed.

Normal Operation

During normal operation, the clarifier splitter directs mixed liquor from the activated sludge basins to the clarifiers. The slide gates are opened and closed manually. Gates G-301, G-302, and G-303 allow full flow beneath the gate and are normally fully open or fully closed. Gates G-304, G-305, and G-306 function as weir gates allowing over-the-top flow. These weir gates are set to the elevations shown in **Table 5-1**.

Alternate Operation

Alternate operation of the flow splitter could be considered to be any of the configurations to allow flow between each basin and each clarifier. All such operations are done manually.

Emergency Operation

The clarifier flow splitter is manually operated and will be unaffected by a loss of normal power to the WWTF.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the flow splitter slide gates can be found in the manufacturer's operation and maintenance (O&M) manuals as shown below:

- Slide Gates: **Appendix C, Volume 5**

Clarifiers

Description

The intended operational strategy is to have one clarifier online for each online activated sludge basin. The clarifier mechanisms are called to run manually, and the variable frequency drive (VFD)-controlled speed of the clarifier drive mechanism is also set manually. The supervisory control and data acquisition (SCADA) system will monitor torque in the drive shaft. In a high torque scenario, the motor will be shut off. All other clarifier components operate integrally with the clarifier mechanism.

Three hydrostatic pressure relief wall valves are installed in each buried clarifier tank at 18 inches above the floor. The purpose of these valves is to counteract external buoyancy forces if the clarifier is empty and groundwater rises to the elevation of the valves. The valves will open and groundwater will enter the tank. If a clarifier is taken out of service for an extended period, it will ideally be filled with clean water to a minimum depth of 3-feet.

Additional information regarding the operation of the clarifiers can be found in the standard operating procedures located in **Appendix A**.

Normal Operation

During normal operation, the flow splitter will convey the mixed liquor to the clarifier mechanism. The clarifier mechanism will be called to run by the operator at the Human-Machine Interface (HMI) to the SCADA system. The operator will also set the rake arm speed. The SCADA system will control the speed using the clarifier drive motor by VFD. Through operating experience, the operator will determine the speed at which to run the mechanism to achieve optimum clarifier performance. The mechanism should not be operated faster than needed to achieve efficient collection of the settled activate sludge. As the speed of the mechanism increases, it creates currents which can reduce the settling performance of the clarifier. Clarifier performance can be monitored based on sludge blanket depth and RAS concentration and various loading conditions. **Appendix A** contains the clarifier standard operating procedures.

The clarifier drive mechanism contains limit switches for drive torque. Torque on the mechanism would likely come from an obstruction on the rake arm or skimming arm. At 75 percent of the drive's rated torque (11,250 foot-pounds (ft-lb)), a high torque alarm will sound. At 85 percent of the drive's rated torque (12,750 ft-lb), the motor is shut off. At 100 percent of the drive's rated torque (15,000 ft-lb), a secondary motor shut-off exists.

Alternate Operation

The clarifier mechanism can be locally turned on using the physical Hand-Off-Auto (HOA) switch located on the clarifier bridge by turning the switch to "HAND." The local HOA can be used if the operator is unable to call the clarifier to run at the HMI. The operator will have to turn the HOA switch back to "AUTO" after the manual override is complete so that the clarifier can be controlled remotely by the SCADA system.

Alternate operation of the clarifiers could also be considered either single or dual clarifier operation. In either case, the control strategy is unchanged.

Emergency Operation

During an outage of normal power to the plant, the EG has been sized to run a single clarifier mechanism – Clarifier No. 1. If both clarifiers are operational when normal power goes out, flow to Clarifier No. 2 would need to be manually isolated at the clarifier flow splitter by closing slide gate G-305 such that all flow from the basins is directed to Clarifier No. 1.

Maintenance and Troubleshooting

Torque overload is one of the primary operational concerns for the clarifier mechanisms. Torque on the drive mechanism can come from an obstruction of the rake arm on the bottom of the tank or an obstruction of the skimming arm at the water surface. A surface water obstruction is particularly likely in the winter if ice builds up. The operator should continually inspect the operation of the mechanism visually to ensure that obstructions do not occur.

Gearbox lubrication is the primary maintenance requirement for the clarifier mechanisms. The operator should strictly follow the lubrication schedule set by the manufacturer's operations and maintenance (O&M) manual.

Detailed maintenance and troubleshooting procedures related to the clarifier components can be found in the manufacturer's O&M manuals as shown below:

- Clarifier Mechanism: **Appendix C, Volume 3**

Return Activated Sludge System

Description

The RAS collection and pumping system recycles built-up sludge from the base of the clarifiers and returns it to the Headworks flow splitter. The clarifier's integral scraper and sludge withdrawal ring deposits the collected RAS into a 6-inch main cast vertically into the base of the clarifier structure. This pipe allows RAS to be removed using three Wemco screw centrifugal pumps located in the Equipment Building Pump room.

Each RAS pump is dedicated to each clarifier and the third pump functions as a backup. The backup pump will likely be used in the wasting scenario discussed in the WAS section of this chapter. The RAS pumps discharge into a dual 6-inch header system. The lower pipe receives flow from RAS Pump No. 1, which is the dedicated pump for Clarifier No. 1, and from the backup RAS pump depending on manual valve configuration. The upper pipe receives flow from RAS Pump No. 2, which is the dedicated pump for Clarifier No. 2, and from the backup RAS pump based on manual valve configuration. Both header pipes are metered; Ft-446 is located on the lower pipe and Ft-448 is located on the upper pipe. The dual pipes run below grade from the Pump room to the Headworks, where each discharges to flow splitter.

Additional information regarding the operation of the RAS pumping system can be found in the standard operating procedures located in **Appendix A**.

The pumps and equipment related to the RAS collection system are listed in **Table 5-2.**

Table 5-2
Return Activated Sludge System Pumping Components Equipment

Equipment	P&ID Tags	Location
RAS Pumps	P-440, P-442, P-444	Equipment Building Pump Room
Electromagnetic Flowmeters	Ft-446, Ft-448	Equipment Building Pump Room

Normal Operation

During normal operation of the RAS pumping system, RAS is continually returned from the clarifiers back to the Headworks flow splitter based on plant influent "flow pacing." At the HMI, the operator calls the RAS pumps to run and selects the percentage of influent flow to be recycled. RAS flowrates for each clarifier are expected to be between 40 and 100 percent of the average annual influent flowrate into the plant. This would result in a flowrate from each clarifier of 103 to 257 GPM based on the 2012 average annual flow of 0.37 MGD. The operator will determine the exact rate of return based on the sludge loading into the clarifiers, sludge blanket levels, and RAS concentrations. RAS rates for small activated sludge plants are generally in the range of 50 percent to 100 percent of plant influent flow. At low influent flow and loading periods, such as late at night, the RAS rates may exceed 100 percent due to turn down limitations of the RAS pumping systems, but this should not adversely affect the treatment process. **Appendix A** contains the standard operating procedure for the clarifiers and RAS pumping system.

The SCADA system will control the VFD associated with each pump. The system will receive feedback regarding the flow rate in each header pipe from the following flowmeters:

- Flowmeter Ft-446 monitors flow from RAS pump #1 (and the backup pump if discharged in this orientation) to the Headworks
- Flowmeter Ft-448 monitors flow from RAS pump #2 (and the backup pump if discharged in this orientation) to the Headworks

The SCADA system will use these flowmeters to produce the desired flowrate to the Headworks.

The three RAS pumps must be manually manipulated via plug valves to correctly direct flow to the Headworks. This can be done for single or dual clarifier RAS return as shown in **Figure 5-6.**

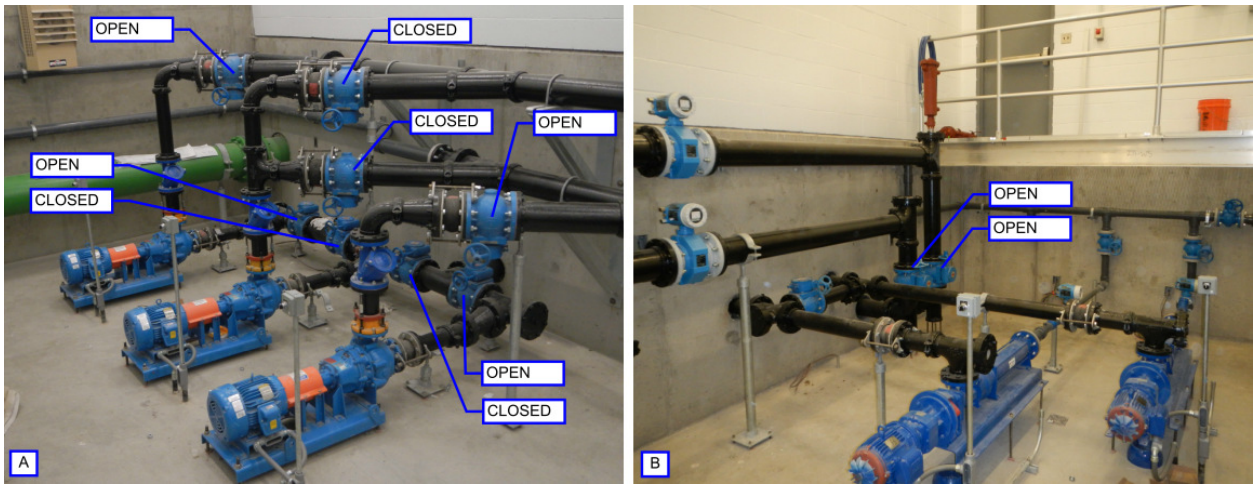


Figure 5-6 – Valve Orientation Photos – Manual valve orientation for dual clarifier RAS pumping. (A) West wall of Pump room; (B) North wall of Pump room

Alternate Operation

An alternate operation of the RAS pumping system allows for the operator to pump a specific volume of RAS from either or both clarifiers back to the Headworks over a specific period of time. For this operation to occur, the operator must take the desired volume of RAS to be returned and divide it by an acceptable flowrate to produce the RAS return time period. The operator calls the RAS pump(s) to run for a set time period at the set flowrate via the HMI.

The RAS pumps can also be locally turned on using the physical HOA panel located adjacent to each pump by turning the switch to "HAND." The local HOA can be used if the operator is unable to call the pumps to run at the HMI. The operator will have to turn the HOA switch back to "AUTO" after the manual override is complete so that the RAS pumps can be controlled remotely.

Alternate Operation – Maintenance Mode

During RAS recycling, it is important that each RAS pump is operated at the higher end of its flow range for a short duration each day to keep solids from settling in the pipelines. The SCADA system can be programmed so that this maintenance activity is completed each day at a time set by the operator. It is recommended that the operator be present to inspect the pump's operation during this period. This maintenance operation can also be manually completed by the operator by inputting a higher flowrate in the HMI for each operating RAS pump.

Emergency Operation

During an outage of normal power to the plant, the emergency generator (EG) has been sized to run a single RAS pump – RAS pump No. 1. It is important to note that the maximum RAS recycle rate is equal to the maximum allowable flowrate for a single RAS pump. This means that only one clarifier will operate during a power outage and the EG set is sized for this scenario.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the RAS system can be found in the manufacturer's O&M manuals as shown below:

- Clarifier Mechanism (sludge removal): **Appendix C, Volume 3**
- Screw Centrifugal Pumps: **Appendix C, Volume 1**
- Plug Valves: **Appendix C, Volume 5**
- Sewage Air Vacuum/Relief Valves: **Appendix C, Volume 5**
- Electromagnetic Flowmeter: **Appendix C, Volume 11**

Back-up Waste Activated Sludge (WAS) System

Description

The RAS pump station can be used to waste activated sludge from the clarifier underflow directly to the digesters when the surface wasting system and/or the DAF is out of surface or if it is desired to maintain a lower solids retention time (SRT) than can be achieved using the surface wasting system alone (bypassing the DAF thickening process). To initiate this mode of operation, the operator must manually manipulate the valves within the Equipment Building Pump room to direct the RAS into the digesters. This operation is considered an alternate operation of the RAS pumping system and will not occur frequently. The WAS pumping system consists of the following components listed in **Table 5-3**.

Table 5-3
Waste Activated Sludge System Pumping Components Equipment

Equipment	P&ID Tags	Location
RAS Pumps	P-440, P-442, P-444	Equipment Building Pump Room
Electromagnetic Flowmeters	Ft-447	Equipment Building Pump Room

Normal Operation – WAS Wasting to the Digesters via Fixed Flow

This alternative method of operation for wasting activated sludge directly from the clarifiers is expected to occur when the WAS pumps from the surface wasting system and/or the DAF unit is out of operation for maintenance.

The operation of the clarifier wasting system is similar to the RAS pumping system. The operator selects the RAS pump(s) to run and selects the flowrate for the pump(s) from within the each pump's range discussed in the RAS section. The operator will waste a specific volume of WAS to the digesters and must calculate the pump run time at the selected flowrate to waste this volume. The 3-inch WAS electromagnetic flowmeter (Ft-447) will record the wasting rate and provide the SCADA system with feedback for controlling the pump's VFD.

When wasting from the RAS pumps to the digesters, is necessary to know the RAS concentration in mg/L. The number of gallons to be wasted to achieve the desired SRT must be calculated. To achieve a

10-day SRT, for example, one must know the total pounds of mixed liquor suspended solids (MLSS) in the aeration basins and waste one-tenth of that amount from the RAS. Due the pumping capacities of the RAS pumps it will be necessary to pump intermittently when wasting from the clarifiers to the digesters. This could be done once a day for the required number of minutes or it could be done for a few minutes a day depending on the preference of the operator. Some automation would be possible using the SCADA system

It is expected that the operator will use the RAS backup pump, discharging to the lower header pipe, for this wasting operation. The valves should be configured as shown in **Figure 5-7** to perform this operation.

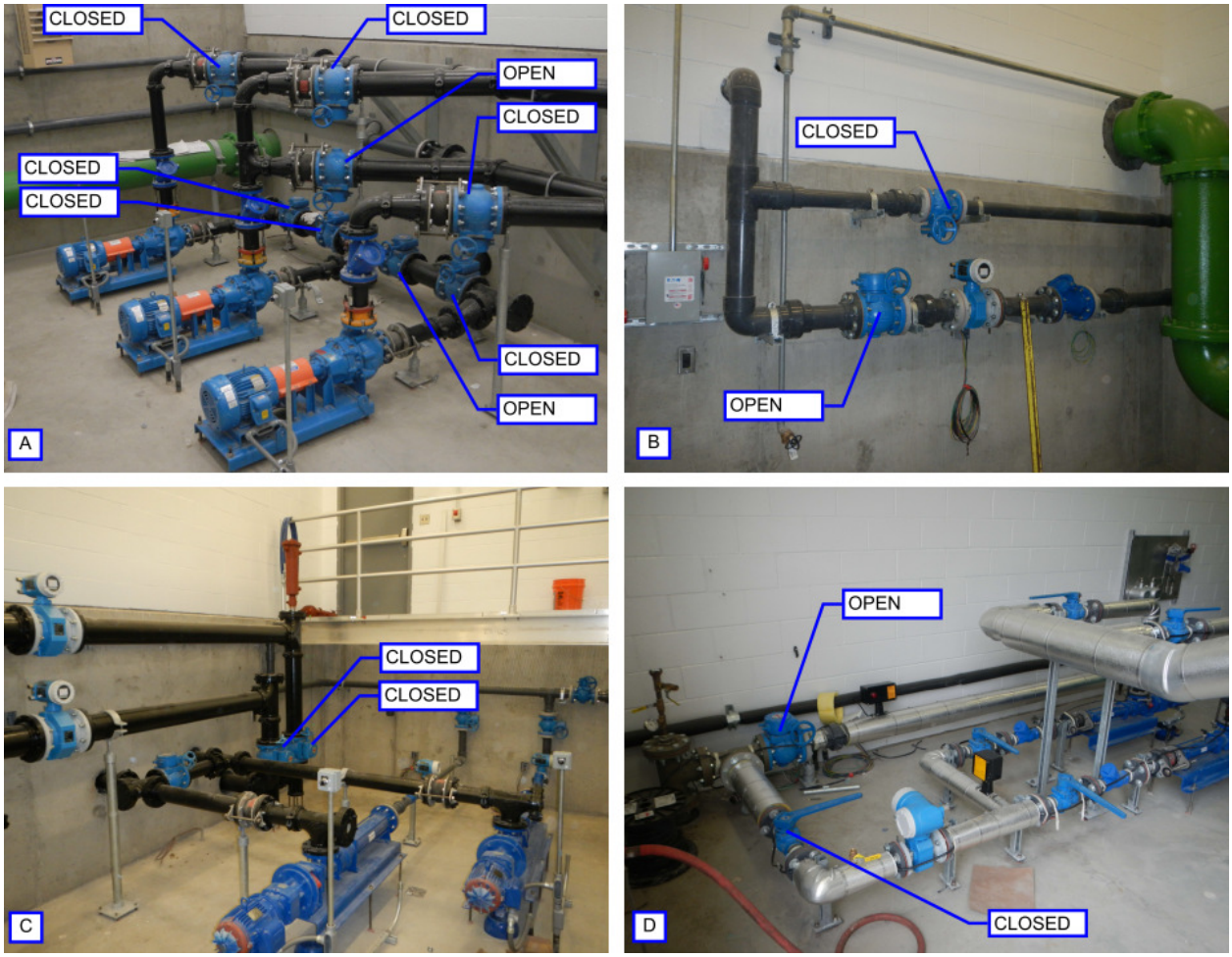


Figure 5-7 – Valve Orientation Photos – Manual valve orientation for Clarifier No. 1 wasting via back-up RAS pump to aerobic digesters. (A) West wall of Pump room; (B) East wall of Pump room; (C) North of Pump room; (D) southeast corner of Thickening room

Alternate Operation – Maintenance Mode

During clarifier wasting, it is important to operate the RAS pump at the higher end of its flow range for a short duration each day to keep settling of solids from occurring in pipeline. The SCADA system can be programmed so that this maintenance activity is completed each day at a time set by the operator. It is recommended that the operator be present to inspect the pump's operation during this period. This

maintenance operation can also be manually completed by the operator by inputting a higher flow rate in the HMI for each operating RAS pump.

Emergency Operation

During an outage of normal power to the plant, the EG has been sized to run a single RAS pump. Should this outage occur, the operator would be able to waste clarifier WAS directly to the digesters if necessary.

Maintenance and Troubleshooting

Manufacturer O&M manuals for the clarifier WAS pumping system are the same as those listed in the RAS pumping system in this chapter.

Scum Wasting System

The scum wasting system for each clarifier consists of the following components:

- Clarifier mechanism skimming arm
- Skimmings box and auto-flusher assembly
- NPW system and spray bar
- Concrete sump and scum collection piping

The scum baffle separates the floating scum that collects on the surface of the clarifiers from the clarified effluent. The scum is continually collected by the two rotating clarifier skimming arms. A NPW spray bar attached to the clarifier walkway constantly sprays NPW on the clarifier water surface through spray nozzles mounted to the clarifier bridge; this directs the skimmings into the skimming box. As the clarifier skimming arm passes the skimmings box, the integral broom attached to the arm pushes scum into the skimmings box. Also, with each pass, the arm trips the auto-flusher assembly which allows scum to outfall from the skimmings box for a brief period. A bronze scraper on the skimming arm continuously removes scum from the side of the skimmings box and scum baffle. From the skimmings box, scum outfalls through a 6-inch ductile iron scum (SC) piping to the concrete sump adjacent to the walkway of each clarifier. Scum from the sump flows through the 6-inch SC collection piping by gravity to the IPPS, where it is pumped back to the Headworks. Ultimately, this scum is removed from the treatment process entirely by the surface wasting collection system in the basins.

Normal Operation

The scum wasting system operates continuously during normal operation if the clarifier is online. Manual or supervisory control of this system is not required and the system operation is integral to the clarifier mechanism operation. Opening and closing the NPW isolation valve on the spray bar is the only manual control portion of this system. The exposed NPW spray bar is heat-traced and should automatically maintain pipe temperatures above freezing during the winter months.

The operator should be aware that an increase in floating sludge on the surface of the clarifiers could indicate that excessive denitrification is occurring within the sludge blanket releasing nitrogen gas (N2) which in turn can carry significant amounts of sludge to the surface. This could occur if too much nitrate is entering the clarifier from the aeration basin. Under normal operation this should not be the case. If

this scenario occurs, the operator should investigate and make operational adjustment as necessary. Possible remedies could include increasing the internal recycle rate from Ox3 to Ax1, reducing aeration in Ox2 and/or Ox3. If the system is operating probably low concentration of nitrate will be in the ML flowing to the clarifier. Some denitrification in the clarifiers is normal and beneficial for enhanced biological phosphorus removal (EBPR) since it further reduces the amount of nitrate entering the anaerobic zone. A typical remedy for excessive denitrification in a final clarifier in a non-EBPR plant would be to increase the recycle rate of RAS from the clarifiers. In the case of an EBPR plant such as the Cashmere WWTF, this should not be done. Rather it needs to be determined why high nitrate levels are reaching the clarifier and take appropriate action to correct that problem. For additional information, refer to **Appendix A** for the clarifier standard operating procedure.

Alternate Operation

No alternate operation of this system has been considered at this time.

Emergency Operation

The clarifier scum wasting system is integral to the clarifier mechanism. During an outage of normal power, the essential clarifier and scum wasting system will remain operational. The NPW pump station that supplies water to the spray bar is the only separately powered portion of the scum wasting system. The NPW pump station is considered essential to plant operation and thus the EG is sized to run this device during out power outage.

Maintenance and Troubleshooting

Periodic washdown of the skimmings arm, skimmings box, and concrete sump will be the primary maintenance task related to the scum wasting system.

Detailed maintenance and troubleshooting procedures related to the scum wasting system can be found in the manufacturer's O&M manuals as shown below:

- Clarifier Mechanism (skimming arm and box): **Appendix C, Volume 3**
- NPW Pump Station: **Appendix C, Volume 1**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Clarifier System
  - RAS System
  - Headworks (Flow Splitter and Equalization Basin) System

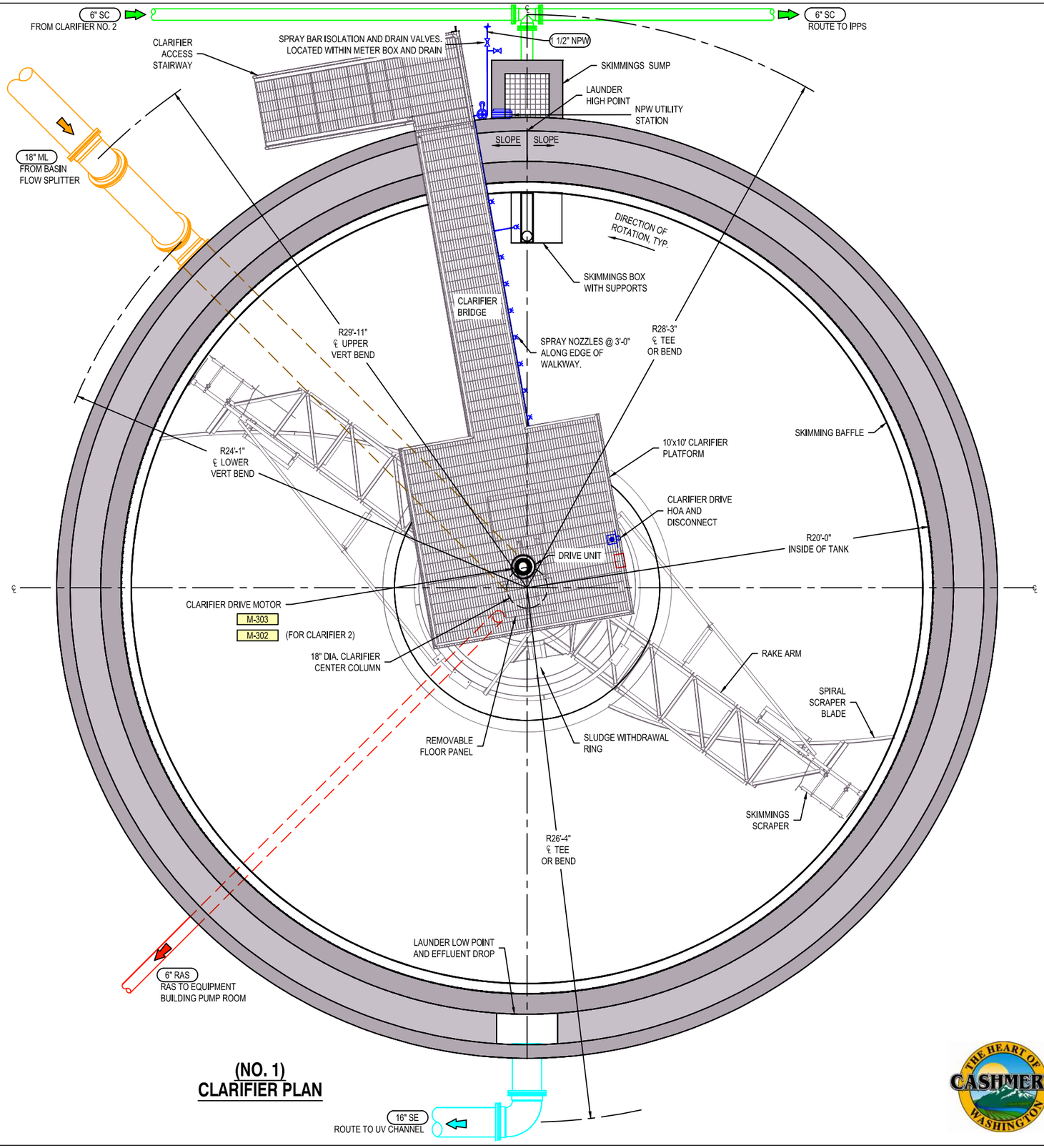
- *Standard Instrumentation and Equipment Descriptions*
  - Flow Meter
  - Torque Switch
  - Variable Frequency Drive

SAFETY

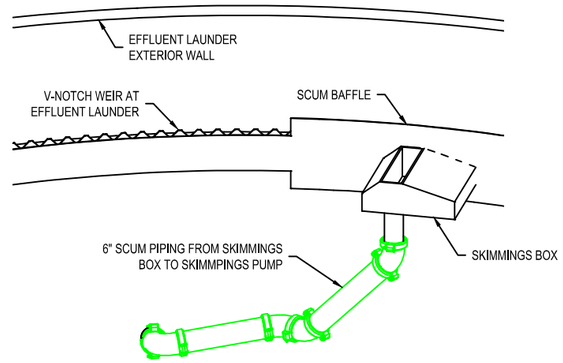
The primary safety concerns related to operation of the clarifiers are as follows:

- Fall Prevention
- Open Water Safety
- Confined Space
- Electrical Hazards
- Personal Protective Measures

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to Clarifiers can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 2.4.



(NO. 1) CLARIFIER PLAN

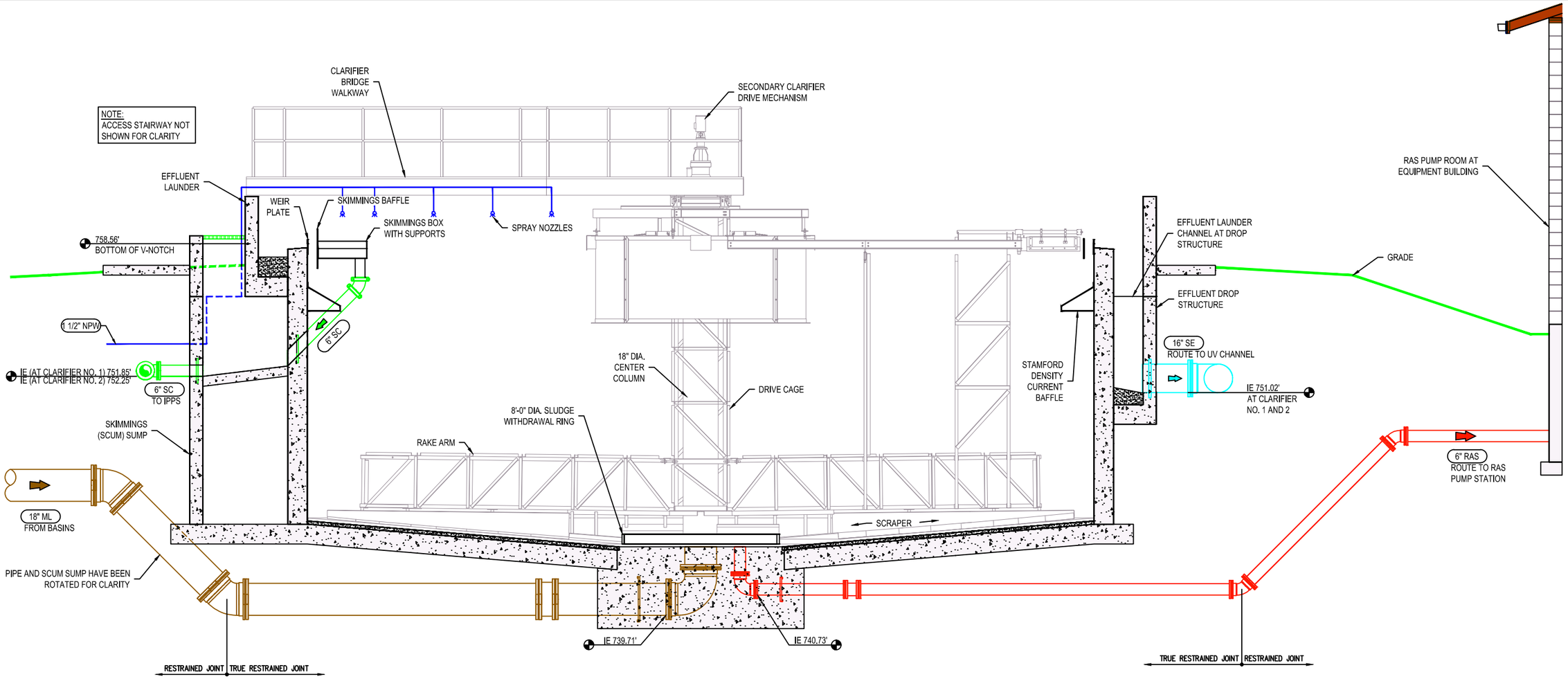


SECONDARY CLARIFIER NO. 2 SCUM PIPING CONFIGURATION OBLIQUE

NTS

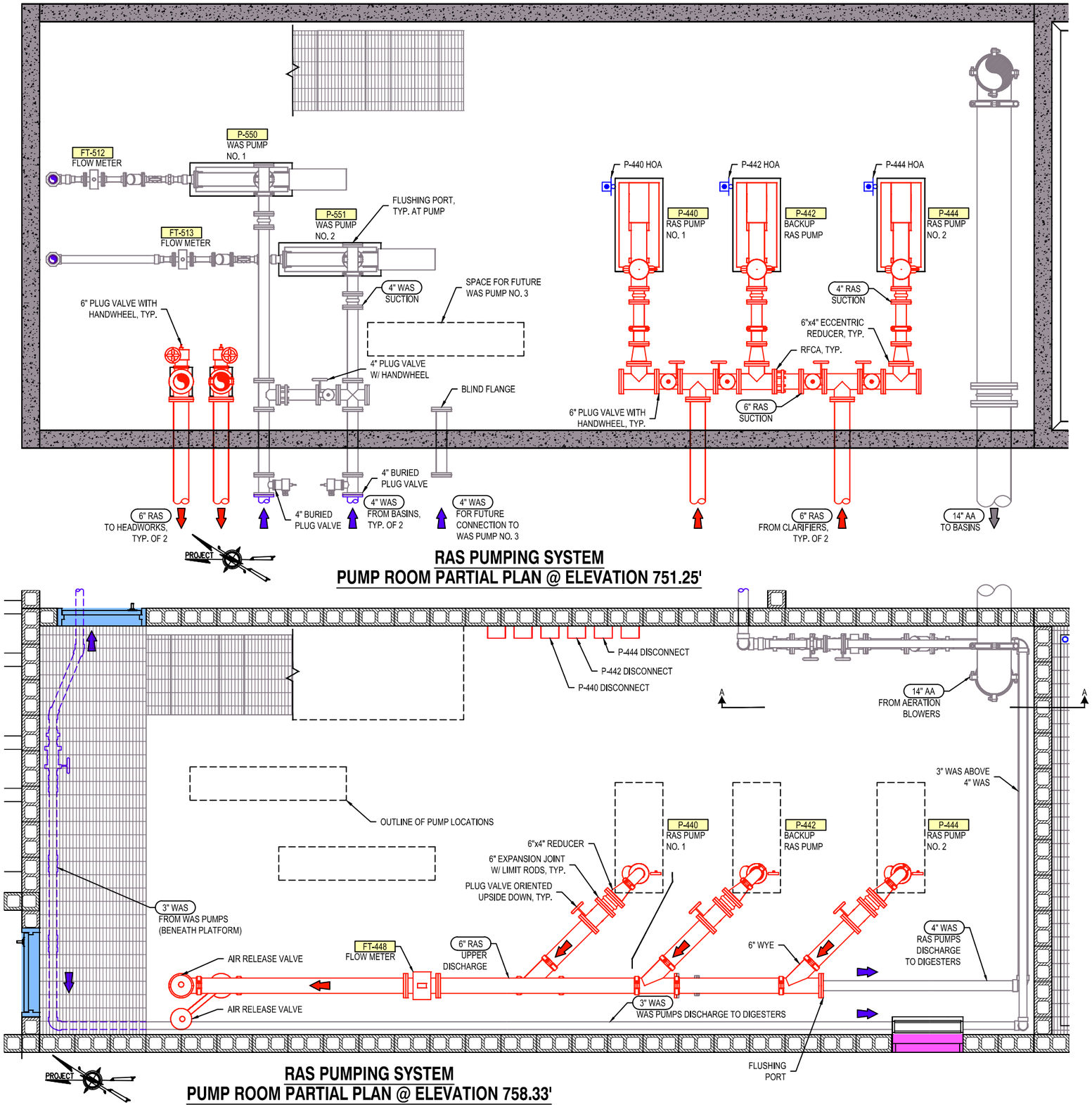
NOTE: CLARIFIER BRIDGE NOT SHOWN THIS VIEW FOR CLARITY

FIGURE 5-8
SECONDARY CLARIFIER PLAN



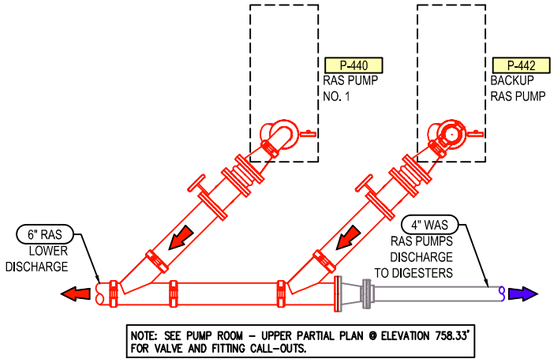
SECONDARY CLARIFIER (NO. 1) MECHANICAL SECTION

FIGURE 5-9
SECONDARY CLARIFIER PROFILE

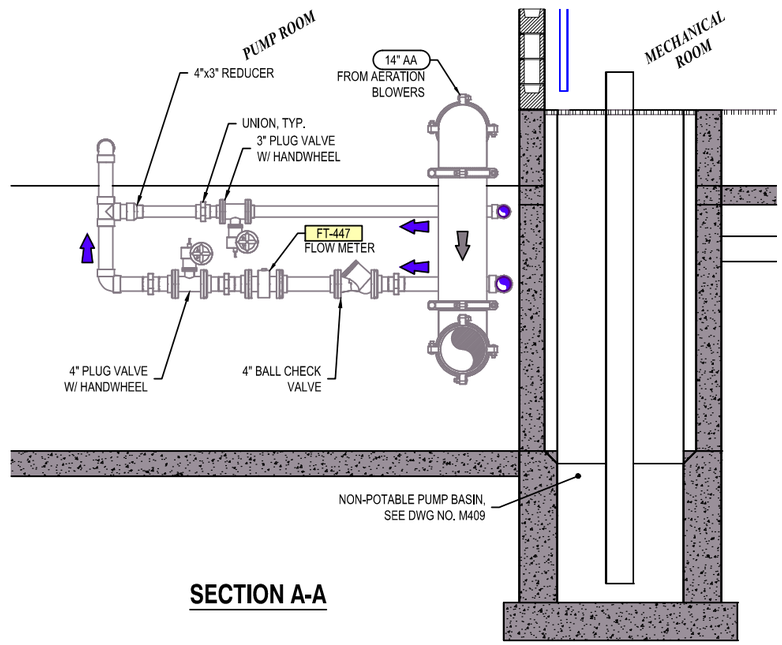


RAS PUMPING SYSTEM
PUMP ROOM PARTIAL PLAN @ ELEVATION 751.25'

RAS PUMPING SYSTEM
PUMP ROOM PARTIAL PLAN @ ELEVATION 758.33'



PUMP ROOM - MIDDLE PARTIAL
PLAN @ ELEVATION 754.33'



SECTION A-A

FIGURE 5-10
RAS PUMPING SYSTEM PLAN

CHAPTER 6 – DISINFECTION AND EFFLUENT FLOW MONITORING

*The plan view for the ultraviolet (UV) disinfection and effluent metering system is shown in **Figure 6-3** at the end of this chapter.*

OVERVIEW

The effluent from the two circular clarifiers is conveyed through 16-inch secondary effluent (SE) piping to the UV disinfection system. Prior to reaching the UV disinfection units, the effluent is metered with a 12-inch electromagnetic flow meter that is contained in a below grade utility vault. The UV disinfection system is located southeast of the Equipment Building under the UV shelter. The disinfected effluent is then conveyed to an outfall located in the Wenatchee River through the 18-inch treated effluent (TE) piping. The TE pipe reduces down to 10 inches at the outfall manhole (MH-2) prior to being discharged to the Wenatchee River.

The SE piping reduces to a 12-inch pipe prior to entering the effluent flow meter vault. The valve vault contains a 12-inch electromagnetic flow meter to monitor effluent flow and a sump pump to drain the valve vault when required. Twelve-inch gate valves are located on the upstream and downstream sides of the flow meter valve vault for isolation. The clarified effluent is then conveyed from the effluent flow meter valve vault to an open channel UV system (**Figure 6-1**). The UV channel contains two UV disinfection units. Each unit is capable of disinfecting 1.32 million gallons per day (MGD) of wastewater. Both units combined can treat 2.6 MGD which is the 20-year maximum day design flow. The water level in the UV disinfection channel is controlled by a serpentine finger weir. A composite sampler continuously draws wastewater effluent samples after disinfection by the UV units. The disinfected effluent is then conveyed through the 18-inch TE pipe that reduces down to 10-inch to the outfall located in the Wenatchee River. The non-potable water (NPW) pump station draws a portion of this disinfected effluent for plant process water (**Chapter 8**).

Figure 6-1 – UV Disinfection System
(A) UV Shelter – West End; (B) UV Shelter – East End; (C) UV Channel – East End

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING AND PREVENTATIVE MAINTENANCE

The Routine Operation and Maintenance Checklist related to the UV disinfection and effluent monitoring system is located in ***Appendix F.***

UV Disinfection System

Description

The clarified effluent is disinfected as it passes through the UV unit(s) located in the channel. The UV disinfection system functions by providing light at the proper wavelength to disrupt the DNA of pathogens; this disruption prohibits the pathogens from surviving or reproducing. The total suspended solids (TSS) of the clarified effluent must be 30 milligrams per liter (mg/L) or less in order for the UV light to penetrate the pathogens and be effective. The unit is designed for a UV transmittance of 65 percent or greater. The UV unit will meet a disinfection standard of 200 fecal coliform per 100 mL based on a 30-day geometric mean and 400 fecal coliform per 100 mL based on a 7-day geometric mean.

A series of wastewater quality tests are recommended by the UV disinfection system manufacturer to be periodically conducted by the operator to determine the effectiveness of the UV system for disinfection. The following samples should be collected by the operator prior to the UV unit: Percent UV Transmittance, Total Suspended Solids, and Particle Size Distribution. A post-disinfection microbial analysis should be periodically conducted after UV disinfection to ensure the Wastewater Treatment Facility (WWTF) is conforming to disinfection standards. The effluent composite sampler collects the sample for the operator to perform the analysis.

Additional information regarding the operation of the UV system can be found in the standard operating procedures located in **Appendix A**.

Table 6-1
UV Disinfection Equipment

Equipment	P&ID Tags	Location
Trojan UV3000Plus™ Modules (QTY = 6)	NA	UV Channel – 3 modules per bank, 2 banks of UV units
UV Hydraulic System Center (HSC)	NA	UV Shelter
UV System Control Center (SCC)	NA	UV Shelter
UV Power Distribution Center (PDC) 1A	NA	UV Shelter
UV Power Distribution Center (PDC) 1B	NA	UV Shelter
UV Intensity Sensor (QTY = 2)	NA	UV Bank (QTY = 2)
Level Control Weir	NA	UV Channel – downstream of UV units
Ultrasonic Level Sensor	Lt-404	UV Channel
UV Water Level Sensor	Lt-403	UV Channel- downstream of UV units

Normal Operation

During normal operation, the clarified effluent will be routed through the effluent flow meter valve vault prior to entering the UV channel. The UV channel includes two units (banks) for disinfection. Each bank contains three modules. All ballast and lamp wiring is inside the module frame. A module contains two to four ballasts; the City's UV disinfection system has 2 ballast per module. A ballast is used to monitor and control two lamps. The City's UV disinfection system has 12 lamps per bank for a total of 24 lamps.

The serpentine finger weir keeps the water level within the channel at a minimum height so that the UV units can operate effectively. The dose is controlled by an algorithm processed by a microprocessor contained within the UV Power Distribution Center. The dose algorithm uses effluent flow rate, UV transmittance, lamp age and power level of the operating UV unit(s) to calculate the applied dose.

The desired UV Dose setpoint is manually entered by the operator. The Power Distribution Center will control the number of banks that are operating and the power level to each bank to maintain the UV dose setpoint if the UV disinfection system is set to "Remote Auto". The variation in bank operation and power level occurs after an initial warm up period. The UV lamps operate at full power during the warm up period.

The flow recorded using the effluent flow meter is transmitted to the Power Distribution Center in order to provide dose pacing. An operator entered flow value can also be used to replace the measured flow value from the effluent flow meter if needed.

A UV transmittance signal is required to provide dose pacing. The City's UV disinfection system does not have an on-line UV transmittance sensor. An operator entered UV transmittance value will be entered.

A UV intensity sensor is provided for each UV unit and this 4-20 mA signal originates from the probe mounted on the middle module of a bank of lamps (each bank has three modules). This signal is not used for dose control. The UV sensor is installed within its own full length quartz sleeve.

The UV banks can be automatically rotated with each on/off cycle or the automatic rotation can be disabled by the operator.

Alternate Operation

If the UV disinfection system is in "remote auto," the UV banks are controlled by the dose pacing routine. An alternate operation is to set the UV disinfection system into "remote hand." This allows the operator to enter the power level to each bank in the range of 60 to 100 percent after the initial warm up time.

Emergency Operation

During an outage of normal power to the WWTF, the emergency generator (EG) has been sized to run one UV unit. In this situation, a single activated sludge basin and a single clarifier will be in operation with essential equipment powered by the EG. Should influent flows to the plant exceed the treatment capacity of a single basin and clarifier, storage of influent flows to the equalization (EQ) basin should occur. This operation will ensure that secondary effluent flows to the UV system are maintained below

1.32 MGD, which is the treatment capacity of a single UV unit. SE flows will be verified by the supervisory control and data acquisition (SCADA) system by flow meter (Ft-401).

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the UV disinfection system can be found in the manufacturer's operation and maintenance (O&M) manual as shown below:

- UV Disinfection Unit(s): **Appendix C, Volume 3**

The UV disinfection units contain lamps that are positioned horizontally and parallel to the wastewater flow. The lamps are low pressure, high intensity amalgam lamps and are rated for continuous submergence. Each UV lamp is enclosed in a quartz sleeve to prevent moisture from entering the module. The quartz sleeves may require periodic manual cleaning. The manufacturer recommends that the sleeve cleaning system be checked every 6 months or when a UV unit is removed.

Each UV unit has wipers for automatic cleaning of the quartz sleeves. The wiping system setpoints are operator adjustable. The recommended cleaning schedule for normal conditions is once every 12 hours. A submersible wiper driver is located on each UV module and it drives the wiper carriage assembly along the module. Wiper canisters surround the quartz sleeves and are filled with ActiClean™ WW gel. The gel has food grade ingredients to remove scale from the lamp sleeves. The gel is applied to the quartz sleeves between the two wiper seals and the lamp sleeves are cleaned while submerged and in operation.

The UV ballast enclosure is designed to be lifted by hand using two operators or by a lifting device mounted near the channel. A davit crane has been installed for this purpose.

The UV disinfection units can run in automatic mode (microcontroller monitors and controls the UV dosage produced by the UV banks) or manual mode where the operator selects the power level. A serpentine weir located downstream of the UV units controls the water level within the channel. The manufacturers recommended water level must be maintained within the channels at all times. One low water electrode sensor is located in the channel between the weir and last (furthest downstream) UV bank. The UV bank will power down when the water level in the channel no longer covers both rods. If a preset low water level condition exists, the UV lamps will de-energize and remain off until the proper water level is present.

Effluent Flow Metering

Description and Normal Operation

Wastewater effluent that is discharged to the outfall located in the Wenatchee River is metered using an electromagnetic flowmeter (**Figure 6-2**). The WWTF effluent flow rate is sent to the UV disinfection system and effluent composite sampler for control.

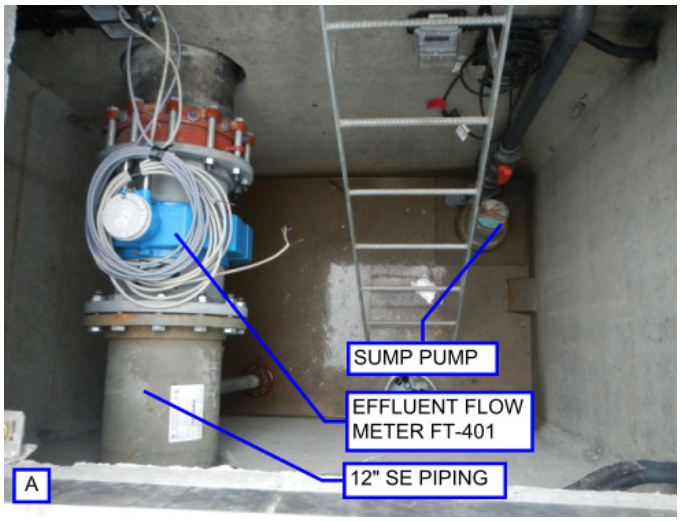


Figure 6-2 – Effluent Flow Metering Vault

Isolation valves are located upstream and downstream of the WWTF effluent flow meter for maintenance of the magnetic flow meter.

Table 6-2
Effluent Flow Metering Equipment

Equipment	P&ID Tags	Location
WWTF Effluent Electromagnetic Flowmeter	FT-401	Valve Vault located upstream of UV channel

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the effluent flowmeters can be found in the manufacturer's O&M manual as shown below:

- Electromagnetic Flow Meters: **Appendix C, Volume 11**
- Sump Pump: **Appendix C, Volume 1**

Effluent Sampling

Description

The effluent composite sampler is located downstream of the UV disinfection units next to the UV channel. The sampler receives secondary effluent flowrate data from the SCADA system in order to adjust sampling frequency. Samples are stored within the sampler's refrigerated storage compartment and must be periodically retrieved by the operator.

Normal Operation

Normal operation of the composite sampler will require sampling rate to be "flow-paced" based on the SE flow rate measured at Ft-401. The sampler will receive the secondary effluent flowrate from the

SCADA system. The operator will manually input the flow-pacing sampling rate into the local sampler control panel.

Alternate Operation

Alternate operation of the composite sampler "time-paced" is sampling of the secondary effluent. The operator will manually input the sampling interval in minutes into the local sampler control panel.

Table 6-3
Effluent Sampling Equipment

Equipment	P&ID Tags	Location
Composite Sampler	SMP-405	Next to UV Channel – UV Shelter

Emergency Operation

During an outage of normal power to the WWTF, the composite sampler will remain powered through The Equipment Building Lighting Panel LP-401 in Motor Control Center MCC-401.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the effluent composite sampler can be found in the manufacturer's O&M manual as shown below:

- Effluent Composite Sampler: **Appendix C, Volume 11**

Outfall System

Description and Normal Operation

The disinfected effluent is discharged through a 10-inch existing effluent pipe in the Wenatchee River.

Maintenance and Troubleshooting

The existing outfall will need 30 3-inch holes added to the existing diffuser in order to flow by gravity at the 25-year flood level (approximately 748 feet) and peak future flow rates. At flood stages above 748 feet, a portion of the effluent may be discharged near the bank of the Wenatchee River at peak flow conditions to prevent backup into the UV channel. The additional holes can be added if needed by the City.

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Disinfectant and Effluent Metering System

- *Standard Instrumentation and Equipment Descriptions*
  - Composite Sampler
  - Flow Meter
  - Level Transmitter

SAFETY

The primary safety concerns related to operation of the UV Building are as follows:

- Fall Prevention
- Open Water Safety
- Confined Space
- Electrical Hazards
- Personal Protective Measures

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to UV Disinfection can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* **Chapter 4**, Section 2.4.

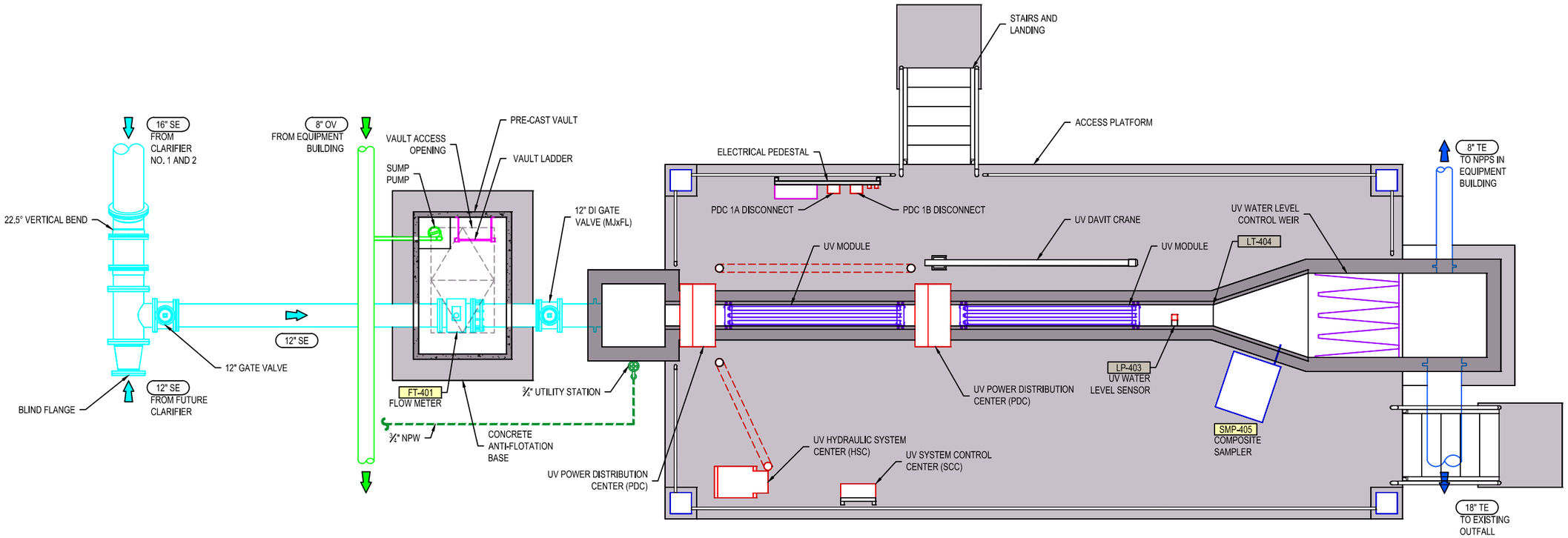


FIGURE 6-3
UV DISINFECTION AND EFFLUENT FLOW METERING

CHAPTER 7 – SOLIDS AND RESIDUALS HANDLING

***Figures 7-15** thru **7-18** at the end of this chapter include the plan view for each facility involved with solids and residuals handling.*

OVERVIEW

The solids handling system for the Wastewater Treatment Facility (WWTF) is contained within the Equipment Building Thickening room (**Figure 7-1**), Solids Handling Building, and aerobic digesters (**Figure 7-2**). The evaporation pond is also an ancillary component to the solids handling system.

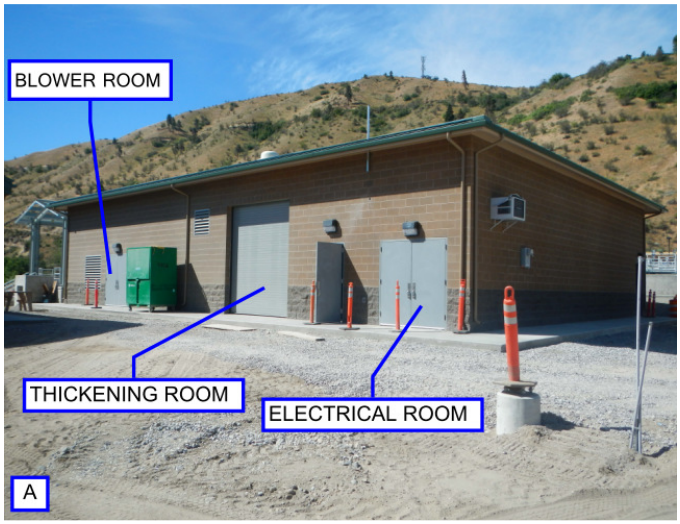


Figure 7-1 – Equipment Building (East Side)

The dissolved air floatation (DAF) unit, located in the Equipment Building Thickening room, functions to thicken waste activated sludge (WAS) from the activated sludge basin surface wasting system prior to it entering the aerobic digesters. WAS is pumped to the DAF unit via the WAS pumps in the Equipment Building Pump room (**Chapter 4**). A flocculator, located upstream of the DAF unit, serves to flocculate WAS influent with dissolved oxygen (DO) using compressed air injection. The flocculator can also be used as a future injection point for polymer. Two thickened sludge (TS) transfer pumps, located within the Thickening room, are downstream of the DAF unit. The thickened sludge discharged from the DAF unit has an approximate concentration of 4 percent solids.

The two TS pumps deliver the thickened sludge to the aerobic digesters which are located adjacent to the Solids Handling Building. WAS removed from the clarifiers can also be delivered directly to the digesters from the return activated sludge (RAS) pumps, thus bypassing the DAF unit (**Chapter 5**). The two identical digesters contain a top-entering tank mixer and an air diffusion sparge ring beneath the mixer. Air is delivered to the digesters from two rotary positive displacement blowers that are located in the Solids Handling Building Blower room.

Figure 7-2 – Solids Handling Building
(A) West Side of Building; (B) South Side of Building and Digesters

The digested sludge is withdrawn periodically from the digesters into the solids handling equipment located in the Solids Building Dewatering room. The sludge is pumped by the digested sludge (DS) pump to the belt filter press (BFP). Polymer is injected into the sludge at the DS pump. The BFP serves to dewater the sludge into cake form (approximately 16 to 18 percent solids), which is then pumped via the cake transfer pump to the 30-cubic-yard dumpster adjacent the Solids Handling Building. Filtrate (the water removed from the sludge by the BFP) as well as the BFP washwater outfalls to either the evaporation pond or to the In-Plant Pump Station (IPPS) as determined by the operator through manual valve operation.

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

The Routine Operation and Maintenance Checklist related to the solids and residuals handling equipment is located in ***Appendix F.***

Thickening Equipment

Description

The thickening equipment (**Figure 7-3**) located in the Equipment Building Thickening room includes the DAF unit, flocculator, two TS pumps and associated piping, valves, and appurtenances. The FRC F2.5-2-2 flocculator is fed with WAS at a rate of 16 to 70 gallons per minute (GPM) from the WAS pumps. The flocculator consists of 2.5-inch-diameter Schedule 80 piping arranged in a serpentine manner to achieve flocculation of the WAS prior to discharging into the DAF unit. The flocculator has the ability to also function as a coagulator with the addition of polymer. The flocculator contains 0.5-inch injection taps that are isolated with stainless steel ball valves. These taps are used to inject the incoming WAS with an air/wastewater mixture referred to as "whitewater." This whitewater is recycled from the DAF unit via a recycle pump. The DAF unit has two recycle pumps installed; one pump is redundant. The flocculator also contains an integral manually-operated isolation valve. The WAS discharges from the flocculator to the DAF unit via a 4-inch flanged pipe penetration at the middle of the unit.

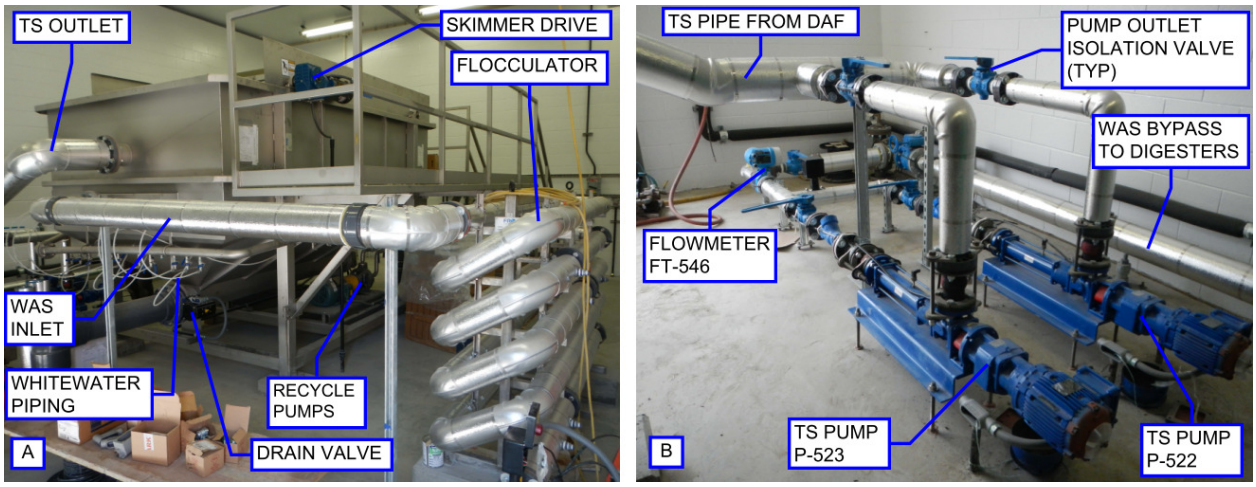


Figure 7-3 – Thickening Equipment
(A) DAF Unit and Flocculator; (B) Thickened Sludge Pumps

The flocculated WAS is dispersed across the width of the FRC PWL-15 DAF unit via a distribution manifold. The WAS is injected with whitewater from the DAF recycle pump and flows into the body of the DAF unit. Generally, 10 to 25 percent of total DAF influent flow is recycled for whitewater usage. Air bubbles from the whitewater attach to flocculated solids in the incoming WAS, allowing them to float to the surface within the body of the DAF unit.

The skimming mechanism removes the flocculated sludge from the water surface within the tank and deposits the "thickened sludge" into a hopper. A 6-inch TS pipe flows out of the hopper to the two Monoflo thickened sludge transfer pumps. Grit and heavy solids settle out of the DAF unit and are removed by an auger to flow by gravity back to the IPPS. Grit removal is controlled by a motor actuated butterfly valve on the drain line. Clarified effluent flows under a baffle and out the back of the DAF unit by gravity through piping to the IPPS.

Mounted on the south wall of the Thickening room are the DAF pneumatic panel and air control panel. 100 pounds per square inch (psi) compressed air is provided to these panels from the Atlas Copco air compressor located in the Blower room. An air dryer, located within the Blower room, is plumbed into the air line downstream of the compressor.

The flocculator and all exposed piping in the DAF room is insulated and heat traced with self-regulating heat cable.

Additional information regarding the operation of the thickening system can be found in the standard operating procedures located in **Appendix A**.

The DAF unit and thickening system consists of the components listed in **Table 7-1**.

Table 7-1
DAF Unit Equipment

Equipment	P&ID Tags	Location
DAF Unit	DAF-526	Equipment Building Thickening Room
DAF Unit – Recycle Pumps	P-528; P-529	Equipment Building Thickening Room
DAF Unit – Auger Drive Motor	DAF-525	Equipment Building Thickening Room
DAF Unit – Automatic Drain Valve	XV-524	Equipment Building Thickening Room
Flocculator	FLC-515	Equipment Building Thickening Room
Air Compressor and Dryer	C-514	Equipment Building Blower Room
Pneumatic and Air Control Panels	None	Equipment Building Thickening Room
Pneumatic Control Panels Solenoid Valve	XV-518	Equipment Building Thickening Room
Compressed Air Pressure Switches	PSL1-517; PSL2-216	Equipment Building Thickening Room
Conductivity Sensor for DAF Hopper	NA	Equipment Building Thickening Room
TS Transfer Pumps	P-522, P-523	Equipment Building Thickening Room
Electromagnetic Flowmeter	Ft-546	Equipment Building Thickening Room

Normal Operation

During normal operation, the WAS pumps will be continually wasting from the surface of the basins at an operator-selected flowrate (**Chapter 4**). The WAS pumps can either waste to the DAF or directly to the digester via manual valve operation. When wasting to the DAF, the operator will initiate the DAF process to run via the Human-Machine Interface (HMI). The supervisory control and data acquisition (SCADA) system will then continuously run the DAF process as long as the WAS pumps are operating. The DAF equipment does not have a local control, though each piece of equipment has local Hand Off Auto (HOA) switches.

During normal operation, the DAF unit skimmer, auger, and drain valve will operate based on timed on/off periods. The operator may adjust the lengths of these periods through the HMI. The speed of the skimmer is controlled by a variable frequency drive (VFD) and can also be adjusted by the operator through the HMI.

During normal operation, one recycle pump will continuously operate at a fixed speed. The air compressor will also run continuously to maintain a constant 100 psi supply pressure.

The operator will have manual control of the outlet weir in order to vary the depth of skimmings removed from the water surface of the DAF. Periodic visual inspection of skimmings throughout DAF operation is required by the operator to maintain the proper depth of thickened sludge being removed. Inspection of collected thickened sludge within the hopper will alert the operator if too much water is being removed with the sludge or if not enough sludge is being removed.

When the operator initiates the DAF unit to run, one of the two TS pumps will be chosen to operate at a constant flow rate between 3 and 6 GPM. The operator must manually manipulate the valves to direct flow to and from the operating pump (**Figure 7-4**). The SCADA system will monitor a level sensor within the hopper of the DAF unit in order to shut down the WAS pump when the hopper is empty and restart the pump when the hopper is full. Flow from the TS pump to the digesters is measured by electromagnetic flowmeter Ft-546. One TS pump must be in operation while the DAF is online to remove the built-up sludge from the DAF. The second pump is a fully redundant to the first.

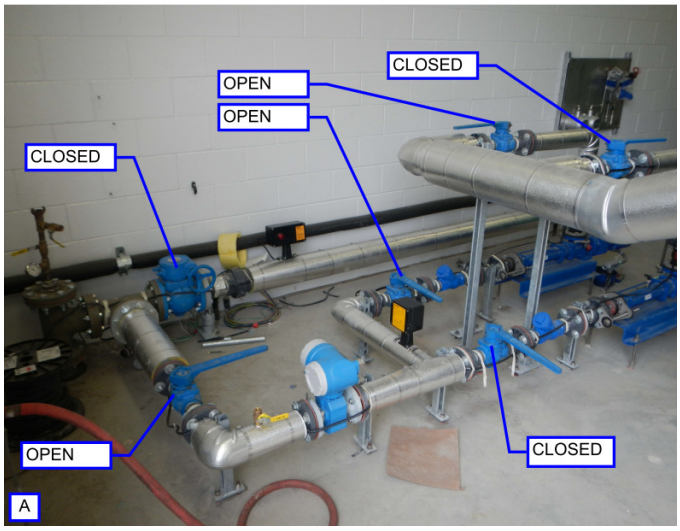


Figure 7-4 – Valve Orientation Photo – Manual valve orientation for thicken sludge transfer from the TS Pump #1 to the digesters. To use Pump #2 – close the inlet/outlet valves for Pump #1 and open the inlet/outlet valves for Pump #2. (A) Southeast corner of Thickening room

Alternate Operation

Each of the DAF unit components and the TS pumps contain physical HOAs located in the Thickening room. The operator can switch these devices to “HAND” mode to run each manually and override the SCADA system. However, this would not be a normal form of operation. The operator must switch each HOA back to “AUTO” for the device to be automatically controlled by the SCADA system.

Emergency Operation

During an outage of normal power to the plant, the emergency generator (EG) has the capacity to run the DAF unit as well as TS pump N0.1. During a short power outage, the surface wasting system may not necessarily need to be in use.

Maintenance and Troubleshooting

The primary maintenance concern related to the DAF unit is the periodic cleaning of the unit, discussed in detail in the manufacturer's O&M manual. It is imperative that the operator follows this suggested cleaning process. This will include filling the DAF unit entirely with non-potable water (NPW). Due to the volume of water required to do this, a 1.5-inch utility station has been located on the southwest corner of the Thickening room to facilitate an increased filling rate.

The operator must also be aware that whitewater testing is required when starting up the DAF unit to ensure proper air flow into the unit. The manufacturer's operation and maintenance (O&M) manual discusses this test in detail (**Appendix C**).

Detailed maintenance and troubleshooting procedures related to the thickening system can be found in the manufacturer's O&M manuals as shown below:

- DAF Unit and associated equipment: **Appendix C, Volume 3**
  - DAF Unit
  - Flocculator
  - Auger and Drive Unit
  - Recycle Pumps and Motors
  - Skimmer and Motor
  - Air Compressor and Dryer
- TS Transfer Pumps: **Appendix C, Volume 1**
- Plug Valves: **Appendix C, Volume 5**
- Electromagnetic Flowmeter: **Appendix C, Volume 11**

Aerobic Digesters

Description

The two aerobic digesters (**Figure 7-5**) receive thickened sludge via 4-inch TS piping from the TS pumps. The digesters produce Class B biosolids through the decomposition of organic matter within the sludge. Both digesters, adjacent to the Solids Handling Building, are identical in size. It is anticipated that 4,500 gallons per day (GPD) of thickened sludge will be transferred from the DAF to the aerobic digesters. The solids will be in the range of 3 to 5 percent.

Additional information regarding the operation of the aerobic digesters can be found in the standard operating procedures located in **Appendix A**.

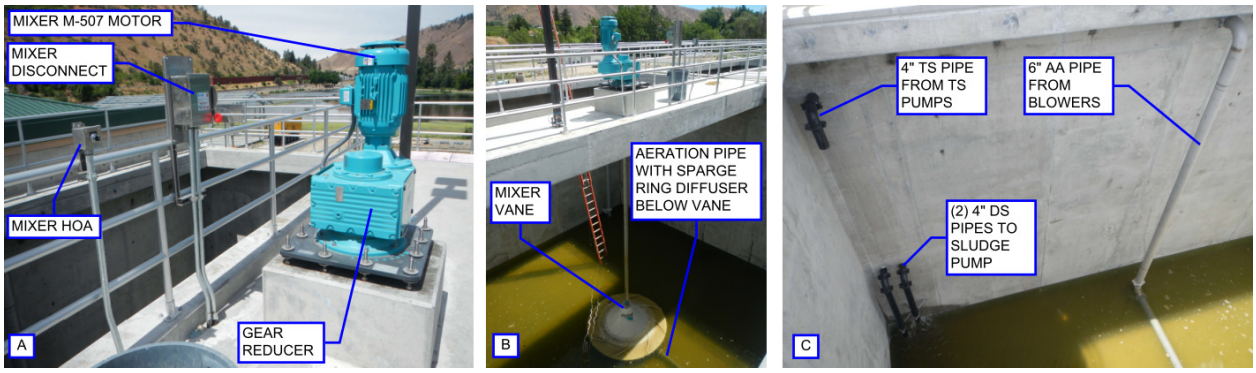


Figure 7-5 – Aerobic Digesters
(A) Digester Mixer Motor; (B) Digester Mixer; (C) Digester Piping

The thickened sludge enters through a single 4-inch pipe near the top of each digester, and the digested sludge is removed via dual 4-inch pipes near the bottom of each digester. A single 6-inch aeration pipe enters the top of each digester and drops vertically to the floor and is routed to the center high-density polyethylene (HDPE) sparge ring. Both aeration pipes are tapped at the high point with a 0.5-inch pipe controlled by a solenoid valve. This pipe prevents sludge from siphoning into the blower room by opening whenever the blowers are not in operation. Air is fed from two 30 horsepower (HP) Aerzen rotary positive displacement blowers located in the Solids Handling Blower room.

A single top entering tank mixer is suspended in the center of each digester from the concrete catwalk above. Digester #2 has an overflow blockout through the wall to Digester #1. Digester #1 overflows through a vertical 6-inch standpipe to the plant tank drain system. Both digesters contain concrete sumps with tank drains manually-controlled by buried plug valves on the east side of the digesters.

The digesters are covered with fiberglass reinforced plastic (FRP) covers. Each digester contains two access ports through the covers and also contains a 6-inch FRP vent pipe with an integral damper.

The digesters are sized as shown in **Table 7-2**.

Table 7-2
Aerobic Digester Tank Capacity

Name	Storage Size (L x W x H)	Storage Capacity (gal)	Mixer (Hp)	Aeration
Digester #1	36’ x 36’ x 20’-3”	180,000	Yes	Yes
Digester #2	36’x 36’ x 20’-3”	180,000	Yes	Yes

The aerobic digesters contain the equipment listed in **Table 7-3**.

Table 7-3
Aerobic Digester Components

Equipment	P&ID Tags	Location
Top Entering Tank Mixers	M-507, M-508	Solids Handling Building Digesters
Rotary Positive Displacement Blowers	B-504, B-505	Solids Handling Building Blower Room
ORP Sensor	ORP-548, ORP-549	Solids Handling Building Digesters
Ultrasonic Level Transducer	Lt 506, Lt-509	Solids Handling Building Digesters
Aeration System – Sparge Ring	None	Solids Handling Building Digesters
Anti-siphon Solenoid Valve	XV-552, XV-553	Solids Handling Building Blower & Dewatering Rooms
AA Butterfly Valves (5)	None	Solids Handling Building Blower Room
TS Plug Valves (2)	None	Solids Handling Building Dewatering Room

Normal Operation

Normal operation of the digesters will consist of feeding both digesters in parallel from the DAF unit. This will require manually opening both TS plug valves within the Solids Handling Building to allow sludge to flow into both digesters as shown in **Figure 7-6.**

Figure 7-6 – Valve Orientation Photo – Manual valve orientation for TS transfer to both digesters. For filling the digesters in series, close either TS valve to fill a single digester. (A) East wall of Dewatering room

During any operational mode of the digesters, the operator will need to manually take daily readings of liquid temperature. These measurements will be used to calculate the solids retention time (SRT) and thus the proper wasting rate from the digesters. Solids wasting is discussed in depth in the BFP section of this chapter. The operator must also take daily pH readings in the digesters. If pH readings drop below 6.5, this could be an indication of over-aeration. The operator must adjust the aeration control accordingly. Periodically, the operator must also take ammonia and nitrate measurements at the beginning and end of aeration cycles. These measurements will be used in optimizing the aeration system as discussed further in the standard operation procedure for the digesters (**Appendix A**).

Digester operation requires continuous mixing of the contents as well as cycling between Aerobic (air added via aeration system) and Anoxic (no aeration) conditions. Digester cycling between Aerobic and Anoxic modes is discussed in detail in the Aeration, Blowers, and Mixing system section of this manual.

Alternate Operation

Alternate operation of the digesters will consist of feeding a single digester at a time; either a single digester will be operating or both digesters will be operating but feeding will cycle from one digester to the other. In the case of feeding both digesters in series, the operator will have to manually align the TS plug valves within the Solids Handling Building to allow sludge to flow into one digester or the other. The operator can choose the rate at which to cycle this series.

Emergency Operation

Wasting to digesters (in series or parallel) should not be affected by an outage of normal power. Digester aeration and mixing during a power outage is discussed in detail in the Aeration, Blowers, and Mixing System section.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the digesters can be found in the manufacturer's O&M manuals as shown below:

- Top Entering Tank Mixers: **Appendix C, Volume 2**
  - Sparge Ring
- Rotary Positive Displacement Blower: **Appendix C, Volume 3**
- Oxidation reduction potential (ORP) Sensor: **Appendix C, Volume 11**
- Ultrasonic Level Transducer: **Appendix C, Volume 11**
- Plug Valves: **Appendix C, Volume 5**
- FRP Tank Covers: **Appendix C, Volume 1**

Aeration, Blowers, and Mixing System

Description

The digester will be filled based on the digester operational mode discussed in the aerobic digesters section above. As a digester fills to the elevation of 752.20 feet, mixing of the tank will begin. The fluid level within the tank will be monitored by an ultrasonic level transducer mounted in each digester. Mixing of each tank by a single Invent top-entering tank mixer occurs continuously as long as the

digester level is maintained above 752.20 feet. Digester operation requires cycling the digester between Anoxic and Aerobic modes to facilitate the biological decomposition of the organic matter within the sludge. Air to the digesters is supplied by two Aerzen 30 HP rotary positive displacement blowers located in the Solids Handling Building Blower room (**Figure 7-7**). The blowers can supply an air flowrate of 120 to 400 standard cubic feet per minute (scfm) each. The two blower control modes are the ORP Mode, which is the normal operational mode, and Timed Cycle Mode – an alternate operational mode. The operator must manually select between these modes. The SCADA system will then automatically operate the aeration system in the selected mode.

Figure 7-7 – Solids Handling Blower Room
(A) 25-HP Digester Blowers; (B) AA Piping to Digesters

During normal operation, the manually-set valve lineup in the Solids Handling Building Blower room will allow Digester Blower #1 to discharge to Digester #1 and Digester Blower #2 to discharge to Digester #2 as shown in **Figure 7-8.**

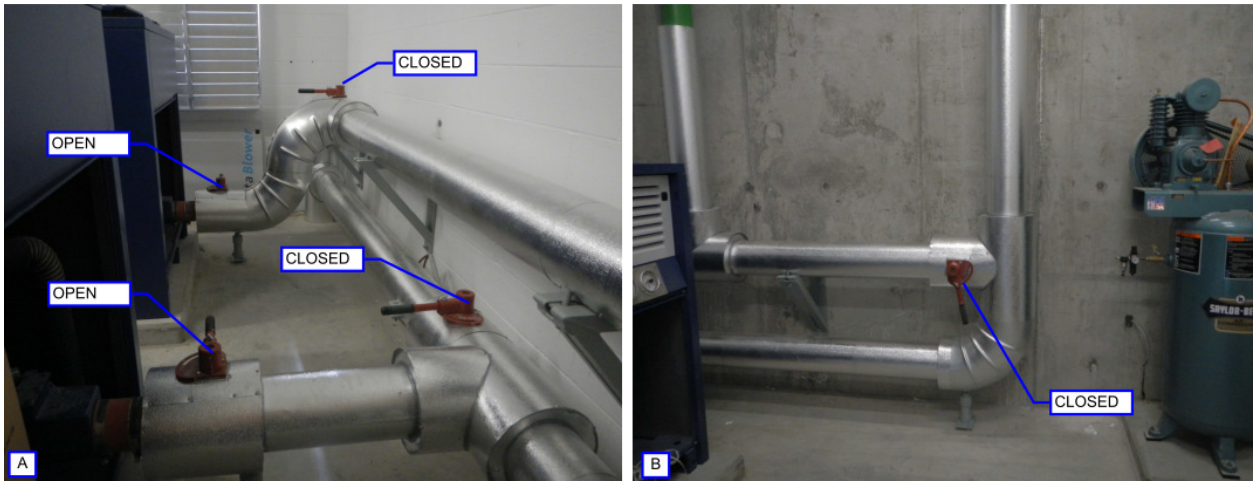


Figure 7-8 – Valve Orientation Photo – Manual valve orientation for directing blowers to respective digesters. (A) North side of Solids Handling Blower room; (B) East wall of Solids Handling Blower room

If necessary, the valving can be rearranged to cross either blower to the opposite digester. Furthermore, the valving can be manipulated in the Equipment Building Blower room so that the digesters are supplied with air from the backup Basin blower if necessary, as shown in **Figure 7-9.**

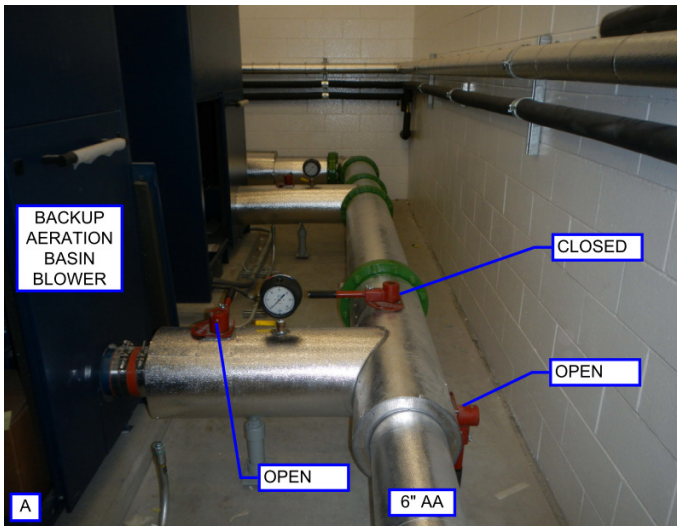


Figure 7-9 – Valve Orientation Photo – Manual valve orientation for directing backup aeration basin blower to digesters. A) North side of Equipment Building Blower room

Additional information regarding the operation of the digester aeration and mixing system can be found in the standard operating procedures located in **Appendix A**.

Normal Operation

During normal operation, the Waste Water Treatment Facility (WWTF) SCADA system will operate the digester mixing and aeration system in "ORP mode." In this mode, the system will turn the aeration on for each digester for an operator-selected period of 30-minute increments. The SCADA system will monitor the ORP via a probe in each basin. The system will aerate to keep the ORP levels above -150 mv. Aeration will be turned off when each time cycle is complete (assuming ORP levels remain above -150 mv). Should ORP levels fall below -150 mv during the OFF period, the SCADA system will automatically begin an aeration cycle. The operator will modify the time-cycle lengths based on the standard operation procedure for the digesters (**Appendix A**).

The rate of aeration is altered by VFDs controlling the blower speed. In order to optimize aeration, the operator will vary aeration rates based on the standard operation procedure for the digesters (**Appendix A**).

Mixing of the sludge during this, and all operational modes, should be continuous as long as the fluid level within the digester is above 752.20 feet, as measured by the ultrasonic level transducer in each tank. The level transducers are monitored by the SCADA system, which will shut down the mixers on a low level condition.

Whenever a blower is called to run, the SCADA system simultaneously closes the respective anti-siphon solenoid valve. When the blower is shutoff, the solenoid is simultaneously re-opened. It is critical that the operator periodically checks the solenoid on each anti-siphon line to ensure that they are functioning properly. These valves vent outside of the Solids Handling Building on the west digester catwalk.

Alternate Operation

In the event that a DO sensor fails in the digester, the SCADA system will operate the digester in a "timed cycle mode." In this mode, the operator must set specific periods of blower run times in increments of 30 minutes throughout the day. A typical timed cycle mode will equally split aeration ON and OFF periods. The operator must monitor digester operation and adjust the cycling accordingly.

Mixing will remain continuous throughout this mode. Once the ORP sensor(s) are restored, the operator may switch the system back to ORP mode.

Emergency Operation

The emergency generator is sized to operate a single digester mixer and blower during an outage of normal power to the plant. If a single digester is in operation when an outage occurs, no change to the blower or mixer operation will be necessitated. If both digesters are operating when an outage occurs, the SCADA system will automatically alternate aerating and mixing both digesters for 2-hour periods**.** As an alternate form of operating both digesters during a power outage, the operator may manually orient the Solids Handling Building Blower room valves such that air from a single blower is sent to both digesters. In this scenario, the operator would set the SCADA system to alternate the digester mixers on 2-hour increments.

The operator can also manually run a single blower and a single mixer at a time via the physical HOAs located adjacent to each piece of equipment. The operator must be aware that not aerating an active aerobic digester for an extended period of time could cause the sludge to turn anaerobic. Alternation of the aeration between digesters during a power outage must be maintained.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the digester blower, aeration and mixer components can be found in the manufacturer's O&M manuals as shown below:

- Top Entering Tank Mixers: **Appendix C, Volume 2**
    - Sparge Ring
- Rotary Positive Displacement Blower: **Appendix C, Volume 3**
- ORP Sensor: **Appendix C, Volume 11**
- Ultrasonic Level Transducer: **Appendix C, Volume 11**
- Plug Valves: **Appendix C, Volume 5**

Belt Filter Press System

Description

The belt BFP system (**Figure 7-10**) dewaters the digested sludge prior to hauling off site. This increases the solids content of the sludge to decrease hauling costs. The solids content of the final sludge cake from the belt filter press will be in the range of 16 to 18 percent solids.

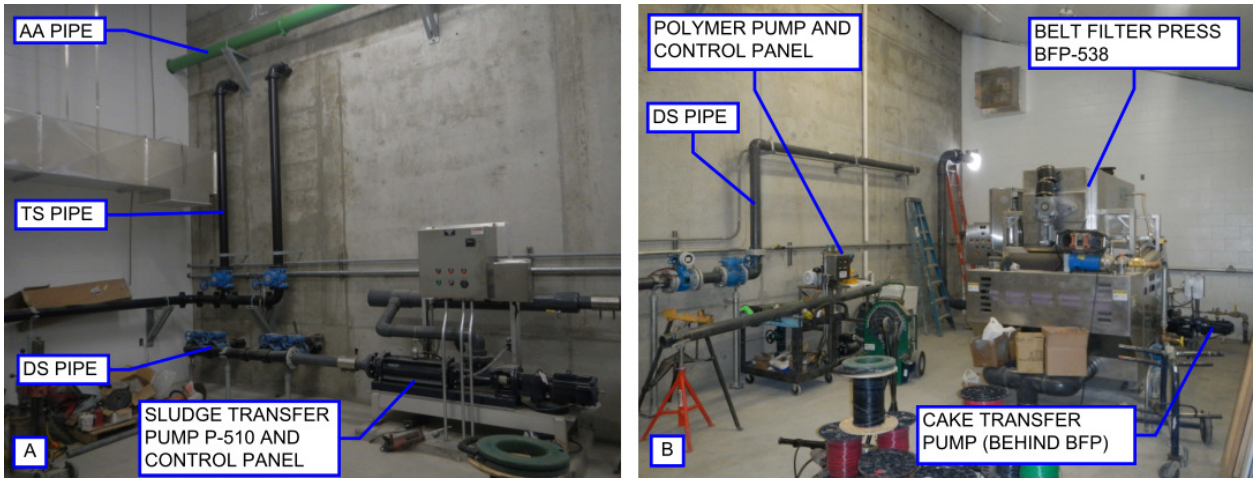


Figure 7-10 – Solids Handling Thickening Room
(A) Sludge Piping and Transfer Pump; (B) Belt Filter Press and components

The Aeromod belt filter press and ancillary components are contained in the Solids Handling Building Dewatering room. On the east wall of the building, four 4-inch digested sludge (DS) pipes extend through the wall from the digesters (two from each digester). These pipes are each isolated with a manually-operated plug valve and discharge into a shared 4-inch DS header pipe running to the Seepex progressing cavity digested sludge transfer pump. This pump transfers sludge to the belt filter press and also serves as the injection point for polymer. The polymer system sits adjacent to the sludge transfer pump. The digested sludge is metered by electromagnetic flowmeter Ft-511 prior to entering the filter press.

Sludge enters the top of the belt filter press into the rotary drum thickener, where it is moved horizontally by an auger that discharges the sludge to the top of the endless belt system. The belt then moves sludge to the pressing zone, where water is pressed from the sludge as it passes between the belt and a rotating drum. After passing the drum, the dewatered sludge is discharged into the hopper of the Seepex progressing cavity cake transfer pump that sits behind the filter press. The cake pump lifts the sludge cake vertically to a discharge pipe running through the south wall of the Solids Handling Building, depositing the cake in a 30 cubic yard dumpster. The washwater, as well as water removed from the sludge (filtrate), outfalls on the opposite end of the filter press from the cake pump. The filtrate flows by gravity to the evaporation pond or the IPPS depending on the manual valve operation (refer to the Filtrate section of this chapter).

The air compressor, an ancillary component of the BFP, provides the necessary 85 to 130 psi oil/water free compressed air used by the filter press' internal pneumatic air cylinder that adjusts the belt for proper position and tracking.

The filter press contains in integral washing system that cleans the filter press at the end of each pressing period. The washing system consists of three internal washing manifolds containing multiple nozzles on each. The wash water connection is made adjacent to the filter press and is controlled by a solenoid valve. The Belt Filter Press system consists of the following components listed in **Table 7-4**.

Table 7-4
Belt Filter Press System Components

Equipment	P&ID Tags	Location
Belt Filter Press	BFP-538	Solids Handling Building Dewatering Room
Digested Sludge Transfer Pump	P-510	Solids Handling Building Dewatering Room
Cake Transfer Pump	P-542	Solids Handling Building Dewatering Room
Polymer System	None	Solids Handling Building Dewatering Room
Air Compressor	C-539	Solids Handling Building Blower Room
NPW Solenoid Valve	XV-541	Solids Handling Building Dewatering Room
DS Electromagnetic Flowmeter	Ft-511	Solids Handling Building Dewatering Room
NPW Electromagnetic Flowmeter	Ft-554	Solids Handling Building Dewatering Room
Digested Sludge Transfer Pump Control Panel	Cp-504	Solids Handling Building Dewatering Room
Belt Filter Press Control Panel	Cp-502	Solids Handling Building Dewatering Room
Cake Transfer Pump Control Panel	Cp-503	Solids Handling Building Dewatering Room
DS Plug Valves (4)	None	Solids Handling Building Dewatering Room

Additional information regarding the operation of the dewatering system can be found in the standard operating procedures located in **Appendix A**.

Normal Operation

Normal operation of the belt filter press system and ancillary components is principally controlled manually using local control panels for the sludge transfer pump, belt filter press, and cake transfer pump located in the Solids Handling Building Dewatering room. It is expected that operation of the

system will occur approximately twice a week producing an estimated 4 cubic yards of sludge for each operational period based on 2012 loading calculations.

The belt filter press control panel will control the filter press, air compressor, washwater solenoid and the polymer feed system. The operator will start the wasting process from the filter press control panel. The filter press control panel will prime the air and washwater lines and signal that the filter press is ready for operation.

To begin wasting, the 4-inch DS plug valves on the east wall of the Dewatering room must be opened. Wasting can either be done in parallel (from both digesters) or in series (from a single digester) as shown in **Figure 7-11.**

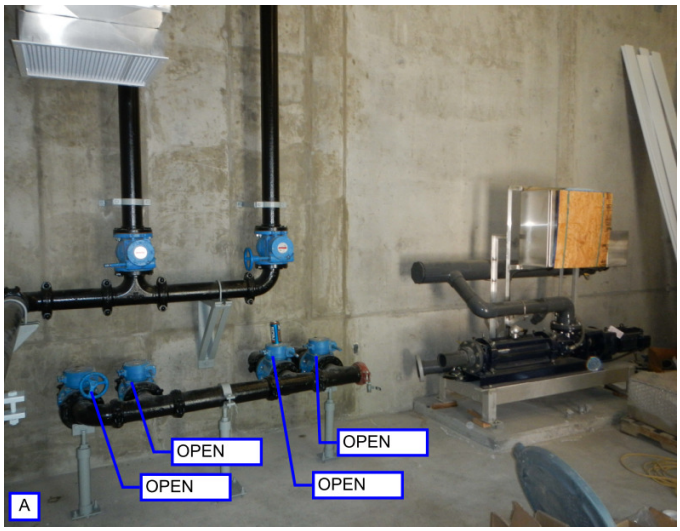


Figure 7-11 – Valve Orientation Photo – Manual valve orientation for parallel digester wasting.
A) East wall of Dewatering room

The operator will begin the digested sludge transfer pump via its local control panel. The operator will specify the flowrate from the range of 25 to 150 GPM. An electromagnetic flowmeter downstream of the pump will monitor the thickened sludge flowrate.

The BFP controls the rate of polymer injection into the digested sludge at the transfer pump. The polymer injection rate will need to be verified by inspection of the thickened sludge. Aeromod's O&M manual (**Appendix C**) discusses the rate of polymer injection and subsequent sludge inspection in detail.

The sludge will enter the top of the filter press and cake sludge will be discharged via the cake transfer pump while filtrate will outfall through the gravity filtrate piping. It is recommended that the operator routinely inspect the filter press during operation per the manufacture's recommendations though continual operator inspection is not required.

The operator will start the cake transfer pump via its local control panel. The operator will specify the pumps flowrate from the range of 2 to 10 GPM.

At the end of each wasting period, the operator will first shut down the digested sludge transfer pump and polymer feed system, followed by the filter press via each respective control panel. The filter press panel should automatically put the unit into a default wash cycle. The operator should clean the area around the filter press for splashes or spills that occurred during operation.

Alternate Operation

No alternate operational strategy has been considered at this time.

Emergency Operation

The emergency generator is not sized to run the sludge transfer pump, filter press or cake transfer pump. During an outage of normal power to the plant, no sludge wasting from the digesters is expected to occur. In the extreme event that both digesters are at full capacity during a power outage, wasting to the digesters will not be possible. In this extreme scenario, storage of influent flows to the equalizing basin (EQ basin) will be necessary.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the belt filter press and ancillary components can be found in the manufacturer's O&M manuals as shown below:

- Belt Filter Press Equipment and Control Panel: **Appendix C, Volume 4**
  - Belt Filter Press
  - Digested Sludge Transfer Pump and Control Panel
  - Cake Transfer Pump and Control Panel
  - Polymer System
  - Air Compressor
- Electromagnetic Flowmeter: **Appendix C, Volume 11**
- Plug Valve: **Appendix C, Volume 5**

Biosolids Hauling

Description

It is anticipated that the City of Cashmere (City) will haul biosolids 1 to 2 times per month at startup. The plant operator will schedule sludge dewatering as to not coincide with biosolids collection in order to ensure that the dumpster is not removed during a sludge dewatering session. Access to the site for waste collection must be available to the sludge hauling contractor.

No alternate or emergency operation of this system has been considered.

Filtrate and Washwater Evaporation Pond and Pumping

Description

The evaporation pond is situated on the southeast corner of the site. The double membrane lined pond contains a manual leak detection system and provides a storage capacity of approximately 634,000 gallons. The pond stores high-phosphate filtrate removed from the digested sludge by the BFP. This reduces phosphate loading in the wastewater effluent discharged to the Wenatchee River during the

months of March through May and July through October, when the Wenatchee River is typically at low flows. During the higher flow periods, filtrate from the evaporation pond can be recycled to the Headworks via the evaporation pond pump station (**Figure 7-12**). During these periods, filtrate and wash water generated from the filter press can be sent directly to the IPPS in lieu of the evaporation pond. Both of these measures will allow the phosphate to follow the liquid stream back through the plant and be discharged with the effluent.

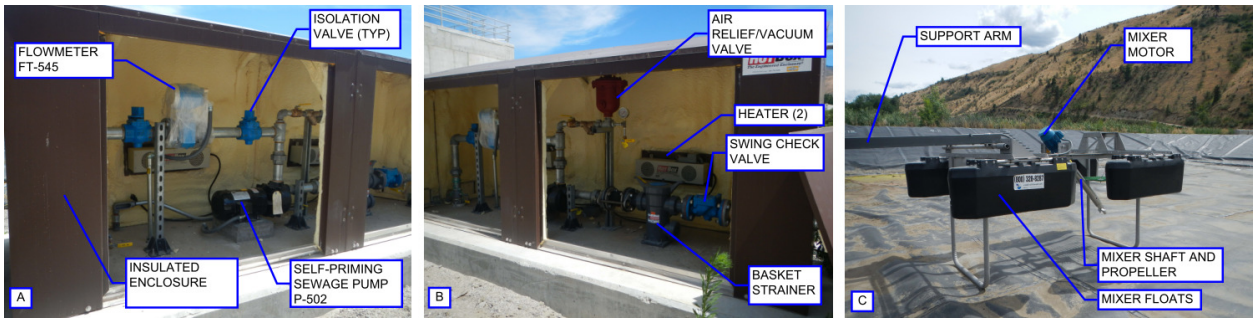


Figure 7-12 – Evaporation Pond Pump Station and Mixer

(A), (B) Evaporation pond pump station; (C) Evaporation pond floating mixer

The evaporation pond contains a floating mixer that is extended into the pond on a FRP support arm. The evaporation pond pump station sits on the northwest corner of the pond and pumps filtrate to the Headworks influent structure. The pond contains an overflow manhole with the overflow weir set at the pond liquid level of 5 feet. Overflow from the pond flows to the IPPS.

A local control panel is mounted to Unistrut adjacent to the pump station. **Table 7.5** lists the evaporation pond existing system components.

Table 7-5
Evaporation Pond System Components

Equipment	P&ID Tags	Location
Floating Aspirating Mixer	M-501	Evaporation Pond Mixer Arm
Self-priming Sewage Pump	P-502	Evaporation Pond Pump Station
Electromagnetic Flowmeter	Ft-545	Evaporation Pond Pump Station

Normal Operation - Filtrate Storage

Normal operation of the evaporation pond will occur during the months of March through May and July through October when filtrate and washwater from the belt filter press will be stored in the pond. An estimated average annual daily loading of 4,000 GPM of filtrate is expected to enter the pond under the 2012 design conditions and will increase to over 8,000 GPM by 2030.

The manual valve operation on the filtrate and sewer lines south of the Solids Handling Building will allow filtrate to run to the pond as shown in **Figure 7-13.**

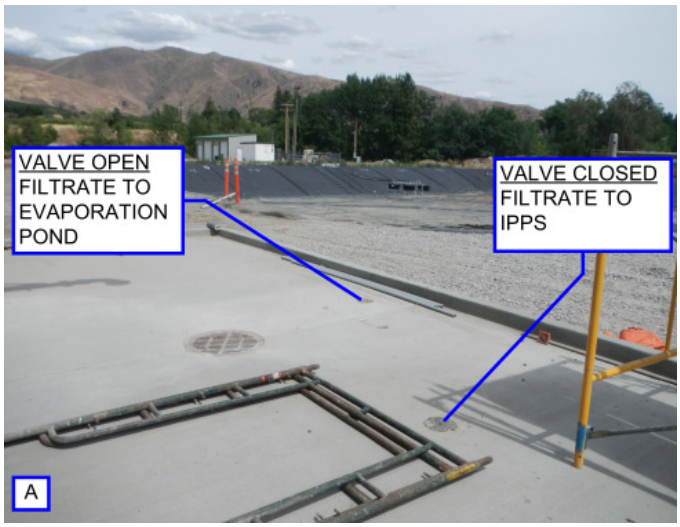


Figure 7-13 – Valve Orientation Photo – Manual valve orientation for directing Filtrate to the evaporation pond.

The operator will select the timeframe for pond storage, and pond withdrawal/return. During pond storage periods, the floating aspirating mixer will run continuously. Filtrate and washwater will be stored in the pond until it can be released back to the liquid stream via the pond pump station.

Alternate Operation – Filtrate Return

Returning filtrate to the liquid stream for discharge with the plant effluent will occur outside of the March through May and July through October timeframes. During this alternate operation of the pond, no new influent will be added to the pond. The operator will manually set the filtrate and sewage gate valves to force filtrate and washwater to run back to the IPPS from the BFP. The valve orientation is shown **Figure 7-14.**

Figure 7-14 – Valve Orientation Photo – Manual valve orientation for directing filtrate to the IPPS.

During this period, the pond pump station will be used to pump filtrate from the pond back to the Headworks influent structure. The plant operator will select the exact dates of pond pump station usage within the SCADA system. Pumping will produce a continuous flowrate (no VFD on pump) between 30 and 78 GPM. Filtrate flow will be monitored by the electromagnetic flowmeter (Ft-545) in the pump station enclosure.

Emergency Operation

The emergency generator is not sized for operation of either the floating aspirating mixer or the evaporation pond pump station during an outage of normal power to the plant. During a power outage, the pond should not experience any inflow of filtrate since the belt filter press will not be in operation.

The evaporation pond also functions as an emergency overflow should the IPPS fail. In this instance, sewage filling the IPPS would back up within the site sewer piping into MH-1.2, where it would overflow the manhole at elevation 750.00 feet and outfall into the pond. In the extreme event where the pond was at capacity, a secondary overflow of the weir in MH-1.2.1 set at 750.50 feet would allow the pond to overflow to a 12-inch pipe leading to the south side of the site where it daylights.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the evaporation pond can be found in the manufacturer's O&M manual as shown below:

- Floating Aspirating Mixer: **Appendix C, Volume 2**
- Self-priming Sewage Pump: **Appendix C, Volume 2**
- Plug Valves: **Appendix C, Volume 5**
- Electromagnetic Flow Meters: **Appendix C, Volume 11**
- Air Relief Valves: **Appendix C, Volume 5**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - Thickening System
  - Aerobic Digester System
  - Dewatering System
  - Evaporation Pond System

- *Standard Instrumentation and Equipment Descriptions*
  - Across the Line Starter
  - Flow Meter
  - Level Transmitter
  - Motor Actuated Valve
  - Oxidation Reduction Potential (ORP) Sensor
  - Pressure Switch
  - Solenoid Operated Valve
  - Variable Frequency Drive

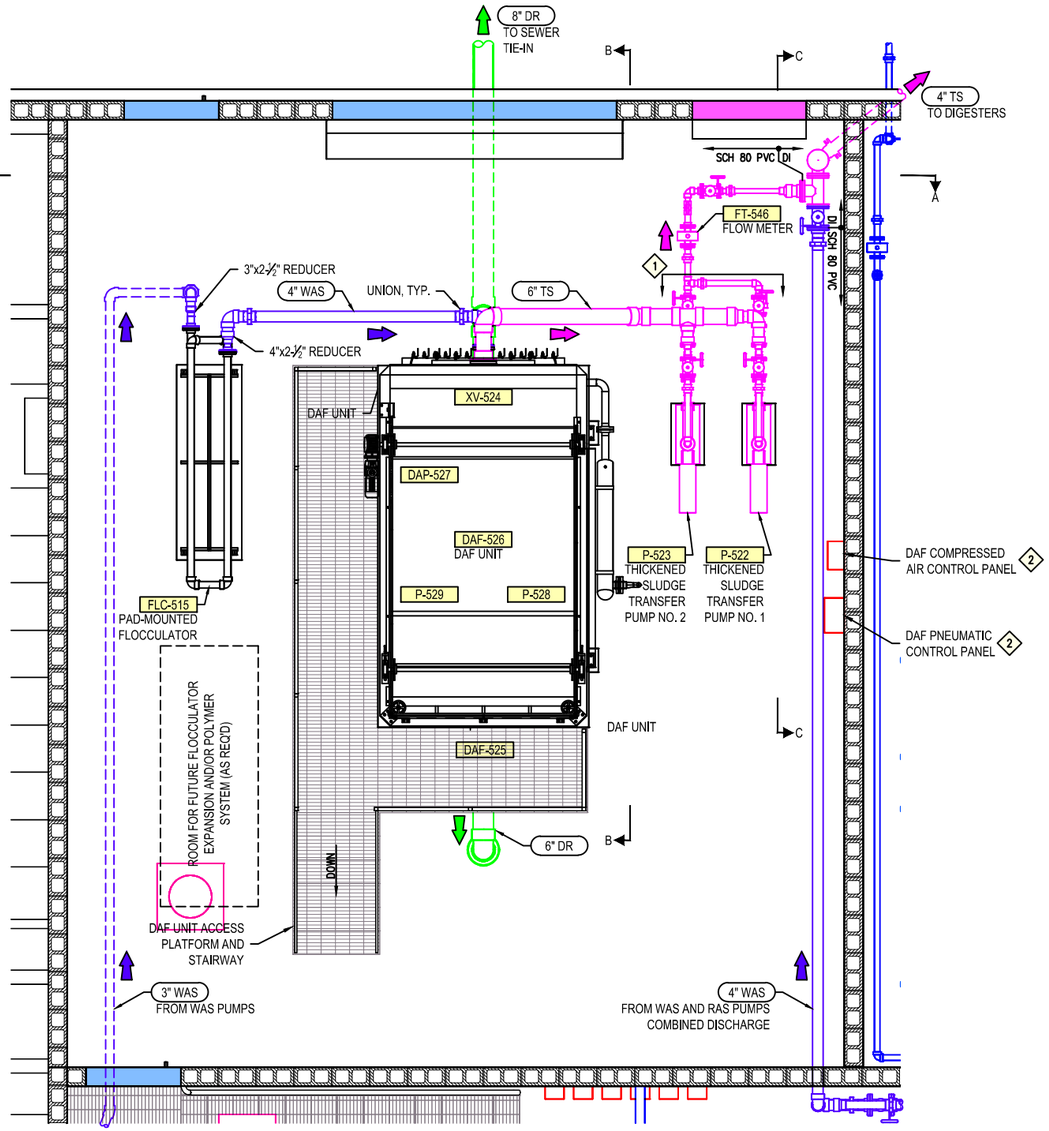
SAFETY

The primary safety concerns related to operation of the Solids and Residuals Handling systems are as follows:

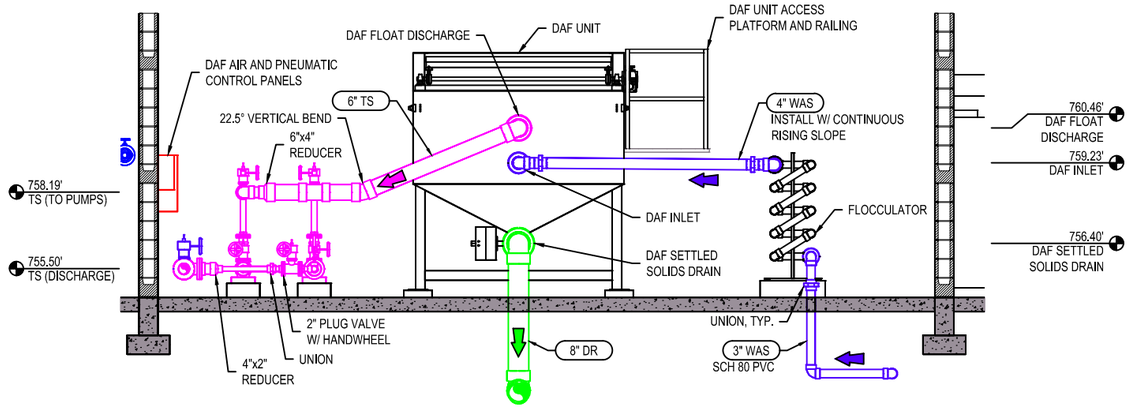
- Biological Hazards
- Fall Prevention
- Open Water Safety
- Gas Exposure
- Confined Space
- Electrical Hazards
- Personal Protective Measures
- Chemicals – Polymer
- DAF Unit Hazards
- BFP Hazards

For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to:

- Polymer usage can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 3.3.2
- Digesters can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 3.4
- Dewatering systems can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 3.5

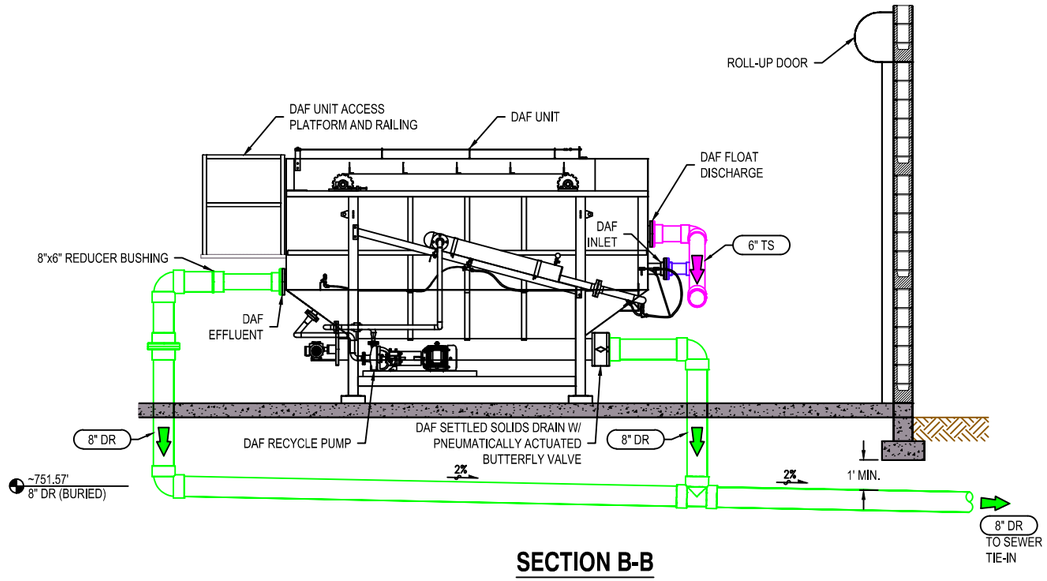


THICKENING ROOM - PARTIAL PLAN

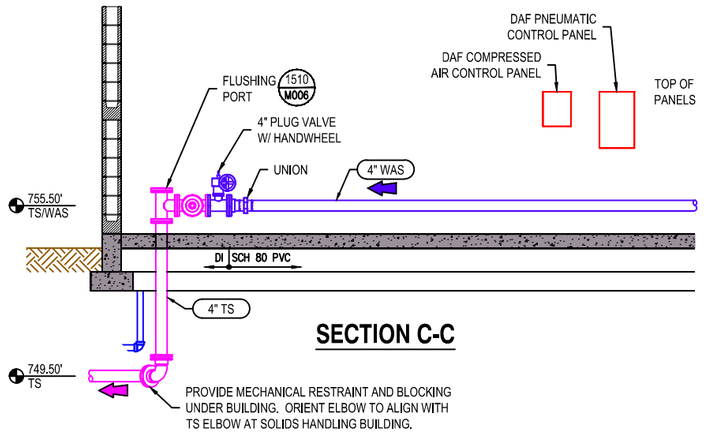


NOTE: NOT ALL OF DAF UNIT APPURTENANCES SHOWN IN THIS VIEW FOR CLARITY

SECTION A-A



SECTION B-B



SECTION C-C

THE HEART OF CASHMERE WASHINGTON

FIGURE 7-15
THICKENING SYSTEMS PLAN

RH2 ENGINEERS PLANNERS SCIENTISTS

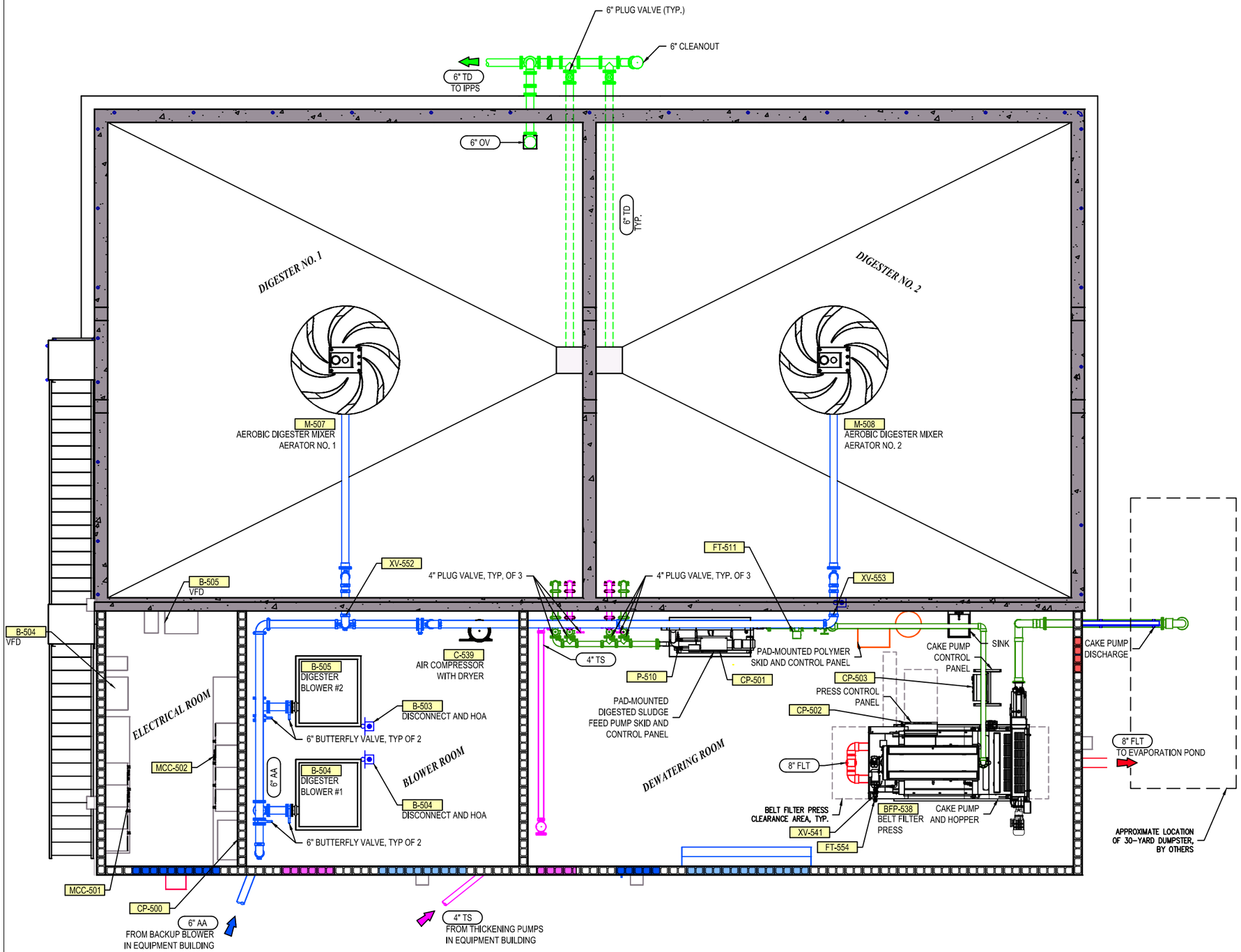
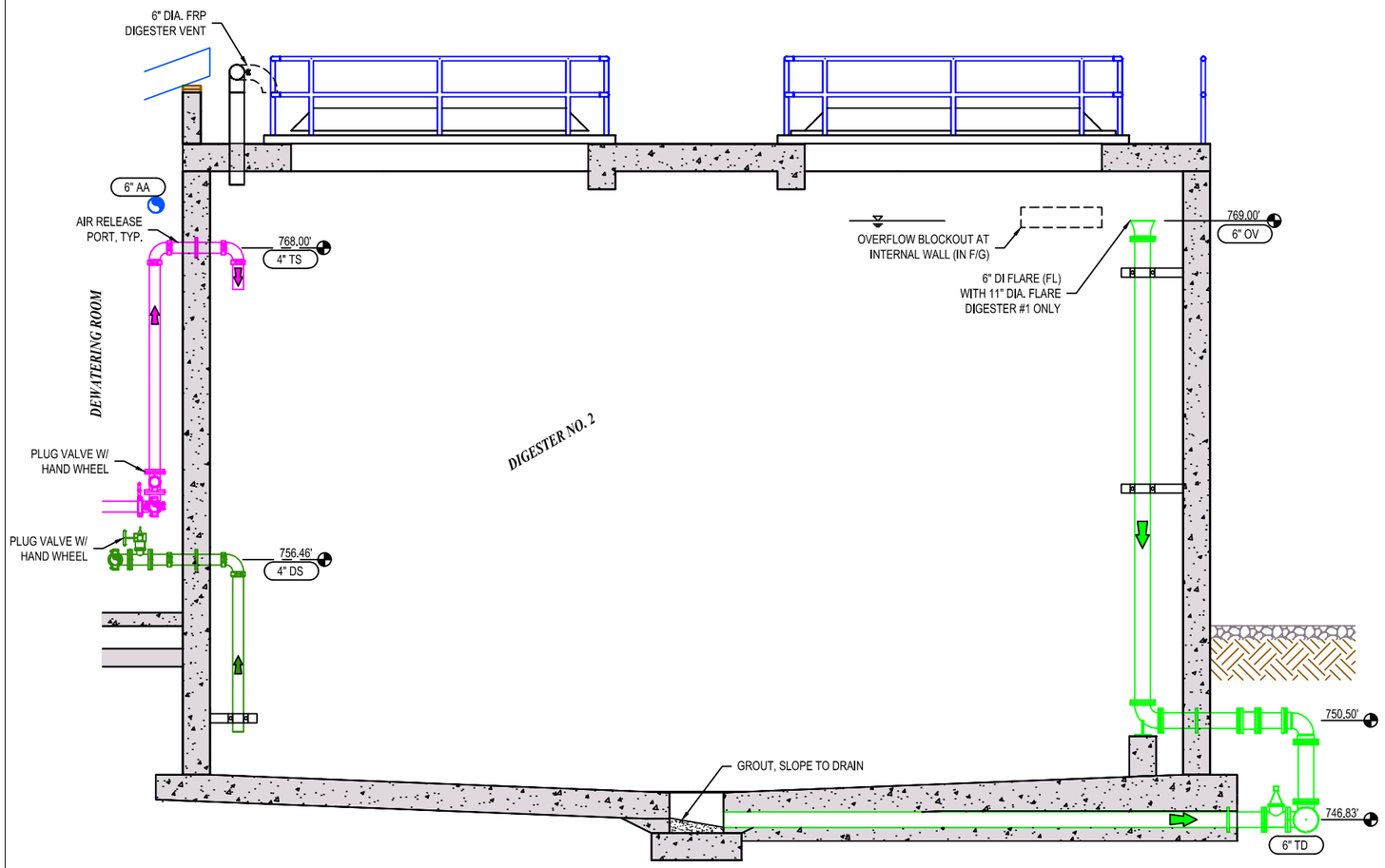
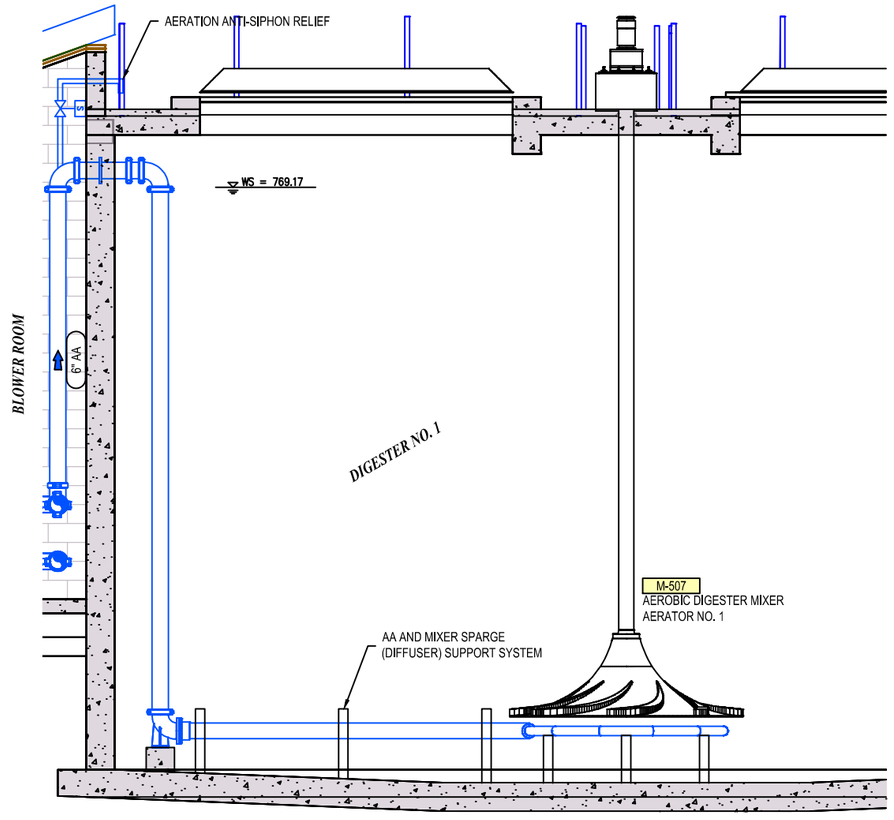


FIGURE 7-16
SOLIDS HANDLING BUILDING
FACILITY PLAN

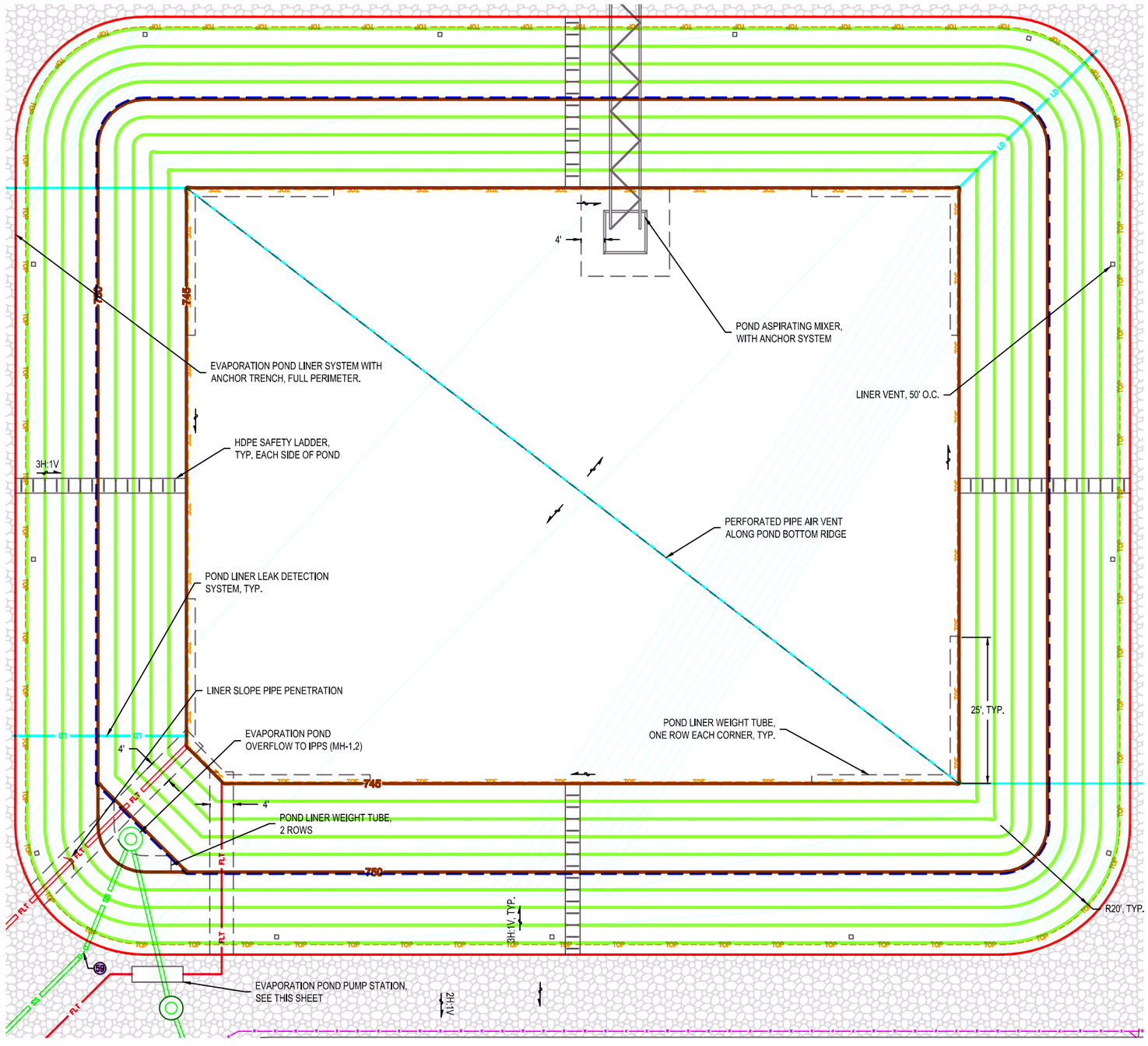


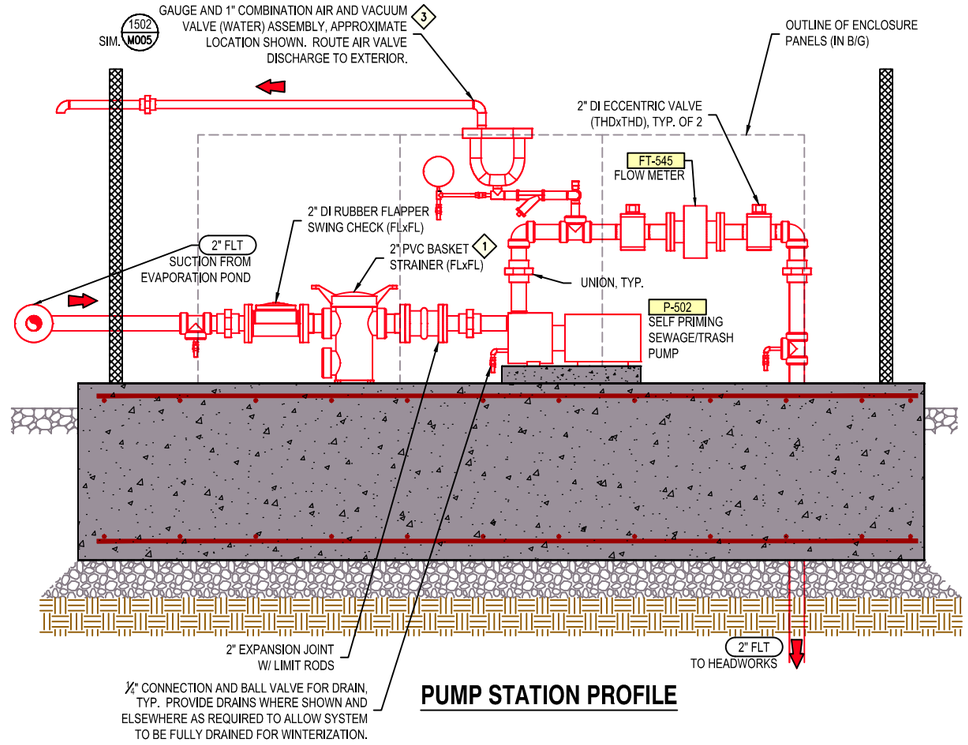
DIGESTER PROFILE



DIGESTER PROFILE

FIGURE 7-17
DIGESTER PROFILE





PUMP STATION PROFILE

FIGURE 7-18
EVAPORATION POND FACILITY PLAN

CHAPTER 8 – SUPPORT SYSTEMS

Figure 8-5 *at the end of this chapter shows the Non-potable water pump station plan.* ***Figure 8-6*** *shows the In-Plant Pump Station Plan.*

OVERVIEW

Various systems exist within the Wastewater Treatment Facility (WWTF) to support the primary operations. These systems are described in detail below.

PROCESS COMPONENTS – FUNCTION, OPERATION, TROUBLESHOOTING, AND PREVENTATIVE MAINTENANCE

The Routine Operation and Maintenance Checklist related to the support systems is located in ***Appendix F.***

Non-Potable Water Supply System

Description

The non-potable water (NPW) system (**Figure 8-1**) supplies recycled plant effluent water for use by the basin and clarifiers spray bars, utility stations, and equipment connections in each process building as well as for site irrigation usage. The NPW pump station consists of a packaged booster pump station in the Equipment Building Mechanical room which pumps directly from a concrete basin located in this room. Recycled plant effluent is supplied to this basin by gravity from the ultraviolet (UV) disinfection channel outfall sump. During periods of low effluent flow, the basin is supplied with potable water via the "low-flow" supply station. The "low-flow" supply station is controlled by the water level within the basin: at low water levels, a 2-inch float valve allows potable water to be discharged from the fire protection system directly into the basin.

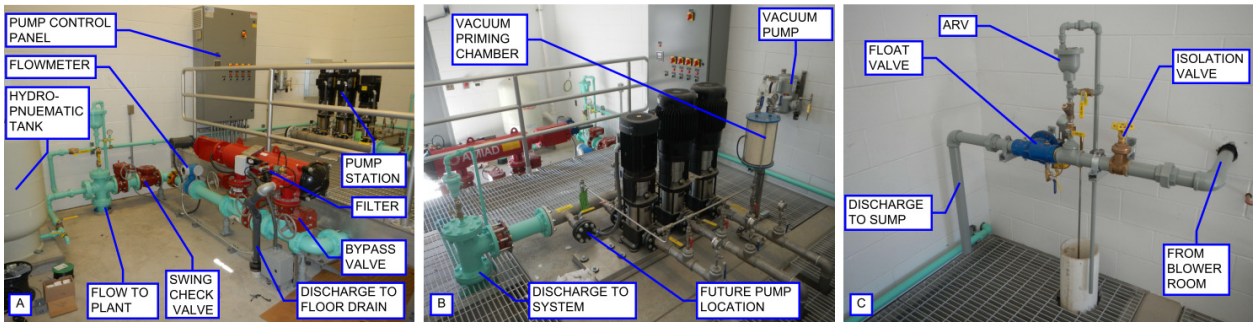


Figure 8-1 – Non-Potable Water Supply
(A) Automatic Self-cleaning Filter; (B) Non-potable Water Pump Station; (C) Low-flow Supply Station

The Grundfos Hydronix booster pump station consists of two 15 horse power (HP) and one 5 HP vertical multistage centrifugal pumps. Each pump is controlled by a variable frequency drive (VFDs) located in the pump control panel mounted adjacent to the pumps. The pump station has the capacity to provide 45 to 250 gallons per minute (gpm) at 80 pounds per square inch (psi). The pump station includes a

vacuum priming pump that is wall-mounted next to the pump station. The system also includes an 86-gallon floor-mounted hydro-pneumatic tank located in the Mechanical room.

To filter suspended solids from the recycled effluent water, an Amiad automatic self-cleaning filter is located directly downstream of the pump station. Solids are removed as the water passes through the internal screens of the filter. As solids collect on the screens, headloss increases. An integral pressure differential switch monitors the pressure drop across the screens (an indication of this headloss). As headloss increases, the drive unit will rotate the internal suction scanner, which removes solids buildup and discharges them through the exhaust valve. The screen continues to supply water through the cleaning cycle. The filter can also be bypassed by manually changing the butterfly valve alignment directly below the filter. The automatic filter local control panel is mounted within the Mechanical room.

The exposed NPW piping within the upper floor of the Headworks, basins, clarifiers, and Equipment Building Thickening room are insulated and heat traced. Wherever the NPW system enters a structure, a manually operated isolation valve exists on the NPW mainline.

Figure 8-1 illustrates the facility plan for the NPW pumping system. **Table 8-1** lists the NPW system components.

Table 8-1
Non-Potable Water Supply Components

Equipment	P&ID Tags	Location
Non-Potable Packaged Pump Station	None	Equipment Building Mechanical Room
Pump Station Control Panel	None	Equipment Building Mechanical Room
Vacuum Priming Pump	None	Equipment Building Mechanical Room
Automatic Self-Cleaning Filter	None	Equipment Building Mechanical Room
Automatic Self-Cleaning Filter Control Panel	None	Equipment Building Mechanical Room
Electromagnetic Flowmeter	Ft-449	Equipment Building Mechanical Room
Pressure Transmitter	Pt-451	Equipment Building Mechanical Room
Level Transmitter – Float	None	Equipment Building Mechanical Room
Level Transmitter – Submersible	Lt-450	Equipment Building Mechanical Room

Normal Operation

During normal operation of the NPW pump station, the operator will be able to manually call the pumps to run as well as set the pressure setpoint for the system via the pump station local control panel. The VFD associated with each pump will vary pump speed to maintain the set pressure (80 psi), as measured

at the pressure transmitter (Pt-451). The local control panel includes "soft" Hand-Off-Auto switches (HOAs) on the screen for each pump. The operator will also be able to remotely start and stop the pump station as well as change the pressure setpoint from the plant supervisory control and data acquisition (SCADA) system.

The vacuum priming system, consisting of a vacuum pump and priming chamber, will be called to run via the pump station local control panel. The purpose of this system is to maintain the prime for the pump station. The prime level is measured by a level sensor within the priming chamber. When priming is required, the vacuum pump removes air from the pump station suction lines in order to prime the pump station. The local control panel includes a HOA for the vacuum pump. In the "HAND" mode, the vacuum pump will run until the pump station is primed. In the "AUTO" mode, the vacuum system will be automatically controlled by the pump station control panel.

The operator will manually set the self-cleaning filter to run at its local control panel. The filter will run in "flush mode" until it is necessary to enter a "self-cleaning mode." The self-cleaning process is based on an operator-selected option: either the self-cleaning process can begin based on pressure differential due to solids buildup on the screens or based on a set time value. It there is a filter malfunction, the filter will enter the "malfunction mode" and alert the SCADA system of an error. The operator will be able to pause or reset the filter system remotely via the WWTF SCADA system.

Valves within the Mechanical room and throughout the NPW system will be operated by the operator manually.

Alternate Operation

Alternate operation of the NPW system may occur in the event that the self-cleaning filter needs to be taken out of service for maintenance. In this situation, the operator can manually re-align the butterfly valves beneath the filter to utilize the filter bypass.

Emergency Operation

The emergency generator (EG) is sized to run the NPW system during an outage of normal power to the plant. The operator will make manual changes to the system such as isolating the spray bars in either basin or clarifier that is not operating during a power outage.

Maintenance and Troubleshooting

The basin and clarifier NPW headers contain buried drain valves located where each NPW line enters the structure. These lines can be used to drain the exposed headers as necessary. The exposed NPW systems for the basins and clarifiers are also insulated and heat traced for winter operation.

The irrigation system, also supplied by NPW, will need to be isolated and "blown-out" to prevent freezing during winter months.

Detailed maintenance and troubleshooting procedures related to the non-potable water system can be found in the manufacturer's operation and maintenance (O&M) manuals as shown below:

- Packaged Pump Station: **Appendix C, Volume 1**
- Automatic Self-cleaning Filter: **Appendix C, Volume 5**
- Plug Valves: **Appendix C, Volume 5**
- Float Valves: **Appendix C, Volume 5**
- Level Sensor, Float-Style: **Appendix C, Volume 11**
- Level Sensor, Submersible-Style: **Appendix C, Volume 11**

In-Plant Pump Station

Description

The In-Plant Pump Station (IPPS) is located on the north side of the basins and consists of 60-inch diameter wet- and drywell manholes (**Figure 8-2**). The IPPS receives flow the tank drain lines (fed from the basin floor drains) as well as from the sanitary sewer lines (containing flow from equipment drains, floor drains, on-site sewage, and clarifier scum wasting).

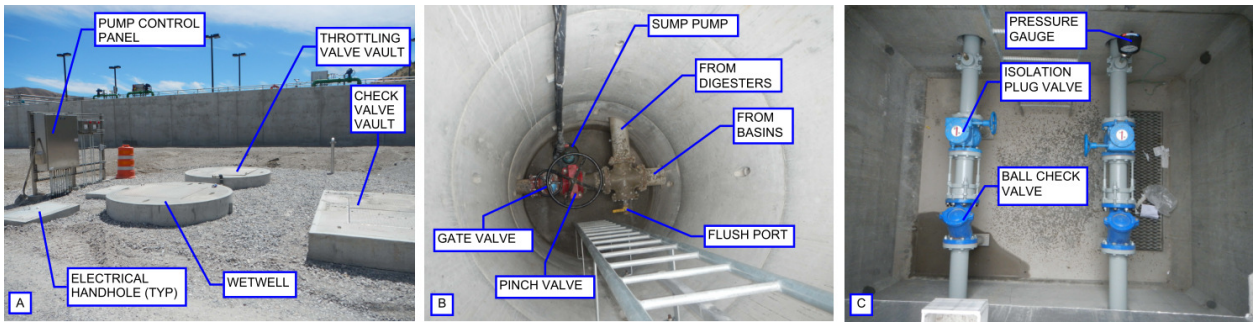


Figure 8-2 – In-Plant Pump Station
(A) IPPS; (B) IPPS Throttling Valve Vault; (C) IPPS Check Valve Vault

The wetwell contains two 4.7 HP 3-inch ABS XFP submersible pumps that are controlled by VFDs housed in the Equipment Building Electrical room. The pumps discharge to a single 6-inch forcemain running to the Headworks influent structure. Four float-style level transmitters are located in the wetwell at the following elevations:

- Pump stop – 737.00 feet
- Lead pump on – 739.00 feet
- Lag pump on – 739.50 feet
- Emergency high level – 742.50 feet

The wetwell contains an emergency overflow that, in a catastrophic event, allows flows to back up the sanitary sewer system and overflow to the evaporation pond.

The IPPS drywell serves as a throttling valve vault in the event that either the basins or the digesters are drained to the IPPS. The tank drain lines from both of these structures combine in the drywell, where

they pass through a pinch valve and a gate valve prior to discharging to the IPPS. The pinch valve will serve as a "throttling" valve to control flow into the IPPS. The gate valve serves to isolate the tank drain system from the IPPS wetwell.

The two submersible pumps discharge into dual 4-inch forcemains that run through the check valve vault adjacent to the wetwell; the two lines combine into a single 6-inch forcemain downstream of the vault. The check valve vault includes a ball check valve, plug valve, and pressure gauge for each 4-inch line.

A local pump control panel and disconnect switches for each pump is located on a unitstrut rack adjacent to the IPPS structures. Power and control to the IPPS are fed from the Equipment building.

A list of IPPS system components are shown in **Table 8-2**.

Table 8-2
In-Plant Pump Station Components

Equipment	P&ID Tags	Location
Submersible Sewage Pumps	P-707, P-708	IPPS Wetwell
Level Transmitter – Flow	Ls-705A, Ls-705B, Ls-705C, Ls-705D	IPPS Wetwell
Sump Pump	None	IPPS Throttling Valve Vault
Level Transmitter – Submersible	Lt-706	IPPS Wetwell

Normal Operation

During normal operation, the IPPS will be controlled by the plant SCADA system in "low-flow mode." The IPPS mode of operation is triggered by the total calculated flow to the Headworks influent structure. Low-flow mode will occur when the influent structure is receiving flows below 2,430 gpm. During this period, the IPPS will be able to pump at maximum capacity to the influent structure. During the normal IPPS operation of low-flow mode, the IPPS pumps will be turned on at the low-flow lead/lag levels. The "pump off" level will be held constant.

The operator may manually designate the lead pump at the HMI; the SCADA system will automatically vary lead/lag pumps to allow even starts/stops and run times for both pumps.

Pump speed will be varied by each pump's VFD based on the total allowable flow to the Headworks influent structure. During low-flow mode, the IPPS will be run at 100 percent capacity when called to run.

Alternate Operation

The alternate form of IPPS operation will be "high-flow mode." The IPPS mode of operation is again triggered by the total calculated flow to the Headworks influent structure – high flow mode will occur at influent flows above 2,430 gpm. During high-flow mode, the IPPS pumps will be turned on at the high-flow lead/lag levels. The "pump off" level will be held constant.

During high-flow mode, pump speed will again be varied by each pump's VFD based on the total allowable flow to the Headworks influent structure. The maximum Headworks allowable influent flowrate is 2,430 GPM. The allowable discharge to the influent structure will be 2,430 GPM less the current influent structure influent flowrate. The IPPS pump VFDs will seek to maintain this flowrate, as monitored by the 6-inch force main electromagnetic flowmeter at the influent structure.

Emergency Operation

The EG is sized to run a single IPPS submersible pump during an outage of normal power to the plant. The maximum capacity of the IPPS will be limited to 150 gpm. The operator must be aware of this when operating equipment during an outage of normal power to the plant and should be aware of each piece of equipment contributes flow to the IPPS during a power outage:

- Grit cyclone and classifier (not typically used during a short outage of power)
- DAF unit (not typically used during a short outage of power)
- Clarifier surface scum system

Other flows to the IPPS that can be alleviated by operator conservation during a power outage are sanitary sewer flows from the Administration building and floor drain flows due to washdown.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the IPPS components can be found in the manufacturer's O&M manuals as shown below:

- Submersible Pumps: **Appendix C, Volume 2**
- Sump Pump: **Appendix C, Volume 1**
- Plug Valves: **Appendix C, Volume 5**
- Pinch Valves: **Appendix C, Volume 5**
- Level Sensor, Float-Style: **Appendix C, Volume 11**
- Level Sensor, Submersible-Style: **Appendix C, Volume 11**

Administration Building

Description

Located on the north side of the site, the Administration building (**Figure 8-3**) houses the WWFT office rooms, and network equipment, Conference room, Laboratory (discussed in Laboratory Section of this chapter), and restrooms.

Figure 8-3 – Administration Building

The Administration building contains two offices with a single computer and furniture set up for single operator usage. The Conference room contains a conference desk and 42-inch monitor with touch-screen overlay for operation of the SCADA system. This room also contains the small kitchen area.

The control station is located adjacent to the conference room and includes the control desktop computer. The networking room, located in the northwest corner of the building, contains the server rack and remote operator interface (I/O) panel and autodialer.

The Administration building includes male and female restrooms, both with single showers. Lockers for each operator are located in the restrooms, as well as in the Mud room of the Administration building. A stackable washer/dryer is also located in the Mud room. A third handicap restroom is located off the conference room.

The building's heating, ventilation, and air conditioning (HVAC) equipment, hot water tank and lighting panel are located in the Mechanical room. The HVAC system consists of the air handler unit within the Mechanical room, heat pump located on the north side of the building, ducting above the drop ceiling of the building, and a digital thermostat located in the Conference room.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the Administration building components can be found in the manufacturer's O&M manuals as shown below:

- Network and Computer Equipment: **Appendix C, Volume 10-11**
- Residential Appliances: **Appendix C, Volume 5**
- HVAC Equipment (all buildings): **Appendix C, Volume 5**
- Security Cameras: **Appendix C, Volume 10**
- IPads: **Appendix C, Volume 10**
- Flat Screen/Touch Screen Overlay: **Appendix C, Volume 10**

Laboratory

Description

Located on the east side of the Administration building, the Laboratory houses the equipment necessary for the operator to perform the quantitative testing required for plant operation. The Laboratory includes the following major pieces equipment:

- Muffle Furnace
- Drying Oven
- Dessicator
- Steroclave
- Water Bath Incubator
- Microscope
- Analytical Balance
- Spectrophotometer
- Glassware Washer
- Refrigerator
- Type II Water System
- Fume Hood and Exhaust Fan

The laboratory furnishings include laboratory casework, sinks, a work desk and safety shower and eyewash fed with tepid water via the thermostatic mixing valve within the Mechanical room.

Laboratory testing will be completed as required for regulatory compliance as well as to verify plant operation. The tests listed in **Table 8-3** are expected to occur regularly during plant operation.

Table 8-3
Wastewater Monitoring

Wastewater Influent				
Parameter	**Units**	**Minimum Sampling Frequency**	**Sample Type**	**Sample Location**
BOD	mg/L	2/week	24-hr composite	Inf. Structure
COD	mg/L	5/week	24-hr composite	Inf. Structure
TSS	mg/L	5/week	24-hr composite	Inf. Structure
VSS	mg/L	5/week	24-hr composite	Inf. Structure
Alkalinity	mg/L	1/week	24-hr composite	Inf. Structure
Total Hardness	mg/L	1/week	24-hr composite	Inf. Structure
Nitrate	mg/L	1/week	24-hr composite	Inf. Structure
TKN	mg/L	3/week	24-hr composite	Inf. Structure
Total Ammonia	mg/L	3/week	24-hr composite	Inf. Structure
Total Phosphorus	mg/L	3/week	24-hr composite	Inf. Structure
Soluble Phosphorus	mg/L	3/week	24-hr composite	Inf. Structure
FOG	mg/L	1 per 2 weeks	24-hr composite	Inf. Structure
Total Flow (From City only)	MGD	7/week	On-line Measurement	Inf. Structure
pH	Std. Units	5/week	Grab	Inf. Structure
Temperature	°C	7/week	Grab	Inf. Structure
Conductivity	mmhos/cm	1/week	Grab	Inf. Structure
DO	mg/L	5/week	Grab	Inf. Structure

Wastewater Effluent				
Parameter	**Units**	**Minimum Sampling Frequency**	**Sample Type**	**Sample Location**
BOD	mg/L	2/week	24-hr composite	End of UV
COD	mg/L	5/week	24-hr composite	End of UV
TSS	mg/L	5/week	24-hr composite	End of UV
VSS	mg/L	5/week	24-hr composite	End of UV
Alkalinity	mg/L	1/week	24-hr composite	End of UV
Total Phosphorus	mg/L	3/week	24-hr composite	End of UV
Soluble Phosphorus	mg/L	3/week	24-hr composite	End of UV
TKN	mg/L	3/week	24-hr composite	End of UV
Total Ammonia	mg/L	3/week	24-hr composite	End of UV
Nitrate	mg/L	1/week	24-hr composite	End of UV
Nitrite	mg/L	1/week	24-hr composite	End of UV
Flow	MGD	Daily Average	Measurement	End of UV
pH	Std. Units	5/week	Grab	End of UV
DO	mg/L	5/week	Grab	End of UV
Temperature	°C	1/day	Grab	End of UV
Fecal Coliform	Org./100 ml	2/week	Grab	End of UV
% Transmittance	%	5/week	Grab	End of UV

Process Wastewater - Basins, Clarifiers, DAF				
Parameter	**Units**	**Minimum Sampling Frequency**	**Sample Type**	**Sample Location**
Soluble Phosphorus*	mg/L	2/week	Grab	AN
Ammonia**	mg/L	1/week	Grab	Ax2
Ammonia**	mg/L	2/week	Grab	Ox3
Nitrate**	mg/L	2/week	Grab	Ax2
Nitrate**	mg/L	2/week	Grab	Ox3
ORP ** (record time of day)	mV	2/week	Grab	Ax2
Time of day for P, NO3, ORP - sample all at approx 11 am		2/week	Grab	
MLSS	mg/L	5/week	Grab	Basins
MLVSS	mg/L	5/week	Grab	Basins
MLSS	mg/L	5/week	Grab	RAS
MLVSS	mg/L	5/week	Grab	RAS
MLSS	mg/L	5/week	Grab	TWAS
MLVSS	mg/L	5/week	Grab	TWAS
SVI	ml/g	5/week	Grab	Basins
Settlometer (30 min)	ml	5/week	Grab	Basins
Desc. of Supernatant		5/week		
pH	Std. Units	5/week	Grab	Basins
Sludge Blanket Depth	ft	5/week	Grab	Clarifiers
Temperature	°C	5/week	Grab	Basins
ORP (record time of day)	mV	5/week	Grab	AN
Time of Day		5/week		

* Filter immediately, record time of day

** Filter immediately, record ORP at Ax2 at same time

Process Wastewater - Aerobic Digesters

Parameter	Units	Minimum Sampling Frequency	Sample Type	Sample Location
Temperature	°C	5/week	Grab	Digester #1
Level	ft	5/week	Grab	Digester #1
pH	Std. Units	5/week	Grab	Digester #1
Time of Day				
ORP*	mV	2/week	Fixed Probe	Digester #1
Total Ammonia* After air has been OFF	mg/L	2/week	Grab	Digester #1
Nitrate* After air has been OFF	mg/L	2/week	Grab	Digester #1
Total Ammonia* After air has be ON	mg/L	2/week	Grab	Digester #1
Nitrate* After air has been ON	mg/L	2/week	Grab	Digester #1
Temperature	°C	5/week	Grab	Digester #2
Level	ft	5/week	Grab	Digester #2
pH	Std. Units	5/week	Grab	Digester #2
Time of Day				
ORP*	mV	2/week	Fixed Probe	Digester #2
Total Ammonia* After air has been OFF	mg/L	2/week	Grab	Digester #2
Nitrate* After air has been OFF	mg/L	2/week	Grab	Digester #2
Total Ammonia* After air has be ON	mg/L	2/week	Grab	Digester #2
Nitrate* After air has been ON	mg/L	2/week	Grab	Digester #2

* Record ORP at same time

CrunchPak

Parameter	Units	Minimum Sampling Frequency	Sample Type	Sample Location
Starting Tank Level	ft	3/week	SCADA	SCADA
COD	mg/L	3/week	24-hr composite	Sampler
pH	Std. Units	3/week	Grab	Grab off Tank
BOD (by City off Tank)	mg/L	1/week	Grab	Grab off Tank
BOD (by Cascade off Tank)	mg/L	1/week	Grab	Grab off Tank
BOD (by City off Composite)	mg/L	1/week	24-hr composite	Sampler
BOD (by Cascade off Composite)	mg/L	1/week	24-hr composite	Sampler
Total Phosphorus	mg/L	1/week	24-hr composite	Sampler

At a minimum, testing documentation must include the following:

- Type of testing
- Time of testing
- Quantity of sample(s)
- Point from where the sample was obtained
- Frequency of sampling and testing

The testing intervals required to meet regulatory compliance are listed within the NPDES permit (**Appendix C**).

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures related to the Laboratory components can be found in the manufacturer's O&M manuals as shown follows:

- Laboratory Equipment **Appendix C, Volume 5**

Power Supply

Description

The WWTF is powered from a 750 kilo-volt amps (KVA), 3-phase, 480 Volt utility transformer which is located east of the maintenance building. A 1,200 Amp Primary Service is fed from the utility transformer to the Low Voltage Utility Switchboard, which is located inside the Equipment Building Electrical room. The Low Voltage Utility Switchboard supplies power to two 600 Amp automatic transfer switches. Each automatic transfer switch connects roughly half of the plant's loads to either the Utility Power Service, or the EG.

The EG (**Figure 8-4**) is rated to provide up to 350 kilo-watts (kW), and can supply each automatic transfer switch with no more than 400 Amps. The EG is not capable of operating the entire plant. When the EG is supplying power to the plant, non-essential loads must be turned off. The SCADA system will

automatically shut down non-essential motors and processes when the plant is operated on generator power.

Automatic Power Switch "ATS-401" supplies power to Equipment building Power Distribution Panel No. 1 "DP-401," which feeds Equipment building Motor Control Center No. 1 "MCC-401," Headworks MCC No. 1 "MCC-101," and Solids Handling MCC No. 1 "MCC-501." Equipment Power Distribution Panel No. 1 "DP-401," also supplies power to Distribution Panel "DP-601." Distribution Panel "DP-601" powers the Administration building lighting panel "LP-601," and the Maintenance building lighting panel "LP-602."

Automatic transfer switch "ATS-402" supplies power to Equipment Power Distribution Panel No. 2 "DP-402," which feeds Equipment building MCC No. 2 "MCC-402," Headworks MCC No. 2 "MCC-102," and Solids Handling MCC No. 2 "MCC-502.

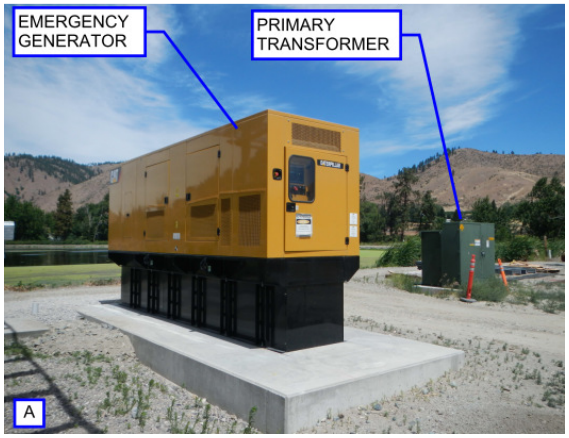


Figure 8-4 – Emergency Generator

Table 8-4 Lists loads to be operated on generator power.

Table 8-4
Loads Operated on Generator Power

System	Essential Loads Powered by Emergency Generator Description	Alternate Loads (Select in SCADA)

Headworks	Fine Screen No. 1	Fine Screen No. 2
	Grit Unit	None
	Grit Pump	None
Aeration Basins	Basin 1 Recycle Pump	Basin 2 Recycle Pump
	Basin 1 AN Mixer	Basin 2 AN Mixer
	Basin 1 AX1 Mixer	Basin 2 AX1 Mixer
	Basin 1 AX2 Mixer	Basin 2 AX2 Mixer
	Basin 1 AX3 Mixer	Basin 2 AX3 Mixer
	Basin 1 OX3 Mixer	Basin 2 OX3 Mixer
	Aeration Blower 1	Aeration Blower 2, 3, or 4
Clarifiers	Clarifier No. 1 Mechanism	Clarifier No. 2 Mechanism
UV Disinfection	UV System No. 1	UV System No. 2
RAS	RAS Pump No. 1	RAS Pump No. 2
Solids Handling	DAF Unit Skimmer	None
	DAF Unit Auger	None
	DAF Unit Air Compressor	None
	DAF Unit Recycle Pump	None
	Thickened Sludge Transfer Pump No.1	Thickened Sludge Transfer Pump No. 2
Aerobic Digesters	Aerobic Digester No. 1 Mixer	Aerobic Digester No. 2 Mixer
	Aerobic Digester Blower No. 1	Aerobic Digester Blower No. 2
Other Systems	In Plant Pump Station Pump No. 1	In Plant Pump Station Pump No. 2
	NPW Pump System	None
	MCC-101 Lighting Loads (LP-101)	None
	MCC-102 Lighting Load (LP-102)	None
	Grit Room Duct Heater	None
	Mechanical Room Duct Heater	None
	Headworks Radiant Heaters	None
	Headworks Misc. Actuators and Fans	None
	MCC-401 Lighting Load (LP-401)	None
	MCC-402 Lighting Load (LP-402)	None
	Equipment Building Misc. Actuators and Fans	None
	Equipment Building Heating Load	None
	MCC-501 Lighting Load (LP-501)	None
	MCC-502 Lighting Load (LP-502)	None
	Solids Handling Heater	None
	Solids Handling Misc. Control Panels	None
	Administration Building Loads (LP-601)	None
	Maintenance Building Loads (LP-602)	None

Normal Operation

During normal operation the plant will be powered from the utility transformer. Both automatic transfer switches will be in the “Utility” position.

Emergency Operation

During a failure of utility power to the plant, the EG will start automatically. The automatic transfer switches will move to the "Emergency" position. When the plant is transferred to generator power, the SCADA system will start essential motors.

Alternate Operation

When the plant is operated on generator power, non-essential loads may be called to run manually, provided that the generator has the additional capacity necessary to operate the non-essential load. The generator available capacity can be obtained from the SCADA system at the HMI computer.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the plant power supply can be found in the manufacturer's O&M manuals as follows.

- Transformers: **Appendix C, Volume 6**
- Surge Protection Device: **Appendix C, Volume 6**
- Switchboard: **Appendix C, Volume 6**
- Branch Circuit Panelboard: **Appendix C, Volume 6**
- Emergency Generator: **Appendix C, Volume 6**
- Automatic Transfer Switch**:** **Appendix C, Volume 6**

SCADA System

Description

The SCADA system monitors and controls the operation of the plant. Monitoring and control functions associated with each system are discussed along with each system in this manual.

The SCADA system consists of a Human-Machine Interface (HMI) computer, four Remote Telemetry Units (RTUs), a remote I/O panel and network cables.

The HMI computer is located in the Administration Building control room. The HMI computer consists of a primary server, a backup server, a monitor, keyboard, and mouse. The HMI computer is the plant's primary plant control and operations hub. The Administration Building also houses the Administration building remote I/O panel, "CP-600," which is connected to the building's intrusion and smoke alarms, as well as an autodialer, which will notify employees of high priority SCADA system alarms.

RTU "CP-100" is located in the Headworks building. RTU "CP-400" is located in the Equipment building. RTU "CP-500" is located in the Solids Handling building. RTU "CP-700" is mounted on the IPPS equipment pedestal. Each RTU contains a Programmable Logic Controller (PLC), Operator Interface screen an Ethernet/fiber optic switch and terminal blocks for connections to field wiring. The RTUs communicate with motor drives, motor control centers (MCC), and miscellaneous control panels over Ethernet. A fiber optic control network connects the RTUs to Primary Ethernet/Fiber Optic switch near the HMI computer. The Equipment building RTU "CP-400" also contains a 450 MHz radio system, which is used to communicate with the City Lift Station, West Lift Station and WWTF.

Normal Operation

During normal operation, the SCADA system will provide monitoring and control of plant system as described with the individual system descriptions of this manual, as well as **Appendix G**.

Emergency Operation

The HMI computer and RTUs are all connected to essentially powered circuits. In addition, Uninterruptable Power Supplies are provided the RTUs for up to 24 hours, should the AC power supply to the panel fail.

The fiber optic network connected the RTUs to the HMI computer is configured in a ring, so that disruption of any single fiber optic cable will not disable communications to and RTU.

Maintenance and Troubleshooting

Detailed maintenance and troubleshooting procedures for the backup plant power supply can be found in the manufacturer's O&M manuals as follows.

- Panels: **Appendix C, Volume 12**
- Motor Control Centers: **Appendix C, Volume 7-8**
- Variable Frequency Drives**:** **Appendix C, Volume 9**

PROCESS MONITORING AND CONTROL

SCADA system monitoring and control have been discussed throughout this chapter. Additional detail is provided in **Appendix G.** The sections of **Appendix G** which are directly related to this chapter include:

- *System Descriptions*
  - In Plant Pump Station (IPPS)
  - Non-Potable Pump Station (Contained in the Disinfectant and Effluent Metering section)

- *Standard Instrumentation and Equipment Descriptions*
  - Float Switch
  - Flow Meter
  - Level Transmitter
  - Variable Frequency Drive

SAFETY

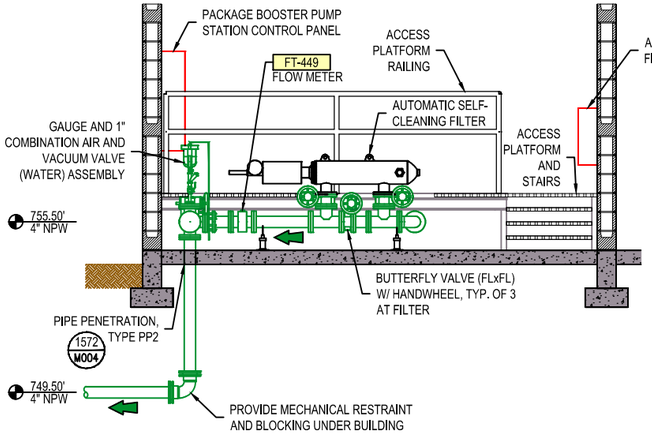
The primary safety concerns related to operation of the plant support systems are as follows:

- Biological Hazards
- Fall Prevention

- Open Water Safety
- Gas Exposure
- Confined Space
- Electrical Hazards
- Personal Protective Measures

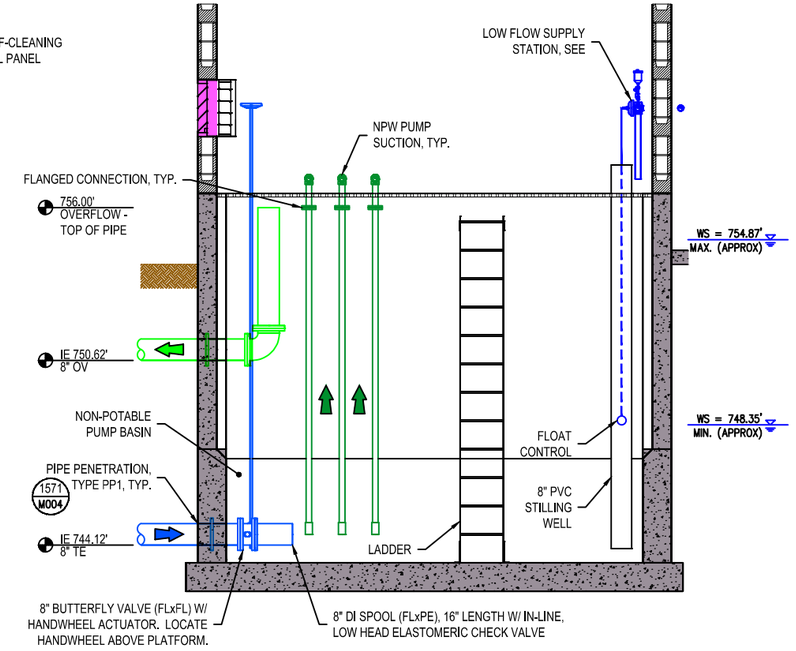
For general safety protocols related to each item listed, refer to **Appendix E** of this manual. Further detail related specifically to:

- Wet- and drywells can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 2.1 and Chapter 6, Section 3.0
- Laboratory safety can be found in the Water Environment Federation (WEF) *Safety, Health and Security in Wastewater Systems Manual,* Chapter 4, Section 5.0



SECTION A-A

3/8" = 1'-0"



SECTION B-B

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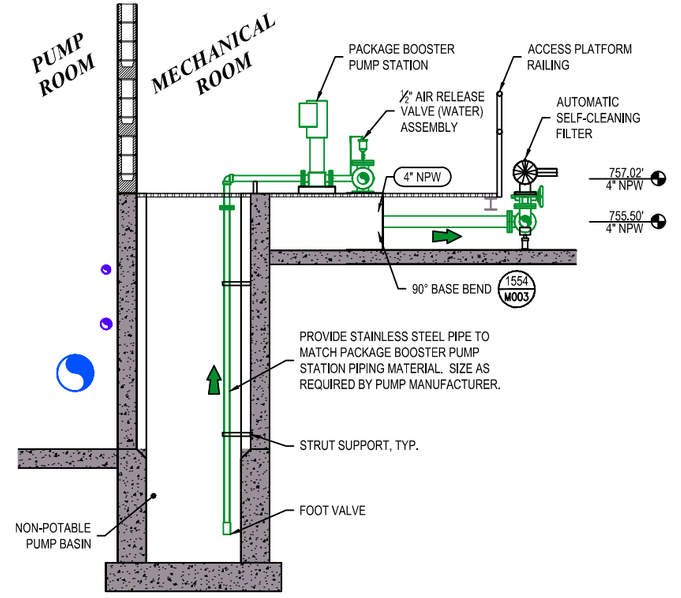

SECTION C-C

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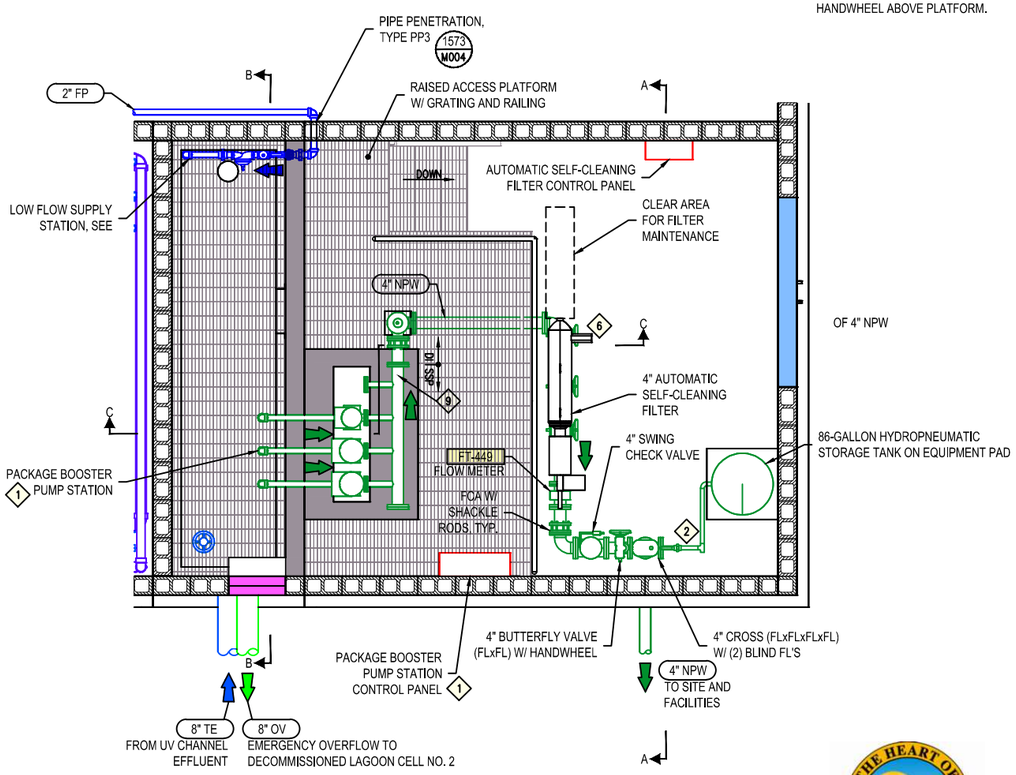
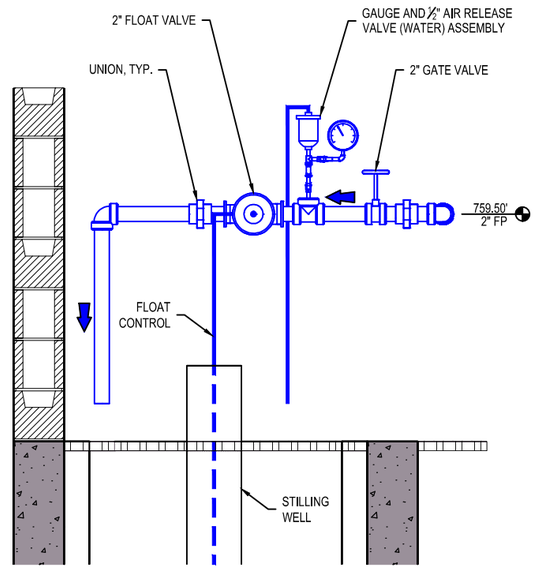


MECHANICAL ROOM - PARTIAL PLAN

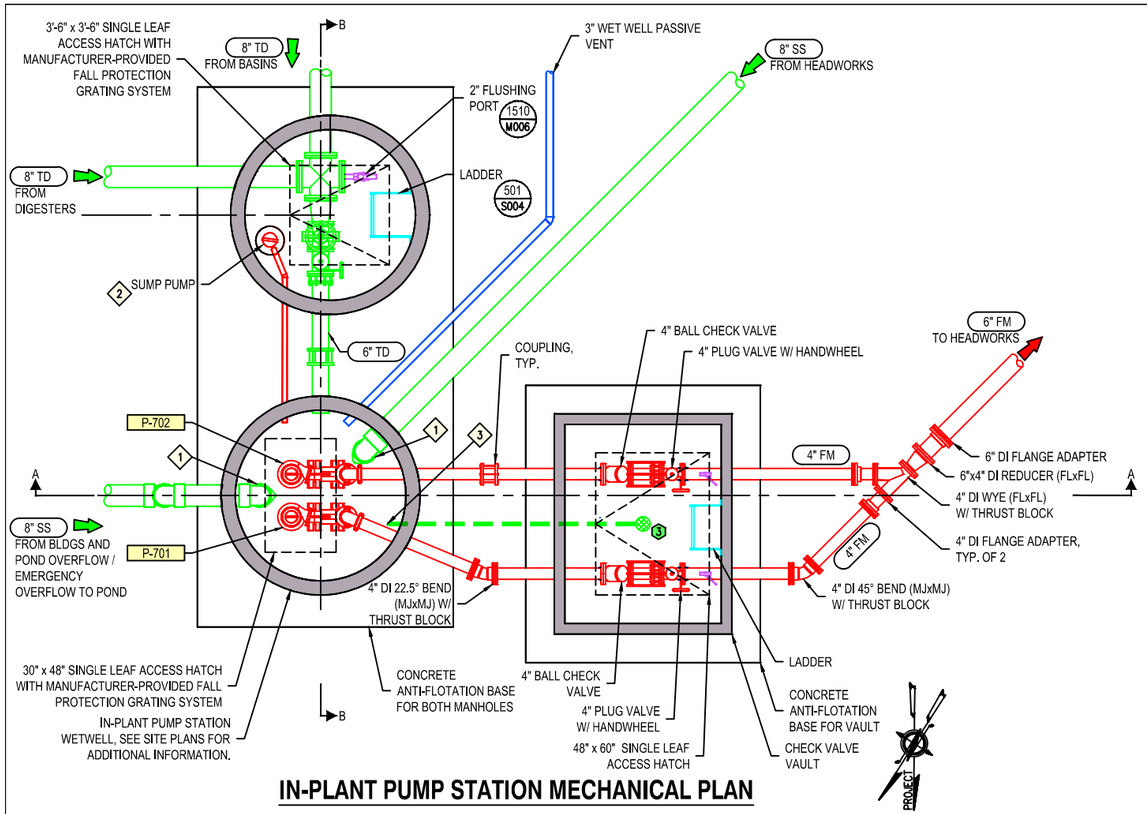
3/8" = 1'-0"



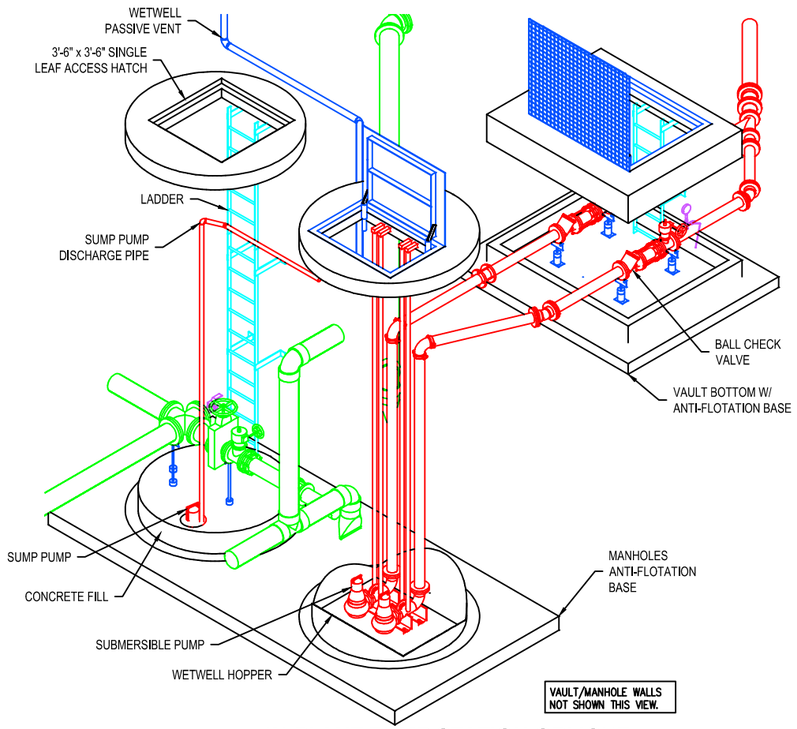
LOW FLOW SUPPLY STATION DETAIL

1" = 1'-0"

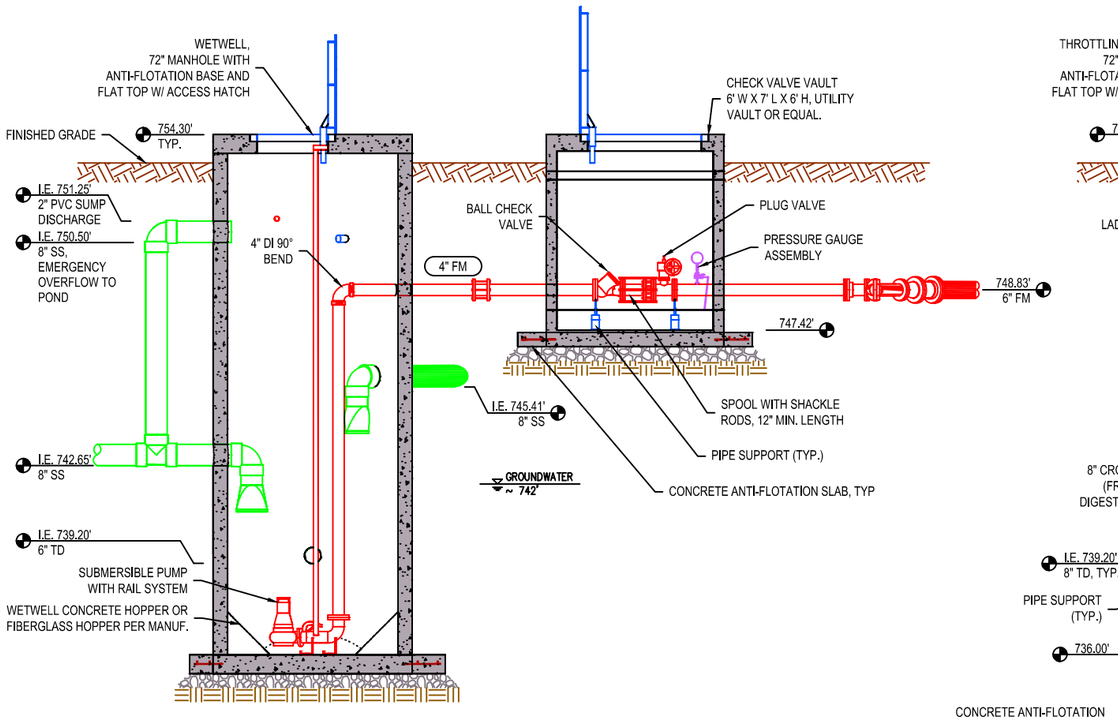
FIGURE 8-5
NON-POTABLE WATER SYSTEM



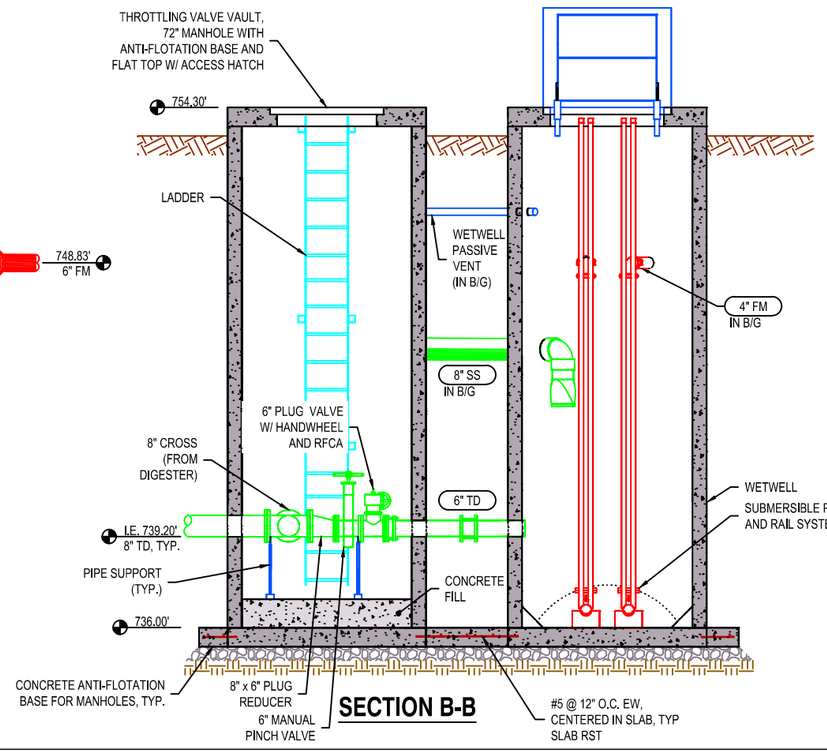
IN-PLANT PUMP STATION MECHANICAL PLAN



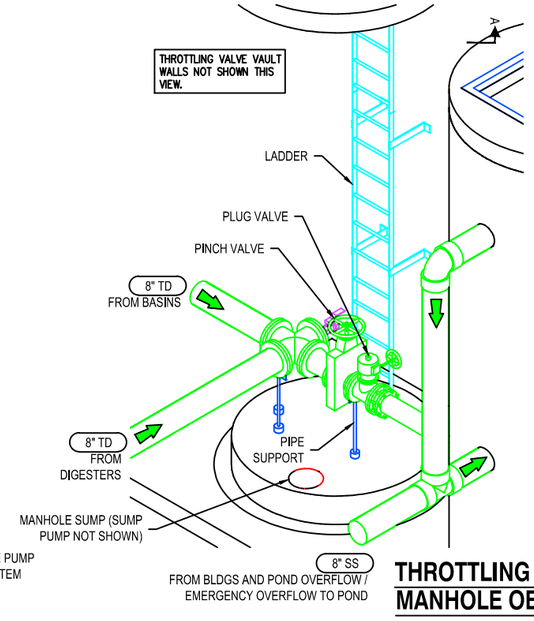
IN-PLANT PUMP STATION OBLIQUE



SECTION A-A



SECTION B-B



THROTTLING VALVE MANHOLE OBLIQUE

FIGURE 8-6
IN-PLANT PUMP STATION FACILITY PLAN

Appendix A
Standard Operating Procedures

SYSTEM STANDARD OPERATING PROCEDURES

1. Influent Pumping and Fine Screens
2. Vortex Grit Removal
3. Headworks Flow Splitting and Equalization Basin
4. Bardenpho and Aeration
5. MLSS Recycle Pump
6. Secondary Clarifier and RAS
7. Ultraviolet Light Disinfection
8. DAFT and WAS Pumping
9. Aerobic Digestion, Thickening Transfer Pumps, Aeration
10. Belt Filter Press and Dewatering Transfer Pump

INDIVIDUAL STANDARD OPERATING PROCEDURES

1. General Equipment ON/OFF, Start-up and Shut-down
2. Basin or Digester Draining
3. Switching Online Basins
4. Switching Online Clarifiers
5. UV Lamp Manual Cleaning
6. RAS to DAF Wasting Via Second WAS Pump
7. NPW Pump Station Priming
8. NPW Spray Bar Winterization and Spring Start-up
9. Switch IPPS out of Emergency Float Mode
10. Digester ORP Cycling
11. Digester Decanting
12. Evaporation Pond Pump Station Operation
13. Belt Filter Press Filtrate Direction Flow Change

Standard Operating Procedure
Influent Pumping and Fine Screens

STANDARD OPERATING PROCEDURE
Fine Screens
City of Cashmere Wastewater Treatment Facility

Table of Contents

Equipment Numbers and Location 2
Equipment Controls 2
Equipment Data 2
Initial Fine Screen Upstream Water Level Set Points 2
Description 2
Process Theory 3
Flow Paths 4
Startup Procedures 4
Normal Operation 5
HAND Mode 6
Shutdown and Cleaning 7
Emergency Shutdown 7
Alarms 7

Equipment Numbers and Location

Equipment	Tag Number	Location
(2) Mechanical Fine Screens	S-113; S-114	Headworks, Upper Level
(2) Fine Screen Control Panels	Co-113; Co-114	Headworks, Upper Level
(2) Ultrasonic Level Transmitters	Lt-113; Lt-114	Headworks Upper Level
(2) Solenoids	XV-113; XV-114	Headworks Upper Level
(2) Thermostats	HT-113; HT-114	Headworks Upper Level
(2) Intrusion Switches	ZS-113; ZS-114	Headworks Upper Level
Sampler	SMP-117	Headworks, Upper Level

Equipment Controls

Equipment	Work Station	Control Panel OIU	Control Station
(2) Mechanical Fine Screens	Remote/Auto Start/Stop	Remote/Auto Start/Stop	Hand/Off/Auto Start Stop E-Stop
Sampler			Keypad Entry

Equipment Data

Parkson Hycor Heliseive	
Peak Flow Capacity (mgd) (1 screen)	1.75
Total Peak Flow Capacity (mgd) (2 screens)	3.50
Screen Drive HP	1.0

Initial Fine Screen Upstream Water Level Set Points

- HLS300 at 17.5 inches

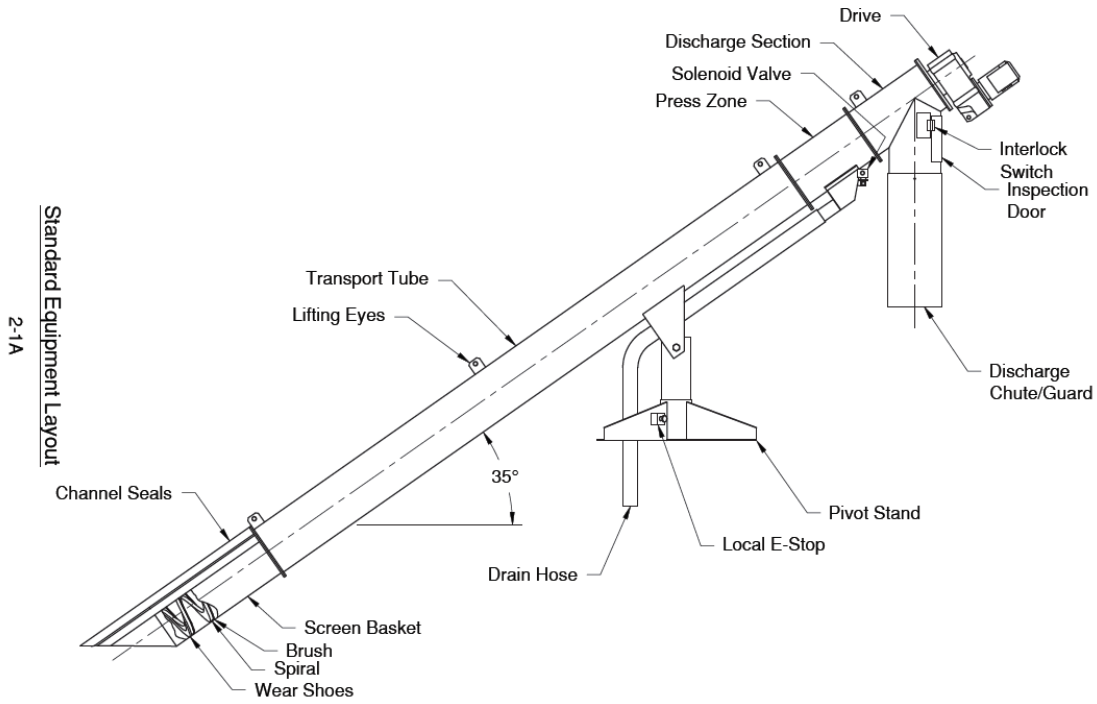
Description

Wastewater flowing into the treatment plant will contain pieces of wood, roots, rags, and other debris. To protect equipment and reduce any interference with in-plant flow, debris is removed by two Helisieve fine screens and a backup manual screen. The fine screens consist of a shaftless spiral subassembly, a screen basket, the transport subassembly, the press zone subassembly, the discharge, the pivot stand, and the drive subassembly.

Debris (screenings) are trapped on the inside diameter of the submerged screen basket of the Helisieve units. The trapped solids cause the screens to "blind" and as a result the channel level

rises. Upon a preset level, the spiral motor will turn on and the accumulated solids are conveyed up the transport tube by the rotating spiral.

The solids are compacted and dewatered. The free water drains through a perforated drainage area in the press zone and is captured in the drain housing. This free water is then returned to the process flow stream for final treatment. The spray wash flushes the perforated drainage area and the drain housing of residues to prevent plugging of the drain line. For more detailed information refer to the vendor O&M manual.



Process Theory

During normal operation of the influent structure, flow to the influent structure from all wastewater sources will be monitored by the SCADA system; the flow will be split equally between the two screening channels to the two fine screens. Stop logs SL – 101, SL – 102, and SL - 109 will be adjusted as necessary to control flow across and out of the influent structure. The WWTF SCADA system does not control the influent rate from City Lift Station. The In Plant Pump Station (IPPS) and Filtrate flow rates are controlled by the SCADA system so that the total flow rate to the influent structure will not exceed the 3.46 MGD (2,430 GPM) hydraulic capacity of the Headworks channels (see Filtrate (FLT) control in Chapter 7 and IPPS control in Chapter 8 of Plant O&M manual).

Flow Paths

Normal			Screen 1 OOS*			Screen 2 OOS			Screen 1 & 2 OOS**	
Gate	**Position**		**Gate**	**Position**		**Gate**	**Position**		**Gate**	**Position**
SL-109	Open		SL-109	Open		SL-109	Open		SL-109	Open
SL-101	Open		SL-101	Closed		SL-101	Open		SL-101	Closed
SL-102	Open		SL-102	Open		SL-102	Closed		SL-102	Open
SL-107	Open		SL-107	Closed		SL-107	Open		SL-107	Closed
SL-108	Open		SL-108	Open		SL-108	Closed		SL-108	Open

* OOS denotes Out of Service

** In the event all flow is to be routed through manual bar screen, pivot Fine Screen No. 2 out of flow stream per equipment manufacturer's instructions.

Startup Procedures

These startup procedures and the manufacturer's instructions should be followed during the initial startup, or after an idle period of one week or more. In addition, startup procedures must be followed closely when placing a unit into service after major repair of overhaul. Information gained from careful observance of the procedures used by the manufacturer's service person during the initial check-out of equipment is applicable for each startup.

Refer to the manufacturer's literature, which is found in separate vendor O&M manuals for specific startup instructions for each piece of equipment. Also refer to videotaped training sessions of the manufacturer's representatives.

The startup of the fine screens requires operation of the channels and washwater.

Check spiral for proper rotation. When viewed from feed end, the spiral should rotate counterclockwise when motor is "jogged on"; or clockwise when viewed from discharge end. Material should be conveyed toward discharge (upper) end. When unit is run dry, lubricate brush with dish washing soap or light biodegradable or food grade oil.

If the spiral is turning in reverse, turn off all power to the Helisieve control panel,(follow lockout/tagout procedures) and exchange any two incoming power leads. Jog motor on again to insure proper rotation.
To set the overcurrent protection, locate the current monitor (located typically near the starter). Note the number of wire passes through the monitor's toroid. This determines the range and the sensitivity of the sensor.

- At 1 pass: 2-20 amp range
- At 2 passes: 1-10 amp range
- At 4 passes: .5-6 amp range

There are two (2) potentiometers on the monitor for trip point(jam) and time delay adjustments.

Turning them counterclockwise will decrease and clockwise will increase set points (see page 4-1A of fine screen vendor O&M manual).

When a fault is sensed (LED on) throughout the trip delay, the output relay will energize after the delay time. If fault is corrected (LED off), before the trip delay is complete, the relay will not energize and trip timer is reset. If the fault continues through the trip delay time, the relay will stop the motor.

It is recommended that these adjustments only be made by a qualified electrician using an insulated screw driver. Turn the trip delay adjustment clockwise to its maximum setting. With the unit in operation, slowly rotate the trip point adjustment counterclockwise until the red LED light comes on, and then rotate the trip point knob back clockwise only enough for the red LED light to shut off. After the trip point setting has been made, rotate the trip delay adjustment counterclockwise to the minimum setting. Stop and restart the unit several times to confirm the trip point setting is high enough so the unit will not trip out under start up load. Should the unit trip out, turn the trip point knob clockwise slightly until the unit can start without tripping out.

Test spray solenoid by turning spray wash selector switch to Hand position. The spray wash should continuously flush the press zone perforated drainage area, the drain housing and the transport tube. If spray solenoid does not activate, check wiring connections.

If there are no mechanical problems, the unit is ready to accept solids. Always inform all area personnel of the impending start up.

Upon start up, the sound of the spiral riding on the wear bars may be noticeable. As screenings are processed and as the wear bars are run in, the sound will diminish.

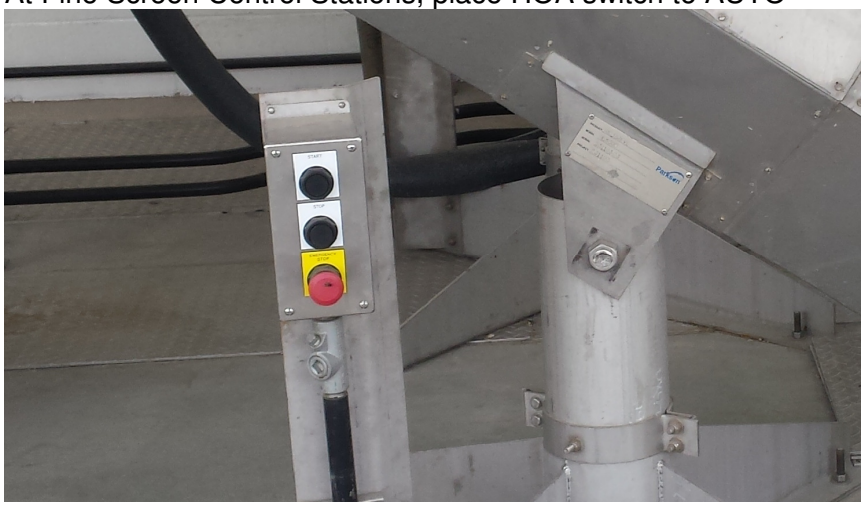
Normal Operation

The Fine Screens will normally be operated in the automatic mode of operation allowing equipment to run automatically under the control of its corresponding PLC (programmable logic controller). An operator at a SCADA screen can observe real time equipment status, change setpoints, and acknowledge alarms,

Under normal conditions, both screens and associated devices will operate simultaneously. The screens will continuously operate once the influent structure is online. The operator will input control variables for each screen at its respective control panel. Screen operation must be visually inspected by the operator periodically.

For normal operations of the Fine Screens confirm controls are in the following positions:

- At Fine Screen Control Stations, place HOA switch to AUTO

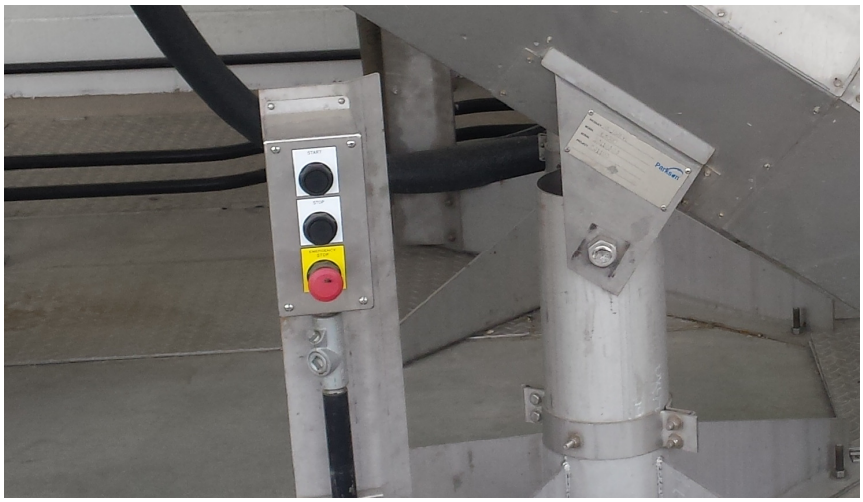


HAND Mode

When the operator sets a Fine Screen HOA switch to “Hand,” the selected Fine Screen will run continuously.

For the Hand mode of operation for a selected Fine Screen place the selected Fine Screen’s controls in the following positions:

- At Fine Screen Control Stations
  - HOA switch to AUTO



Shutdown and Cleaning

When taking the Helisieve® unit off-line for a short term shutdown period for maintenance or any other reason, follow the procedures below to save time and help prevent premature wear or service requirements and follow lockout/tagout procedures

During normal operation, the Helisieve® unit will have a solids plug creating the backpressure necessary for proper solids dewatering (see vendor O&M manual page 5-3C). For maintenance purposes or for long term shutdown or storage the solids plug can be removed by adding 75 to 100 pounds of loose (without the bag) crushed or cubed ice 10 pounds at a time to the upper part of the screen basket and turning the unit on in the forward direction until most of the ice is in the transport tube. Continue the procedure until ice begins to discharge. In cold weather, melt the ice with a mild heat source to prevent expansion damage. Do not use flame or heat sources greater than 150℉. The solids plug may also be accessed by removing the drain housing and perforated section from the bottom of the press zone.

Emergency Shutdown

The Fine Screen unit is equipped with an Emergency Stop push button, mounted on the equipment and in the control panel.

The Fine Screen unit is also equipped with a Safety Interlock switch at the inspection door on the discharge section. If the inspection door is opened, the unit will stop immediately.

Pressing either Emergency Stop push button will shut down the Fine Screens immediately.

A motor overload or motor over current condition may also cause the unit to shut down, causing an emergency situation.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Maintenance

The following table can be found in Section 5 of the Fine Screen vendor O&M manual.

PROCEDURE	DAILY	WEEKLY	MONTHLY	SEMI-ANNUALLY	ANNUALLY
General visual inspection	X				
Rinse accumulated solids off of exterior surfaces	X				
Flush press zone		X			
Inspect level switch device		X			
Inspect channel seals			X		
Inspect wear bars			X		
Check gear reducer oil level			X		
Check drive shaft bolt			X		
Inspect drain lines			X		
Inspect brush and wear shoes			X		
Inspect scraper plate			X		
Check gear reducer output shaft for abnormal play				X	
Check spiral				X	
Inspect press zone				X	
Inspect electrically operated switches				X	
Change oil in gear reducer					X
Thoroughly inspect and clean unit					X

For more detailed maintenance information refer to the Fine Screen vendor O&M manual.

Standard Operating Procedure
Vortex Grit Removal

STANDARD OPERATING PROCEDURE
Vortex Grit Removal
City of Cashmere Wastewater Treatment Facility

Table of Contents

Equipment Numbers and Location 2

Equipment Controls 2

Equipment Data 2

Initial Set Points 3

Description 3

Process Theory 4

Flow Paths 5

Startup Procedures 5

Normal Operation 6

SCADA HAND Mode 8

MANUAL Mode at Control Station 8

Shutdown 10

Emergency Shutdown 11

Maintenance 11

Alarms 12

Equipment Numbers and Location

Equipment	Tag Number	Location
Grit Unit Drive	GR-120	Headworks, Upper Level
Grit Pump No. 1	P-126	Headworks Screening Room
Grit Classifier	GCL-129	Headworks Screening Room
Solenoid Valve – Flush Water	XV-118	Headworks Screening Room
Solenoid Valve – Grit Classifier Wash Water	XV-130	Headworks Screening Room
Flow Meter	Ft-128	Headworks Screening Room

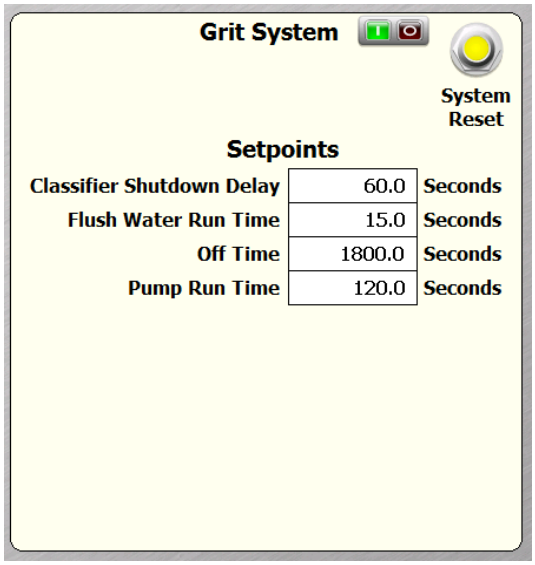
Equipment Controls

Equipment	Work Station	Control Panel OIU	Control Station
Grit Unit Drive	Remote/Auto Start/Stop	Remote/Auto Start/Stop	Hand/Off/Auto
Grit Pump	Remote/Auto Start/Stop	Remote/Auto Start/Stop	Hand/Off/Auto
Grit Classifier	Remote/Auto Start/Stop	Remote/Auto Start/Stop	Hand/Off/Auto

Equipment Data

Vortex Grit Removal	
Flow Capacity (mgd)	2.5 (3.64 mgd with less removal efficiency)
Minimum Particle size Removed (@ 2.5 mgd)	95% of 100 mesh
Grit Pump	
Capacity (gpm)	240 @ 26'TDH
Grit Pump Motor hp	10
Grit Classifier	
Classifier Motor hp	1

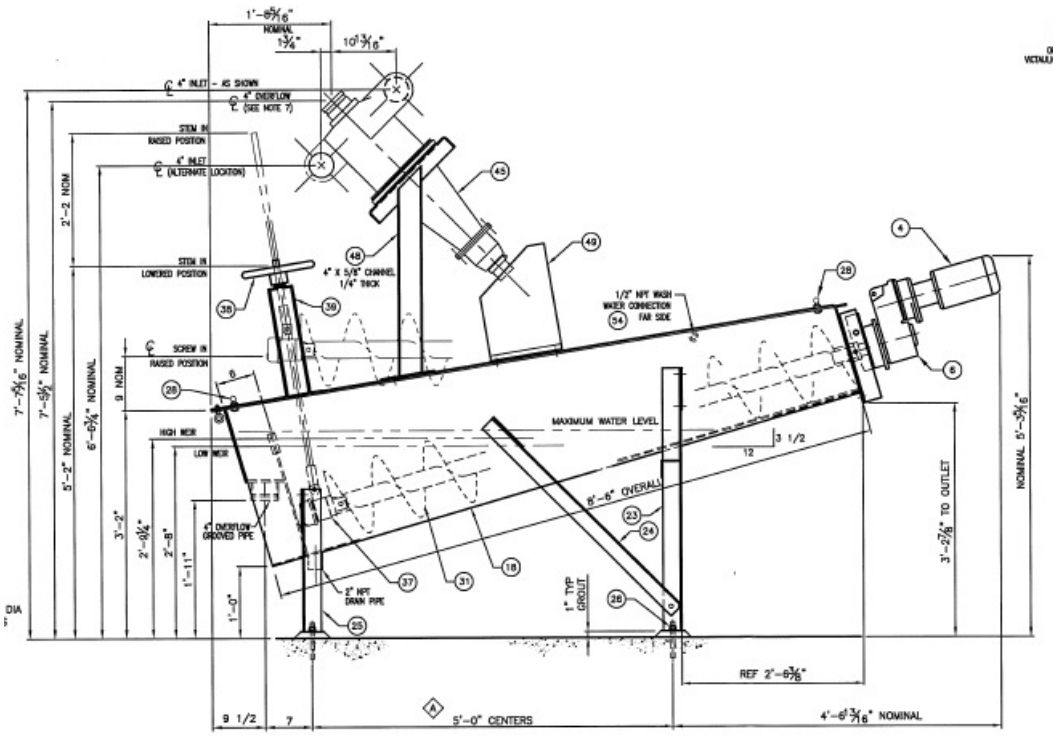
Initial Set Points



Description

Grit material typically includes sand, egg shells, coffee grounds, seeds, and orange rinds to mention a few. Anything that settles in the grit chamber under this “ideal” condition may be classified as grit. The inherent variation in flow rate to the treatment process poses a particular challenge to this physical process. It is difficult to maintain a constant velocity in a grit basin under varying conditions. As a result, under high velocity conditions caused by high influent flows, grit may pass through the grit chamber and under low velocity or low flow conditions, organics may settle out with the grit. For this reason grit basin axial flow propellers are part of the system. When wastewater flow is exposed to a controlled velocity of about 1 foot per second in a grit basin, heavier material settles while lighter materials pass. This allows for the selective removal of grit.

Grit that has settled in the grit removal basin is removed as slurry by a grit pump which discharges to a cyclone which further separates water from grit material. The concentrated grit slurry mixture is then cleaned and dewatered by a grit classifier. Wash water and wastewater are returned to the wastewater flow stream while cleaned and dewatered grit is discharged into waste container.



SIDE ELEVATION

Process Theory

During normal operation, the grit removal system will receive the total influent flow. The grit unit drive mechanism will continuously operate. The grit pump will run at operator-specified intervals, producing a continuous flow rate of approximately 240 gpm. The SCADA system will call the NPW fluff solenoid to open for an operator-specified time period before the grit pump turns on. The SCADA system will also call the classifier to turn on and the wash water solenoid will open when the grit pump is called to run.

Two channels combine downstream of the mechanical fine screens into a single 18-inch wide channel that conveys the wastewater to the grit removal system. The grit removal system consists of the grit unit, grit pump and grit classifier and cyclone. Wastewater flows into the grit chamber which houses the grit unit – a device which circulates the wastewater, allowing grit to gravitate into the lower portion of the chamber, known as the grit hopper. Within the grit chamber, the influent is stirred with impeller blades attached to a shaft driven by a 0.75 HP motor. The shaft extends from the grit chamber to the upper floor of the Headworks building, where the drive motor is located. Grit settles to the bottom of the hopper while effluent flows out the top of the chamber into the channel that leads to the Headworks flow splitter.

The grit and fluid mixture (slurry) that collects on the bottom of the grit hopper is periodically removed. To accomplish this, the grit is “fluffed” using the non-potable water (NPW) flush/fluff system that is tapped into the bottom of the hopper; the grit pump then removes this slurry via suction using 4-inch piping. The flush/fluff process is controlled by the Supervisory Control and Data Acquisition (SCADA) system and occurs prior to each grit pumping period. The grit pump

transfers the grit/fluid mixture through 4-inch piping to the grit cyclone and classifier. The cyclone and classifier remove grit from the mixture and deposit it into a third dumpster in the Screenings room. Water removed by the classifier is routed to the building floor drain system which flows by gravity to the IPPS. The grit removal system is designed with a capacity of 2.5 million gallons per day (MGD) at the optimum removal rate but the grit chamber can hydraulically pass the 2030 peak hour flow of 3.46 MGD.

If necessary, the grit unit can be bypassed using the bypass channel that diverts wastewater directly to the Headworks flow splitter. Stop logs (SL-103, -104, -105, -106) are used to accomplish this.

Flow Paths

Normal			Grit Basin OOS*	
Gate	**Position**		**Gate**	**Position**
SL-103	Open		SL-103	Closed
SL-104	Open		SL-104	Closed
SL-105	Closed		SL-105	Open
SL-106	Closed		SL-106	Open

* OOS denotes Out of Service

Startup Procedures

These startup procedures and the manufacturer's instructions should be followed during the initial startup, or after an idle period of one week or more. In addition, startup procedures must be followed closely when placing a unit into service after major repair of overhaul. Information gained from careful observance of the procedures used by the manufacturer's service person during the initial check-out f equipment is applicable for each startup.

Refer to the manufacturer's literature, which is found in separate vendor O&M manuals for specific startup instructions for each piece of equipment. Also refer to videotaped training sessions of the manufacturer's representatives.

Perform the following work prior to dry startup checkout:

- Check impeller (agitator) rotation. If rotation is not correct, change two of the wires to the motor after turning of power to the motor and locking and tagging out the power source disconnect. Verify correct rotation again.
- Check the slew bearing assembly for "hot spots", noise, and vibration. Address problems as required.
- Verify that the impeller assembly does not wobble in the grit chamber and there is not binding.

- Make any necessary corrections.
- Check the water scour automatic operation.

Perform the following work prior to wet start up:

1. Introduce water into the grit chamber.
2. See Grit Pump vendor O&M manual for additional details.
3. Check Grit Pump Rotation. If the motor rotation is not correct, change two of the wires to the motor after turning of power to the motor and locking and tagging out the power source disconnect. Verify correct rotation again.
4. Check that there no leaks in the pump suction line.
5. Check for any abnormal noise and vibration. Address any problems.
6. Verify grit removal transfer to the classifier.
7. Record voltages and amp draw for each motor.

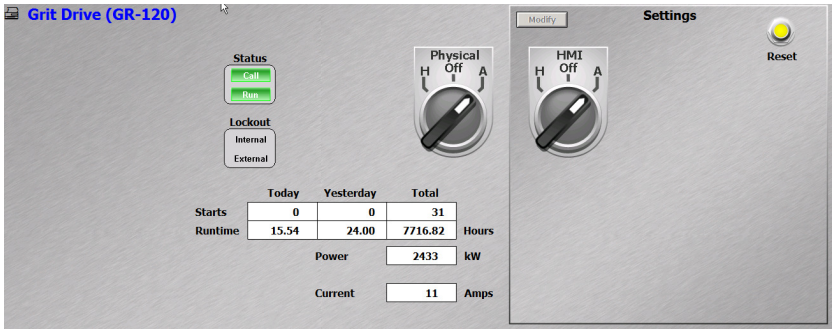
Normal Operation

The Grit Removal System will normally be operated in the automatic mode of operation allowing equipment to run automatically under the control of its corresponding PLC (programmable logic controller). An operator at a SCADA screen can observe real time equipment status, change setpoints, acknowledge alarms, and change from the Auto mode to the Manual mode of operation. To operate equipment in the Remote Auto mode of operation, an operator needs to click the Auto button on the SCADA screen.

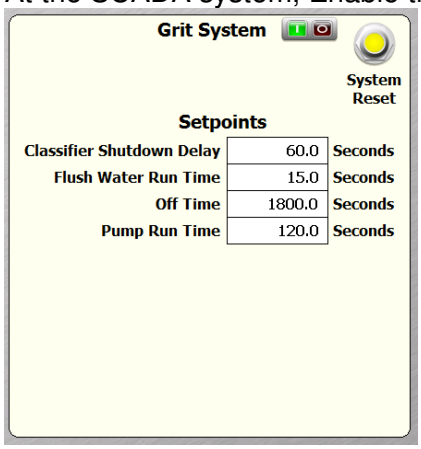
For normal operations of the Grit Removal System confirm controls are in the following positions:

- At the following Control Stations, place HOA switch to AUTO
  - Vortex grit unit – south side of south stairway wall on upper level
  - Grit pump – south grit room wall on lower level
  - Grit cyclone and classifier – south grit room wall on lower level

- At the SCADA system, select the AUTO mode of operation for the grit drive, pump and classifier:



- At the SCADA system, Enable the Grit System:



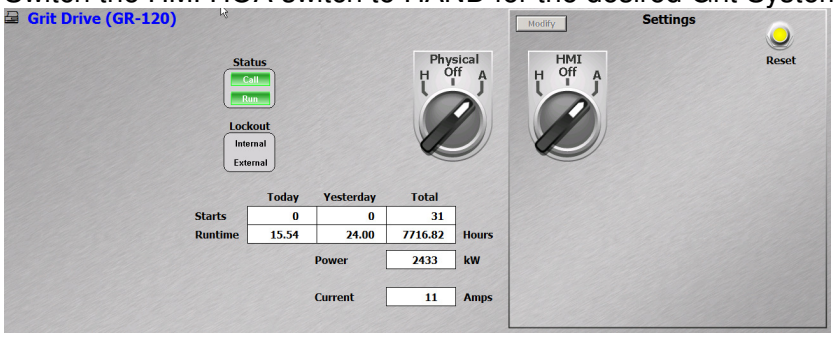
SCADA HAND Mode

When the operator sets a Grit Removal System component SCADA HOA handswitch to "Hand," the selected equipment will run continuously until the operator places the SCADA HOA handswitch to "Off".

For the SCADA *Hand* mode of operation for a Grit Removal System component place the controls in the following positions:

- At Control Stations
  - HOA switch to AUTO

- At the SCADA screen:
  - Switch the HMI HOA switch to HAND for the desired Grit System component



MANUAL Mode at Control Station

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS).

The grit equipment is controlled by the SCADA system and does not have local control panels. Local physical Hand-Off-Auto (HOA) switches exist for each piece of grit equipment. Manual operation of the grit system can be accomplished via the equipment Control Station switches.

Grit Unit Drive

- At Grit Unit Drive Control Station
  - HOA switch to HAND

  - Start and Stop Grit Unit Drive by switching between HAND and OFF

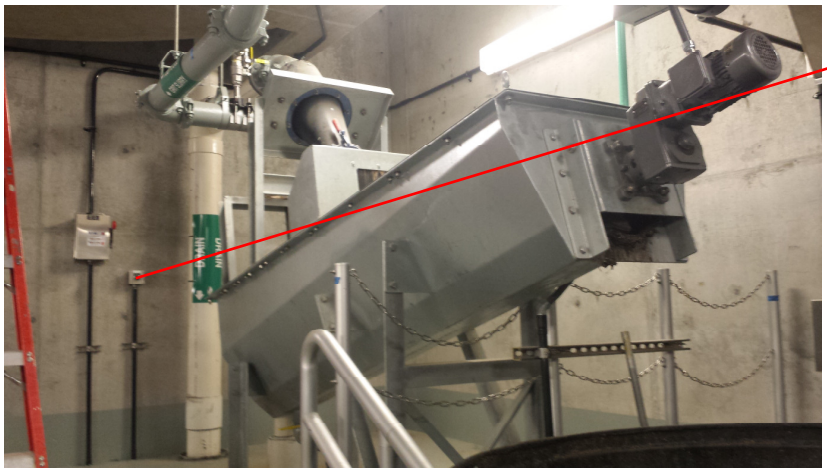
Grit Pump

- At Grit Pump Control Station
  - HOA switch to HAND

  - Start and Stop Grit Unit Drive by switching between HAND and OFF

Grit Classifier

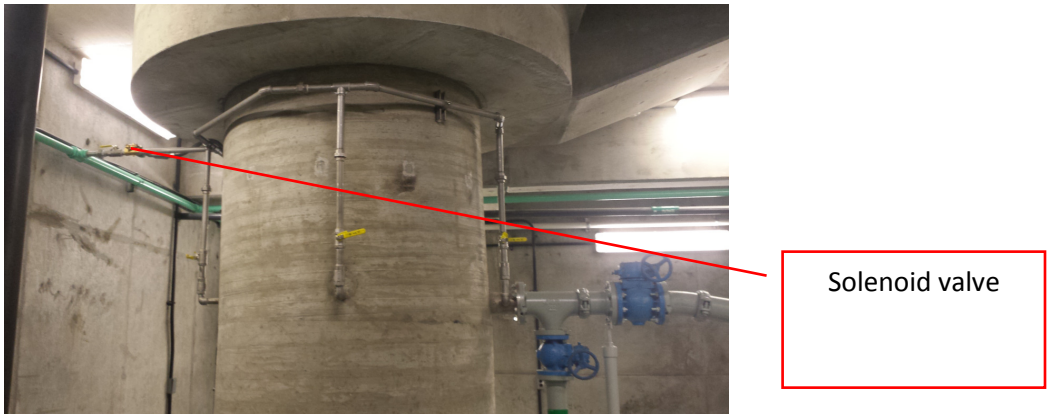
- At Grit Classifier Control Station
  - HOA switch to HAND



  - Start and Stop Grit Unit Drive by switching between HAND and OFF

Flush/Fluff Water Valve

- Flush/Fluff Water Valve is a solenoid valve that can be manually opened or closed



Shutdown

The Grit Removal System equipment can be shut down at any time by turning a control station HOA switch to “Off”.

If equipment will be shut down for an extended period of time, refer to equipment vendor O&M manuals for liong term storage instructions.

Emergency Shutdown

The Grit Removal System equipment is equipped with an Emergency Stop push button, mounted on the MCC bucket for each piece of equipment.

Pressing an Emergency Stop push button will shut down equipment immediately.

A motor overload or motor over current condition may also cause the unit to shut down, causing an emergency situation.

Maintenance

The following table can be found in the Grit Collection Equipment vendor O&M manual.

Cyclone

Equipment Component	Procedure	Frequency
All components	Inspect all parts to observe condition.	Daily
Discharge Chute	Hose off accumulated debris and residue.	Daily
Cyclone	Check for proper operation; clean as required.	Daily
Reducer	Check oil level and breather.	Monthly
Bolts & Fasteners	Check for looseness; Re-tighten as required.	Monthly
Cyclone Apex Valve	Adjust as required; Check for wear.	Monthly
Cyclone Liners	Check for wear; Replace as required.	Quarterly
Screw Conveyor	Check for wear on flights.	Semi-Annually or as determined by service
Screw Conveyor Tail Shaft Bearing	Check for wear.	Semi-Annually or as determined by service
All Components	Check all parts; clean or replace worn or damaged parts. Touch up any nicks or scratches in paint.	Semi-Annually or Annually or as determined by service

Grit Collector

Equipment Component	Procedure	Frequency
All Components	Visual inspection of all parts to observe condition	Daily
Reducer	Check oil level and breather	Monthly
Bolts & Fasteners	Check for looseness; Re-tighten as required	Monthly
Turbine Blade	Check for wear	Semi-Annually
All Components	Check all parts; clean or replace worn or damages parts. Touch up any nicks or scratches in paint.	Semi-Annually or Annually

Grit Classifier

Equipment Component	Procedure	Frequency
All Components	Visual inspection of all parts to observe condition	Daily
Discharge Chute	Hose off accumulated debris and residue	Daily
Cyclone	Check for proper operation; clean as required	Daily
Reducer	Check oil level and breather	Monthly
Bolts & Fasteners	Check for looseness; Re-tighten as required	Monthly
Cyclone Apex Valve	Adjust as required; check for wear	Monthly
Cyclone Liners	Check for wear; replace as required	Quarterly
Screw Conveyor	Check for wear on flights	Semi-Annually or as determined by service
Screw Conveyor Tail Shaft Bearing	Check for wear	Semi-Annually or as determined by service
All Components	Check all parts; clean or replace worn or damages parts. Touch up any nicks or scratches in paint.	Semi-Annually or Annually as determined by service

For more detailed maintenance information refer to the Grit Collection Equipment vendor O&M manual.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
Headworks Flow Splitting and EQ Basin

Table of Contents

Equipment Numbers and Location 2
Headworks Flow Splitter Summary 2
Equalization Basin Summary 2
Equipment Controls 2
Equipment Data 2
Initial Level Set Points 2
Description 3
Flow Splitting - Normal Operation 4
Water Quantity Equalization 4
Water Quality Equalization 4
SCADA HAND Mode 5
Return Pumping - Normal Operation 6
SCADA HAND Mode 7
MANUAL Mode 8
Shutdown and Cleaning 9
Emergency Shutdown 9
Alarms 9
Maintenance 9

Equipment Numbers and Location

Headworks Flow Splitter Summary

Equipment	Tag Number	Function
Slide Gate	G-101	Manual control of flow to Activated Sludge Basin No. 1
Slide Gate	G-102	Manual control of flow to Activated Sludge Basin No. 2
Slide Gate	G-103	Manual control of emergency overflow to the EQ Basin
Drain Valve	G-201	Flow splitter drain to EQ Basin – normally closed
Flow Meter	Ft-134	Measures return flow from EQ Basin
Flow Meter	Ft-139	Measures wastewater flow to EQ Basin
Valve Actuator	A-141	Controls wastewater flow to the EQ Basin

Equalization Basin Summary

Equipment	Tag Number	Location
Submersible Pump	P-245	EQ Basin (EQ1)
Level Switch - Float	Ls-246	EQ Basin (EQ1)
Level Switch - Float	Ls – 247	EQ Basin (EQ1)

Equipment Controls

Equipment	Work Station	Control @ VFD	Control Station
Valve Actuator A-141	Remote/Auto Open/Stop/Close		Local/Remote Open Stop Close
Equalization Pump	Remote/Auto Start/Stop % Speed	Keypad Entry	Hand/Off/Auto Start Stop E-Stop

Equipment Data

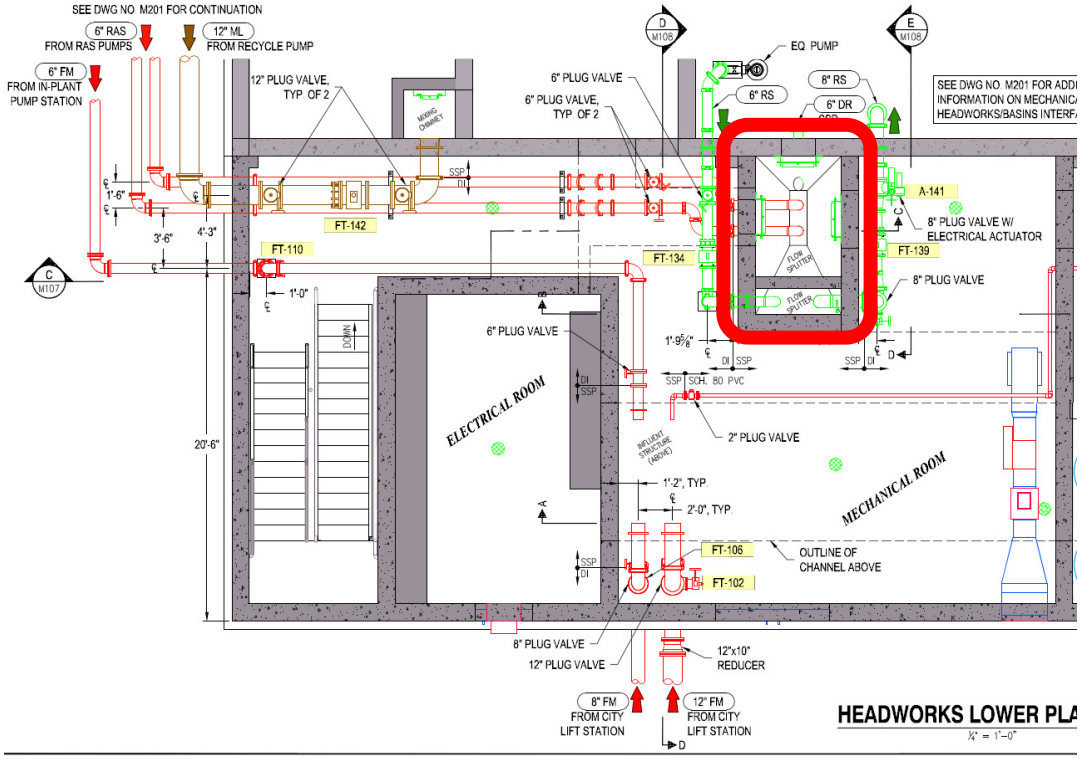
Equalization Pump	
Capacity (gpm)	500 @ 21’ TDH
Motor hp	5

Initial Level Set Points

When a single basin is in operation, the trigger is 1,200 gpm with a three minute delay. During dual basin operation the trigger is 1,800 gpm with a three minute delay.

Description

The Headworks flow splitter splits WWTF influent flows between the two activated sludge basins and the Equalization (EQ) basin. The primary flow path to each basin from the splitter is over a weir gate. Flow can also be diverted to and returned from, the EQ Basin through 6- and 8-inch piping.



The dimensions of the EQ basin are identical to one activated sludge basin. The EQ basin is divided into 3 cells with increasing storage capacities as follows (denoted from nearest to furthest from Headworks):

Cell Name	Cell Denotation	Dimensions (LXWLH)	Storage Capacity (gal)
Equalization Cell # 1	EQ1	18'-6" x 25' x 18'	54,000
Equalization Cell # 2	EQ2	36'-8" x 25' x 18'	110,000
Equalization Cell # 3	EQ3	130'-0" x 25' – 18'	380,000
Total Capacity			*544,000*

The EQ basin is the center train between Activated Sludge Basins #1 and 2. The EQ basin is broken into three cells; EQ1, EQ2 and EQ3. Each cell progressively increases in size. Once EQ1 fills, the wastewater will overtop the basin partition wall in order to fill EQ2, and consecutively overtop to EQ3. It is anticipated that most equalization events will only require the usage of EQ1. The compartmented EQ basin provides the option of capturing short periods of increased influent flowrate or influent strength without utilizing the entire EQ structure.

Process Theory

When needed, the equalization basin (EQ basin) provides equalizing storage of screened and degritted wastewater from the Headworks. During periods in which one activated sludge basin is in operation, the EQ basin may be utilized to provide storage in lieu of starting up the second activated sludge basin. The EQ basin may also be used during periods when both trains are in operation. It is anticipated that the EQ basin will be needed in two scenarios:

- Water quantity (high influent flow rates) – likely to occur during large storm events
    - Each activated sludge basin has a hydraulic capacity of **1.3 MGD (900 GPM)**
    - With both basins operating,the capacity is doubled to **2.6 MGD (1800 GPM)**
- Water quality (high influent strength) – likely to occur during increased discharge from fruit processing plants in the area

Diversion to the EQ basin from the Headworks flow splitter can be accomplished by two methods: overflow into the EQ basin via manual slide gate G-103 or metered flow via the 8-inch Raw Sewage (RS) pipe on the south side of the Headworks flow splitter.

The EQ basin pump (P-245) located in EQ1 is used to pump the wastewater stored in the EQ basin back to the Headworks flow splitter by the SCADA system. EQ2 and EQ3 will drain in succession back to EQ1 through low-head check valves installed at the base of the basin partition walls. Floor drains in EQ1 and EQ3 (controlled by mud valves) provide the option of draining the EQ basin to the In-Plant Pump Station (IPPS). These drains will be utilized during washdown or to remove remaining sewage from the basin after utilizing the EQ pump.

Flow Splitting - Normal Operation

Water Quantity Equalization

The water quantity scenario for flow equalization occurs when the Headworks flow splitter influent flowrate is higher than the treatment capacity of the online activated sludge basin(s).

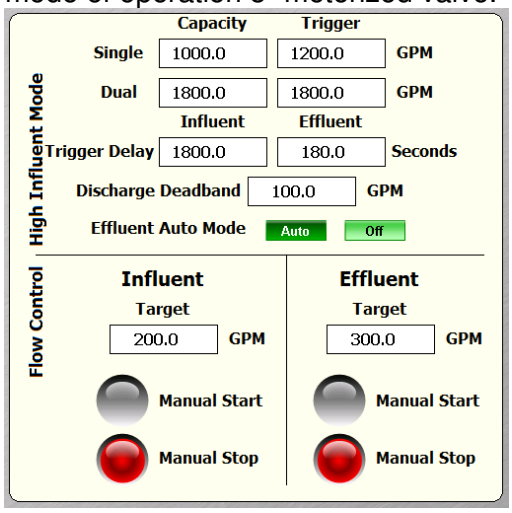
Water Quality Equalization

Equalizing influent flows due to decreased influent water quality will be determined based on the dissolved oxygen (DO) levels measured in the Aerobic zone of the activated sludge basin(s). If DO levels cannot be maintained at the target levels by increasing aeration rates or aeration of the Swing zone, equalization of influent flow may be required. In this scenario, DO levels below the target setpoint for the first Aerobic cell will cause a SCADA system alarm. The operator will then make the decision to begin equalizing a set flow rate through the 8” RS line.

For normal operations of flow splitting ability confirm controls are in the following positions:

- HOA switch to AUTO on 8” motorized valve in EQ piping

- At the SCADA system or CP-100 Headworks Building Control Panel, select the AUTO mode of operation 8” motorized valve.



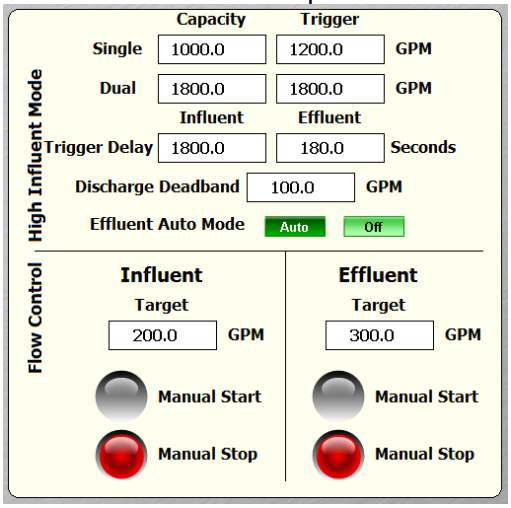
SCADA HAND Mode

When the operator sets the 8” motorized valve SCADA HOA handswitch to “Hand,” the operator can open, close, or throttle the valve.

For the SCADA *Hand* mode of operation of the 8” motorized valve place controls in the following positions:

- HOA switch to AUTO on 8” motorized valve in EQ piping

- At the SCADA system or CP-100 Headworks Building Control Panel, select the Influent Flow Control mode of operation for the 8" motorized valve.



Return Pumping - Normal Operation

During normal operation, the SCADA system will call the EQ basin pump to recycle stored wastewater from EQ1 to the Headworks flow splitter once the need for flow equalization has ended. The operator adjustable delay period must also have occurred. The delay period will ensure that the return pumping does not begin prematurely.

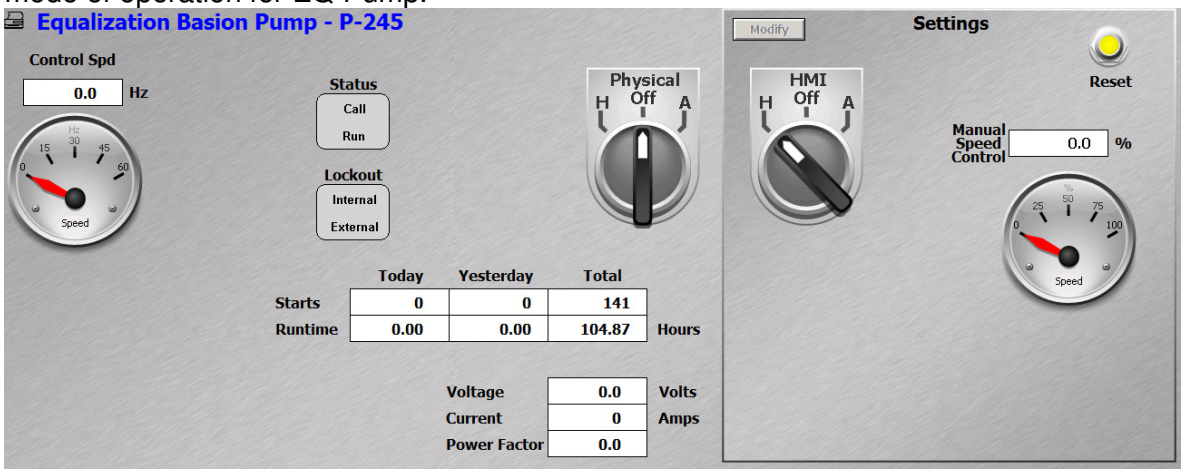
The rate of discharge from the EQ pump will be equal to the difference between the treatment capacity of the online activated sludge train(s) and the Headworks flow splitter influent flow rate. The SCADA system will control the EQ pump's discharge rate using its variable frequency drive (VFD). The SCADA system will monitor the discharge rate via the 6-inch RS flowmeter Ft-134.

The EQ pump can produce a discharge rate between 100-500 GPM.
Low and high level float sensors are located in EQ1. The low level sensor will prevent dry running the EQ pump while the high level sensor will prevent over-filling the basin.
After return pumping, the operator will have to drain the remaining wastewater from EQ1 to the IPPS using the mud valve in EQ1.

For normal operations of the EQ Basin Pump confirm controls are in the following positions:

- EQ Pump HOA switch to AUTO

- At the SCADA system or CP-100 Headworks Building Control Panel, select the AUTO mode of operation for EQ Pump.



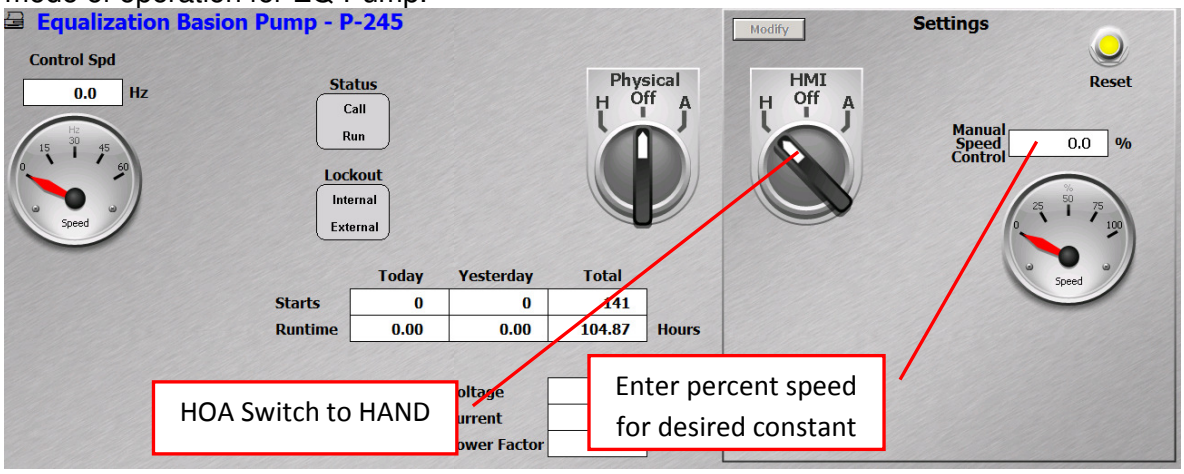
SCADA HAND Mode

When the operator sets the EQ Pump SCADA or CP-100 Headworks Building Control Panel HOA handswitch to “Hand,” the EQ Pump equipment can be started and will run continuously at an operator specified speed until the operator stops the EQ Pump. the SCADA HOA.

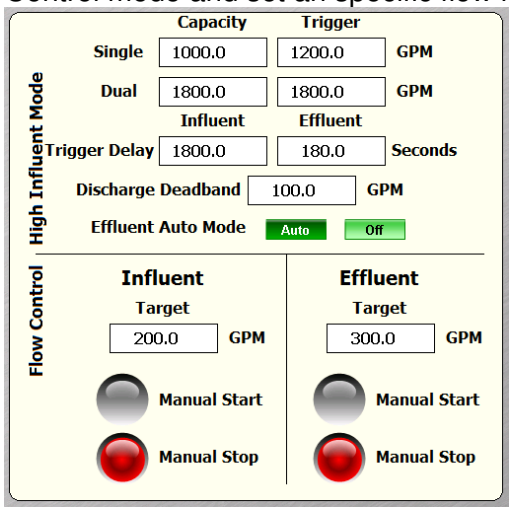
For the SCADA *Hand* mode of operation for the EQ Basin Pump confirm controls are in the following positions:

- EQ Pump HOA switch to AUTO

- At the SCADA system or CP-100 Headworks Building Control Panel, select the HAND mode of operation for EQ Pump.



- At the SCADA system or CP-100 Headworks Building Control Panel, Effluent Flow Control mode and set an specific flow rate for the EQ Pump to run at.



MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

For the MANUAL mode of operation for the EQ Basin Pump confirm controls are in the following positions:

- EQ Pump HOA switch to HAND
- The EQ Pump equipment will run continuously at a default speed set in the VFD until the operator places the HOA Handswitch to OFF.

Shutdown and Cleaning

After return pumping, the operator will have to drain the remaining wastewater from EQ1 to the IPPS using the mud valve in EQ1.

Emergency Shutdown

The emergency generator is not sized to operate the EQ basin pump during an outage of normal power to the plant. Thus, during a power outage, the EQ basin could only return raw wastewater to the activated sludge train by opening mud valves and allowing wastewater to drain to the IPPS and thus be pumped back to the Headworks influent structure. Return of wastewater from the EQ basin is not expected to occur during a power outage.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Maintenance

The following is an excerpt from the ABS Pump vendor O&M manual:

ABS submersible pumps are reliable quality products, each being subjected to careful final inspection. Lubricated-for-life ball bearings, together with monitoring devices, ensure optimum pump reliability provided that the pump has been connected and operated in accordance with the operating instructions. However, should a malfunction occur, do not improvise, but ask your ABS Customer Service Department for assistance. This applies particularly if the pump is continually switched off by the current overload in the control panel, by the thermal sensors of the thermo-control system, or by the seal monitoring system (DI).

Regular inspection and care is recommended to ensure a long service life. Service intervals vary for XFP pumps depending on installation and application. For recommended service interval details contact your local ABS Service Centre. A maintenance contract with our Service Department will guarantee the best technical service.

When carrying out repairs, only original spare parts supplied by the manufacturer should be used. ABS warranty conditions are only valid provided that any repair work has been carried out in an ABS approved workshop and where original ABS spare parts have been used.

For more detailed maintenance information refer to the ABS Pump vendor O&M manual.

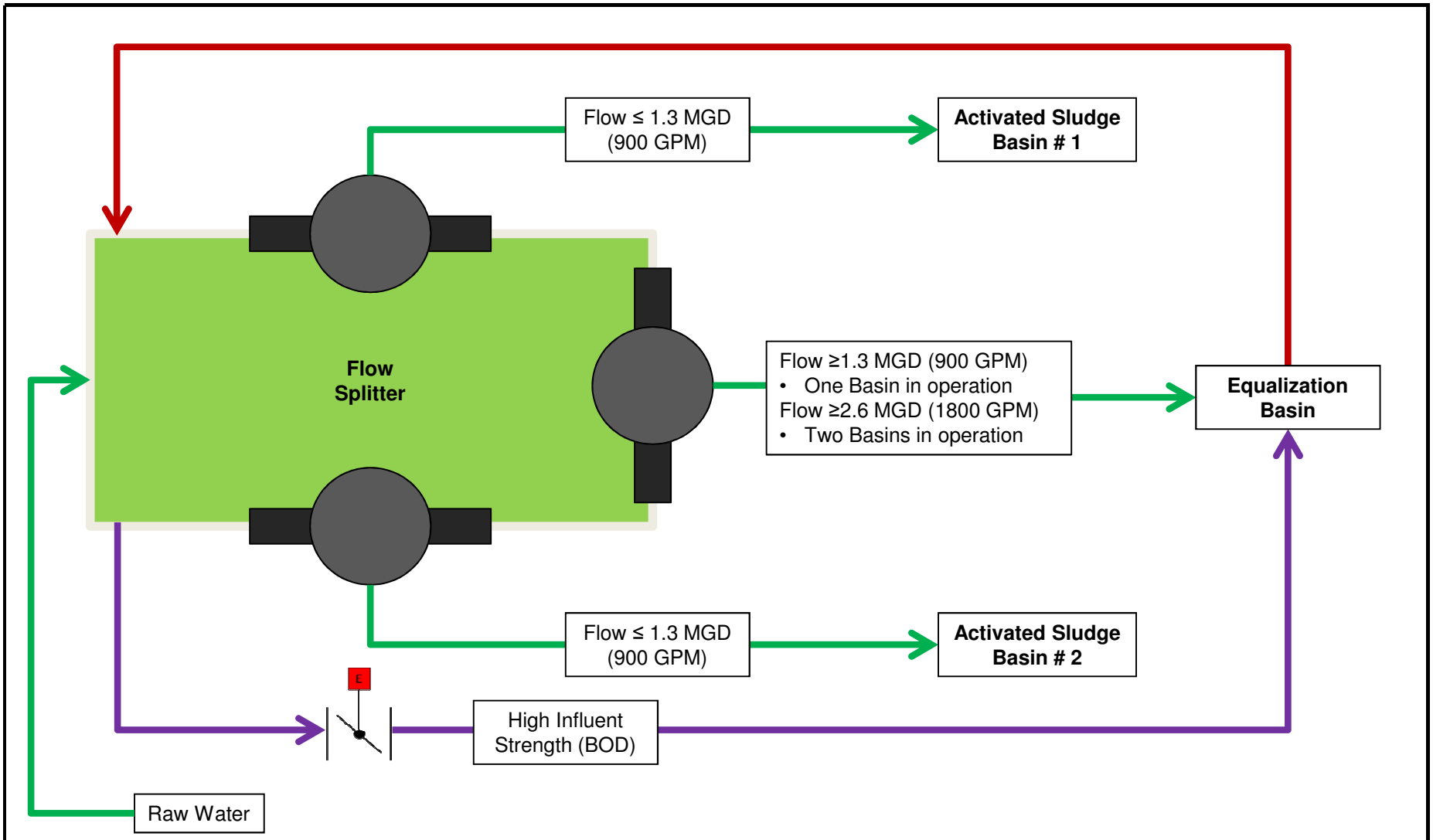


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FIGURE 3.1
HEADWORKS FLOW SPLITTER
CITY OF CASHMERE
WASTEWATER TREATMENT FACILTIY
PROJECT TITLE (LINE 2)
CASHMERE, WASHINGTON

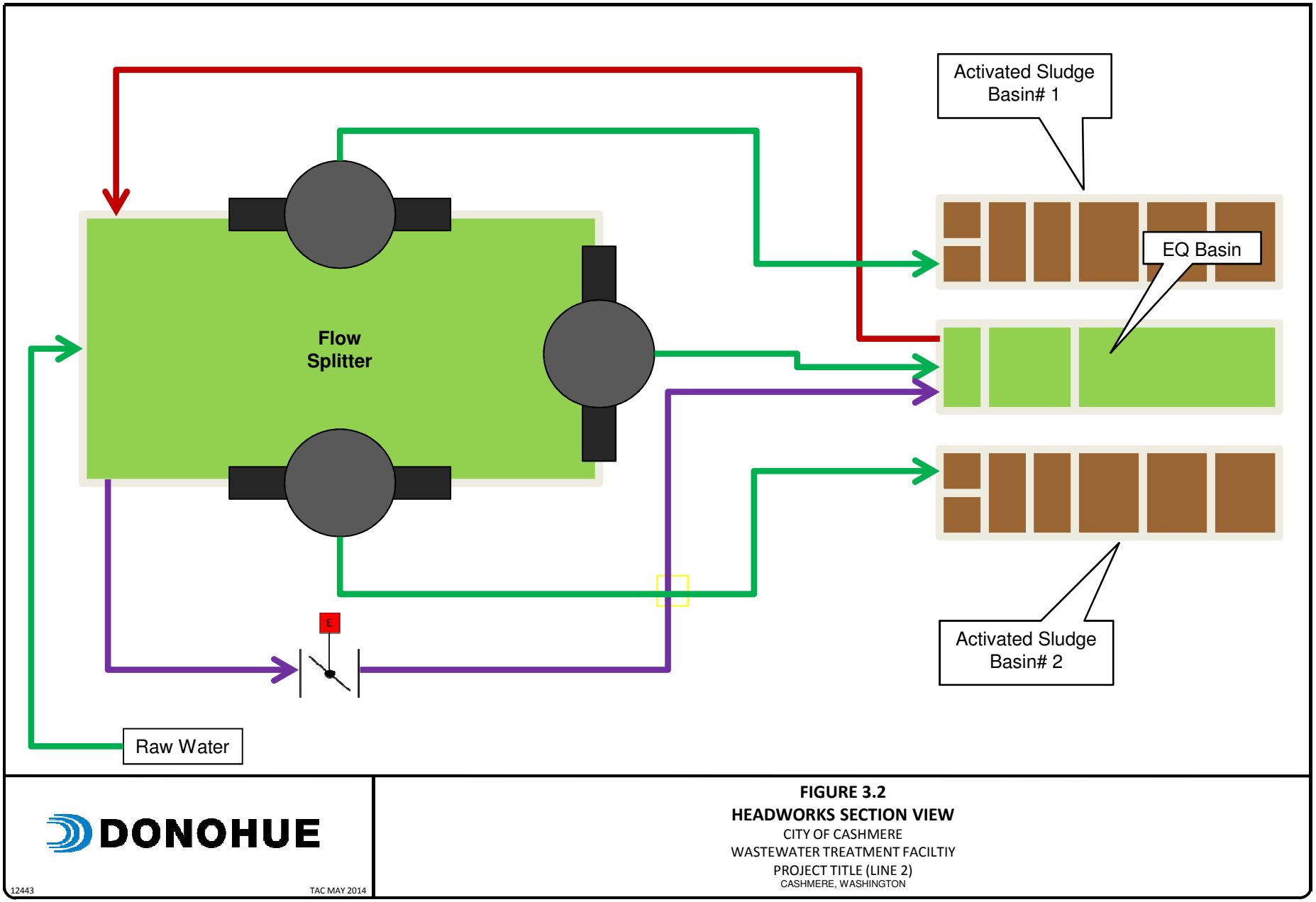

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FIGURE 3.2
HEADWORKS SECTION VIEW
CITY OF CASHMERE
WASTEWATER TREATMENT FACILTIY
PROJECT TITLE (LINE 2)
CASHMERE, WASHINGTON

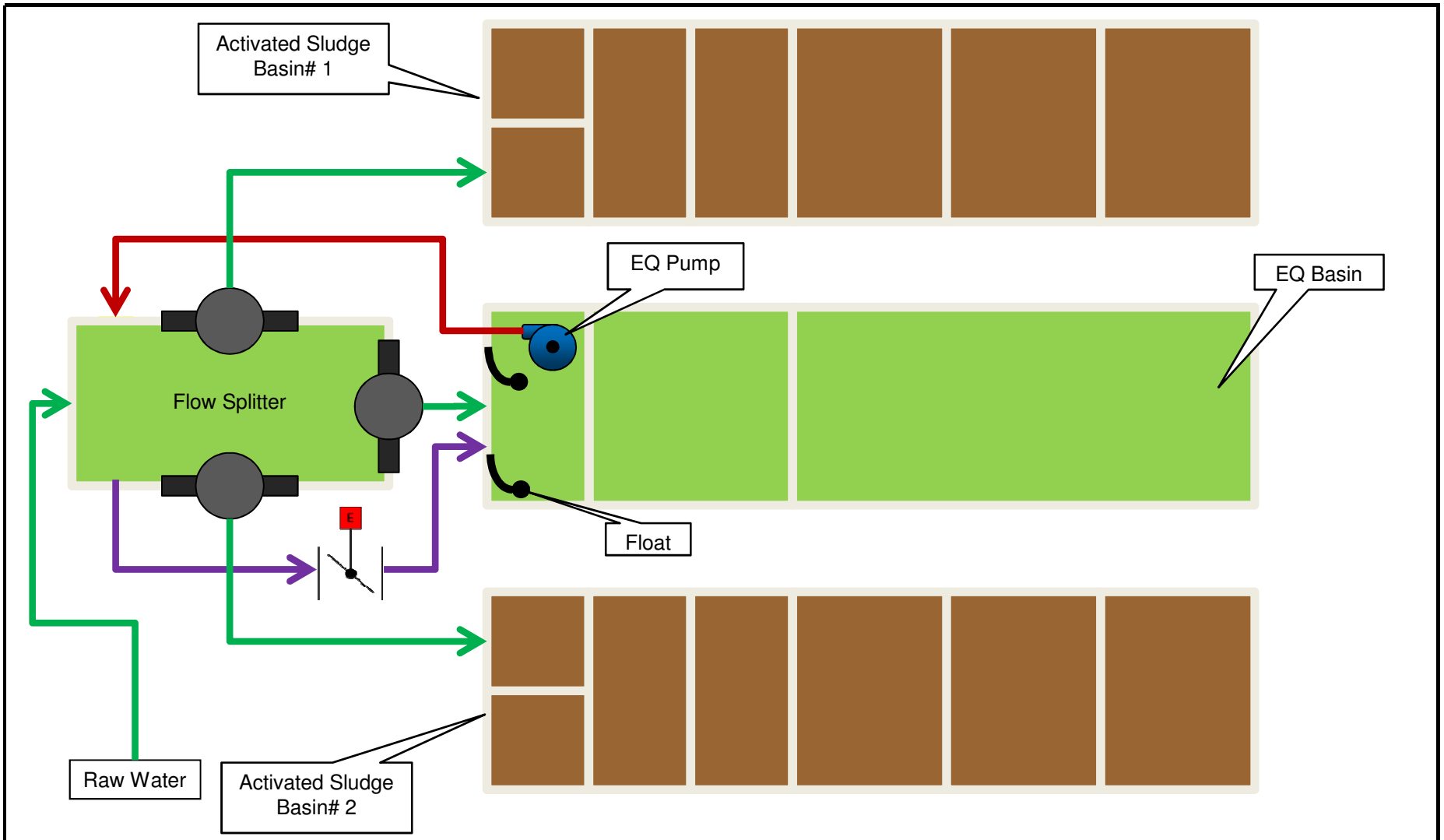

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FIGURE 3.3
HEADWORKS FLOW SPLITTER & EQ BASIN OVERVIEW
CITY OF CASHMERE
WASTEWATER TREATMENT FACILTIY
PROJECT TITLE (LINE 2)
CASHMERE, WASHINGTON

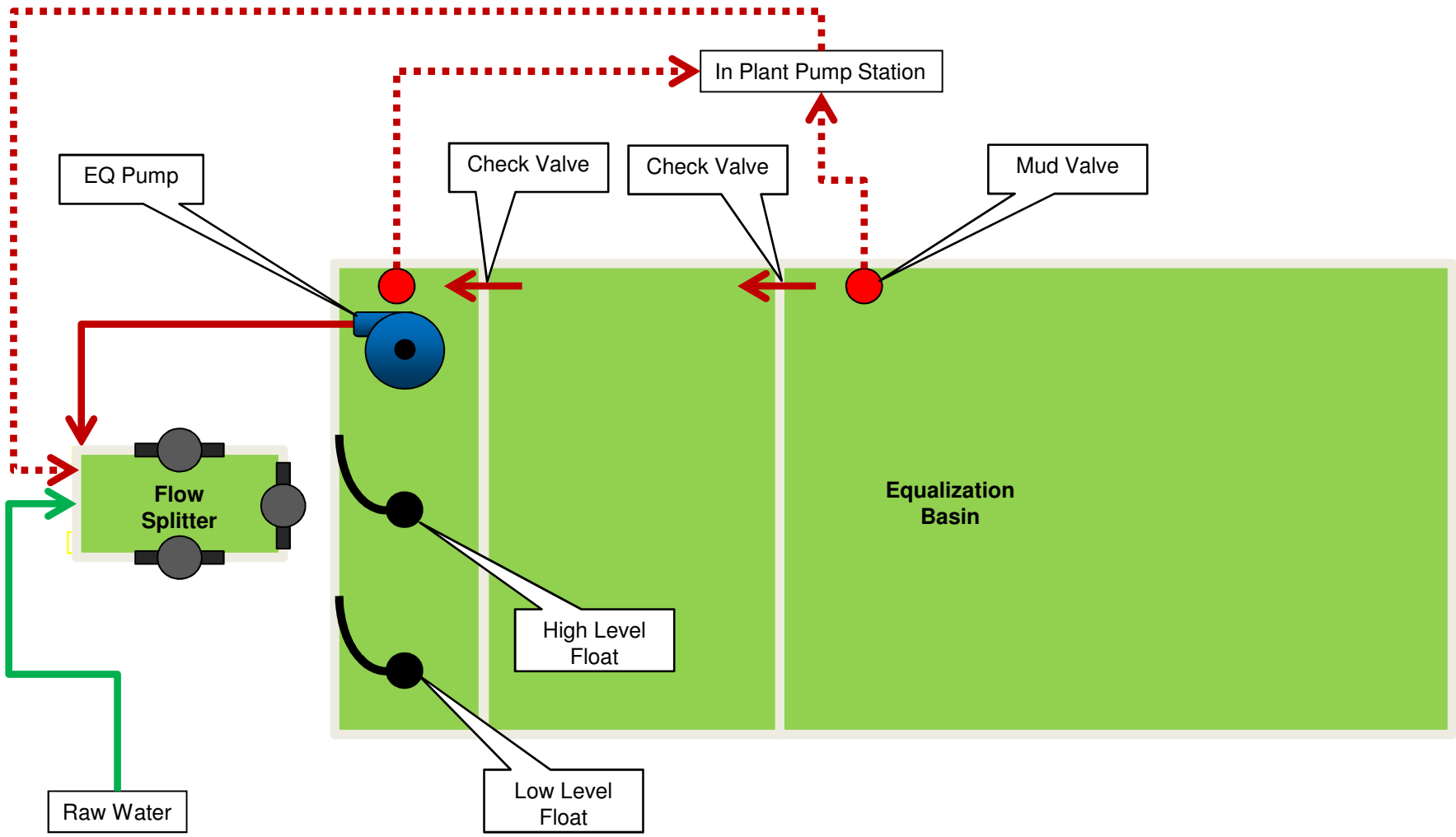

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FIGURE 3.4
EQUALIZATION BASIN FLOW RETURN
CITY OF CASHMERE
WASTEWATER TREATMENT FACILTIY
PROJECT TITLE (LINE 2)
CASHMERE, WASHINGTON

Standard Operating Procedure
Bardenpho Process and Aeration

Table of Contents

Equipment Numbers and Location 2
Anaerobic and Anoxic Zone Equipment 2
Swing Zone Equipment 2
Aerobic System Equipment 2
Equipment Controls 3
Equipment Data 3
Initial Level Set Points 3
Description 4
Process Theory 4
Normal Operation 5
Alternative Operation 7
Flow Control Mode 7
Valve Position Mode 7
Air Bumping Mode 8
Offline Basin Maintenance Mode 8
SCADA HAND Mode 8
Aeration Throttling Butterfly Valves 8
Aeration Blowers 9
MANUAL Mode 9
Aeration Throttling Butterfly Valves 9
Aeration Blowers 10
Maintenance & Troubleshooting 10
Alarms 11

Equipment Numbers and Location

Anaerobic and Anoxic Zone Equipment

Equipment	Tag Number	Location
Top Entering Tank Mixers	M-205, -206, -207 M-225, -226, -227	AN, AX1, AX2 Activated Sludge Basins

Swing Zone Equipment

Equipment	Tag Number	Location
Top Entering Tank Mixers	M-208, -228	AX3 Activated Sludge Basins
6-inch Aeration Header Butterfly Valve and Motorized Actuator	A-209, -229	
Air Flow Meter	Ft-210, -230	
Aeration Diffusers	N/A	

Aerobic System Equipment

Equipment	Tag Number	Location
Top Entering Tank Mixers	M-224, -244	OX3 Activated Sludge Basins
Aeration Drop Leg Butterfly Valve and Motorized Actuator	A-209, -229 A-211, -231 A-231, -233 A-215, -235	AX3, OX1, OX2, OX3 Activated Sludge Basins
Air Flow Meter	Ft-210, -230 Ft-212, -232 Ft-214, -234 Ft-216, -236	AX3, OX1, OX2, OX3 Activated Sludge Basins
Aeration Diffusers	N/A	AX3, OX1, OX2, OX3 Activated Sludge Basins
DO Sensors	DO-220, -240 DO-221, -241 DO-222, -241	OX1, OX2, OX3 Activated Sludge Basins
Rotary Positive Displacement Blower	B-421, -425 B-429, -433	Equipment Building Blower Room
Pressure Transmitter	Pt-454	Equipment Building Blower Room
Relief Discharge Valve Actuator	A-453	Equipment Building Blower Room

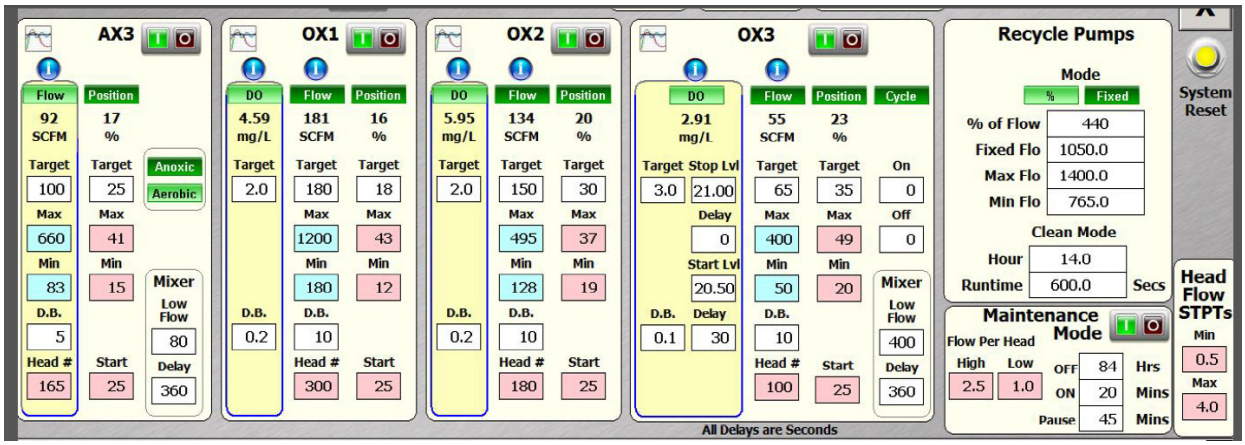
Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
Valve Actuators	Remote/Auto Open/Stop/Close	N/A	Local/Remote Open Stop Close
Top Entering Tank Mixers	Remote/Auto Start/Stop	N/A	Hand/Off/Auto
Rotary Positive Displacement Blower	Hand/Off/Auto	Keypad Entry	Hand/Off/Auto

Equipment Data

Aerzen Aeration Blowers	
Motor Rating	75 hp
Capacity SCFM	266 @ 20 Hz 1160 @ 60 Hz
Discharge Pressure	9.2 psi

Initial Level Set Points



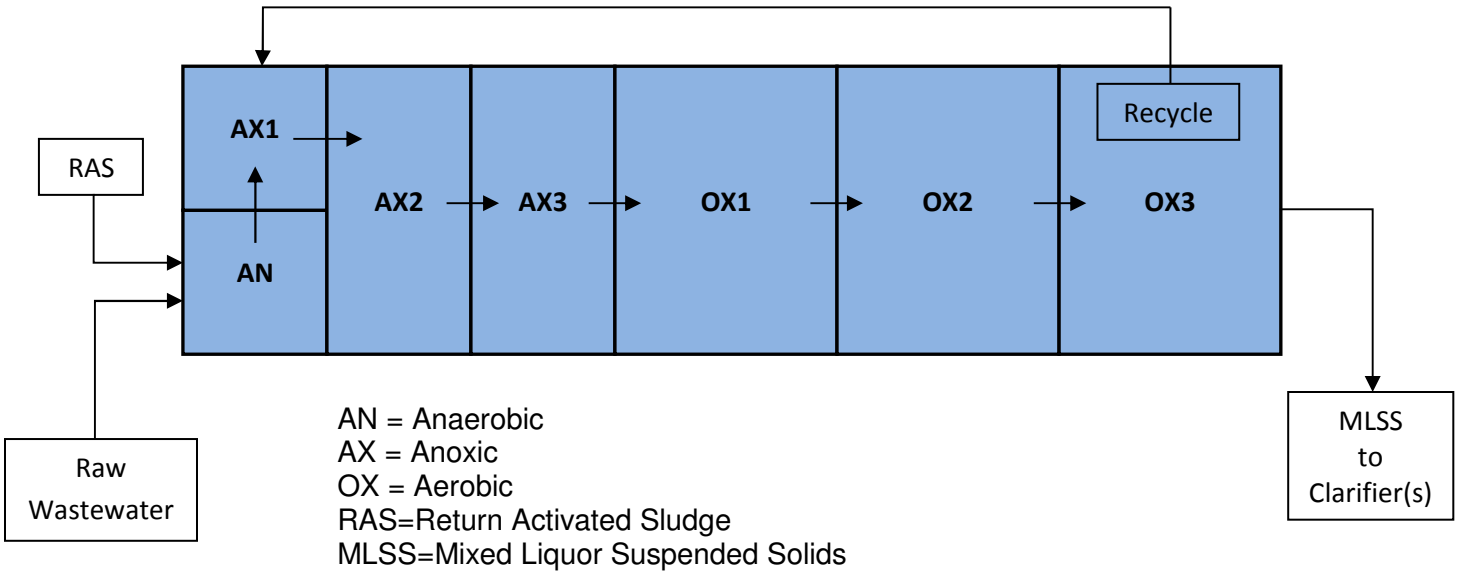
Description

Activated Sludge Basin 1 and Activated Sludge Basin 2 are made up of the following cells:

Cell Name	Cell Denotation	Dimensions (LXWLH)	Storage Capacity (gal)
Anaerobic Cell	AN	18'-6" x 12' x 18'	29,900
Anoxic Cell 1	AX1	18'-6" x 12' x 18'	29,900
Anoxic Cell 2	AX2	17'-8" x 25' x 18'	59,500
Anoxic (Swing) Cell 3	AX3	18' x 25' x 18'	60,600
Aerobic Cell 1	OX1	42'-8" x 25' x 18'	143,700
Aerobic Cell 2	OX2	42'-6" x 25' x 18'	143,100
Aerobic Cell 3	OX3	43' x 25' x 18'	144,800

Process Theory

Biological nutrient removal (BNR) of ammonia and phosphorus is accomplished using a "modified" Bardenpho process which makes use of multiple tank zones operated in anaerobic, anoxic, and aerobic modes. The first zone in the flow stream is the anaerobic zone where return activated sludge (RAS) from the clarifier(s) is mixed with raw wastewater and phosphorus accumulating organisms (PAO's) release phosphorus. The second zone encountered is the anoxic zone where the MLSS from the anaerobic zone mixes with mixed liquor recycled from the aerobic zone and nitrite and nitrate are used as an oxygen source by facultative bacteria. The last zone is the aerobic zone where ammonia is converted to nitrite and nitrate by nitrifying bacteria, phosphorus is absorbed by PAO's, and any remaining organic material is consumed by aerobic and facultative organisms.



Anaerobic - Neither dissolved oxygen nor oxidized forms of nitrogen present

- DO = 0 mg/L
- ORP < -50 mV

Anoxic - Dissolved oxygen not present but oxidized forms of nitrogen present [Nitrate (NO3-N) or Nitrite (NO2-N)]

- DO < 0.5 mg/L
- ORP between -50 to 50 mV

Aerobic - Dissolved oxygen present

- DO > 0.5 mg/L
- ORP > 50 mV

Aerobic Zone Air Flow Rates

Zone	Minimum Air Flow Flux Rate (SCFM)	Minimum Air Flow Rate for Mixing (SCFM)	Maximum Air Flow Rate (SCFM)	Target DO Levels (mg/L)
Activated Sludge Basins Swing Zone AX3	None*	None*	660.0	Not measured
Activated Sludge Basins OX1	225	127.5	1,040.0	2.0
Activated Sludge Basins OX2	110	127.5	410.0	2.0
Activated Sludge Basins OX3	80	123.0**	270.0	2.0

*No minimum rate is required for AX3 – this zone will frequently have no aeration to serve as an anoxic zone. Whenever aeration is not being provided to AX3, the tank mixer MUST be operating.

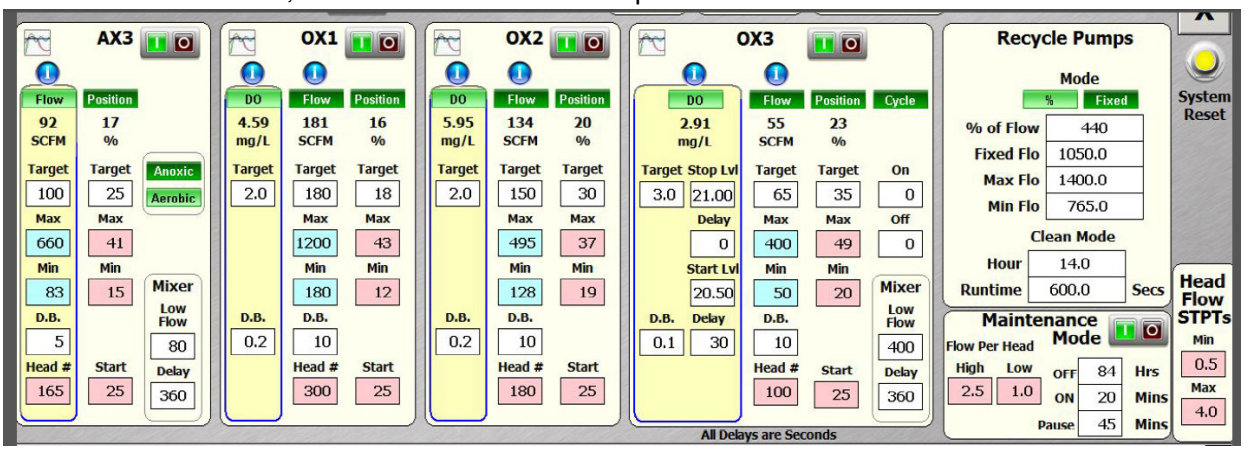
**Air flow rate can fall below this rate if the OX3 mixer is operating.

Normal Operation

In the normal mode of operation (DO Control Mode), PLC's control the operation of the Aeration Throttling Butterfly Valves and the Aeration Blowers. An operator at a SCADA system can change set points for the PLC's, select Auto or Manual control modes, review trending, and observe real time equipment status and equipment alarms.

For the normal automatic mode of operation for the Activated Sludge Basins place controls in the following positions:

- At the SCADA screen, select the Auto mode of operation for each zone:



- Aeration Throttling Butterfly Valves LOCAL/REMOTE Handswitches to REMOTE

- Aeration Blower Control Station Handswitches to AUTO.

At a SCADA station, an operator inputs the desired DO set points for the Activated Sludge Basins OX1, 2, and 3. The electrically actuated Aeration Throttling Butterfly Valves will then change position based on a control loop until the DO probes reach the DO set point or the minimum flow rate for mixing requirements.

An operator will also need to enter a desired Aeration Blower header pressure to maintain (initially set at 8.7 psi). As the DO in the Activated Sludge Basins rises and falls the Aeration Throttling Butterfly Valves will open and close changing the header pressure. The Aeration Blower(s) will adjust speed as needed to maintain the set header pressure while alternating lead lag sequence. An operator needs to input the time between blower alternations.

Alternative Operation

Flow Control Mode

Alternate operation of the aeration system will include the "flow control mode". This mode will be necessitated in the event that one or more DO probes fail in the basins. In this mode, the SCADA system will maintain air flow rates to each cell between the minimum and maximum flow rates by monitoring air flow through each cell aeration dropleg. During start-up of the plant, testing of the flow control mode will occur. The goal of this testing will be to determine the approximate air flow rates required to maintain the target DO levels in each cell. These air flow rates will serve as the "fall-back" rates of aeration used should Flow Control Mode be necessitated.

For the Flow Control Mode of operation for the Activated Sludge Basins place controls in the following positions:

- At the SCADA screen, select the aeration system Flow Control Mode.
- Aeration Throttling Butterfly Valves LOCAL/REMOTE Handswitches to REMOTE
- Aeration Blower Control Station Handswithes to AUTO.

Valve Position Mode

A second alternate operational mode of the aeration system is the "valve position mode". This mode may be necessitated if one or more air flow meters and one or more DO probes fail within the basins. In this mode, the SCADA system will set the aeration dropleg valves to a fixed position while maintaining a header pressure by changing blower speeds, or starting/stopping blowers. During start-up of the plant, testing of the Valve Position Mode will occur. The goal of this testing will be determine a system pressure and valve positions that maintain air flow within the allowed range to each cell with the goal of maintaining the target DO level for each cell.

For the Valve Position Mode of operation for the Activated Sludge Basins place controls in the following positions:

- At a SCADA screen, select the aeration system Valve Position Mode.
- Aeration Throttling Butterfly Valves LOCAL/REMOTE Handswitches to REMOTE
- Aeration Blower Control Station Handswithes to AUTO.

Air Bumping Mode

For 20-30 minutes per week, the SCADA system will automatically "bump" the air flow rate through the diffusers in the online basin(s). The rate of air flow will be increased to 3 scfm/diffuser. This air flow bump is recommended by Xylem as a method of cleansing the diffuser heads in order to prevent premature fouling of the membranes.

Offline Basin Maintenance Mode

In the event that a basin is taken offline, it should be filled with non-potable water using the basin utility stations to a level of 2 feet above the diffuser heads. This is recommended by the diffuser manufacturer to maintain the life of the diffuser membranes. The offline basin should then be put into the operator selected "maintenance mode". During this mode, the SCADA system will periodically open the aeration header butterfly valves to allow air into the diffusers for a short period to combat fouling of the membranes. It is recommended to add chlorine to the non-potable water to prevent algal growth if the basin is expected to be offline for an extended period of time.

To allow for the automated Offline Basin Maintenance Mode of operation for the Activated Sludge Basins place controls in the following positions:

- At a SCADA screen, select the Activated Sludge Basin that is offline.
- Aeration Throttling Butterfly Valves LOCAL/REMOTE Handswitches to REMOTE
- Aeration Blower Control Station Handswithes to AUTO.

SCADA HAND Mode

The "SCADA Hand" mode allows operation of the Aeration Throttling Butterfly Valves and Aeration Blowers from a SCADA station.

Aeration Throttling Butterfly Valves

The SCADA Hand operation of the Aeration Throttling Butterfly Valves allows valves to either be closed or placed in AUTO:

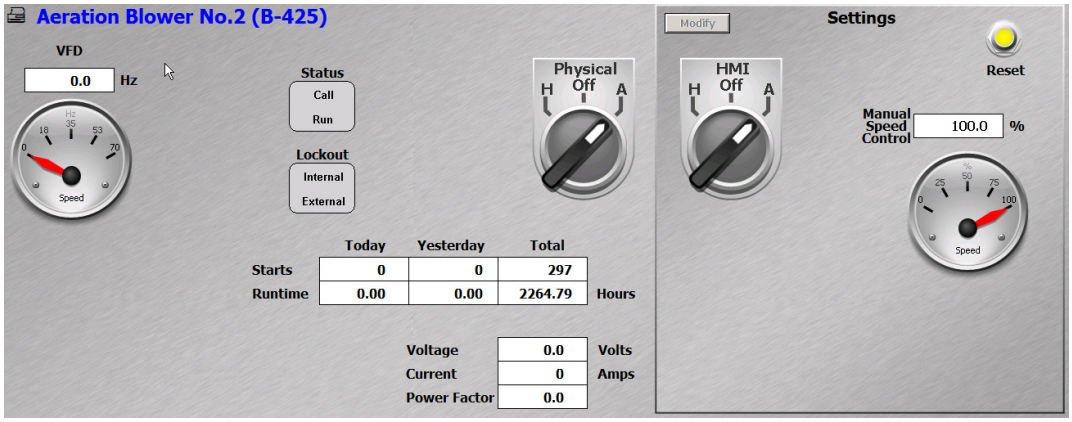
- At a SCADA Station, select the Aeration Throttling Butterfly Valves mode of operation at the HMI HOA switch.

- Aeration Throttling Butterfly Valves LOCAL/REMOTE Handswitch to REMOTE.

Aeration Blowers

For SCADA Hand operation of Aeration Blowers place controls in the following position:

- At a SCADA station, select the Aeration Blower HAND mode of operation on the HMI HOA:



- Aeration Blower Control Station HOA Handswitch to AUTO:

With the SCADA station Manual/Auto selector in HAND, the following control options are available from a SCADA station:

SCADA Command	Equipment Response
Start	This energizes the blower selected.
Stop	This de-energizes the blower selected
% Speed	An operator can enter the % speed desired.

MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

Aeration Throttling Butterfly Valves

For Local operation of the valves place controls in the following position:

- Aeration Throttling Butterfly Valve LOCAL/REMOTE Handswitch to LOCAL.

  With the LOCAL/REMOTE Handswitch in LOCAL, the following control options are available at the throttling butterfly valves.

Control Station	Equipment Response
Open	This energizes the valve to fully open from its current position.
Stop	This de-energizes the valve to stop at its current position when operating in either the Open or Close mode.
Close	This energizes the valve to fully close from its current position.

Aeration Blowers

For Local operation of the Aeration Blowers place controls in the following position:

- Aeration Blower Control Station HOA Handswitch to HAND.

  With the HOA Handswitch in HAND, the following control options are available from the Control Station.

Control Station	Equipment Response
Start	This energizes the blower selected.
Stop	This de-energizes the blower selected
% Speed	An operator can change the blower's speed by changing the VFD percentage at the blower's VFD.

Maintenance & Troubleshooting

The primary operational concern for the aeration system is the clogging or fouling of the fine bubble air diffusion membranes. Over time, membranes become clogged while submerged in wastewater, thus decreasing air diffusion efficiency. Yearly draining of tanks and washdown of diffusers is required as described in further detail in the manufacturer's O&M manuals.

Moisture build-up in the aeration grids is also an operational concern for the aeration system. Each cell contains a purge assembly that is extended from the submerged diffusor grid up to the basin catwalk. The operator must manually purge water from the aeration grid in each cell by opening the purge line ball valve at the catwalk. This operation should occur at least weekly.

Visual inspection during the operation of the aerated basins will help the operator examine the air diffusion characteristics for the diffuser grid. Fine bubbles should be present homogenously throughout the aerated cells. Course bubbles can indicate improper diffuser operation or potentially a leak from the grid piping.

Detailed maintenance and troubleshooting procedures related to the aeration system can be found in the manufacturer's O&Ms as shown below:

- Rotary Positive Displacement Blowers
- Aeration Diffusion Equipment
- Butterfly Valves
- Motorized Valve Actuators
- Air Flow Meter
- Pressure Transmitter

- DO Probes

The following maintenance schedule for the aeration blowers is copied from the Rotary Positive Displacement Blowers vendor O&M manual.

Whenever work is carried out on the positive displacement machine, it must be switched off and isolated from the mains electricity supply.
Failure to follow this instruction could result in injury or damage!
Various steps should be taken to achieve a long service life and provide the optimum operating conditions. These include carrying out the maintenance work specified in this table at the intervals specified here.

DELTA BLOWER / G5 Overpressure mode	Maintenance intervals								
We recommend carrying out the maintenance work on the positive displacement machine at the specified intervals. The operating hours represent average operating conditions. The actual service life of the equipment may vary depending on environmental conditions and operating data. If you think this situation applies to you, please contact Aerzener Maschinenfabrik.	**After the first 3 op. hrs**	**After the first 25 op. hrs**	**After the first 500 op. hrs**	**Weekly**	**After every subsequent 2000 op. hours or every 3 months**	**After every subsequent 4000 op. hours or every 6 months**	**After every subsequent 8000 op. hours or every year**	**After every subsequent 16,000 op. hours or after every subsequent 2 years**	**After every subsequent 20,000 op. hours or after every subsequent 3 years**
Check fixing screws and screwed connections • Re-tighten once the machine has cooled down, if possible	•								
Starting strainer, if fitted • Check; can be removed if dirt is no longer being accumulated			•						
Intake filter • Check level of filter contamination and, if necessary, replace filter cartridge, max. -45 mbar • Replace filter cartridge				•	○		•		
Check and clean inlet/exhaust openings • of acoustic hood						•			
V-belts • Check condition; replace if necessary • Replace		•				•		•	
Belt pulley alignment • Check; correct if necessary		•						•	
Pressure valve • Check function	•				○	•			
Oil level • Check; correct if necessary	•	•		•					
Lubricating oil • Replace • Replace, with final compression temperatures above 140°C			• •			•	•		
Lubricating grease, only with gas-tight shaft seal • Replace • Replace if Aerzener special rotary piston oil is used and with a final compression temperature above 140°C • Replace if ISO VG 220 is used and the oil has a pronounced dark discolouration			• • •			• •	•		
Drive shaft seal **(when conveying toxic / inflammable gases)** • Replace							•		
Non-return valve • Check for wear and leaks, replace if necessary							○	•	
Flexible pipe connection, if fitted pressure side/suction • Check for leaks, replace if necessary								•	
Hydraulic, pneumatic and measurement lines, if fitted • Check for leaks, replace if necessary • Recommendation: Replace every 6 years									• •
○ **Halving of or reduction in maintenance intervals (*recommendation*)**	**Under difficult operating conditions such as:** **- ambient temperatures in excess of 30°C throughout the year** **- high level of dust etc.**								
Main inspection / maintenance (*recommendation*) • Check/replace spare and wearing parts • Check entire machine									• •
Drive motor • Perform maintenance • Observe deadlines for re-lubrication	**Please observe the maintenance intervals and maintenance specifications of the motor manufacturer!** **With Aerzener motors, the Aerzener operating and maintenance instructions must be followed.**								

Arrange for the positive displacement machine to undergo a complete check by the Aerzener Service department at the specified intervals
Or: Take out a maintenance contract with Aerzener Maschinenfabrik.
If you maintain your machine regularly and properly, Aerzener Maschinenfabrik will guarantee maximum reliability for your application.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
Recycle Pumping

Table of Contents

Equipment Numbers and Location 2
Equipment Controls 2
Equipment Data 2
Initial Set Points 2
Description 2
Process Theory 3
Normal Operation 5
Alternative Operation 6
Fixed Flow Mode 6
SCADA HAND Mode 7
MANUAL Mode 7
Maintenance & Troubleshooting 8
Emergency Operation 9
Alarms 9

Equipment Numbers and Location

Equipment	Tag Number	Location
Submersible Recycle Pumps	P-218 P-238	OX3 Activated Sludge Basins
Electromagnetic Flowmeters	Ft-142 Ft-144	Headworks Mechanical Room/Screenings Room
Plug Valves	NA	Headworks Mechanical Room/Screenings Room

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
Recycle Pumps	Hand/Off/Auto Start/Stop % Speed	Keypad Entry	Hand/Off/Auto

Equipment Data

ABS Pumps	
Motor Rating	28 hp
Rated Voltage	460
Full Load Amps	35
Discharge & Suction Size	8”
Flow @ 14 ft TDH	2,290 gpm

Initial Set Points

440% of influent flow

Description

The aeration basin recycle pumping system returns activated sludge from cell OX3 to the mixing chimney in AX1. The pumping system consists of a 28 horsepower ABS submersible pump located in cell Ox3 of each activated sludge basin. These pumps recycle Mixed Liquor (ML) through 12-inch ML piping to the mixing chimneys. The electromagnetic flowmeters and plug valves (located on either side of the meter) for the ML pipes are located on the lower level of the Headworks building just before discharging to the mixing chimney.

Cell Name	Cell Denotation	Dimensions (LXWLH)	Storage Capacity (gal)
Anoxic Cell 1	AX1	18’-6” x 12’ x 18’	29,900
Aerobic Cell 3	OX3	43’ x 25’ x 18’	144,800

Process Theory

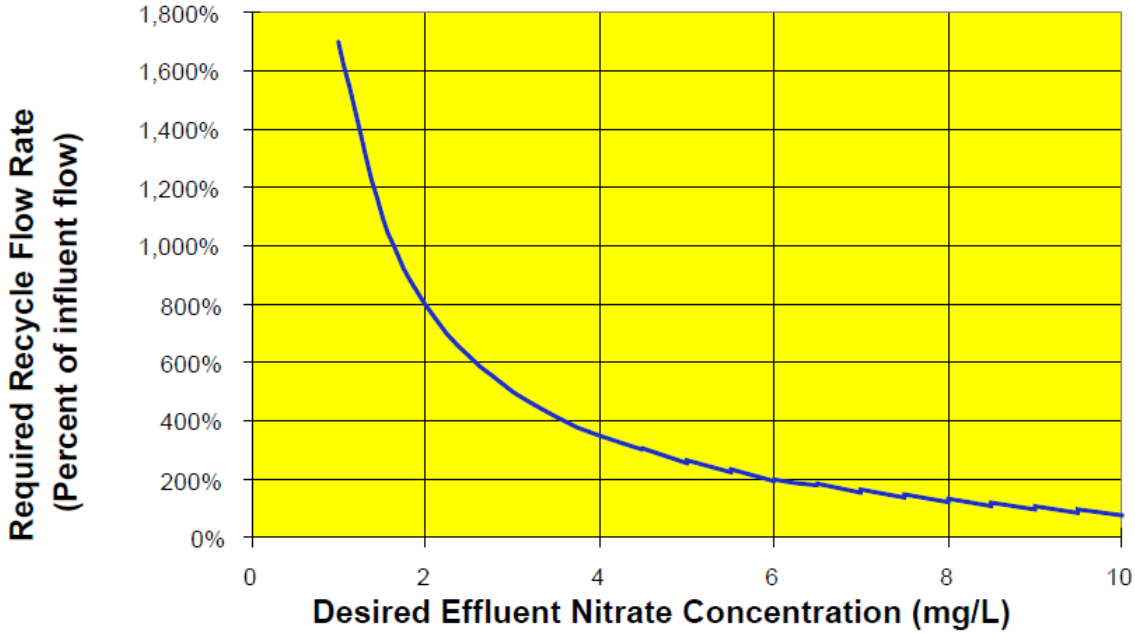
Nitrate from the aerated portions of the activated sludge basins is recycled to the anoxic zones of the activated sludge basins so that denitrification can take place. The conditions necessary for denitrification are:

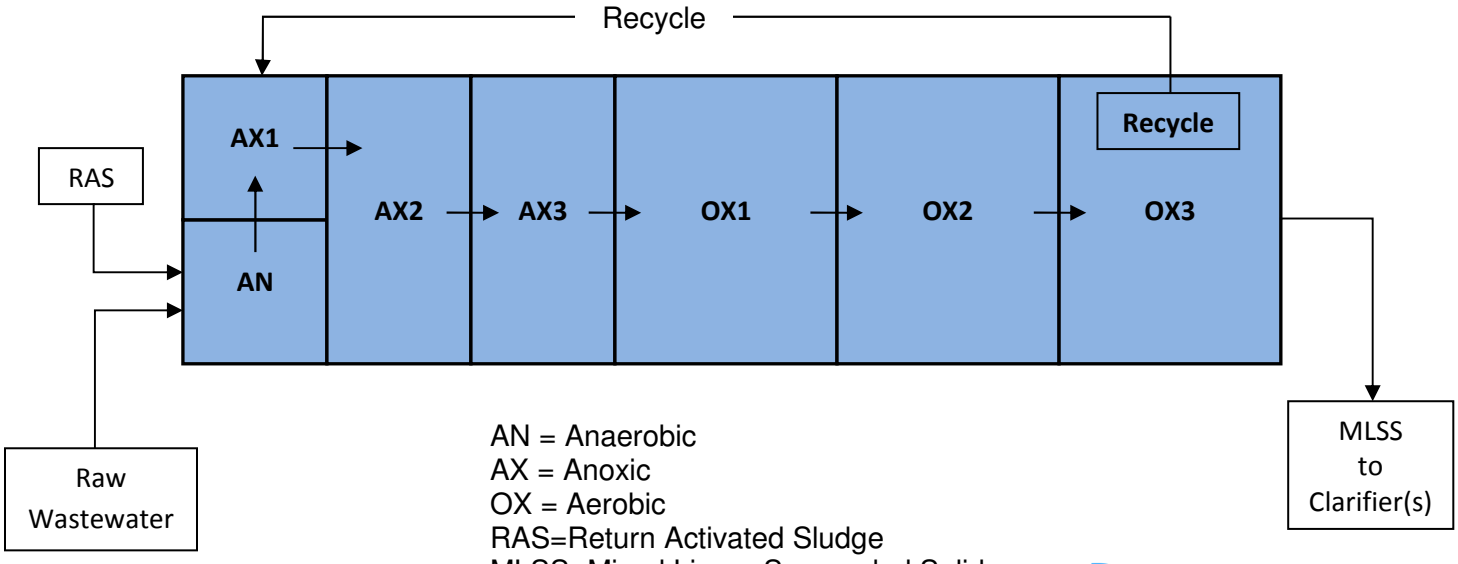
- Denitrifying (facultative heterotrophic) bacteria
- Food (readily available BOD)
- Nitrate
- No dissolved oxygen

The MLSS Recycle Rate can be determined by the following formula:

MLSS Recycle Flow = Influent Plant Flow x (Nitrate/Desired Effluent Nitrate – 1) x RAS Flow

The graph below illustrates a recycle flow based on a % of influent flow needed to achieve a desired effluent nitrate concentration.





AN = Anaerobic
AX = Anoxic
OX = Aerobic
RAS=Return Activated Sludge
MLSS=Mixed Liquor Suspended Solids

Anaerobic - Neither dissolved oxygen nor oxidized forms of nitrogen present

DO = 0 mg/L

ORP < -50 mV

Anoxic - Dissolved oxygen not present but oxidized forms of nitrogen present

[Nitrate (NO3-N) or Nitrite (NO2-N)]

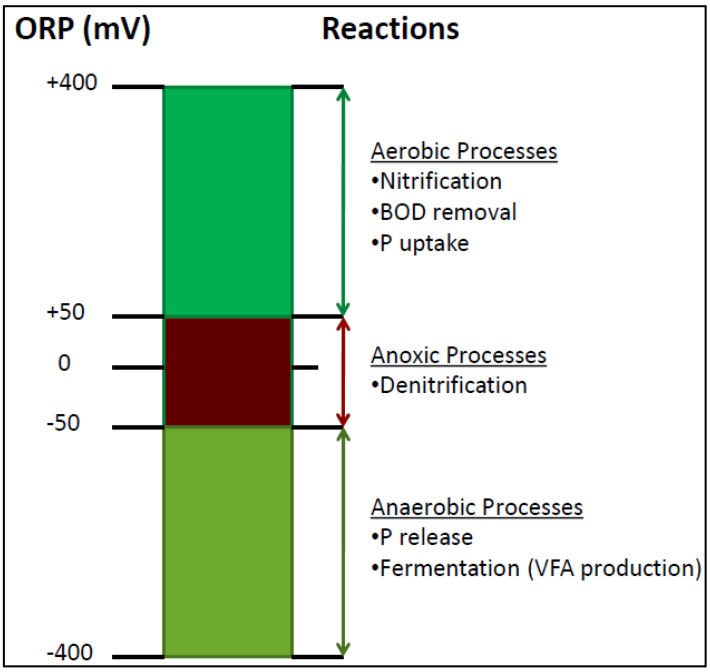
DO < 0.5 mg/L

ORP between -50 to 50 mV

Aerobic - Dissolved oxygen present

DO > 0.5 mg/L

ORP > 50 mV



For an anoxic environment maintain the ORP between -50 and +50

If Anoxic Zone ORP is greater than +50

- Decrease Recycle Flow Rate

If Anoxic Zone ORP is less than -50

- Increase Recycle Flow Rate

Normal Operation

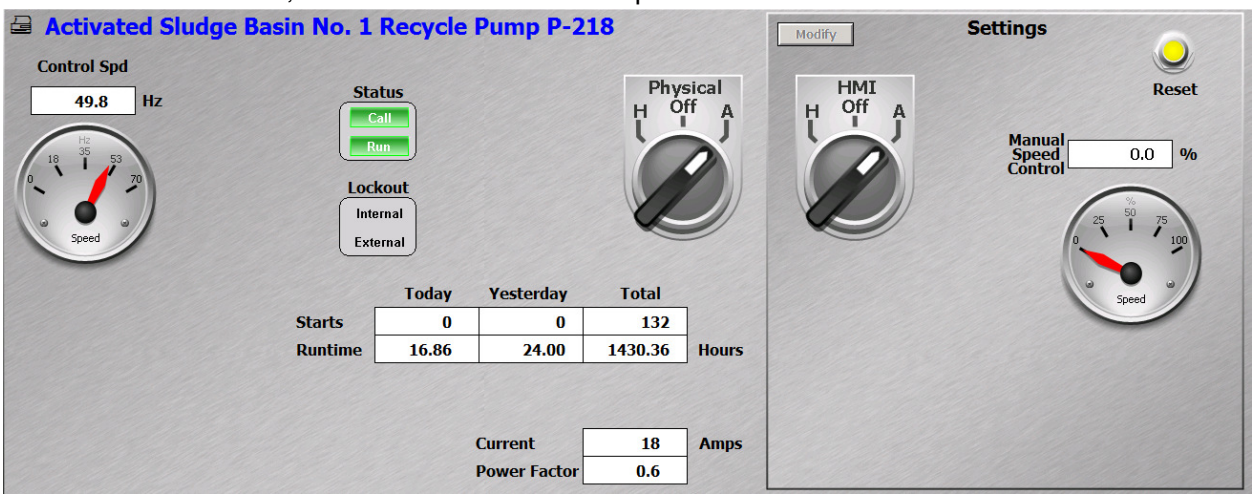
During normal operation of each online basin, each basin's recycle pump will be continuously operated by the plant SCADA system using the percent of influent flow mode of operation. During this mode, the pumps will produce a flowrate equal to the operator-selected percentage of influent flow to recycle. If both basins are operating, this percentage is evenly split by the SCADA system between the two pumps.

If a single basin is operating, the full recycle amount is recycled by a single pump. The flow rate produced by these pumps will be controlled by VFDs and will be between 771 and 1,500 GPM as monitored by the electromagnetic flowmeter on each line.

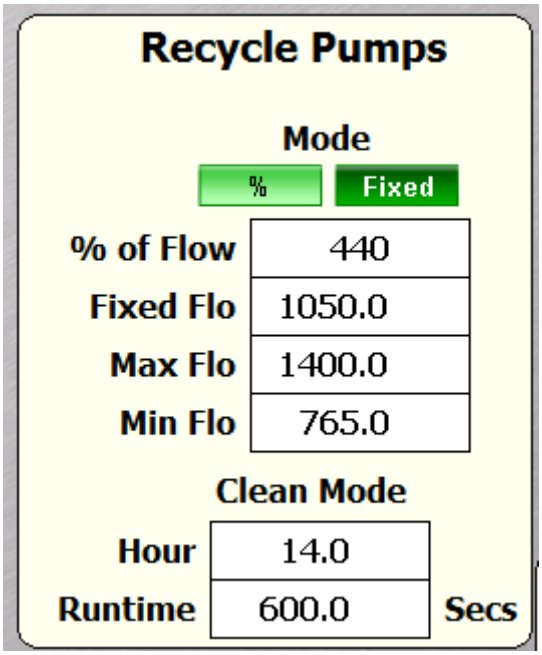
For the normal automatic mode of operation for the Activated Sludge Basins place controls in the following positions:

- Recycle Pump Control Station Hand/Off/Auto switch to Auto.

- At the SCADA screen, select the Auto mode of operation on the HMI HOA switch.



- At the SCADA screen, select the % of Flow mode:



At a SCADA station, an operator inputs the desired mixed liquor recycle rate based on a percentage of influent flow. The Recycle Pump will automatically vary it's speed to maintain the desired flow setpoint.

Alternative Operation

Fixed Flow Mode

As an alternate form of the recycle pump operation, a manual fixed flow mode of operation can occur. In this case, the operator will set a specific flow rate to be recycled by each pump between 771 and 1,500 GPM. The SCADA system will maintain this flowrate for each pump until the operational mode is returned to the percent of influent flow mode.

For the Fixed Flow Mode of operation for the Recycle Pump(s) place controls in the following positions:

- Recycle Pump Control Station Hand/Off/Auto switch to Auto.
- At the SCADA screen, select the Fixed Flow Mode.

For a period of 10 minutes a day, the SCADA system will call the recycle pump(s) for each online basin to be operated at 1,500 GPM. This operation will be considered a "maintenance mode". This increased flowrate will help remove settled solids from the ML piping. It is recommended that the operator visually inspect the operation of the recycle pump during this period of increased flowrate. The operator may alter the time of day, run time length, or flowrate for this mode.

SCADA HAND Mode

The "SCADA Hand" mode allows operation of the Recycle Pump from a SCADA station.

For SCADA Hand operation of a Recycle Pump place controls in the following position:

- Recycle Pump Control Station Hand/Off/Auto switch to Auto.
- At a SCADA Station, select the Recycle Pump manual mode of operation.

With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Start	This energizes the selected Recycle Pump
Stop	This de-energizes the selected Recycle Pump.
% Speed	An operator can enter the % speed for a Recycle Pump to achieve desired flow rate

MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

For Local operation of the valves place controls in the following position:

- Recycle Pump Control Station Hand/Off/Auto switch to Hand

  With the Hand/Off/Auto Handswitch in Hand, the following control options are available for the Recycle pumps.

Control Station	Equipment Response
Hand	This energizes the Recycle Pump and it will run at a default speed set in its respective VFD
Off	This de-energizes the Recycle Pump
Auto	This returns the Recycle Pump to SCADA control.

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures for the Recycle Pump system components can be found in the manufacturer's O&Ms as shown below:

- Submersible Pumps
- Electromagnetic Flowmeter
- Plug Valves

The following maintenance schedule for the Submersible Pumps is an excerpt from the Submersible Pumps vendor O&M manual.

SUBMERSIBLE UNITS – XFP SERIES (PE3 – PE6)

MAINTENANCE SUMMARY *

MAINTENANCE OPERATION	FREQUENCY
Wash Down Unit	Every 6 months
Jog Idle Unit (Idle for long period of time)	Every month
Check Seal Water/Glycol Mixture for Contamination	Every 12 months **
Check Mechanical Seals	If water/glycol mixture is contaminated or if the seal failure indicating light on the control panel is activated ***
Inspect Cable for Chafing, Cuts, or Abrasion	Every 3 months
Inspect Impeller/Wear Plate/Wear Rings for Wear	If unit performance has decreased
Inspect Lifting Chains	Every 3 months
Check Motor Performance (Amp Draw)	Every 6 months
Check Bearings for Wear	Regular inspection is not required

* Consult O&M or Workshop Manual for additional information.
** A regular water/glycol mixture change is not necessary. Replace only if water/glycol mixture is contaminated.
*** Any O-Ring or Seal Washer that is removed during inspection should be replaced.

The maintenance checks should be performed at the intervals stated.
Severe operating environments will require more frequent checks.

Emergency Operation

During an outage of normal power to the plant, the recycle pump in Activated Sludge Basin #1 is considered the essentially-powered recycle pump by default and as such, it will remain powered via the emergency generator.

The operator may choose within the SCADA system to make Activated Sludge Basin #2 the essentially powered train if necessary, in which case this basin's recycle pump will remain powered during an outage.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
Clarifiers and RAS Pumping

Table of Contents

Equipment Numbers and Location 2
Clarifier Flow Splitter Summary 2
Clarifier Summary 2
RAS Pump Summary 2
Equipment Controls 2
Equipment Data 3
Initial Level Set Points 3
Description 3
Process Theory 4
Normal Operation 4
Alternative Operation 5
Clarifier Flow Splitter Box 5
RAS Pumps 5
SCADA HAND Mode 6
Clarifier 6
RAS Pumps 6
MANUAL Mode 7
Clarifier 7
RAS Pumps 7
Maintenance & Troubleshooting 7
RAS Pumps 8
Clarifier Drives 8
Emergency Operation 9
Clarifiers 9
RAS Pumps 9
Alarms 9

Equipment Numbers and Location

Clarifier Flow Splitter Summary

Equipment	Tag Number	Operation
Slide Gate	G-301	Manual control of flow from Activated Sludge Basin #1 to the clarifier splitter. Allows flow beneath the gate when open.
Slide Gate	G-302	Manual control of flow from Activated Sludge Basin #2 to the clarifier splitter. Allows flow beneath the gate when open.
Slide Gate	G-303	Manual control of flow from EQ basin to the clarifier splitter. Closed until EQ basin is converted to 3rd activated sludge basin.
Slide Gate	G-304	Manual control of flow from the clarifier splitter to clarifier #1. Allows flow over the gate; height set at 759.00'.
Slide Gate	G-305	Manual control of flow from the clarifier splitter to clarifier #2. Allows flow over the gate; height set at 759.00'.
Slide Gate	G-306	Manual control of flow the clarifier splitter to the future clarifier. Closed until future clarifier is constructed.

Clarifier Summary

Equipment	Tag Number	Location
Clarifier No. 1	M-301	North Clarifier East of Activated Sludge Basins
Clarifier No. 2	M-302	South Clarifier East of Activated Sludge Basins

RAS Pump Summary

Equipment	Tag Number	Location
RAS Pumps	P-440, -442, -444	Equipment Building Pump Room
Electromagnetic Flow meters	Ft-446, -448	Equipment Building Pump Room

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
RAS Pumps	Hand/Off/Auto Start/Stop % Speed	Keypad Entry	Hand/Off/Auto
Clarifiers	Hand/Off/Auto Start/Stop	NA	Hand/Off/Auto

Equipment Data

Wemco RAS Pumps	
Motor Rating	5 hp
Rated Voltage	460
Full Load Amps	35
Discharge & Suction Size	8”
Flow @ 13 ft TDH	382 gpm

Initial Level Set Points

Clarifier 60 Hz (100%)
RAS 95% of influent flow

Description

The intended operational strategy is to have one clarifier on-line for each on-line activated sludge basin. The clarifier mechanisms are called to run manually, and the VFD-controlled speed of the clarifier drive mechanism is also set manually. The SCADA system will monitor torque in the drive shaft. In a high torque scenario, the motor will be shut off. All other clarifier components operate integrally with the clarifier mechanism.

Three hydrostatic pressure relief wall valves are installed in each buried clarifier tank at 18 inches above the floor. The purpose of these valves is to counteract external buoyancy forces if the clarifier is empty and groundwater rises to the elevation of the valves. The valves will open and groundwater will enter the tank.

The RAS collection and pumping system recycles built-up sludge from the base of the clarifiers and returns it to the Headworks flow splitter. The clarifier’s integral scraper and sludge withdrawal ring deposits the collected RAS into a 6-inch main cast vertically into the base of the clarifier structure. This pipe allows RAS to be removed using three Wemco screw centrifugal pumps located in the Equipment Building Pump room.

Each RAS pump is dedicated to each clarifier and the third pump functions as a backup. The backup pump will likely be used in the wasting scenario discussed in the WAS section below. The RAS pumps discharge into a dual 6-inch header system. The lower pipe receives flow from RAS Pump #1, which is the dedicated pump for Clarifier #1, and from the backup RAS pump depending on manual valve configuration. The upper pipe receives flow from RAS Pump #2, which is the dedicated pump for Clarifier #2, and from the backup RAS pump based on manual valve configuration. Both header pipes are metered; Ft-446 is located on the lower pipe and Ft-448 is located on the upper pipe. The dual pipes run below grade from the Pump room to the Headworks, where each discharges to flow splitter.

Basin Name	Dimensions	Area ft^2	Volume	Overflow Rate (gpd/ft^2)
Clarifier No. 1	40’ diameter x 14’ SWD	1,256	17,500 ft^3 (131,500 gal)	1,000 max
Clarifier No. 2	40’ diameter x 14’ SWD	1,256	17,500 ft^3 (131,500 gal)	1,000 max

Process Theory

Mixed liquor suspended solids (MLSS) from the activated sludge basins enter the clarifiers. The clarifiers create a quiescent environment where solids can settle and floatable material can accumulate on the water's surface.

Return activated sludge (RAS) pumps return settled solids from the clarifiers to the anaerobic zone of the activated sludge process. Scum that floats is collected by a skimmer assembly and is directed to the scum wasting box by non-potable water (NPW) spray water. The scum is sent to a concrete sump adjacent to each clarifier and flow by gravity to the In-Plant Pump Station (IPPS). Clarified water flows by gravity to the UV disinfection system

Normal Operation

During normal operation, the clarifier splitter directs mixed liquor from the activated sludge basins to the clarifiers. The slide gates are opened and closed manually. Gates G-301, G-302, and G-303 allow full flow beneath the gate and are normally fully open or fully closed. Gates G-304, G-305, and G-306 function as weir gates allowing over-the-top flow.

The clarifier mechanism will be called to run by the operator at the Human-Machine Interface (HMI). The operator will also set the rake arm speed. The SCADA system will control the speed using the clarifier drive motor VFD. The operator will determine the speed at which to run the mechanism based on the required rate of RAS collection.

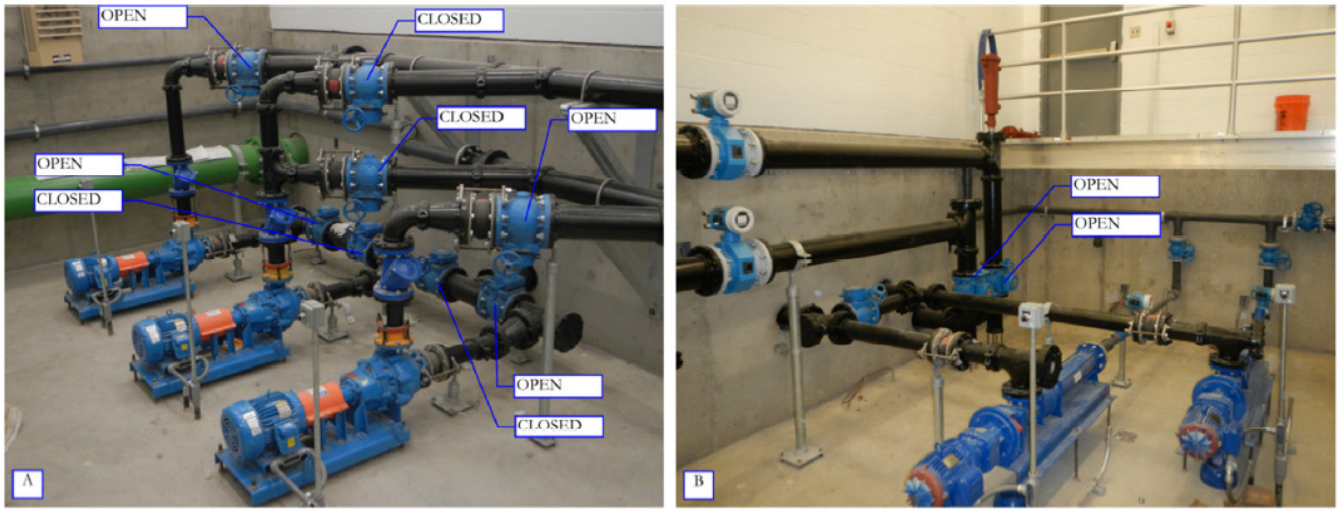
The clarifier drive mechanism contains limit switches for drive torque. Torque on the mechanism would likely come from an obstruction on the rake arm or skimming arm. At 75% of the drive's rated torque (11,250 ft-lb), a high torque alarm will sound. At 85% of the drive's rated torque (12,750 ft-lb), the motor is shut off. At 100% of the drive's rated torque (15,000 ft-lb), a secondary motor shut-off exists.

RAS is continually returned from the clarifiers back to the Headworks flow splitter based on plant influent "flow pacing". At the HMI, the operator calls the RAS pumps to run and selects the percentage of influent flow to be recycled. RAS flowrates for each clarifier are expected to be between 40-100% of the average annual influent flowrate into the plant. This would result in a flowrate from each clarifier of 103-257 GPM based on the 2012 average annual flow of 0.37 MGD. The operator will determine the exact rate of return based on the sludge loading into the clarifiers. The SCADA system will control the VFD associated with each pump. The system will receive feedback regarding the flow rate in each header pipe from the following flowmeters:

- Flowmeter Ft-446 monitors flow from RAS pump #1 (and the backup pump if discharged in this orientation) to the Headworks
- Flowmeter Ft-448 monitors flow from RAS pump #2 (and the backup pump if discharged in this orientation) to the Headworks

The SCADA system will use these flowmeters to produce the desired flowrate to the Headworks.

The three RAS pumps must be manually manipulated via plug valves to correctly direct flow to the Headworks. This can be done for single or dual clarifier RAS return as shown below:



Valve Orientation Photos – Manual valve orientation for dual clarifier RAS pumping. (A) West wall of Pump room; (B) North wall of Pump room

For the normal automatic mode of operation for the Clarifiers and RAS Pumps place controls in the following positions:

- At the SCADA screen, select the Auto mode of operation.
- RAS Pump Control Station Hand/Off/Auto switches to Auto.
- Clarifier Control Station Hand/Off/Auto switches to Auto.

At a SCADA station, an operator inputs the desired RAS rate based on a percentage of influent flow. The RAS Pump(s) will automatically vary its speed to maintain the desired flow setpoint.

Alternative Operation

Clarifier Flow Splitter Box

Alternate operation of the flow splitter could be considered to be any of the configurations to allow flow between each basin and each clarifier. All such operations are done manually.

RAS Pumps

An alternate operation of the RAS pumping system allows for the operator to pump a specific volume of RAS from either or both clarifiers back to the Headworks over a specific period of time. For this operation to occur, the operator must take the desired volume of RAS to be returned and divide it by an acceptable flowrate to produce the RAS return time period. The operator calls the RAS pump(s) to run for a set time period at the set flowrate via the HMI.

The RAS pumps can also be locally turned on using the physical HOA panel located adjacent to each pump by turning the switch to “HAND”. The local HOA can be used if the operator is unable to call the pumps to run at the HMI. The operator will have to turn the HOA switch back to “AUTO” after the manual override is complete so that the RAS pumps can be controlled remotely.

Maintenance Mode
During RAS recycling, it is important that each RAS pump is operated at the higher end of its flow range for a short duration each day to keep solids from settling in the pipelines. The SCADA system can be programmed so that this maintenance activity is completed each day at a time set by the operator. It is recommended that the operator be present to inspect the pump's operation during this period. This maintenance operation can also be manually completed by the operator by inputting a higher flowrate in the HMI for each operating RAS pump.

SCADA HAND Mode

The "SCADA Hand" mode allows operation of the Equipment from a SCADA station.

Clarifier

For SCADA Hand operation of a Clarifier Drive place controls in the following position:

- At a SCADA Station, select the Clairfier manual mode of operation.
- Clarifier Control Station Hand/Off/Auto switch to Auto.

With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Start	This energizes the selected Clarifier
Stop	This de-energizes the selected Clarifier

RAS Pumps

For SCADA Hand operation of a RAS Pump place controls in the following position:

- At a SCADA Station, select the RAS Pump manual mode of operation.
- RAS Pump Control Station Hand/Off/Auto switch to Auto.

With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Start	This energizes the selected RAS Pump
Stop	This de-energizes the selected RAS Pump.
% Speed	An operator can enter the % speed for a RAS Pump to achieve desired flow rate

MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

Clarifier

For Local operation of the clarifiers place controls in the following position:

- Clarifier Control Station Hand/Off/Auto switch to Hand

  With the Hand/Off/Auto Handswitch in Hand, the following control options are available at the clarifier drive mechanism.

Control Station	Equipment Response
Hand	This energizes the Clarifier and it will run at a default speed set in its respective VFD
Off	This de-energizes the Clarifier
Auto	This returns the Clarifier to SCADA control.

RAS Pumps

For Local operation of the RAS Pumps place controls in the following position:

- RAS Pump Control Station Hand/Off/Auto switch to Hand

  With the Hand/Off/Auto Handswitch in Hand, the following control options are available at its respective control station.

Control Station	Equipment Response
Hand	This energizes the RAS Pump and it will run at a default speed set in its respective VFD
Off	This de-energizes the RAS Pump
Auto	This returns the RAS Pump to SCADA control.

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures for the Clarifiers, RAS Pumps, and Clarifier Flow Splitter systems can be found in the manufacturer's O&Ms as shown below:

- Clarifier Mechanism (sludge removal)
- Screw Centrifugal Pumps
- Plug Valves
- Sewage Air Vacuum/Relief Valves
- Electromagnetic Flowmeter

The following maintenance schedule for the RAS Pumps and Clarifier are excerpts from their respective vendor O&M manuals.

RAS Pumps

Maintenance Operation List briefly each maintenance operation required & refer to specific information in mfr's std. maintenance manual, if applicable.	Frequency List required frequency of each maintenance operation.	Lubricant (If Applicable) Refer by symbol to lubricant list required.	Comments
Inspect pump for proper operation.	Daily	---	Clean/clear as needed.
Check seal chamber oil.	After 1000 hrs. and once per year thereafter.	-C-	Increase frequency as experience dictates.
Check bearing housing lubrication.	4000 operating hours.	-A-	Grease as required.
Check coupling alignment.	Semi-Annually.	---	Adjust as required.
Check motor for proper operation.	500 operating hours or every 3 months whichever comes first.	---	Clean motor/ventilation openings clear.
Motor lubrication.	Semi-Annually.	-B-	Lube as required.

Clarifier Drives

PREVENTATIVE MAINTENANCE CHART

DESCRIPTION	D	W	M	A	OTHER
Check drive unit for unusual sounds, excessive vibrations, oil leakage, etc.	X				
Check skimmer for proper operation	X				
Check scum pipe for proper drainage	X				
Check all drive components for water condensation - drain as required & top of oil levels		X			
Clean Drive Unit exterior		X			
Check all drive components for proper oil level -add as required		X			
Check mounting bolts for tightness			X		
Inspect entire unit above and below the waterline and paint as required				X	

Legend: D = Daily W = Weekly M = Monthly A = Annually

For more detailed maintenance information refer to equipment vendor O&M manuals.

Emergency Operation

Clarifiers

During an outage of normal power to the plant, the emergency generator has been sized to run a single clarifier mechanism – Clarifier #1. If both clarifiers are operational when normal power goes out, flow to Clarifier #2 would need to be manually isolated at the clarifier flow splitter by closing slide gate G-305 such that all flow from the basins is directed to Clarifier #1.

RAS Pumps

During an outage of normal power to the plant, the emergency generator (EG) has been sized to run a single RAS pump – RAS pump #1. It is important to note that the maximum RAS recycle rate is equal to the maximum allowable flowrate for a single RAS pump. This means that only one clarifier will operate during a power outage and the EG set is sized for this scenario.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
UV Disinfection

Table of Contents

Equipment Numbers and Location 2
Equipment Controls 2
Equipment Data 2
Initial Set Points 2
Description 3
Process Theory 3
Normal Operation 3
Alternative Operation 5
Maintenance & Troubleshooting 11
Troubleshooting Guide 11
System Maintenance 12
Emergency Operation 14
Alarms 14

Equipment Numbers and Location

Equipment	Tag Number	Location
Trojan UV3000Plus™ Modules (QTY=6)	NA	UV Channel – 3 modules per bank, 2 banks of UV units
UV Hydraulic System Center (HSC)	NA	UV Shelter
UV System Control Center (SCC)	NA	UV Shelter
UV Power Distribution Center (PDC) 1A	NA	UV Shelter
UV Power Distribution Center (PDC) 1	NA	UV Shelter
UV Intensity Sensor (QTY = 2)	NA	UV Banks
Level Control Weir	NA	UV Channel – downstream of UV units
Ultrasonic Level Sensor	Lt-404	UV Channel
UV Water Level Sensor	Lt-403	UV Channel – downstream of UV units

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
UV Disinfection	Monitoring Only	NA	Panel View touchscreen at SCC Switches at PDC Switches at HSC

Equipment Data

ABS Pumps	
Motor Rating	28 hp
Rated Voltage	460
Full Load Amps	35
Discharge & Suction Size	8”
Flow @ 14 ft TDH	2,290 gpm

Initial Set Points

UVT 70%

Description

The clarified effluent is disinfected as it passes through the UV unit(s) located in the channel. The UV disinfection system functions by providing light at the proper wavelength to disrupt the DNA of pathogens; this disruption prohibits the pathogens from surviving or reproducing. The total suspended solids (TSS) of the clarified effluent must be 30 mg/L or less in order for the UV light to penetrate the pathogens and be effective. The unit is designed for a UV transmittance of 65 percent or greater. The UV unit will meet a disinfection standard of 200 fecal coliform/100 mL based on a 30 day geometric mean and 400 fecal coliform/100 mL based on a 7 day geometric mean.

A series of wastewater quality tests are recommended by the UV disinfection system manufacturer to be periodically conducted by the operator to determine the effectiveness of the UV system for disinfection. The following samples should be collected by the operator prior to the UV unit: Percent UV Transmittance, Total Suspended Solids and Particle Size Distribution. A post-disinfection microbial analysis should be periodically conducted after UV disinfection to ensure the WWTF is conforming to disinfection standards. An effluent grab sample should be used to perform the microbial analysis.

Process Theory

Effluent flows through the effluent channel and over the bulbs. The UV bulbs are kept cool and the effluent is subjected to the UV light wavelength that disrupts the DNA of pathogens. A setpoint dose automatically maintained as effluent flow increases or decreases when the UV system is operated in the automatic mode of operation.

Normal Operation

During normal operation, the clarified effluent will be routed through the effluent flow meter valve vault prior to entering the UV channel. The UV channel includes two units (banks) for disinfection. Each bank contains three modules. All ballast and lamp wiring is inside the module frame. A module contains 2 to 4 ballasts; the City's UV disinfection system has 2 ballast per module. A ballast is used to monitor and control 2 lamps. The City's UV disinfection system has 12 lamps per bank for a total of 24 lamps.

The serpentine finger weir keeps the water level within the channel at a minimum height so that the UV units can operate effectively. The dose is controlled by an algorithm processed by a microprocessor contained within the UV Power Distribution Center. The dose algorithm uses effluent flow rate, UV transmittance, and lamp age and power level of the operating UV unit to calculate the applied dose.

The desired UV Dose setpoint is manually entered by the operator. The Power Distribution Center will control the number of banks that are operating and the power level to each bank to maintain the UV dose setpoint if the UV disinfection system is set to "Remote Auto". The variation in bank operation and power level occurs after an initial warm up period. The UV lamps operate at full power during the warm up period.

The flow recorded using the effluent flow meter is transmitted to the Power Distribution Center in order to provide dose pacing. An operator entered flow value can also be used to replace the measured flow value from the effluent flow meter if needed.

A UV transmittance signal is required to provide dose pacing. The City's UV disinfection system does not have an on-line UV transmittance sensor. An operator entered UV transmittance value will be entered.

A UV intensity sensor is provided for each UV unit and this 4-20 mA signal originates from the probe mounted on the middle module of a bank of lamps (each bank has three modules). This signal is not used for dose control. The UV sensor is installed within its own full length quartz sleeve.

The UV banks can be automatically rotated with each on/off cycle or the automatic rotation can be disabled by the operator.

For Remote Auto operation of the UV Disinfection System place controls in the following position:

1. At a SCADA station, select the Auto mode of operation for the UV Disinfection System.
2. UV Disinfection System Control Panel LOCAL/REMOTE Handswitches to REMOTE.
3. Power Distribution Center (PDC) OFF/REMOTE/ON Handswitch to REMOTE.
4. Wiper Mode Selector OFF/REMOTE/LOCAL Handswitch on Hydraulic System Control (HSC) to REMOTE
5. Wiper Mode Selector RET/EXT/SEQ Handswitch on Hydraulic System Control (HSC) to SEQ

The Remote Auto mode controls the operation of the UV Disinfection system by the Dose Pacing routine of the PLC. The PLC will control the number of banks that are operating and the power level of each bank to a level that maintains the current delivered UV dose above an entered setpoint. In REMOTE AUTO mode, all banks that are requested to be switched on are operated at full power for an initial configured warm-up time, and will then drop to a power level that is requested by the Dose Pacing routine once the warm-up and dampen timers expire. Additionally, all banks in a channel will be forced to full power any time any additional bank is in a warm-up phase. When a bank is no longer required by the Dose Pacing routine, the bank will remain running at a minimum power level until a configured Bank Time Off period expires. All banks in the UV system have a "Bank Healthy" bit that is used to determine if they are available to the Dose Pacing routine. Banks that are not "Healthy" due to a Multiple Lamp or Ballast fault will only be operated at full power when no other banks are available to meet dose requirements. The Dose Pacing routine is further described in section 10 of the Trojan UV operations and maintenance manual.

To assist in the reliable delivery of UV radiation to the wastewater effluent, an automatic lamp tube wiper cleaning system is incorporated into the UV system design. The system uses physical and chemical action to clean the UV lamps. A submersible wiper for each UV module and a cleaning agent contacts the UV lamp sleeve. When activated, the system effectively removes accumulated scum and debris from the lamps. This improves UV transmittance and reduces the amount of electricity necessary to deliver the dose to meet permit limits.

The automatic cleaning system may be initiated automatically or manually by the operator at the System Control Center. In the automatic initiation mode, the operator may select a frequency in which initiations occur. In manual, the operator may override the automatic initiation.

In the event of a power outage, the Disinfection System will automatically restart on emergency power and upon return to utility power.

Interlocks

- De-energize bulbs with low level alarms

The following parameters can be monitored at a HMI:

UV Banks
- UV Intensity
- % Lamps Out

UV Channel
- High Water Level
- Low Water Level

Plant Effluent Flume
- Monitor and Totalize Flow

Alternative Operation

If the UV disinfection system is in “remote auto”, the UV banks are controlled by the dose pacing routine. An alternate operation is to set the UV disinfection system into “remote hand.” This allows the operator to enter the power level to each bank in the range of 60 to 100 percent after the initial warm up time.

“Remote hand” operations available for UV system control through the PanelView Plus Operator Interface are summarized below, and more fully described in the Operator Interface Screens Section of the Trojan Vendor O&M manual.

The Operator Interface is controlled through a combination of touchscreen buttons (called push buttons in this document).

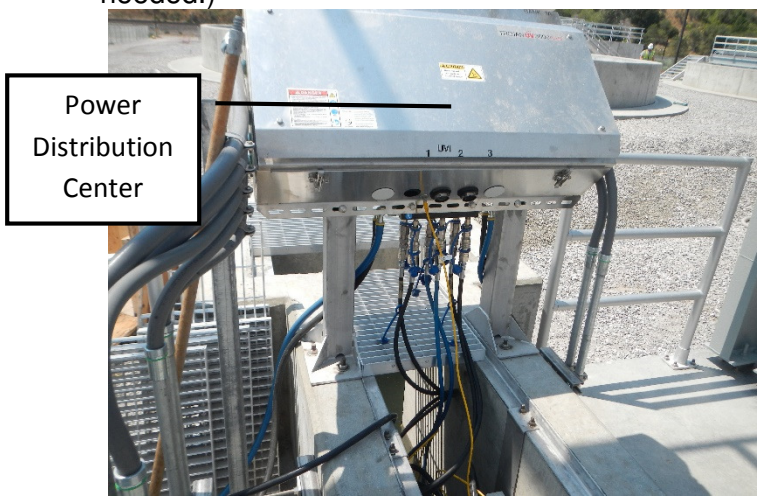
Operation of the unit in either the ON or OFF modes of control is considered to be for maintenance or emergency conditions. Both the ON and OFF Handswitch position overrides REMOTE control.

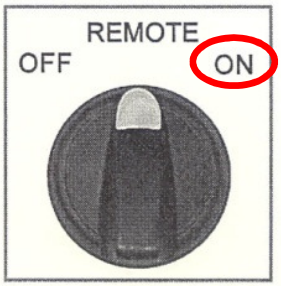
ON: All modules in the selected bank will energize at 100% power level.

OFF: All modules in the selected bank will de-energize.

Repair of the equipment should be accomplished as soon as possible. Consult the manufacturer's instructions. If additional assistance is required, contact the equipment supplier.

- Turn on each bank at the **Power Distribution Center** (PDC) by turning selector switch to **ON** position. (Depending on flows and effluent conditions, two banks may be needed.)





PDC - Bank Mode Selector Switch

- Bulb wipers must be manually sequenced at the **Hydraulic System Center** (HSC) by turning the top selector switch to **LOCAL** and the bottom selector switch to **SEQ** for each wipe needed.

Wiper Mode Selector Switch (HSC Compact)

Wiper Control Switch (HSC Compact)

Manual Entered Values

If certain equipment is not supplied (e.g. flow meter, UVT sensor, etc.) the desired value must be entered into the controller manually.

Select Flow Signal Source

Typically the dose pacing routine will use a plant flow meter as the source of the flow value. If the flow meter has failed or is not used a Manual Flow value must be entered.

Manually Entered Flow Value

Access the System Overview Screen. Toggle Flow source selector switch to Manual Flow.

Enter desired flow value using pop-up numeric touch pad.

Manually Enter UV Transmittance Value

Access the System Overview Screen.

Toggle UV transmittance source selector switch to Manual UVT if not already selected.

Enter desired transmittance value using pop-up numeric touch pad.

Control the ActiClean™ Cleaning System (ACS)

ACS control is initiated through the Wiper Overview Screen.

From this screen the operator can manually initiate a wipe sequence for each wiper group, and enable or disable wiping for an entire wiper group.

Initiate a Wipe for One Wiper Group

Use the Next and Prev buttons to navigate to the desired Hydraulic System Center (HSC) and wiper group. Toggle the INITIATE WIPE selector on the screen. This selector shares a dual role and will display the message WIPE IN PROGRESS if a wipe has already been initiated on the wiper group currently displayed.

Reset Lamp Life Hours

The running time of UV bank lamps is maintained through counters for each bank. When a bank's lamps have been replaced, its lamp counter can be reset. Press the Security menu button and the Login menu button and enter the plant maintenance Username and Password in the pop-up box. Access the Bank Overview Screen. Press the Lamp Hours text on the screen and a window will appear that allows entry of a new value. Select the box for the new Lamp Hours value and enter 0. Press the blue enter

symbol on the screen to accept the new Lamp Hour value Press the Close button to close the entry window.

Bank Control

All Bank control functions are accessed through the Bank Overview Screen. From this screen, the operator can set the operational mode for each bank to:

- REMOTE OFF
- REMOTE HAND
- REMOTE AUTO
- SCADA HAND

Before performing any operation on a bank, make sure the information being displayed is for the desired bank. Use the NEXT BANK and PREV BANK (and NEXT CHAN, PREV CHAN buttons if operating a multi-channel system) push buttons to access the correct bank.

Select Bank Control Functions

Press the View Bank Control push button at the top right hand corner of the screen to toggle the control button area of the screen from Module Control to Bank Control buttons if necessary.

Operate Bank in REMOTE OFF

Press the OFF push button. The lamps in that bank will be shut off.

Operate Bank in REMOTE HAND

Press the HAND push button. The selected bank's lamps will be energized at 100% power for a warm-up period. To set power level for that bank, select MANUAL PWR entry field and enter the desired power setting. Push the blue enter symbol on the screen to accept the new manual power value.

Operate Bank in REMOTE AUTO

Press the Auto push button. The controller will include that bank in the dose pacing routine.

Operate Bank in SCADA HAND

If the system has SCADA control, a bank can be operated in SCADA HAND mode.

Press the SCADA push button. The controller will then give control of that bank to the SCADA network.

Module Control

Each module can be individually controlled to allow Enabling/Disabling or Reset functions.

Select Module Control Functions

Press the View Module Control push button at the top right hand corner of the screen to toggle the control button area of the screen from Bank Control to Module

Control buttons if necessary. Use the left/right arrow symbols to navigate to the desired module.

Enable/Disable Modules

Each module also has an Enable/Disable indicator which shows the current enable status. Push the Enable or Disable button to toggle the status for the selected module. Push and hold the enable button to enable all modules in the selected bank. Disabled modules will not power their lamps.

Reset Modules

Each module also has a Reset indicator which shows the current reset status. Push the Reset button to initiate a reset sequence for the selected module.

Assign the Lead Bank or Channel

The lead and lag UV banks or channels can be rotated through the Priority Assignment Screen. Navigate to the System Overview and select the Next Rotation push button to access this screen. Assign the desired bank and channel number for the lead, 1st lag and 2nd lag banks and channels. The same bank and channel numbers cannot be assigned more than once. Press the blue Accept Priority Changes button to activate the changes.

System Settings

The configuration settings for the UV system are accessed, reviewed or changed through the System Settings Screens. Press the numeric entry box, for the value you wish to change, followed by the Enter ( ) push button. Use the pop-up numeric touch pad to enter the desired value. Refer to the System Settings Screen section for further details.

Set System Clock

The system time is accessed through the System Information Screen. Press the desired hour, minute or second window. Enter the desired value using the pop-up numeric touch pad.

All operator interface screens contain Screen Navigation Buttons. The buttons allow an operator to navigate to the desired screen regardless of the displayed screen. The following page has a table that outlines the buttons and their functions:

Button	Screen	Functions of Screen
	Overview	An operational summary of all UV channels and banks. Allows access to Priority Assignment screen and to manually enter flow and UV Transmittance values
	Alarm Status Screen	Displays the currently active alarms and allows access to Alarm History Screen.
	Trend Screen	Displays trend data for Flow, UV Transmittance, and Dose.
	Security	Pops-up Login and Logout buttons on the Navigation bar to allow control of user security level.
	Information Screen	Displays information about the PLC system hardware and software. It also allows access to change clock time and other operator interface maintenance functions.
	Systems Settings Screens	Allows access to system configuration settings as allowed by current security level. Settings are organized in pages by function.
	Wiper Overview Screen	Allows access to control wiper/cleaning system.
	Bank Overview Screen	Allows access to control UV banks and display bank specific information
	Channel Overview Screen	Allows access to control slide gates and display channel specific information.
	Help	Displays help text for the currently selected screen.

The Operator Interface screens utilize the following color codes within all user screens:

- **Black text** on a gray background – represents static text or numeric data that is unable to be changed by an operator at the current security level.
- **Black text** on a white background – represents an active button or numeric entry field that will either change the currently displayed screen, or will allow entry of numeric data.
- **Black text** on a yellow background – represents a function that is a manually controlled mode.
- Light blue background for text or symbol – represents a running status for UV lamps.
- Black background for text or symbol – represents a not running status for UV lamps.
- Red background for text or symbol – represent faulted equipment.
- White Text on a Blue background – represents a function controlled by the PLC.

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures for the UV disinfection system can be found in the manufacturer's O&M as shown below:

- UV Disinfection Unit(s)

For troubleshooting purposes, refer to the Trojan UV vendor O&M manual.

The following condensed tables are from the Trojan UV vendor O&M manual. For more specific information consult the vendor O&M manual.

Troubleshooting Guide

UV MODULE		
Condition	**Possible Cause**	**Solutions**
Lamp Failure	EOL* > 12,000 hours	Replace lamps, Reset Lamp hours.
	On/off cycles – Blackened Lamp Ends.	See 'Blackened Lamps' Condition in UV module troubleshooting section of Trojan vendor O&M manual.
	Running Lamps in air (top lamp)	Determine if water level management system is working properly.
	Broken Lamp	Replace with new.
	Water in sleeve	Lamp may still be fine, clean using isopropyl alcohol, with lint free wipes and let lamp dry completely before reusing.
		Replace sleeve O-ring if missing or damaged.
		Tighten loose sleeve nut.
		Replace sleeve if cracked or broken.
	Lamp holder/corrosion or burnt/ damaged pins	Replace Lamp socket and/or lamp.
	Improper lamp connection (not plugged in completely)	Remove lamp from socket check pin alignment and try again. Lamp and socket should seat tight in place with no gaps.
	Broken Lamp Filament	Replace lamp.
	Lamp Handling/Storage	Store in a dry / clean stable environment.
		Use rubber/ cotton gloves to handle the lamps.
	Bad lamp	Replace with new.
	Ballast enclosure lamp connectors	Make sure all wires inserted in the connectors are not loose.
	Pinched/broken wires	Replace wires as required.

* EOL refers to "End of Life' and distinguishes the expected life (hrs) of a typical lamp.

System Maintenance

Daily visual walk about inspection. (From Trojan Vendor O&M manual)

Visual Walk About Inspection Check List (approximately 10 min/day)	
1	Check Alarm Status screen for new faults and record new alarms
2	Check the Alarm History screen to get an overview of past faults
3	Check the Bank Control screens on the Operator Interface to ensure all the banks are in REMOTE AUTO and that all Modules are enabled
4	Check the Wiper Control screen on the Operator Interface to ensure that all the wiper groups are in REMOTE AUTO and that all wiper groups are enabled
5	Visually inspect Low Water Level Sensor for debris build up and clean if necessary
6	Visually inspect Manifold and HSC for hydraulic fluid leaks

Regular Maintenance Requirements (From Trojan Vendor O&M manual)

System Component	**Maintenance Requirement**	**On Removal**	**Daily**	**Monthly**	**Every 2 Months**	**Semi-Annually**	**Annually**	**12,000 Hours**	**Every 2 Years**
UV System	Visual walk about inspection		X						
	Clean channel around UV System (Perform semi-annually for low water quality conditions)						X		
Hydraulic System Center (HSC)	Initiate wipe sequence and check the HSC pressure is within range (180-200 psi)			X					
	Check the hydraulic fluid level			X					
	Inspect the hydraulic hoses for wear. Replace hoses if bulges, splits, cracks, or nicks are apparent. Perform when recharging the Acti Clean Gel.	X							
	Replace hydraulic fluid								X

System Component	Maintenance Requirement	On Removal	Daily	Monthly	Every 2 Months	Semi-Annually	Annually	12,000 Hours	Every 2 Years
Low Water Level Sensor	Check Low Level Sensor for debris, algae, or damage. Clean if necessary and replace if worn. (Perform Bi-weekly for low water quality conditions)			X					
Water Level Control	Inspect and if required remove debris. (Perform Bi-weekly for low water quality conditions)			X					
	Inspect grouting/seals and repair/replace if any signs of cracking or damage.						X		
UV Module	Inspect and if required remove debris from module. Use low pressure washer (garden hose). (Perform quarterly for low water quality conditions)	X			X				
	Remove module and replace lamps and sleeve O-ring seals at 12,000 EOLL							X	
ActiClean Cleaning System	Remove module, debris, and top up the wiper collars with ActiClean Gel	X				X			
	Grease wiper cylinder – done at same time as topping up the ActiClean Gel					X			
	Apply Safegard M1 to hydraulic components – done at the same time as topping up the ActiClean Gel					X			

System Component	Maintenance Requirement	On Removal	Daily	Monthly	Every 2 Months	Semi-Annually	Annually	12,000 Hours	Every 2 Years
	Flush and clean entire cleaning system and replace ActiClean Gel (perform at the same time as replacing lamps at EOLL) or every 18 months. (Perform Annually for low water quality conditions)							X	
	Replace Wiper Seals								X

Troubleshooting (Copied from Trojan Vendor O&M manual)

Emergency Operation

During an outage of normal power to the WWTF, the emergency generator (EG) has been sized to run one UV unit. In this situation, a single activated sludge basin and a single clarifier will be in operation with essential equipment powered by the EG. Should influent flows to the plant exceed the treatment capacity of a single basin and clarifier, storage of influent flows to the EQ basin should occur. This operation will ensure that effluent flow to the UV system is maintained below 1.32 MGD, which is the treatment capacity of a single UV unit. Effluent flow will be verified by the SCADA system by flow meter (Ft-401).

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
DAF and WAS Pumping

Table of Contents

Equipment Numbers and Location 2
Equipment Controls 2
Equipment Data 3
Description 3
Normal Operation 4
Alternative Operation 6
Wasting to Digesters via Fixed Flow 6
SCADA HAND Mode 6
Wasting Gate 6
WAS Pumps 7
Wasting Gate 7
WAS Pumps 8
Maintenance & Troubleshooting 8
Maintenance 8
Troubleshooting 9
Alarms 11

Equipment Numbers and Location

Surface Wasting System & WAS Pumping Equipment

Equipment	Tag Number	Location
Electric Slide Gate Actuators	A-217, A-237	Activated Sludge Basins
Level Transmitter – Ultrasonic	Lt-217, Lt-237	Activated Sludge Basins
WAS Pumps	P-550, P-551	Equipment Building Pump Room
Electromagnetic Flow Meter	Ft-512, -513, -405, -447	Equipment Building Pump Room

DAF Unit Equipment

Equipment	Tag Number	Location
DAF Unit	DAF-526	Equipment Building Thickening Room
DAF Unit Recycle Pumps	P-528, P-529	Equipment Building Thickening Room
DAF Unit Auger Drive Motor	DAF-526	Equipment Building Thickening Room
DAF Unit Automatic Drain Valve	XV-524	Equipment Building Thickening Room
Flocculator	FLC-515	Equipment Building Thickening Room
Air Compressor & Dryer	C-514	Equipment Building Blower Room
Pneumatic and Air Control Panels	None	Equipment Building Thickening Room
Pneumatic Control Panels & Solenoid Valve	XV-518	Equipment Building Thickening Room
Compressed Air Pressure Switches	PSL1-517 PSL2-216	Equipment Building Thickening Room
Conductivity Sensor @ DAF Hopper	NA	Equipment Building Thickening Room
Thickened Sludge Transfer Pumps	P-522, P-523	Equipment Building Thickening Room
Electromagnetic Flowmeter	Ft-546	Equipment Building Thickening Room

Bypass DAF Unit – Using RAS as WAS

Equipment	Tag Number	Location
RAS Pumps	P-440, P-442, P-444	Equipment Building Pump Room
Electromagnetic Flow Meters	Ft-447	Equipment Building Pump Room

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
Electric Sludge Gate Actuators	Open/Stop/Close Hand/Off/Auto	NA	Local/Remote Open/Stop/Close Manual actuation
WAS Pumps	Hand/Off/Auto Start/Stop % Speed/Flow	Keypad Entry	Hand/Off/Auto
DAF Unit	Hand/Off/Auto Start/Stop		Hand/Off/Auto

Equipment Data

WAS Pumps	
Flow Rate	16-35 gpm

Description

Surface wasting in the basins serves as the primary method for wasting of solids from the activated sludge process. Wasting in the basins removes mixed liquor continuously at a fixed rate. Wasting also removes floating sludge and foam by allowing the floating material to flow freely across the basin surface to the surface wasting collection system. The collection system is located at the east end of the basins in cell Ox3.

The surface wasting collection system consists of a scum baffle, non-potable water (NPW) sprayers and surface wasting collection box located in both Ox3 cells. The collection box contains a weir gate with a motorized actuator and an ultrasonic level transmitter. The weir gate elevation is modulated by the SCADA system to maintain a fixed fluid level in the collection box. The liquid removed from the basin collection boxes, or Waste Activated Sludge (WAS), flows through 4-inch piping to the Monoflo progressive cavity WAS pumps located in the Equipment Building Pump room. The WAS pumps transfer the WAS to the Dissolved Air Flocculation (DAF) unit in the Equipment Building Thickening room.

The thickening equipment located in the Equipment Building Thickening room includes the DAF unit, flocculator, two thickened sludge transfer pumps and associated piping, valves, and appurtenances. The FRC F2.5-2-2 flocculator is fed with WAS at a rate of 16-70 GPM from the WAS pumps. The flocculator consists of 2.5-inch diameter Schedule 80 piping arranged in a serpentine manner to achieve flocculation of the WAS prior to discharging into the DAF unit. The flocculator has the ability to also function as a coagulator with the addition of polymer. The flocculator contains ½-inch injection taps that are isolated with stainless steel ball valves. These taps are used to inject the incoming WAS with an air/wastewater mixture referred to as “whitewater.” This whitewater is recycled from the DAF unit via a recycle pump. The DAF unit has two recycle pumps installed; one pump is redundant. The flocculator also contains an integral manually-operated isolation valve. The WAS discharges from the flocculator to the DAF unit via a 4-inch flanged pipe penetration at the middle of the unit.

The flocculated WAS is dispersed across the width of the FRC PWL-15 DAF unit via a distribution manifold. The WAS is injected with whitewater from the DAF recycle pump and flows into the body of the DAF unit. Generally, 10-25% of total DAF influent flow is recycled for whitewater usage. Air bubbles from the whitewater attach to flocculated solids in the incoming WAS, allowing them to float to the surface within the body of the DAF unit.
The skimming mechanism removes the flocculated sludge from the water surface within the tank and deposits the “thickened sludge” into a hopper. A 6-inch TS pipe flows out of the hopper to the two Monoflo thickened sludge transfer pumps. Grit and heavy solids settle out of the DAF unit and are removed by an auger to flow by gravity back to the IPPS. Grit removal is controlled by a motor actuated butterfly valve on the drain line. Clarified effluent flows under a baffle and out the back of the DAF unit by gravity through piping to the IPPS.

Normal Operation

During normal operation, the WAS pumps will be continually wasting from the surface of the basins at an operator-selected flowrate (16 – 35 gpm) to the DAF. The WAS pumps can either waste to the DAF or directly to the digester via manual valve operation. When wasting to the DAF, the operator will initiate the DAF process to run via the HMI. The SCADA system will then continuously run the DAF process as long as the WAS pumps are operating. The DAF equipment does not have a local control, though each piece of equipment has local HOA switches.

Calculate the pounds of WAS required to maintain the desired aerated SRT by dividing the pounds of MLSS under aeration by the desired SRT. After the pounds of WAS is calculated, the pounds of WAS can be converted go million gallons of WAS. The equations shown below demonstrate the calculation process.

$$\frac{\text{lbs. MLSS under aeration}}{\text{Desired SRT days}} = \text{lbs. WAS/day to maintain desired SRT}$$

$$\frac{\text{lbs. WAS to waste/day}}{\text{mg/L WAS x 8.34 lbs/gallon}} = \text{million gallons of WAS/day}$$

Determine the WAS flow rate to the DAF using the aerated SRT formula to determine gallons to waste per day. After the gallons to waste have been determined use the following formula to determine the wasting rate (gpm) based on sending WAS to the DAF unit over a 24 hour period.

$$\frac{\text{gallons to waste / day}}{\text{1440 min / day}} = \frac{\text{gallons to waste}}{\text{min}}$$

During normal operation, the DAF unit skimmer, auger and drain valve will operate based on timed on/off periods. The operator may adjust the lengths of these periods through the HMI. The speed of the skimmer is controlled by a VFD and can also be adjusted by the operator.

During normal operation, one recycle pump will continuously operate at a fixed speed. The air compressor system will also continuously maintain a constant 100 psi supply pressure.

The operator will have manual control of the outlet weir in order to vary the depth of skimmings removed from the water surface of the DAF. Periodic visual inspection of skimmings throughout DAF operation is required by the operator to maintain the proper depth of thickened sludge being removed. Inspection of collected thickened sludge within the hopper will alert the operator if too much water is being removed with the sludge or if not enough sludge is being removed.

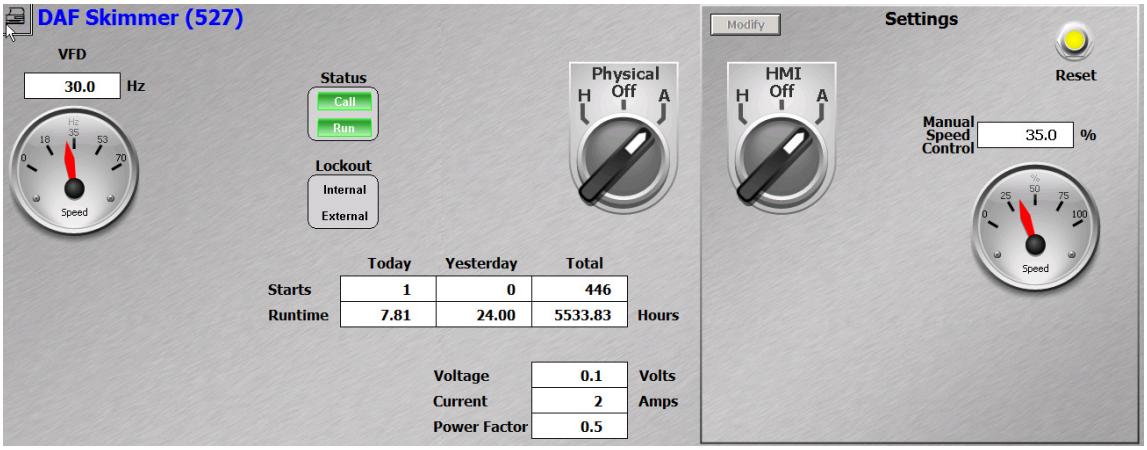
When the operator initiates the DAF unit to run, they will need to choose one of the two thickened sludge pumps to operate at a constant flow rate between 3-6 GPM. The operator must manually manipulate the valves to direct flow to and from the operating pump as shown below. The SCADA system will monitor a level sensor within the hopper of the DAF unit in order to shut down the WAS pump when the hopper is empty and restart the pump when the hopper

is full. Flow from the thickened sludge pump to the digesters is measured by electromagnetic flowmeter Ft-546. One thickened sludge pump must be in operation while the DAF is on-line to remove the built-up sludge from the DAF. The second pump is a fully redundant to the first.

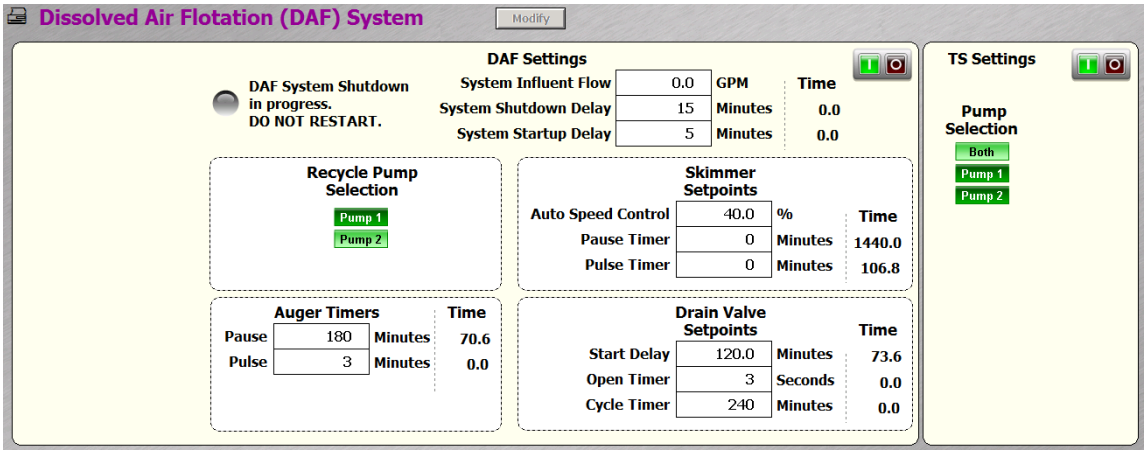
For the normal automatic wasting of sludge to the DAF unit:

- All Control Station Hand/Off/Auto switches to Auto for the WAS gate and pumps, DAF equipment and TS pumps:

- At the SCADA screen, select the Auto mode of operation on the HMI Hand/Off/Auto switch for the WAS gate and pumps, DAF equipment and TS pumps:



- At the SCADA screen, Enable the DAF and TS systems:



At a SCADA station, an operator inputs the desired WAS rate. The WAS Pump will automatically maintain the desired flow setpoint.

Alternative Operation

Wasting to Digesters via Fixed Flow

The RAS pump station can be used to waste built up sludge from the base of the clarifiers directly to the digesters (bypassing the DAF thickening process). For this operation to occur, the operator must manually manipulate the valves within the Equipment Building Pump room to direct the RAS into the digesters. This operation is considered an alternate operation of the RAS pumping system and will not occur frequently. If more sludge needs to be wasted than what the DAF unit can process in a 24 hour period is needed,

After valves are properly set, an operator will need to enter a volume to be wasted to the digester(s) from the RAS header. A flow meter will allow the 400-PLC to totalize the waste flow and stop the pump after the desired waste amount has been sent to the digester.

SCADA HAND Mode

The “SCADA Hand” mode allows operation of the Equipment from a SCADA station.

Wasting Gate

For SCADA Hand operation of a Wasting Gate place controls in the following position:

- Wasting Gate Control Station Local/Remote switch to Remote.
- At a SCADA Station, select either the Open or Close operation at the HMI Hand/Off/Auto switch:

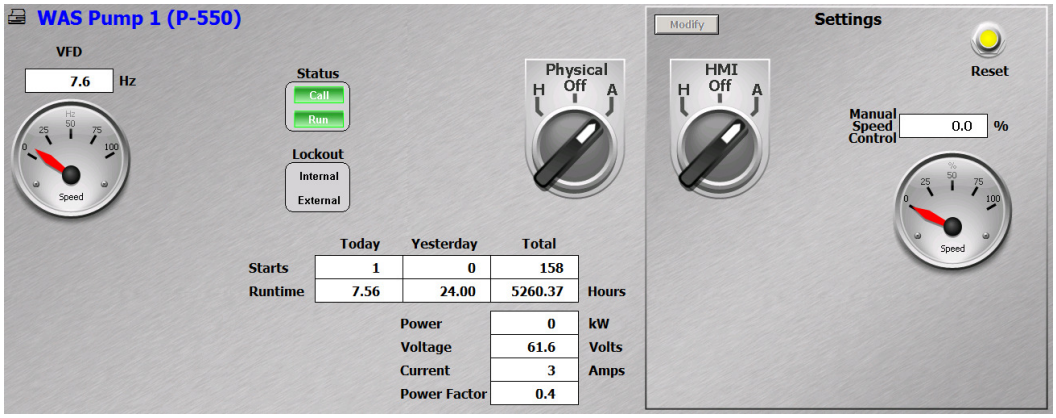
With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Open	This opens the selected Wasting Gate
Close	This closes the selected Wasting Gate
Auto	This puts the Wasting Gate in Auto Mode for SCADA control

WAS Pumps

For SCADA Hand operation of a WAS Pump place controls in the following position:

- WAS Pump Control Station Hand/Off/Auto switch to Auto.
- At a SCADA Station, select the Hand mode of operation on the HMI Hand/Off/Auto switch:



With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Start	This energizes the selected WAS Pump
Stop	This de-energizes the selected WAS Pump.
% Speed	An operator can enter the % speed for a WAS Pump to achieve desired flow rate

MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

Wasting Gate

For manual operation of a Wasting Gate place controls in the following position:

- Wasting Gate Control Station Local/Off/Remote switch to Local.

With the Control Station Local/Off/Remote switch to Local, the following control options are available at the Wasting Gate.

Control Station	Equipment Response
Open	This opens the selected Wasting Gate
Stop	This stops the gate
Close	This closes the selected Wasting gate

WAS Pumps

For manual operation of a WAS Pump place controls in the following position:

- WAS Pump Control Station Hand/Off/Auto switch to Hand.

With the control station Handswitch in Hand, the selected WAS pump will run at a default speed set in the VFD.

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures for the DAF unit, Wasting Gates, and WAS Pumps can be found in the manufacturer's O&Ms as shown below:

- DAF Equipment
- Gates and Stoplogs
- Progressive Cavity Pumps

Maintenance

The following maintenance schedule for the DAF is an excerpt from their respective vendor O&M manual.

Daily Operational Checklist

- Control system alarms
- Effluent quality/turbidity
- Air filter/regulator in Pneumatic Panel
- Inspect system for leaks in pipes and pumps
- Sludge layer
- Influent flow rate
- Recycle Pump pressure
- Ejection of sediment from drain valves
- Air flow setting in Pneumatic Panel
- Aeration Valve position (check for clogging)
- Bleed Valve should be opened 100% and returned to normal position
- Skimmer system for smooth operation and correct tension

Weekly Operational Checklist

- Clean DAF unit as required

- Inspect strainers and filters. Replace as necessary
- Purge plate pack using purge valves
- Inspect tanks and sumps for sediment

Monthly Operational Checklist

- Apply anti-seize to frequently used threaded parts.
- Grease bearings
- Check skimmer drive oil
- Check recycle pump oil/grease (if equipped)
- Inspect 3rd party components as per their O&M Manuals.
- Check lamps on control panel
- Switch to Alternate Pumps/Motors

Refer to vendor O&M manuals for more detailed maintenance information

Troubleshooting

The following Troubleshooting tables for the DAF unit are excerpts from their DAF Equipment vendor O&M manual.

"Floc" Carry Over in Clear Effluent

Possible Causes	Solutions
Aeration system is not functioning correctly.	• Review section 5.2 to adjust and calibrate the aeration system • Perform "White Water" Test if necessary
DAF "Plate Packs" are dirty	• Use purge valve on bottom of DAF unit to loosen material stuck to plate packs. • Drain and clean unit as per section 6.1
Float/Sludge layer has become too thick	• Review section 5.5 to adjust water level and skimmer speed
Flow rate to DAF to high	• Verify influent flow rate is within the flow range of the DAF

High Turbidity and Color in Effluent

Possible Causes	Solutions
Flow rate to DAF to high	• Verify influent flow rate is within the flow range of the DAF
Incorrect chemical dosing	• Check chemical supply • Check that chemical pumps are running • Check for obstructions in chemical line • Check that all chemical feed valves are open • Check for loss of prime of chemical pumps • Verify chemical scheme with jar tests
The influent pH is not within proper range for treatment	• Verify neutralizer supply • Check that neutralizer pumps are running • Check for obstructions in neutralizer line • Check that all neutralizer feed valves are open • Check for loss of prime of neutralizer pumps • Verify neutralization scheme with jar • Sample influent for large variations in influent pH

Poor Aeration System Function

Possible Causes	Solutions
Plugged aeration header	• Open aeration header purge valve to eliminate blockage • Remove and clean aeration header
Incorrect setting of aeration valves	• Check that all valves are in approximately the same position to provide equal flow • Set aeration valves to provide recycle pump discharge pressure of 70-90 psi (closer to 90 psi is better)
Plugged aeration lines (hoses)	• Isolate line with aeration valves, and replace with same length and size hose
Blocked or plugged bleed valve	• Open the valve completely several times to flush out blockage and readjust in accordance with vendor O&M manual
Air supply too high	• Reduce air supply to aeration system with pneumatic panel rotometer
Low air pressure	• Verify air pneumatic panel pressure regulator is set to ~10 psi higher than recycle pump discharge pressure
Damage or worn recycle pump	• Verify maximum pressure of pump by closing off aeration valves. Pump pressure should be 70-90 psi • Repair or overhaul pump

Low Dry Solids in Sludge (Wet Sludge)

Possible Causes	Solutions
Skimmer speed too high	• Review section 5.5 in vendor O&M manual to adjust water level and skimmer speed
Water level too high	• Review section 5.5 in vendor O&M manual to adjust water level

Possible Causes	Solutions
	and skimmer speed
Poor aeration	• Review troubleshooting for aeration system
Flow rate to DAF too high	• Verify flow rate is within the flow range of the DAF

Emergency Operation

The surface wasting systems are not considered essentially-powered components in the event of an outage of normal power to the plant. As such, the emergency generator is not sized to run either of the WAS pumps while the full load of essentially-powered devices are in use. In the event that surface wasting is required during an outage of normal power to the plant, a WAS pump may be used if sufficient generator load capacity is available (i.e. aeration to the basins is decreased during surface wasting).

The ultrasonic level transducer in the basins also serves to detect an extreme high-level event for fluid in the basins. This situation may occur if the effluent piping from the activated sludge basin(s) became plugged. In this scenario, the activated sludge basin(s) would backup and outfall to the EQ basin by flow through the wall blockout at 761.00 feet. In the extreme scenario in which the EQ basin was completely full, the basins as a whole may be in danger of overtopping. The ultrasonic level transducers within either surface wasting collection box would alert the SCADA system of this danger.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
Aerobic Digestion

Table of Contents

Equipment Numbers and Location 2
Aerobic Digester Tank Capacity 2
Equipment Controls 2
Equipment Data 2
Description 3
Process Theory 3
Normal Operation 4
Alternative Operation 5
SCADA HAND Mode 6
Digester Blowers 6
Top Entering Tank Mixer 6
MANUAL Mode 7
Thickened Sludge Transfer Pump 7
Digester Blowers 7
Top Entering Tank Mixers 8
Maintenance & Troubleshooting 9
Emergency Operation 11
Alarms 11

Equipment Numbers and Location

Equipment	Tag Number	Location
Thickened Sludge Transfer Pump No. 1 & 2	P-522, P-523	Equipment Building Thickening Room
Flow Transmitter	FT-546	Equipment Building Thickening Room
Digester Blowers No. 1 & 2	B-504, B-505	Equipment Building Pump Room
Level Sensors	LT-506, LT-508	Aerobic Digester Covers
ORP Probes	ORP-548, ORP-549	Aerobic Digester Covers
Top Entering Tank Mixers	M-507 , M-508	Aerobic Digesters
Solenoid Valves	XV-552, XV-553	Solids Handling Blower Room
AA Butterfly Valves (5)	None	Solids Handling Building Blower Room
TS Plug Valves (2)	None	Solids Handling Building Blower Room

Aerobic Digester Tank Capacity

Name	Storage Size (l x w x h)	Storage Capacity (gallons)
Digester No. 1	36’ x 36’ x 20’-3”	180,000
Digester No. 2	36’ x 36’ x 20’-3”	180,000

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
Thickened Sludge Transfer Pumps	Hand/Off/Auto % Speed	Keypad Entry	Hand/Off/Auto
Top Entering Tank Mixers	Remote/Auto Start/Stop	N/A	Hand/Off/Auto
Rotary Positive Displacement Blower	Hand/Off/Auto % Speed	Keypad Entry	Hand/Off/Auto

Equipment Data

Digester Aeration Blowers			Thickened Sludge Transfer Pumps	
Motor Rating	30 hp		Motor Rating	2 hp
Capacity SCFM	80 @ 21 Hz 400 @ 60 Hz		Capacity	6 gpm @ 9 psi
Discharge Pressure	9.2 psi			

Description

Surface wasting in the basins serves as the primary method for wasting of solids from the activated sludge process. Wasting in the basins removes mixed liquor continuously at a fixed rate. Wasting also removes floating sludge and foam by allowing the floating material to flow freely across the basin surface to the surface wasting collection system. The collection system is located at the east end of the basins in cell Ox3.

The two aerobic digesters receive thickened sludge via 4-inch TS piping from the thickened sludge transfer pumps. The digesters produce Class B biosolids through the decomposition of organic matter within the sludge. Both digesters, adjacent to the Solids Handling Building, are identical in size. It is anticipated that 4,500 gallons per day (GPM) of thickened solids will be transferred from the DAF to the aerobic digesters. The solids will be in the range of 3 to 5 percent. The thickened sludge enters through a single 4-inch pipe near the top of each digester, and the digested sludge is removed via dual 4-inch pipes near the bottom of each digester. A single 6-inch aeration pipe enters the top of each digester and drops vertically to the floor and is routed to the center HDPE sparge ring. Both aeration pipes are tapped at the high point with a ½-inch pipe controlled by a solenoid valve. This pipe prevents sludge from siphoning into the blower room by opening whenever the blowers are not in operation. Air is fed from two 30 HP Aerzen rotary positive displacement blowers located in the Solids Handling Blower room.

A single top entering tank mixer is suspended in the center of each digester from the concrete catwalk above. Digester #2 has an overflow blockout through the wall to Digester #1. Digester #1 overflows through a vertical 6-inch standpipe to the plant tank drain system. Both digesters contain concrete sumps with tank drains manually-controlled by buried plug valves on the east side of the digesters.

The digesters are covered with Fiberglass Reinforced Plastic (FRP) covers. Each digester contains two access ports through the covers and also contains a 6-inch FRP vent pipe with an integral damper.

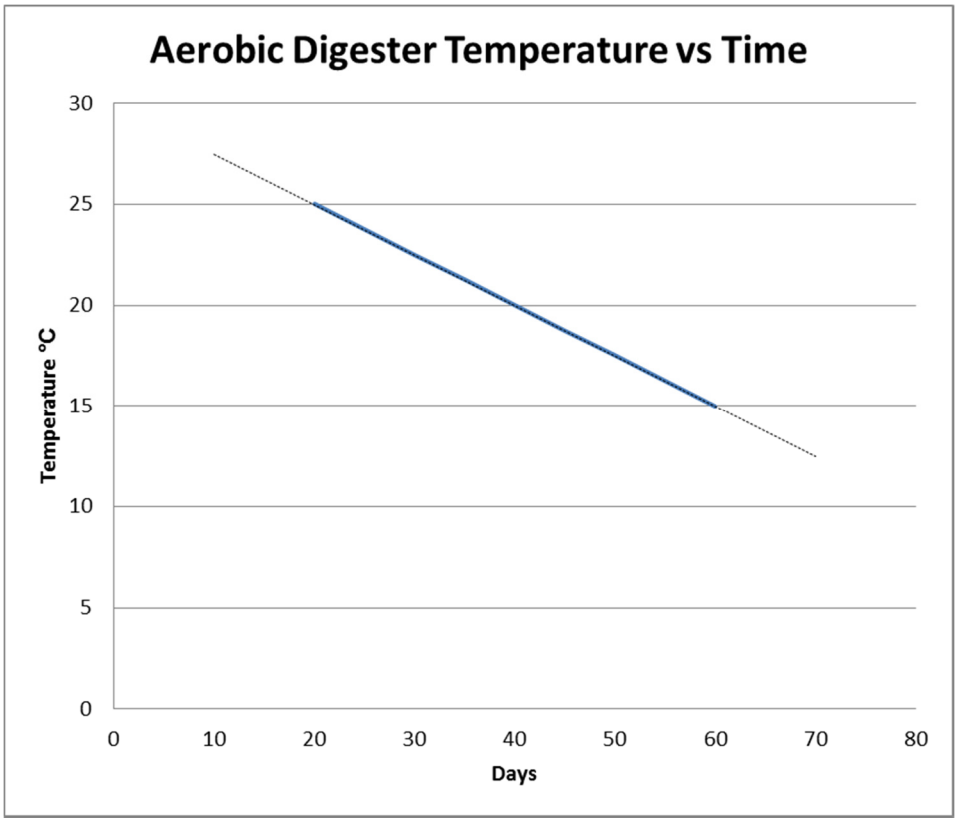
Process Theory

EPA 40 CFR 503 requires that waste activated sludge be agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the sludge retention time (SRT) and temperature are between 40 days at 20℃ and 60 days at 15℃ to significantly reduce pathogens and allow for land application of biosolids.

ORP probes in the aerobic digesters help to ensure aerobic conditions are maintained in the digesters while allowing for cycling of the blowers for energy conservation.

The following table and graph illustrate the amount of time needed to significantly reduce pathogens depending on aerobic digester temperature.

Temp ℃	Days
25	20
24	25
23	30
21	35
20	40
19	45
18	50
16	55
15	60



Normal Operation

During normal operation, the WAS pumps will be continually wasting from the surface of the basins at an operator-selected flowrate (16 – 35 gpm) to the DAF. The WAS pumps can either waste to the DAF or directly to the digester via manual valve operation. When wasting to the DAF, the operator will initiate the DAF process to run via the HMI. The SCADA system will then continuously run the DAF process as long as the WAS pumps are operating. The DAF equipment does not have a local control, though each piece of equipment has local HOA switches.

Normal operation of the digesters will consist of feeding both digesters in parallel from the DAF unit. This will require manually opening both TS plug valves within the Solids Handling Building to allow sludge to flow into both digesters as shown below:

Valve Orientation Photo – Manual valve orientation for TS transfer to both digesters. For filling the digesters in series, close either TS valve to fill a single digester.
East wall of Dewatering room

During any operational mode of the digesters, the operator will need to manually take daily readings of liquid temperature. These measurements will be used to calculate the desired Solids Retention Time (SRT) and required haul-out-volume from the digesters. The operator must also take daily pH readings in the digesters. If pH readings drop below 6.5, this could be an indication of over-aeration. The operator must adjust the aeration control accordingly. Periodically, the operator must also take ammonia and nitrate measurements at the beginning and end of aeration cycles. Digester operation requires continuous mixing of the contents as well as cycling between Aerobic (air added via aeration system) and Anoxic (no aeration) conditions.

Alternative Operation

Alternate operation of the digesters will consist of feeding a single digester at a time; either a single digester will be operating or both digesters will be operating but feeding will cycle from one digester to the other. In the case of feeding both digesters in series, the operator will have to manually align the TS plug valves within the Solids Handling Building to allow sludge to flow into one digester or the other. The operator can choose the rate at which to cycle this series.

SCADA HAND Mode

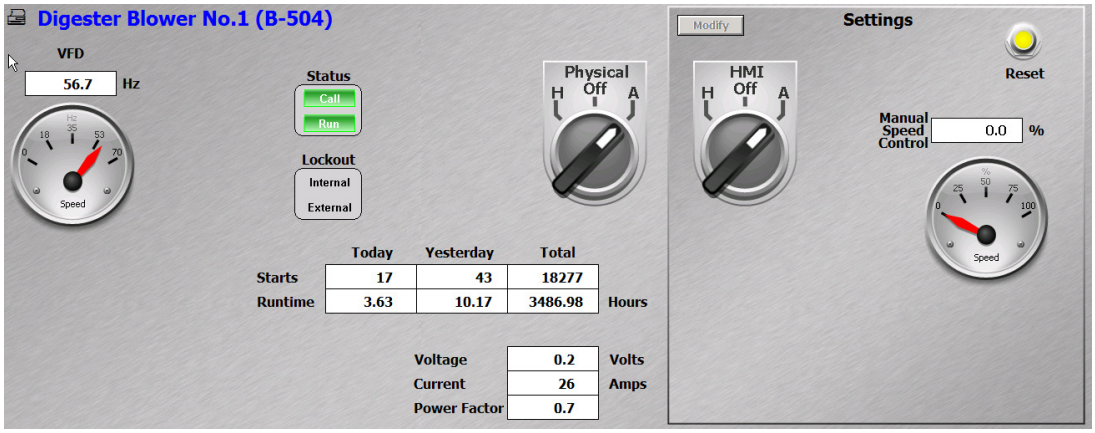
The "SCADA Hand" mode allows operation of the Equipment from a SCADA station.

Digester Blowers

For SCADA Hand operation of a Digester Blower place controls in the following position:

- Digester Blower Control Station Hand/Off/Auto switch to Auto.

- At a SCADA Station, select the Digester Blower Hand mode of operation.



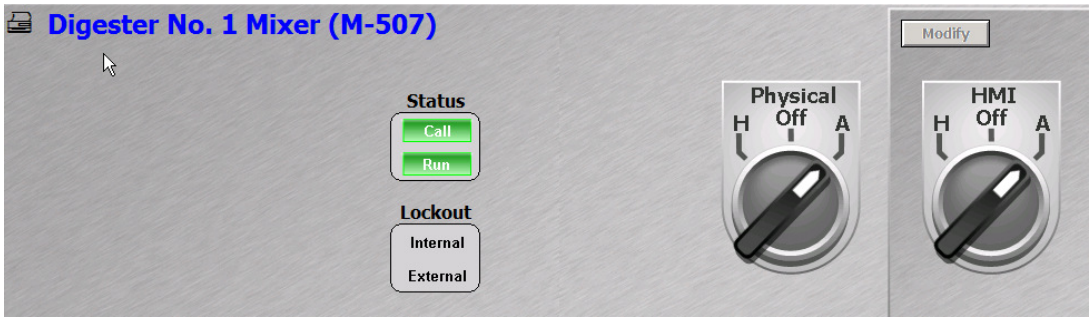
With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Hand	This energizes the selected Digester Blower
Off	This de-energizes the selected Digester Blower.
% Speed	An operator can enter the % speed for a Digester Blower to achieve desired air flow rate in Hand mode

Top Entering Tank Mixer

For SCADA Hand operation of a Top Entering Tank Mixer place controls in the following position:

- Top Entering Tank Mixer Control Station Hand/Off/Auto switch to Auto.
- At a SCADA Station, select the Top Entering Tank Mixer Hand mode of operation.



With the SCADA Manual/Auto selector in Manual, the following control options are available from a SCADA station.

SCADA Command	Equipment Response
Hand	This energizes the selected Top Entering Tank Mixer
Off	This de-energizes the selected Top Entering Tank Mixer

MANUAL Mode

Manual Mode is intended for maintenance purposes only. The Manual mode of operation removes control of equipment from a PLC. Equipment in the Manual mode of operation is controlled from its respective Control Station (CS) or Control Panel (CP).

Thickened Sludge Transfer Pump

For manual operation of a Thickened Sludge Tranfer Pump place controls in the following position:

- Thickened Sludge Transfer Pump Control Station Hand/Off/Auto switch to Hand.

With the control station Handswitch in Hand, the selected Thickened Sludge Transfer Pump will run at a default speed set in the VFD.

Digester Blowers

For Local operation of the Digester Blowers place controls in the following position:

- Digester Blower Control Station Station Hand/Off/Auto switch to Hand.

With the control station Handswitch in Hand, the selected Digester Blower will run at a default speed set in the VFD.

Top Entering Tank Mixers

For Local operation of the Top Entering Tank Mixers place controls in the following position:

- Top Entering Tank Mixer Control Station hand/Off/Auto Handswitch to Hand.

With the control station Handswitch in Hand, the selected Digester Blower will run at a default speed set in the VFD.

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures related to the digesters can be found in the manufacturer's O&Ms as shown below:

- Top Entering Tank Mixers
- Sparge Ring
- Rotary Positive Displacement Blower
- Solenoid Valve
- ORP Sensor
- Ultrasonic Level Transducer
- Plug Valves

The following maintenance schedule for the aeration blowers is copied from the Rotary Positive Displacement Blowers vendor O&M manual.

Whenever work is carried out on the positive displacement machine, it must be switched off and isolated from the mains electricity supply.
Failure to follow this instruction could result in injury or damage!
Various steps should be taken to achieve a long service life and provide the optimum operating conditions. These include carrying out the maintenance work specified in this table at the intervals specified here.

DELTA BLOWER / G5 Overpressure mode	Maintenance intervals								
We recommend carrying out the maintenance work on the positive displacement machine at the specified intervals. The operating hours represent average operating conditions. The actual service life of the equipment may vary depending on environmental conditions and operating data. If you think this situation applies to you, please contact Aerzener Maschinenfabrik.	**After the first 3 op. hrs**	**After the first 25 op. hrs**	**After the first 500 op. hrs**	**Weekly**	**After every subsequent 2000 op. hours or every 3 months**	**After every subsequent 4000 op. hours or every 6 months**	**After every subsequent 8000 op. hours or every year**	**After every subsequent 16,000 op. hours or after every subsequent 2 years**	**After every subsequent 20,000 op. hours or after every subsequent 3 years**
Check fixing screws and screwed connections • Re-tighten once the machine has cooled down, if possible	•								
Starting strainer, if fitted • Check; can be removed if dirt is no longer being accumulated			•						
Intake filter • Check level of filter contamination and, if necessary, replace filter cartridge, max. -45 mbar • Replace filter cartridge				•	○		•		
Check and clean inlet/exhaust openings • of acoustic hood						•			
V-belts • Check condition; replace if necessary • Replace		•				•		•	
Belt pulley alignment • Check; correct if necessary		•						•	
Pressure valve • Check function	•				○	•			
Oil level • Check; correct if necessary	•	•		•					
Lubricating oil • Replace • Replace, with final compression temperatures above 140°C			• •			• •	•		
Lubricating grease, only with gas-tight shaft seal • Replace • Replace if Aerzener special rotary piston oil is used and with a final compression temperature above 140°C • Replace if ISO VG 220 is used and the oil has a pronounced dark discolouration			• • •			• •	•		
Drive shaft seal **(when conveying toxic / inflammable gases)** • Replace							•		
Non-return valve • Check for wear and leaks, replace if necessary							○	•	
Flexible pipe connection, if fitted pressure side/suction • Check for leaks, replace if necessary								•	
Hydraulic, pneumatic and measurement lines, if fitted • Check for leaks, replace if necessary • Recommendation: Replace every 6 years									• •
○ **Halving of or reduction in maintenance intervals** ***(recommendation)***	**Under difficult operating conditions such as:** **- ambient temperatures in excess of 30°C throughout the year** **- high level of dust etc.**								
Main inspection / maintenance ***(recommendation)*** • Check/replace spare and wearing parts • Check entire machine									• •
Drive motor • Perform maintenance • Observe deadlines for re-lubrication	**Please observe the maintenance intervals and maintenance specifications of the motor manufacturer!** **With Aerzener motors, the Aerzener operating and maintenance instructions must be followed.**								

Arrange for the positive displacement machine to undergo a complete check by the Aerzener Service department at the specified intervals
Or: Take out a maintenance contract with Aerzener Maschinenfabrik.
If you maintain your machine regularly and properly, Aerzener Maschinenfabrik will guarantee maximum reliability for your application.

Emergency Operation

The emergency generator is sized to operate a single digester mixer and blower during an outage of normal power to the plant. If a single digester is in operation when an outage occurs, no change to the blower or mixer operation will be necessitated. If both digesters are operating when an outage occurs, the SCADA system will automatically alternate aerating and mixing both digesters for 2-hour periods. As an alternate form of operating both digesters during a power outage, the operator may manually orient the Solids Handling Building Blower room valves such that air from a single blower is sent to both digesters. In this scenario, the operator would set the SCADA system to alternate the digester mixers on 2-hour increments.

The operator can also manually run a single blower and a single mixer at a time via the physical HOAs located adjacent to each piece of equipment. The operator must be aware that not aerating an active aerobic digester for an extended period of time could cause the sludge to turn anaerobic. Alternation of the aeration between digesters during a power outage must be maintained.

Alarms

Refer to Appendix G – Plant Control System for alarms.

Standard Operating Procedure
Belt Filter Press

Table of Contents

Equipment Numbers and Location 2
Equipment Controls 2
Description 3
Normal Operation 4
Belt Filter Press Startup 6
Belt Filter Press Final Wash Cycle Operation (Shut Down) 7
Belt Filter Press Periodic Manual Washing 8
Maintenance & Troubleshooting 8
Emergency Operation 10
Alarms 10

Equipment Numbers and Location

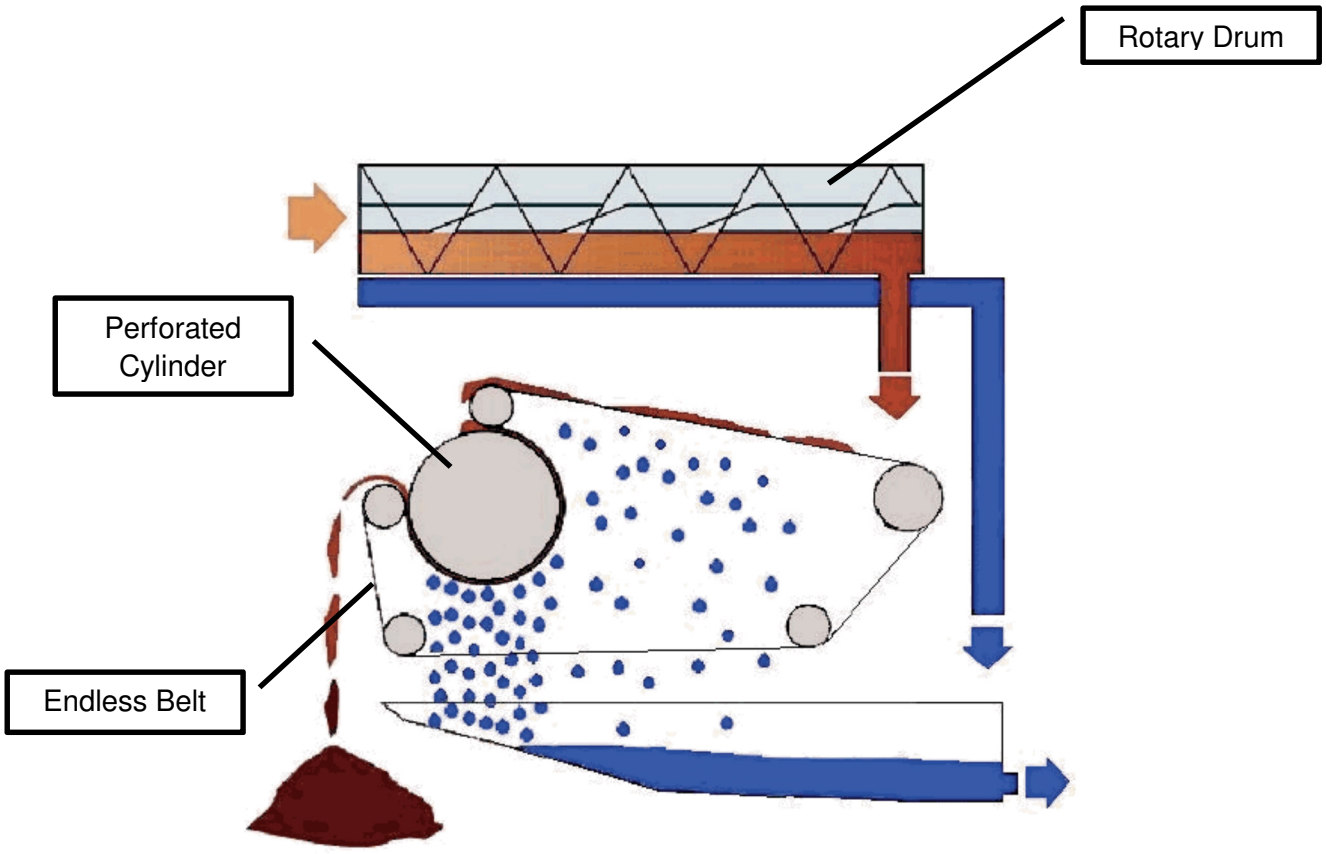
Equipment	Tag Number	Location
Belt Filter Press	BFP-538	Solids Handling Building Dewatering Room
Digested Sludge Transfer Pump	P-510	Solids Handling Building Dewatering Room
Cake Transfer Pump	P-542	Solids Handling Building Dewatering Room
Polymer System	None	Solids Handling Building Dewatering Room
Air Compressor	C-539	Solids Handling building Blower Room
NPW Solenoid Valve	XV-541	Solids Handling Building Dewatering Room
DS Electromagnetic Flowmeter	Ft-511	Solids Handling Building Dewatering Room
NPW Electromagnetic Flowmeter	Ft-554	Solids Handling Building Dewatering Room
Digested Sludge Transfer Pump Control Panel	Cp-504	Solids Handling Building Dewatering Room
Belt Filter Press Control Panel	Cp-502	Solids Handling Building Dewatering Room
Cake Transfer Pump Control Panel	Cp-503	Solids Handling Building Dewatering Room
DS Plug Valves (4)	None	Solids Handling Building Dewatering Room

Equipment Controls

Equipment	SCADA	Control @ VFD	Control Station
Belt Filter Press	Hand/Off/Auto % Speed	Keypad Entry	Hand/Off/Auto
Polymer Feed System	Remote/Auto Start/Stop	N/A	Hand/Off/Auto
Dewatered Sludge Transfer Pump	Hand/Off/Auto % Speed	Keypad Entry	Hand/Off/Auto
Cake Solids Transfer Pump			

Description

The belt filter press system dewaters the digested sludge prior to hauling offsite. This increases the solids content of the sludge to decrease hauling costs. The solids content of the final sludge cake from the belt filter press will be in the range of 16-18% solids. Each foot of sludge removed from an aerobic digester equates to 9,700 gallons.



Process Theory

TRITAN™ belt presses are able to dewater the sludge coming from industrial and municipal wastewater treatment plants. As with other dewatering equipment, to ensure good dewatering results the sludge has to be conditioned with a flocculent. Flocculation may be done in-line, but regardless, it must be completed before the sludge enters the TRITAN™.

The sludge that is being dewatered enters the TRITAN™ through the top of the machine (ROTARY DRUM THICKENER), while the dried sludge (cake) is discharged at the lower part of the machine (PRESSING ZONE). The filtrate water is discharged to the bottom of the machine and exits through one or more 6" diameter SS pipe(s).

The TRITAN™ is equipped with a control panel for operation of all the functions of the machine. The control panel has an emergency stopping device and a PLC able to identify problems that may occur with the TRITAN™ and the other associated equipment provided by Aero-Mod.

While in operation, the TRITAN™ does not need to be continuously manned, but checked on at least every 4 hours and it is recommended that the machine be in sight at all times.

Normal Operation

Normal operation of the belt filter press system and ancillary components is principally controlled manually using local control panels for the sludge transfer pump, belt filter press, and cake transfer pump located in the Solids Handling Building Dewatering room. It is expected that operation of the system will occur approximately twice a week producing an estimated 4 cubic yards of sludge for each operational period based on 2012 loading calculations.

The belt filter press control panel will control the filter press, air compressor, washwater solenoid and the polymer feed system. The operator will start the wasting process from the filter press control panel. The filter press control panel will prime the air and washwater lines and signal that the filter press is ready for operation.

To begin wasting, the 4-inch DS plug valves on the east wall of the Dewatering room must be opened. Wasting can either be done in parallel (from both digesters) or in series (from a single digester) as shown below:

The operator will begin the digested sludge transfer pump via its local control panel. The operator will specify the flowrate from the range of 25-150 GPM. An electromagnetic flowmeter downstream of the pump will monitor the thickened sludge flowrate. The belt filter press controls the rate of polymer injection into the digested sludge at the transfer pump.

The polymer injection rate will need to be verified by inspection of the thickened sludge. Aeromod's O&M manual (Appendix C) discusses the rate of polymer injection and subsequent sludge inspection in detail.

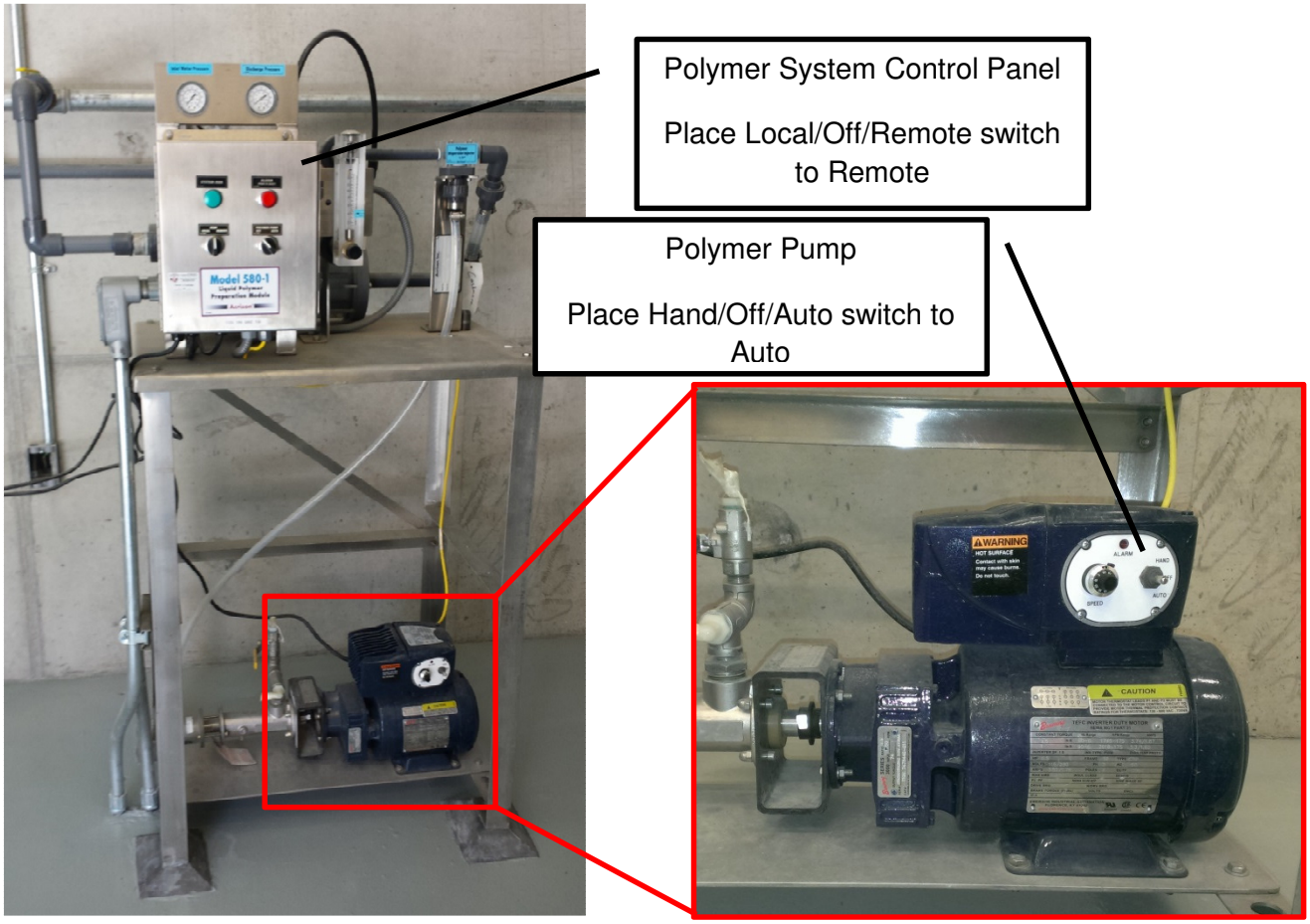
The sludge will enter the top of the filter press and cake sludge will be discharged via the cake transfer pump while filtrate will outfall through the gravity filtrate piping. It is recommended that the operator routinely inspect the filter press during operation per the manufacture's recommendations though continual operator inspection is not required.

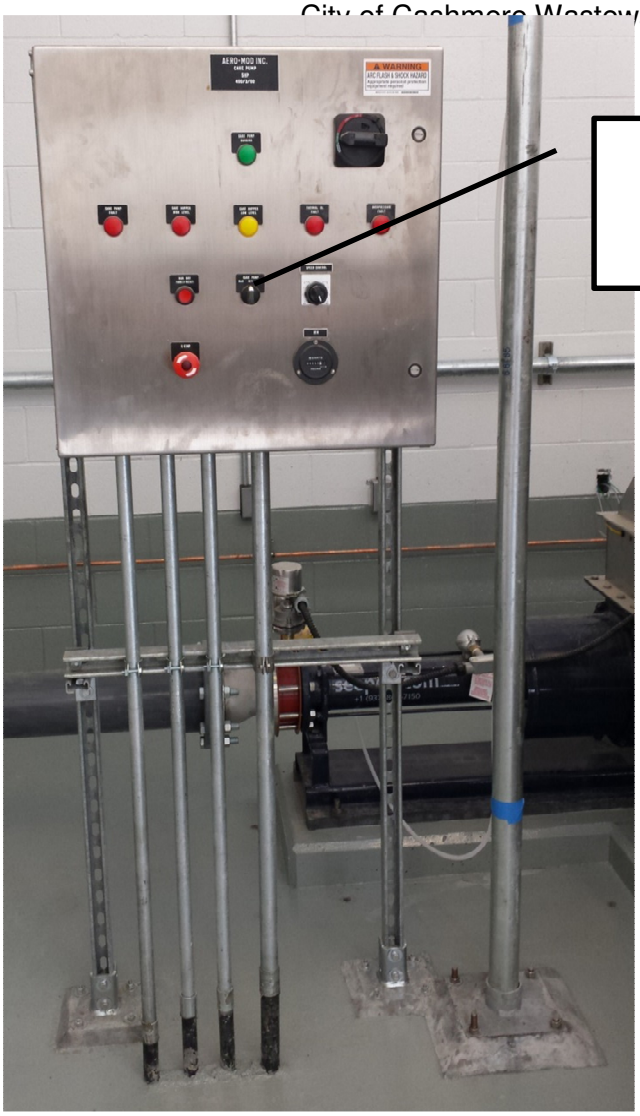
The operator will start the cake transfer pump via its local control panel. The operator will specify the pumps flowrate from the range of 2-10 GPM.

At the end of each wasting period, the operator will first shut down the digested sludge transfer pump and polymer feed system, followed by the filter press via each respective control panel. The filter press panel should automatically put the unit into a default wash cycle. The operator should clean the area around the filter press for splashes or spills that occurred during operation.

To start and run the Belt Filter Press, place controls in the positions shown below.

Place Manual/Off/Remote Selector Switch to Remote
Digested Sludge Transfer Pump and Control Panel


Polymer System Control Panel
Place Local/Off/Remote switch to Remote
Polymer Pump
Place Hand/Off/Auto switch to Auto
Model 580-1
WARNING
HOT SURFACE
CAUTION



Belt Filter Press Startup

OPERATION	EFFECT	DISPLAY
1) Make an inspection of the area surrounding the belt press.	Verify that all necessary hook ups are sound and that nobody is in a danger zone around the machine.	Ensure that all fixed and moveable guards are properly assembled and in place.
2) Turn the main disconnect switch to the “on” position to power on the control panel.	Verify the power supply is connected to the control panel.	The white power light will be activated.
3) Push the “air” button on the “belt press control” screen to pressurize the pneumatic lines.	Verify pneumatic supply source is connected to the pneumatic lines of the belt press.	Pneumatic actuators are pressurized. The “ready” light is activated.

OPERATION	EFFECT	DISPLAY
4) The water source to the 1.5" solenoid valve on the wash pump should be open. If a valve is present, open it all the way.	Verify that the washing pump is working properly.	If the hydraulic source has enough pressure the washing manifolds will start to work.
5) Depress the "start" button continuously for 5 seconds. Keep ancillary equipment (polymer system, sludge pumps, cake removal system, etc.) in the OFF position.	Verify that the belt press, RDT, and washing pump motors start up after the 5 second safety pause.	As the "start" button is depressed a warning sound is broadcast to warn all nearby. After the 5 seconds the sound will end with the starting of the belt press. Ready light will switch to the green running light on the control panel.
6) Wait several minutes before activating the sludge pumps and the polymer system.	Check that the belt press is operating normally.	All equipment does not vibrate or make unusual sounds. A proximity sensor and air cylinder controls the correct tracking of the belt.
7) Turn the Off/Auto switches for the polymer system and the sludge pump to Auto.	Sludge pump and polymer system start up.	After a brief pause, sludge will be visible on belt.

Belt Filter Press Final Wash Cycle Operation (Shut Down)

OPERATION	EFFECT	DISPLAY
1) Push "Wash Cycle Start" button OR "Auto Shutdown Timer".	The washing cycle will begin. Sludge pump and polymer system are stopped automatically.	After a few seconds, the sludge will not arrive at endless belt.
2) Wait for complete cleaning cycle to end.	The sludge is washed from the machine.	The belts become progressively cleaner.
3) The belt press automatically turns itself off.	The washing cycle is over. All control signals are shut off to all the equipment.	All equipment indicators are off.
4) The hydraulic source is automatically turned off by a solenoid valve located before the washing pump.	The washing circuit is off.	The washing manifolds are off.

Belt Filter Press Periodic Manual Washing

OPERATION	EFFECT	DISPLAY
1) Set time in minutes for length of washing duration.		
2) Manual valve start	Opens 1" solenoid valve	
3) End of preset time	Timer resets and valve closes	

Maintenance & Troubleshooting

Detailed maintenance and troubleshooting procedures related to the Belt Filter Press can be found in the manufacturer's O&Ms as shown below:

- Belt Filter Press Equipment & Control Panel
  - Belt Filter Press
  - Digested Sludge Transfer Pump
  - Cake Transfer Pump
  - Polymer System
  - Air Compressor
- Electromagnetic Flowmeter
- Solenoid Valve
- Plug Valve

The following maintenance schedule for the Belt Filter Press is an excerpt from the Belt Filter Press System vendor O&M manual.

Schedule	Task
Every 10 hours	• Verify that washing manifolds are working properly. • View belt through safety guards to see if the belt is clean. If the belt is stripped or spotted, remove right hand or left hand fixed guards and examine the endless belt washing manifold by lifting its cover. Remove any nozzles that are clogged and clean or replace. • Check the filtering cloth for the rotating drum for cleanliness. If the belt is striped or spotted, remove the nozzles that are clogged and clean or replace. • Inspect the filtering cloth for the perforated drum. If the filtering cloth is striped or spotted, remove the nozzles that are clogged and clean or replace.
Every 40 hours	• Clean and grease the rails of the alignment roller and tensioning roller. o Clean and lubricate the rams for the tensioning roller. • Once these maintenance operations have been made, pressurize the pneumatic circuit and verify that the tracking system correcting works properly and that the tensioning roller moves properly. If everything operates properly, replace all guards.
Every 160 hours	• Check the air filter regulator and condensate trap. If required, open the drain by turning drain release to allow the water to come out. When the filter is completely drained, close the drain by turning drain release in the opposite direction. • Check that the bearings are quiet and that they are amply greased. • Check that the doctor blades uniformly make contact to their respective belts. If needed, adjust them as indicted. Adjust the doctor blade for the endless belt by loosening the screws which hold the doctor blade and adjusting it until it is uniformly touching the belt. If doctor blade for the perforated drum filtering cloth needs adjustment, remove the screws attaching the fixed guard and then remove this guard from the belt press. Loosen the screws that hold the doctor blade and adjust it accordingly. Reassemble the fixed guard and check that it is functioning properly. If the problem remains for either doctor blade, replace the doctor blade.
Every 500 hours	• Grease all the bearings with 5 ml (2-3 pumps) of the proper grease. To grease housing the SS pillow block bearing, remove the rubber cap. For the ram housing bearing, remove the safety guards. The rotating drum bearing housings can be reached directly. • Check the condition of the belts. Should one of them be broken or severely worn, proceed with replacing it. The endless belt should be replaced when the pneumatic actuators reach the maximum extension point allowed.

Emergency Operation

The emergency generator is not sized to run the sludge transfer pump, filter press or cake transfer pump. During an outage of normal power to the plant, no sludge wasting from the digesters is expected to occur. In the extreme event that both digesters are at full capacity during a power outage, wasting to the digesters will not be possible. In this extreme scenario, storage of influent flows to the EQ Basin will be necessary.

Alarms

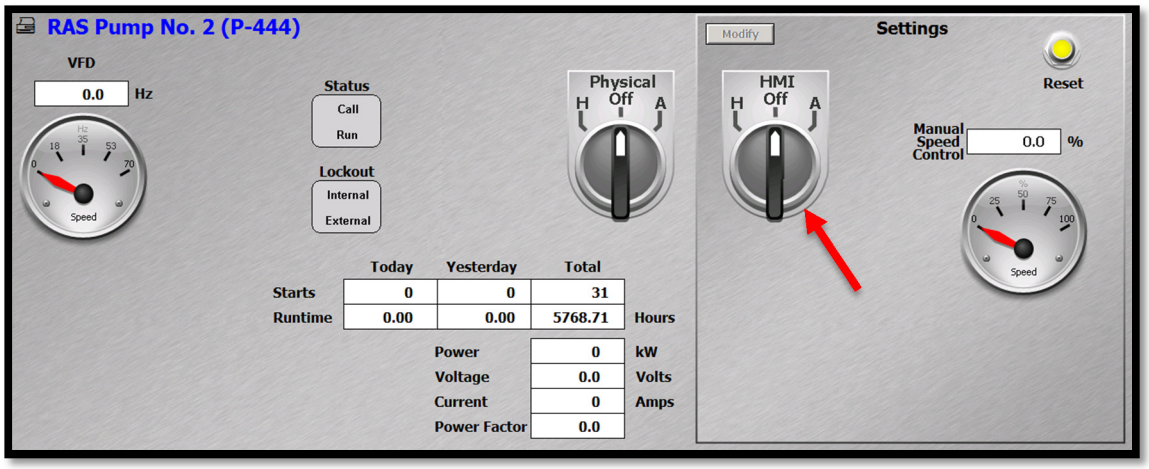
Refer to Appendix G – Plant Control System for alarms.

Individual Standard Operating Procedures

General Equipment ON/OFF, Start-up and Shut-down

Equipment ON/OFF at SCADA System

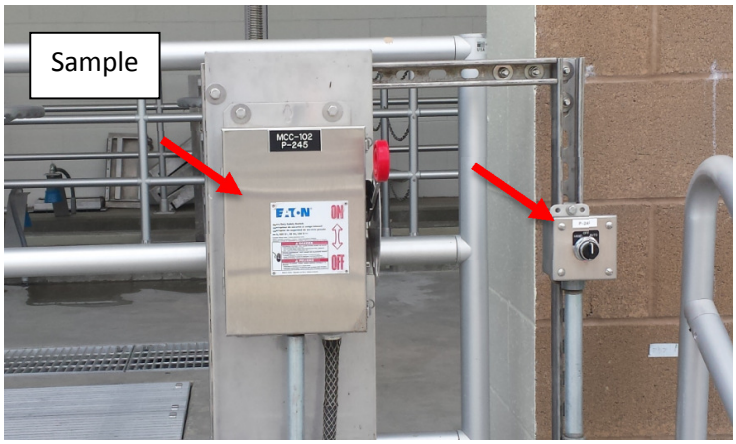
1. Most equipment may be switched between HAND-OFF-AUTO remotely at the SCADA screen.



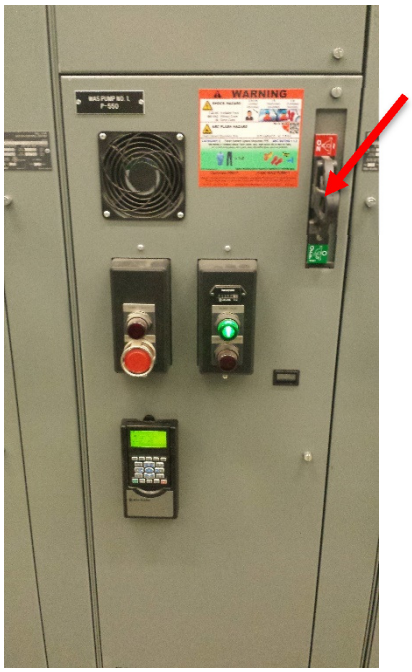
2. If the equipment is in HAND or OFF at the local physical HOA, remote control will not work.

Equipment ON/OFF at Local HOA, Disconnect and Motor Control Center (MCC) bucket.

1. Equipment can be switched between HAND-OFF-AUTO (HOA) at the local, physical HOA switch.
2. Power to equipment can be disconnected by switching the local disconnect to OFF.



3. Power to equipment can be disconnected by switching MCC bucket to OFF.



Equipment Start-up

1. Verify equipment bucket is turned on at the MCC.
2. Make sure that the bucket emergency stop button is not depressed
3. Turn on local equipment disconnect.
4. Turn local HOA switch to either HAND or AUTO
5. If turning HOA to AUTO, ensure equipment is in AUTO at the SCADA system.

Equipment Shut-down

1. Turn equipment to OFF at the SCADA system.
2. Turn local HOA switch to OFF.
3. Turn off local equipment disconnect.
4. Turn off equipment bucket at the MCC.

Basin or Digester Draining

Basin draining

1. In order to drain a basin to the IPPS, ensure the IPPS isolation valve is closed.
2. Ensure the IPPS pinch valve is closed.

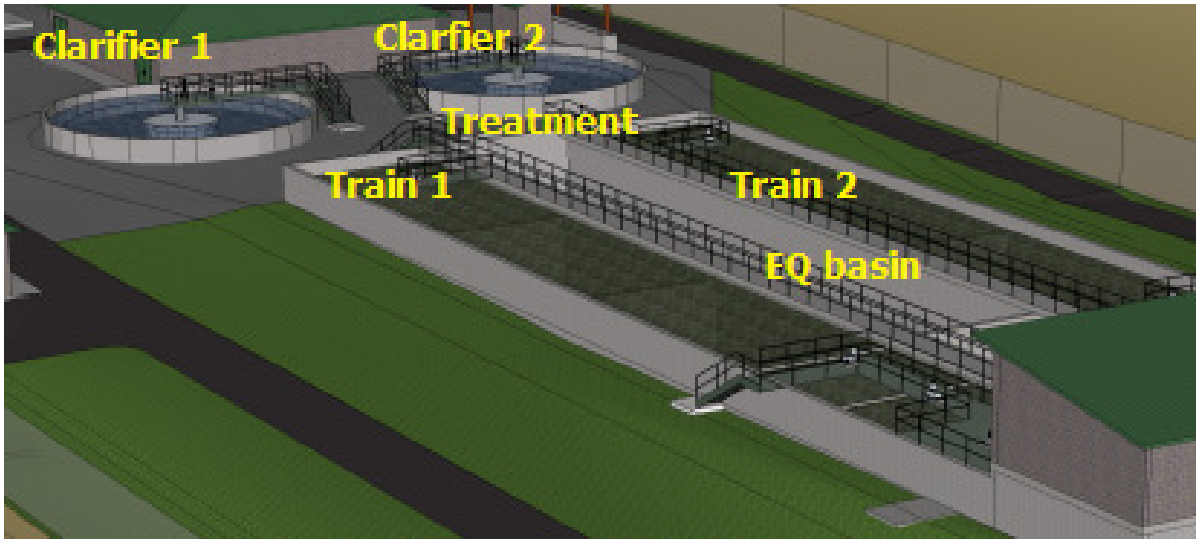
3. Ensure both IPPS pumps are in AUTO running off of level control.
4. Ensure all basin mud valves are closed.

5. Ensure both digester drain valves are closed.
6. Ensure headworks flow is diverted to the correct basin.
7. Open the mud valves in the basin to be drained.
8. Open the IPPS gate valve.
9. Open the IPPS pinch valve approximately two full turns.
10. Monitor IPPS to ensure both pumps are running. Throttle pinch valve up or down as necessary to approximately match flow output of two IPPS pumps.

Digester draining

1. Follow steps 1-6 for basin draining.
2. Open drain line for digester to be drained.
3. Follow steps 10-12 for basin draining.

Switching Online Basins



Standard Operating Procedure for Switching Basin 2 to Basin 1, assuming Basin 1 is idle.

Steps to Remove Clean Water from Basin 1

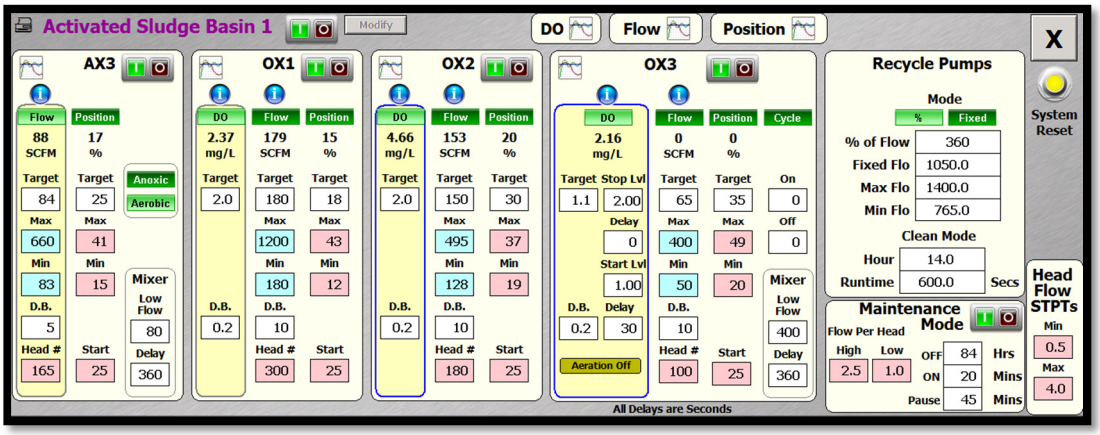
1. If Basin 1 is full of clean water, test mixers and air diffusion system. If operating satisfactorily, turn off the air and mixers in Basin 1.
2. Drop submersible pumps into the Ox3 zone of Basin 1 and pump clean water into the clarifier flow splitter.
3. Remove water down to 2-3 feet above air diffusor heads and turn on aeration to verify that no leaks or problems are present. Pump out remaining clean water and rectify any aeration issues and retest by filling clean water to 2-3 feet above air diffusor heads. Once aeration system operating properly, pump out remain clean water.
4. Once Basin 1 is empty further inspect the aeration system and make any repairs / adjustments as necessary.
5. Verify that the gates at Basin flow splitter are operating properly.

Steps for Switching Basins

1. Operators may want to consider splitting shifts for the basin switch. During the 2015 switch, equalizing began at 6 am and effluent outfall to the river recurred at approximately noon. However, the full removal of Basin 2 mixed liquor could not be completed within the remainder of the shift. A separate afternoon/evening shift may allow for this to occur within the same day, alleviating potential odor problems that arise waiting to finish cleanout on the next day.
2. Equalize Basin 2 to Basin 1 through the following steps:
    a. Verify tank drain valve to IPPS is closed.
    b. Turn off recycle pump in Basin 2 at SCADA system.
    c. Turn off RAS flow and WAS flow from online Clarifier at SCADA system.
    d. Turn off WAS wasting from Basin 2 and shut down DAF system at SCADA system.

e. Switch all aeration valves in Basin 2 to Flow Mode.
f. Open all mud valves in Basin 1, verify all mud valves in EQ basin are closed and open all mud valves in Basin 2.
g. Open influent flow to Basin 2, close influent flow to Basin 1 at basin flow splitter.
h. Turn on air in Basin 1 to Flow Mode (see picture above) and manually set air to minimum settings for Basin 1 once Basin 1 level is 2 feet above diffusor heads.
i. Turn off UV system by switch local HOAs to OFF. Monitor NPW sump now that no flow is going through UV channel. Fill with potable water as necessary.

3. Once Basins are equalized, pump remaining volume in Basin 2 to Basin 1:
   a. Close the Basin 1 mud valves.
   b. Open EQ1 mud valve partially to equalize from Basin 2. Turn on EQ pump to HAND at full speed with valves open (approx. 500 gpm). Monitor that EQ is getting enough flow from Basin 2 through mud valve without dry-running the pump.
   c. Open pinch valve in IPPS throttling valve vault partially. Open gate valve in vault. Monitor flow into IPPS. Open pinch valve as necessary to allow flow from Basin 2 into IPPS such that flow into the IPPS is approximately the same as both IPPS pumps running at full speed (approx. 700 gpm)
   d. Once level in Basin 2 is at 3 feet above diffusor heads, turn off air in Basin 2.
   e. Check level in UV channel. If water level has dropped, refill to weir elevation with non-potable water prior to turning on UV. 30 minutes before Basin 1 level rises to the point of outfall to Clarifier 2, turn on UV system into AUTO.
4. Once Basin 1 level rises to the point of outfall to online clarifier:
   a. Turn on the Basin 1 recycle pump in flow-pacing mode.
   b. Turn on RAS pump from online clarifier to Headworks in flow-pacing mode.
   c. Turn aeration system to DO control mode.



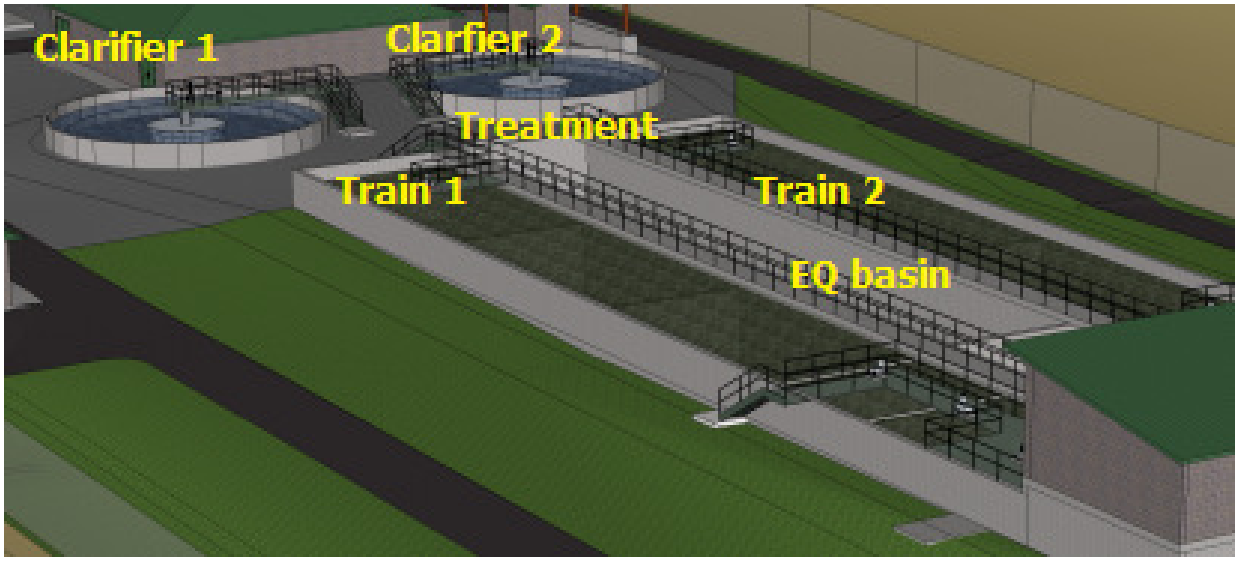
5. Once Basin 2 is empty:
   a. Close EQ1 and Basin 2 mud valves.
   b. Shut off EQ pump and drain remaining from EQ1 to IPPS.
   c. Close gate valve in IPPS throttling valve vault once EQ drained.
6. Monitor effluent clarity from Clarifier 2 to UV. If settling in online clarifier is poor, a portion of influent flow can be diverted to the EQ basin until settling is restored.

7. Turn on Basin 1 wasting gate and WAS pump at fixed rate for Basin 1 and turn on WAS wasting from Clarifier 2.
8. Start-up DAF unit.

Steps for Cleanup and Conclusion of Switch

1. Clean and inspect Basin 2.
2. Clean and inspect Basin 2 aeration system and diffusers.
3. Fill Basin 2 with clean water to 2-3 feet over diffusers and turn on air to visually inspect aeration system.
4. If needed drain Basin 2 to the IPPS to repair aeration system as necessary.

Switching Online Clarifiers



Standard Operating Procedure for Switching Clarifier 2 to Clarifier 1, assuming Clarifier 1 is idle.

Steps for Switching Clarifiers

1. Fill Clarifier 1 with potable or non-potable water to within 12” of sawtooth weir elevation.
2. Direct flow from Basins to Clarifier 1 at Clarifier Flow Splitter by closing weir gate to Clarifier 2 and opening gate to Clarifier 1.
3. Turn on the Clarifier 1 mechanism to AUTO. Ensure mechanism is operating properly.
4. Turn on spray bars at Clarifier 1.
5. Turn off any WAS wasting from Clarifier 2.
6. Leave RAS pumping on from Clarifier 2 until depth in Clarifier 2 reaches 8 feet below the sawtooth weir. Once RAS pumping turned off, turn of Clarifier 1 mechanism.
7. Turn on RAS pumping from Clarifier 1 to Headworks in flow-pacing mode once sludge blanket has reached a minimum of 1 foot thick. *Do not try to pump Clarifier 2 all the way down with RAS pump as this creates an NPSH issue for pump.**
8. Turn on WAS wasting from Clarifier 1 if necessary.

Steps for Cleanup and Conclusion of Switch

1. Pump the remaining water and sludge from Clarifier 2 into the online basin.
2. Clean and inspect Clarifier 2

UV Lamp Manual Cleaning

Shutdown bank to be cleaned

1. Ensure disinfection level is provided with one bank online.
2. Turn bank to OFF at local HOA on power distribution center.

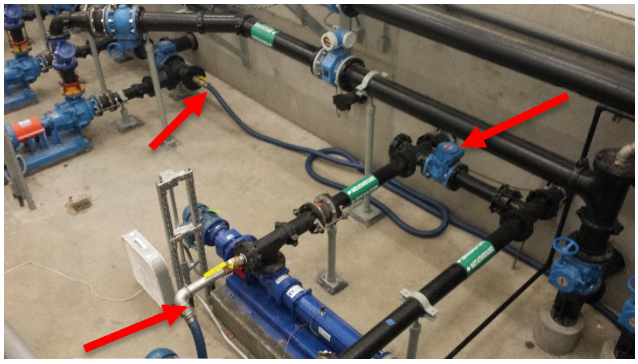
Clean bank

1. Use hoist to remove one module at a time.
2. Hoist module until all lamps are exposed.
3. Use Lime-away on a cloth to manually wipe down sleeves – repeat for all sleeves and modules. Verify cleaning process with manufacturer O&M.
4. Inspect all sleeves per manufacturer O&M.
5. Replace all modules and turn local HOA back to AUTO.

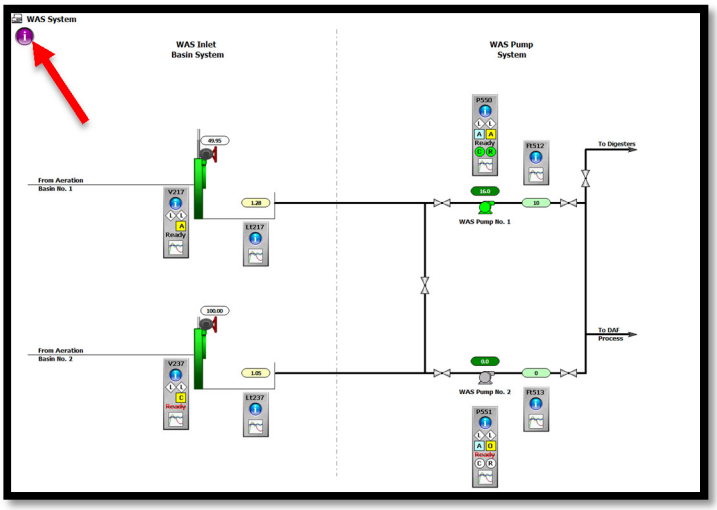
RAS to DAF Wasting Via Second WAS Pump

In order to pump clarifier RAS directly to the DAF, a second WAS pump may be used.

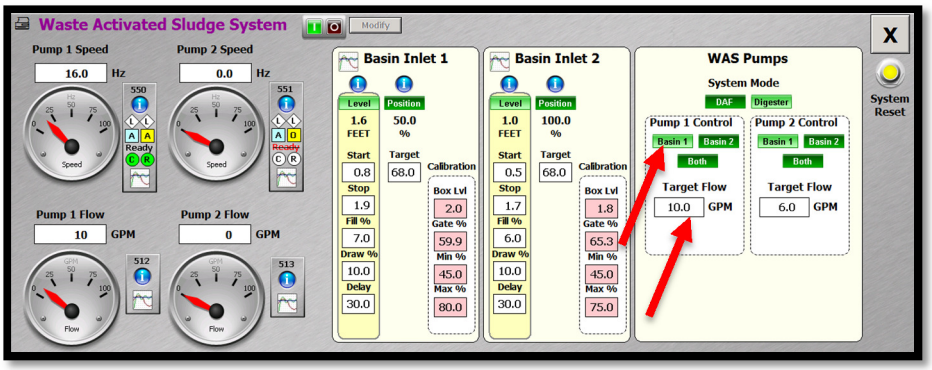
1. Connect hose from RAS suction header (on the side of the on-line clarifier) to the offline WAS pump (pump not being used for surface wasting.
2. Ensure valve between is closed.



3. Open valve on discharge side of WAS pump.
4. Navigate to WAS system SCADA screen.



5. For WAS pump used to pump RAS, select the currently online basin and target flow rate based on desired SRT. Leave WAS pump used for surface wasting as-is.

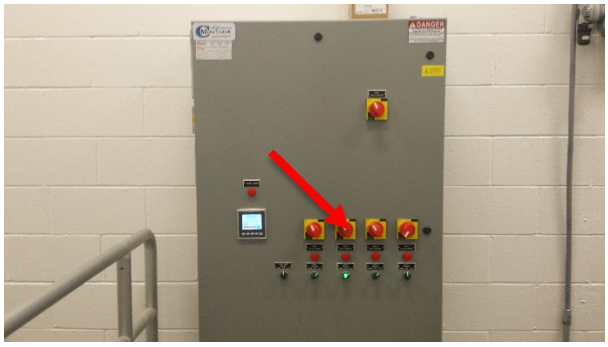


6. Verify that both WAS pumps are pumping at correct flow rates to maintain SRT.

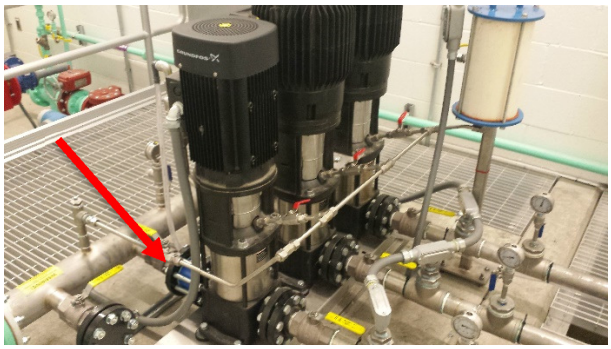
NPW Pump Station Priming

Priming via bypass line

1. In the event that one of the NPW pumps loses prime, turn off that pump at the local HOA on the local control panel.



2. Allow one of the other two pumps to continue to pump (as long as they have prime)
3. Open ¼" bypass line on the discharge header and to pump that has lost prime.



4. Once pump primed, turn pump to HAND at local control panel to verify proper function.
5. Place pump bank in AUTO on the local control panel.

Priming via vacuum pump

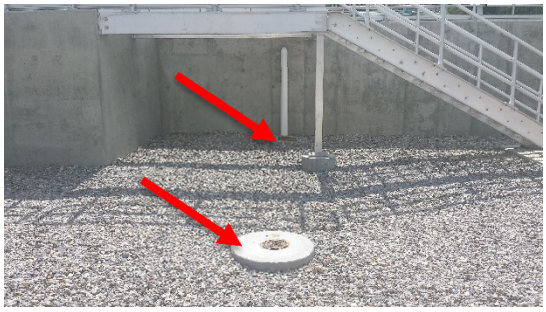
1. In the event that one of the NPW pumps loses prime, turn off the un-primed pump at the local HOA on the local control panel.
2. Connect vacuum pump suction line to quick connect on top of priming chamber.
3. Open priming line valves at vacuum chamber and on the suction side of the unprimed pump.
4. Turn on vacuum pump and allow to pull prime. Pump should shut off automatically once priming is complete.
5. Monitor suction side pressure gauge to verify prime has occurred.
6. Disconnect vacuum pump.
7. Turn primed pump to HAND at local control panel to verify proper function.
8. Place pump bank in AUTO on the local control panel.

NPW Spray Bar Winterization and Spring Start-up

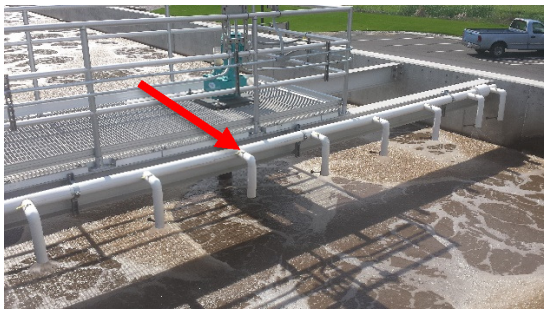
This SOP pertains to the exposed spray bars on the clarifiers and basins.

Spray Bar Winterization

1. For spray bars that are not required for winter operation, turn off each individual spray bar isolation valve.
2. Close buried 2” service line valve and partially open the ¼” buried drain valve to allow spray bar piping to drain.



3. Open each individual spray bar isolation valve.

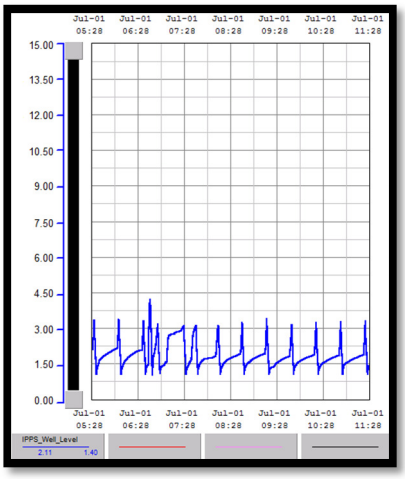


Spray Bar Spring Startup.

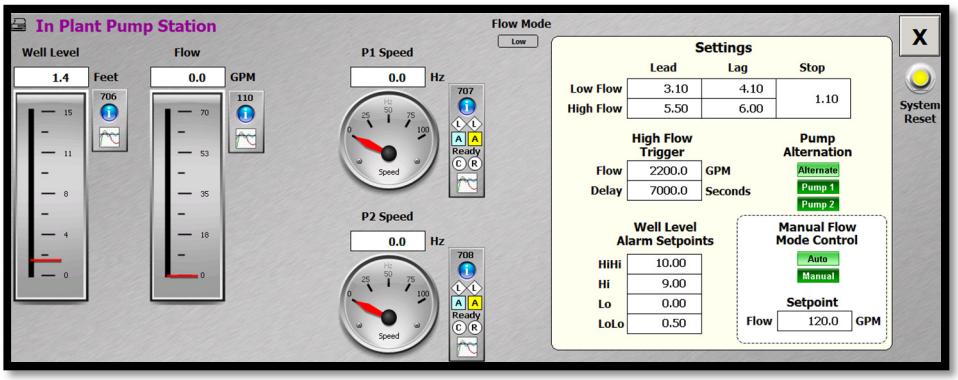
1. For spray bars that are to be started up, turn off each individual spray bar isolation valve.
2. Close ¼” buried drain valve and open buried 2” service line valve.
3. Open each individual spray bar isolation valve to desired amount.

Switch IPPS out of Emergency Float Mode

1. Ensure IPPS level sensor is operational by trending level on SCADA screen.



2. During a period of low flow to the IPPS (less than 100 gpm), pump (in HAND) liquid level down below the lowest float.
3. Turn both pumps to off at the local control panel.
4. Hit the High Level Reset button at the local control panel.
5.
6. On the IPPS SCADA screen, hit Modify and the yellow System Reset button.

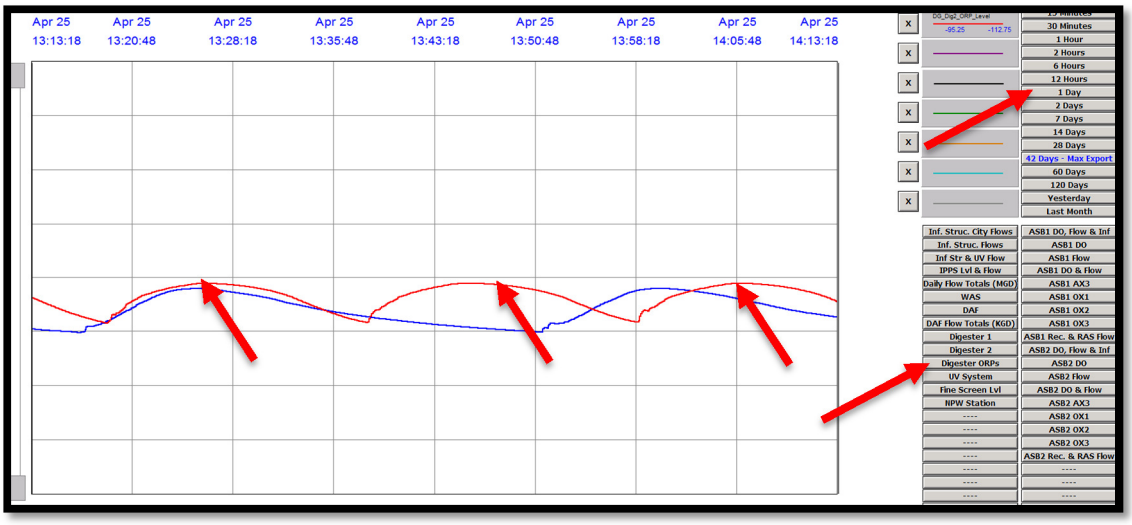


7. Verify that Emergency Float sign has stopped blinking on the IPPS SCADA screen.
8. Turn both pumps back to AUTO on the IPPS local control panel.

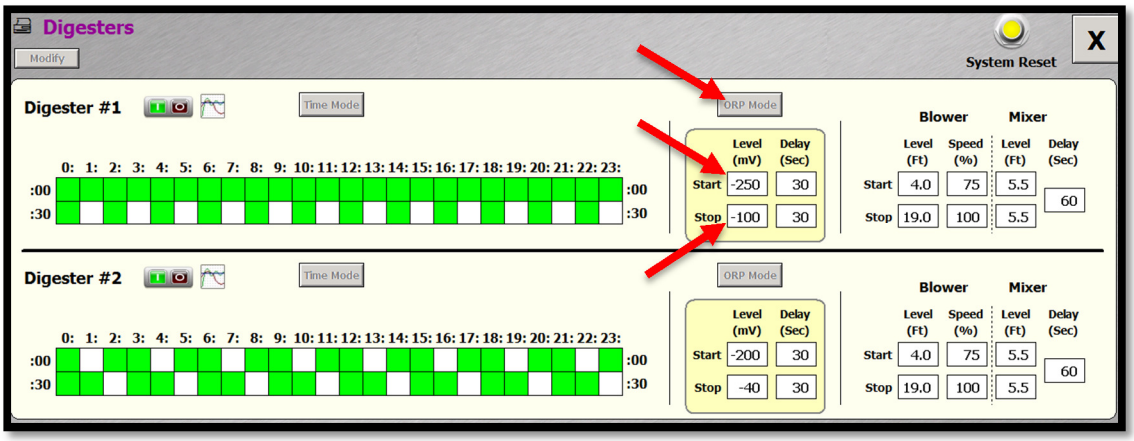
Digester ORP Cycling

Monitoring the ORP cycling within each digester allows the operator to determine the cycles per hour on the digester blowers. Typical operation should allow for 3-5 cycles per hour on these blowers. Operators should check this a few times per week.

1. Go to Digester ORP historical screen; trend screen for the last hour.



2. If either ORP trend shows greater than 5 cycles per hour, navigate to Digester SCADA screen

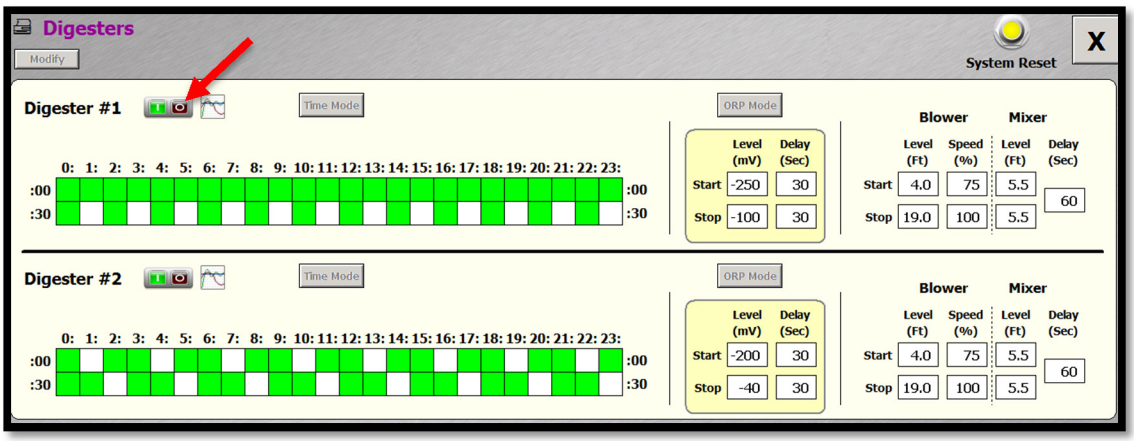


3. Adjust ORP setpoints to widen blower operating band in order to decrease blower cycles as desired.
4. If blowers are cycling less than 3 times per hour, decrease blower operating band to increase blower cycles as desired.s

Digester Decanting

Operators shall determine digester decant frequency based on digester capacity and belt filter press operation.

1. Turn of aeration and mixing in the digester to be decanted via SCADA screen at the beginning of the work day.



2. Allow digester to settle for 1 hour.
3. Place submersible pump on a rope into supernatant on top of digester.
4. Pump either to IPPS via digester overflow pipe or to Evaporation pond via a long hose.
5. Pump for length of time as necessary to remove desired volume.
6. Remove pump from digester.
7. Turn on aeration and mixing in digester at SCADA screen.

Evaporation Pond Pump Station Operation

1. Ensure 2” plug valve on west side of influent structure (near ceiling in Headworks mechanical room) is open.

2. Ensure 2” ball valve on FLT line on south wall of Grit Handling Room is open.

3. Ensure both 2” plug valves on Evaporation Pond Pump Station manifold are open.

4. Ensure suction line extends below the water level of the evaporation pond.
5. Turn pond pump bucket ON at MCC.
6. Turn pond pump local disconnect ON.
7. Turn pond pump local HOA to AUTO or HAND.

8. Pump should take approximately 20 minutes to prime.
9. Once pumping, throttle downstream valve at pump station to desired flow rate.

Belt Filter Press Filtrate Direction Flow Change

Valves located in concrete dumpster pad south of Belt Filter Press Room.

Filtrate to Evaporation Pond

1. Open Valve A in photo above and close Valve B.

Filtrate to IPPS

1. Close Valve A in photo above and open Valve B.

Appendix B
Material Safety Data Sheets

Appendix C
Equipment Manufacturer O&M Manuals

DIVISION	DESCRIPTION
VOLUME 1	
05.80.1	FIBERGLASS REINFORCED PLASTIC TANK COVERS
11.11.13	PACKAGED PUMP STATION – NPW PUMP SYSTEM
11.12.3	SUMP PUMP
11.12.5	SCREW CENTRIFUGAL PUMP – RAS PUMPS
11.12.6	PROGRESSING CAVITY PUMP – WAS AND TS PUMPS
VOLUME 2	
11.12.7	SUBMERSIBLE SEWAGE PUMP – RECYCLE, EQ BASIN AND IPPS PUMPS
11.12.9	RECESSED IMPELLER PUMP – GRIT PUMP
11.12.10	SELF –PRIMING SEWAGE PUMP
11.70.21.39	MECHANICAL FINE SCREENS
11.70.23.23	VORTEX GRIT UNIT
11.70.23.63	GRIT CLASSIFIER AND CYCLONE
11.70.41.26	ASPIRATING FLOATING MIXER
11.70.41.41	TOP-ENTERING TANK MIXERS
VOLUME 3	
11.70.43.21	CLARIFIER MECHANISMS
11.70.51.36	AIR DIFFUSION EQUIPMENT
11.70.55.33	ROTARY POSITIVE DISPLACEMENT BLOWERS
11.70.66.56	ULTRAVIOLET DISINFECTION SYSTEM
11.70.71.23	DISSOLVED AIR FLOATATION (DAF) THICKENING EQUIPMENT
VOLUME 4	
11.70.76.21	BELT FILTER PRESS
VOLUME 5	
11.95.34.1	WALL VENTILATORS
11.95.34.2	CEILING VENTILATORS
11.95.83.33	RADIANT SPACE HEATERS
11.95.83.34	ELECTRIC DUCT HEATERS
11.95.86	HEAT PUMP
11.97	AUTOMATIC SELF-CLEANING FILTER
12.60	LABORATORY EQUIPMENT
12.60.5	FUME HOOD
12.70	APPLIANCES
15.32.3	BUTTERFLY VALVES AND ELECTRIC ACTUATORS
15.32.5	PLUG VALVES AND ELECTRIC ACTUATOR
15.32.9	PINCH VALVES
15.34.12	FLOAT VALVE

15.35	AIR VALVES
15.40.10	ELECTRICAL HEAT TRACING COMPONENTS
15.90	WEIR GATES AND ELECTRIC ACTUATORS; SLIDE GATES; STOP GATES

VOLUME 6

16.26.2	DRY-TYPE TRANSFORMERS
16.35.10	SURGE PROTECTION DEVICE
16.51	LOW VOLTAGE SERVICE SWITCHBOARD
16.52	BRANCH CIRCUIT PANELBOARD
16.85	LIGHTING
16.91.2	DIESEL ENGINE GENERATOR SET
16.92.2	AUTOMATIC TRANSFER SWITCH

VOLUME 7-8

16.41	MOTOR CONTROL CENTER

VOLUME 9

16.45	VARIABLE FREQUENCY DRIVE

VOLUME 10-11

13.51.2	SMOKE DETECTOR
13.51.3	INTRUSION MOTION DETECTOR
13.51.4	INTRUSION ALARM SWITCH
13.51.5	OPERATOR IN TROUBLE (PANIC) ALARM BUTTON
13.52.2	FLOOD LIQUID LEVEL SWITCH
13.52.3	WASTEWATER LEVEL FLOAT SWITCH
13.52.10	PRESSURE TRANSMITTER
13.52.13	SUBMERSIBLE LEVEL TRANSMITTER (WASTEWATER)
13.52.14	ULTRASONIC LEVEL SENSOR AND TRANSMITTER
13.52.15	FLOW SWITCH
13.53.2	WALL MOUNTED COOLING THERMOSTAT
13.53.3	WALL MOUNTED HEATING THERMOSTAT
13.54.1	DISSOLVED OXYGEN/ORP METER
13.54.2	COMPOSITE SAMPLER
15.52.3	ELECTROMAGNETIC FLOW METERS
15.52.5	GAS FLOW METERS

VOLUME 12

17.10	PANELS

Appendix D
NPDES Permit and Fact Sheet

CITY OF CASHMERE PUBLICLY-OWNED TREATMENT WORKS WASTE DISCHARGE PERMIT

1. NPDES Permit
2. NPDES Permit Factsheet
3. NPDES Permit Factsheet Addendum

City of Cashmere
Publicly-Owned Treatment Works
National Pollutant Discharge Elimination System
Waste Discharge Permit

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT NO. WA-002318-3

State of Washington
DEPARTMENT OF ECOLOGY
Yakima, Washington 98902

In compliance with the provisions of
The State of Washington Water Pollution Control Law
Chapter 90.48 Revised Code of Washington
and
The Federal Water Pollution Control Act
(The Clean Water Act)
Title 33 United States Code, Section 1342 et seq.

CITY OF CASHMERE
PUBLICLY-OWNED TREATMENT WORKS
101 WOODRING STREET
CASHMERE, WA 98815

Plant Location: Riverfront Drive Cashmere, WA 98815	Receiving Water: Wenatchee River, River Mile 8.6
Water Body ID # 1203156474560	Discharge Location: Latitude: 47.5085 Longitude: -120.4479 W

Plant Type:
Industrial pretreatment facility consists of a Bulk Volume Fermenter, an anaerobic reactor. Main treatment plant includes three stabilization ponds, chlorine disinfection, and river discharge through a perforated diffuser.

is authorized to discharge in accordance with the Special and General Conditions that follow.

Charles McKinney
Section Manager
Water Quality Program
Central Regional Office
Washington State Department of Ecology

TABLE OF CONTENTS

Page

SUMMARY OF PERMIT REPORT SUBMITTALS 4

SPECIAL CONDITIONS 5
S1. DISCHARGE LIMITS 5
A.1. Effluent Limits 5
A.2. TMDL Compliance 5
B. Mixing Zone Authorization 6
S2. MONITORING REQUIREMENTS 6
A. Monitoring Schedule 6
B. Sampling and Analytical Procedures 8
C. Flow Measurement, Field Measurement and Continuous Monitoring Devices 8
D. Laboratory Accreditation 9
E. Request for Reduction in Monitoring 9
S3. REPORTING AND RECORDING REQUIREMENTS 9
A. Reporting 9
B. Records Retention 10
C. Recording of Results 10
D. Additional Monitoring by the Permittee 10
E. Reporting Permit Violations 11
1. Immediate Reporting 11
2. Twenty-four-hour Reporting 11
3. Report Within Five Days 12
4. Waiver of Written Reports 12
5. All Other Permit Violation Reporting 12
6. Report Submittal 12
F. Other Reporting 12
G. Maintaining a Copy of This Permit 13
S4. FACILITY LOADING 13
A. Design Criteria 13
B. Plans for Maintaining Adequate Capacity 13
C. Duty to Mitigate 14
D. Notification of New or Altered Sources 14
E. Infiltration and Inflow Evaluation 15
F. Wasteload Assessment 16
S5. OPERATION AND MAINTENANCE 16
A. Certified Operator 16
B. O & M Program 16
C. Short-term Reduction 17
D. Electrical Power Failure 17
E. Prevent Connection of Inflow 18

F. Bypass Procedures 18
G. Operations and Maintenance Manual 20
S6. PRETREATMENT 20
A. General Requirements 20
B. Duty to Enforce Discharge Prohibitions 21
C. Wastewater Discharge Permit Required 22
D. Identification and Reporting of Existing, New, and Proposed Industrial Users 22
S7. SOLID WASTES 22
A. Solid Waste Handling 22
B. Leachate 23
S8. APPLICATION FOR PERMIT RENEWAL 23
S9. ENGINEERING DOCUMENTS FOR THE PLANNED UPGRADE 23
A. Engineering Report 23
B. Plans and Specifications 23
S10. NOTICE OF UPGRADE COMPLETION 23

GENERAL CONDITIONS 24
G1. SIGNATORY REQUIREMENTS 24
G2. RIGHT OF INSPECTION AND ENTRY 25
G3. PERMIT ACTIONS 26
G4. REPORTING PLANNED CHANGES 27
G5. PLAN REVIEW REQUIRED 27
G6. COMPLIANCE WITH OTHER LAWS AND STATUTES 27
G7. TRANSFER OF THIS PERMIT 27
G8. REDUCED PRODUCTION FOR COMPLIANCE 28
G9. REMOVED SUBSTANCES 28
G10. DUTY TO PROVIDE INFORMATION 28
G11. OTHER REQUIREMENTS OF 40 CFR 29
G12. ADDITIONAL MONITORING 29
G13. PAYMENT OF FEES 29
G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS 29
G15. UPSET 29
G16. PROPERTY RIGHTS 30
G17. DUTY TO COMPLY 30
G18. TOXIC POLLUTANTS 30
G19. PENALTIES FOR TAMPERING 30
G20. COMPLIANCE SCHEDULES 30
G21. CONTRACT REVIEW 31

APPENDIX A 32

SUMMARY OF PERMIT REPORT SUBMITTALS

Refer to the Special and General Conditions of this permit for additional submittal requirements. The following table is for quick reference only. Enforceable submittal requirements are contained in the permit narrative.

Permit Section	Submittal	Frequency	First Submittal Date
S3.A.	Discharge Monitoring Report	Monthly	**January 15, 2011**
S3.E.	Reporting Permit Violations	As necessary	
S4.B.	Plans for Maintaining Adequate Capacity	As necessary	
S4.D.	Notification of New or Altered Sources	As necessary	
S4.E.3.	Infiltration and Inflow Evaluation	1/permit cycle	**November 30, 2014**
S4.F.1.	Wasteload Assessment	1/permit cycle	**November 30, 2014**
S5.G.1.	Operations and Maintenance Manual Review	Annually	
S5.G.2.	Operations and Maintenance Manual Update	As necessary	
S8.	Application for Permit Renewal	1/permit cycle	**November 30, 2014**
S9.A.	Engineering Documents for the Planned WWTF Upgrade	1/permit cycle	**July 31, 2012**
S9.B.	Engineering Plans and Specifications for the Planned WWTF Upgrade	1/permit cycle	**April 30, 2013**
S10.	Notice of WWTF Upgrade Completion		**August 25, 2019**
G1.C.	Signatory Requirements	As necessary	
G4.	Reporting Planned Changes	As necessary	
G5.	Plan Review Required	As necessary	
G7.	Notice of Permit Transfer	As necessary	
G10.	Duty to Provide Information	As necessary	
G21.	Contract Review	As necessary	

SPECIAL CONDITIONS

In this permit, the word "must" denotes an action that is mandatory and is equivalent to the word "shall" used in previous permits.

S1. DISCHARGE LIMITS

A.1. Effluent Limits

All discharges and activities authorized by this permit must comply with the terms and conditions of this permit. The discharge of any of the following pollutants more frequently than, or at a level in excess of, that identified and authorized by this permit violates the terms and conditions of this permit.

Beginning on **December 1, 2010** and lasting through **November 30, 2015**, the Permittee may discharge municipal wastewater to the Wenatchee River at the permitted location subject to compliance with the following limits:

EFFLUENT LIMITATIONS : OUTFALL # 001		
Parameter	**Average Monthly** [a]	**Average Weekly** [a]
5-Day Biochemical Oxygen Demand (BOD_5)	45 mg/L, 354 lbs/day and 65% minimum removal	65 mg/L, 511 lbs/day
Total Suspended Solids (TSS)	75 mg/L, 590 lbs/day	112 mg/L, 880 lbs/day
Fecal Coliform Bacteria	200/100 mL	400/100 mL
pH	shall not be outside the range of 6.0 to 9.0	
ADDITIONAL EFFLUENT LIMITATIONS: OUTFALL # 001		
Parameter	**Average Monthly**	**Daily Maximum** [b]
Total Residual Chlorine	Minimized	0.05 mg/L [c], 0.4 lbs/day
a-The average monthly and weekly effluent limitations are based on the arithmetic mean of the samples taken with the exception of fecal coliform, which is based on the geometric mean.		
b-The daily maximum effluent limitations are the greatest allowable value for any calendar day.		
c-The method detection level (MDL) for Chlorine is 18 ug/L using EPA method 330.5 (DPD-FAS) from 40 CFR Part 136. Average values shall be calculated as follows: measurements below the MDL = 0; and measurements greater than the MDL = the measurement.		

A.2. TMDL Compliance

The Permittee shall make consistent progress toward meeting the requirements of the Wenatchee River pH and Dissolved Oxygen TMDL. The Permittee shall be in compliance with TMDL assigned wasteload allocations no later than **August 25, 2019.**

B. Mixing Zone Authorization

The mixing zone authorized under this permit shall be no larger than that allowed under Chapter 173-201A WAC.

The length of the chronic and acute mixing zones shall extend downstream no greater than 300 feet and 30 feet, respectively. The chronic mixing zone shall extend upstream no greater than 100 feet from the center point of the outfall's discharge opening. The dilution factors for the chronic and acute mixing zones are approximately **113.9** and **23.6**, respectively.

S2. MONITORING REQUIREMENTS

A. Monitoring Schedule

The Permittee must monitor in accordance with the following schedule and must use the laboratory method, detection level (DL), and quantitation level (QL) specified in Appendix A. The Permittee may use alternative methods included in 40 CFR Part 136 if the DL and QL are equivalent to those specified in Appendix A or if the alternative method's DL and QL are low enough to detect the parameter.

Parameter	Sample Point	Sampling Frequency	Sample Type
Flow, mgd	BVF Effluent [a] Municipal Influent [c] Final Effluent [d]	continuous [b] continuous continuous	On-line measurement On-line measurement On-line measurement
pH, units	BVF Effluent Municipal Influent Final Effluent	2/week [e] 2/week 2/week	Grab [f] Grab Grab
Temperature, °C	Final Effluent	2/week	Grab
Dissolved Oxygen, mg/L	Final Effluent	2/week	Grab
BOD_5, mg/L [g]	BVF Influent BVF Effluent Municipal Influent Final Effluent	1/week [h] 1/week 1/week 1/week	24-hr composite [i] Grab 24-hr composite 24-hr composite
BOD_5, lbs/day	BVF Effluent Municipal Influent Final Effluent	1/week 1/week 1/week	Calculation Calculation [j] Calculation
BOD_5, % removal	Final Effluent [j]	1/week	Calculation [k]
	BVF Influent	1/week	24-hr composite

Parameter	Sample Point	Sampling Frequency	Sample Type
TSS, mg/L	BVF Effluent Municipal Influent Final Effluent	1/week 1/week 1/week	Grab 24-hr composite 24-hr composite
TSS, lbs/day	BVF Effluent Municipal Influent Final Effluent	1/week 1/week 1/week	Calculation Calculation Calculation
TSS, % removal	Final Effluent [l]	1/week	Calculation
Total Residual Chlorine, mg/L	Final Effluent	1/week	Grab
Total Residual Chlorine, lbs/day	Final Effluent	1/week	Calculation
Fecal Coliform Bacteria, #/100 ml	Final Effluent	2/week	Grab
Total Ammonia, mg/L	Final Effluent	1/week	Grab
Total Ammonia, lbs/day	Final Effluent	1/week	Calculation
Total Phosphorous mg/L	Final Effluent	1/month	Grab
Total Phosphorous lbs/Day	Final Effluent	1/month	Calculation
Phosphorous (Summer) [m] mg/L	Final Effluent	1/week	Grab
Phosphorous (Summer) lbs/Day	Final Effluent	1/week	Calculation
Total Kjeldahl Nitrogen mg/L	Final Effluent	1/month	Grab
Total Kjeldahl Nitrogen lbs/Day	Final Effluent	1/month	Calculation
Total Kjeldahl Nitrogen (Summer) mg/L	Final Effluent	1/week	Grab
Total Kjeldahl Nitrogen (Summer) lbs/Day	Final Effluent	1/week	Calculation

a BVF means the Bulk Volume Fermenter.
b BVF sampling need only occur when it is in operation. When the BVF is not in operation the Permittee must write "No Discharge" on the appropriate DMR and submit it as required to Ecology
c Municipal Influent means the raw sewage from the municipality, other than from the BVF.
d Final Effluent means wastewater which is exiting, or has exited, the last treatment operation.
e 2/week means samples collected two times every calendar week.
f Grab means an individual sample collected in less than 15 minutes.
g Samples for BOD_5 analysis must be taken before the disinfection process.
h 1/week means samples collected once every calendar week.
i 24-hr composite means a series of, at least, four individual samples collected over a 24-hour period at selected intervals based on an increment of either flow or time, and combined into a single container to be subsequently analyzed as one sample.
j Calculation for lbs/Day loading is Flow in MGD times concentration in mg/L times the constant 8.34.

k Percent removal is calculated using the total influent loadings into the lagoon system, including influent from the City and effluent from the BVF, and the final effluent discharged from the lagoon system.
l Calculation for percent removal is (influent concentration –effluent concentration) / influent concentration times 100.
[m] Summer means July 1 through September 30.

B. Sampling and Analytical Procedures

Samples and measurements taken to meet the requirements of this permit must represent the volume and nature of the monitored parameters. The Permittee must conduct representative sampling of any unusual discharge or discharge condition, including bypasses, upsets, and maintenance-related conditions that may affect effluent quality.

Sampling and analytical methods used to meet the monitoring requirements specified in this permit must conform to the latest revision of the *Guidelines Establishing Test Procedures for the Analysis of Pollutants* contained in 40 CFR Part 136.

C. Flow Measurement, Field Measurement and Continuous Monitoring Devices

The Permittee must:

1. Select and use appropriate flow measurement, field measurement, and continuous monitoring devices and methods consistent with accepted scientific practices.
2. Install, calibrate, and maintain these devices to ensure the accuracy of the measurements is consistent with the accepted industry standard and the manufacturer's recommendation for that type of device.
3. If the Permittee uses micro-recording temperature devices known as thermistors it must calibrate the devices using protocols from Ecology's Quality Assurance Project Plan Development Tool (*Continuous Temperature Sampling Protocols for the Environmental Monitoring and Trends*). This document is available online at http://www.ecy.wa.gov/programs/eap/qa/docs/QAPPtool/Mod6%20Ecology%20SOPs/Protocols/ContinuousTemperatureSampling.pdf . Calibration as specified in this document is not required if the Permittee uses recording devices which are certified by the manufacturer.
4. Use field measurement devices as directed by the manufacturer and do not use reagents beyond their expiration dates.
5. Calibrate these devices at the frequency recommended by the manufacturer.
6. Calibrate flow monitoring devices at a minimum frequency of at least one calibration per year.
7. Maintain calibration records for at least three years.

D. Laboratory Accreditation

The Permittee must ensure that all monitoring data required by Ecology are prepared by a laboratory registered or accredited under the provisions of chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* Flow, temperature, settleable solids, conductivity, pH, and internal process control parameters are exempt from this requirement. The Permittee must obtain accreditation for conductivity and pH if it must receive accreditation or registration for other parameters.

E. Request for Reduction in Monitoring

The Permittee may request a reduction of the sampling frequency after twelve (12) months of monitoring. Ecology will review each request and at its discretion grant the request through a permit modification or when it reissues the permit.

The Permittee must:

1. Provide a written request.
2. Clearly state the parameters for which it is requesting reduced monitoring.
3. Clearly state the justification for the reduction.

S3. REPORTING AND RECORDING REQUIREMENTS

The Permittee must monitor and report in accordance with the following conditions. Falsification of information submitted to Ecology is a violation of the terms and conditions of this permit.

A. Reporting

The first monitoring period begins on **December 1, 2010** of the permit. The Permittee must:

1. Submit monitoring results each month.
2. Summarize, report, and submit monitoring data obtained during each monitoring period on a Discharge Monitoring Report (DMR) form provided, or otherwise approved, by Ecology.
3. Submit DMR forms monthly whether or not the facility was discharging. If the facility did not discharge during a given monitoring period, submit the form as required with the words "NO DISCHARGE" entered in place of the monitoring results.
4. Ensure that DMR forms are **postmarked or received by** Ecology no later than the 15th day of the month following the completed monitoring period, unless otherwise specified in this permit.

5. Submit priority pollutant analysis data no later than forty-five (45) days following the monitoring.
6. Send report(s) to Ecology at:

Water Quality Permit Coordinator
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

All laboratory reports providing data for organic and metal parameters must include the following information: sampling date, sample location, date of analysis, parameter name, CAS number, analytical method/number, method detection limit (MDL), laboratory practical quantitation limit (PQL), reporting units, and concentration detected. Analytical results from samples sent to a contract laboratory must include information on the chain of custody, the analytical method, QA/QC results, and documentation of accreditation for the parameter.

B. Records Retention

The Permittee must retain records of all monitoring information for a minimum of three (3) years. Such information must include all calibration and maintenance records and all original 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. The Permittee must extend this period of retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee or when requested by Ecology.

C. Recording of Results

For each measurement or sample taken, the Permittee must record the following information:

1. The date, exact place, method, and time of sampling or measurement.
2. The individual who performed the sampling or measurement.
3. The dates the analyses were performed.
4. The individual who performed the analyses.
5. The analytical techniques or methods used.
6. The results of all analyses.

D. Additional Monitoring by the Permittee

If the Permittee monitors any pollutant more frequently than required by Condition S2

of this permit, then the Permittee must include the results of such monitoring in the calculation and reporting of the data submitted in the Permittee's DMR.

E. Reporting Permit Violations

The Permittee must take the following actions when it violates or is unable to comply with any permit condition:

a. Immediately take action to stop, contain, and cleanup unauthorized discharges or otherwise stop the noncompliance and correct the problem.
b. If applicable, immediately repeat sampling and analysis. Submit the results of any repeat sampling to Ecology within thirty (30) days of sampling.

1. Immediate Reporting

The Permittee must report any failure of the disinfection system, any collection system overflows, or any plant bypass discharging to a waterbody used as a source of drinking water immediately to the Department of Ecology and the Department of Health, Drinking Water Program at the numbers listed below:

Central Regional Office	509-575-2490
Department of Health,	1-800-521-0323 (business hours)
Drinking Water Program	1-877-481-4901 (after business hours)
Chelan Douglas Health	509-886-6400 (M-F, 8-5)
District	509-886-6499 (after business hours)

2. Twenty-four-hour Reporting

The Permittee must report the following occurrences of noncompliance by telephone, to Ecology at the telephone numbers listed above, within 24 hours from the time the Permittee becomes aware of any of the following circumstances:

a. Any noncompliance that may endanger health or the environment, unless previously reported under subpart 1, above.
b. Any unanticipated **bypass** that exceeds any effluent limitation in the permit (See Part S4.B., "Bypass Procedures").
c. Any **upset** that exceeds any effluent limitation in the permit (See G.15, "Upset").
d. Any violation of a maximum daily or instantaneous maximum discharge limitation for any of the pollutants in Section S1.A of this permit.
e. Any overflow prior to the treatment works, whether or not such overflow endangers health or the environment or exceeds any effluent limitation in the permit.

3. Report Within Five Days

The Permittee must also provide a written submission within five days of the time that the Permittee becomes aware of any event required to be reported under subparts 1 or 2, above. 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 recurrence of the noncompliance.
e. If the noncompliance involves an overflow prior to the treatment works, an estimate of the quantity (in gallons) of untreated overflow.

4. Waiver of Written Reports

Ecology may waive the written report required in subpart 3, above, on a case-by-case basis upon request if a timely oral report has been received.

5. All Other Permit Violation Reporting

The Permittee must report all permit violations, which do not require immediate or within 24 hours reporting, when it submits monitoring reports for S3.A ("Reporting"). The reports must contain the information listed in paragraph E.3, above. Compliance with these requirements does not relieve the Permittee from responsibility to maintain continuous compliance with the terms and conditions of this permit or the resulting liability for failure to comply.

6. Report Submittal

The Permittee must submit reports to the address listed in S3.

F. Other Reporting

The Permittee must report a spill of oil or hazardous materials in accordance with the requirements of RCW 90.56.280 and WAC 173-303-145. You can obtain further instructions at the following website:
http://www.ecy.wa.gov/programs/spills/other/reportaspill.htm .

Where the Permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application, or in any report to Ecology, it must submit such facts or information promptly.

G. Maintaining a Copy of This Permit

The Permittee must keep a copy of this permit at the facility and make it available upon request to Ecology inspectors.

S4. FACILITY LOADING

A. Design Criteria

The flows or waste loads for the permitted facility must not exceed the following design criteria:

Flows or waste loadings of the following design criteria for the permitted treatment facility shall not be exceeded.

City of Cashmere POTW Maximum Flow Design Criteria

Parameter	Flow Rate
BVF Maximum Month	0.440 MGD
BVF Maximum Daily	0.533 MGD
Municipal Max. Month	0.573 MGD
Combined Max. Month	1.013 MGD

City of Cashmere POTW Influent Loadings Design Criteria

Parameter	Flow Rate
BOD to BVF	24,500 lbs/day
TSS to BVF	9,500 lbs/day
Municipal BOD to Lagoon	5,000 lbs/day
Industrial (BVF effluent) BOD to Lagoon	6,200 lbs/day
Combined BOD to Lagoon	11,200 lbs/day

B. Plans for Maintaining Adequate Capacity

The Permittee must submit a plan and a schedule for continuing to maintain capacity to Ecology when:

1. The actual flow or waste load reaches 85 percent of any one of the design criteria in S4.A for three consecutive months.

2. The projected increase would reach design capacity within five years.

   The plan and schedule for continuing to maintain capacity must be sufficient to achieve the effluent limits and other conditions of this permit. This plan must identify any of the following actions or any other actions necessary to meet the objective of maintaining capacity.

   a. Analysis of the present design, including the introduction of any process modifications that would establish the ability of the existing facility to achieve the effluent limits and other requirements of this permit at specific levels in excess of the existing design criteria specified in paragraph A, above.
   b. Reduction or elimination of excessive infiltration and inflow of uncontaminated ground and surface water into the sewer system.
   c. Limitation on future sewer extensions or connections or additional waste loads.
   d. Modification or expansion of facilities necessary to accommodate increased flow or waste load.
   e. Reduction of industrial or commercial flows or waste loads to allow for increasing sanitary flow or waste load.

   Engineering documents associated with the plan must meet the requirements of WAC 173-240-060, "Engineering Report," and be approved by Ecology prior to any construction.

   If the Permittee intends to apply for state or federal funding for the design or construction of a facility project, the plan may also need to meet the environmental review requirements as described in 40 CFR 35.3040 and 40 CFR 35.3045 and it may also need to demonstrate cost effectiveness as required by WAC 173-95-730. The plan must specify any contracts, ordinances, methods for financing, or other arrangements necessary to achieve this objective.

C. 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.

D. Notification of New or Altered Sources

1. The Permittee must submit written notice to Ecology whenever any new discharge or a substantial change in volume or character of an existing discharge into the POTW is proposed which:

a. Would interfere with the operation of, or exceed the design capacity of, any portion of the POTW;
b. Is not part of an approved general sewer plan or approved plans and specifications; or
c. Would be subject to pretreatment standards under 40 CFR Part 403 and Section 307(b) of the Clean Water Act.

2. This notice must include an evaluation of the POTW's ability to adequately transport and treat the added flow and/or waste load, the quality and volume of effluent to be discharged to the POTW, and the anticipated impact on the Permittee's effluent [40 CFR 122.42(b)].

E. Infiltration and Inflow Evaluation

1. The Permittee must conduct an infiltration and inflow evaluation. Refer to the U.S. EPA publication, *I/I Analysis and Project Certification*, available as Publication No. 97-03 at:

Publications Office
Department of Ecology
P.O. Box 47600
Olympia, WA, 98504-7600

or at

http://www.ecy.wa.gov/programs/wq/permits/guidance.html .

The Permittee may use plant monitoring records to assess measurable infiltration and inflow.

2. The Permittee must prepare a report which summarizes any measurable infiltration and inflow. If infiltration and inflow have increased by more than 15 percent from that found in the previous report based on equivalent rainfall, the report must contain a plan and a schedule for:

a. Locating the sources of infiltration and inflow; and
b. Correcting the problem.

3. The Permittee must submit a report summarizing the results of the evaluation and any recommendations for corrective actions **by November 30, 2014.**

F. Wasteload Assessment

1. The Permittee must conduct an assessment of its **influent flow and waste load and submit a report to Ecology by November 30, 2014.**

2. The report must contain the following: an indication of compliance or noncompliance with the permit effluent limits; a comparison between the existing and design monthly average dry weather and wet weather flows, peak flows, BOD, and total suspended solids loadings; and (except for the first report) the percentage change in these parameters since the previous report.

3. The report must also state the present and design population or population equivalent, projected population growth rate, and the estimated date upon which the design capacity is projected to be reached, according to the most restrictive of the parameters above.

4. Ecology may modify the interval for review and reporting if it determines that a different frequency is sufficient.

S5. 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 to achieve compliance with the terms and conditions of this permit. Proper operation and maintenance also includes keeping a daily operation logbook (paper or electronic), adequate laboratory controls, and appropriate quality assurance procedures. This provision of the permit requires the Permittee to operate backup or auxiliary facilities or similar systems only when the operation is necessary to achieve compliance with the conditions of this permit.

A. Certified Operator

An operator certified for at least a Class II plant by the State of Washington shall be in responsible charge of the day-to-day operation of the wastewater treatment facility (WWTF). An operator certified for at least a Class I plant shall be in charge during all regularly scheduled shifts.

B. O & M Program

The Permittee must:

1. Institute an adequate operation and maintenance program for the entire sewage system.

2. Keep maintenance records on all major electrical and mechanical components of the treatment plant, as well as the sewage system and pumping stations. Such records must clearly specify the frequency and type of maintenance recommended by the manufacturer and must show the frequency and type of maintenance performed.

3. Make maintenance records available for inspection at all times.

C. Short-term Reduction

The Permittee must schedule any facility maintenance, which might require interruption of wastewater treatment and degrade effluent quality, during non-critical water quality periods and carry this maintenance out in a manner approved by Ecology.

If a Permittee contemplates a reduction in the level of treatment that would cause a violation of permit discharge limits on a short-term basis for any reason, and such reduction cannot be avoided, the Permittee must:

1. Give written notification to Ecology, if possible, thirty (30) days prior to such activities.

2. Detail the reasons for, length of time of, and the potential effects of the reduced level of treatment.

This notification does not relieve the Permittee of its obligations under this permit.

D. Electrical Power Failure

The Permittee must ensure that adequate safeguards prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations. Adequate safeguards include, but are not limited to: alternate power sources, standby generator(s), or retention of inadequately treated wastes.

The Permittee is responsible for maintaining adequate safeguards to prevent the discharge of untreated wastes or wastes not treated in accordance with the requirements of this permit during electrical power failure at the treatment plant and/or sewage lift stations either by means of alternate power sources, standby generator, or retention of inadequately treated wastes. The Permittee shall maintain Reliability Class II (EPA 430-99-74-001) at the wastewater treatment facility , which requires primary sedimentation and disinfection.

E. Prevent Connection of Inflow

The Permittee must strictly enforce its sewer ordinances and not allow the connection of inflow (roof drains, foundation drains, etc.) to the sanitary sewer system.

F. Bypass Procedures

This permit prohibits a bypass which is the intentional diversion of waste streams from any portion of a treatment facility. Ecology may take enforcement action against a Permittee for a bypass unless one of the following circumstances (1, 2, or 3) applies.

1. Bypass for Essential Maintenance without the Potential to Cause Violation of Permit Limits or Conditions.

   Bypass is authorized if it is for essential maintenance and does not have the potential to cause violations of limits or other conditions of this permit, or adversely impact public health as determined by Ecology prior to the bypass. The Permittee must submit prior notice, if possible, at least ten (10) days before the date of the bypass.

2. Bypass which is Unavoidable, Unanticipated, and Results in Noncompliance of this Permit.

   This bypass is permitted only if:

   a. Bypass is unavoidable to prevent loss of life, personal injury, or severe property damage. “Severe property damage” means substantial physical damage to property, damage to the treatment facilities which would cause them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass.

   b. No feasible alternatives to the bypass exist, such as:

      - The use of auxiliary treatment facilities.
      - Retention of untreated wastes.
      - Stopping production.
      - Maintenance during normal periods of equipment downtime, but not if the Permittee should have installed adequate backup equipment in the exercise of reasonable engineering judgment to prevent a bypass.
      - Transport of untreated wastes to another treatment facility or preventative maintenance), or transport of untreated wastes to another treatment facility.

c. Ecology is properly notified of the bypass as required in condition S3E of this permit.

3. If bypass is anticipated and has the potential to result in noncompliance of this permit.

   a. The Permittee must notify Ecology at least thirty (30) days before the planned date of bypass. The notice must contain:

      - A description of the bypass and its cause.
      - An analysis of all known alternatives which would eliminate, reduce, or mitigate the need for bypassing.
      - A cost-effectiveness analysis of alternatives including comparative resource damage assessment.
      - The minimum and maximum duration of bypass under each alternative.
      - A recommendation as to the preferred alternative for conducting the bypass.
      - The projected date of bypass initiation.
      - A statement of compliance with SEPA.
      - A request for modification of water quality standards as provided for in WAC 173-201A-410, if an exceedance of any water quality standard is anticipated.
      - Details of the steps taken or planned to reduce, eliminate, and prevent reoccurrence of the bypass.

   b. For probable construction bypasses, the Permittee must notify Ecology of the need to bypass as early in the planning process as possible. The Permittee must consider the analysis required above during preparation of the engineering report or facilities plan and plans and specifications and must include these to the extent practical. In cases where the Permittee determines the probable need to bypass early, the Permittee must continue to analyze conditions up to and including the construction period in an effort to minimize or eliminate the bypass.

   c. Ecology will consider the following prior to issuing an administrative order for this type of bypass:

      - If the bypass is necessary to perform construction or maintenance-related activities essential to meet the requirements of this permit.
      - If feasible alternatives to bypass exist, such as the use of auxiliary treatment facilities, retention of untreated wastes, stopping production, maintenance during normal periods of equipment down time, or transport of untreated wastes to another treatment facility.

- If the Permittee planned and scheduled the bypass to minimize adverse effects on the public and the environment.

After consideration of the above and the adverse effects of the proposed bypass and any other relevant factors, Ecology will approve or deny the request. Ecology will give the public an opportunity to comment on bypass incidents of significant duration, to the extent feasible. Ecology will approve a request to bypass by issuing an administrative order under RCW 90.48.120.

G. Operations and Maintenance Manual

The Permittee must:

1. Review the O&M Manual at least annually.
2. Submit to Ecology for review and approval substantial changes or updates to the O&M Manual whenever it incorporates them into the manual.
3. Keep the approved O&M Manual at the permitted facility.
4. Follow the instructions and procedures of this manual.

In addition to the requirements of WAC 173-240-080 (1) through (5), the O&M Manual must include:

1. Emergency procedures for cleanup in the event of wastewater system upset or failure.
2. Wastewater system maintenance procedures that contribute to the generation of process wastewater.
3. Any directions to maintenance staff when cleaning or maintaining other equipment or performing other tasks which are necessary to protect the operation of the wastewater system (for example, defining maximum allowable discharge rate for draining a tank, blocking all floor drains before beginning the overhaul of a stationary engine).
4. The treatment plant process control monitoring schedule.
5. Minimum staffing adequate to operate and maintain the treatment processes and carry out compliance monitoring required by the permit.

S6. PRETREATMENT

A. General Requirements

The Permittee must work with Ecology to ensure that all commercial and industrial users of the publicly owned treatment works (POTW) comply with the pretreatment regulations in 40 CFR Part 403 and any additional regulations that the Environmental

Protection Agency (U.S. EPA) may promulgate under Section 307(b) (pretreatment) and 308 (reporting) of the Federal Clean Water Act.

B. Duty to Enforce Discharge Prohibitions

1. Under 40 CFR 403.5(a), the Permittee must not authorize or knowingly allow the discharge of any pollutants into its POTW which may be reasonably expected to cause pass through or interference, or which otherwise violate general or specific discharge prohibitions contained in 40 CFR Part 403.5 or WAC-173-216-060.

2. The Permittee must not authorize or knowingly allow the introduction of any of the following into their treatment works:

    a. Pollutants which create a fire or explosion hazard in the POTW (including, but not limited to waste streams with a closed cup flashpoint of less than 140 degrees Fahrenheit or 60 degrees Centigrade using the test methods specified in 40 CFR 261.21).
    b. Pollutants which will cause corrosive structural damage to the POTW, but in no case discharges with pH lower than 5.0, or greater than 11.0 standard units, unless the works are specifically designed to accommodate such discharges.
    c. Solid or viscous pollutants in amounts that could cause obstruction to the flow in sewers or otherwise interfere with the operation of the POTW.
    d. Any pollutant, including oxygen demanding pollutants, (BOD, etc.) released in a discharge at a flow rate and/or pollutant concentration which will cause interference with the POTW.
    e. Petroleum oil, non-biodegradable cutting oil, or products of mineral origin in amounts that will cause interference or pass through.
    f. Pollutants which result in the presence of toxic gases, vapors, or fumes within the POTW in a quantity which may cause acute worker health and safety problems.
    g. Heat in amounts that will inhibit biological activity in the POTW resulting in interference but in no case heat in such quantities such that the temperature at the POTW headworks exceeds 40 degrees Centigrade (104 degrees Fahrenheit) unless Ecology, upon request of the Permittee, approves, in writing, alternate temperature limits.
    h. Any trucked or hauled pollutants, except at discharge points designated by the Permittee.
    i. Wastewaters prohibited to be discharged to the POTW by the Dangerous Waste Regulations (chapter 173-303 WAC), unless authorized under the Domestic Sewage Exclusion (WAC 173-303-071).

3. The Permittee must also not allow the following discharges to the POTW unless approved in writing by Ecology:

a. Noncontact cooling water in significant volumes.
b. Stormwater and other direct inflow sources.
c. Wastewaters significantly affecting system hydraulic loading, which do not require treatment, or would not be afforded a significant degree of treatment by the system.

4. The Permittee must notify Ecology if any industrial user violates the prohibitions listed in this section (S6.B), and initiate enforcement action to promptly curtail any such discharge.

C. Wastewater Discharge Permit Required

The Permittee must require all non-domestic discharges to apply for a permit, and may not allow any significant industrial users (SIUs) to discharge wastewater to the Permittee's sewer system until such user has received a wastewater discharge permit from Ecology in accordance with chapter 90.48 RCW and chapter 173-216 WAC.

D. Identification and Reporting of Existing, New, and Proposed Industrial Users

1. The Permittee must take continuous, routine measures to identify all existing, new, and proposed SIUs and potential significant industrial users (PSIUs) discharging or proposing to discharge to the Permittee's sewer system (see Appendix B of the Fact Sheet for definitions).

2. Within 30 days of becoming aware of an unpermitted existing, new, or proposed industrial user who may be an SIU, the Permittee must notify such user by registered mail that, if classified as an SIU, they must apply to Ecology and obtain a State Waste Discharge Permit. The Permittee must send a copy of this notification letter to Ecology within this same 30-day period.

3. The Permittee must also notify all Potential SIUs (PSIUs), as they are identified, that if their classification should change to an SIU, they must apply to Ecology for a State Waste Discharge Permit within 30 days of such change.

S7. SOLID WASTES

A. Solid Waste Handling

The Permittee must handle and dispose of all solid waste material in such a manner as to prevent its entry into state ground or surface water.

The final use and disposal of biosolids shall be done in accordance with Chapter 173-308 WAC ("Biosolids Management"), 40 CFR Part 503, and under coverage of the State general permit for biosolids management, as applicable.

B. Leachate

The Permittee must not allow leachate from its solid waste material to enter state waters without providing all known, available and reasonable methods of treatment, nor allow such leachate to cause violations of the State Surface Water Quality Standards, Chapter 173-201A WAC, or the State Ground Water Quality Standards, Chapter 173-200 WAC. The Permittee must apply for a permit or permit modification as may be required for such discharges to state ground or surface waters.

S8. APPLICATION FOR PERMIT RENEWAL

The Permittee must submit an application for renewal of this permit by **November 30, 2014.**

S9. ENGINEERING DOCUMENTS FOR THE PLANNED UPGRADE

The Permittee is required to submit to Ecology for approval engineering documents to support the funding and construction of the planned upgrade to its wastewater treatment facility .

A. Engineering Report

The Permittee must submit to Ecology an approvable Engineering Report for the planned upgrade of the wastewater treatment facility **no later than July 31, 2012.** The report must meet the requirements of Chapter 173-240 Washington Administrative Code (WAC*) Submission of Plans and Reports for Construction of Wastewater Facilities.*

WAC 173-240-060(2) states: "The engineering report shall be sufficiently complete so that plans and specifications can be developed from it without substantial changes."

B. Plans and Specifications

The Permittee must submit to Ecology for approval two copies of the Plans and Specifications for the construction of the planned upgrade **no later than April 30, 2013.**

Prior to the start of construction, the Permittee must submit to Ecology a quality assurance plan as required by Chapter 173-240 WAC.

S10. NOTICE OF UPGRADE COMPLETION

The Permittee must submit to Ecology written notification that construction of the upgraded wastewater treatment facility is complete **no later than August 25, 2019.**

GENERAL CONDITIONS

G1. SIGNATORY REQUIREMENTS

A. All applications, reports, or information submitted to Ecology must be signed and certified.

1. In the case of corporations, by a responsible corporate officer.

   For the purpose of this section, a responsible corporate officer means:

   (i) A president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation, or

   (ii) The manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

2. In the case of a partnership, by a general partner.

3. In the case of sole proprietorship, by the proprietor.

4. In the case of a municipal, state, or other public facility, by either a principal executive officer or ranking elected official.

Applications for permits for domestic wastewater facilities that are either owned or operated by, or under contract to, a public entity shall be submitted by the public entity.

B. All reports required by this permit and other information requested by Ecology must be signed by a person described above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described above and submitted to Ecology.

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility, such as the position of plant manager, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters. (A duly authorized representative may thus be either a named individual or any individual occupying a named position.)

C. Changes to authorization. If an authorization under paragraph B.2, above, is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization satisfying the requirements of paragraph B.2, above, must be submitted to Ecology prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Certification. Any person signing a document under this section must make the following certification:

> "I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

G2. RIGHT OF INSPECTION AND ENTRY

The Permittee must allow an authorized representative of Ecology, upon the presentation of credentials and such other documents as may be required by law:

A. To enter upon the premises where a discharge is located or where any records must be kept under the terms and conditions of this permit.

B. To have access to and copy, at reasonable times and at reasonable cost, any records required to be kept under the terms and conditions of this permit.

C. To inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, methods, or operations regulated or required under this permit.

D. To sample or monitor, at reasonable times, any substances or parameters at any location for purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act.

G3. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated either at the request of any interested person (including the Permittee) or upon Ecology's initiative. However, the permit may only be modified, revoked and reissued, or terminated for the reasons specified in 40 CFR 122.62, 40 CFR 122.64 or WAC 173-220-150 according to the procedures of 40 CFR 124.5.

A. The following are causes for terminating this permit during its term, or for denying a permit renewal application:

1. Violation of any permit term or condition.
2. Obtaining a permit by misrepresentation or failure to disclose all relevant facts.
3. A material change in quantity or type of waste disposal.
4. A determination that the permitted activity endangers human health or the environment, or contributes to water quality standards violations and can only be regulated to acceptable levels by permit modification or termination.
5. A change in any condition that requires either a temporary or permanent reduction, or elimination of any discharge or sludge use or disposal practice controlled by the permit.
6. Nonpayment of fees assessed pursuant to RCW 90.48.465.
7. Failure or refusal of the Permittee to allow entry as required in RCW 90.48.090.

B. The following are causes for modification but not revocation and reissuance except when the Permittee requests or agrees:

1. A material change in the condition of the waters of the state.
2. New information not available at the time of permit issuance that would have justified the application of different permit conditions.
3. Material and substantial alterations or additions to the permitted facility or activities which occurred after this permit issuance.
4. Promulgation of new or amended standards or regulations having a direct bearing upon permit conditions, or requiring permit revision.
5. The Permittee has requested a modification based on other rationale meeting the criteria of 40 CFR Part 122.62.
6. Ecology has determined that good cause exists for modification of a compliance schedule, and the modification will not violate statutory deadlines.
7. Incorporation of an approved local pretreatment program into a municipality's permit.

C. The following are causes for modification or alternatively revocation and reissuance:

1. When cause exists for termination for reasons listed in A1 through A7 of this section, and Ecology determines that modification or revocation and reissuance is appropriate.

2. When Ecology has received notification of a proposed transfer of the permit. A permit may also be modified to reflect a transfer after the effective date of an automatic transfer (General Condition G8) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new Permittee.

G4. REPORTING PLANNED CHANGES

The Permittee must, as soon as possible, but no later than sixty (60) days prior to the proposed changes, give notice to Ecology of planned physical alterations or additions to the permitted facility, production increases, or process modification which will result in:
1) the permitted facility being determined to be a new source pursuant to 40 CFR 122.29(b);
2) a significant change in the nature or an increase in quantity of pollutants discharged; or
3) a significant change in the Permittee's sludge use or disposal practices. Following such notice, and the submittal of a new application or supplement to the existing application, along with required engineering plans and reports, this permit may be modified, or revoked and reissued pursuant to 40 CFR 122.62(a) to specify and limit any pollutants not previously limited. Until such modification is effective, any new or increased discharge in excess of permit limits or not specifically authorized by this permit constitutes a violation.

G5. PLAN REVIEW REQUIRED

Prior to constructing or modifying any wastewater control facilities, an engineering report and detailed plans and specifications must be submitted to Ecology for approval in accordance with chapter 173-240 WAC. Engineering reports, plans, and specifications must be submitted at least one hundred eighty (180) days prior to the planned start of construction unless a shorter time is approved by Ecology. Facilities must be constructed and operated in accordance with the approved plans.

G6. COMPLIANCE WITH OTHER LAWS AND STATUTES

Nothing in this permit must be construed as excusing the Permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations.

G7. TRANSFER OF THIS PERMIT

In the event of any change in control or ownership of facilities from which the authorized discharge emanate, the Permittee must notify the succeeding owner or controller of the existence of this permit by letter, a copy of which must be forwarded to Ecology.

A. Transfers by Modification

Except as provided in paragraph (B) below, this permit may be transferred by the Permittee to a new owner or operator only if this permit has been modified or revoked and reissued under 40 CFR 122.62(b)(2), or a minor modification made under 40 CFR 122.63(d), to identify the new Permittee and incorporate such other requirements as may be necessary under the Clean Water Act.

B. Automatic Transfers

This permit may be automatically transferred to a new Permittee if:

1. The Permittee notifies Ecology at least thirty (30) days in advance of the proposed transfer date.
2. The notice includes a written agreement between the existing and new Permittees containing a specific date transfer of permit responsibility, coverage, and liability between them.
3. Ecology does not notify the existing Permittee and the proposed new Permittee of its intent to modify or revoke and reissue this permit. A modification under this subparagraph may also be minor modification under 40 CFR 122.63. If this notice is not received, the transfer is effective on the date specified in the written agreement.

G8. REDUCED PRODUCTION FOR COMPLIANCE

The Permittee, in order to maintain compliance with its permit, must control production and/or all discharges upon reduction, loss, failure, or bypass of the treatment facility until the facility is restored or an alternative method of treatment is provided. This requirement applies in the situation where, among other things, the primary source of power of the treatment facility is reduced, lost, or fails.

G9. REMOVED SUBSTANCES

Collected screenings, grit, solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters must not be resuspended or reintroduced to the final effluent stream for discharge to state waters.

G10. DUTY TO PROVIDE INFORMATION

The Permittee must submit to Ecology, within a reasonable time, all information which Ecology may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The

Permittee must also submit to Ecology upon request, copies of records required to be kept by this permit.

G11. OTHER REQUIREMENTS OF 40 CFR

All other requirements of 40 CFR 122.41 and 122.42 are incorporated in this permit by reference.

G12. ADDITIONAL MONITORING

Ecology may establish specific monitoring requirements in addition to those contained in this permit by administrative order or permit modification.

G13. PAYMENT OF FEES

The Permittee must submit payment of fees associated with this permit as assessed by Ecology.

G14. PENALTIES FOR VIOLATING PERMIT CONDITIONS

Any person who is found guilty of willfully violating the terms and conditions of this permit is deemed guilty of a crime, and upon conviction thereof must be punished by a fine of up to ten thousand dollars ($10,000) and costs of prosecution, or by imprisonment in the discretion of the court. Each day upon which a willful violation occurs may be deemed a separate and additional violation.

Any person who violates the terms and conditions of a waste discharge permit will incur, in addition to any other penalty as provided by law, a civil penalty in the amount of up to ten thousand dollars ($10,000) for every such violation. Each and every such violation is a separate and distinct offense, and in case of a continuing violation, every day's continuance is deemed to be a separate and distinct violation.

G15. UPSET

Definition – “Upset” means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limits because of factors beyond the reasonable control of the Permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limits if the requirements of the following paragraph are met.

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 cause(s) of the upset; 2) the permitted facility was being properly operated at the time of the upset; 3) the Permittee submitted notice of the upset as required in Condition S3.E; and 4) the Permittee complied with any remedial measures required under S4.C of this permit.

In any enforcement action the Permittee seeking to establish the occurrence of an upset has the burden of proof.

G16. PROPERTY RIGHTS

This permit does not convey any property rights of any sort, or any exclusive privilege.

G17. DUTY TO COMPLY

The Permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application.

G18. TOXIC POLLUTANTS

The Permittee must comply with effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if this permit has not yet been modified to incorporate the requirement.

G19. PENALTIES FOR 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 must, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two (2) years per violation, or by both. If a conviction of a person is for a violation committed after a first conviction of such person under this condition, punishment must be a fine of not more than $20,000 per day of violation, or by imprisonment of not more than four (4) years, or by both.

G20. COMPLIANCE SCHEDULES

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 fourteen (14) days following each schedule date.

G21. CONTRACT REVIEW

The Permittee must submit to Ecology any proposed contract for the operation of any wastewater treatment facility covered by this permit. The review is to ensure consistency with chapters 90.46 and 90.48 RCW. In the event that Ecology does not comment within a thirty (30)-day period, the Permittee may assume consistency and proceed with the contract.

APPENDIX A

EFFLUENT CHARACTERIZATION FOR POLLUTANTS
THIS LIST INCLUDES EPA REQUIRED POLLUTANTS (PRIORITY POLLUTANTS) AND SOME ECOLOGY PRIORITY TOXIC CHEMICALS (PBTs)

The following table specifies analytical methods and levels to be used for effluent characterization in NPDES and State waste discharge permits. This appendix specifies effluent characterization requirements of the Department of Ecology unless other methods are specified in the body of this permit.

This permit specifies the compounds and groups of compounds to be analyzed. Ecology may require additional pollutants to be analyzed within a group. The objective of this appendix is to reduce the number of analytical "non-detects" in permit-required monitoring and to measure effluent concentrations near or below criteria values where possible at a reasonable cost. If a Permittee knows that an alternate, less sensitive method (higher DL and QL) from 40 CFR Part 136 is sufficient to produce measurable results in their effluent, that method may be used for analysis.

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
CONVENTIONALS			
Biochemical Oxygen Demand	SM5210-B		2 mg/L
Chemical Oxygen Demand	SM5220-D		10 mg/L
Total Organic Carbon	SM5310-B/C/D		1 mg/L
Total Suspended Solids	SM2540-D		5 mg/L
Total Ammonia (as N)	SM4500-NH3- GH		0.3 mg/L
Flow	Calibrated device		
Dissolved oxygen	4500-OC/OG		0.2 mg/L
Temperature (max. 7-day avg.)	Analog recorder or Use micro-recording devices known as thermistors		0.2º C
pH	SM4500-H^+ B	N/A	N/A
NONCONVENTIONALS			
Total Alkalinity	SM2320-B		5 mg/L as CaCo3
Chlorine, Total Residual	4500 Cl G		50.0
Color	SM2120 B/C/E		10 color unit
Fecal Coliform	SM 9221D/E,9222	N/A	N/A
Fluoride (16984-48-8)	SM4500-F E	25	100
Nitrate-Nitrite (as N)	4500-NO3- E/F/H		100

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
Nitrogen, Total Kjeldahl (as N)	4500-NH3-C/E/FG		300
Ortho-Phosphate (PO_4 as P)	4500- PE/PF	3	10
Phosphorus, Total (as P)	4500-PE/PF	3	10
Oil and Grease (HEM)	1664A	1,400	5,000
Salinity	SM2520-B		3 PSS
Settleable Solids	SM2540 -F		100
Sulfate (as mg/L SO_4)	SM4110-B		200
Sulfide (as mg/L S)	4500-S^2F/D/E/G		200
Sulfite (as mg/L SO_3)	SM4500-SO3B		2000
Total dissolved solids	SM2540 C		20 mg/L
Total Hardness	2340B		200 as CaCO3
Aluminum, Total (7429-90-5)	200.8	2.0	10
Barium Total (7440-39-3)	200.8	0.5	2.0
Boron Total (7440-42-8)	200.8	2.0	10.0
Cobalt, Total (7440-48-4)	200.8	0.05	0.25
Iron, Total (7439-89-6)	200.7	12.5	50
Magnesium, Total (7439-95-4)	200.7	10	50
Molybdenum, Total (7439-98-7)	200.8	0.1	0.5
Manganese, Total (7439-96-5)	200.8	0.1	0.5
Tin, Total (7440-31-5)	200.8	0.3	1.5
METALS, CYANIDE & TOTAL PHENOLS			
Antimony, Total (7440-36-0)	200.8	0.3	1.0
Arsenic, Total (7440-38-2)	200.8	0.1	0.5
Beryllium, Total (7440-41-7)	200.8	0.1	0.5
Cadmium, Total (7440-43-9)	200.8	0.05	0.25
Chromium (hex) dissolved (18540-29-9)	SM3500-Cr EC	0.3	1.2
Chromium, Total (7440-47-3)	200.8	0.2	1.0
Copper, Total (7440-50-8)	200.8	0.4	2.0
Lead, Total (7439-92-1)	200.8	0.1	0.5
Mercury, Total (7439-97-6)	1631E	0.0002	0.0005
Nickel, Total (7440-02-0)	200.8	0.1	0.5
Selenium, Total (7782-49-2)	200.8	1.0	1.0
Silver, Total (7440-22-4)	200.8	0.04	0.2
Thallium, Total (7440-28-0)	200.8	0.09	0.36
Zinc, Total (7440-66-6)	200.8	0.5	2.5
Cyanide, Total (57-12-5)	335.4	2	10
Cyanide, Weak Acid Dissociable	SM4500-CN I	2	10
Phenols, Total	EPA 420.1		50
DIOXIN			
2,3,7,8-Tetra-Chlorodibenzo-P-Dioxin	1613B	1.3 pg/L	5 pg/L

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
(176-40-16)			
VOLATILE COMPOUNDS			
Acrolein (107-02-8)	624	5	10
Acrylonitrile (107-13-1)	624	1.0	2.0
Benzene (71-43-2)	624	1.0	2.0
Bromoform (75-25-2)	624	1.0	2.0
Carbon tetrachloride (56-23-5)	624/601 or SM6230B	1.0	2.0
Chlorobenzene (108-90-7)	624	1.0	2.0
Chloroethane (75-00-3)	624/601	1.0	2.0
2-Chloroethylvinyl Ether (110-75-8)	624	1.0	2.0
Chloroform (67-66-3)	624 or SM6210B	1.0	2.0
Dibromochloromethane (124-48-1)	624	1.0	2.0
1,2-Dichlorobenzene (95-50-1)	624	1.9	7.6
1,3-Dichlorobenzene (541-73-1)	624	1.9	7.6
1,4-Dichlorobenzene (106-46-7)	624	4.4	17.6
Dichlorobromomethane (75-27-4)	624	1.0	2.0
1,1-Dichloroethane (75-34-3)	624	1.0	2.0
1,2-Dichloroethane (107-06-2)	624	1.0	2.0
1,1-Dichloroethylene (75-35-4)	624	1.0	2.0
1,2-Dichloropropane (78-87-5)	624	1.0	2.0
1,3-dichloropropylene (mixed isomers) (542-75-6)	624	1.0	2.0
Ethylbenzene (100-41-4)	624	1.0	2.0
Methyl bromide (74-83-9) (Bromomethane)	624/601	5.0	10.0
Methyl chloride (74-87-3) (Chloromethane)	624	1.0	2.0
Methylene chloride (75-09-2)	624	5.0	10.0
1,1,2,2-Tetrachloroethane (79-34-5)	624	1.9	2.0
Tetrachloroethylene (127-18-4)	624	1.0	2.0
Toulene (108-88-3)	624	1.0	2.0
1,2-Trans-Dichloroethylene (156-60-5) (Ethylene dichloride)	624	1.0	2.0
1,1,1-Trichloroethane (71-55-6)	624	1.0	2.0
1,1,2-Trichloroethane (79-00-5)	624	1.0	2.0
Trichloroethylene (79-01-6)	624	1.0	2.0
Vinyl chloride (75-01-4)	624/SM6200B	1.0	2.0
ACID COMPOUNDS			
2-Chlorophenol (95-57-8)	625	1.0	2.0
2,4-Dichlorophenol (120-83-2)	625	0.5	1.0
2,4-Dimethylphenol (105-67-9)	625	0.5	1.0
4,6-dinitro-o-cresol (534-52-1) (2-methyl-4,6,-dinitrophenol)	625/1625B	1.0	2.0

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
2,4 dinitrophenol (51-28-5)	625	1.0	2.0
2-Nitrophenol (88-75-5)	625	0.5	1.0
4-nitrophenol (100-02-7)	625	0.5	1.0
Parachlorometa cresol (59-50-7) (4-chloro-3-methylphenol)	625	1.0	2.0
Pentachlorophenol (87-86-5)	625	0.5	1.0
Phenol (108-95-2)	625	2.0	4.0
2,4,6-Trichlorophenol (88-06-2)	625	2.0	4.0
BASE/NEUTRAL COMPOUNDS (compounds in bold are Ecology PBTs)			
Acenaphthene (83-32-9)	625	0.2	0.4
Acenaphthylene (208-96-8)	625	0.3	0.6
Anthracene (120-12-7)	625	0.3	0.6
Benzidine (92-87-5)	625	12	24
Benzyl butyl phthalate (85-68-7)	625	0.3	0.6
Benzo(*a*)anthracene (56-55-3)	625	0.3	0.6
Benzo(j)fluoranthene (205-82-3)	625	0.5	1.0
Benzo(r,s,t)pentaphene (189-55-9)	625	0.5	1.0
Benzo(*a*)pyrene (50-32-8)	610/625	0.5	1.0
3,4-benzofluoranthene (Benzo(b)fluoranthene) (205-99-2)	610/625	0.8	1.6
11,12-benzofluoranthene (Benzo(k)fluoranthene) (207-08-9)	610/625	0.8	1.6
Benzo(*ghi*)Perylene (191-24-2)	610/625	0.5	1.0
Bis(*2-chloroethoxy)*methane (111-91-1)	625	5.3	21.2
Bis(*2-chloroethyl*)ether (111-44-4)	611/625	0.3	1.0
Bis(*2-chloroisopropyl*)ether (39638-32-9)	625	0.3	0.6
Bis(*2-ethylhexyl*)phthalate (117-81-7)	625	0.1	0.5
4-Bromophenyl phenyl ether (101-55-3)	625	0.2	0.4
2-Chloronaphthalene (91-58-7)	625	0.3	0.6
4-Chlorophenyl phenyl ether (7005-72-3)	625	0.3	0.5
Chrysene (218-01-9)	610/625	0.3	0.6
Dibenzo (a,j)acridine (224-42-0)	610M/625M	2.5	10.0
Dibenzo (a,h)acridine (226-36-8)	610M/625M	2.5	10.0
Dibenzo(a-*h*)anthracene (53-70-3)(1,2,5,6-dibenzanthracene)	625	0.8	1.6
Dibenzo(a,e)pyrene (192-65-4)	610M/625M	2.5	10.0
Dibenzo(a,h)pyrene (189-64-0)	625M	2.5	10.0

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
3,3-Dichlorobenzidine (91-94-1)	605/625	0.5	1.0
Diethyl phthalate (84-66-2)	625	1.9	7.6
Dimethyl phthalate (131-11-3)	625	1.6	6.4
Di-n-butyl phthalate (84-74-2)	625	0.5	1.0
2,4-dinitrotoluene (121-14-2)	609/625	0.2	0.4
2,6-dinitrotoluene (606-20-2)	609/625	0.2	0.4
Di-n-octyl phthalate (117-84-0)	625	0.3	0.6
1,2-Diphenylhydrazine (*as Azobenzene*) (122-66-7)	1625B	5.0	20
Fluoranthene (206-44-0)	625	0.3	0.6
Fluorene (86-73-7)	625	0.3	0.6
Hexachlorobenzene (118-74-1)	612/625	0.3	0.6
Hexachlorobutadiene (87-68-3)	625	0.5	1.0
Hexachlorocyclopentadiene (77-47-4)	1625B/625	0.5	1.0
Hexachloroethane (67-72-1)	625	0.5	1.0
Indeno(*1,2,3-cd*)Pyrene (193-39-5)	610/625	0.5	1.0
Isophorone (78-59-1)	625	0.5	1.0
3-Methyl cholanthrene (56-49-5)	625	2.0	8.0
Naphthalene (91-20-3)	625	0.3	0.6
Nitrobenzene (98-95-3)	625	0.5	1.0
N-Nitrosodimethylamine (62-75-9)	607/625	2.0	4.0
N-Nitrosodi-n-propylamine (621-64-7)	607/625	0.5	1.0
N-Nitrosodiphenylamine (86-30-6)	625	0.5	1.0
Perylene (198-55-0)	625	1.9	7.6
Phenanthrene (85-01-8)	625	0.3	0.6
Pyrene (129-00-0)	625	0.3	0.6
1,2,4-Trichlorobenzene (120-82-1)	625	0.3	0.6
PESTICIDES/PCBs			
Aldrin (309-00-2)	608	0.025	0.05
alpha-BHC (319-84-6)	608	0.025	0.05
beta-BHC (319-85-7)	608	0.025	0.05
gamma-BHC (58-89-9)	608	0.025	0.05
delta-BHC (319-86-8)	608	0.025	0.05
Chlordane (57-74-9)	608	0.025	0.05
4,4'-DDT (50-29-3)	608	0.025	0.05
4,4'-DDE (72-55-9)	608	0.025	0.05[10]
4,4' DDD (72-54-8)	608	0.025	0.05
Dieldrin (60-57-1)	608	0.025	0.05
alpha-Endosulfan (959-98-8)	608	0.025	0.05
beta-Endosulfan (33213-65-9)	608	0.025	0.05
Endosulfan Sulfate (1031-07-8)	608	0.025	0.05

Pollutant & CAS No. ***(if available)***	**Recommended Analytical Protocol**	**Detection (DL)**[1] ***µg/L unless specified***	**Quantitation Level (QL)** [2] ***µg/L unless specified***
Endrin (72-20-8)	608	0.025	0.05
Endrin Aldehyde (7421-93-4)	608	0.025	0.05
Heptachlor (76-44-8)	608	0.025	0.05
Heptachlor Epoxide (1024-57-3)	608	0.025	0.05
PCB-1242 (53469-21-9)	608	0.25	0.5
PCB-1254 (11097-69-1)	608	0.25	0.5
PCB-1221 (11104-28-2)	608	0.25	0.5
PCB-1232 (11141-16-5)	608	0.25	0.5
PCB-1248 (12672-29-6)	608	0.25	0.5
PCB-1260 (11096-82-5)	608	0.13	0.5
PCB-1016 (12674-11-2)	608	0.13	0.5
Toxaphene (8001-35-2)	608	0.24	0.5

1. Detection level (DL) or detection limit means the minimum concentration of an analyte (substance) that can be measured and reported with a 99% confidence that the analyte concentration is greater than zero as determined by the procedure given in 40 CFR part 136, Appendix B.
2. Quantitation Level (QL) is equivalent to EPA's Minimum Level (ML) which is defined in 40 CFR Part 136 as the minimum level at which the entire GC/MS system must give recognizable mass spectra (background corrected) and acceptable calibration points. These levels were published as proposed in the Federal Register on March 28, 1997.

City of Cashmere
Publicly-Owned Treatment Works
Fact Sheet for NPDES Permit

FACT SHEET FOR NPDES PERMIT NO. WA-002318-3

CITY OF CASHMERE PUBLICLY-OWNED TREATMENT WORKS

SUMMARY

The City of Cashmere is seeking reissuance of its NPDES Permit for its Publicly-Owned Treatment Works (POTW). The City is located in central Washington, approximately 10 miles west of Wenatchee, and straddles the Wenatchee River. The POTW provides wastewater collection and treatment for a combination of residential, commercial and industrial dischargers. Industrial users are the Tree Top, Inc. and Crunch Pak fruit processing facilities, two fruit packing facilities, and Liberty Orchards, a candy maker.

Cashmere's wastewater treatment facilities are located on the southeast end of the City, along the banks of the Wenatchee River. The City's main treatment plant and the City Lift Station are to the west of, and adjacent to the river; the pretreatment facility, consisting of a the Bulk Volume Fermenter (BVF), and the remaining two lift stations are on the east bank of the river. The facilities include an influent flow meter, sewage lift stations, the BVF system, aerated lagoons, transfer structures, disinfection equipment and a river outfall. Effluent is disinfected and continuously discharged to the river through a diffused outfall on the river bottom.

The City anticipates its main treatment plant will require a major upgrade during the proposed permit term, due to the anticipated lack of capacity of many major components and the need to comply with new environmental regulations. Major concerns include: capacity of the treatment lagoons to accommodate future organic and hydraulic loadings, compliance with State ground water quality regulations regarding leakage from the unlined lagoons and limited hydraulic capacity of outfall and diffuser structures. Design of the upgrade should also consider impacts of effluent BOD, TSS and temperature on the receiving water quality. In addition, the implementation of the TMDL wasteload allocations will require the City to meet strict limitations for phosphorous in the near future. The Permit will contain Special Condition, S9, which requires submission of a draft engineering plan, a final engineering report, approved plans and specifications and a construction quality assurance plan by the end of the permit term.

TABLE OF CONTENTS

Page

SUMMARY 1

INTRODUCTION 4

GENERAL INFORMATION 5

BACKGROUND INFORMATION 5
DESCRIPTION OF THE FACILITY 6
Collection System 6
City Lift Station 6
Museum Lift Station 7
East Cashmere Lift Station 7
West Cashmere Lift Station 7
Main Treatment Plant 7
Industrial Pretreatment Plant (BVF) 8
Improvements 9
Phase I 9
Phase II 10
Discharge Outfall 10
Residual Solids 10
PERMIT STATUS 10
SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT 11
WASTEWATER CHARACTERIZATION 11
Pretreatment Plant (BVF) 11
Main Treatment Plant 12

PROPOSED PERMIT LIMITATIONS 12
DESIGN CRITERIA 13
TECHNOLOGY-BASED EFFLUENT LIMITATIONS 13
SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS 14
Numerical Criteria for the Protection of Aquatic Life 15
Numerical Criteria for the Protection of Human Health 15
Narrative Criteria 15
Antidegradation 15
Critical Conditions 15
Mixing Zones 16
Description of the Receiving Water 16
TMDL CONSIDERATIONS 16
Surface Water Quality Criteria 17
CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR 17
NUMERIC CRITERIA 17

Whole Effluent Toxicity 19
Human Health 20
Sediment Quality 20
GROUND WATER QUALITY LIMITATIONS 20
COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED JANUARY 22, 2001 20

MONITORING REQUIREMENTS 21
LAB ACCREDITATION 22

OTHER PERMIT CONDITIONS 22
REPORTING AND RECORDKEEPING 22
PREVENTION OF FACILITY OVERLOADING 22
OPERATION AND MAINTENANCE (O&M) 23
RESIDUAL SOLIDS HANDLING 23
FEDERAL AND STATE PRETREATMENT PROGRAM REQUIREMENTS 23
WASTEWATER PERMIT REQUIRED 23
DUTY TO ENFORCE DISCHARGE PROHIBITIONS 23
GENERAL CONDITIONS 24

PERMIT ISSUANCE PROCEDURES 24
PERMIT MODIFICATIONS 24
RECOMMENDATION FOR PERMIT ISSUANCE 24

REFERENCES FOR TEXT AND APPENDICES 25

APPENDIX A -- PUBLIC INVOLVEMENT INFORMATION 26

APPENDIX B -- GLOSSARY 27

APPENDIX C -- TECHNICAL CALCULATIONS 33

APPENDIX D -- RESPONSE TO COMMENTS 43

INTRODUCTION

The Federal Clean Water Act (FCWA, 1972, and later modifications, 1977, 1981, and 1987) established water quality goals for the navigable (surface) waters of the United States. One of the mechanisms for achieving the goals of the Clean Water Act is the National Pollutant Discharge Elimination System of permits (NPDES permits), which is administered by the Environmental Protection Agency (EPA). The EPA has authorized the State of Washington to administer the NPDES permit program. Chapter 90.48 RCW defines the Department of Ecology's authority and obligations in administering the wastewater discharge permit program.

The regulations adopted by the State include procedures for issuing permits (Chapter 173-220 WAC), technical criteria for discharges from municipal wastewater treatment facilities (Chapter 173-221 WAC), water quality criteria for surface and ground waters (Chapters 173-201A and 200 WAC), and sediment management standards (Chapter 173-204 WAC). These regulations require that a permit be issued before discharge of wastewater to waters of the State is allowed. The regulations also establish the basis for effluent limitations and other requirements which are to be included in the permit. One of the requirements (WAC 173-220-060) for issuing a permit under the NPDES permit program is the preparation of a draft permit and an accompanying fact sheet. Public notice of the availability of the draft permit is required at least thirty days before the permit is issued (WAC 173-220-050). The fact sheet and draft permit are available for review (see Appendix A--Public Involvement of the fact sheet for more detail on the Public Notice procedures).

The fact sheet and draft permit have been reviewed by the Permittee. Errors and omissions identified in this review have been corrected before going to public notice. After the public comment period has closed, the Department will summarize the substantive comments and the response to each comment. The summary and response to comments will become part of the file on the permit and parties submitting comments will receive a copy of the Department's response. The fact sheet will not be revised. Comments and the resultant changes to the permit will be summarized in Appendix D--Response to Comments.

GENERAL INFORMATION	
Applicant	City of Cashmere
Facility Name and Address	City of Cashmere Publicly-Owned Treatment Works Riverfront Drive Cashmere, WA 98815
Type of Treatment	Industrial pretreatment facility consists of a Bulk Volume Fermenter (BVF), an anaerobic reactor. Main treatment plant includes three stabilization lagoons, chlorine disinfection, and river discharge through a perforated diffuser.
Discharge Location	Waterbody name: Wenatchee River, River Mile 8.6 Latitude: 47º 30' 39" N Longitude: 120º 26' 47" W
Water Body ID Number	WA-45-1010

BACKGROUND INFORMATION

The City of Cashmere is primarily an agricultural community located in Chelan County, approximately 8.5 river miles northwest of confluence of the Wenatchee and Columbia River. The community was incorporated in 1904, and has experienced relatively slow growth. The current population is approximately 2,980. The City is located at a bend in the Wenatchee River, with most of the City situated south and west of the river; the Tree Top plant, the pretreatment facility (BVF) and a small residential area located east of the river. The predominant industries are fruit producing, packing, and processing.

The City's water is supplied from wells and a surface water treatment facility on the Wenatchee River. Sewage collection, treatment and disposal are provided through a conventional gravity collection system, an industrial pretreatment unit, and aerated lagoons, followed by chlorine disinfection and a river discharge.

In August 1997, the City authorized preparation of a *Wastewater Treatment Facility Plan*, Phase 1. The *Facility Plan* was approved by the Department on February 2, 1999. The *Facility Plan* was based on the 1995 *Comprehensive Sewer Plan* and the 1997 *Chelan County Planning Report*. The *Facility Plan* was written in response to an Administrative Order issued by the Department in 1995. The Order noted that the City's treatment facilities had neared or exceeded NPDES permitted influent and discharge capacities on a number of occasions, and required the City to submit a plan to maintain adequate capacity. The *Comprehensive Sewer Plan* contains a description and evaluation of the existing and proposed sewer collection system improvements through 2012.

In 1999 the City requested an amendment to its urban growth boundary. This added approximately 96 acres to the west of the City, including the Chelan County Fairgrounds. The amendment resulted in a 30 percent increase in the population projections contained in the 1995 *Comprehensive Sewer Plan*. In November 1999 the Department received an amendment to the *Comprehensive Sewer Plan*, which describes measures the City took to accommodate the expanded wastewater service area. These measures included construction of the West Cashmere Lift Station and the addition of approximately 4.5 miles of sewer pipe. The amendment to the *Comprehensive Sewer Plan* was approved by the Department in November 1999. Expansion of the collection system was completed in September 2000.

The City's 1999 Facility Plan outlined tasks and construction activities to be undertaken in two phases, Phases I and II. The Phase I plan described and evaluated the existing facilities and forecasted future wastewater facility needs for the 20-year planning horizon. The Phase I plan also included evaluations, descriptions, cost estimates, and implementation schedules for proposed interim improvements and modifications necessary to bring the treatment facilities into compliance with current permit requirements. The BVF was repaired and renovated. Improvements included a grit chamber and a 2.0 million gallon sludge storage tank. Existing storm to sanitary sewer connections were removed.

The Phase II planning was delayed for numerous reasons. Chief among them was the ongoing Total Maximum Daily Load (TMDL) analysis of the Wenatchee River and development of wasteload allocations. Milestones for Phase II planning are included in the proposed permit. Planning milestones will require detailed evaluations, descriptions, cost estimates, and implementation schedules for the complete upgrade that will allow the facility to operate in compliance with permit requirements to the end of the 20-year planning horizon.

DESCRIPTION OF THE FACILITY

Collection System

The recent expansion, which was completed in 2000, resulted in construction of a fourth lift station and approximately 4.5 miles of new sewer pipe. The collection system accommodates demand in the newly incorporated portions of West Cashmere. The pre-existing conventional gravity sewer system consisted of three sewage lift stations and approximately 15.5 miles of sewers.

City Lift Station

All wastewater, except flow from the BVF, travels through the city lift station and then to the main treatment plant. Wastewater is collected in a wet well until a certain level is sensed by float switches and then the controller operates the three station pumps as necessary.

Previously when flow to the station exceeded capacity during heavy rain events and rapid snowmelt conditions, the sewer lines backed up and discharged through an overflow pipe to the river. In addition, the station was not equipped with a backup power source or any remote alarm system. In the event of any type of system failure or an extended power outage, raw sewage would be discharged to the river. A third serious deficiency was that the existing 8" force main which connects the lift station to the main treatment plant had insufficient capacity at high flow volumes (*Facility Plan*, p. 7). Replacement of this lift station, removal of storm to sanitary sewer connections and installation of a new force main were completed in 2000.

Museum Lift Station

This station serves all of the East Cashmere area, except Tree Top. Wastewater collects in a wet well and, when float switches activate the station pumps, is pumped to the collection system via a pipe across the Cottage Avenue Bridge. In December 2004 new pump and float systems were installed.

East Cashmere Lift Station

This lift station was originally designed to handle all wastewater discharges from the Tree Top facility; however, the station presently handles only the domestic wastewater portion of Tree Top's discharge and Bethlehem Construction's domestic wastewater. Wastewater collects in a wet well and, when float switches activate the station pumps, is pumped to the City Lift Station through a pipe buried in the Wenatchee riverbed. In 1995 the station was redesigned and reconstructed to accommodate the lower flow volumes and flow characteristics of present wastewater discharges.

West Cashmere Lift Station

This lift station was built to accommodate flows from new areas within the expanded urban growth boundary. The lift station contains a submersible-type pump station with two pumps and standby power.

Main Treatment Plant

The main treatment plant is located on City property adjacent to the Wenatchee River, approximately one mile southeast of the central business district. The lagoon treatment system portion of the plant consists of three unlined aerated lagoons configured to treat wastewater in series. Cell #1 receives municipal wastewater from Cashmere via the City Lift Station and Tree Top's pretreated wastewater directly from the BVF.

The 19-acre lagoon treatment system was originally designed as a 4'-to-5' foot deep, non-overflow, facultative (non-aerated) system. The system has had supplemental aeration added to it several times in efforts to increase treatment capacity. A significant amount of organic load

was removed from the system when the BVF went online in 1992. Lagoon system loading is now relatively light compared to the available treatment capacity and, consequently, the existing aeration units are only partially utilized however, in the near future loading are expected to increase dramatically due to a new industrial user.

The City removed an estimated 1,113 dry tons of sludge from Cell #1 in 2000. The City then removed an additional 2700 tons of sludge from Cell #1 in August of 2002.

Wastewater flows through gravity piping from treatment Cell #3 to the chlorine contact chamber, where it is disinfected prior to river discharge. This system consists of a large baffled concrete tank, a mixer, and a gas chlorine delivery system. Fecal coliform are monitored as flow leaves the chlorine contact chamber. Effluent is then pH adjusted and dechlorinated with a sulfur dioxide (SO_2) system installed in February 2000. The dechlorination system is not electronically linked to the chlorination system therefore; SO_2 is injected not to exceed the chlorine limit based on chlorine dosage.

Flow rate is measured and recorded at three locations. The two influent streams are measured at the City Lift Station and the BVF. Treatment plant effluent is metered at the discharge weir in the chlorine contact chamber. Daily totals are recorded at the BVF and effluent meters, and flow rate is continuously recorded at the City Lift Station.

The City had been adding hydrochloric acid during the summer to the effluent to control pH and had generally been able to keep effluent pH at or below 9.0 for the two years previous to the *Facility Plan*. Suspended solids cannot be as easily controlled. Suspended solids levels generally exceed permitted effluent limits during the three to four months of summer and early fall. BOD also exceeded permitted limits for three summer months in 1998. This trend was associated with the high levels of algae growth that occurred during summer. Installation of the cover over Cell #3 in the autumn of 1999 appears to have dramatically reduced algal growth and discharge of suspended solids. Since the cover has been installed, there have been no further compliance problems with BOD or TSS, related to algal growth.

Environmental deficiencies of an unknown magnitude include; the impacts of partially treated wastewater (that leaks from the unlined lagoons) on ground and surface water quality; and the capacity of the river outfall to accommodate increased discharge volumes.

Industrial Pretreatment Plant (BVF)

In 1992, an industrial pretreatment system was constructed to treat fruit processing wastewater from the Tree Top processing plant. The treatment process is anaerobic and the system is generally referred to as the BVF. The BVF was designed and constructed by ADI Systems, Inc., based on design loading projections provided by Tree Top. The BVF is located at the Tree Top processing plant site and consists of a 5.0 MG reactor tank, a control building, nutrient and

chemical control systems, mixing and recirculation equipment, ventilation systems, and gas discharge systems.

Raw wastewater is pumped from the processing plant into the BVF. A flow meter on the pump station discharge line is utilized to measure and record flow entering the BVF. Effluent flows to the main treatment plant through an 8" HDPE gravity force main (inverted siphon). There are two byproducts from the BVF treatment process. One byproduct is sludge. BVF-generated sludge is different from main treatment plant sludge because the BVF treats only fruit processing wastewater. Because of this, BVF sludge can be put to beneficial use without additional treatment required for a sludge derived from domestic sources, which is subject to biosolids regulation. The City holds a Beneficial Use Permit for the BVF sludge.

The other byproduct is biogas. During 2003, 63,045,538 cubic feet of gas was produced. Presently, this gas is burned using a flare system.

In 1995, ADI prepared a detailed evaluation of the operating capacity of the BVF, based on actual performance from 1992 to 1995. Actual performance was then compared to the original design criteria. It was noted that while hydraulic flow rates had been at or near design flow rate, the actual BVF BOD, COD and TSS loading rates were generally well below anticipated levels. Based on loading rates, the reactor is operating well below design capacity and, if necessary, additional treatment capacity is available. Effluent concentrations are generally very stable and much lower than anticipated (*Facility Plan,* Section 2, p. 8). See *WASTEWATER CHARACTERIZATION* section of this fact sheet for influent and effluent data (page 13) and *DESIGN CRITERIA* section for a summary of the BVF design criteria (page 14).

Improvements

Phase I

The Permittee has completed Phase I, or interim, improvements necessary to bring the POTW into compliance with current permit requirements. According to the 1999 Facility Plan the following improvements were expected to extend the life of the existing facility by 5 to 10 years. The results of the ground water monitoring program and additional loading from a new industrial user have since rendered the predicted life expectancy of the existing facility 1999 Facility Plan moot.

Phase I-First Priority Projects include:

1. Replacement of the City Lift Station (completed August 2000);

2. Removal of storm water discharges from the sanitary sewer (2001);

3. Installation of a cover over treatment lagoon #3 (completed in autumn 1999);

4. Installation of a dechlorination system (completed February 2000); and,

5. Implementation of a ground water monitoring program (implemented 2003).

Phase II

The City anticipates its main treatment plant will require a major upgrade during this phase, due to the need to comply with new environmental regulations and the potential lack of capacity of many major components as a new industrial user increases production. Major concerns include: capacity of the treatment lagoons to accommodate future organic and hydraulic loadings, compliance with State ground water quality regulations regarding leakage from the unlined lagoons and limited hydraulic capacity of the outfall and diffuser structures. Design of the Phase II upgrade should also consider impacts of effluent BOD, TSS and temperature on the receiving water quality. In addition, the implementation of the TMDL wasteload allocations will require the City to meet strict limitations for phosphorous in the near future. The Permit will contain Special Condition, S9, which requires submission of a draft engineering plan, a final engineering report, plans and specifications and a construction quality assurance plan by the end of the permit term.

Discharge Outfall

Secondary treated and disinfected effluent is discharged from the chlorine contact chamber via an outfall pipe with a 30-foot long perforated polyethylene diffuser. This outfall diffuser is anchored to the river bottom, laying perpendicular to the river flow. The outfall location is at Lat: 47° 30' 39", Long: 120° 26' 47", in the West ½ of Section 3, Township.23 N., Range.19 E.W.M. in Chelan County.

Residual Solids

Under contract, 2700 tons of sludge were removed from lagoon # 1 in 2002, by Boulder Farms in Mansfield, Washington.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 173-308 WAC, "Biosolids Management". The disposal of other solid waste is under the jurisdiction of the Chelan County Health Department. The City anticipates removal of biosolids from the lagoons sometime in the near future.

PERMIT STATUS

The previous permit for this facility was issued on January 22, 2001. The previous permit placed effluent limitations on 5-day Biochemical Oxygen Demand (BOD_5), Total Suspended Solids

(TSS), pH, Fecal Coliform bacteria, and Total Residual Chlorine and Sulfites. Ammonia was monitored with a limit to be determined during the permit term. No limit was imposed.

An application for permit renewal was received by the Department on April 1, 2005 and accepted by the Department on April 5, 2005.

SUMMARY OF COMPLIANCE WITH THE PREVIOUS PERMIT

The facility received its last inspection on March 28, 2005.

During the history of the previous permit, the Permittee has remained in compliance, based on Discharge Monitoring Reports (DMRs) submitted to the Department and inspections conducted by the Department.

WASTEWATER CHARACTERIZATION

Pretreatment Plant (BVF)

Data presented in the table below reflect BVF influent and effluent characteristics from April 2002 through April 2005. Data are presented in the format of pounds per day (lbs/day) to facilitate comparison with the facility's design criteria (see page 14). The pretreatment plant's influent and effluent are characterized as follows:

BVF Wastewater Characterization

Parameter	Influent			Effluent		
	3-Year Average	Lowest Monthly Average	Highest Monthly Average	3-Year Average	Lowest Monthly Average	Highest Monthly Average
Flow (MGD)	0.251	0.091	0.345	NR	NR	NR
BOD_5 (lbs/day)	5675.3	1206.7	9935.3	142.1	12.1	1367.5
TSS (lbs/day)	3150.6	532.8	8954.2	821.3	22.5	4048
pH range	NR			Low pH = 6.4		High pH = 7.3

NR-Not Reported

During this 36 month period BOD removal rates for the BVF averaged 97.8% TSS; removal rates averaged 76.7%. Average BOD effluent concentrations varied substantially from 13 mg/L to 514 mg/L, with a median concentration of 22 mg/L. TSS concentrations varied significantly, ranging from 14 mg/L to 2101 mg/L, with a median of 111 mg/L.

Main Treatment Plant

Loadings to the POTW and the effluent were characterized for the three year period from April 2002 to April 2005. The data were taken from the DMRs submitted to the Department.

Main Treatment Plant Wastewater Characterization

Parameter	Influent	Effluent		
	Annual Average	Annual Average	Highest Monthly Average	Lowest Monthly Average
Flow (MGD)	City 0.340 BVF 0.251	0.443	0.566	0.258
BOD_5 (mg/L)	City 282.9 BVF 514	17.1	26	5.3
TSS (mg/L)	City 327.1 BVF 2101	19.1	34	9
Fecal Coliform (colonies per 100 mL)	NA	NA	NA	189
Total Residual Chlorine (mg/L)	NA	0.020	0.03	0.01
Ammonia Nitrogen (mg of N/L)	NA	5.5	11.2	1
Temperature, summer (ºC)	City 20.6	21.3	23	19
Temperature, winter (ºF)	City 10.1	2.3	3.0	1.0
Dissolved Oxygen	NA	5.5	3.4	8.0
pH range	NA	Low pH= 8.1		High pH= 9.0

PROPOSED PERMIT LIMITATIONS

Federal and State regulations require that effluent limitations set forth in a NPDES permit must be either technology- or water quality-based. Technology-based limitations for municipal discharges are set by regulation (40 CFR 133, and Chapters 173-220 and 173-221 WAC). Water quality-based limitations are based upon compliance with the Surface Water Quality Standards (Chapter 173-201A WAC), Ground Water Standards (Chapter 173-200 WAC), Sediment Quality Standards (Chapter 173-204 WAC) or the National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992.) The most stringent of these types of limits must be chosen for each of the parameters of concern. Each of these types of limits is described in more detail below.

The limits in this permit are based in part on information received in the application. The effluent constituents in the application were evaluated on a technology- and water quality-basis. The limits necessary to meet the rules and regulations of the State of Washington were determined and included in this permit. Ecology does not develop effluent limits for all pollutants that may be reported on the application as present in the effluent. Some pollutants are

not treatable at the concentrations reported, are not controllable at the source, are not listed in regulation, and do not have a reasonable potential to cause a water quality violation. Effluent limits are not always developed for pollutants that may be in the discharge but not reported as present in the application. In those circumstances the permit does not authorize discharge of the non-reported pollutants. Effluent discharge conditions may change from the conditions reported in the permit application. If significant changes occur in any constituent, as described in 40 CFR 122.42(a), the Permittee is required to notify the Department of Ecology. The Permittee may be in violation of the permit until the permit is modified to reflect additional discharge of pollutants.

DESIGN CRITERIA

In accordance with WAC 173-220-150 (1)(g), flows or waste loadings shall not exceed approved design criteria.

Section 5 of the *Facility Plan* contains existing and revised design criteria for the POTW (pp. 2, 3). The design criteria were adjusted to reflect greater operational experience with the system. The *Facility Plan* states that loadings from the City have exceeded expectations and loadings from the BVF have been less than anticipated.

City of Cashmere POTW Maximum Flow Design Criteria vs. Maximum Month

Parameter	Revised Flow Rate	3 Year Maximum	% of Design Criteria
BVF Maximum Month	0.440 MGD	0.345 MGD	78.4
Municipal Max. Month	0.573 MGD	0.394 MGD	68.8
Combined Max. Month	0.943 MGD	0.690 MGD*	73.2

* Combined flow for January 2004 from municipal and BVF

City of Cashmere POTW Influent Loadings Design Criteria vs. Maximum Month

Parameter	Revised Loading Rate	3 Year Maximum	% Design Criteria
BOD to BVF	24,500 lbs/day	8477.3	34.6
TSS to BVF	9,500 lbs/day	6891.1	72.5
Municipal BOD to Lagoon	5,000 lbs/day	1110.7	22.2
Industrial (BVF effluent) BOD to Lagoon	6,200 lbs/day	1367.5	22.1
Combined BOD to Lagoon	11,200 lbs/day	2478.2	22.1

TECHNOLOGY-BASED EFFLUENT LIMITATIONS

Municipal wastewater treatment plants are a category of discharger for which technology-based effluent limits have been promulgated by Federal and State regulations. These effluent limitations are given in the Code of Federal Regulations (CFR) 40 CFR Part 133 (Federal) and in Chapter 173-221 WAC (State). These regulations are performance standards that constitute all

known available and reasonable methods of prevention, control, and treatment for municipal wastewater.

The final technology-based effluent limits for BOD_5, TSS, Fecal Coliform Bacteria, and pH that were established in the previous permit remain unchanged in this permit. These limits remain unchanged because, although hydraulic and organic influent loadings between the BVF and main treatment plant have been revised, the total loadings design criteria for the main treatment plant were not modified.

The existing permit has a chlorine limit of 0.05 mg/L and the facility is able to comply with it. The proposed permit contains the same limit.

The following technology-based mass limits are based on WAC 173-220-130(3)(b) and 173-221-030(11)(b).

BOD average weekly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (65 mg/L) x 8.34 (conversion factor) = mass limit 511 lb. /day.

BOD average monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (45 mg/L) x 8.34 (conversion factor) = mass limit 354 lb. /day.

TSS average weekly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (112 mg/L) x 8.34 (conversion factor) = mass limit 880 lb. /day.

TSS average monthly effluent mass loadings (lbs/day) were calculated as the maximum monthly design flow (0.943 MGD) x Concentration limit (75 mg/L) x 8.34 (conversion factor) = mass limit 590 lb. /day.

SURFACE WATER QUALITY-BASED EFFLUENT LIMITATIONS

In order to protect existing water quality and preserve the designated beneficial uses of Washington's surface waters, WAC 173-201A-060 states that waste discharge permits shall be conditioned such that the discharge will meet established Surface Water Quality Standards. The Washington State Surface Water Quality Standards (Chapter 173-201A WAC) is a State regulation designed to protect the beneficial uses of the surface waters of the State. Water quality-based effluent limitations may be based on an individual waste load allocation (WLA) or on a WLA developed during a basin-wide total maximum daily loading study (TMDL).

Numerical Criteria for the Protection of Aquatic Life

"Numerical" water quality criteria are numerical values set forth in the State of Washington's Water Quality Standards for Surface Waters (Chapter 173-201A WAC). They specify the levels of pollutants allowed in a receiving water while remaining protective of aquatic life. Numerical criteria set forth in the Water Quality Standards are used along with chemical and physical data for the wastewater and receiving water to derive the effluent limits in the discharge permit. When surface water quality-based limits are more stringent or potentially more stringent than technology-based limitations, they must be used in a permit.

Numerical Criteria for the Protection of Human Health

The State was issued 91 numeric water quality criteria for the protection of human health by the U.S. EPA (EPA 1992). These criteria are designed to protect humans from cancer and other disease and are primarily applicable to fish and shellfish consumption and drinking water from surface waters.

Narrative Criteria

In addition to numerical criteria, "narrative" water quality criteria (WAC 173-201A-030) limit toxic, radioactive, or deleterious material concentrations below those which have the potential to adversely affect characteristic water uses, cause acute or chronic toxicity to biota, impair aesthetic values, or adversely affect human health. Narrative criteria protect the specific beneficial uses of all fresh (WAC 173-201A-130) and marine (WAC 173-201A-140) waters in the State of Washington.

Antidegradation

The State of Washington's Antidegradation Policy requires that discharges into a receiving water shall not further degrade the existing water quality of the water body. In cases where the natural conditions of a receiving water are of lower quality than the criteria assigned, the natural conditions shall constitute the water quality criteria. Similarly, when receiving waters are of higher quality than the criteria assigned, the existing water quality shall be protected. More information on the State Antidegradation Policy can be obtained by referring to WAC 173-201A-070.

Critical Conditions

Surface water quality-based limits are derived for the waterbody's critical condition, which represents the receiving water and waste discharge condition with the highest potential for adverse impact on the aquatic biota, human health, and existing or characteristic water body uses.

Mixing Zones

The Water Quality Standards allow the Department of Ecology to authorize mixing zones around a point of discharge in establishing surface water quality-based effluent limits. Both "acute" and "chronic" mixing zones may be authorized for pollutants that can have a toxic effect on the aquatic environment near the point of discharge. The concentration of pollutants at the boundary of these mixing zones may not exceed the numerical criteria for that type of zone. Mixing zones can only be authorized for discharges that are receiving all known, available, and reasonable methods of prevention, control and treatment (AKART) and in accordance with other mixing zone requirements of WAC 173-201A-100.

The National Toxics Rule (EPA, 1992) allows the chronic mixing zone to be used to meet human health criteria.

Description of the Receiving Water

The facility discharges to the Wenatchee River, which is designated as a Class A receiving water in the vicinity of the outfall. Characteristic uses include the following:

Water supply (domestic, industrial, agricultural); stock watering; fish migration; fish rearing, spawning and harvesting; wildlife habitat; primary contact recreation; sport fishing; boating and aesthetic enjoyment; commerce and navigation. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

According to the 1998 303(d) list of water quality-impaired waterbodies, this segment of the Wenatchee River violates State's water quality standards for instream flow, pH and temperature. The TMDL process is well under way and wasteload allocations for phosphorous are expected to be established in the near future.

TMDL CONSIDERATIONS

The Wenatchee River TMDL is very likely to include wasteload allocations for phosphorous during the proposed permit cycle. This is in response to high pH values found in the Wenatchee River. Phosphorous stimulates plant growth, which in turn affects pH in the water column. In anticipation that a wasteload allocation will be imposed sometime during the proposed permit term, Special Conditions S1A. 2a and 2b, require the Permittee to meet a schedule of Compliance for meeting the wasteload allocation and to provide the Department with a Progress Report. Other parameters of TMDL concern, in addition to pH, are Pesticides, Fecal Coliform Bacteria, Temperature and Dissolved Oxygen.

TKN monitoring will be included in the proposed permit. The data collected is expected to provide the Department with data with which to assess the performance of the facility and characterize the relationship between TKN and effluent ammonia at this facility. Phosphorous,

believed to be a limiting factor in plant growth at this reach of the Wenatchee River, will also be required to be monitored.

Surface Water Quality Criteria

Applicable criteria are defined in Chapter 173-201A WAC for aquatic biota. In addition, U.S. EPA has promulgated human health criteria for toxic pollutants (EPA 1992). Criteria for this discharge are summarized below:

Table 5: Applicable Water Quality Criteria

Parameter	Criterion
Fecal Coliforms	100 organisms/100 mL maximum geometric mean
Dissolved Oxygen	8 mg/L minimum
Temperature	18 degrees Celsius maximum or incremental increases above background
pH	6.5 to 8.5 standard units
Turbidity	less than 5 NTUs above background
Toxics	No toxics in toxic amounts (see Appendix C for numeric criteria for toxics of concern for this discharge)

CONSIDERATION OF SURFACE WATER QUALITY-BASED LIMITS FOR NUMERIC CRITERIA

The only toxic pollutants expected to be present in the discharge are chlorine and ammonia. A preliminary determination for chlorine in the effluent to exceed the water quality criteria showed reasonable potential for violations to occur when the present permit was written. The data that determined the dilution factors was not documented in the previous permit but the dilution factors were incorrectly carried over into the present permit term which showed reasonable potential. New dilution factors were determined for the proposed permit using recent data. No reasonable potential for chlorine in the discharge to exceed the water quality criteria exists using the corrected dilution factors; however, anti-backsliding requires the present chlorine limit remain in effect.

Regarding ammonia, the present permit contains a Schedule of Compliance, which required the City to verify that the POTW's discharge is in compliance with the water quality standards for this parameter. It is now known that ammonia present in the effluent does not have potential to violate water quality criteria for this pollutant and therefore no limit is established. However, monitoring for ammonia will continue in the proposed permit.

Pollutant concentrations in the proposed discharge exceed water quality criteria with technology-based controls which the Department has determined to be AKART. A mixing zone is authorized in accordance with the geometric configuration, flow restriction, and other restrictions for mixing zones in Chapter 173-201A WAC and are defined below:

The length of the chronic and acute mixing zones shall extend downstream no greater than 300 feet and 30 feet, respectively. The chronic mixing zone shall extend upstream and no greater than 100 feet from the centerpoint of the outfall's discharge opening.

The dilution factors of effluent to receiving water that occur within these zones have been determined at the critical condition by the use of three different mathematical models, Cormix 4.3, Visual Plumes and RIVPLUM. (See Appendix C) computer software. The dilution factors imposed in this permit contain the most stringent dilution factor in the acute mixing zone, which was derived from the Department's RIVPLUME analysis tool.

Table 6: Applicable Dilution Factors

Mixing Zone Type	Acute	Chronic
Aquatic Life	23.6	113.9

The critical condition for the Wenatchee River is the seven day average low river flow with a recurrence interval of ten years (7Q10). Ambient data at critical conditions in the vicinity of the Cashmere outfall were taken from The Department's Environmental Assessment Program monitoring station located below Cashmere above the confluence of the Wenatchee and Columbia Rivers.

Table 7: Data Used for Reasonable Potential Determination

Parameter	Value used
7Q10 low flow	343 cfs
Velocity	0.48 ft/sec
Depth	1.5 feet
Width	230 feet
Roughness (Manning)	n=0.035
Temperature *	23.8^{o} C
pH (high)	8.2
Alkalinity	17.3
Total Ammonia-N	0.053 mg/L

* Maximum reported temperature August 2001

Temperature--The impact of the discharge on the temperature of the receiving water was modeled by CORMIC 4.3 mixing analysis at critical condition (See Appendix C). The receiving water temperature at the critical condition is 23.8 ^{o}C and the effluent temperature is 25 ^{o}C. The predicted resultant temperature at the boundary of the chronic mixing zone is 23.96^{o}C and the incremental rise is 0.16 ^{o}C.

WAC173-201A-030 (2) allows for Class A waters, when the ambient water temperature is above 18ºC, a temperature rise of 0.3 ºC rise at the edge of the chronic mixing zone from manmade sources.

$$0.16ºC < 0.30ºC$$

Or when ambient conditions are 18ºC or below the allowed temperature increase at the edge of the chronic mixing zone is determined by the following formula.

$$\Delta T = 28ºC / (18ºC_{\text{ambient}} + 7ºC)$$
$$\text{Allowed } \Delta T = 1.12ºC$$
$$0.16ºC < 1.12ºC$$

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, no effluent limitation for temperature was placed in the proposed permit.

pH--The impact of pH was modeled using the calculations from EPA, 1988. The input variables were dilution factor 23.6, upstream temperature 23.8^{o}C, upstream pH 8.2, upstream alkalinity 17.3 (as mg $CaCO_3$/L), effluent temperature 25^{o}C, effluent pH of 9, and effluent alkalinity 100 (as mg $CaCO_3$/L).

Under critical conditions there is no predicted violation of the Water Quality Standards for Surface Waters. Therefore, the technology-based effluent limitation for pH was placed in the permit.

Whole Effluent Toxicity

The Water Quality Standards for Surface Waters require that the effluent not cause toxic effects in the receiving waters. Many toxic pollutants cannot be detected by commonly available detection methods. However, toxicity can be measured directly by exposing living organisms to the wastewater in laboratory tests and measuring the response of the organisms. Toxicity tests measure the aggregate toxicity of the whole effluent, and therefore this approach is called whole effluent toxicity (WET) testing.

In accordance with WAC 173-205-040, the Permittee's effluent has been determined to have the potential to contain toxic chemicals. No wet testing will be required at this time because the only toxics present in the effluent are ammonia and chlorine, which have been addressed.

Human Health

Washington's water quality standards now include 91 numeric health-based criteria that must be considered in NPDES permits. These criteria were promulgated for the State by the U.S. EPA in its National Toxics Rule (Federal Register, Volume 57, No. 246, Tuesday, December 22, 1992).

The Department has determined that the applicant's discharge is unlikely to contain chemicals regulated for human health.

Sediment Quality

The Department has promulgated aquatic sediment standards (Chapter 173-204 WAC) to protect aquatic biota and human health. These standards state that the Department may require Permittees to evaluate the potential for the discharge to cause a violation of applicable standards (WAC 173-204-400).

The Department has determined through a review of the discharger characteristics and effluent characteristics that this discharge has no reasonable potential to violate the Sediment Management Standards.

GROUND WATER QUALITY LIMITATIONS

The Department has promulgated Ground Water Quality Standards (Chapter 173-200 WAC) to protect uses of ground water. Permits issued by the Department shall be conditioned in such a manner so as not to allow violations of those standards (WAC 173-200-100).

The Department is concerned that the City's unlined lagoons may be impacting the ground water beneath the ponds and the nearby Wenatchee River. In the existing permit the Permittee was required to conduct a Groundwater Quality Evaluation according to the State's Ground Water Quality Standards.

The required Ground Water Evaluation was conducted by the Permittee during the present permit term. The evaluation has demonstrated the lagoons are impacting groundwater quality. The Permittee will be required under the Schedule of Compliance to develop an engineering report to bring the treatment plant into compliance with the Surface and Groundwater Quality Standards.

COMPARISON OF EFFLUENT LIMITS WITH THE EXISTING PERMIT ISSUED JANUARY 22, 2001

Values in the Previous Permit Limits columns reflect the final effluent limits; the interim limits established in the companion order were significantly less stringent than the final limits. With

the exception of ammonia, effluent limits in this permit are unchanged from the final limits established in the previous permit.

Technology-Based Limits				
Parameter	**Previous Permit Limits**		**New Permit Limits**	
	Monthly Average	Weekly Average	Monthly Average	Weekly Average
BOD_5	45 mg/L 65 % removal 354 lbs/day	65 mg/L 511 lbs/day	45 mg/L 65 % removal 354 lbs/day	65 mg/L 511 lbs/day
TSS	75 mg/L 590 lbs/day	112 mg/L 880 lbs/day	75 mg/L 590 lbs/day	112 mg/L 880 lbs/day
Fecal Coliform	200/100 mL	400/100 mL	200/100 mL	400/100 mL
Residual Chlorine	Daily Maximum 0.05 mg/L 0.4 lbs/day		Daily Maximum 0.05 mg/L 0.4 lbs/day	
pH	6 to 9 standard units		6 to 9 standard units	

Water Quality-Based Limits			
Previous Permit Limits		**New Permit Limits**	
Total Ammonia	None	Total Ammonia	None

MONITORING REQUIREMENTS

Monitoring, recording, and reporting are required (WAC 173-220-210 and 40 CFR 122.41) to verify that the treatment process is functioning correctly and the effluent limitations are being achieved.

Monitoring of the final effluent is required for Flow, BOD, TSS, Temperature, pH, D.O., Residual Chlorine, Sulfites, Ammonia, TKN, Phosphorus and Fecal Coliform is being required to further characterize the effluent. These pollutant(s) could have a significant impact on the quality of the surface water.

Required influent monitoring consists of Flow for municipal and industrial sources, pH, Temperature, BOD, and TSS.

The City owned and maintained BVF influent and effluent will be required to be monitored for Flow, pH, Temperature, BOD and TSS.

The monitoring schedule is detailed in the proposed permit under Special Condition S2. Specified monitoring frequencies take into account the quantity and variability of discharge, the treatment method, past compliance, significance of pollutants, and cost of monitoring.

The City has requested a reduction in the monitoring frequency of BOD and TSS from twice a week to once a week for all influent and effluent monitoring stations. The Department agrees that a reduction in frequency is warranted based upon the coefficient of variation and/or the percentage of the design criteria the current loading rates consume. In addition the Department has reviewed the monitoring frequencies for pH, Temperature, DO and Residual Chlorine and has found a reduction from five times a week to twice a week to be appropriate for the same reasons. The required monitoring frequency is consistent with agency guidance given in the current version of the Department's *Permit Writer's Manual*.

LAB ACCREDITATION

With the exception of certain parameters the permit requires all monitoring data to be prepared by a laboratory registered or accredited under the provisions of Chapter 173-50 WAC, *Accreditation of Environmental Laboratories.* The City of Cashmere Wastewater Treatment Plant is accredited for General Chemistry and Microbiology

OTHER PERMIT CONDITIONS

REPORTING AND RECORDKEEPING

The provisions of Special Condition S3. are based on the authority to specify any appropriate reporting and recordkeeping requirements to prevent and control waste discharges (WAC 173-220-210).

PREVENTION OF FACILITY OVERLOADING

Overloading of the treatment plant is a violation of the terms and conditions of the permit. To prevent this from occurring, RCW 90.48.110 and WAC 173-220-150 require the Permittee to take the actions detailed in Special Condition S4. to plan expansions or modifications before existing capacity is reached and to report and correct conditions that could result in new or increased discharges of pollutants. Special Condition S4. restricts the amount of flow.

The last Inflow and Infiltration Report (I&I) and Wasteload Assessment where received at the Department on September 24, 2002. A second set of submittals was required with the application for permit renewal but in light of the pending facility upgrade Engineering Report (ER), due August 31, 2006, a later date for the required submittals is appropriate. The ER is required to address future growth and industrial capacity as well as the means with which to meet wasteload allocation associated with the TMDL.

OPERATION AND MAINTENANCE (O&M)

The proposed permit contains Special Condition S5. as authorized under RCW 90.48.110, WAC 173-220-150, Chapter 173-230 WAC, and WAC 173-240-080. It is included to ensure proper operation and regular maintenance of equipment, and to ensure that adequate safeguards are taken so that constructed facilities are used to their optimum potential in terms of pollutant capture and treatment.

RESIDUAL SOLIDS HANDLING

To prevent water quality problems the Permittee is required in Special Condition S7. to store and handle all residual solids (grit, screenings, scum, sludge, and other solid waste) in accordance with the requirements of RCW 90.48.080 and State Water Quality Standards.

The final use and disposal of sewage sludge from this facility is regulated by U.S. EPA under 40 CFR 503, and by Ecology under Chapter 70.95J RCW and Chapter 173-308 WAC. The disposal of other solid waste is under the jurisdiction of the Chelan County Health Department.

FEDERAL AND STATE PRETREATMENT PROGRAM REQUIREMENTS

Under the terms of the addendum to the "Memorandum of Understanding between Washington Department of Ecology and the United States Environmental Protection Agency, Region 10" (1986), the Department of Ecology (Department) has been delegated authority to administer the Pretreatment Program (i.e. act as the Approval Authority for oversight of delegated Publicly Owned Treatment Works (POTWs)). Under this delegation of authority, the Department has exercised the option of issuing wastewater discharge permits for significant industrial users discharging to POTWs which have not been delegated authority to issue wastewater discharge permits.

WASTEWATER PERMIT REQUIRED

RCW 90.48 and WAC 173-216-040 require SIUs to obtain a permit prior to discharge of industrial waste to the Permittee's sewerage system. This provision prohibits the POTW from accepting industrial wastewater from any such dischargers without authorization from the Department.

DUTY TO ENFORCE DISCHARGE PROHIBITIONS

This provision prohibits the POTW from authorizing or permitting an industrial discharger to discharge certain types of waste into the sanitary sewer. The first portion of the provision prohibits acceptance of pollutants which cause pass through or interference. The definitions of pass through and interference are in Appendix B of the fact sheet.

The second portion of this provision prohibits the POTW from accepting certain specific types of wastes, namely those which are explosive, flammable, excessively acidic, basic, otherwise corrosive, or obstructive to the system. In addition wastes with excessive BOD, petroleum based oils, or which result in toxic gases are prohibited to be discharged. The regulatory basis for these prohibitions is 40 CFR Part 403, with the exception of the pH provisions which are based on WAC 173-216-060.

The third portion of this provision prohibits certain types of discharges unless the POTW receives prior authorization from the Department. The discharges include cooling water in significant volumes, stormwater and other direct inflow sources, and wastewaters significantly affecting system hydraulic loading, which do not require treatment.

GENERAL CONDITIONS

General Conditions are based directly on State and Federal law and regulations and have been standardized for all individual municipal NPDES permits issued by the Department.

PERMIT ISSUANCE PROCEDURES

PERMIT MODIFICATIONS

The Department may modify this permit to impose numerical limitations, if necessary to meet Water Quality Standards, Sediment Quality Standards, or Ground Water Standards, based on new information obtained from sources such as inspections, effluent monitoring, outfall studies, and effluent mixing studies.

The Department may also modify this permit as a result of new or amended State or Federal regulations.

RECOMMENDATION FOR PERMIT ISSUANCE

This proposed permit meets all statutory requirements for authorizing a wastewater discharge, including those limitations and conditions believed necessary to protect human health, aquatic life, and the beneficial uses of waters of the State of Washington. The Department proposes that this permit be issued for 5 years.

REFERENCES FOR TEXT AND APPENDICES

Environmental Protection Agency (EPA)
1992. National Toxics Rule. Federal Register, V. 57, No. 246, Tuesday, December 22, 1992.

1991. Technical Support Document for Water Quality-based Toxics Control. EPA/505/2-90-001.

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1985. Water Quality Assessment: A Screening Procedure for Toxic and Conventional Pollutants in Surface and Ground Water. EPA/600/6-85/002a.

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1991. Wastewater Engineering, Treatment, Disposal, and Reuse. Third Edition.

Tsivoglou, E.C., and J.R. Wallace.

1972. Characterization of Stream Reaeration Capacity. EPA-R3-72-012. (Cited in EPA 1985 op.cit.)

Washington State Department of Ecology.

Laws and Regulations(http://www.ecy.wa.gov/laws-rules/index.html)

Permit and Wastewater Related Information
(http://www.ecy.wa.gov/programs/wq/wastewater/index.html

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1994. Permit Writer's Manual. Publication Number 92-109

Water Pollution Control Federation.

1976. Chlorination of Wastewater.

Wright, R.M., and A.J. McDonnell.

1979. In-stream Deoxygenation Rate Prediction. Journal Environmental Engineering Division, ASCE. 105(EE2). (Cited in EPA 1985 op.cit.)

APPENDIX A -- PUBLIC INVOLVEMENT INFORMATION

The Department has tentatively determined to reissue a permit to the applicant listed on page 1 of this fact sheet. The permit contains conditions and effluent limitations which are described in the rest of this fact sheet.

The Department will publish a Public Notice of Draft (PNOD) on September 14, 2005, in the Leavenworth Echo and Cashmere Valley Record to inform the public that a draft permit and fact sheet are available for review. Interested persons are invited to submit written comments regarding the draft permit. The draft permit, fact sheet, and related documents are available for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m. weekdays, by appointment, at the regional office listed below. Written comments should be mailed to:

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

Any interested party may comment on the draft permit or request a public hearing on this draft permit within the 30 day comment period to the address above. The request for a hearing shall indicate the interest of the party and the reasons why the hearing is warranted. The Department will hold a hearing if it determines there is a significant public interest in the draft permit (WAC 173-220-090). Public notice regarding any hearing will be circulated at least 30 days in advance of the hearing. People expressing an interest in this permit will be mailed an individual notice of hearing (WAC 173-220-100).

Comments should reference specific text followed by proposed modification or concern when possible. Comments may address technical issues, accuracy and completeness of information, the scope of the facility's proposed coverage, adequacy of environmental protection, permit conditions, or any other concern that would result from issuance of this permit.

The Department will consider all comments received within 30 days from the date of public notice of draft indicated above, in formulating a final determination to issue, revise, or deny the permit. The Department's response to all significant comments is available upon request and will be mailed directly to people expressing an interest in this permit.

Further information may be obtained from the Department by telephone, 509/457-7105, or by writing to the address listed above.

This permit and fact sheet were written by Richard Marcley.

APPENDIX B -- GLOSSARY

Acute Toxicity--The lethal effect of a pollutant on an organism that occurs within a short period of time, usually 48 to 96 hours.

AKART-- An acronym for "all known, available, and reasonable methods of prevention, control, and treatment".

Ambient Water Quality--The existing environmental condition of the water in a receiving water body.

Ammonia--Ammonia is produced by the breakdown of nitrogenous materials in wastewater. Ammonia is toxic to aquatic organisms, exerts an oxygen demand, and contributes to eutrophication. It also increases the amount of chlorine needed to disinfect wastewater.

Average Monthly Discharge Limitation --The highest allowable average of daily discharges over a calendar month, calculated as the sum of all daily discharges measured during a calendar month divided by the number of daily discharges measured during that month (except in the case of fecal coliform). The daily discharge is calculated as the average measurement of the pollutant over the day.

Average Weekly Discharge Limitation -- The highest allowable average of daily discharges over a calendar week, calculated as the sum of all daily discharges measured during a calendar week divided by the number of daily discharges measured during that week. The daily discharge is calculated as the average measurement of the pollutant over the day.

Best Management Practices (BMPs)--Schedules of activities, prohibitions of practices, maintenance procedures, and other physical, structural and/or managerial practices to prevent or reduce the pollution of waters of the State. BMPs include treatment systems, operating procedures, and practices to control: plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage. BMPs may be further categorized as operational, source control, erosion and sediment control, and treatment BMPs.

BOD_5--Determining the Biochemical Oxygen Demand of an effluent is an indirect way of measuring the quantity of organic material present in an effluent that is utilized by bacteria. The BOD_5 is used in modeling to measure the reduction of dissolved oxygen in a receiving water after effluent is discharged. Stress caused by reduced dissolved oxygen levels makes organisms less competitive and less able to sustain their species in the aquatic environment. Although BOD is not a specific compound, it is defined as a conventional pollutant under the Federal Clean Water Act.

Bypass--The intentional diversion of waste streams from any portion of a treatment facility.

CBOD5 – The quantity of oxygen utilized by a mixed population of microorganisms acting on the nutrients in the sample in an aerobic oxidation for five days at a controlled temperature of 20 degrees Celsius, with an inhibitory agent added to prevent the oxidation of nitrogen compounds. The method for determining CBOD5 is given in 40 CFR Part 136.

Chlorine--Chlorine is used to disinfect wastewaters of pathogens harmful to human health. It is also extremely toxic to aquatic life.

Chronic Toxicity--The effect of a pollutant on an organism over a relatively long time, often 1/10 of an organism's lifespan or more. Chronic toxicity can measure survival, reproduction or growth rates, or other parameters to measure the toxic effects of a compound or combination of compounds.

Clean Water Act (CWA)--The Federal Water Pollution Control Act enacted by Public Law 92-500, as amended by Public Laws 95-217, 95-576, 96-483, 97-117; USC 1251 et seq.

Combined Sewer Overflow (CSO)--The event during which excess combined sewage flow caused by inflow is discharged from a combined sewer, rather than conveyed to the sewage treatment plant because either the capacity of the treatment plant or the combined sewer is exceeded.

Compliance Inspection - Without Sampling--A site visit for the purpose of determining the compliance of a facility with the terms and conditions of its permit or with applicable statutes and regulations.

Compliance Inspection - With Sampling--A site visit to accomplish the purpose of a Compliance Inspection - Without Sampling and as a minimum, sampling and analysis for all parameters with limits in the permit to ascertain compliance with those limits; and, for municipal facilities, sampling of influent to ascertain compliance with the percent removal requirement. Additional sampling may be conducted.

Composite Sample--A mixture of grab samples collected at the same sampling point at different times, formed either by continuous sampling or by mixing a minimum of four discrete samples. May be "time-composite"(collected at constant time intervals) or "flow-proportional" (collected either as a constant sample volume at time intervals proportional to stream flow, or collected by increasing the volume of each aliquot as the flow increased while maintaining a constant time interval between the aliquots).

Construction Activity--Clearing, grading, excavation and any other activity which disturbs the surface of the land. Such activities may include road building, construction of residential houses, office buildings, or industrial buildings, and demolition activity.

Continuous Monitoring –Uninterrupted, unless otherwise noted in the permit.

Critical Condition--The time during which the combination of receiving water and waste discharge conditions have the highest potential for causing toxicity in the receiving water environment. This situation usually occurs when the flow within a water body is low, thus, its ability to dilute effluent is reduced.

Dilution Factor--A measure of the amount of mixing of effluent and receiving water that occurs at the boundary of the mixing zone. Expressed as the inverse of the effluent fraction e.g., a dilution factor of 10 means the effluent comprises 10% by volume and the receiving water 90%.

Engineering Report--A document which thoroughly examines the engineering and administrative aspects of a particular domestic or industrial wastewater facility. The report shall contain the appropriate information required in WAC 173-240-060 or 173-240-130.

Fecal Coliform Bacteria--Fecal coliform bacteria are used as indicators of pathogenic bacteria in the effluent that are harmful to humans. Pathogenic bacteria in wastewater discharges are controlled by disinfecting the wastewater. The presence of high numbers of fecal coliform bacteria in a water body can indicate the recent release of untreated wastewater and/or the presence of animal feces.

Grab Sample--A single sample or measurement taken at a specific time or over as short period of time as is feasible.

Industrial User-- A discharger of wastewater to the sanitary sewer which is not sanitary wastewater or is not equivalent to sanitary wastewater in character.

Industrial Wastewater--Water or liquid-carried waste from industrial or commercial processes, as distinct from domestic wastewater. These wastes may result from any process or activity of industry, manufacture, trade or business, from the development of any natural resource, or from animal operations such as feed lots, poultry houses, or dairies. The term includes contaminated storm water and, also, leachate from solid waste facilities.

Infiltration and Inflow (I/I)--"Infiltration" means the addition of ground water into a sewer through joints, the sewer pipe material, cracks, and other defects. "Inflow" means the addition of precipitation-caused drainage from roof drains, yard drains, basement drains, street catch basins, etc., into a sewer.

Interference -- A discharge which, alone or in conjunction with a discharge or discharges from other sources, both:

Inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal and;

Therefore is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation) or of the prevention of sewage sludge use or disposal in compliance with the following statutory provisions and regulations or permits issued thereunder (or more stringent State or local regulations): Section 405 of the Clean Water Act, the Solid Waste Disposal Act (SWDA) (including title II, more commonly referred to as the Resource Conservation and Recovery Act (RCRA), and including State regulations contained in any State sludge management plan prepared pursuant to subtitle D of the SWDA), sludge regulations appearing in 40 CFR Part 507, the Clean Air Act, the Toxic Substances Control Act, and the Marine Protection, Research and Sanctuaries Act.

Major Facility--A facility discharging to surface water with an EPA rating score of > 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Maximum Daily Discharge Limitation--The highest allowable daily discharge of a pollutant measured during a calendar day or any 24-hour period that reasonably represents the calendar day for purposes of sampling. The daily discharge is calculated as the average measurement of the pollutant over the day.

Method Detection Level (MDL)--The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is above zero and is determined from analysis of a sample in a given matrix containing the analyte.

Minor Facility--A facility discharging to surface water with an EPA rating score of < 80 points based on such factors as flow volume, toxic pollutant potential, and public health impact.

Mixing Zone--A volume that surrounds an effluent discharge within which water quality criteria may be exceeded. The area of the authorized mixing zone is specified in a facility's permit and follows procedures outlined in State regulations (Chapter 173-201A WAC).

National Pollutant Discharge Elimination System (NPDES)--The NPDES (Section 402 of the Clean Water Act) is the Federal wastewater permitting system for discharges to navigable waters of the United States. Many states, including the State of Washington, have been delegated the authority to issue these permits. NPDES permits issued by Washington State permit writers are joint NPDES/State permits issued under both State and Federal laws.

Pass through -- A discharge which exits the POTW into waters of the-State in quantities or concentrations which, alone or in conjunction with a discharge or discharges from other sources, is a cause of a violation of any requirement of the POTW's NPDES permit (including an increase in the magnitude or duration of a violation), or which is a cause of a violation of State water quality standards.

pH--The pH of a liquid measures its acidity or alkalinity. A pH of 7 is defined as neutral, and large variations above or below this value are considered harmful to most aquatic life.

Potential Significant Industrial User--A potential significant industrial user is defined as an Industrial User which does not meet the criteria for a Significant Industrial User, but which discharges wastewater meeting one or more of the following criteria:

a. Exceeds 0.5 % of treatment plant design capacity criteria and discharges <25,000 gallons per day or;

b. Is a member of a group of similar industrial users which, taken together, have the potential to cause pass through or interference at the POTW (e.g. facilities which develop photographic film or paper, and car washes).

The Department may determine that a discharger initially classified as a potential significant industrial user should be managed as a significant industrial user.

Quantitation Level (QL)-- A calculated value five times the MDL (method detection level).

Significant Industrial User (SIU)--
1) All industrial users subject to Categorical Pretreatment Standards under 40 CFR 403.6 and 40 CFR Chapter I, Subchapter N and;

2) Any other industrial user that: discharges an average of 25,000 gallons per day or more of process wastewater to the POTW (excluding sanitary, noncontact cooling, and boiler blow-down wastewater); contributes a process wastestream that makes up 5 percent or more of the average dry weather hydraulic or organic capacity of the POTW treatment plant; or is designated as such by the Control Authority* on the basis that the industrial user has a reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement (in accordance with 40 CFR 403.8(f)(6)).

Upon finding that the industrial user meeting the criteria in paragraph 2, above, has no reasonable potential for adversely affecting the POTW's operation or for violating any pretreatment standard or requirement, the Control Authority* may at any time, on its own initiative or in response to a petition received from an industrial user or POTW, and in accordance with 40 CFR 403.8(f)(6), determine that such industrial user is not a significant industrial user.

*The term "Control Authority" refers to the Washington State Department of Ecology in the case of non-delegated POTWs or to the POTW in the case of delegated POTWs.

State Waters--Lakes, rivers, ponds, streams, inland waters, underground waters, salt waters, wetlands, and all other surface waters and watercourses within the jurisdiction of the State of Washington.

Stormwater--That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes, and other features of a storm water drainage system into a defined surface water body, or a constructed infiltration facility.

Technology-based Effluent Limit--A permit limit that is based on the ability of a treatment method to reduce the pollutant.

Total Suspended Solids (TSS)--Total suspended solids are the particulate materials in an effluent. Large quantities of TSS discharged to a receiving water may result in solids accumulation. Apart from any toxic effects attributable to substances leached out by water, suspended solids may kill fish, shellfish, and other aquatic organisms by causing abrasive injuries and by clogging the gills and respiratory passages of various aquatic fauna. Indirectly, suspended solids can screen out light and can promote and maintain the development of noxious conditions through oxygen depletion.

Upset--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 operational error, improperly designed treatment facilities, lack of preventative maintenance, or careless or improper operation.

Water Quality-based Effluent Limit--A limit on the concentration or mass of an effluent parameter that is intended to prevent the concentration of that parameter from exceeding its water quality criterion after it is discharged into a receiving water.

APPENDIX C -- TECHNICAL CALCULATIONS

Several of the Excel® spreadsheet tools used to evaluate a discharger's ability to meet Washington State water quality standards can be found on the Department's homepage at (http://www.ecy.wa.gov/programs/wq/wastewater/index.html

Chronic Mixing Zone Data

```
AMBIENT PARAMETERS:
  Cross-section                          = bounded
  Width                          BS      = 71.63 m
  Channel regularity             ICHREG  = 1
  Ambient flowrate               QA      = 9.68 m^3/s
  Average depth                  HA      = 0.46 m
  Depth at discharge             HD      = 0.46 m
  Ambient velocity               UA      = 0.2918 m/s
  Darcy-Weisbach friction factor F       = 0.1242
    Calculated from Manning's n          = 0.035
  Wind velocity                  UW      = 1 m/s
Stratification Type              STRCND  = U
  Surface temperature                    = 23.80
 degC
  Bottom temperature                     = 23.80 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density                RHOAS   = 997.3465 kg/m^3
  Bottom density                 RHOAB   = 997.3465 kg/m^3
```

```
-------------------------------------------------------------------------
DISCHARGE PARAMETERS:              Submerged Multiport Diffuser Discharge
  Diffuser type                    DITYPE = unidirectional perpendicular
  Diffuser length                  LD     = 9.14 m
  Nearest bank                            = left
  Diffuser endpoints               YB1    = 24.38 m;    YB2 = 33.53 m
  Number of openings               NOPEN  = 30
  Spacing between risers/openings  SPAC   = 0.32 m
  Port/Nozzle diameter             DO     = 0.0253 m
    with contraction ratio                = 0.6
  Equivalent slot width            BO     = 0.0010 m
  Total area of openings           TAO     = 0.0090 m^2
  Discharge velocity               UO     = 2.74 m/s
  Total discharge flowrate         QO     = 0.024798 m^3/s
  Discharge port height            HO     = 0.09 m
  Nozzle arrangement               BETYPE = unidirectional without fanning
  Diffuser alignment angle         GAMMA  = 90 deg
  Vertical discharge angle         THETA  = 0 deg
  Horizontal discharge angle       SIGMA  = 0 deg
  Relative orientation angle       BETA   = 90 deg
  Discharge temperature (freshwater)      = 23 degC
    Corresponding density          RHOO   = 997.5393 kg/m^3
  Density difference               DRHO   = 1.0758 kg/m^3
  Buoyant acceleration             GPO    = 0.0106 m/s^2
  Discharge concentration          CO     = 0.01 deg.C
  Surface heat exchange coeff.     KS     = 0 m/s
  Coefficient of decay             KD     = 0 /s
-------------------------------------------------------------------------
```

Chronic Mixing Zone

```
********************** REGULATORY MIXING ZONE SUMMARY *********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                 = 0.162457  deg.C
Corresponding dilution                    = 43.1
  Plume location:                       x = 91.44 m
    (centerline coordinates)            y = 0 m
                                        z = 0.46 m
  Plume dimensions:                half-width = 5.68 m
                                    thickness = 0.46 m
```

Acute Mixing Zone Data

```
                    CORMIX MIXING ZONE EXPERT SYSTEM
                        CORMIX-GI Version 4.3GT
                     HYDRO2:Version-4.3  April,2004
SITE NAME/LABEL:                Cashmere
  DESIGN CASE:                  Cashmere Dilution Factors
  FILE NAME:                    Y:\WPFILES\MARCLEY\CINDY DRAFTS\Cashmere STP\Cashmere.prd
Using subsystem CORMIX2:        Submerged Multiport Diffuser Discharges
  Start of session:             07/11/2005--14:36:55
*******************************************************************************
SUMMARY OF INPUT DATA:
-------------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                         = bounded
  Width                         BS      = 71.63 m
  Channel regularity            ICHREG  = 1
  Ambient flowrate              QA      = 9.68 m^3/s
  Average depth                 HA      = 0.46 m
  Depth at discharge            HD      = 0.46 m
  Ambient velocity              UA      = 0.2918 m/s
  Darcy-Weisbach friction factor F      = 0.1242
    Calculated from Manning's n         = 0.035
  Wind velocity                 UW      = 1 m/s
Stratification Type             STRCND  = U
  Surface temperature                   = 17.90
 degC
  Bottom temperature                    = 17.90 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density               RHOAS   = 998.6151 kg/m^3
  Bottom density                RHOAB   = 998.6151 kg/m^3
-------------------------------------------------------------------------------

DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE  = unidirectional perpendicular
  Diffuser length               LD      = 9.14 m
  Nearest bank                          = left
  Diffuser endpoints            YB1     = 24.38 m;     YB2 = 33.53 m
  Number of openings            NOPEN   = 30
  Spacing between risers/openings SPAC  = 0.32 m
  Port/Nozzle diameter          DO      = 0.0253 m
    with contraction ratio              = 0.6
  Equivalent slot width         BO      = 0.0010 m
  Total area of openings        TAO      = 0.0090 m^2
  Discharge velocity            UO      = 3.95 m/s
  Total discharge flowrate      QO      = 0.035751 m^3/s
  Discharge port height         HO      = 0.09 m
  Nozzle arrangement            BETYPE  = unidirectional without fanning
  Diffuser alignment angle      GAMMA   = 90 deg
  Vertical discharge angle      THETA   = 0 deg
  Horizontal discharge angle    SIGMA   = 0 deg
  Relative orientation angle    BETA    = 90 deg
  Discharge temperature (freshwater)    = 25 degC
    Corresponding density       RHOO    = 997.0456 kg/m^3
  Density difference            DRHO    = 1.5696 kg/m^3
  Buoyant acceleration          GPO     = 0.0154 m/s^2
  Discharge concentration       CO      = 7.1 deg.C
  Surface heat exchange coeff.  KS      = 0 m/s
  Coefficient of decay          KD      = 0 /s
```

Acute Mixing Zone

```
********************* REGULATORY MIXING ZONE SUMMARY **********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                 = 0.175197  deg.C
Corresponding dilution                    = 40.5
  Plume location:                       x = 9.14 m
    (centerline coordinates)            y = 0 m
                                        z = 0.46 m
  Plume dimensions:               half-width = 5.34 m
                                   thickness = 0.46 m
```

Visual Plumes Acute Dilution Factor

Diffuser, Flow, Mixing Zone Inputs

Port diameter	n/r	Port elevation	Vertical angle	Hor angle	Num of ports	Port spacing	n/r	n/r	n/r	Acute mix zone	Chronic mix zone	Port depth	Effluent flow	Effluent salinity(*)	Effluent temp	Effluent conc
in	m	in	deg	deg		ft	s	s	s	ft	ft	ft	MGD	psu	C	ppb
1		8	0	90	30	2				30	300	1.5	0.816	0.001	25	10

Ambient Inputs

	Measurement depth or height	Near-field current speed	Near-field current dir.	Ambient salinity(*)	Ambient temperature	Background concentration	Pollutant decay rate(*)	n/r	n/r	Far-field diffusion coeff
Depth or Height		depth	depth	depth	depth	depth	depth	depth	depth	depth
Extrapolation (sfc)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Extrapolation (btm)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Measurement unit	m	ft/s	deg	psu	C	ppb	s-1	m/s	deg	m0.67/s2
	0	0.48	0	0.001	20	1	0.001			0
	1.5	0.48	0	0.001	20	1	0.001			0

```
Simulation:
Froude number:      138.2; effluent density (sigma-T) -2.89197126; effluent velocity     2.352(m/s);
        Depth  Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)   (ft/s)     (in)    (ppb)       ()       ()     (ft)     (ft)
   0      1.5    0.48      1.0     10.0      1.0      1.0      0.0      0.0;
 153    1.498    0.48    15.97    1.453    19.84    12.81    0.557    1.312; merging;
 154    1.497    0.48    16.14    1.446    20.11    13.03    0.584    1.334; bottom hit;
 181    1.455    0.48    35.63    1.265    33.65    27.68    3.846    3.364; surface;
 190    1.426    0.48    50.28    1.221    40.22    33.64    5.353    4.034; matched energy radial vel =  0.113m
 234    0.571    0.48    144.3    1.089    96.13    87.58    29.23    9.789; acute zone;
 311   -7.555    0.48    665.9    1.017    441.6    432.6    176.1    20.24; stream limit reached;
```

Visual Plumes Chronic Dilution Factor

Diffuser, Flow, Mixing Zone Inputs

Port diameter	n/r	Port elevation	Vertical angle	Hor angle	Num of ports	Port spacing	n/r	n/r	n/r	Acute mix zone	Chronic mix zone	Port depth	Effluent flow	Effluent salinity(*)	Effluent temp	Effluent conc
in	m	in	deg	deg		ft	s	s	s	ft	ft	ft	MGD	psu	C	ppb
1		8	0	90	30	2				30	300	1.5	0.566	0.001	25	10

Ambient Inputs

	Measurement depth or height	Near-field current speed	Near-field current dir.	Ambient salinity(*)	Ambient temperature	Background concentration	Pollutant decay rate(*)	n/r	n/r	Far-field diffusion coeff
Depth or Height		depth	depth	depth	depth	depth	depth	depth	depth	depth
Extrapolation (sfc)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Extrapolation (btm)		constant	constant	constant	constant	constant	constant	constant	constant	constant
Measurement unit	m	ft/s	deg	psu	C	ppb	s-1	m/s	deg	m0.67/s2
	0	0.48	0	0.001	20	1	0.001			0
	1.5	0.48	0	0.001	20	1	0.001			0

```
Simulation:
Froude number:      95.83; effluent density (sigma-T) -2.89197126; effluent velocity     1.631(m/s);
        Depth   Amb-cur    P-dia  Polutnt   Dilutn  CL-diln   x-posn   y-posn
Step     (ft)   (ft/s)     (in)    (ppb)       ()       ()     (ft)     (ft)
   0      1.5     0.48      1.0     10.0      1.0      1.0      0.0      0.0;
 150    1.498     0.48    13.41    1.494    18.18     10.8    0.526    0.981; merging;
 160     1.49     0.48    16.37    1.412    21.76    14.43    1.407    1.491; bottom hit;
 183    1.436     0.48    35.24    1.259    34.32    27.82     4.58    2.816; surface;
 195    1.296     0.48    45.24    1.203    43.53    36.36    9.506    4.249; matched energy radial vel =  0.108m
 228     0.41     0.48    87.78    1.102    83.67    75.25    28.96    7.835; acute zone;
 331    -13.7     0.48    672.5    1.013    643.2    633.6    267.1    17.55; stream limit reached;
```

Mass Balance Dilution Calculation

344	7Q10 cfs - Wenatchee River at Cashmere
86	25 % of 7Q10 cfs
0.865	Max Monthly Flow (cfs) 2001 - 2004
100.4	Cashmere's Chronic Dilution Mass Balance Dilution Factor

RIVPLUM Dilution
Calculation

Spread of a plume from a point source in a river with boundary effects from the shoreline		
based on the method of Fischer *et al.* (1979) with correction for the effective origin of effluent.		
Revised 22-Feb-96		
INPUT		
	ACUTE	CHRONIC
1. Effluent Discharge Rate (cfs):	1.34	0.877
2. Receiving Water Characteristics Downstream From Waste Input		
Stream Depth (ft):	1.52	1.52
Stream Velocity (fps):	0.96	0.96
Channel Width (ft):	235.00	235.00
Stream Slope (ft/ft) or Manning roughness "n":	0.035	0.035
0 if slope or 1 if Manning "n" in previous cell:	0	0
3. Discharge Distance From Nearest Shoreline (ft):	100	100
4. Location of Point of Interest to Estimate Dilution		
Distance Downstream to Point of Interest (ft):	30	300
Distance From Nearest Shoreline (ft):	100	100
5. Transverse Mixing Coefficient Constant (usually 0.6):	0.6	0.6
6. Original Fischer Method (enter 0) or *Effective Origin* Modifi	0	0
OUTPUT		
1. Source Conservative Mass Input Rate		
Concentration of Conservative Substance (%):	100.00	100.00
Source Conservative Mass Input Rate (cfs*%):	134.00	87.70
2. Shear Velocity		
Shear Velocity based on slope (ft/sec):	1.309	1.309
Shear Velocity based on Manning "n":		
using Prasuhn equations 8-26 and 8-54 assuming		
hydraulic radius equals depth for wide channel		
Darcy-Weisbach friction factor "f":	#N/A	#N/A
Shear Velocity from Darcy-Weisbach "f" (ft/sec):	#N/A	#N/A
Selected Shear Velocity for next step (ft/sec):	1.309	1.309
3. Transverse Mixing Coefficient (ft2/sec):	1.194	1.194

3. Transverse Mixing Coefficient (ft2/sec):	1.194		1.194
4. Plume Characteristics Accounting for Shoreline Effect (Fischer *et al.* , 1979)			
Co	3.91E-01		2.56E-01
x'	6.75E-04		6.75E-03
y'o	4.26E-01		4.26E-01
y' at point of interest	4.26E-01		4.26E-01
Solution using superposition equation (Fischer eqn 5.9)			
Term for n= -2	0.00E+00		6.48E-258
Term for n= -1	0.00E+00		5.05E-65
Term for n= 0	1.00E+00		1.00E+00
Term for n= 1	6.47E-213		6.04E-22
Term for n= 2	0.00E+00		4.08E-160
Upstream Distance from Outfall to *Effective Origin* of Efflu	#N/A		#N/A
Effective Distance Downstream from Effluent to Point of Int	30.00		300.00
x' Adjusted for *Effective Origin*	6.75E-04		6.75E-03
C/Co (dimensionless)	1.09E+01		3.43E+00
Concentration at Point of Interest (Fischer Eqn 5.9)	4.24E+00		8.78E-01
Unbounded Plume Width at Point of Interest (ft)	34.549		109.254
Unbounded Plume half-width (ft)	17.275		54.627
Distance from near shore to discharge point (ft)	100.00		100.00
Distance from far shore to discharge point (ft)	135.00		135.00
Plume width bounded by shoreline (ft)	34.55		109.25
Approximate Downstream Distance to Complete Mix (ft):	5,863		5,863
Theoretical Dilution Factor at Complete Mix:	255.904		391.006
Calculated Flux-Average Dilution Factor Across Entire Plun	37.623		181.784
Calculated Dilution Factor at Point of Interest:	23.576		113.916

REASONABLE POTENTIAL

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

This spreadsheet calculates the reasonable potential to exceed state water quality standards for a small number of samples. The procedure and calculations are done per the procedure in Technical Support Document for Water Quality-based Toxics Control, U.S. EPA, March, 1991 (EPA/505/2-90-001) on page 56. User input columns are shown with red headings. Corrected formulas in col G and H on 5/98 (GB)

CALCULATIONS

				State Water Quality Standard		Max concentration at edge of...											
	Metal Criteria Translator as decimal	Metal Criteria Translator as decimal	Ambient Concentration (metals as dissolved)	Acute	Chronic	Acute Mixing Zone	Chronic Mixing Zone	LIMIT REQ'D?	Effluent percentile value		Max effluent conc. measured (metals as total recoverable)	Coeff Variation		# of samples	Multiplier	Acute Dil'n Factor	Chronic Dil'n Factor
Parameter	Acute	Chronic	ug/L	ug/L	ug/L	ug/L	ug/L			Pn	ug/L	CV	s	n			
AMMONIA	0.95	0.95	53.0000	4500.0000	730.0000	934.01	235.54	NO	0.95	0.779	13500.00	0.60	0.55	12	1.63	24	114
CHLORINE	0.95	0.95	0.0010	19	11	2.30	0.48	NO	0.95	0.920	50.00	0.60	0.55	36	1.14	24	114

CRITICAL SEASON TEMPERATURE CALCULATIONS
Class A Stream

The allowable incremental temperature increase at the edge of the chronic mixing zone, when stream temperatures are at or below 18ºC is: Maximum temperature increase shall not be greater than 2.8ºC due to human activities at any time or:

$$T_{limit} = 28/ (18\ T_{max\ ambient\ temp} + 7)$$

T_{LIMIT} = 1.12ºC RISE

When natural conditions exceed 18ºC no increase at the edge of the chronic mixing zone greater than **0.3 ºC** is allowed. The most restrictive model predicts a 0.16ºC rise < either a 1.12ºC or a 0.3ºC rise.

```
********************* REGULATORY MIXING ZONE SUMMARY *********************
The plume conditions at the boundary of the specified RMZ are as follows:
  Pollutant concentration                = 0.162457  deg.C
Corresponding dilution                   = 43.1
  Plume location:                      x = 91.44 m
    (centerline coordinates)           y = 0 m
                                       z = 0.46 m
  Plume dimensions:              half-width = 5.68 m
                                  thickness = 0.46 m
```

State Modeling. USEPA Office of Water, Washington D.C.)

Based on Lotus File PHMIX2.WK1 Revised 19-Oct-93

INPUT	
1. DILUTION FACTOR AT MIXING ZONE BOUNDARY	23.600
1. UPSTREAM/BACKGROUND CHARACTERISTICS	
Temperature (deg C):	23.80
pH:	8.20
Alkalinity (mg CaCO3/L):	17.30
2. EFFLUENT CHARACTERISTICS	
Temperature (deg C):	25.00
pH:	9.00
Alkalinity (mg CaCO3/L):	0.00

OUTPUT	
1. IONIZATION CONSTANTS	
Upstream/Background pKa:	6.36
Effluent pKa:	6.35
2. IONIZATION FRACTIONS	
Upstream/Background Ionization Fraction:	0.99
Effluent Ionization Fraction:	1.00
3. TOTAL INORGANIC CARBON	
Upstream/Background Total Inorganic Carbon (mg CaCO3/L):	17.55
Effluent Total Inorganic Carbon (mg CaCO3/L):	0.00
4. CONDITIONS AT MIXING ZONE BOUNDARY	
Temperature (deg C):	23.85
Alkalinity (mg CaCO3/L):	16.57
Total Inorganic Carbon (mg CaCO3/L):	16.80
pKa:	6.36
pH at Mixing Zone Boundary:	8.20

APPENDIX D -- RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.

City of Cashmere
Publicly-Owned Treatment Works
Fact Sheet Addendum for NPDES Permit

ADDENDUM TO THE FACT SHEET
FOR NATIONAL POLLUTANT DISCHARGE
ELIMINATION SYSTEM (NPDES)
PERMIT NO. WA-002318-3

AUGUST 4, 2010

I. GENERAL INFORMATION

Facility:

CITY OF CASHMERE
PUBLICLY-OWNED TREATMENT WORKS
101 WOODRING STREET
CASHMERE, WA 98815

II. APPLICATION REVIEW

The City of Cashmere (Cashmere) submitted an application to Ecology on November 19, 2009 for permit reissuance, and Ecology accepted it on November 30, 2009. Ecology has sufficiently reviewed the application, discharge monitoring reports, and other facility information in enough detail to ensure that:

- Cashmere has substantially complied with all of the terms, conditions, requirements and schedules of compliance of the expired permit.
- Ecology has up-to-date information on the Cashmere waste treatment practices, the facility's production levels; and the nature, content, volume, and frequency of its discharge.
- The discharge meets applicable effluent standards and limits, water quality standards, and other legally applicable requirements.

III. PERMIT REAUTHORIZATION

When Ecology reauthorizes a discharge permit it essentially reissues the permit with the existing limits, terms and conditions. Alternatively, when Ecology renews a permit it re-evaluates the impact of the discharge on the receiving water, which may lead to changes in the limits, terms and conditions of the permit.

This fact sheet addendum accompanies the permit, which Ecology proposes to reauthorize for the discharge of wastewater to the Wenatchee River. The previous fact sheet explains the basis for the discharge limitations and conditions of the reauthorized permit and remains as part of the administrative record.

Ecology determined it does not need to substantially change the existing permit requirements, including discharge limits and monitoring, to protect the receiving water

quality with the exception or revising the compliance schedule as noted below. The existing permit includes a compliance schedule for Cashmere to meet the requirements of the (TMDL) implementation plan. Since the issuance of the current permit, Ecology completed the Wenatchee River Watershed pH and Dissolved Oxygen Wenatchee River total maximum daily load (TMDL) study. The reauthorized permit requires the Permittee to upgrade its plant to meet the requirements of the Wenatchee River TMDL. The Cashmere POTW currently meets the requirements of the Wenatchee River Temperature TMDL. The reauthorized permit is virtually identical to the previous permit issued on October 28, 2005, with the exception of the revised compliance schedule.

Ecology has removed sulfite monitoring from the proposed permit because it now has sufficient data for analysis. The previous fact sheet addressed conditions and issues at the facility at the time when Ecology issued the previous permit in October 2005.

Ecology reviewed inspections and assessed compliance of the Cashmere facility's discharge with the terms and conditions in the previous permit and determined that it should not rank the facility as a high priority for permit renewal. Ecology assigns a high priority for permit renewals in situations where water quality would benefit from a more stringent permit during the next five-year cycle.

The permit reauthorization process, along with the renewal of high priority permits, allows Ecology to reissue permits in a timely manner and minimize the number of active permits that have passed their expiration dates. For permit reissuance planning purposes, Ecology follows a system of ranking that considers the benefit gained by renewing a permit rather than reauthorizing a permit during its annual permit planning process. Ecology assesses each permit that is expiring and due for reissuance and compares it with other permits due for reissuance. Ecology notifies the public and seeks input after it has tentatively established the initial draft ranking of the permits it plans to renew and those it plans to reauthorize. Ecology considers all relevant comments and suggestions before it makes a final decision.

As required by the existing permit, Cashmere submitted a General Sewer Plan and Wastewater Facility Plan prepared by RH2 Engineering, Inc. Ecology accepted the plan on November 25, 2009. The plan outlines alternatives for a proposed major upgrade of the facility. The upgrade is needed to address the present leaking lagoon system and achieve compliance with the Wenatchee River dissolved oxygen and pH total maximum daily load (TMDL) by 2019. The plan provides a timeline for submittal of an approvable engineering report and construction of the upgraded plant. The permit requires Cashmere to adhere to the timeline presented in the plan.

Tree Top Inc., Cashmere's largest industrial user, suspended operation at the Cashmere plant approximately three years ago and at this time it is uncertain if the plant will become active in the proposed permit cycle. For this reason, Ecology carried over the discharge limits and conditions in effect at the time of expiration of the previous permit to this reauthorized permit. Ecology will require monitoring of the industrial discharge only in the event the plant becomes active once more.

Ecology only changed the submittal dates for reports from those in the previous permit. Ecology removed the completed report requirements that do not require additional or continued assessment. It adjusted the dates for the other standard compliance and submittal requirements that it carried over from the past permit into this reauthorized permit. Ecology considered these reports necessary in the previous permit and no information has come forward to cause it to reconsider.

Ecology must public notice the availability of the draft reauthorized permit at least 30 days before it reissues the permit [Washington Administrative Code (WAC) 173-220-050]. Ecology invites you to review and comment on its decision to reauthorize the permit (see Appendix A-Public Involvement for more detail on the Public Notice procedures).

After the public comment period has closed, Ecology will prepare a response to comments document that it will attach to this fact sheet addendum. The response to comments will include the resultant changes to the permit and either addresses each comment individually or summarizes the substantive comments and respond. Ecology sends a copy of the response to comments to all parties who submitted comments. Ecology will include the response to comments in this fact sheet addendum.

IV. RECOMMENDATION FOR PERMIT ISSUANCE

Ecology proposes to reissue this permit for 5 years.

APPENDIX A--PUBLIC INVOLVEMENT INFORMATION

Ecology proposes to reauthorize a permit to the City of Cashmere. The permit includes wastewater discharge limits and other conditions. This fact sheet addendum describes the facility and Ecology's reasons for reauthorizing the permit conditions.

Ecology will place a Public Notice of Draft Reauthorization on September 3, 2010 in the Wenatchee World to inform the public and to invite comment on the proposed draft National Pollutant Discharge Elimination System permit and fact sheet addendum.

The Notice –

- Tells where copies of the draft Permit and Fact Sheet are available for public evaluation (a local public library, the closest Regional or Field Office, posted on our website.).
- Offers to provide the documents in an alternate format to accommodate special needs.
- Urges people to submit their comments, in writing, before the end of the Comment Period
- Tells how to request a public hearing of comments about the proposed NPDES Permit.
- Explains the next step(s) in the permitting process.

NOTICE: **ANNOUNCEMENT OF AVAILABILITY OF DRAFT REAUTHORIZATION PERMIT**

PERMIT NO.: **WA-002318-3**

APPLICANT: **CITY OF CASHMERE**
101 WOODRING STREET
CASHMERE, WA 98815

has applied for renewal of National Pollutant Discharge Elimination System (NPDES) Permit No. WA-002318-3 in accordance with the provisions of Chapter 90.48 Revised Code of Washington (RCW), Chapter 173-220 Washington Administrative Code (WAC), and the Federal Clean Water Act.

Following evaluation of the application and other available information, a draft reauthorization permit has been developed which would allow the discharge of municipal wastewater to a maximum of 943,000 gallons per day to the Wenatchee River at River Mile 8.6 from its facility located at Riverfront Drive, Cashmere, WA. All discharges to be in compliance with the Department of Ecology's Water Quality Standards for a permit to be issued.

A tentative determination has been made to reauthorize this permit based on the effluent limitations and special permit conditions that will prevent and control pollution. A final determination will not be made until all timely comments received in response to this notice have been evaluated.

PUBLIC COMMENT AND INFORMATION

The draft permit and fact sheet may be viewed at the Department of Ecology (Department) website: http://www.ecy.wa.gov/programs/wq/permits/central_permits.html. The application, fact sheet, proposed permit, and other related documents are also available at the Department's Central Regional Office for inspection and copying between the hours of 8:00 a.m. and 5:00 p.m., weekdays. To obtain a copy or to arrange to view copies at the Central Regional Office, please call Cindy Huwe at 509/457-7105, e-mail cynthia.huwe@ecy.wa.gov, or write to the address below.

Interested persons are invited to submit written comments regarding the proposed permit. All comments must be submitted by October 3, 2010 (within 30 days of the final date of publication of this notice) to be considered for the final determination. Comments should be sent to: Department of Ecology, Central Regional Office, 15 West Yakima Avenue, Suite 200, Yakima, WA 98902, Attention: Cindy Huwe. E-mail comments should be sent to Cindy Huwe at cynthia.huwe@ecy.wa.gov.

Any interested party may request a public hearing on the proposed permit within 30 days of the publication date of this notice. The request for a hearing shall state the interest of the party and the reasons why a hearing is necessary. The request should be sent to the above address. The Department will hold a hearing if it determines that there is significant public interest. If a hearing is to be held, public notice will be published at least 30 days in advance of the hearing date. Any party responding to this notice with comments will be mailed a copy of a hearing public notice. Please bring this public notice to the attention of persons who you know would be interested in this matter. The Department is an equal opportunity agency. If you have a special accommodation needs, please contact Cindy Huwe at 509/457-7105 or TTY (for the speech and hearing impaired) at 1-800-833-6388.

Publication date of this Notice is September 3, 2010.

Ecology has published a document entitled **Frequently Asked Questions about Effective Public Commenting** which is available on our website at http://www.ecy.wa.gov/biblio/0307023.html.

You may obtain further information from Ecology by telephone 509-457-7105 or by writing to the permit writer at the address listed below.

Water Quality Permit Coordinator
Department of Ecology
Central Regional Office
15 West Yakima Avenue, Suite 200
Yakima, WA 98902

The primary author of this permit and fact sheet is Richard Marcley**.**

APPENDIX B--DISCHARGE MONITORING DATA

WA0023183											
Surface Water Body		CASHMERE POTW		Dept of Ecology							
	2		shaded cell indicates either a compliance violation or questionable data entry that in not verifiable								
	Ammonia (Total)		Biochemical Oxygen Demand (BOD5) (Not Applicable)					Chlorine residual		D.O.	Flow
	Lbs/Day	Mg/L	Lbs/Day		Mg/L		Percent	Lbs/Day	Mg/L	Mg/L	MGD
	Max	Min	Ave Mon	Week Ave	Week Ave	Ave Mon	Minimum	Daily Max	Daily Max	Average	Max
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
1/2/2007	41.84	9.71	137	203	56	35	90	0.21	0.05	5.4	0.6276
2/5/2007	36.46	9.79	188	239	64	47	88	0.21	0.05	5.9	0.6196
3/5/2007	52.67	11.5	61	138	30	14	96	0.23	0.05	8.6	103
4/1/2007	29.87	8.36	54	64	18	15	93	0.17	0.04	6.4	0.524
5/3/2007	40	10.9	44	55	16	14	96	0.15	0.05	5.1	0.4963
6/6/2007	21.83	7.54	66	87	28	23	86	0.17	0.05	5.5	0.6324
7/1/2007	19.97	10.4	21	31	28	23	94	0.09	0.05	4.9	0.3404
8/4/2007	25.36	11	30	61	26	16	96	0.19	0.05	4.4	0.4508
9/7/2007	35.21	11.6	51	77	22	19	95	0.19	0.05	23	0.4324
10/2/2007	43.43	12	59	71	20	18	93	0.18	0.05	6.5	0.4412
11/5/2007	39.16	10.6	83	110	31	21	93	0.23	0.05	7.5	0.6148
12/7/2007	2	2	95	129	34	30	84	0.25	0.05	4	0.5977
1/3/2008	20.43	13.1	50	69	44	37	87	0.06	0.05	6.2	0.2136
2/6/2008	35.87	13.2	134	195	83	65	91	0.14	0.05	5.2	0.3308
3/7/2008	42.66	13.9	153	242	60	51	80	0.29	0.05	4.7	0.692
4/3/2008	45.04	15.1	65	93	41	29	96	0.05	0.04	11	0.628
5/5/2008			23	51	46	30	97	0.09	0.05	18	0.256
6/1/2008	15.67	9.35	24	63	37	26	99	0.08	0.05	21	0.214
7/3/2008	7.93	9.08	35	81	39	21	91	0.22	0.05	4.6	0.5636
8/6/2008	4.08	4.8	24	39	44	24	97	0.06	0.05	4.3	0.1364
9/2/2008	15.81	4.59	22	35	26	17	98	0.29	0.05	5.7	0.6892
10/4/2008	8.34	5.88	21	31	20	15	99	0.1	0.05	4.5	0.2344
11/7/2008	35.87	9.12	89	162	34	21	95	0.21	0.05	5.6	0.8826
12/2/2008	23.87	14.6	48	84	45	31	97	0.12	0.05	6	0.3084
1/5/2009	38.81	14.8	130	192	54	50	87	0.22	0.05	5.7	0.532
2/1/2009	28.22	14.3	117	236	41	40	86	0.31	0.05	4.9	0.7444
3/1/2009	35.31	13	68	121	36	31	93	0.19	0.05	5.4	0.4476
4/4/2009	19.95	13.9	33	42	29	22	97	0	0	3.5	0.206
5/6/2009	22.92	13.5	30	38	21	18	96			3	0.6064
6/2/2009	6.12	3.95	50	58	17	16	96	0	0	3.5	0.9508
7/4/2009	2.4	1.97	16	22	20	15	99	0	0	3.2	0.2004
8/7/2009	2.91	3.73	5	8	10	7	99	0	0	5	0.1024
9/3/2009	8.2	4.1	32	90	16	11	98			3.2	0.936
10/5/2009	9.19	6.66	34	55	27	21	98	0.09	0.02	3.7	0.4816
11/1/2009	10.95	4.06	91	146	24	21	94	0.13	0.05	2.9	0.7956
12/3/2009	38.19	11.2	74	89	29	24	95	0	0	8	0.4781
1/6/2010	67.74	16	89	95	28	23	94	0.22	0.04	3.7	0.5668
2/2/2010	68.73	17.4	78	98	21	26	95	0.21	0.05	9.2	0.52
3/2/2010	73.7	17.6	72	99	23	20	95	0.18	0.01	3.9	0.528
4/5/2010	58.83	17	88	105	30	23	91	91	0.24	0.05	2.9
Min	2	1.97	5	8	10	7	80	0	0	2.9	0.1
Max	73.7	17.6	188	242	83	65	99	0.31	0.05	23	103
Avg	29.12	10.29	64.6	97.6	32.95	25.25	93.54	0.15	0.04	6.39	3.07
Median	28.22	10.9	56.5	85.5	29	22.5	95	0.18	0.05	5.15	0.53
95th %	68.73	17.4	137	236	60	50	99	0.29	0.05	18	0.94

	Kjeldahl Nitrogen (TKN) (Total)				Phosphorus (Total)				Solids (Residue) (Total suspended (TSS))				
	Lbs/Day		Mg/L		Lbs/Day		Mg/L		Lbs/Day		Mg/L		Percent
	Min	Max	Min	Max	Max	Max	Max	Max	Week Ave	Ave Mon	Week Ave	Ave Mon	Minimum
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value
1/2/2007		69.5	17.8		14.81			3.4	271	208	56	52	71
2/5/2007		74.38	20.8		47.74			10.6	338	267	85	66	36
3/5/2007		68	15.2		10.31			2.25	211	118	46	26	78
4/1/2007		41.03	12		11.29			3.24	345	145	100	41	52
5/3/2007		58.35	15.9		33.25			9.06	102	83	30	27	90
6/6/2007		25.66	10.04		13.08			4.39	234	131	70	44	79
7/1/2007	31.49			39.5	12.29	12.29	5.77	5.77	41	30	37	32	96
8/4/2007	36.64			14.7	14.48	14.48	5.71	5.71	129	75	60	44	87
9/7/2007	49.18			16.2	21.13			6.96	141	111	50	41	88
10/2/2007									143	94	40	28	89
11/5/2007		65.12	16.5		21.63			5.94	220	175	54	45	64
12/7/2007		73.22	15.7		15.86			3.43	252	185	66	56	66
1/3/2008		16.64	15.4		3.59			3.3	68	47	38	35	87
2/6/2008		62.07	22.5		10.76			3.97	106	86	46	38	88
3/7/2008		61.08	19.9		12.18			3.97	208	121	42	40	74
4/3/2008		52.87	21.8		9.73			4.15	131	59	37	24	92
5/5/2008									58	26	29	24	91
6/1/2008		22.12	13.9		9.76			7.1	31	15	21	18	98
7/3/2008	19.4			13.8	8.46	8.46	6.55	6.55	103	41	51	27	92
8/6/2008	5.44			6.4	2.62	2.62	2.94	2.94	101	45	114	48	92
9/2/2008	34.49			7.2	18.57	18.57	3.55	3.55	90	35	28	18	95
10/4/2008		11.06	7.8		6.71			4.41	43	28	28	19	93
11/7/2008		51.92	13.2		16.99			4.32	192	113	42	28	82
12/2/2008		37.87	21.1		9.01			5.45	105	56	47	34	86
1/5/2009		58.47	22.3		10.72			4.24	228	161	70	62	68
2/1/2009		42.86	21.1		8.91			4.36	211	120	52	44	75
3/1/2009		52.96	18.9		11.1			3.96	128	68	36	30	61
4/4/2009		25.02	18		5.66			3.84	33	28	20	19	96
5/6/2009		26.49	15.6		6.8			4.01	105	54	62	31	86
6/2/2009		28.8	9.5		12.49			3.81	103	101	36	33	80
7/4/2009	6.69			5.3		3.52	2.92		26	15	23	16	97
8/7/2009	4.76			6.1		2.82	3.63		17	9	21	12	96
9/3/2009	47.29			7.6		28.03	5.02		206	86	45	29	59
10/5/2009		9.91	6.6		15.54			7.2	74	49	35	30	73
11/1/2009		26.13	7.5		19.79			6	153	124	36	30	73
12/3/2009		59.01	17.2		19.42			5.19	135	106	42	34	66
1/6/2010		90.31	31.7		18.12			5.28	122	113	30	29	86
2/2/2010		84.18	21.4		15.58			4.11	133	103	34	27	79
3/2/2010		91.81	23.7		16.16			4.56	118	97	34	27	85
4/5/2010	0.614		80.51	21.8		13.31			3.62	164	111	39	29
Min	4.76	9.91	6.6	5.3	2.62	2.62	2.92	2.25	17	9	20	12	36
Max	49.18	91.81	31.7	39.5	47.74	28.03	6.55	10.6	345	267	114	66	98
Avg	26.15	50.6	17.06	12.98	14.22	11.35	4.51	4.88	140.48	90.98	45.8	33.43	80.18
Median	31.49	52.96	17.2	7.6	12.49	10.38	4.33	4.32	128.5	90	41	30	85.5
95th %	49.18	90.31	23.7	39.5	33.25	28.03	6.55	9.06	271	185	85	56	96

	Sulfite (Total)		Temp	Coliform, Fecal		pH	pH
	Lbs/Day	Mg/L	Degrees C	#/100ml		S.U.	S.U.
	Maximum	Maximum	Maximum	Ave Mon	Week Ave	Minimum	Maximum
Date	Value	Value	Value	Value	Value	Value	Value
1/2/2007	2	2	3	271	350	6.9	7.5
2/5/2007	2	2	4	396	462	7.1	7.3
3/5/2007	2	2	11	3	6	7.5	8.3
4/1/2007	2	2	13	8	19	8	8.8
5/3/2007	2	2	15	36	95	8.2	8.8
6/6/2007	2	2	17	47	80	8.3	8.9
7/1/2007	2	2	23	59	80	8.1	8.8
8/4/2007	2	2	24	60	98	8	8.7
9/7/2007	2	2	21	83	133	7.9	8.3
10/2/2007	2	2	19	83	94	7.4	8.4
11/5/2007	2	2	10	68	133	7.6	8.3
12/7/2007	38.4	8.2	2	83	192	7.5	7.9
1/3/2008	2	2	3	63	143	7.3	7.8
2/6/2008	2	2	2	135	160	7	7.6
3/7/2008	2	2	6	112	190	7.2	7.6
4/3/2008	2	2	7	25	57	7.4	8.2
5/5/2008			14	131	190	7.5	8.2
6/1/2008	2	2	20	18	75	7.4	8.2
7/3/2008	2	2	22	40	90	7.2	8.8
8/6/2008	2	2	23	18	40	7.4	8.5
9/2/2008	2	2	20	32	135	7.7	8.6
10/4/2008	2	2	18	85	170	4.8	8.2
11/7/2008	2	2	15	64	135	7.3	8.1
12/2/2008	2	2	11	19	90	6.8	7.5
1/5/2009	10.72	4.24	7	29	60	7	7.5
2/1/2009	2	2	7	32	55	7	7.5
3/1/2009	2	2	7	29	82	7	7.4
4/4/2009	2	2	12	18	28	7.1	7.9
5/6/2009	4.2	2.5	15	37	55	7.4	8
6/2/2009	4.2	2.5	16	50	105	7.3	8.6
7/4/2009	2	2	23	30	42	7.6	8.4
8/7/2009	1.8	2.5	24	16	28	7.3	7.8
9/3/2009	2	2	24	34	56	7.3	7.8
10/5/2009	2	2.5	19	78	129	7.1	7.8
11/1/2009	7	3	11	20	27	7.2	7.7
12/3/2009	2	2	4	24	45	6.9	7.8
1/6/2010	2	2	8	54	90	7.3	7.6
2/2/2010	2	2	9	37	61	6.9	7.5
3/2/2010	2	2	10	10	14	7.2	7.5
4/5/2010	61	7	2	13	22	400	7.3
Min	1.8	2	2	3	6	4.8	7.3
Max	38.4	8.2	24	396	462	8.3	8.9
Avg	3.52	2.29	13.3	61.48	112.35	7.31	8.05
Median	2	2	13	37	90	7.3	7.95
95th %	10.72	4.24	24	135	350	8.1	8.8

INFLUENT MONITORING DATA

	INFLUENT													
	Biochemical Oxygen Demand (BOD5) (Not App				Flow (Not Applicable)			Solids (Residue) (Total suspended (TSS))				pH	pH	
	Lbs/Day		Mg/L		MGD			Lbs/Day		Mg/L		Standard U	Standard U	
	Maximum	Average	Maximum	Average	Average	Total	Maximum	Maximum	Average	Maximum	Average	Minimum	Maximum	
Date	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	Value	
1/2/2007	2776	1823	767	561	0.3796	11.7678	0.5744	1367	894	375	274	7.4	8.4	
2/5/2007	1763	1572	600	512	0.3812	10.6738	0.5573	1384	791	436	251	7.3	9.1	
3/5/2007	2336	1528	680	465	0.3724	11.5433	0.423	962	823	318	254	7.6	9.1	
4/1/2007	1217	1022	420	358	0.3177	9.532	0.3898	2019	872	708	304	7.4	7.9	
5/3/2007	1935	1216	513	365	0.4209	13.0465	0.8328	1517	917	443	276	7.4	7.8	
6/6/2007	2794	1492	520	377	0.4342	13.0262	0.7444	2111	1188	378	308	7.5	7.7	
7/1/2007	1202	645	531	335	0.2693	8.3477	0.337	828	519	430	304	7.3	7.7	
8/4/2007	847	640	377	285	0.2693	8.3483	0.2693	993	544	442	242	7.4	7.7	
9/7/2007	1071	966	383	345	0.347	10.41	0.371	914	784	318	280	7.3	7.6	
10/2/2007	1317	973	480	319	0.3624	11.233	0.56	1289	856	340	250	7.1	7.8	
11/5/2007	2228	1309	730	439	0.3501	10.503	0.502	1170	628	370	210	7.5	7.9	
12/7/2007	1663	1253	545	429	0.3781	11.722	1.02	998	716	380	249	7.5	7.8	
1/3/2008	1877	1157	640	398	0.3305	10.2448	0.377	658	539	234	187	6.4	7.8	
2/6/2008	1954	1498	610	464	0.4022	11.664	0.604	1185	840	370	254	7.4	7.7	
3/7/2008	2049	1270	740	431	0.3626	11.24	0.467	958	769	346	258	7.4	7.7	
4/3/2008	2505	1569	770	526	0.3371	10.113	0.445	1789	1065	550	352	7.3	7.8	
5/5/2008	2780	2048	110	716	0.3512	10.887	0.442	1371	686	372	227	7.2	7.9	
6/1/2008	2606	1683	930	545	0.3541	10.6239	0.449	1216	880	434	283	7.3	7.9	
7/3/2008	1770	1132	550	384	0.333	10.323	0.417	1462	807	520	274	7.3	7.8	
8/6/2008	2249	1766	670	653	0.3274	10.149	0.401	1213	697	480	261	7.3	7.9	
9/2/2008	1830	1542	630	485	0.3608	10.8236	0.422	1830	757	520	229	7.6	8.1	
10/4/2008	2136	1521	660	499	0.3729	11.561	0.538	677	484	232	158	7.2	7.8	
11/7/2008	4096	2306	1070	540	0.4141	12.423	0.949	760	592	198	149	7.3	8	
12/2/2008	2004	1506	610	489	0.3519	10.91	0.413	592	427	182	137	7	7.8	
1/5/2009	2365	1432	475	327	0.4197	13.0121	1.121	1234	679	160	148	5.7	8.2	
2/1/2009	1738	1379	550	455	0.3641	10.195	0.463	834	572	264	188	7.3	8.6	
3/1/2009	1706	1581	600	528	0.3625	11.237	0.646	721	533	242	177	7.1	7.8	
4/4/2009	2338	1522	730	527	0.3575	10.725	0.423	757	687	268	240	7.3	7.9	
5/6/2009	1196	1016	610	425	0.3547	10.996	0.704	905	532	328	218	7.3	8	
6/2/2009	2728	1586	870	508	0.3667	10.9996	0.435	1336	1045	426	333	7	7.8	
7/4/2009	1635	1174	555	413	0.3355	10.399	0.44	1306	558	488	201	7	7.7	
8/7/2009	1455	1181	510	392	0.3441	10.666	0.437	764	522	268	171	7	7.8	
9/3/2009	1340	1222	425	374	0.3666	11.597	0.466	1475	765	486	243	7.1	7.8	
10/5/2009	2634	1649	658	490	0.3922	12.157	0.576	912	580	284	177	7.3	7.9	
11/1/2009	1825	1469	585	494	0.3608	10.8923	0.531	1360	739	436	246	7.3	8	
12/3/2009	1861	1477	595	480	0.3528	10.936	0.427	976	476	380	164	7.4	7.9	
1/6/2010	1535	1283	500	379	0.3773	11.695	0.54	687	539	224	161	7.1	7.8	
2/2/2010	2502	1669	750	539	0.3747	10.492	0.741	734	513	220	169	6.3	7.8	
3/2/2010	1942	1489	710	518	0.3319	10.289	0.423	1029	716	376	248	5.4	8	
4/5/2010	2404	1494	710	510	0.3476	10.4273	0.498	1084	743	380	257	7.1	8.4	
Min	847	640	110	285	0.27	8.35	0.27	592	427	160	137	5.4	7.6	
Max	4096	2306	1070	716	0.43	13.05	1.12	2111	1188	708	352	7.6	9.1	
Avg	2005.23	1401.5	609.23	456.98	0.36	10.95	0.53	1134.43	706.85	365.15	232.8	7.15	7.95	
Median	1938.5	1483	605	464.5	0.36	10.89	0.46	1056.5	706.5	373.5	244.5	7.3	7.8	
95th %	2780	1823	870	561	0.42	13.01	0.95	1830	1045	520	308	7.5	8.6	

APPENDIX C--RESPONSE TO COMMENTS

No comments were received by the Department of Ecology.

Appendix E
Operator Safety

CONTENTS

Appendix E - Operator Safety 2
General Safety Topics 2
Biological Hazards 2
Chemical Usage 3
Confined Space 3
Electrical Hazards 4
Fire Protection and Prevention 4
Fall Prevention 4
Open Water Safety 5
Personal Protective Measures 5
Specific Safety Topics 6
Belt Filter Press System 6
Grit Separation Devices 6
Laboratory Work 6
Polymer Systems 7
Screening Devices 7
Ultraviolet Light 7

APPENDIX E - OPERATOR SAFETY

Safe operation of a wastewater facility is affected by variety of factors, the majority of which cannot be covered in this manual. The primary safety concerns related to the operation of this plant have been described briefly in this Appendix. General safety protocols have been listed, but these in no way override the requirements of OSHA and the City's safety procedures. Below are excerpts from, and references to, WEF's 6th edition of *Safety, Health and Security in Wastewater Systems (Safety Manual)*, which should be on site at the treatment plant at all times. The *Safety Manual* should be considered the plant personnel's "go-to" reference manual for safety issues.

The OSHA requires the facility to have its own written safety program. At a minimum, the program must include the following elements as excerpted from the *Safety Manual*:

- Emergency Action Plan
- Fire Prevent/Protection Plan
- Bloodborn Pathogen Exposure Control Plan
- Hazard Communication Program
- Respiratory Protection Program
- Hearing Conservation Program
- Permit-required Confined Space Entry
- Fall Protection Program
- Personal Protective Equipment

It should be the goal of all plant personal to adopt a culture of safe operation. Continued personnel safety is an ongoing and evolving process. New personnel must be adequately taught safety procedures while experienced personnel must make a point to continuously follow safety procedures. Safety-related incidences should always be investigated and thoroughly documented for the purpose of amending the safety program in order to limit incident recurrence.

GENERAL SAFETY TOPICS

Biological Hazards

This section is generally relevant to the entire plant.

Working with raw wastewater exposes operators to parasites, bacteria, and viruses. Infection can be caused through ingestion, inhalation, or direct contact. The primary method for alleviating exposure to these pathogens is for the operator to always use proper personal protective equipment when working with raw sewage. This will likely include protective clothing and eyewear as well as some form of respiratory protection. Further, wastewater personnel should be vaccinated as recommended by the U.S. Public Health Service. These protective measures along with proper working procedures will reduce the wastewater personnel's likelihood of contracting an infectious disease.

Refer to the *Safety Manual* Chapter 8 for further detail on Biological Hazards.

Chemical Usage

This section is specifically relevant to the Laboratory and Solids Handling Building.

Chemicals are used both in the Laboratory and in the Solids Handling Building Dewatering room (see Polymer section of this Appendix). Chemical handling should only be carried out when the operator is wearing proper protective clothing. The operator should be aware of the particular hazards related to each chemical used (MSDSs practical safety data "sheet" should be available for personnel handling chemicals). The operator should also be aware that spilt chemicals can cause slip hazards for personnel.

Refer to the *Safety Manual* Chapter 4, Section 3.3 for further detail on Chemical Usage.

Confined Space

This section is specifically relevant to the Headworks flow splitter, activated sludge basins, clarifiers, non-potable sump, UV sumps, digesters, IPPS manholes, site manholes, and metering vaults.

Entry into confined space locations throughout the site is expected periodically for maintenance work. These spaces pose the hazards of entrapping the occupant in a space that could quickly flood or cause toxic gas inhalation. The following locations throughout the site could be considered confined spaces:

- Headworks flow splitter
- Activated sludge basin cells (the mixing chimneys, collection boxes, and launder chimneys are especially confined)
- Clarifiers
- Non-potable sump
- UV inlet and outlet sumps
- Aerobic digesters
- IPPS wet-wells and drywells
- Site sewer manholes
- Metering vaults

The plant personnel have the obligation to evaluate all potential confined spaces and determine whether or not they are deemed a confined space. For each space classified as a confined space, the operators must determine if it is a permit-required or non-permit-required space as outlined in the *Safety Manual* Chapter 5, Section 8.0. The plant operators must follow the confined space pre-checklist and procedures outlined in the facility's safety plan for these spaces.

Many of these locations, particularly the basins and digesters, require extension ladders for entry and involve a significant fall potential. Refer to the Fall Protection section of this Appendix for these locations.

Refer to the *Safety Manual* Chapter 5, Section 8.0 for further detail on Confined Space Entry.

Electrical Hazards

This section is generally relevant to the entire plant.

Throughout the plant, proper lockout/tagout procedures must be followed by all personnel. OSHA requires a detailed "energy control procedure" for the facility. In general, all electrically-powered equipment must be de-energized prior to work on the equipment. Testing of the state of the device must also be done prior to lockout. Only qualified workers shall be permitted to work on electrical systems in the plant and at least two workers must always be present when working with live electrical systems. Proper protective equipment must be utilized at all times.

Refer to the *Safety Manual* Chapter 5, Section 2.0 and Section 6.0 for further detail on Electrical Hazards.

Fire Protection and Prevention

This section is generally relevant to the entire plant.

Wastewater personnel should be aware of the location of fire extinguishers throughout the plant and be proficient in using them. Extinguishers are located near the exits of each building, except the Administration building which contains two cabinet extinguishers. All fire extinguishers shall be rated "ABC." The wastewater personnel must keep each extinguisher properly serviced.

Refer to the *Safety Manual* Chapter 5, Section 7.0 for further detail on Fire Protection and Prevention.

Fall Prevention

This section is relevant to the entire site with specific areas of concern detailed in the following subsections.

The aeration basin walls and walkways are approximately 18 feet above the basin floor while those in the digesters are over 23 feet tall. Work in these areas presents significant fall potential. Work outside of the guardrail over an empty basin requires a personal anchorage system to be worn and at minimum two workers present to do the work. Overhead work above an active basin is discussed in the following Open Water section.

Entrance to the cells will require usage of extension ladders. Ladders shall be tied off at all times during usage. Refer to the Confined Space section in this Appendix.

Slippery surfaces are likely especially in and around the basins and digesters. Walkways, stairs, ladders, and especially the floors should be expected to be slippery.

Refer to the *Safety Manual* Chapter 10, Section 6.0 for further detail on Fall Protection.

Open Water Safety

This section is specifically relevant to the activated sludge basins, clarifiers, digesters, and evaporation pond.

Aerated sludge in the basins and digesters present a significant drowning risk. Aerated sludge is much less dense than non-aerated water, thus making it extremely difficult for a swimming body to stay on the surface. If any work is to be done outside of the guardrails above a live basin, life preservers must be worn and at least two people must be available to provide rescue measures if needed. Further, a fall protection system must be worn by anyone working outside the guardrail. Life rings and life hooks should be available on the walkways for rescue purposes.

Personal Protective Measures

This section is relevant to the entire plant with specific areas of concern listed below.

Refer to the *Safety Manual* Chapter 10 and Chapter 5, Section 1.0 for further detail on each form of Personal Protective Equipment listed as follows.

Head Protection

Hard hats should be worn by operators throughout the plant, especially when doing any sort of maintenance work. Hard hats worn should be comply with ANSI standards relevant to the type of work being performed. Head protection may also include month protection to prevent oral contamination from splashing sewage or chemicals.

Eye Protection

Eye protection will likely be needed in areas of operating machinery and while using tools for maintenance work. Further, eye protection should be utilized in all areas where the possibility of fluid or chemical splashing is present. Within the laboratory, two eye wash stations are present.

Ear Protection

Ear protection will likely be needed in areas of operating machinery. The blower rooms of the plant may be especially loud and require ear protection. Using tools and machinery for maintenance work will also require the usage of ear protection, especially in areas where noise is heavily reverberated such as within the basins.

Bodily Protection

Bodily protection can consist of both physical protective clothing as well as proper ergonomics while doing physical work. Hard hats should be worn during all maintenance work. Protective clothing such as hand, foot, and skin protection should be worn especially when working areas of biological hazards (i.e.,

the Headworks, basins, IPPS wetwell, digesters). Refer to the Biological Hazards section for further information.

Respiratory Protection

Any worker wearing personal respiratory equipment should undergo an annual "fit" test. The test will determine the correct respirator fit for each worker. The areas within the plant that could necessitate respiratory protection are the potential confined spaces.

SPECIFIC SAFETY TOPICS

Belt Filter Press System

This section is specifically relevant to the Solids Handling Building.

During all operation of the filter press system, it is recommended that the operator wear protective eye wear and clothing to protect against splashing sludge, filtrate, or chemicals. Further, ear protection may be necessary due to machinery noise.

The belt filter press will also emit gases as it processes digested sludge. The operator should be aware of this and make sure the HVAC system is functioning properly during cake production.

The operator should be aware that electrical and mechanical hazards exist with the belt filter press as with all equipment.

Refer to the *Safety Manual* Chapter 4, Section 3.5.3 for further detail on Belt Filter Press devices.

Grit Separation Devices

This section is specifically relevant to the Headworks.

Grit separation devices, as found in the Headworks upper and lower levels, pose the danger related to electrical shock, fall potential, drowning and confined space dangers. Refer to these specific sections of this manual for more information on mitigating each of these dangers.

Refer to the *Safety Manual* Chapter 4, Section 2.2.2 for further detail on grit separation devices.

Laboratory Work

This section is specifically relevant to the Administration Building Laboratory.

Work within the Laboratory primarily presents chemical handling hazards. The operator should be aware of the specific hazards of each chemical used and wear protective clothing when working with chemicals. The laboratory contains two eye wash stations and one safety shower.

Refer to the *Safety Manual* Chapter 4, Section 5.0 for further detail on Laboratory Safety.

Polymer Systems

This section is specifically relevant to the Solids Handling Building.

Polymer is used in the Solids Handling Dewatering Room. It is injected upstream of the Belt Filter Press. Operators should be aware that polymer is very slippery when spilled. Also, it is an eye, skin, and nasal irritant – protective clothing should be worn when working with polymer.

Refer to the *Safety Manual* Chapter 4, Section 3.3.2 for further detail on Polymer.

Screening Devices

This section is specifically relevant to the Headworks.

Mechanical screens, such as the two fine screens at the Headworks influent channels, pose the danger of both mechanical injury (lacerations and amputation) as well as electrical shock injury. To prevent both types of danger, the equipment should be shut down and de-energized prior to any work on or around the device. Also refer to the Electrical Hazard section of this manual for more information regarding de-energizing equipment.

Refer to the *Safety Manual* Chapter 4, Section 2.2.1 for further detail on Screening devices.

Ultraviolet Light

This section is specifically relevant to the UV Building

Maintenance work of with the UV disinfection system will require personal protective measures if chemicals are used during lighting cleaning. Electrical safety is also required with this equipment.

Refer to the *Safety Manual* Chapter 4, Section 2.6.5 for further detail on Ultraviolet Light.

Appendix F
Routine Operation and Maintenance Checklists

OPERATIONS AND MAINTENANCE CHECKLISTS

Checklists by Area

1. Area 1 Checklist
2. Area 2 Checklist
3. Area 3 Checklist
4. Area 4 Checklist
5. Area 5 Checklist
6. Area 6 Checklist
7. Area 7 Checklist

Checklists by Interval:

8. Daily Checklists
9. Weekly Checklists
10. Monthly Checklists
11. Quarterly Checklists
12. Semi-Annually Checklists
13. Annually Checklists
14. Greater than Annually Checklists

Area	Building	Building Location	Item	Action	Date	Initials
Area 1	Headworks	Upper Floor	Slide Gates	Visual inspection for obstructions		
Area 1	Headworks	Upper Floor	Stop Logs	Visual inspection for obstructions		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	General Visual Inspection and Cleaning - Check brush for good cleaning contact against the screen basket. Check unit to insure proper operation is maintained. Check that the solids are being transported to the discharge point. Inspect solids receptacle to insure that its volume is not in danger of overfilling or backing up into Helisieve unit. Rinse accumulated solids off of exterior surfaces. Clean other components as needed.		
Area 1	Headworks	Upper Floor	Trash Rack / Bar Screen	Visual inspection; Clean as necessary.		
Area 1	Headworks	Upper Floor	Influent Structure and Channels	Verify proper flow, remove obstructions, washdown as necessary		
Area 1	Headworks	Grit Room	Screenings Disposal Dumpsters	Visual inspection		
Area 1	Headworks	Grit Room	Expansion Joint	Visually inspect		
Area 1	Headworks	Grit Room	Grit Cyclone	Visual inspection		
Area 1	Headworks	Upper Floor	Grit Unit	Visual inspection		
Area 1	Headworks	Upper Floor	Composite Sampler	Visual inspection		
Area 1	Headworks	Grit Room	Grit Recessed Impeller Pump	Visual inspection		
Area 1	Headworks	Entire Building	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Flush Press Zone - Manually flush press zone by turning water spray on. Slow water discharge at the end of the drain hose may indicate blockage of spray pipe orifices or drain hose.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Level Switch Device - Check level switch device for obstructions that will interfere in the proper operation of the unit. Remove debris as needed.		
Area 1	Headworks	Mechanical Room	Plug Valve - Auma Gearbox	Fully operate gear box		
Area 1	Equipment Bldg	Mechanical Room	Tankless Hot Water Heater	Verify proper operation		
Area 1	Headworks	Electrical Room	Window AC Unit	Clean filter and unit		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Check Drive Shaft Bolt - Remove the plastic end cap on the gear reducer and ensure that the bolt holding the drive shaft to the reducer is tight.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Check Gear Reducer Oil Level - Check that the oil level in the reducer is at the bottom of the oil level plug. If necessary, add oil to bring to proper level.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Brush and Wear Shoes - Check brush for excessive wear. The brush should be cleaning the entire screen face of screen basket and the unit should be able to handle the flow. Replace the brush when brush bristles are even with the spiral OD, there are brush bristles missing or the screen can no longer handle the flow. Check the wear shoes. Replace if worn even with the spiral OD.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Channel Seals - Check seals for damage, wear or age. Replace if seals are unable to prevent solids from by-passing the screen.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Drain Lines - Visually inspect drain lines for cracks or signs of deterioration.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Scraper Plate - Remove inspection door on discharge chute and inspect the scraper plate. Tighten bolts as necessary. Replace or repair scraper if it is damaged.		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Inspect Wear Bars - Visually check wear bars for excessive wear. Remove a bolt holding wear bar in place. If bolt is less than .38 inch long, replace wear bars and bolts. If leading edges of wear bars are raised up from transport tube, tighten wear bar bolts. Replace wear bars if leading edges are bent.		
Area 1	Headworks	Grit Room	Grit Cyclone	It is important to maintain smooth surfaces on the interior of the cyclone. The cyclones should be inspected on a regular basis. When the interior surfaces become worn or uneven, the part should be replaced. After experience has been gained in operating the cyclones under given conditions, a regular maintenance schedule can be determined. Once the apex opens more than 10% of its original size, it should be replaced.		
Area 1	Headworks	Upper Floor	Grit Unit	Reducer - Check oil level and breather. Bolts and Fasteners - Check for looseness, tighten as required.		
Area 1	Headworks	Grit Room, Upper Floor	Solenoid Valve	Visually inspect for proper operation; clean and inspect internal valve parts		

Area	Building	Building Location	Item	Action	Date	Initials
Area 1	Headworks	Electrical Room	Variable Frequency Drives	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.		
Area 1	Headworks	Mechanical Room	Floor Drain Trap Primer System	Verify proper operation of solenoid		
Area 1	Headworks	Upper Floor	Slide Gates	Gates, slide, sluice and weir gates should be cleaned and operated.		
Area 1	Headworks	Mechanical and Grit Rooms	Duct Heater	Tighten electrical connections. Operater heating elements.		
Area 1	Headworks	Upper Floor	Level Transmitter - Ultrasonic	Clean sensor as necessary		
Area 1	Headworks	Mechanical and Grit Rooms	Duct Fan	Lubricate fan bearings.		
Area 1	Headworks	Upper Floor	Roof Exhaust Fans	Lubricate fan bearings.		
Area 1	Headworks	Grit Room	Wall Exhaust Fans	Lubricate fan bearings.		
Area 1	Headworks	Mechanical Room	Plug Valve - Auma Actuator	Visually inspect; check wire connections, etc; inspect bolts for tightness; preform run test (every 6 months)		
Area 1	Headworks	Electrical Room	Window AC Unit	Clean coils and chassis		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Check gear reducer output shaft for abnormal play. Check spiral for wear or warpage. Inspect press zone for signs of damage, clean spray nozzle, inspect stationary cutter, tight bolts as necessary. Inspect heating system and thermostat. Inspect electrically operated switches (solenoid, door intrusion switch, electrical switches)		
Area 1	Headworks	Both Floors	Plug Valve	Full open and close each valve at least every 6 months		
Area 1	Headworks	Both Floors	Plug Valve	Full open and close each valve at least every 6 months		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Perform infrared scan		

Area	Building	Building Location	Item	Action	Date	Initials
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Visually inspect and clean the enclosure prior to opening panels		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Bus Bar: visually inspect insulators		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Bus Bar: visually inspect wiring		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Disconnects: visually inspect and clean		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Disconnects: verify proper operation		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Contactors: visually inspect and clean		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Electrical Interlocks: inspect		
Area 1	Headworks	Electrical Room	MCCs 101 and 102	Mechanical Interlocks: inspect		
Area 1	Headworks	Both Floors	Electromagnetic Flowmeter	Check seals; calibrate as recommended by manufacturer		
Area 1	Headworks	Mechanical and Grit Rooms	Duct Fan	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 1	Headworks	Upper Floor	Roof Exhaust Fans	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 1	Headworks	Grit Room	Wall Exhaust Fans	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 1	Headworks	Mechanical Room	Plug Valve - Auma Gearbox	Inspect bolts for tightness; preform run test (every 6 months); inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)		
Area 1	Headworks	Upper Floor	Vault Hatches	Lubricate moving parts		
Area 1	Headworks	Upper Floor	Mechanical Fine Screens and Hopper	Change oil in gear reducer. Thoroughly inspect and clean unit.		
Area 1	Headworks	Upper Floor	Radiant Space Heater	Clean heater assembly. Tighten electrical connections.		
Area 1	Headworks	Upper Floor	Heat Trace System - Self Regulating Cable	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit		
Area 1	Headworks	Upper Floor	Grit Unit	10,000 service hours or two years, Reducer - drain oil and refill with Mobilegear 600 XP220.		
Area 1	Headworks	Upper Floor	Grit Unit	Bi-annually, Reducer - grease lubricated seals. Turbine Blade - Check for wear. All Parts - Replace worn or damaged parts. Touch up nicks of scratches in paint.		
Area 1	Headworks	Mechanical and Grit Rooms	Duct Heater	Tighten hangers and mechanical connections. Check fuses, contactors, element resistance.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers	Check for obvious noises, vibrations and changes		
Area 2	Basins	Activated Sludge Basins and EQ Basin	Launders and Wasting Boxes	Verify proper flow, remove obstructions, washdown as necessary		
Area 2	Basins	Activated Sludge Basins	Sprayer Bar and Nozzles	Verify proper operation. Verify heat tracing is operable during winter months.		
Area 2	Basins	Activated Sludge Basins	Expansion Joint	Visually inspect		
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers - Gearboxes	Check for tightness of connections at gearbox; check covers and plugs		
Area 2	Basins	Activated Sludge Basins	Adjustable Weir	Clean weirs, check for debris; verify proper operation		
Area 2	Basins	Activated Sludge Basins	Air Diffusion Equipment	Visually inspect the aeration basin surface pattern. The flow should be, for the most part, a nice quiescent pattern. Some course bubbles at the basin inlet may occur due to surfactants in the wastewater and is generally dispersed shortly downstream. Excessive coarse bubbling throughout the tank idicates the diffusers may be fouling. Large boiling in an isolated area indicates a failure in the submerged piping. Keep record of air system pressure daily. Continuous increasing operating pressure indicates diffuser fouling.		
Area 2	Basins	Entire Building	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 2	Basins	Activated Sludge Basins	Butterfly Valve - Limitorque Actuator	Change the oil level every 100 hours of operation if in a Hazardous Area		
Area 2	Basins	Activated Sludge Basins	Butterfly Valve - Limitorque Actuator	Check the oil level every 50 hours of operation if in a Hazardous Area		
Area 2	Basins	Activated Sludge Basins	Air Diffusion Equipment	Purge moisture from each cell's diffuser grid manually at the ball valves located on the catwalks. Bump air flow to 3 SCFM for 20-30 min (SCADA system to preform) to remove debris from membranes. Bump air to offline basins as well.		
Area 2	Basins	Activated Sludge Basins	Slide Gate - Auma Gearbox	Fully operate gear box		
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers - Motors	Check temperature of housing.		
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers - Gearboxes	Check oil level.		
Area 2	Basins	Activated Sludge Basins	DO Sensor	Clean the sensor and inspect for damage		
Area 2	Basins	Activated Sludge Basins and EQ Basin	Submersible Pumps	Every three months. Inspect cable for chafing, cuts, or abrasion. Inspect lifting chains.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers - Motors	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.		
Area 2	Basins	Activated Sludge Basins	Slide Gates	Gates, slide, sluice and weir gates should be cleaned and operated.		
Area 2	Basins	Activated Sludge Basins	Butterfly Valve - Limitorque Actuator	All ball bearings, oil seals, O-rings and quad-rings are to be replaced after 450 hours of operation if in a Hazardous Area		
Area 2	Basins	Activated Sludge Basins	Butterfly Valve - Limitorque Actuator	Clean and lubricate the valve		
Area 2	Basins	Activated Sludge Basins	Slide Gate - Auma Actuator	Visually inspect; check wire connections, etc; inspect bolts for tightness; preform run test (every 6 months); inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)		
Area 2	Basins	Activated Sludge Basins	Level Transmitter - Ultrasonic	Clean sensor as necessary		
Area 2	Basins	Activated Sludge Basins and EQ Basin	Submersible Pumps	Every six months. Wash down unit and check amp draw. If unit performance decreases. Check impeller/wear plate/wear rings.		
Area 2	Basins	Activated Sludge Basins	Top Entering Tank Mixers - Gearboxes	Check condition of gearbox oil. Check the gearbox seals visually for leakage. Clean or change gear ventilation.		
Area 2	Basins	EQ Basin	Level Switch - Float	Verify proper operation		

Area	Building	Building Location	Item	Action	Date	Initials
Area 3	Clarifiers	Clarifier	Clarifier Mechanism	Check drive unit for unusual sounds, excessive vibrations, oil leakage, etc. Check skimmer for proper operation. Check scum pipe for proper drainage.		
Area 3	Clarifiers	Clarifier	Launders / Drop Structure / Scum Box	Verify proper flow, remove obstructions, washdown as necessary		
Area 3	Clarifiers	Clarifier	Sprayer Bar and Nozzles	Verify proper operation. Verify heat tracing is operable during winter months.		
Area 3	Clarifiers	Entire Area	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 3	Clarifiers	Clarifier	Clarifier Mechanism	Check all drive components for water condensation - drain as required & top of oil levels. Clean Drive Unit exterior. Check all drive components for proper oil level - add as required.		
Area 3	Clarifiers	Clarifier	Sawtooth Weir and Skimmings Baffle	Clean weirs, check for debris; verify proper operation		
Area 3	Clarifiers	Clarifier	Clarifier Mechanism	Fill out inspection reports from ESI on the first day of each month. Check mounting bolts for tightness		
Area 3	Clarifiers	Clarifier	Clarifier Mechanism - Primary and Secondary Gear Reducers	Check oil level. Check condition of gearbox oil.		
Area 3	Clarifiers	Clarifier	Clarifier Mechanism	Test synthetic oil for contaminates, viscosity breakdown, thermal breakdown, etc.		
Area 3	Clarifiers	Clarifier	Clarifier Mechanism	Collect oil sample from main bath housing and submit report with sample to ESI along with monthly inspection reports.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Visually inspect for dust/debris accummulation and clean as necessary		
Area 4	Equipment Bldg	Mechanical Room	Pressure Transmitter (NPW Pump Station)	Remove and check for debris; verify calibration		
Area 4	Equipment Bldg	Blower Room	Rotary Positive Displacement Blowers	Check vacuum pressure; check discharge pressure; check discharge air temp; check screwed connection tightness		
Area 4	Equipment Bldg	Blower Room	Air Compressor (DAF Unit)	Check oil level, verify bolts are tight, drain condensate, check for loose parts or excessive noise/vibration. Clean electrical equipment as necessary.		
Area 4	Equipment Bldg	Mechanical Room	Packaged Booster Pump Station	Log elapsed time for each pump;check suction gauge for prime; verify any alarms		
Area 4	Equipment Bldg	Pump, Thickening, and Blower Rooms	Expansion Joint	Visually inspect		
Area 4	UV Bldg	UV Channel	Composite Sampler	Visual inspection		
Area 4	UV Bldg	UV Channel	Control Weir (UV Channel)	Clean weirs, check for debris; verify proper operation		
Area 4	UV Bldg	UV Channel	UV System	Visually inspect; check system faults and alarms; check that banks and wiper groups are both in REMOTE AUTO; inspect lower water level sensor for debris and clean as necessary; visually inspect manifold and HSC for hydraulic leaks		
Area 4	Equipment Bldg	Entire Building	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 4	UV Bldg	Entire Building	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Automatic Start/Stop - Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Battery Charger - Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Battery Electrolyte Level - Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Cooling System Coolant Level- Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Electrical Connections - Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine Air Cleaner Service Indicator- Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine Oil Level - Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Fuel System Primary Filter/Water Separator - Drain		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Fuel Tank Water and Sediment - Drain		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Generator - Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Generator Bearing Temperature - Test/Record		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Generator Lead-Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Instrument Panel-Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Jacket Water Heater-Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Power Factor-Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Space Heater-Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Standby Generator Set Maintenance Recommendations		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Voltage and Frequency-Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Walk-Around Inspection		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Battery - Recycle		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Battery - Replace		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Battery or Battery Cable - Disconnect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Circuit Breakers -Reset		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Fuel System - Prime		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Generator -Dry		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Generator Load - Check		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Generator Set - Test		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	When required - Rotating Rectifer - Test		
Area 4	Equipment Bldg	Blower Room	Rotary Positive Displacement Blowers	Check/clean intake filter and replace as necessary; check and correct oil level as necessary		
Area 4	Equipment Bldg	Mechanical Room	Automatic Self-cleaning Filter	Manually close low pressure sensor port to verify that proper flush cycle is initiated; clean filter on exhaust solenoid; check drive shaft grease; check for any leakage		
Area 4	Equipment Bldg	Blower Room	Compressed Air Dryer (DAF Unit)	Clean dryer as necessary, inspect and clean the filter of condensate drain.		
Area 4	Equipment Bldg	Blower Room	Butterfly Valve - Limitorque Actuator	Change the oil level every 100 hours of operation if in a Hazardous Area		
Area 4	Equipment Bldg	Blower Room	Butterfly Valve - Limitorque Actuator	Check the oil level every 50 hours of operation if in a Hazardous Area		
Area 4	Equipment Bldg	Mechanical Room	Packaged Booster Pump Station	Run each pump in HAND mode to verify operation; note discharge pressure for each pump		
Area 4	Equipment Bldg	Mechanical Room	Solenoid Valve (NPW Pump Station)	Visually inspect for proper operation; clean and inspect internal valve parts		
Area 4	Equipment Bldg	Thickening Room	Solenoid Valve (DAF Unit)	Visually inspect for proper operation; clean and inspect internal valve parts		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Operate engine generator and observe for proper operation		
Area 4	Equipment Bldg	Blower Room	Air Compressor (DAF Unit)	Remove, check and replace air filter if necessary. Check belt tension		
Area 4	Equipment Bldg	Blower Room	Compressed Air Dryer (DAF Unit)	Brush or blow off the finned surface of the condenser monthly.		
Area 4	Equipment Bldg	Mechanical Room	Float Valve	Periodically inspected and provide maintenance as necessary. No lubrication required.		
Area 4	Equipment Bldg	Pump Room	Sewage Air Relief and Vacuum Valve	Periodically inspect for leakage and backflush		
Area 4	Equipment Bldg	Mechanical Room	Water Air Relief and Vacuum Valve	Periodically inspect for leakage		
Area 4	Equipment Bldg	Mechanical Room	Tankless Hot Water Heater	Verify proper operation		
Area 4	Equipment Bldg	Pump, Thickening Rooms	Ball Check Valves	Visually inspect for leaks; verify no obstructions exist in valve		
Area 4	Equipment Bldg	Electrical Room	Window AC Unit	Clean filter and unit		
Area 4	UV Bldg	UV Channel	UV System - Hydraulic System	Initiate wipe sequence and check pressure is within 180-200 psi		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	UV Bldg	UV Channel	UV System - Low Water Level Sensor	Clean as necessary		
Area 4	UV Bldg	UV Channel	UV System - Module	Remove debris and clean; check power cable strain relief for tightness		
Area 4	UV Bldg	UV Channel	UV System - Water Level Control	Visually inspect for debris		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Inspect the area, especially where switching device is installed, for any safety hazards, including personnel safety and fire hazards. Exposure to certain chemical vapors can cause deterioration of electrical connections.Inspect for accumulated dirt, loose hardware, or physical damage. Examine the primary insulation for vidence of cracking or overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. Inspect the secondary control connections for damage and the control wiring for insulation integrity.		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Remove dust, dirt, soot, grease, moisture, and corrosion contamination from the surface of the switching device using a dry soft lint-free cloth, dry soft bristle brush, and vacuum cleaner. Do not blow debris into the power contactor. If contamination is found, look for the source and fix the problem.		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Severe material cracking will require replacement and loose hardware will need to be tightened.		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Overheating will show as discoloration, melting, or blistering of the conductor insulation. Connections that do not have signs of looseness or overheating should not be disturbed.		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	Remove all the screws on the molded cover over the power assembly. Inspect the contacts. Contact your Cat dealer if the contacts have excessive wear. Reinstall the molded cover and tighten screws to 17 in-lbs.		
Area 4	Equipment Bldg	Electrical Room	Automatic Transfer Switches	If the power contactor is used for frequent switching during normal operation, this step can be disregarded.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	Equipment Bldg	Electrical Room	Variable Frequency Drives	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.		
Area 4	Equipment Bldg	Blower Room	Floor Drain Trap Primer System	Verify proper operation of solenoid		
Area 4	Equipment Bldg	Blower Room	Rotary Positive Displacement Blowers	Check function of pressure valve		
Area 4	Equipment Bldg	Blower Room	Air Compressor (DAF Unit)	Change oil		
Area 4	Equipment Bldg	Blower Room	Rotary Positive Displacement Blowers	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.		
Area 4	Equipment Bldg	Thickening Room	DAF Unit, Flocculator, and Accessories	DAF recycle pump, establish an interval. a) Any auxiliary systems installed must be monitored, if necessary, to ensure they function correctly. b) Gland packing must be adjusted correctly to give visible leakage and concentric alignment of the gland follower to prevent excessive temperature of the packing or follower. c) Check for any leaks from gaskets and seals. The correct functioning of the shaft seal must be checked regularly. d) Check bearing lubricant level, and the remaining hours before a lubricant change is required. e) Check that the duty condition is in the safe operating range for the pump.		
Area 4	Equipment Bldg	Blower Room	Butterfly Valve - Limitorque Actuator	All ball bearings, oil seals, O-rings and quad-rings are to be replaced after 450 hours of operation if in a Hazardous Area		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	Equipment Bldg	Blower Room	Butterfly Valve - Limitorque Actuator	Clean and lubricate the valve		
Area 4	UV Bldg	Effluent Metering Vault	Sump Pump	Visually inspect for proper operation		
Area 4	UV Bldg	UV Channel	Davit Crane	Visually inspect and clean as necessary. Lubricate roller assembly, all pins, and ratchet jack.		
Area 4	Equipment Bldg	Pump Room	RAS Screw Centrifugal Pumps	Every 500 hours or three months, Check motor for proper operation.		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Cooling System Coolant Sample (Level 1) - Obtain		
Area 4	UV Bldg	UV Channel	Level Transmitter - Ultrasonic	Clean sensor as necessary		
Area 4	Equipment Bldg	Mechanical Room	Level Transmitter - Submersible	Change desiccant and clean transducer as necessary		
Area 4	Equipment Bldg	Pump, Thickening, Blower, Mechanical Rooms	Roof Exhaust Fans	Lubricate fan bearings.		
Area 4	Equipment Bldg	Blower Room	Rotary Positive Displacement Blowers	Check/clean inlet/outlet openings in acoustic hood; check/replace v-belts as necessary; replace oil if final compression temp above 140 deg C; replace grease if final compression temp above 140 deg C or is discolored		
Area 4	Equipment Bldg	Electrical Room	Window AC Unit	Clean coils and chassis		
Area 4	Equipment Bldg	Pump, Thickening Rooms	Plug Valve	Full open and close each valve at least every 6 months		
Area 4	Equipment Bldg	Mechanical Room	Swing Check Valves	Visually inspect for leaks; check bolt tightness; visually inspect for proper operation		
Area 4	Equipment Bldg	Pump, Thickening Rooms	Progressing Cavity Pumps	Check pump for proper mechanical seal leakage Check pump rotor and stator for wearing		
Area 4	Equipment Bldg	Pump, Thickening Rooms	Progressing Cavity Pumps	Pump Drive (Pin) Joints As Necessary Every 4,000 Op. Hours		
Area 4	Equipment Bldg	Thickening Room	Thickened Sludge Progressing Cavity Pumps	Check pump for proper mechanical seal leakage Check pump rotor and stator for wearing		
Area 4	Equipment Bldg	Thickening Room	Thickened Sludge Progressing Cavity Pumps	Pump Drive (Pin) Joints As Necessary Every 4,000 Op. Hours		
Area 4	UV Bldg	UV Channel	Davit Winch	Visually inspect and clean as necessary. Lubricate roller assembly, all pins, and ratchet jack.bearings and shafts. Lubricate winch gears before every operation.		
Area 4	UV Bldg	UV Channel	UV System - ActiClean System	Remove module debris and fill the wiper collars with ActiClean-WW Gel Apply grease to the wiper cylinder—done at same time as filling the ActiClean - WW Gel		
Area 4	Equipment Bldg	Pump Room	RAS Screw Centrifugal Pumps	Every 4,000 hours, Check bearing housing lubrication and grease as required.		
Area 4	Equipment Bldg	Pump Room	RAS Screw Centrifugal Pumps	Every 6 months, Check coupling alignment and adjust as required, check motor lubrication.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Perform infrared scan		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Visually inspect and clean the enclosure prior to opening panels		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Bus Bar: visually inspect insulators		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Bus Bar: visually inspect wiring		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Disconnects: visually inspect and clean		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Disconnects: verify proper operation		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Contactors: visually inspect and clean		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Electrical Interlocks: inspect		
Area 4	Equipment Bldg	Electrical Room	MCCs 401 and 402	Mechanical Interlocks: inspect		
Area 4	Equipment Bldg	Mechanical Room	Level Switch - Float	Verify proper operation		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Alternator - Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Belts - Inspect/Adjust/Replace		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Cooling System Coolant Sample (Level 2) - Obtain		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Cooling System Supplemental Coolant Additive (SCA)-Test/Add		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Crankshaft Vibration Damper - Inspect		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Cylinder Head Grounding Stud - Inspect/Clean/Tighten		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine - Clean		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine Air Cleaner Element (Dual Element) - Clean/Replace		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine Crankcase Breather - Clean		
Area 4	Equipment Bldg	Generator Pad	Emergency Generator	Engine Mounts - Inspect		

Area	Building	Building Location	Item	Action	Date	Initials
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check vacuum pressure; check discharge pressure; check discharge air temp; check screwed connection tightness		
Area 5	Digesters	Digesters	FRP Tank Covers	Visually inspect		
Area 5	Digesters	Digesters	Top Entering Tank Mixers	Check for obvious noises, vibrations and changes		
Area 5	Solids Bldg	Dewatering Room	Polymer Feed Unit (Belt Filter Press)	None from manufacturer		
Area 5	Digesters	Digesters	Top Entering Tank Mixers - Gearboxes	Check for tightness of connections at gearbox; check covers and plugs		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press - Rotary Drum Thickener Drive	Touch up or renew the surface/anticorrosion coating.		
Area 5	Digesters	Digesters	FRP Vent and Damper	Visually inspect		
Area 5	Solids Bldg	Entire Building	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press	Inspect washing manifolds every 10 hours of operation		
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check/clean intake filter and replace as necessary; check and correct oil level as necessary		
Area 5	Solids Bldg	Southside of Bldg	30-yard Dumpster	Visually inspect		
Area 5	Solids Bldg	Blower Room	Air Compressor (Belt Filter Press)	Check for unusal noise, failure to compress, overheating, oil leaks, and vibration. Drain all condensate from receiver and traps.		
Area 5	Solids Bldg	Dewatering Room	Solenoid Valve (Belt Filter Press)	Visually inspect for proper operation; clean and inspect internal valve parts		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press	Check air regulator, water filter, bearings, doctor blades, tracking limit switches every 160 hours of operation		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press	Clean & grease rails & rams every 40 hours of operation		
Area 5	Digesters	Digesters	Top Entering Tank Mixers - Motors	Check temperature of housing.		
Area 5	Equipment Bldg	Mechanical Room	Tankless Hot Water Heater	Verify proper operation		
Area 5	Solids Bldg	Electrical Room	Window AC Unit	Clean filter and unit		
Area 5	Solids Bldg	Blower Room	Air Compressor (Belt Filter Press)	Examine intake filter elements; check oil level; keep compressor clean		
Area 5	Digesters	Digesters	Top Entering Tank Mixers - Gearboxes	Check oil level.		
Area 5	Digesters	Digesters	ORP Sensors	Clean the sensor and inspect for damage		

Area	Building	Building Location	Item	Action	Date	Initials
Area 5	Solids Bldg	Electrical Room	Variable Frequency Drives	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.		
Area 5	Solids Bldg	Electrical Room	Variable Frequency Drives	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.		
Area 5	Solids Bldg	Dewatering Room	Floor Drain Trap Primer System	Verify proper operation of solenoid		
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check function of pressure valve		
Area 5	Digesters	Digesters	Top Entering Tank Mixers - Motors	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.		

Area	Building	Building Location	Item	Action	Date	Initials
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.		
Area 5	Solids Bldg	Blower Room	Air Compressor (Belt Filter Press)	Check and tighten all bolts and nuts Check air connections for air leaks Check belt tension. Inspect valves, clean if necessary		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press - Drive	Check oil & oil level; check seals visually for leakage; for gear units with a torque arm: check the rubber buffer & change it (if necessary)		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press - Rotary Drum Thickener Drive	Check oil & oil level; check seals visually for leakage; for gear units with a torque arm: check the rubber buffer & change it, if necessary		
Area 5	Solids Bldg	Dewatering Room	Duct Heater	Tighten electrical connections. Operater heating elements.		
Area 5	Digesters	Digesters	Level Transmitter - Ultrasonic	Clean sensor as necessary		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press	Grease all bearings, belt condition every 500 hours of operation		
Area 5	Solids Bldg	Dewatering Room	Duct Fan	Lubricate fan bearings.		
Area 5	Solids Bldg	Blower Room	Roof Exhaust Fans	Lubricate fan bearings.		
Area 5	Solids Bldg	Dewatering Room	Wall Exhaust Fans	Lubricate fan bearings.		
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check/clean inlet/outlet openings in acoustic hood; check/replace v-belts as necessary; replace oil if final compression temp above 140 deg C; replace grease if final compression temp above 140 deg C or is discolored		
Area 5	Solids Bldg	Electrical Room	Window AC Unit	Clean coils and chassis		
Area 5	Solids Bldg	Dewatering Room	Plug Valve	Full open and close each valve at least every 6 months		
Area 5	Solids Bldg	Evaporation Pond and Pump Station	Plug Valve	Full open and close each valve at least every 6 months		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press - Cake Transfer Pump	Inspect bearings every 10,000 hours		
Area 5	Digesters	Digesters	Top Entering Tank Mixers - Gearboxes	Check condition of gearbox oil. Check the gearbox seals visually for leakage. Clean or change gear ventilation.		
Area 5	Solids Bldg	Dewatering Room	Belt Filter Press - Drive	Touch up or renew the surface/anticorrosion coating.		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Perform infrared scan		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Visually inspect and clean the enclosure prior to opening panels		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Bus Bar: visually inspect insulators		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Bus Bar: visually inspect wiring		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Disconnects: visually inspect and clean		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Disconnects: verify proper operation		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Contactors: visually inspect and clean		

Area	Building	Building Location	Item	Action	Date	Initials
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Electrical Interlocks: inspect		
Area 5	Solids Bldg	Electrical Room	MCCs 501 and 502	Mechanical Interlocks: inspect		
Area 5	Headworks	Both Floors	Electromagnetic Flowmeter	Check seals; calibrate as recommended by manufacturer		
Area 5	Digesters	Digesters	ORP Sensors	Calibrate the sensor as recommended by regulatory agency		
Area 5	Solids Bldg	Dewatering Room	Duct Fan	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 5	Solids Bldg	Blower Room	Roof Exhaust Fans	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 5	Solids Bldg	Dewatering Room	Wall Exhaust Fans	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.		
Area 5	Solids Bldg	Blower Room	Rotary Positive Displacement Blowers	Check and replace non-return check valve if necessary; lubricate motor		

Area	Building	Building Location	Item	Action	Date	Initials
Area 6	Admin and Maint. Bldg	Laboratory	Fume Hood	Visually inspect for proper operation		
Area 6	Admin and Maint. Bldg	Both Bldgs	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 6	Admin and Maint. Bldg	Laboratory	Safety Shower and Eyewash	Operate safety eyewash and shower		
Area 6	Admin and Maint. Bldg	Laboratory	Thermostatic Mixing Valve	Check thermostatic mixing valve for proper operation while operating eyewash and shower		
Area 6	Admin and Maint. Bldg	Office and Control Area	Network, Communications and Security Equipment	Follow maintenance tasks detailed in manufacturer's O&M		
Area 6	Equipment Bldg	Mechanical Room	Tankless Hot Water Heater	Verify proper operation		
Area 6	Admin and Maint. Bldg	Admin Building and Shop	Floor Drain Trap Primer System	Verify proper operation of solenoid		
Area 6	Admin and Maint. Bldg	Mechanical Room	Air Handling Unit	Check air filter quarterly or as needed		
Area 6	Admin and Maint. Bldg	North side of Admin Bldg	Heat Pump	Change air filter as needed.		
Area 6	Admin and Maint. Bldg	Laboratory	Fume Hood Fan	Motor does not require lubrication. Clean fanwheel and housing.		
Area 6	Admin and Maint. Bldg	North side of Admin Bldg	Heat Pump	Clean indoor and outdoor coils.		
Area 6	Admin and Maint. Bldg	North side of Admin Bldg	Power Distribution Panel	Follow maintenance tasks detailed in manufacturer's O&M		

Area	Building	Building Location	Item	Action	Date	Initials
Area 7	IPPS	Entire Area	Housekeeping	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.		
Area 7	IPPS	Entire Area	Electrical Handholes	Visually inspect and clean as necessary		
Area 7	IPPS	Check Valve Vault	Ball Check Valves	Visually inspect for leaks; verify no obstructions exist in valve		
Area 7	IPPS	Throttling Valve Vault	Pinch Valve	Actuate valve and lubricate per manufacturer recommendations		
Area 7	IPPS	Wet Well	Submersible Pumps	Every three months. Inspect cable for chafing, cuts, or abrasion. Inspect lifting chains.		
Area 7	IPPS	Throttling Valve Vault	Sump Pump	Visually inspect for proper operation		
Area 7	IPPS	Wet Well	Level Transmitter - Submersible	Clean sensor as necessary		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Slide Gates	Golden Harvest Inc	Visual inspection for obstructions	Volume 5		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Stop Logs	Golden Harvest Inc	Visual inspection for obstructions	Volume 5		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	General Visual Inspection and Cleaning - Check brush for good cleaning contact against the screen basket. Check unit to insure proper operation is maintained. Check that the solids are being transported to the discharge point. Inspect solids receptacle to insure that its volume is not in danger of overfilling or backing up into Helisieve unit. Rinse accumulated solids off of exterior surfaces. Clean other components as needed.	Volume 2		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Trash Rack / Bar Screen	Intermountain	Visual inspection; Clean as necessary.	NA		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Influent Structure and Channels	NA	Verify proper flow, remove obstructions, washdown as necessary	NA		
Daily	**Area 1**	Headworks	Grit Room	Equipment	Screenings Disposal Dumpsters	NA	Visual inspection	NA		
Daily	**Area 1**	Headworks	Grit Room	Equipment	Expansion Joint	Red Valve	Visually inspect	NA		
Daily	**Area 1**	Headworks	Grit Room	Equipment	Grit Cyclone	Schloss Equipment	Visual inspection	Volume 2		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Grit Unit	Schloss Equipment	Visual inspection	Volume 2		
Daily	**Area 1**	Headworks	Upper Floor	Equipment	Composite Sampler	Teledyne/ISCO	Visual inspection	Volume 11		
Daily	**Area 1**	Headworks	Grit Room	Equipment	Grit Recessed Impeller Pump	Wemco	Visual inspection	Volume 2		
Daily	**Area 1**	Headworks	Entire Building	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers	Invent	Check for obvious noises, vibrations and changes	Volume 2		
Daily	**Area 2**	Basins	Activated Sludge Basins and EQ Basin	Equipment	Launders and Wasting Boxes	NA	Verify proper flow, remove obstructions, washdown as necessary	NA		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Sprayer Bar and Nozzles	NA	Verify proper operation. Verify heat tracing is operable during winter months.	NA		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Expansion Joint	Red Valve	Visually inspect	NA		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check for tightness of connections at gearbox; check covers and plugs	Volume 2		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Adjustable Weir	Strongwell	Clean weirs, check for debris; verify proper operation	NA		
Daily	**Area 2**	Basins	Activated Sludge Basins	Equipment	Air Diffusion Equipment	Xylem	Visually inspect the aeration basin surface pattern. The flow should be, for the most part, a nice quiescent pattern. Some course bubbles at the basin inlet may occur due to surfactants in the wastewater and is generally dispersed shortly downstream. Excessive coarse bubbling throughout the tank idicates the diffusers may be fouling. Large boiling in an isolated area indicates a failure in the submerged piping. Keep record of air system pressure daily. Continuous increasing operating pressure indicates diffuser fouling.	Volume 3		
Daily	**Area 2**	Basins	Entire Building	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	Envirodyne Systems Inc.	Check drive unit for unusual sounds, excessive vibrations, oil leakage, etc. Check skimmer for proper operation. Check scum pipe for proper drainage.	Volume 3		
Daily	**Area 3**	Clarifiers	Clarifier	Equipment	Launders / Drop Structure / Scum Box	NA	Verify proper flow, remove obstructions, washdown as necessary	NA		
Daily	**Area 3**	Clarifiers	Clarifier	Equipment	Sprayer Bar and Nozzles	NA	Verify proper operation. Verify heat tracing is operable during winter months.	NA		
Daily	**Area 3**	Clarifiers	Entire Area	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Visually inspect for dust/debris accummulation and clean as necessary	Volume 6		
Daily	**Area 4**	Equipment Bldg	Mechanical Room	Electrical / Instrument	Pressure Transmitter (NPW Pump Station)		Remove and check for debris; verify calibration	Volume 1		
Daily	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check vacuum pressure; check discharge pressure; check discharge air temp; check screwed connection tightness	Volume 3		
Daily	**Area 4**	Equipment Bldg	Blower Room	Equipment	Air Compressor (DAF Unit)	Atlas Copco	Check oil level, verify bolts are tight, drain condensate, check for loose parts or excessive noise/vibration. Clean electrical equipment as necessary.	Volume 3		
Daily	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Packaged Booster Pump Station	Pump Tech	Log elapsed time for each pump;check suction gauge for prime; verify any alarms	Volume 1		
Daily	**Area 4**	Equipment Bldg	Pump, Thickening, and Blower Rooms	Equipment	Expansion Joint	Red Valve	Visually inspect	NA		
Daily	**Area 4**	UV Bldg	UV Channel	Equipment	Composite Sampler	Teledyne/ISCO	Visual inspection	Volume 11		
Daily	**Area 4**	UV Bldg	UV Channel	Equipment	Control Weir (UV Channel)	Trojan	Clean weirs, check for debris; verify proper operation	Volume 3		
Daily	**Area 4**	UV Bldg	UV Channel	Equipment	UV System	Trojan	Visually inspect; check system faults and alarms; check that banks and wiper groups are both in REMOTE AUTO; inspect lower water level sensor for debris and clean as necessary; visually inspect manifold and HSC for hydraulic leaks	Volume 3		
Daily	**Area 4**	Equipment Bldg	Entire Building	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 4**	UV Bldg	Entire Building	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check vacuum pressure; check discharge pressure; check discharge air temp; check screwed connection tightness	Volume 3		
Daily	**Area 5**	Digesters	Digesters	Equipment	FRP Tank Covers	Enduro	Visually inspect	Volume 1		
Daily	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers	Invent	Check for obvious noises, vibrations and changes	Volume 2		
Daily	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Polymer Feed Unit (Belt Filter Press)	Seepex	None from manufacturer	Volume 4		
Daily	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check for tightness of connections at gearbox; check covers and plugs	Volume 2		
Daily	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Rotary Drum Thickener Drive	SEW Eurodrive	Touch up or renew the surface/anticorrosion coating.	Volume 4		
Daily	**Area 5**	Digesters	Digesters	Equipment	FRP Vent and Damper		Visually inspect	NA		
Daily	**Area 5**	Solids Bldg	Entire Building	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 6**	Admin and Maint. Bldgs	Laboratory	Equipment	Fume Hood	Kewaunee	Visually inspect for proper operation	Volume 5		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Daily	**Area 6**	Admin and Maint. Bldgs	Both Bldgs	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Area 7**	IPPS	Entire Area	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Visually inspect for proper operation, noise and vibration	Volume 2		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Self-priming Sewage Pump	Grainger	Visually inspection for proper operation	Volume 2		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	PVC Basket Strainer	Hayward	Visually inspect and clean as necessary	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Insulated Enclosure	Hubbell	Visually inspect	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Heater	Hubbell	Verify operating properly in winter months	NA		
Daily	**Site**	Site and Evap Pond	Site-wide	Equipment	Security Fencing and Gates	Idaho Fence	Visually inspect	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Pond Liner System	Northwest Linings	Visually inspect	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Expansion Joint	Red Valve	Visually inspect	NA		
Daily	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Rubber Flapper Check Valve	Red Valve	Visually inspect	NA		
Daily	**Site**	Site and Evap Pond	Entire Area	General	Housekeeping	NA	Perform a walk around of the entire facility looking for vandalism, breaches in security systems and maintenance needs.	NA		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Weekly	Area 1	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Flush Press Zone - Manually flush press zone by turning water spray on. Slow water discharge at the end of the drain hose may indicate blockage of spray pipe orifices or drain hose.	Volume 2		
Weekly	Area 1	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Level Switch Device - Check level switch device for obstructions that will interfere in the proper operation of the unit. Remove debris as needed.	Volume 2		
Weekly	Area 2	Basins	Activated Sludge Basins	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Change the oil level every 100 hours of operation if in a Hazardous Area	Volume 5		
Weekly	Area 2	Basins	Activated Sludge Basins	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Check the oil level every 50 hours of operation if in a Hazardous Area	Volume 5		
Weekly	Area 2	Basins	Activated Sludge Basins	Equipment	Air Diffusion Equipment	Xylem	Purge moisture from each cell's diffuser grid manually at the ball valves located on the catwalks. Bump air flow to 3 SCFM for 20-30 min (SCADA system to preform) to remove debris from membranes. Bump air to offline basins as well.	Volume 3		
Weekly	Area 3	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	Envirodyne Systems Inc.	Check all drive components for water condensation - drain as required & top of oil levels. Clean Drive Unit exterior. Check all drive components for proper oil level - add as required.	Volume 3		
Weekly	Area 3	Clarifiers	Clarifier	Equipment	Sawtooth Weir and Skimmings Baffle	Warminster	Clean weirs, check for debris; verify proper operation	NA		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Automatic Start/Stop - Inspect	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Battery Charger - Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Battery Electrolyte Level - Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Cooling System Coolant Level- Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Electrical Connections - Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Air Cleaner Service Indicator- Inspect	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Oil Level - Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Fuel System Primary Filter/Water Separator - Drain	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Fuel Tank Water and Sediment - Drain	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Generator - Inspect	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Generator Bearing Temperature - Test/Record	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Generator Lead-Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Instrument Panel-Inspect	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Jacket Water Heater-Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Power Factor-Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Space Heater-Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Standby Generator Set Maintenance Recommendations	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Voltage and Frequency-Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Walk-Around Inspection	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Battery - Recycle	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Battery - Replace	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Battery or Battery Cable - Disconnect	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Circuit Breakers -Reset	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Fuel System - Prime	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Generator -Dry	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Generator Load - Check	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Generator Set - Test	Volume 6		
Weekly	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	When required - Rotating Rectifer - Test	Volume 6		
Weekly	Area 4	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check/clean intake filter and replace as necessary; check and correct oil level as necessary	Volume 3		
Weekly	Area 4	Equipment Bldg	Mechanical Room	Equipment	Automatic Self-cleaning Filter	Amaid	Manually close low pressure sensor port to verify that proper flush cycle is initiated; clean filter on exhaust solenoid; check drive shaft grease; check for any leakage	Volume 5		
Weekly	Area 4	Equipment Bldg	Blower Room	Equipment	Compressed Air Dryer (DAF Unit)	Atlas Copco	Clean dryer as necessary, inspect and clean the filter of condensate drain.	Volume 3		
Weekly	Area 4	Equipment Bldg	Blower Room	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Change the oil level every 100 hours of operation if in a Hazardous Area	Volume 5		
Weekly	Area 4	Equipment Bldg	Blower Room	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Check the oil level every 50 hours of operation if in a Hazardous Area	Volume 5		
Weekly	Area 4	Equipment Bldg	Mechanical Room	Equipment	Packaged Booster Pump Station	Pump Tech	Run each pump in HAND mode to verify operation; note discharge pressure for each pump	Volume 1		
Weekly	Area 5	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press	Aero-Mod	Inspect washing manifolds every 10 hours of operation	Volume 4		
Weekly	Area 5	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check/clean intake filter and replace as necessary; check and correct oil level as necessary	Volume 3		
Weekly	Area 5	Solids Bldg	Southside of Bldg	Equipment	30-yard Dumpster	NA	Visually inspect	NA		
Weekly	Area 5	Solids Bldg	Blower Room	Equipment	Air Compressor (Belt Filter Press)	Saylor Beall	Check for unusal noise, failure to compress, overheating, oil leaks, and vibration. Drain all condensate from receiver and traps.	Volume 4		
Weekly	Area 6	Admin and Maint. Bldgs	Laboratory	Equipment	Safety Shower and Eyewash	Guardian	Operate safety eyewash and shower	Volume 5		
Weekly	Area 6	Admin and Maint. Bldgs	Laboratory	Equipment	Thermostatic Mixing Valve	Leonard	Check thermostatic mixing valve for proper operation while operating eyewash and shower	Volume 5		
Weekly	Site	Site and Evap Pond	Potable Water Service	Equipment	Insulated Enclosure	Hubbell	Verify heated enclosure is operating properly in winter months	NA		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Monthly	**Area 1**	Headworks	Mechanical Room	Equipment	Plug Valve - Auma Gearbox	Auma	Fully operate gear box	Volume 5		
Monthly	**Area 1**	Equipment Bldg	Mechanical Room	Equipment	Tankless Hot Water Heater	Eemax	Verify proper operation	NA		
Monthly	**Area 1**	Headworks	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean filter and unit	Volume 5		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Check Drive Shaft Bolt - Remove the plastic end cap on the gear reducer and ensure that the bolt holding the drive shaft to the reducer is tight.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Check Gear Reducer Oil Level - Check that the oil level in the reducer is at the bottom of the oil level plug. If necessary, add oil to bring to proper level.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Brush and Wear Shoes - Check brush for excessive wear. The brush should be cleaning the entire screen face of screen basket and the unit should be able to handle the flow. Replace the brush when brush bristles are even with the spiral OD, there are brush bristles missing or the screen can no longer handle the flow. Check the wear shoes. Replace if worn even with the spiral OD.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Channel Seals - Check seals for damage, wear or age. Replace if seals are unable to prevent solids from by-passing the screen.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Drain Lines - Visually inspect drain lines for cracks or signs of deterioration.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Scraper Plate - Remove inspection door on discharge chute and inspect the scraper plate. Tighten bolts as necessary. Replace or repair scraper if it is damaged.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Inspect Wear Bars - Visually check wear bars for excessive wear. Remove a bolt holding wear bar in place. If bolt is less than .38 inch long, replace wear bars and bolts. If leading edges of wear bars are raised up from transport tube, tighten wear bar bolts. Replace wear bars if leading edges are bent.	Volume 2		
Monthly	**Area 1**	Headworks	Grit Room	Equipment	Grit Cyclone	Schloss Equipment	It is important to maintain smooth surfaces on the interior of the cyclone. The cyclones should be inspected on a regular basis. When the interior surfaces become worn or uneven, the part should be replaced. After experience has been gained in operating the cyclones under given conditions, a regular maintenance schedule can be determined. Once the apex opens more than 10% of its original size, it should be replaced.	Volume 2		
Monthly	**Area 1**	Headworks	Upper Floor	Equipment	Grit Unit	Schloss Equipment	Reducer - Check oil level and breather. Bolts and Fasteners - Check for looseness, tighten as required.	Volume 2		
Monthly	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Slide Gate - Auma Gearbox	Auma	Fully operate gear box	Volume 5		
Monthly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Motors	Baldor	Check temperature of housing.	Volume 2		
Monthly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check oil level.	Volume 2		
Monthly	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	Envirodyne Systems Inc.	Fill out inspection reports from ESI on the first day of each month. Check mounting bolts for tightness	Volume 3		
Monthly	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism - Primary and Secondary Gear Reducers	SEW Eurodrive	Check oil level. Check condition of gearbox oil.	Volume 3		
Monthly	**Area 4**	Equipment Bldg	Mechanical Room	Electrical / Instrument	Solenoid Valve (NPW Pump Station)	ASCO	Visually inspect for proper operation; clean and inspect internal valve parts	Volume 1		
Monthly	**Area 4**	Equipment Bldg	Thickening Room	Electrical / Instrument	Solenoid Valve (DAF Unit)	Avid	Visually inspect for proper operation; clean and inspect internal valve parts	Volume 3		
Monthly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Operate engine generator and observe for proper operation	Volume 6		
Monthly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Air Compressor (DAF Unit)	Atlas Copco	Remove, check and replace air filter if necessary. Check belt tension	Volume 3		
Monthly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Compressed Air Dryer (DAF Unit)	Atlas Copco	Brush or blow off the finned surface of the condenser monthly.	Volume 3		
Monthly	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Float Valve	Cla-Val	Periodically inspected and provide maintenance as necessary. No lubrication required.	Volume 5		
Monthly	**Area 4**	Equipment Bldg	Pump Room	Equipment	Sewage Air Relief and Vacuum Valve	Crispin	Periodically inspect for leakage and backflush	Volume 5		
Monthly	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Water Air Relief and Vacuum Valve	Crispin	Periodically inspect for leakage	Volume 5		
Monthly	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Tankless Hot Water Heater	Eemax	Verify proper operation	NA		
Monthly	**Area 4**	Equipment Bldg	Pump, Thickening Rooms	Equipment	Ball Check Valves	Flomatic	Visually inspect for leaks; verify no obstructions exist in valve	NA		
Monthly	**Area 4**	Equipment Bldg	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean filter and unit	Volume 5		
Monthly	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Hydraulic System	Trojan	Initiate wipe sequence and check pressure is within 180-200 psi	Volume 3		
Monthly	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Low Water Level Sensor	Trojan	Clean as necessary	Volume 3		
Monthly	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Module	Trojan	Remove debris and clean; check power cable strain relief for tightness	Volume 3		
Monthly	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Water Level Control	Trojan	Visually inspect for debris	Volume 3		
Monthly	**Area 5**	Solids Bldg	Dewatering Room	Electrical / Instrument	Solenoid Valve (Belt Filter Press)	ASCO	Visually inspect for proper operation; clean and inspect internal valve parts	Volume 4		
Monthly	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press	Aero-Mod	Check air regulator, water filter, bearings, doctor blades, tracking limit switches every 160 hours of operation	Volume 4		
Monthly	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press	Aero-Mod	Clean & grease rails & rams every 40 hours of operation	Volume 4		
Monthly	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Motors	Baldor	Check temperature of housing.	Volume 2		
Monthly	**Area 5**	Equipment Bldg	Mechanical Room	Equipment	Tankless Hot Water Heater	Eemax	Verify proper operation	NA		
Monthly	**Area 5**	Solids Bldg	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean filter and unit	Volume 5		
Monthly	**Area 5**	Solids Bldg	Blower Room	Equipment	Air Compressor (Belt Filter Press)	Saylor Beall	Examine intake filter elements; check oil level; keep compressor clean	Volume 4		
Monthly	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check oil level.	Volume 2		
Monthly	**Area 6**	Admin and Maint. Bldgs	Office and Control Area	Electrical / Instrument	Network, Communications and Security Equipment	Various	Follow maintenance tasks detailed in manufacturer's O&M	Volume 10-11		
Monthly	**Area 6**	Equipment Bldg	Mechanical Room	Equipment	Tankless Hot Water Heater	Eemax	Verify proper operation	NA		
Monthly	**Area 7**	IPPS	Entire Area	Electrical / Instrument	Electrical Handholes	H2 Precast	Visually inspect and clean as necessary	NA		
Monthly	**Area 7**	IPPS	Check Valve Vault	Equipment	Ball Check Valves	Flomatic	Visually inspect for leaks; verify no obstructions exist in valve	NA		
Monthly	**Area 7**	IPPS	Throttling Valve Vault	Equipment	Pinch Valve	Red Valve	Actuate valve and lubricate per manufacturer recommendations	Volume 5		
Monthly	**Site**	Site and Evap Pond	Site-wide	Electrical / Instrument	Electrical Handholes	H2 Precast	Visually inspect and clean as necessary	NA		
Monthly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Water Air Relief and Vacuum Valve	Crispin	Periodically inspect for leakage	Volume 5		
Monthly	**Site**	Site and Evap Pond	Site-wide	Equipment	Manholes	H2 Precast	Visually inspect; remove debris and washdown as necessary	NA		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Quarterly	**Area 1**	Headworks	Grit Room, Upper Floor	Electrical / Instrument	Solenoid Valve	ASCO	Visually inspect for proper operation; clean and inspect internal valve parts	NA		
Quarterly	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	Variable Frequency Drives	Rockwell Automation	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.	Volume 9		
Quarterly	**Area 1**	Headworks	Mechanical Room	Electrical / Instrument	Floor Drain Trap Primer System	Sioux Chief	Verify proper operation of solenoid	NA		
Quarterly	**Area 1**	Headworks	Upper Floor	Equipment	Slide Gates	Golden Harvest Inc	Gates, slide, sluice and weir gates should be cleaned and operated.	Volume 5		
Quarterly	**Area 1**	Headworks	Mechanical and Grit Rooms	Equipment	Duct Heater	Thermolec	Tighten electrical connections. Operater heating elements.	Volume 5		
Quarterly	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	DO Sensor	Hach	Clean the sensor and inspect for damage	Volume 11		
Quarterly	**Area 2**	Basins	Activated Sludge Basins and EQ Basin	Equipment	Submersible Pumps	ABS	Every three months. Inspect cable for chafing, cuts, or abrasion. Inspect lifting chains.	Volume 2		
Quarterly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Motors	Baldor	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.	Volume 2		
Quarterly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Slide Gates	Golden Harvest Inc	Gates, slide, sluice and weir gates should be cleaned and operated.	Volume 5		
Quarterly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	All ball bearings, oil seals, O-rings and quad-rings are to be replaced after 450 hours of operation if in a Hazardous Area	Volume 5		
Quarterly	**Area 2**	Basins	Activated Sludge Basins	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Clean and lubricate the valve	Volume 5		
Quarterly	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	Envirodyne Systems Inc.	Test synthetic oil for contaminates, viscosity breakdown, thermal breakdown, etc.	Volume 3		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Inspect the area, especially where switching device is installed, for any safety hazards, including personnel safety and fire hazards. Exposure to certain chemical vapors can cause deterioration of electrical connections.Inspect for accumulated dirt, loose hardware, or physical damage. Examine the primary insulation for vidence of cracking or overheating. Overheating will show as discoloration, melting, or blistering of conductor insulation, or as pitting or melting of conductor surfaces due to arcing. Inspect the secondary control connections for damage and the control wiring for insulation integrity.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Remove dust, dirt, soot, grease, moisture, and corrosion contamination from the surface of the switching device using a dry soft lint-free cloth, dry soft bristle brush, and vacuum cleaner. Do not blow debris into the power contactor. If contamination is found, look for the source and fix the problem.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Severe material cracking will require replacement and loose hardware will need to be tightened.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Overheating will show as discoloration, melting, or blistering of the conductor insulation. Connections that do not have signs of looseness or overheating should not be disturbed.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	Remove all the screws on the molded cover over the power assembly. Inspect the contacts. Contact your Cat dealer if the contacts have excessive wear. Reinstall the molded cover and tighten screws to 17 in-lbs.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Automatic Transfer Switches	CAT	If the power contactor is used for frequent switching during normal operation, this step can be disregarded.	Volume 6		
Quarterly	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	Variable Frequency Drives	Rockwell Automation	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.	Volume 9		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Electrical / Instrument	Floor Drain Trap Primer System	Sioux Chief	Verify proper operation of solenoid	NA		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check function of pressure valve	Volume 3		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Air Compressor (DAF Unit)	Atlas Copco	Change oil	Volume 3		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Baldor	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.	Volume 3		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Quarterly	**Area 4**	Equipment Bldg	Thickening Room	Equipment	DAF Unit, Flocculator, and Accessories	FRC	DAF recycle pump, establish an interval. a) Any auxiliary systems installed must be monitored, if necessary, to ensure they function correctly. b) Gland packing must be adjusted correctly to give visible leakage and concentric alignment of the gland follower to prevent excessive temperature of the packing or follower. c) Check for any leaks from gaskets and seals. The correct functioning of the shaft seal must be checked regularly. d) Check bearing lubricant level, and the remaining hours before a lubricant change is required. e) Check that the duty condition is in the safe operating range for the pump.	Volume 3		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	All ball bearings, oil seals, O-rings and quad-rings are to be replaced after 450 hours of operation if in a Hazardous Area	Volume 5		
Quarterly	**Area 4**	Equipment Bldg	Blower Room	Equipment	Butterfly Valve - Limitorque Actuator	Limitorque	Clean and lubricate the valve	Volume 5		
Quarterly	**Area 4**	UV Bldg	Effluent Metering Vault	Equipment	Sump Pump	Little Giant	Visually inspect for proper operation	Volume 1		
Quarterly	**Area 4**	UV Bldg	UV Channel	Equipment	Davit Crane	Thern Inc	Visually inspect and clean as necessary. Lubricate roller assembly, all pins, and ratchet jack.	Volume 3		
Quarterly	**Area 4**	Equipment Bldg	Pump Room	Equipment	RAS Screw Centrifugal Pumps	Wemco	Every 500 hours or three months, Check motor for proper operation.	Volume 1		
Quarterly	**Area 5**	Digesters	Digesters	Electrical / Instrument	ORP Sensors	Hach	Clean the sensor and inspect for damage	Volume 11		
Quarterly	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	Variable Frequency Drives	Rockwell Automation	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.	Volume 9		
Quarterly	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	Variable Frequency Drives	Rockwell Automation	Preform periodic inspection for dust build-up, etc Check cooling fans for proper operation Check for propoer function of operating mechanisms Check contacts; clean and replace as necessary Indirectly check vacuum contactors Check for tightness of terminal connections Check arc hoods for cracks, breaks, corrosion Replace batteries, pilot lights as necessary Check condition and operation of locking and interlocking devices Preform maintenance after fault conditions For additional information, refer to NEMA ICS 1.3, PREVENTIVE MAINTENANCE OF INDUSTRIAL CONTROL AND SYSTEMS EQUIPMENT, published by the National Electrical Manufacturers Association, and NFPA70B, ELECTRICAL EQUIPMENT MAINTENANCE, published by the National Fire Protection Association.	Volume 9		
Quarterly	**Area 5**	Solids Bldg	Dewatering Room	Electrical / Instrument	Floor Drain Trap Primer System	Sioux Chief	Verify proper operation of solenoid	NA		
Quarterly	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check function of pressure valve	Volume 3		
Quarterly	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Motors	Baldor	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.	Volume 2		
Quarterly	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Baldor	Check motor operation - check for cleanliness and ventilation, Megger to check winding insulation and record readings; check all electrical connections.	Volume 3		
Quarterly	**Area 5**	Solids Bldg	Blower Room	Equipment	Air Compressor (Belt Filter Press)	Saylor Beall	Check and tighten all bolts and nuts Check air connections for air leaks Check belt tension. Inspect valves, clean if necessary	Volume 4		
Quarterly	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Drive	SEW Eurodrive	Check oil & oil level; check seals visually for leakage; for gear units with a torque arm: check the rubber buffer & change it (if necessary)	Volume 4		
Quarterly	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Rotary Drum Thickener Drive	SEW Eurodrive	Check oil & oil level; check seals visually for leakage; for gear units with a torque arm: check the rubber buffer & change it, if necessary	Volume 4		
Quarterly	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Duct Heater	Thermolec	Tighten electrical connections. Operater heating elements.	Volume 5		
Quarterly	**Area 6**	Admin and Maint. Bldgs	Admin Building and Shop	Electrical / Instrument	Floor Drain Trap Primer System	Sioux Chief	Verify proper operation of solenoid	NA		
Quarterly	**Area 6**	Admin and Maint. Bldgs	Mechanical Room	Equipment	Air Handling Unit	Trane	Check air filter quarterly or as needed	Volume 5		
Quarterly	**Area 6**	Admin and Maint. Bldgs	North side of Admin Bldg	Equipment	Heat Pump	Trane	Change air filter as needed.	Volume 5		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Quarterly	**Area 7**	IPPS	Wet Well	Equipment	Submersible Pumps	ABS	Every three months. Inspect cable for chafing, cuts, or abrasion. Inspect lifting chains.	Volume 2		
Quarterly	**Area 7**	IPPS	Throttling Valve Vault	Equipment	Sump Pump	Little Giant	Visually inspect for proper operation	Volume 1		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Grease motor bearings	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Check all bolts for tightness	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	If span bridle cabling is used, check the cable bridle attachment for wear	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Check electrical connections, power cable condition, and power cable fastenings	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Lower unit inspection of propeller and bearing	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Inspect the Blower filter every 3 months and replace if dirty	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Measure and record voltage at each leg	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Measure and record amp draw at each leg	Volume 2		
Quarterly	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Estimated cumulative hours in operation	Volume 2		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Semi-Annually	**Area 1**	Headworks	Upper Floor	Electrical / Instrument	Level Transmitter - Ultrasonic	Endress Hauser	Clean sensor as necessary	Volume 11		
Semi-Annually	**Area 1**	Headworks	Mechanical and Grit Rooms	Equipment	Duct Fan	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 1**	Headworks	Upper Floor	Equipment	Roof Exhaust Fans	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 1**	Headworks	Grit Room	Equipment	Wall Exhaust Fans	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 1**	Headworks	Mechanical Room	Equipment	Plug Valve - Auma Actuator	Auma	Visually inspect; check wire connections, etc; inspect bolts for tightness; preform run test (every 6 months)	Volume 5		
Semi-Annually	**Area 1**	Headworks	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean coils and chassis	Volume 5		
Semi-Annually	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Check gear reducer output shaft for abnormal play. Check spiral for wear or warpage. Inspect press zone for signs of damage, clean spray nozzle, inspect stationary cutter, tight bolts as necessary. Inspect heating system and thermostat. Inspect electrically operated switches (solenoid, door intrusion switch, electrical switches)	Volume 2		
Semi-Annually	**Area 1**	Headworks	Both Floors	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Area 1**	Headworks	Both Floors	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Slide Gate - Auma Actuator	Auma	Visually inspect; check wire connections, etc; inspect bolts for tightness; preform run test (every 6 months); inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)	Volume 5		
Semi-Annually	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Level Transmitter - Ultrasonic	Endress Hauser	Clean sensor as necessary	Volume 11		
Semi-Annually	**Area 2**	Basins	Activated Sludge Basins and EQ Basin	Equipment	Submersible Pumps	ABS	Every six months. Wash down unit and check amp draw. If unit performance decreases. Check impeller/wear plate/wear rings.	Volume 2		
Semi-Annually	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check condition of gearbox oil. Check the gearbox seals visually for leakage. Clean or change gear ventilation.	Volume 2		
Semi-Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	SEW Eurodrive	Collect oil sample from main bath housing and submit report with sample to ESI along with monthly inspection reports.	Volume 3		
Semi-Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism - Primary and Secondary Gear Reducers	SEW Eurodrive	Collect oil sample from both gear reducers and submit report with sample to ESI along with monthly inspection reports. Check the gearbox seals visually for leakage. Clean or change gear ventilation.	Volume 3		
Semi-Annually	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Cooling System Coolant Sample (Level 1) - Obtain	Volume 6		
Semi-Annually	**Area 4**	UV Bldg	UV Channel	Electrical / Instrument	Level Transmitter - Ultrasonic	Endress Hauser	Clean sensor as necessary	Volume 11		
Semi-Annually	**Area 4**	Equipment Bldg	Mechanical Room	Electrical / Instrument	Level Transmitter - Submersible	kPSI	Change desiccant and clean transducer as necessary	Volume 11		
Semi-Annually	**Area 4**	Equipment Bldg	Pump, Thickening, Blower, Mechanical Rooms	Equipment	Roof Exhaust Fans	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check/clean inlet/outlet openings in acoustic hood; check/replace v-belts as necessary; replace oil if final compression temp above 140 deg C; replace grease if final compression temp above 140 deg C or is discolored	Volume 3		
Semi-Annually	**Area 4**	Equipment Bldg	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean coils and chassis	Volume 5		
Semi-Annually	**Area 4**	Equipment Bldg	Pump, Thickening Rooms	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Swing Check Valves	Milliken	Visually inspect for leaks; check bolt tightness; visually inspect for proper operation	NA		
Semi-Annually	**Area 4**	Equipment Bldg	Pump, Thickening Rooms	Equipment	Progressing Cavity Pumps	Monoflo	Check pump for proper mechanical seal leakage Check pump rotor and stator for wearing	Volume 1		
Semi-Annually	**Area 4**	Equipment Bldg	Pump, Thickening Rooms	Equipment	Progressing Cavity Pumps	Monoflo	Pump Drive (Pin) Joints As Necessary Every 4,000 Op. Hours	Volume 1		
Semi-Annually	**Area 4**	Equipment Bldg	Thickening Room	Equipment	Thickened Sludge Progressing Cavity Pumps	Monoflo	Check pump for proper mechanical seal leakage Check pump rotor and stator for wearing	Volume 1		
Semi-Annually	**Area 4**	Equipment Bldg	Thickening Room	Equipment	Thickened Sludge Progressing Cavity Pumps	Monoflo	Pump Drive (Pin) Joints As Necessary Every 4,000 Op. Hours	Volume 1		
Semi-Annually	**Area 4**	UV Bldg	UV Channel	Equipment	Davit Winch	Thern Inc	Visually inspect and clean as necessary. Lubricate roller assembly, all pins, and ratchet jack.bearings and shafts. Lubricate winch gears before every operation.	Volume 3		
Semi-Annually	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - ActiClean System	Trojan	Remove module debris and fill the wiper collars with ActiClean-WW Gel Apply grease to the wiper cylinder—done at same time as filling the ActiClean - WW Gel	Volume 3		
Semi-Annually	**Area 4**	Equipment Bldg	Pump Room	Equipment	RAS Screw Centrifugal Pumps	Wemco	Every 4,000 hours, Check bearing housing lubrication and grease as required.	Volume 1		
Semi-Annually	**Area 4**	Equipment Bldg	Pump Room	Equipment	RAS Screw Centrifugal Pumps	Wemco	Every 6 months, Check coupling alignment and adjust as required, check motor lubrication.	Volume 1		
Semi-Annually	**Area 5**	Digesters	Digesters	Electrical / Instrument	Level Transmitter - Ultrasonic	Endress Hauser	Clean sensor as necessary	Volume 11		
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press	Aero-Mod	Grease all bearings, belt condition every 500 hours of operation	Volume 4		
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Duct Fan	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Blower Room	Equipment	Roof Exhaust Fans	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Wall Exhaust Fans	Aerovent	Lubricate fan bearings.	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check/clean inlet/outlet openings in acoustic hood; check/replace v-belts as necessary; replace oil if final compression temp above 140 deg C; replace grease if final compression temp above 140 deg C or is discolored	Volume 3		
Semi-Annually	**Area 5**	Solids Bldg	Electrical Room	Equipment	Window AC Unit	Friedrich	Clean coils and chassis	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Evaporation Pond and Pump Station	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Cake Transfer Pump	Seepex	Inspect bearings every 10,000 hours	Volume 4		
Semi-Annually	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Check condition of gearbox oil. Check the gearbox seals visually for leakage. Clean or change gear ventilation.	Volume 2		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Semi-Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Drive	SEW Eurodrive	Touch up or renew the surface/anticorrosion coating.	Volume 4		
Semi-Annually	**Area 6**	Admin and Maint. Bldgs	Laboratory	Equipment	Fume Hood Fan	FanAm	Motor does not require lubrication. Clean fanwheel and housing.	Volume 5		
Semi-Annually	**Area 6**	Admin and Maint. Bldgs	North side of Admin Bldg	Equipment	Heat Pump	Trane	Clean indoor and outdoor coils.	Volume 5		
Semi-Annually	**Area 7**	IPPS	Wet Well	Electrical / Instrument	Level Transmitter - Submersible	Endress Hauser	Clean sensor as necessary	Volume 11		
Semi-Annually	**Area 7**	IPPS	Wet Well	Equipment	Submersible Pumps	ABS	Every six months. Wash down unit and check amp draw. If unit performance decreases. Check impeller/wear plate/wear rings.	Volume 2		
Semi-Annually	**Area 7**	IPPS	Check Valve Vault	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		
Semi-Annually	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Plug Valve	Milliken	Full open and close each valve at least every 6 months	Volume 5		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Perform infrared scan	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Visually inspect and clean the enclosure prior to opening panels	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Bus Bar: visually inspect insulators	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Bus Bar: visually inspect wiring	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Disconnects: visually inspect and clean	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Disconnects: verify proper operation	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Contactors: visually inspect and clean	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Electrical Interlocks: inspect	Volume 7-8		
Annually	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	Mechanical Interlocks: inspect	Volume 7-8		
Annually	**Area 1**	Headworks	Both Floors	Electrical / Instrument	Electromagnetic Flowmeter	Endress Hauser	Check seals; calibrate as recommended by manufacturer	Volume 11		
Annually	**Area 1**	Headworks	Mechanical and Grit Rooms	Equipment	Duct Fan	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Roof Exhaust Fans	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	**Area 1**	Headworks	Grit Room	Equipment	Wall Exhaust Fans	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	**Area 1**	Headworks	Mechanical Room	Equipment	Plug Valve - Auma Gearbox	Auma	Inspect bolts for tightness; preform run test (every 6 months); inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)	Volume 5		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Vault Hatches	H2 Precast	Lubricate moving parts	NA		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Mechanical Fine Screens and Hopper	Hycor Helisieve	Change oil in gear reducer. Thoroughly inspect and clean unit.	Volume 2		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Radiant Space Heater	Qmark-Marley	Clean heater assembly. Tighten electrical connections.	Volume 5		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Grit Unit	Schloss Equipment	10,000 service hours or two years, Reducer - drain oil and refill with Mobilegear 600 XP220.	Volume 2		
Annually	**Area 1**	Headworks	Upper Floor	Equipment	Grit Unit	Schloss Equipment	Bi-annually, Reducer - grease lubricated seals. Turbine Blade - Check for wear. All Parts - Replace worn or damaged parts. Touch up nicks of scratches in paint.	Volume 2		
Annually	**Area 1**	Headworks	Mechanical and Grit Rooms	Equipment	Duct Heater	Thermolec	Tighten hangers and mechanical connections. Check fuses, contactors, element resistance.	Volume 5		
Annually	**Area 1**	Headworks	Mechanical Room	Equipment	Reduced Pressure Backflow Assembly	Watts	Test using certified tester	NA		
Annually	**Area 2**	Basins	EQ Basin	Electrical / Instrument	Level Switch - Float	Anchor Scientific	Verify proper operation	Volume 11		
Annually	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Slide Gate - Auma Gearbox	Auma	Inspect bolts for tightness; preform run test (every 6 months); inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)	Volume 5		
Annually	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Air Flow Meter	FCI	Calibrate (18 mo minimum); check seals, electrical connections, remove probe and inspect for debris	Volume 11		
Annually	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	DO Sensor	Hach	Calibrate the sensor as recommended by regulatory agency	Volume 11		
Annually	**Area 2**	Basins	Activated Sludge Basins and EQ Basin	Equipment	Submersible Pumps	ABS	Check seal water/glycol mixture for contamination. If contaminated check mechanical seals.	Volume 2		
Annually	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers	Invent	Motor oil change according to manufacturer instructions. Check ventilation fan, covers, feet and frame of the whole motor for visible damage. Clean the motor over and ventilating fan cover from dust, dirt, fibbers etc. Check all seals and, if need be, replace according to manufacturer's operational instruction. Operation test of the mixer at a fixed rotational speed. Operation test of the mixer / aerator throughout the whole range of rotational speeds. Measure the power consumption (amp draw). Acoustic check. Check all fixings and, if need, be, tighten all screw connections. Check the machine feet. Check the motor for paint damage. Check the mixer body for damage. Check Ferro form bushing neck at bottom guide for wear and tear and change if necessary. Check the condition of the transport ribs. Check the condition of the shear ribs. Check the fastening of the ring.	Volume 2		
Annually	**Area 2**	Basins	Activated Sludge Basins	Equipment	Butterfly Valve	Pratt	Cycle valve; close valve and check for leakage; check flange connections for leakage; check top trunnion area for shaft leakage; check for irregular sound; verify bolt tightness	Volume 5		
Annually	**Area 2**	Basins	Activated Sludge Basins	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	**Area 2**	Basins	Activated Sludge Basins	Equipment	Air Diffusion Equipment	Xylem	Drain aeration basin. Remove excess solids accumulation. Clean diffusers. Inspect support hardware, insure components are tight and intact. Inspect diffuser retaining rings are in place and tight. Inspect expansion joint retaining rings are tight.	Volume 3		
Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism	Envirodyne Systems Inc.	Change synthetic oil inmain housing oil bath. Inspect entire unit above and below the waterline and paint as required	Volume 3		
Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Clarifier Mechanism - Primary and Secondary Gear Reducers	SEW Eurodrive	Change synthetic oil. Replace anti-friction bearing grease (recommendation) depending on operating conditions (3 years at latest) Replace oil seal (do not install it in the same track) depending on operating conditions (3 years at latest) Touch up or renew the surface/anticorrosion coating as necessary	Volume 3		
Annually	**Area 3**	Clarifiers	Clarifier	Equipment	Pressure Relief Valves	Troy Valve	Verify valves not obstructed when clarifier not in operaiton.	NA		
Annually	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Perform infrared scan	Volume 7-8		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Visually inspect and clean the enclosure prior to opening panels	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Bus Bar: visually inspect insulators	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Bus Bar: visually inspect wiring	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Disconnects: visually inspect and clean	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Disconnects: verify proper operation	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Contactors: visually inspect and clean	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Electrical Interlocks: inspect	Volume 7-8		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	Mechanical Interlocks: inspect	Volume 7-8		
Annually	Area 4	Equipment Bldg	Mechanical Room	Electrical / Instrument	Level Switch - Float	Anchor Scientific	Verify proper operation	Volume 11		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Alternator - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Belts - Inspect/Adjust/Replace	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Cooling System Coolant Sample (Level 2) - Obtain	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Cooling System Supplemental Coolant Additive (SCA)-Test/Add	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Crankshaft Vibration Damper - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Cylinder Head Grounding Stud - Inspect/Clean/Tighten	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine - Clean	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Air Cleaner Element (Dual Element) - Clean/Replace	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Crankcase Breather - Clean	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Mounts - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Oil Sample - Obtain	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Oil and Filter - Change	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Performance - Test	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Protective Devices - Check	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Speed/Timing Sensors - Check/Clean/Calibrate	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Valve Lash - Inspect/Adjust	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Engine Valve Rotators - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Fuel System Primary Filter (WaterSeparator) Element - Replace	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Fuel System Secondary Filter - Replace	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Generator Bearing - Lubricate	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Generator Set Vibration - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Hoses and Clamps - Inspect/Replace	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Insulation - Test	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Magnetic Pickups - Clean/Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Radiator - Clean	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Starting Motor - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Stator Lead - Check	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Varistor - Check	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Water Pump - Inspect	Volume 6		
Annually	Area 4	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 200 Service Hours or 1 Year - Engine Oil and Filter - Change	Volume 6		
Annually	Area 4	Equipment Bldg	Pump, Thickening, Blower, Mechanical Rooms	Electrical / Instrument	Electromagnetic Flowmeter	Endress Hauser	Check seals; calibrate as recommended by manufacturer	Volume 11		
Annually	Area 4	UV Bldg	Effluent Metering Vault	Electrical / Instrument	Electromagnetic Flowmeter	Endress Hauser	Check seals; calibrate as recommended by manufacturer	Volume 11		
Annually	Area 4	Equipment Bldg	Blower Room	Electrical / Instrument	Pressure Transmitter	Invensys	Remove and check for debris; verify calibration	Volume 11		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	Power Distribution Panel	Siemens	Follow maintenance tasks detailed in manufacturer's O&M	Volume 6		
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	Switchboard	Siemens	A. Check general condition of switchboard installation. B. Inspect interior for accumulation of dust, dirt or any foreign matter. Vacuum the interior to remove any dirt or dust deposits. Do not use an air hose as pressurized air may blow dust into critical electrical contact areas. C. Check the interior carefully for moisture, condensation buildup, or signs of any previous wetness. Inspect all conduit entrances and cracks and seal off any leaks to eliminate moisture. Clean air filters by washing in a mild household detergent. D. Examine indicating lamps and replace as required. E. Check terminal blocks contacts for loose connections. F. Check instrument and control switches and inspect their contacts. G. Check for proper condition of instrument transformers. Replace burned out fuses, if any. Check primary and secondary connections. H. Remove dust from all de-energized insulators. I. Inspect bus bars and connections for proper condition. If bus bars are overheating, check for poor or loose connections or for overload.	Volume 6		

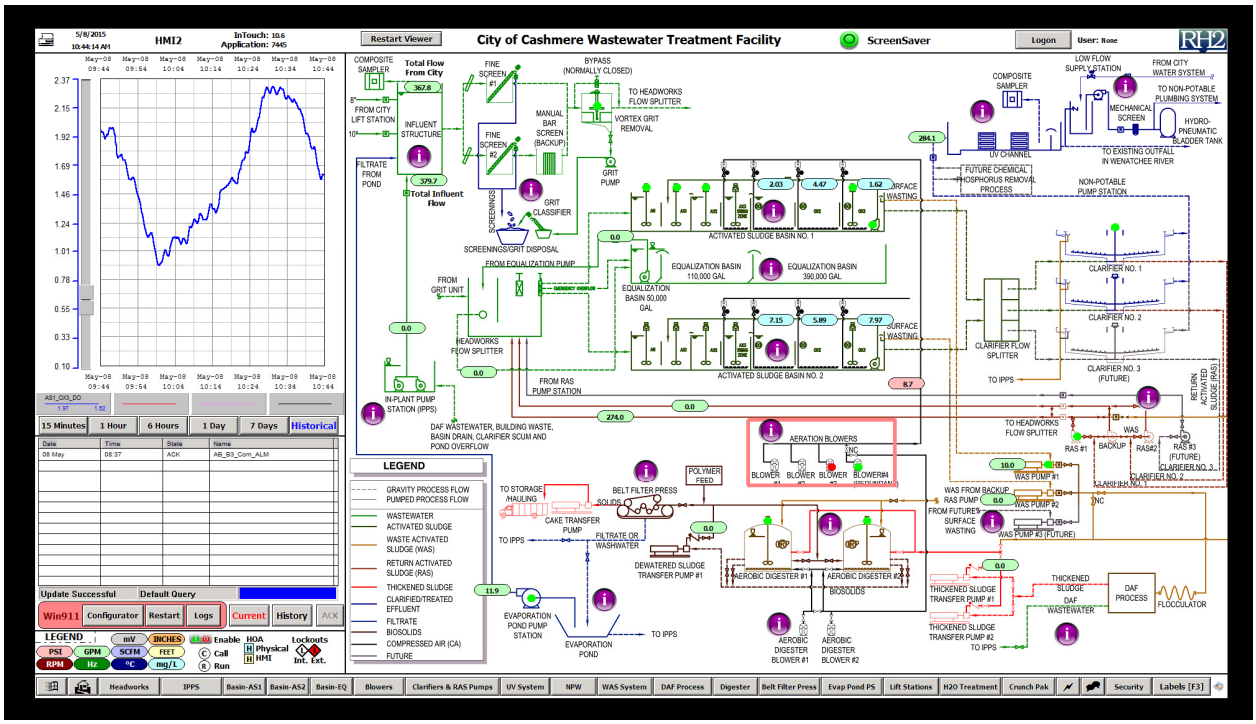
Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Annually	Area 4	Equipment Bldg	Electrical Room	Electrical / Instrument	Switchboard	Siemens	J. Examine fuse clip contact pressure and contact means. If signs of over-heating or looseness, contact sales for replacement. K. Look for and replace deteriorated insulated material where sealing compound has melted. L. Examine all safety interlocks to insure they are functional and in proper working order. M. Carefully inspect all devices for any worn, cracked, or missing parts. Manually open and close devices several times to insure they are in proper working order. Perform maintenance of interrupting devices as outlined in the device instruction manual. Do not open sealed breaker or trip unit as calibration may be disturbed. Return to factory for any replacement. For reference, see NEMA AB4-2000. N. Check space heaters and thermostat (if equipped) for proper operation. O. Maintain other auxiliary equipment per their respective instruction book requirements. P. Lubricate mechanisms, contacts, and other moving components. Do not lubricate parts of molded case circuit breakers. Q. Inspect painted surfaces and touch up as needed. R. Check for signs of rodent or insect nesting inside the switchboard. S. Replace, reassemble, re-insulate, return all items to proper operating conditions and remove grounds prior to energization. T. Ensure satisfactory operation of relays and instruments as per instruction books furnished separately. Do not leave device covers off longer than necessary. When a cover has been broken, cover the device temporarily and replace broken glass as soon as possible. U. Test ground fault protection system (if furnished). V. Conduct an electrical insulation resistance test to ensure that the switchboard is free of short circuit and ground.	Volume 6		
Annually	Area 4	Equipment Bldg	Pump, Thickening, Blower, Mechanical Rooms	Equipment	Roof Exhaust Fans	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	Area 4	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check and replace non-return check valve if necessary; lubricate motor	Volume 3		
Annually	Area 4	Equipment Bldg	Mechanical Room	Equipment	Hydropneumatic Tank (NPW Pump Station)	Amtrol	A plumber should inspect the tank annually	Volume 1		
Annually	Area 4	Equipment Bldg	Blower Room	Equipment	Air Compressor (DAF Unit)	Atlas Copco	Inspect tank for pinholes, rust, etc.	Volume 3		
Annually	Area 4	Equipment Bldg	Pump, Blower, Mechanical Rooms	Equipment	Radiant Space Heater	Indeeco	Tighten electrical connections. Tighten hangers and mechanical connections.	Volume 5		
Annually	Area 4	Equipment Bldg	Blower, Mechanical Rooms	Equipment	Butterfly Valve	Pratt	Cycle valve; close valve and check for leakage; check flange connections for leakage; check top trunnion area for shaft leakage; check for irregular sound; verify bolt tightness	Volume 5		
Annually	Area 4	Equipment Bldg	Blower, Mechanical Rooms	Equipment	Butterfly Valve	Pratt	Verify actuator is still bolted securely to the valve; If operation is difficult or gear box is noisy, remove actuator cover to inspect gearing and lubricant; clean actuator and replace grease if it has separated or worn away; check pointer on top of actuator to see if it properly indicates valve position	Volume 5		
Annually	Area 4	Equipment Bldg	Thickening Room	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	Area 4	UV Bldg	UV Channel	Equipment	UV System	Trojan	Clean channel around system as necessary	Volume 3		
Annually	Area 4	UV Bldg	UV Channel	Equipment	UV System - Hydraulic System	Trojan	Replace filter	Volume 3		
Annually	Area 4	UV Bldg	UV Channel	Equipment	UV System - Hydraulic System	Trojan	Visually inspect all hydraulic hoses	Volume 3		
Annually	Area 4	UV Bldg	UV Channel	Equipment	UV System - Water Level Control	Trojan	Inspect seal and repair as necessary	Volume 3		
Annually	Area 4	Equipment Bldg	Pump, Thickening Rooms	Equipment	Progressing Cavity Pumps - Motor	Weg	Inspect motor for proper lubrication levels, dust free	Volume 1		
Annually	Area 4	Equipment Bldg	Thickening Room	Equipment	Thickened Sludge Progressing Cavity Pumps - Motor	Weg	Inspect motor for proper lubrication levels, dust free	Volume 1		
Annually	Area 4	Equipment Bldg	Pump Room	Equipment	RAS Screw Centrifugal Pumps	Wemco	Initially after 1000 hrs then Annually thereafter, Check seal chamber oil.	Volume 1		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Perform infrared scan	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Visually inspect and clean the enclosure prior to opening panels	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Bus Bar: visually inspect insulators	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Bus Bar: visually inspect wiring	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Disconnects: visually inspect and clean	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Disconnects: verify proper operation	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Contactors: visually inspect and clean	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Electrical Interlocks: inspect	Volume 7-8		
Annually	Area 5	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	Mechanical Interlocks: inspect	Volume 7-8		
Annually	Area 5	Headworks	Both Floors	Electrical / Instrument	Electromagnetic Flowmeter	Endress Hauser	Check seals; calibrate as recommended by manufacturer	Volume 11		
Annually	Area 5	Digesters	Digesters	Electrical / Instrument	ORP Sensors	Hach	Calibrate the sensor as recommended by regulatory agency	Volume 11		
Annually	Area 5	Solids Bldg	Dewatering Room	Equipment	Duct Fan	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	Area 5	Solids Bldg	Blower Room	Equipment	Roof Exhaust Fans	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	Area 5	Solids Bldg	Dewatering Room	Equipment	Wall Exhaust Fans	Aerovent	Lubricate ball bearing motors annually or as need. Replace fan belts. Clean fan assembly.	Volume 5		
Annually	Area 5	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check and replace non-return check valve if necessary; lubricate motor	Volume 3		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Annually	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixer/Aerator	Invent	Motor oil change according to manufacturer instructions. Check ventilation fan, covers, feet and frame of the whole motor for visible damage. Clean the motor over and ventilating fan cover from dust, dirt, fibbers etc. Check all seals and, if need be, replace according to manufacturer's operational instruction. Operation test of the mixer at a fixed rotational speed. Operation test of the mixer / aerator throughout the whole range of rotational speeds. Measure the power consumption (amp draw). Acoustic check. Check all fixings and, if need, be, tighten all screw connections. Check the machine feet. Check the motor for paint damage. Check the mixer body for damage. Check Ferro form bushing neck at bottom guide for wear and tear and change if necessary. Check the condition of the transport ribs. Check the condition of the shear ribs. Check the fastening of the ring.	Volume 2		
Annually	**Area 5**	Solids Bldg	Blower Room	Equipment	Butterfly Valve	Pratt	Cycle valve; close valve and check for leakage; check flange connections for leakage; check top trunnion area for shaft leakage; check for irregular sound; verify bolt tightness	Volume 5		
Annually	**Area 5**	Solids Bldg	Blower Room	Equipment	Butterfly Valve	Pratt	Verify actuator is still bolted securely to the valve; If operation is difficult or gear box is noisy, remove actuator cover to inspect gearing and lubricant; clean actuator and replace grease if it has separated or worn away; check pointer on top of actuator to see if it properly indicates valve position	Volume 5		
Annually	**Area 5**	Solids Bldg	Blower Room	Equipment	Air Compressor (Belt Filter Press)	Saylor Beall	Change oil regularly - at minimum, once every three months	Volume 3		
Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Cake Transfer Pump	Seepex	Change oil every 10,000 hours	Volume 4		
Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Digested Sludge Pump (Belt Filter Press)	Seepex	Change oil every 10,000 hours	Volume 4		
Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Duct Heater	Thermolec	Tighten hangers and mechanical connections. Check fuses, contactors, element resistance.	Volume 5		
Annually	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Reduced Pressure Backflow Assembly	Watts	Test using certified tester	NA		
Annually	**Area 6**	Admin and Maint. Bldgs	North side of Admin Bldg	Electrical / Instrument	Power Distribution Panel	Siemens	Follow maintenance tasks detailed in manufacturer's O&M	Volume 6		
Annually	**Area 6**	Admin and Maint. Bldgs	Shop	Equipment	Hydropneumatic Tank	Amtrol	A plumber should inspect the tank annually	NA		
Annually	**Area 6**	Admin and Maint. Bldgs	Mechanical Room	Equipment	Hot Water Tank	AO Smith	Periodically the drain valve should be opened and the water allowed to run until it flows clean. This will help to prevent sediment buildup in the tank bottom. Periodically check the temperature and pressure relief valve to ensure that it is in operating condition. Lift the lever at the top of the valve several times until the valve seats properly and operates freely. Water heater maintenance includes periodic tank flushing and cleaning, and removal of lime scale from the heating element. The heater tank is equipped with an anode rod to aid in corrosion control and should be inspected periodically	NA		
Annually	**Area 6**	Admin and Maint. Bldgs	Shop	Equipment	Radiant Space Heater	Indeeco	Tighten electrical connections. Tighten hangers and mechanical connections.	Volume 5		
Annually	**Area 6**	Admin and Maint. Bldgs	Garage Area	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	**Area 6**	Admin and Maint. Bldgs	North side of Admin Bldg	Equipment	Heat Pump	Trane	Clean housing; check and tighten electrical connections.	Volume 5		
Annually	**Area 6**	Admin and Maint. Bldgs	Laboratory	Equipment	Laboratory Equipment	Various	Follow manufacturer recommendations, maintain certifications, etc.	Volume 5		
Annually	**Area 6**	Admin and Maint. Bldgs	Shop	Equipment	Reduced Pressure Backflow Assembly	Watts	Test using certified tester	NA		
Annually	**Area 7**	IPPS	Wet Well	Electrical / Instrument	Level Switch - Float	Anchor Scientific	Verify proper operation	Volume 11		
Annually	**Area 7**	IPPS	Wet Well	Equipment	Submersible Pumps	ABS	Check seal water/glycol mixture for contamination. If contaminated check mechanical seals.	Volume 2		
Annually	**Area 7**	IPPS	All Vaults	Equipment	Vault Hatches	H2 Precast	Lubricate moving parts	NA		
Annually	**Site**	Site and Evap Pond	Site-wide	Electrical / Instrument	Electromagnetic Flowmeter	Endress Hauser	Check seals; calibrate as recommended by manufacturer	Volume 11		
Annually	**Site**	Site and Evap Pond	Evaporation Pond and Pump Station	Equipment	Aspirating Mixer/Aerator	AII, Inc	Disassembly of the aerator at for universal U-joint lubrication and to visually inspect bearings, sleeve and shaft for wear or damage.	Volume 2		
Annually	**Site**	Site and Evap Pond	All Electrical Vaults	Equipment	Vault Hatches	H2 Precast	Lubricate moving parts	NA		
Annually	**Site**	Site and Evap Pond	Site-wide	Equipment	Fire Hydrants	M&H	Exercise, inspect and test per agency requirements	NA		
Annually	**Site**	Site and Evap Pond	Site-wide	Equipment	Irrigation System	NA	Blow out sprinkler system at the end of irrigation season prior to freezing temperatures and isolate from NPW system. Place irrigation filter indoors.	NA		
Annually	**Site**	Site and Evap Pond	Site-wide	Equipment	Heat Trace System - Self Regulating Cable	Raychem	Visually inspect as able; preform insulation resistance test for circuit and power test for circuit	Volume 5		
Annually	**Site**	Site and Evap Pond	Potable Water Service	Equipment	Reduced Pressure Backflow Assembly	Watts	Test using certified tester	NA		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	2 years - Bus Bar: check connections for tightness and proper torque	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	2 years - Bus Bar: electrical test	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	2 years - Motor Overload Relays: check connections for tightness	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	3 years - Motor Overload Relays: perform cleaning, calibration and function tests	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	3 years - Molded Case Circuit Breakers: visual inspection and cleaning	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	2 years - Molded Case Circuit Breakers: mechanical test	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Electrical Room	Electrical / Instrument	MCCs 101 and 102	Allen Bradley	3-5 years - Molded Case Circuit Breakers: electrical test	Volume 7-8		
Greater than 1 yr	**Area 1**	Headworks	Mechanical Room	Equipment	Plug Valve - Auma Actuator	Auma	Inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)	Volume 5		
Greater than 1 yr	**Area 1**	Headworks	Upper Floor	Equipment	Slide Gates	Golden Harvest Inc	Every 2 years - Non-Geared Operators, Clean and Lubricate with small amount of Grease, Refer to Lubrication Chart for recommended greases. Every 2 years - Operating Stems, Clean and Greese, Refer to Lubrication Chart for recommended greases.	Volume 5		
Greater than 1 yr	**Area 1**	Headworks	Grit Room	Equipment	Filtrate System Drain Ball Valve	Spears	Drain filtrate system within Headworks when filtrate system not pumping.	NA		
Greater than 1 yr	**Area 2**	Basins	Activated Sludge Basins	Electrical / Instrument	Slide Gate - Auma Actuator	Auma	Inspect for grease leakage; preform detailed run test (every 5 years); lubricate (every 4-6 years)	Volume 5		
Greater than 1 yr	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Motors	Baldor	Preform complete insection of drive unit annually; relubricate motor at intervals based on motor speed - see manufacturer documentation	Volume 2		
Greater than 1 yr	**Area 2**	Basins	Activated Sludge Basins	Equipment	Slide Gates	Golden Harvest Inc	Every 2 years - Non-Geared Operators, Clean and Lubricate with small amount of Grease, Refer to Lubrication Chart for recommended greases. Every 2 years - Operating Stems, Clean and Greese, Refer to Lubrication Chart for recommended greases.	Volume 5		
Greater than 1 yr	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Change oil every 10,000 hours or 2 years	Volume 2		
Greater than 1 yr	**Area 2**	Basins	Activated Sludge Basins	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Change synthetic oil depending on operating conditions (5 years at latest) Replace anti-friction bearing grease (recommendation) depending on operating conditions (3 years at latest) Replace oil seal (do not install it in the same track) depending on operating conditions (3 years at latest) Touch up or renew the surface/anticorrosion coating as necessary	Volume 2		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	2 years - Bus Bar: check connections for tightness and proper torque	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	2 years - Bus Bar: electrical test	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	2 years - Motor Overload Relays: check connections for tightness	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	3 years - Motor Overload Relays: perform cleaning, calibration and function tests	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	3 years - Molded Case Circuit Breakers: visual inspection and cleaning	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	2 years - Molded Case Circuit Breakers: mechanical test	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Electrical Room	Electrical / Instrument	MCCs 401 and 402	Allen Bradley	3-5 years - Molded Case Circuit Breakers: electrical test	Volume 7-8		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 400 Service Hours - Overhaul (TopEnd)	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 800 Service Hours - Overhaul (Major)	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Cooling System Coolant (DEAC) - Change	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Cooling System Coolant Extender (ELC) - Add	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Cooling System WaterTemperature Regulator - Replace	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Ether Starting Aid Cylinder - Replace	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Rotating Rectifer - Check	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 3 years - Turbocharger - Inspect	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Generator Pad	Electrical / Instrument	Emergency Generator	CAT	Every 6 years - Cooling System Coolant (ELC) - Change	Volume 6		
Greater than 1 yr	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check and replace flexible connection from blower to pipe as necessary	Volume 3		
Greater than 1 yr	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Service technician inspection of wearing parts and check hydraulic, pneumatic and measurement lines every 3 yrs or 20,000 hours. Replace as necessary.	Volume 3		
Greater than 1 yr	**Area 4**	Equipment Bldg	Mechanical Room	Equipment	Automatic Self-cleaning Filter	Amaid	Clean course screen	Volume 5		
Greater than 1 yr	**Area 4**	Equipment Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Baldor	Relubricate motor at intervals based on motor speed - see manufacturer documentation	Volume 3		
Greater than 1 yr	**Area 4**	Equipment Bldg	Pump, Thickening Rooms	Equipment	Progressing Cavity Pumps - Gear Box	Nord	Gearbox lubrication every 10,000 hours	Volume 1		
Greater than 1 yr	**Area 4**	Equipment Bldg	Thickening Room	Equipment	Thickened Sludge Progressing Cavity Pumps - Gearbox	Nord	Gearbox lubrication every 10,000 hours	Volume 1		
Greater than 1 yr	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - ActiClean System	Trojan	Every 18 months - Flush and clean entire cleaning system and replace ActiClean-WW Gel (perform at the same time as replacing lamps at EOLL) or every 18 months	Volume 3		
Greater than 1 yr	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - ActiClean System	Trojan	Every 2 yrs - Replace Wiper Seals	Volume 3		
Greater than 1 yr	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Hydraulic System	Trojan	Every 2 yrs - replace hydraulic fluid	Volume 3		
Greater than 1 yr	**Area 4**	UV Bldg	UV Channel	Equipment	UV System - Module	Trojan	12,000 hours - Remove module; replace lamps and sleeve o-ring seals	Volume 3		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	2 years - Bus Bar: check connections for tightness and proper torque	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	2 years - Bus Bar: electrical test	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	2 years - Motor Overload Relays: check connections for tightness	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	3 years - Motor Overload Relays: perform cleaning, calibration and function tests	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	3 years - Molded Case Circuit Breakers: visual inspection and cleaning	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	2 years - Molded Case Circuit Breakers: mechanical test	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Electrical Room	Electrical / Instrument	MCCs 501 and 502	Allen Bradley	3-5 years - Molded Case Circuit Breakers: electrical test	Volume 7-8		
Greater than 1 yr	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Check and replace flexible connection from blower to pipe as necessary	Volume 3		

Interval	Area	Building	Building Location	Item Type	Item	Supplier	Action	O&M Volume	Date	Initials
Greater than 1 yr	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Aerzen	Service technician inspection of wearing parts and check hydraulic, pneumatic and measurement lines every 3 yrs or 20,000 hours. Replace as necessary.	Volume 3		
Greater than 1 yr	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Motors	Baldor	Preform complete insection of drive unit annually; relubricate motor at intervals based on motor speed - see manufacturer documentation	Volume 2		
Greater than 1 yr	**Area 5**	Solids Bldg	Blower Room	Equipment	Rotary Positive Displacement Blowers	Baldor	Relubricate motor at intervals based on motor speed - see manufacturer documentation	Volume 3		
Greater than 1 yr	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Change oil every 10,000 hours or 2 years	Volume 2		
Greater than 1 yr	**Area 5**	Digesters	Digesters	Equipment	Top Entering Tank Mixers - Gearboxes	SEW Eurodrive	Change synthetic oil depending on operating conditions (5 years at latest) Replace anti-friction bearing grease (recommendation) depending on operating conditions (3 years at latest) Replace oil seal (do not install it in the same track) depending on operating conditions (3 years at latest) Touch up or renew the surface/anticorrosion coating as necessary	Volume 2		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Drive	SEW Eurodrive	Change mineral oil; replace anti-friction bearing grease (recommendation); and replace oil seal (do not install it in the same track).	Volume 4		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Drive	SEW Eurodrive	Change synthetic oil (depending on operating conditions - every 5 years at latest)	Volume 4		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Drive	SEW Eurodrive	Replace anti-friction bearing grease; replace oil seal (do not install in same track). Both items is according to oil temperature.	Volume 4		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Rotary Drum Thickener Drive	SEW Eurodrive	Change mineral oil; replace anti-friction bearing grease (recommendation); and replace oil seal (do not install it in the same track).	Volume 4		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Rotary Drum Thickener Drive	SEW Eurodrive	Change synthetic oil (depending on operating conditions - every 5 years at latest)	Volume 4		
Greater than 1 yr	**Area 5**	Solids Bldg	Dewatering Room	Equipment	Belt Filter Press - Rotary Drum Thickener Drive	SEW Eurodrive	Replace anti-friction bearing grease; replace oil seal	Volume 4		

Appendix G
Plant Control System



Cashmere Wastewater Treatment Plant

SCADA Operations & Maintenance Manual

RH2 Engineering

6-1-2015

Table of Contents

1. Standard WWTP Monitoring and Control Devices 4

Across the Line Starter (with Intelligent Overload Relay) 5

Air Flow Meter 8

Automatic Transfer Switch 11

Composite Sampler 11

Dissolved Oxygen Sensor 12

Float Switch 13

Flood Switch 14

Flow Meter 14

Flow Switch 17

Generator 17

Intrusion Switch 18

Level Transmitter 19

Level Switch 21

Motion Detector 21

Motor Actuated Gate 21

Motor Actuated Valve 23

Oxidation Reduction Potential (ORP) Sensor 25

Panic Button 26

Power Monitor 27

Pressure Switch 30

Pressure Transmitter 30

Smoke Alarm 32

Solenoid Operated Valve 33

Torque Switch 34

Variable Frequency Drive (VFD) 34

2. WWTP Sub-Systems 39

System Overview 39

Headworks - Influent System 40

Headworks - Fine Screen System 44

Headworks - Grit Removal System 46

In Plant Pump Station (IPPS) 50
In-Plant Pump Station Control – In-Plant Pump Station System 52
In Plant Pump Station Wet Well Level Control 52
In Plant Pump Station Pump Speed Control 52
Headworks (Flow Splitter and Equalization Basin) System 55
Headworks Flow Splitter – Headworks System 56
Equalization Basin – Headworks System 58
Activated Sludge Basin 1 System 62
Activated Sludge Basin 2 System 66
Aeration System 75
Clarifier System 79
Clarifiers – Clarifier System 80
Disinfectant and Effluent Metering System 82
Non-Potable Pump Station System 84
Return Activated Sludge (RAS) System 87
Thickening System 91
Flocculator and DAF Process control sequencing description 92
Aerobic Digester System 99
Dewatering System 103
Evaporation Pond System 106
Crunch-Pak Wastewater Storage System 109
PLC Communications 111
Miscellaneous SCADA System Devices 112
3. Alarm and Historian System 113
Alarm System – Alarm Summary 113
Alarm System – Alarm/Event History 115
Historian System 116
Appendix A – WWTP Alarm List 118

1. Standard WWTP Monitoring and Control Devices

The City of Cashmere WWTP currently has two Human Machine Interface (HMI) computers for monitoring and controlling the facility. One of these computers is a desktop system with a monitor, keyboard and mouse. The second computer consists of a wall mounted 48" touch screen that has no keyboard and mouse. In addition, the operations staff has two IPAD tablets that can access the HMI screen from any location that has cellular service.

The Human Machine Interface (HMI) for the Cashmere WWTP is based on an object model layout. There are two levels of objects laid out in the HMI interface.

1. **Device Object** – A device object relates to a monitoring or control device within the plant control system. Examples of these objects would be devices such as motor control centers, level sensors, flow sensors, float switches, or chemistry sensors. More complex objects will have their own pop-up screen that will show status, alarm settings or control settings for that device. Simpler devices will not have a pop-up screen but will display status on a subsystem screen. Section 1 of this manual will define all of the properties and screen layouts for device objects.
2. **Subsystem Object** – The WWTP has been broken into separate subsystems that are defined in the next section of this manual. These subsystems have **Overview** and C**ontrol** pop-up screens. Device objects are contained within the subsystem objects. Subsystem objects are defined in section 2 of this manual.

The HMI control screens are designed for mouse/keyboard or touch screen interaction. The following screen "buttons" are designed for displaying object properties for devices and subsystems.

DEVICE DISPLAY BUTTON

SUBSYSTEM CONTROL DISPLAY BUTTON

Across the Line Starter (with Intelligent Overload Relay)

Across the Line Starters with Intelligent Overload Relays accepts control signals and provides status signals to telemetry units via an Ethernet connection.

The Across the Line Starter receives a “motor call” discrete output and provides “motor running,” “motor in hand,” “motor in auto,” “phase fail,” motor fail” and “over temperature” discrete inputs to the telemetry system. The across the line starter also provides motor current and a real input to the telemetry system. The across the line starter receives MCC Voltage and MCC Power factor real outputs from the telemetry system. The current, voltage and power factor are used to estimate power consumption. The power consumption is provided to the telemetry system as a real input.

The control setpoint associated with an across the line starter is the “maximum motor starts per hour.”

If the motor run status does not match the motor call status, a “call no run” or “run no call” alarm is triggered. If the motor has been started the maximum number of times in an hour, and excessive starts alarm is triggered.

Across the Line Starters with Intelligent Overload Relays receive 10 separate fault bits as inputs, which are used to generate the “motor fail” alarm. Additionally, “phase fail,” and “over temperature” inputs trigger separate alarms.

The motor run signal is used to calculate today’s total, yesterday’s total and the grand total motor run times, while the motor call signal is used to calculate today’s total, yesterday’s total and the grand total number of starts for the motor.

The current input is used to calculate today and yesterday’s min, max and average current. The estimated power is totalized to provide todays, yesterdays and the cumulative power consumed by the motor.

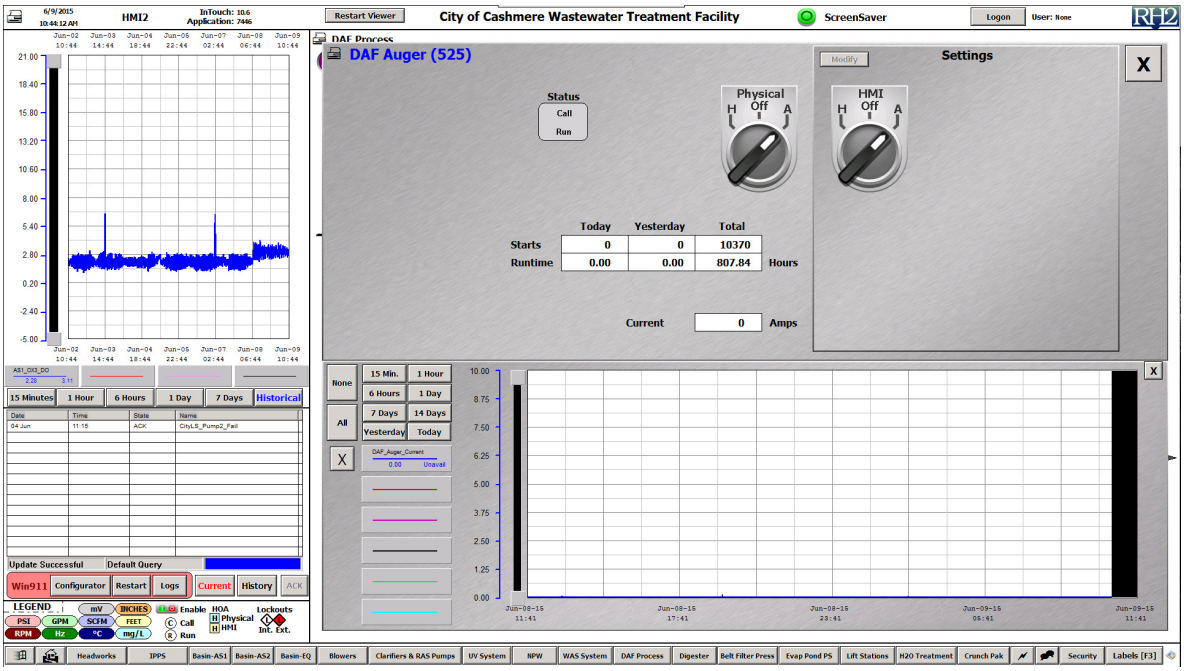
The telemetry system assigns each Across the Line Starter with the following data: “internal lockout” (based on starter specific alarms and information), “external lockout” (based on system-wide alarms and information), “Ready” as well as “remote hand”, “remote off”, and “remote auto” motor control modes.

Equipment: Across the Line Starter					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
DO: Motor Call	Excessive Starts Alarm Delay. Max Starts / Hour.		Excessive Starts	Number of Starts Number of Starts Number of Starts	(Today) (Yesterday) (Cumulative)
DI: Motor Running	Run No Call Alarm Delay. Call No Run Alarm Delay.		Run No Call Call No Run	Runtime Runtime Runtime	(Today) (Yesterday) (Cumulative)
DI: Overload DI: Ground Fault DI: Stall DI: Jam DI: Underload DI: Current Imbalance DI: Comm Fault DI: Comm Idle DI: Nonvolatile Memory Fault DI: Hardware Fault	Motor Fail Alarm Delay.		Motor Fail (If any of the inputs on in this row are true, the Motor Fail Alarm is triggered)		
DI: In Hand					
DI: In Auto					
DI: Over temperature	Over temperature Alarm Delay.		Over temperature		
DI: Phase Fail	Phase Fail Delay.		Phase Fail		
RE: Current				Max Current	(Today)

				Avg Current Min Current Max Current Avg Current Min Current	(Today) (Today) (Yesterday) (Yesterday) (Yesterday)
Control Data From Telemetry		Ready Internal Lockout External Lockout Remote Hand Remote Off Remote Auto MCC Voltage MCC Power Factor			
Calculated Data to Telemetry		Power		Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday

IMAGE 1-1

ACROSS THE LINE STARTER HMI SCREEN OBJECT



Air Flow Meter

Air Flow Meters provide an “Air Flow” signal as an analog input to the telemetry system.

The analog flow signal is used to trigger four alarms based on flow rate and one flow meter failure alarm. Flow rate alarms are triggered when flow exceeds the “High High” or “High” flow rate setpoints. Flow rate alarms are also triggered when the flow rate is below the “Low” or “Low Low” flow rate setpoints.

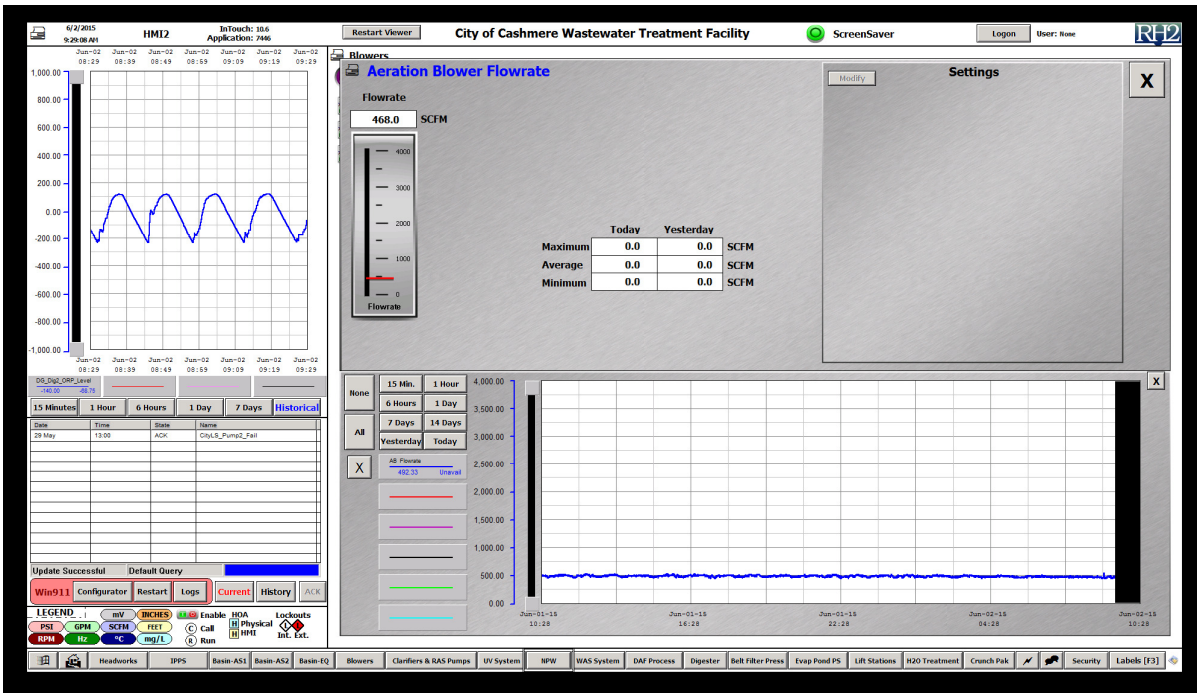
When the air flow though the meter is dependent on a specific process the “Low” and “Low Low” alarms may be disabled depending on the process status. For instance, a blower discharge air flow meter depends on the blower run status. The “Air Flow Expected” bit is used to disable the “Low” and “Low Low” flow alarms when the pump is not running. The air flow meter fail alarm is triggered when the analog signal received from the flow meter is outside of the signal range defined by the span and offset setpoints.

Today and yesterday’s max, min and average air flow is recorded for each air flow sensor. For air flow meters that measure flow from a process that does not run continuously, the average flow is not calculated when the process is not running. The air flow analog input will also be totalized to provide today’s total yesterday’s total and the grand total air flow.

Instrument: Air Flow Meter					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Air Flow	Hi Hi Flow Hi Flow Lo Flow Lo Lo Flow Span Offset Hi Hi Alarm Delay Hi Alarm Delay Lo Alarm Delay Lo Lo Alarm Delay Sensor Fail Alarm Delay	Simulated Air Flow Air Flow Expected	Hi Hi Air Flow Hi Air Flow Lo Air Flow Lo Lo Air Flow Sensor Fail	Max Air Flow Avg Air Flow Min Air Flow Max Air Flow Avg Air Flow Min Air Flow Total Air Flow Total Air Flow Total Air Flow	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday) (Today) (Yesterday) (Cumulative)

IMAGE 1-2

AIR FLOW METER HMI SCREEN OBJECT



Automatic Transfer Switch

Automatic Transfer Switches provide “ATS in Utility,” “ATS in Emergency” and “ATS Fail” discrete inputs to the telemetry system. The “ATS Fail” signal triggers an alarm.

Equipment: Automatic Transfer Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: ATS Fail	ATS Fail Alarm Delay		ATS Fail
DI: ATS in Utility	ATS in Utility	ATS in Utility	
DI: ATS in Emergency	ATS in Emergency Alarm Delay	ATS in Emergency	ATS in Emergency

Composite Sampler

The Composite Sampler receives a “Total Flow” analog output from the telemetry system, which is used to calculate the sampling interval based on the “samples per KGAL” setpoint. The Composite Sampler provides 4 discrete inputs to the telemetry system: “Pump Air Full,” “Pump Bottle Full,” “Air Distributer Jammed,” and “Delay Before Start.”

“Pump Air Full,” “Pump Bottle Full,” and “Air Distributer Jammed” inputs are used to generate alarms.

The “Total Flow” signal is used to generate Today’s Max, Average, and Minimum Flow, as well as Yesterday’s Max, Average and Minimum Flow.

Instrument: Composite Sampler					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AO: Total Influent Flow		Total Calculated Influent Flow			
DI: Pump Air Full	Pump Air Full Alarm Delay		Pump Air Full		
DI: Pump Bottle Full	Pump Bottle Full Alarm Delay		Pump Bottle Full		
DI: Air Distributer Jammed	Air Distributer Jammed Alarm Delay		Air Distributer Jammed		

DI: Delay Before Start					

Dissolved Oxygen Sensor

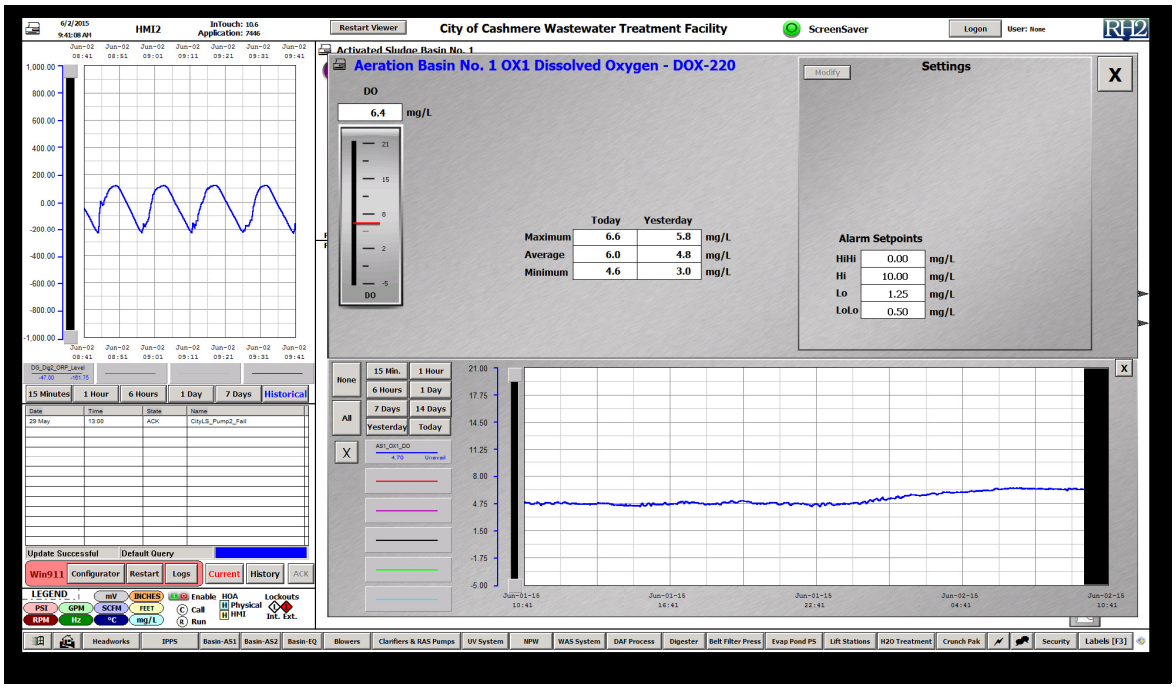
Dissolved Oxygen Sensors provide “Dissolved Oxygen” as an analog input. The analog input is used to trigger five alarms. “High” and “High High” Dissolved Oxygen alarms are triggered when the Dissolved Oxygen exceeds the “High” or “High High” Dissolved Oxygen setpoint. “Low” and “Low Low” Dissolved Oxygen alarms are triggered when the Dissolved Oxygen is drops below the “Low” or “Low Low” Dissolved Oxygen setpoints. The “Dissolved Oxygen Sensor Fail” alarm is triggered when the analog Dissolved Oxygen signal is outside the signal bound setpoints.

Today and yesterday’s max, min and average dissolved oxygen levels are recorded for each dissolved oxygen sensor.

Instrument: Dissolved Oxygen Sensor					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Dissolved Oxygen	Hi Hi D.O. Hi D.O. Lo D.O. Lo Lo D.O. Span Offset Hi Hi Alarm Delay Hi Alarm Delay Lo Alarm Delay Lo Lo Alarm Delay Sensor Fail Alarm Delay	Simulated D.O.	Hi Hi D.O. Hi D.O. Lo D.O. Lo Lo D.O. Sensor Fail	Max D.O. Avg D.O. Min D.O. Max D.O. Avg D.O. Min D.O.	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)

IMAGE 1-3

DISSOLVED OXYGEN SENSOR HMI SCREEN OBJECT



Float Switch

Float Switches provide one discrete input to the telemetry system, which is used to trigger an alarm or event. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Float Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Float Switch Status	Float Alarm Delay	Float Event Alarm enable	Float Alarm

Flood Switch

Flood Switches provide one discrete input to the telemetry system, which are used to trigger an alarm. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Flood Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Flood Switch Status	Flood Alarm Delay	Alarm enable	Flood Alarm

Flow Meter

Flow Meters provide "flow" signals as analog inputs, along with "totalizer pulse" digital inputs, which indicate when a certain volume of fluid has passed through the flow meter.

The analog flow signal is used to trigger four alarms based on flow rate and one flow meter failure alarm. Flow rate alarms are triggered when flow exceeds the "High High" or "High" flow rate setpoints. Flow rate alarms are also triggered when the flow rate is below the "Low" or "Low Low" flow rate setpoints. When the flow rate though the meter is dependent on a specific process the "Low" and "Low Low" alarms may be disabled depending on the process status. For instance, a pump discharge flow meter depends on the pump run status. The "Flow Expected" bit is used to disable the "Low" and "Low Low" flow alarms when the pump is not running. The flow meter fail alarm is triggered when the analog signal received from the flow meter is outside of the signal range defined by the span and offset setpoints.

The today and yesterday's average flow, max flow, and minimum flow for each flow meter will be calculated and recorded. For flow meters that measure flow from a process that does not run continuously, the average flow is not calculated when the process is not running.

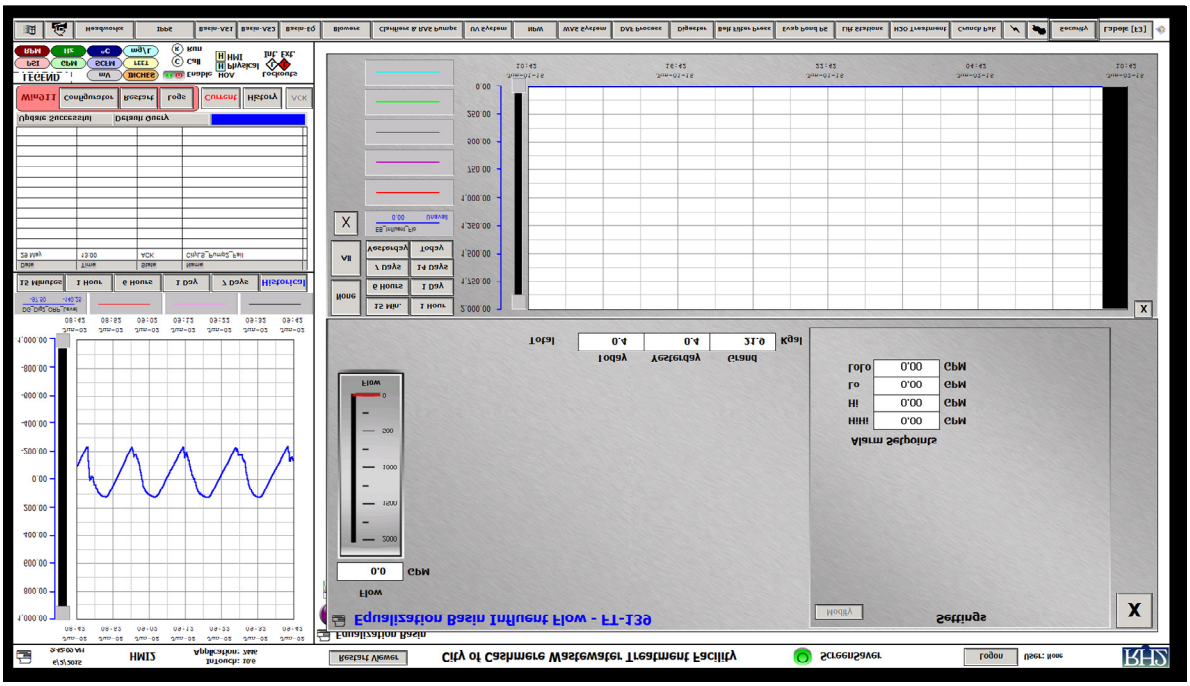
The volume of fluid indicated by each flow meter's totalizer pulse signal is entered as a setpoint. The grand total volume of fluid passed though each flow meter is calculated by multiplying the totalizer pulse quantity by the number of pulses. The PLC will record the grand total, today's total and yesterday's total flow.

Instrument: Flow Meter					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Flow	Hi Hi Flow Hi Flow Lo Flow	Simulated Flow Flow Expected	Hi Hi Flow Hi Flow Lo Flow	Max Flow Avg Flow Min Flow	(Today) (Today) (Today)

	Lo Lo Flow Span Offset Hi Hi Flow Alarm Delay Hi Flow Alarm Delay Lo Flow Alarm Delay Lo Lo Flow Alarm Delay Transmitter Fail - Alarm Delay		Lo Lo Flow Transmitter Fail	Max Flow Avg Flow Min Flow	(Yesterday) (Yesterday) (Yesterday)
DI: Totalizer Pulse	Pulse Quantity		N/A	Flow Total Flow Total Flow Total	(Today) (Yesterday) (Cumulative)

IMAGE 1-4

FLOW METER HMI SCREEN OBJECT



Flow Switch

Flow Switches provide one discrete input to the telemetry system, which may be used to trigger an alarm or event. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Flow Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Flow Switch Status	Flow Alarm Delay	Flow Event Alarm enable	Flow Alarm

Generator

Generators provide "Run," "Fail," "Trouble," "Not in Auto" and "Low Fuel" discrete inputs to the telemetry system. The "Fail," "Trouble," "Not in Auto" and "Low Fuel" signals trigger alarms. The "Generator Run" signal also triggers an alarm if the Automatic Transfer Switch is in the Emergency Position while the Generator is running. The generator "Run" signal is used to calculate today's total, yesterday's total and the grand total number of generator starts. The generator "Run" signal is also used to calculate today's total, yesterday's total and the grand total hours of operation.

Equipment: Generator					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
DI: Run	Generator Run Alarm Delay	Generator Run	Generator Run Alarm	Number of Starts Runtime Number of Starts Runtime Number of Starts Runtime	(Today) (Today) (Yesterday) (Yesterday) (Cumulative) (Cumulative)
DI: Fail	Generator Fail Alarm Delay		Generator Fail		
DI: Trouble	Generator Trouble Alarm Delay		Generator Trouble		
DI: Not In Auto	Generator Not in Auto Alarm Delay		Generator Not in Auto		

DI: Low Fuel	Generator Low Fuel Alarm Delay		Generator Low Fuel		

Intrusion Switch

Intrusion switches are used to control access to cabinets and buildings. Intrusion alarms are triggered by the single discrete input. Intrusion switches are assigned a zone, so that an operator can disable all the intrusion switches in a zone. Intrusion switches also have an individual intrusion enable bit. There is also a master intrusion disable bit available to disable all intrusion switches in the plant.

Instrument: Intrusion Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Intrusion Switch Status	Intrusion Alarm Delay	Intrusion Zone Individual Alarm Enable	Intrusion Alarm

Level Transmitter

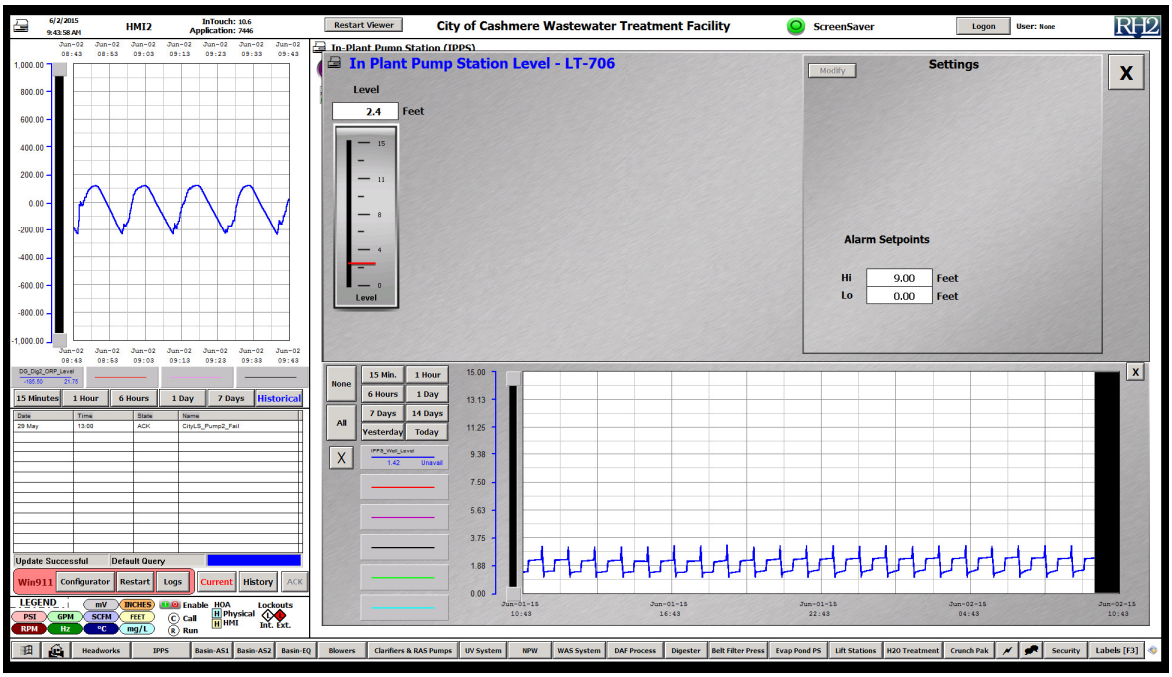
Level Transmitters provide “level” as analog inputs. The analog input is used to trigger five alarms. “High” and “High High” level alarms are triggered with the level exceeds the “High” or “High High” level setpoint. “Low” and “Low Low” level alarms are triggered when the level is drops below the “Low” or “Low Low” level setpoints. The “Level Transmitter Fail” alarm is triggered when the analog level signal is outside the signal range defined by the span and offset setpoints.

Today and yesterday’s max, min and average levels are recorded for each level transmitter.

Instrument: Level Transmitter					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Level	Hi Hi Level Hi Level Lo Level Lo Lo Level Span Offset Hi Hi Alarm Delay Hi Alarm Delay Lo Alarm Delay Lo Lo Alarm Delay Transmitter Fail - Alarm Delay	Simulated Level	Hi Hi Level Alarm Hi Level Alarm Lo Level Alarm Lo Lo Level Alarm Transmitter Fail	Max Level Average Level Min Level Max Level Average Level Min Level	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)

IMAGE 1-5

LEVEL SENSOR HMI SCREEN OBJECT



Level Switch

Level Switches provide one discrete input to the telemetry system, which may be used to trigger an alarm or event. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Level Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Level Switch Status	Level Alarm Delay	Level Event Alarm enable	Level Alarm

Motion Detector

Motion Detectors are used in the same way as intrusion switches. See the intrusion switch description.

Motor Actuated Gate

Motor Actuated Gates receive an analog "Gate Position Control" output from the telemetry system. Motor Actuated Gates provide an analog "Gate Position Feedback" input and discrete "Gate Open" and "Gate Closed" inputs to the telemetry system.

The "Gate Fail" alarm is triggered if the "Gate Position Control" and "Gate Position Feedback" signals are not within the "Acceptable Position Error" of each other.

Gate operations are counted to generate today's total, yesterday's total and the cumulative total number valve operations. The Gate position feedback signal is monitored to provide the valve minimum, maximum and average position for today and yesterday.

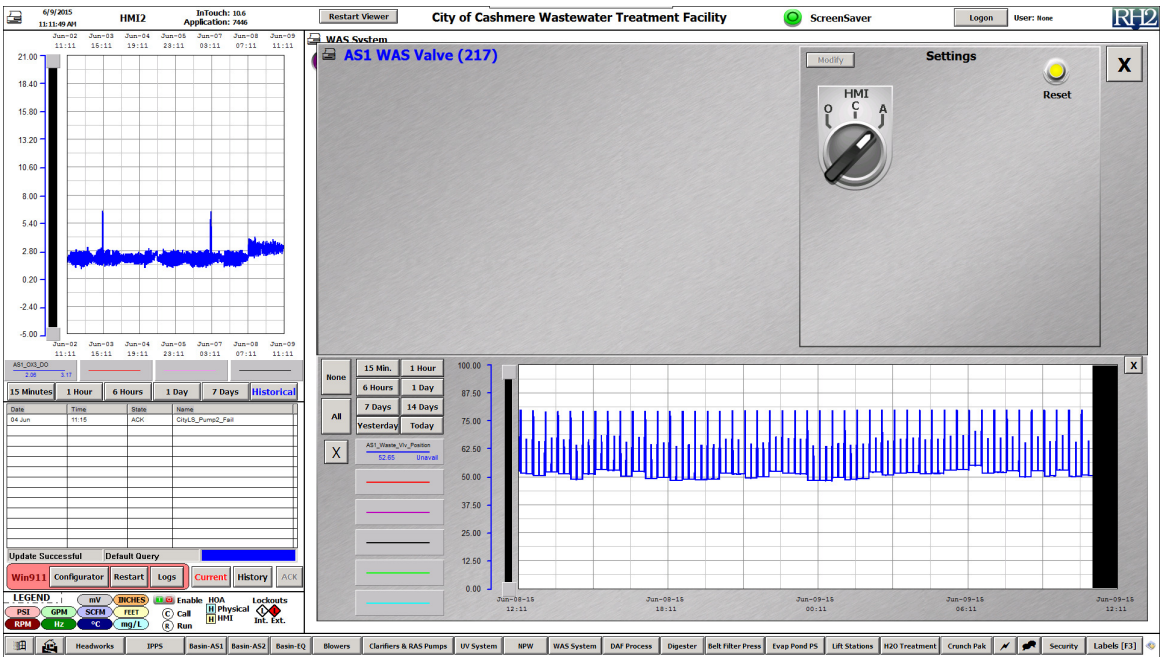
The telemetry system assigns each Gate with the following data: "internal lockout" (based on Gate specific alarms and information), "external lockout" (based on system-wide alarms and information), and "Ready."

Instrument: Motor Actuated Gate					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AO: Gate Position Control	Span Offset				
AI: Gate Position Feedback	Span		Gate Fail	Max Position	(Today)

	Offset Acceptable Position Error Gate Fail Alarm Delay			Avg Position Min Position Max Position Avg Position Min Position	(Today) (Today) (Yesterday) (Yesterday) (Yesterday)
DI: Gate Open		Gate Open			
DI: Gate Closed		Gate Closed			
Control Data From Telemetry		Ready Internal Lockout External Lockout			

IMAGE 1-6

MOTOR ACTUATED GATE HMI SCREEN OBJECT



Motor Actuated Valve

Motor Actuated Valves receive an analog "Valve Position Control" output from the telemetry system. Motor Actuated Valves provide an analog "Valve Position Feedback" input and discrete "Valve Open" and "Valve Closed" inputs to the telemetry system.

The "Valve Fail" alarm is triggered if the "Valve Position Control" and "Valve Position Feedback" signals are not within the "acceptable position error."

Valve operations are counted to generate today's total, yesterday's total and the cumulative total number valve operations. The valve position feedback signal is monitored to provide the valve minimum, maximum and average position for today and yesterday.

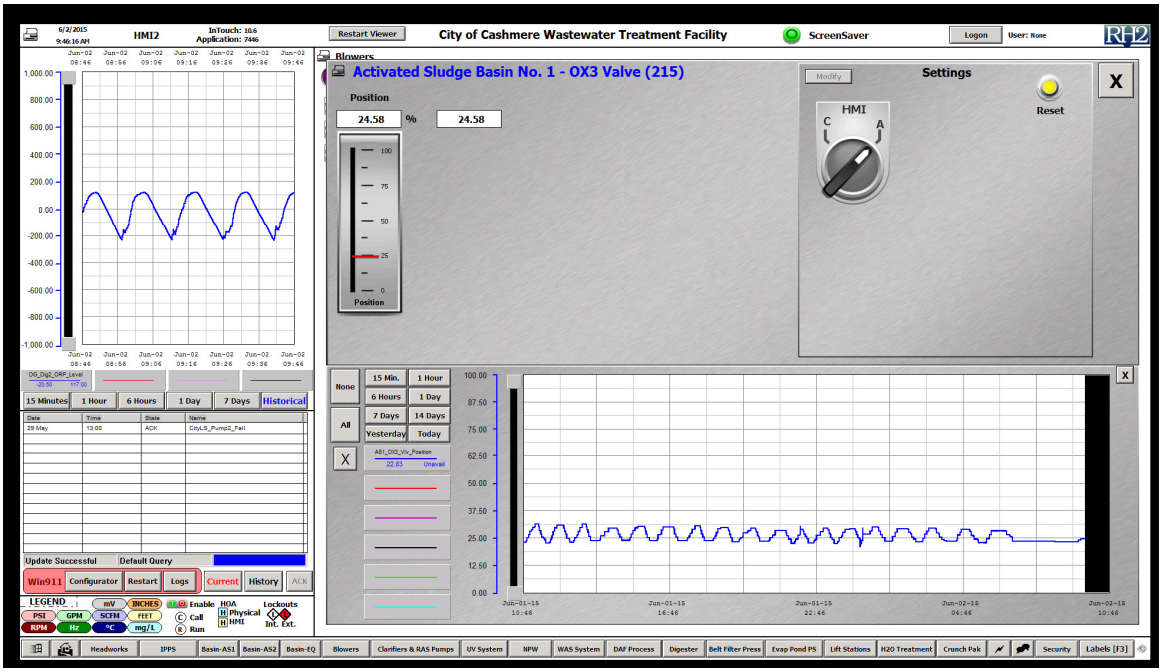
The telemetry system assigns each valve with the following data: "internal lockout" (based on Valve specific alarms and information), "external lockout" (based on system-wide alarms and information), and "Ready."

Instrument: Motor Actuated Valve					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AO: Valve Position Control	Span Offset	Internal Lockout External Lockout			
AI: Valve Position Feedback	Span Offset "Acceptable Position Error" "Valve Fail Alarm Delay"		Valve Fail	Max Position Avg Position Min Position Max Position Avg Position Min Position	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)
DO: Valve Call Open				Operations Operations Operations	(Today) (Yesterday) (Cumulative)
DO: Valve Call Closed					
DI: Valve Open		Valve Open			

DI: Valve Closed		Valve Closed			
Control Data From Telemetry		Ready Internal Lockout External Lockout			

IMAGE 1-7

MOTOR ACTUATED VALVE HMI SCREEN OBJECT



Oxidation Reduction Potential (ORP) Sensor

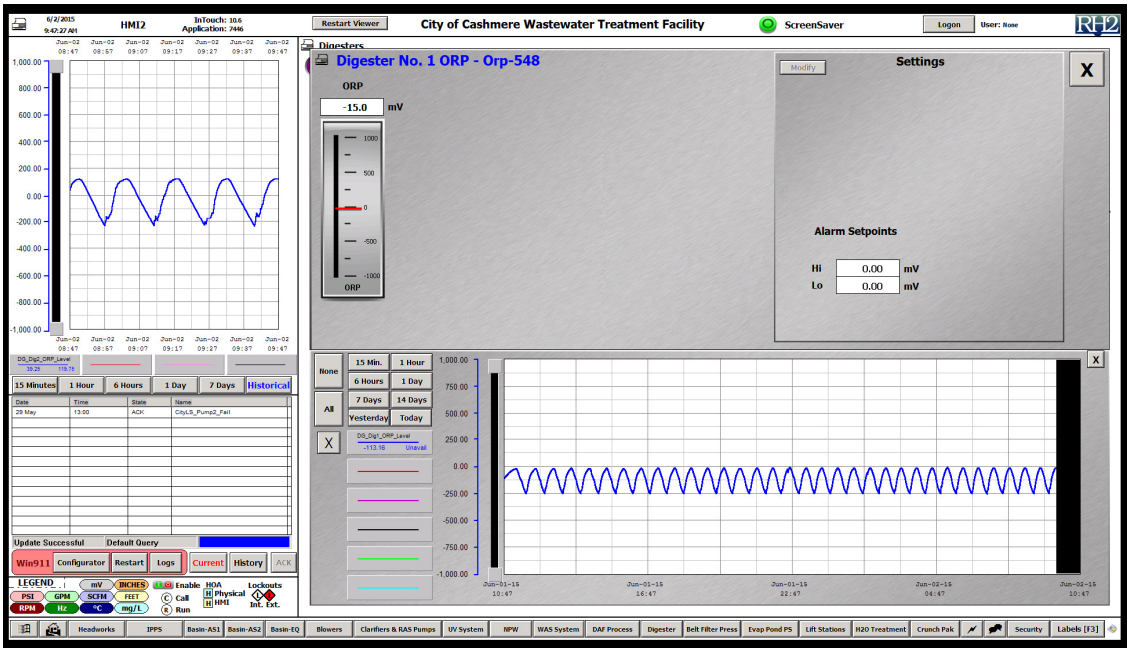
ORP Sensors provide the "ORP" as an analog input. The analog input is used to trigger five alarms. "High" and "High High" ORP alarms are triggered when the ORP exceeds the "High" or "High High" ORP setpoint. "Low" and "Low Low" ORP alarms are triggered when the ORP is drops below the "Low" or "Low Low" ORP setpoints. The "ORP Sensor Fail" alarm is triggered when the analog ORP signal is outside the signal bound setpoints.

Today and yesterday's max, min and average ORP levels are recorded for each ORP Sensor.

Instrument: ORP Sensor					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: ORP	Hi Hi ORP Hi ORP Lo ORP Lo Lo ORP Span Offset Hi Hi Alarm Delay Hi Alarm Delay Lo Alarm Delay Lo Lo Alarm Delay Sensor Fail Alarm Delay	Simulated ORP	Hi Hi ORP Hi ORP Lo ORP Lo Lo ORP ORP Sensor Fail	Max ORP Avg ORP Min ORP Max ORP Avg ORP Min ORP	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)

IMAGE 1-8

ORP SENSOR HMI SCREEN OBJECT



Panic Button

Panic Buttons immediately trigger a Panic Alarm when pressed.

Instrument: Panic Button			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Panic Button Status			Panic Alarm

Power Monitor

Power Monitors are components built in to Motor Control Centers. Power monitors measure electrical parameters at the MCC bus. Power monitors provide Voltage, Current, Frequency, Power, kVAR, kVA, True Power Factor, Voltage Imbalance, and Current Imbalance information to the telemetry system. Data provided by the power monitor is in engineering units, as indicated below.

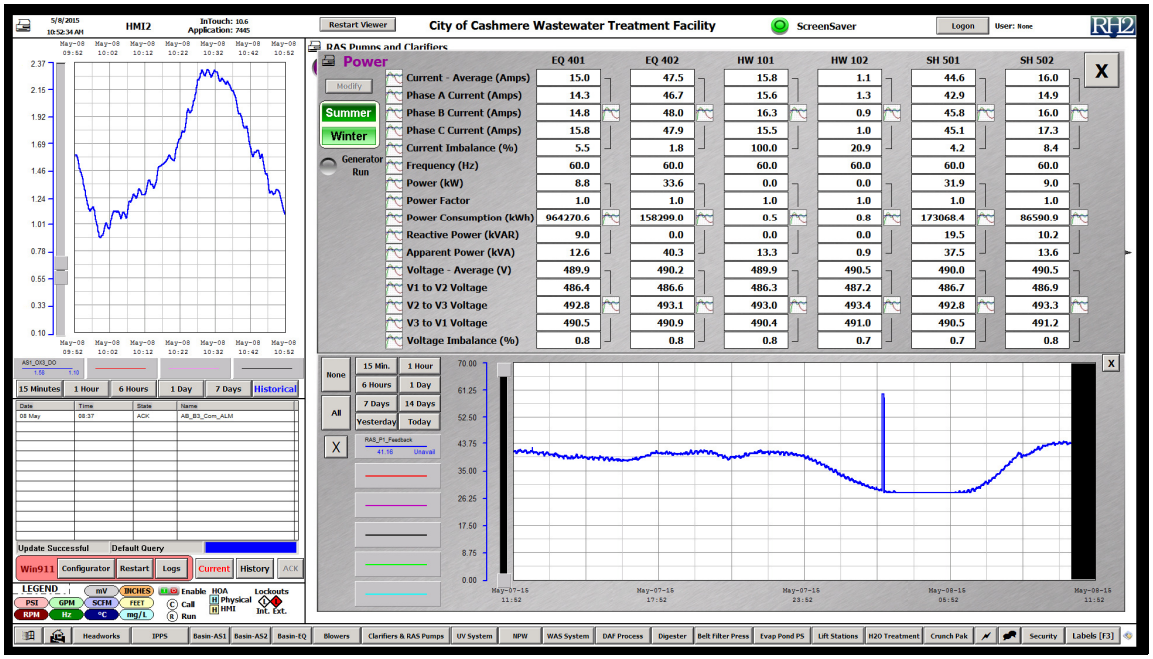
Instrument: Power Monitor			
I/O Type: Name	**Units**	**Summary Data**	
RE: Power	kW	Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
RE: Voltage Avg	Volts	Max Voltage Avg Voltage Min Voltage Max Voltage Avg Voltage Min Voltage	Today Today Today Yesterday Yesterday Yesterday
RE: Voltage V1-V2	Volts		
RE: Voltage V2-V3	Volts		
RE: Voltage V3-V1	Volts		
RE: Current Avg	Amps	Max Current Avg Current Min Current Max Current	Today Today Today Yesterday

		Avg Current Min Current	Yesterday Yesterday
RE: Current A	Amps		
RE: Current B	Amps		
RE: Current C	Amps		
RE: Power Factor	Unitless	Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
RE: Frequency	Hz	Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
RE: Apparent Power	kVA	Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
RE: Reactive Power	kVAR	Max Avg	Today Today

		Min Max Avg Min	Today Yesterday Yesterday Yesterday
RE: Voltage Imbalance	%	Max Imbalance Avg Imbalance Min Imbalance Max Imbalance Avg Imbalance Min Imbalance	Today Today Today Yesterday Yesterday Yesterday
RE: Current Imbalance	%	Max Imbalance Avg Imbalance Min Imbalance Max Imbalance Avg Imbalance Min Imbalance	Today Today Today Yesterday Yesterday Yesterday

IMAGE 1-8

POWER MONITOR HMI SCREEN OBJECT



Pressure Switch

Pressure Switches provide one discrete input to the telemetry system, which may be used to trigger an alarm or event. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Pressure Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Pressure Switch Status	Pressure Alarm Delay	Pressure Event Alarm enable	Pressure Alarm

Pressure Transmitter

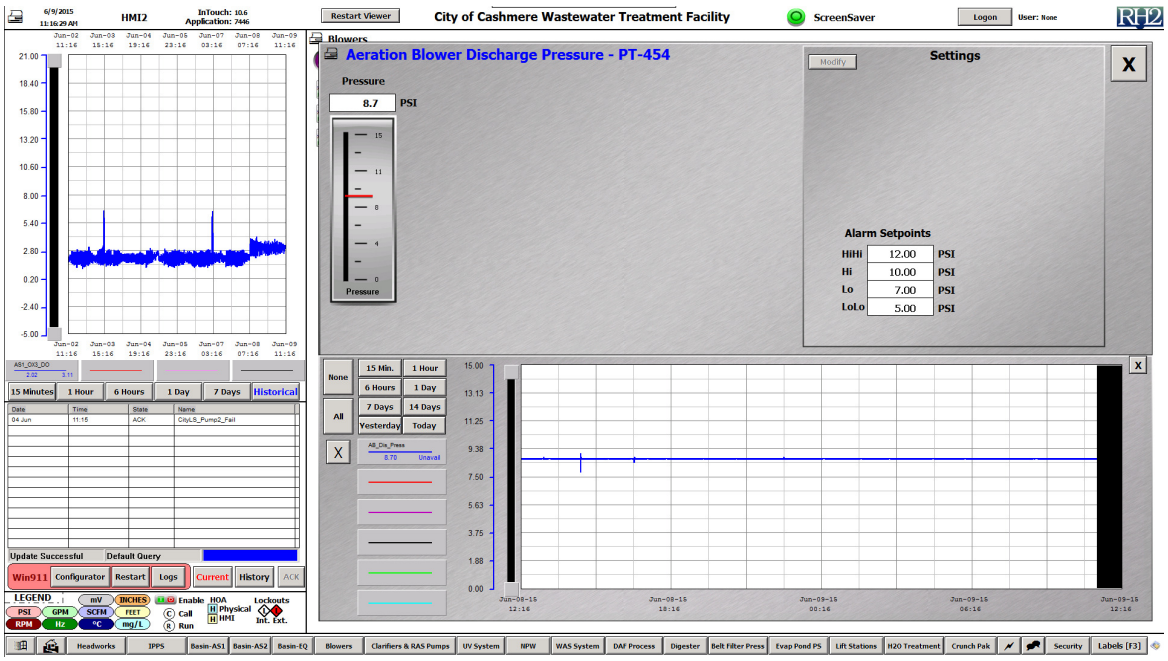
Pressure Transmitters provide “Pressure” as analog inputs. The analog input is used to trigger five alarms. “High” and “High High” Pressure alarms are triggered with the Pressure exceeds the “High” or “High High” Pressure setpoint. “Low” and “Low Low” Pressure alarms are triggered when the Pressure is drops below the “Low” or “Low Low” Pressure setpoints. The “Pressure Transmitter Fail” alarm is triggered when the analog Pressure signal is outside the signal range defined by the span and offset setpoints.

Today and yesterday's yearly max, min and average Pressures are recorded for each Pressure transmitter.

Instrument: Pressure Transmitter					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Pressure	Hi Hi Pressure Hi Pressure Lo Pressure Lo Lo Pressure Span Offset Hi Hi Alarm Delay Hi Alarm Delay Lo Alarm Delay Lo Lo Alarm Delay Transmitter Fail -Alarm Delay	Simulated Pres.	Hi Hi Pressure Hi Pressure Lo Pressure Lo Lo Pressure Transmitter Fail	Max Pressure Average Pressure Min Pressure Max Pressure Average Pressure Min Pressure	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)

IMAGE 1-9

PRESSURE SENSOR HMI SCREEN OBJECT



Smoke Alarm

Smoke Alarms provide one discrete input to the telemetry system, which is used to trigger an alarm. The alarm is triggered after the alarm delay has past.

Instrument: Smoke Alarm			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Smoke Alarm	Smoke Alarm Delay		Smoke Alarm

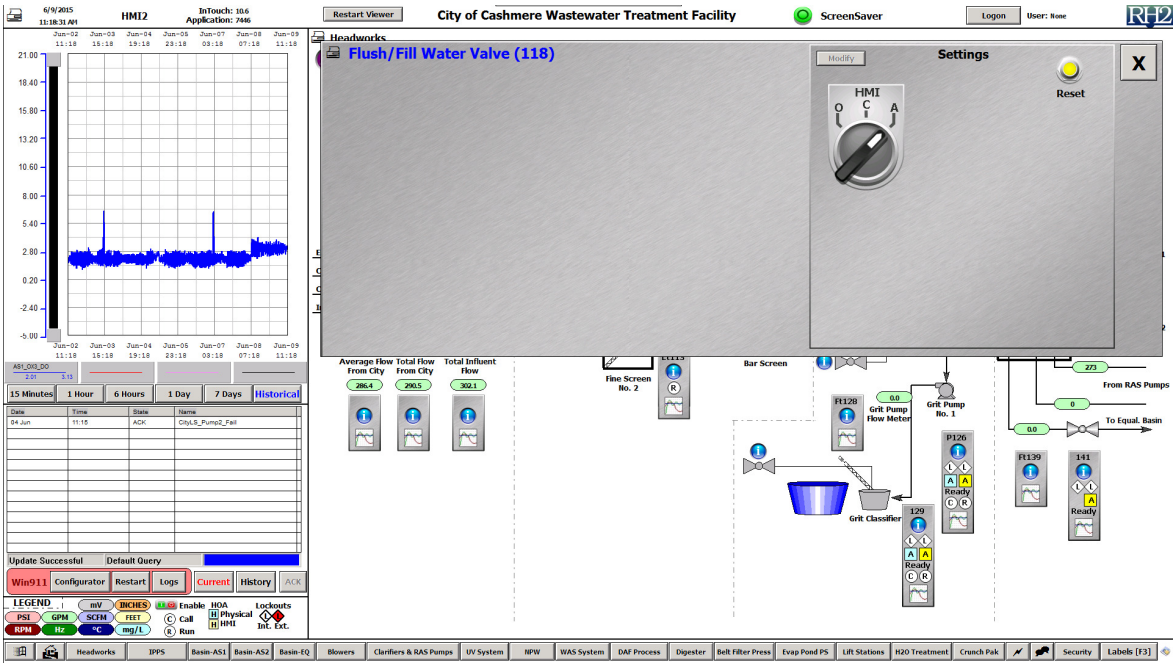
Solenoid Operated Valve

Solenoid Operated Valves receive “Valve open” calls as a Digital Output. Valve operations are counted to today’s total, yesterday’s total and grand total number valve operations.

Instrument: Solenoid Operated Valve					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
DO: Valve Call Open		Internal Lockout External Lockout		Operations Operations Operations	(Today) (Yesterday) (Cumulative)

IMAGE 1-10

SOLENOID VALVE HMI SCREEN OBJECT



Torque Switch

Torque Switches provide one discrete input to the telemetry system, which are used to trigger an alarm. The alarm is triggered after the alarm delay has past, and only if the alarm is enabled.

Instrument: Torque Switch			
I/O Type: Name	**Setpoints**	**Data**	**Alarms**
DI: Torque Switch Status	Torque Alarm Delay	Torque enable	Torque Alarm

Variable Frequency Drive (VFD)

Variable frequency drives may take inputs or provide outputs to equipment, relays, switches or other hardwired instrumentation. The VFD accepts control signals and provides status signals to telemetry units via an ethernet connection.

The VFD receives a “motor speed control” analog output as well as a “motor call” discrete output from the telemetry system. The VFD provides an analog “motor speed feedback” input and discrete “motor running,” “motor fail,” “input phase fail” “output phase fail.” “motor overtemperature,” “Discharge overtemperature,” “seal fail,” “torque hi,” “torque hi hi lockout,” “drive ready” “motor in hand,” “motor in auto,” inputs to the telemetry system. Not all VFDs provide all of these inputs to the telemetry system.

The VFD also provides real values for current, voltage, power, power factor, and frequency signals. These signals are used to generate today and yesterday’s minimum, average and maximum values.

Control setpoints associated with a VFD include “maximum motor starts per hour,” and “manual speed control.”

Speed feedback values outside the speed signal bounds trigger a “speed instrument fail” alarm. If the motor run status does not match the motor call status, a “call no run” or “run no call” alarm is triggered. If the motor has been started the maximum number of times in an hour, and excessive starts alarm is triggered. The “motor fail,” “phase fail,” “motor overtemperature,” “discharge overtemperature,” “seal fail,” “torque high” and “torque high high lockout” inputs also trigger alarms.

The motor run signal is used to calculate today’s total, yesterday’s total and the grand total motor runtime. The motor call output is used to calculate today’s total, yesterday’s total and the grand total number of motor starts.

The telemetry system assigns each VFD with the following data: “internal lockout” (based on VFD specific alarms and information), “external lockout” (based on system-wide alarms and information), “Ready” as well as “remote hand”, “remote off”, and “remote auto” motor control modes.

Equipment: Variable Frequency Drive (VFD)					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
AI: Speed Feedback	Span Offset "Speed Instrument Fail Alarm Delay"		Speed Instrument Fail		
AO: Speed Control	Manual Speed Span Offset	Auto or Manual Mode			
DO: Motor Call	Excessive Starts Alarm Delay	Max Starts Per Hour	Excessive Starts	Number of Starts Number of Starts Number of Starts	(Today) (Yesterday) (Cumulative)
DI: Motor Running	Run No Call Alarm Delay Call No Run Alarm Delay		Run No Call Call No Run	Runtime Runtime Runtime	(Today) (Yesterday) (Cumulative)
DI: Motor Fail	Motor Fail Alarm Delay		Motor Fail		
DI: Input Phase Fail DI: Output Phase Fail	Phase Fail Alarm Delay		Phase Fail (Triggered when either DI in this row goes high)		
DI: Motor Overtemperature	Over temperature Alarm Delay		Motor Overtemperature		
DI: Discharge Overtemperature	Discharge Overtemperature Alarm Delay		Discharge Overtemperature		
DI: Seal Fail	Seal Fail Alarm Delay		Seal Fail		

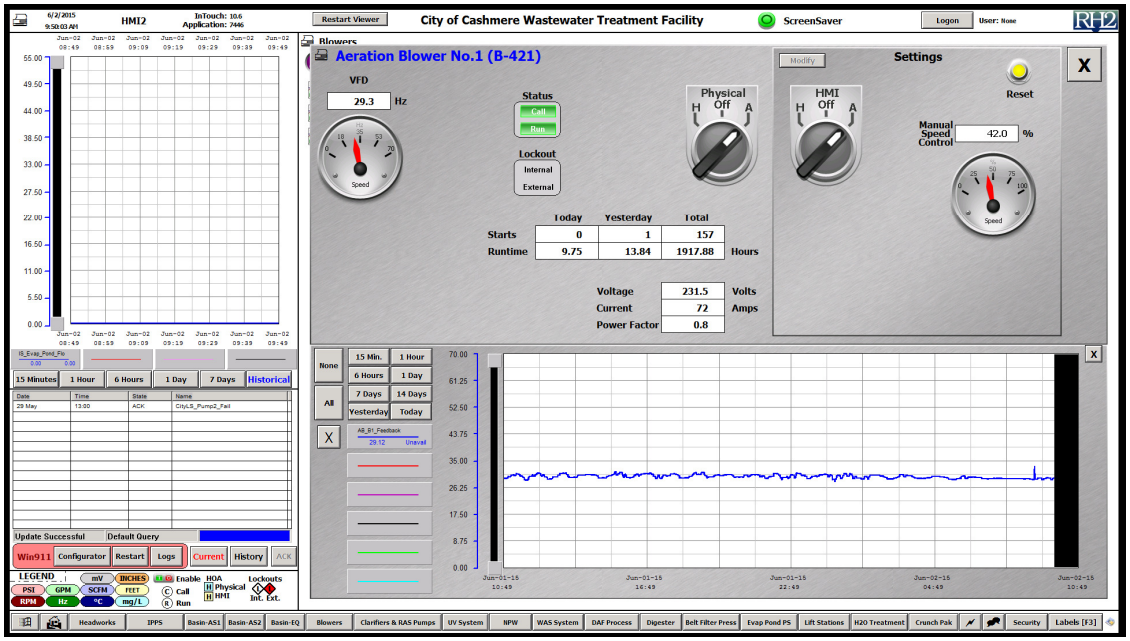
DI: Torque Hi	Torque High Alarm Delay		Torque High Alarm		
DI: Torque Hi Hi Lockout	Torque Hi Hi Lockout Alarm Delay		Torque Hi Hi Lockout		
DI: Drive Ready					
DI: In Hand					
DI: In Auto					
RE: Power				Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
RE: Voltage				Max Voltage Avg Voltage Min Voltage Max Voltage Avg Voltage Min Voltage	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)
RE: Current				Max Current Avg Current Min Current Max Current Avg Current Min Current	(Today) (Today) (Today) (Yesterday) (Yesterday) (Yesterday)
RE: Power Factor				Max PF	(Today)

				Avg PF Min PF Max PF Avg PF Min PF	(Today) (Today) (Yesterday) (Yesterday) (Yesterday)
RE: Frequency				Max Avg Min Max Avg Min	Today Today Today Yesterday Yesterday Yesterday
Control Data From Telemetry		Ready Internal Lockout External Lockout Remote Hand Remote Off Remote Auto			

Note: AI, AO, DI, and DO are virtual signals that will be communicated via Ethernet. RE is a real value passed from the device to the PLC via Ethernet.

IMAGE 1-11

VARIABLE FREQUENCY DRIVE (VFD) HMI SCREEN OBJECT



2. WWTP Sub-Systems

Subsystem Objects – Subsystems objects are a method for viewing and controlling the separate wastewater treatment processes in the HMI software. Subsystems typically consist of the following two screens.

1. **Overview Screen** – A subsystem overview screen is a schematic layout of the treatment process for a specific subsystem. This screen will show real time status of monitoring and control devices identified in section 1. Each device within an overview screen can be selected on the screen to display its pop-up window that displays its properties.
2. **Control Screen** – A subsystem control screen is a pop up screen that is selected from a subsystem overview screen that allows the operations staff to view and control a subsystems operating parameters. These parameters may consists of the following:
    a. Subsystem enable/disable
    b. Alarm Setpoints
    c. Control Setpoints

System Overview

The system overview screen is the top level main HMI screen that shows all of the WWTP subsystems on one screen. The WWTP HMI screen is broken into five separate components:

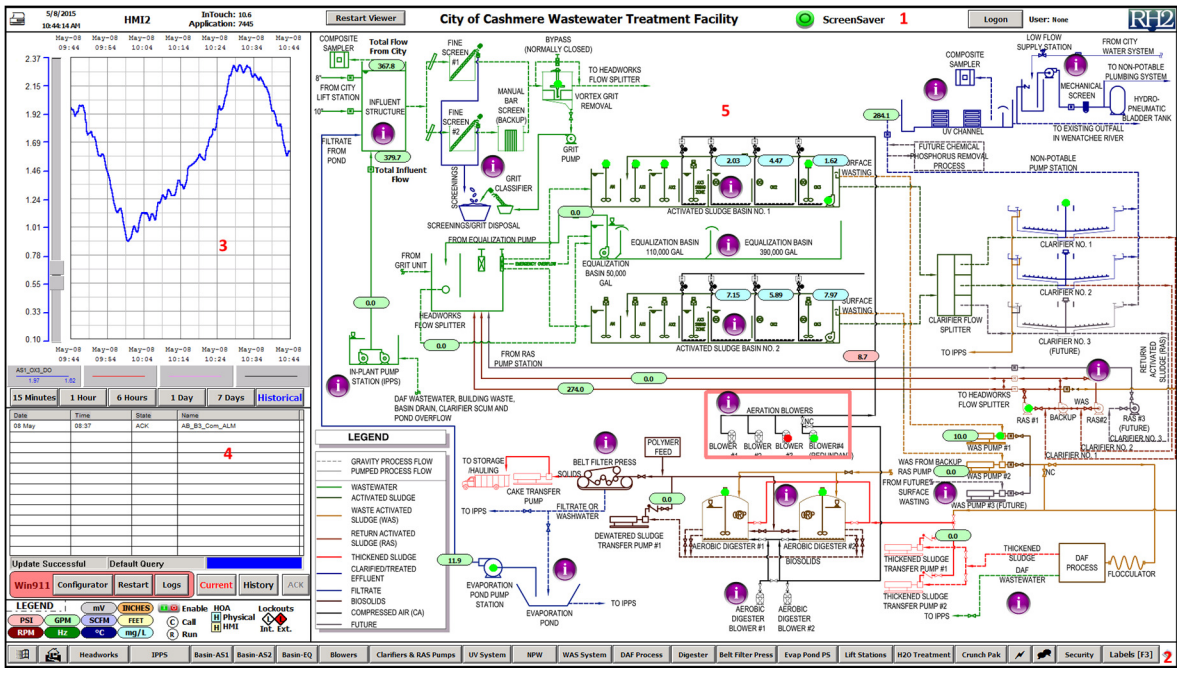
1. Top Menu (Always Visible)
    a. User Login/Logout – HMI security allows only certain options depending on user.
    b. System Clock – Displays current computer time.
    c. Restart View Button – Allows staff to reboot computer.
    d. Screen Saver Button – Turns on screen saver mode.
    e. Print Icon – Prints current screen.
2. Bottom Button Bar (Always Visible) – Displays buttons that change the right side subsystem display.
3. Upper Left Historian (Always Visible) – Displays historical data based on selected history icons.
4. Lower Left Alarm List (Always Visible) – Displays the current facility alarms.
5. Right Side Subsystem Display (Changes with user selection)

New alarms in any of the WWTP subsystems will cause the subsystem to blink red on the overview screen. If the alarm is acknowledge but still exists, the system will just be solid red.

Selecting a subsystem from either the bottom button bar or the system overview will change the right side display to display the selected subsystem.

IMAGE 2-1

WWTP SYSTEM HMI OVERVIEW SCREEN



Headworks - Influent System

The Influent System consists of three flow meters and the Influent Sampler. Each flow meter provides an analog flow input and a discrete totalizer pulse input to the Headworks RTU. The Composite Sampler receives an analog output from the Headworks RTU which corresponds to the total flow into the influent structure. The Composite Sampler provides 4 discrete inputs to the Headworks RTU.

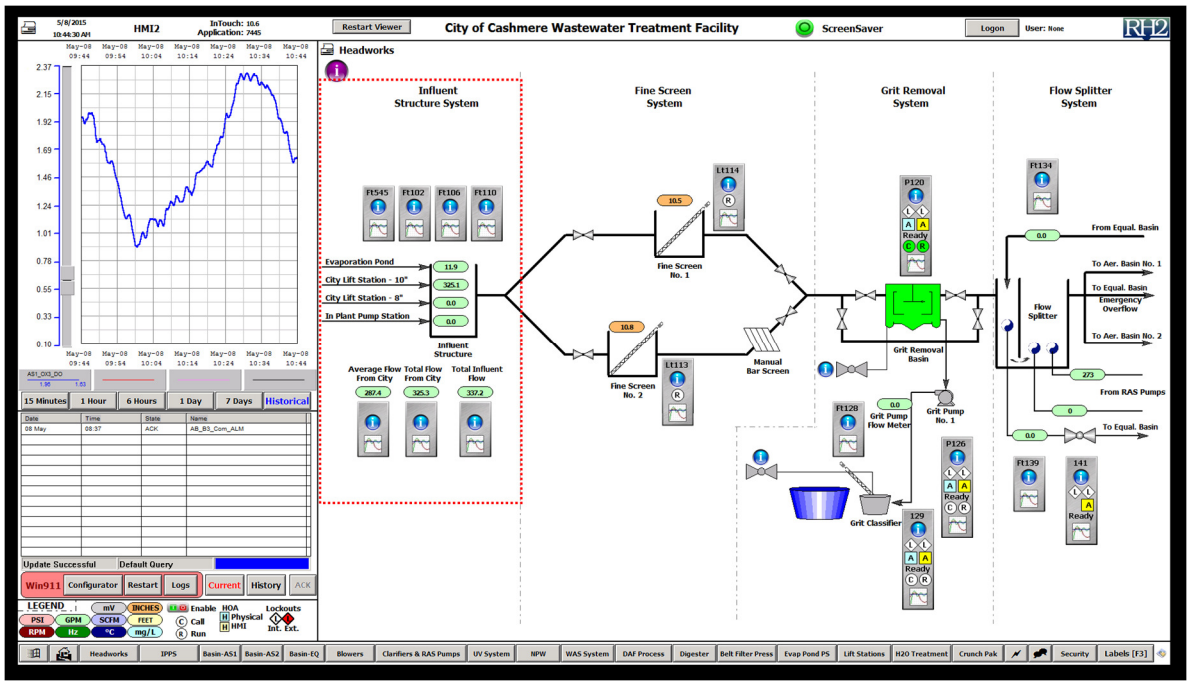
Plant Influent Flow Meter 1 measures flows of 150-2000 GPM from the City Lift Station through a 10” force main. Plant Influent Flow Meter 2 measures flows of 150-950 GPM from the City Lift Station through an 8” force main. Plant Influent Flow Meter 3 measures flow of 0-300 GPM from the In-Plant Pump Station though a 6” force main. The influent structure also receives flows of 30-78 GPM from the evaporation pond via a 2” line. This flow is monitored by the evaporation pond pump station flow meter, which provides inputs to the Solids Handling RTU (see Evaporation Pond System). The maximum total influent flow is 2400 GPM.

Inputs from the four flow meters will be used to calculate total influent flow, which is used to control the composite sampler as well as the grit system. The Composite Sampler calculates its’ sample rate based on the total flow into the Influent Structure as indicated by an analog output received from the Headworks RTU.

Influent System Equipment Summary		
Equipment	**Equipment Type**	**Notes**
Plant Influent Flow Meter No. 1	Flow Meter	Flow: 150 – 1200 GPM Totalizer Quantity per Pulse: Xxx Gal.
Plant Influent Flow Meter No. 2	Flow Meter	Flow: 150 – 950 GPM Totalizer Quantity per Pulse: Xxx Gal.
Plant Influent Flow Meter No. 3	Flow Meter	Flow: 0 – 300 GPM Totalizer Quantity per Pulse: Xxx Gal.
Evaporation Pond Pump Discharge Flow Meter (part of Evaporation Pond System)	Flow Meter	Flow: 14 – 36 GPM Totalizer Quantity per Pulse: Xxx Gal.
Composite Sampler	Composite Sampler	

IMAGE 2-2

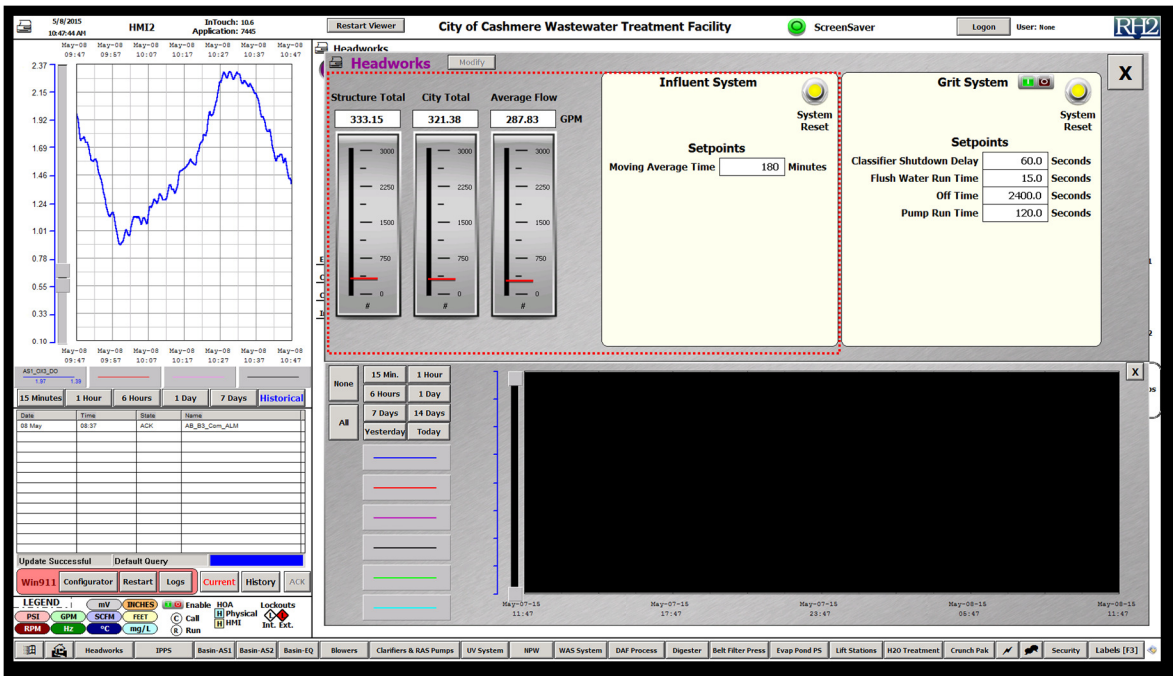
INFLUENT SYSTEM HMI OVERVIEW SCREEN



Headworks – Influent System

IMAGE 2-3

HEADWORKS INFLOW HMI CONTROL SCREEN



Equipment: Headworks Influent Structure	
I/O Type: Name	**Description**
AI: City Flow	Flow Object
AI: Influent Structure Flow	Flow Object
Average Inflow	Moving Average Time in Minutes – Setpoint allows average from 0-180 minutes

Headworks – Influent System

Headworks - Fine Screen System

The Fine Screen System consists of 2 parallel trains, with an ultrasonic level transmitter and fine screen control panel in each train. The ultrasonic level transmitter provides an analog level input, while the fine screen control panel provides discrete inputs for screen running, screen overload alarm and high water level alarm. The screens are supplied with a stand-alone control unit which controls the screens based on the level input (level control loop) or runs the screens with a set ”on time” followed by a set “off time” (time control loop).

The discrete inputs from the fine screen control panels will be used to generate screen overload and high water level alarms. The Screen Running Input will be used to calculate todays, yesterdays, and cumulative runtimes and starts.

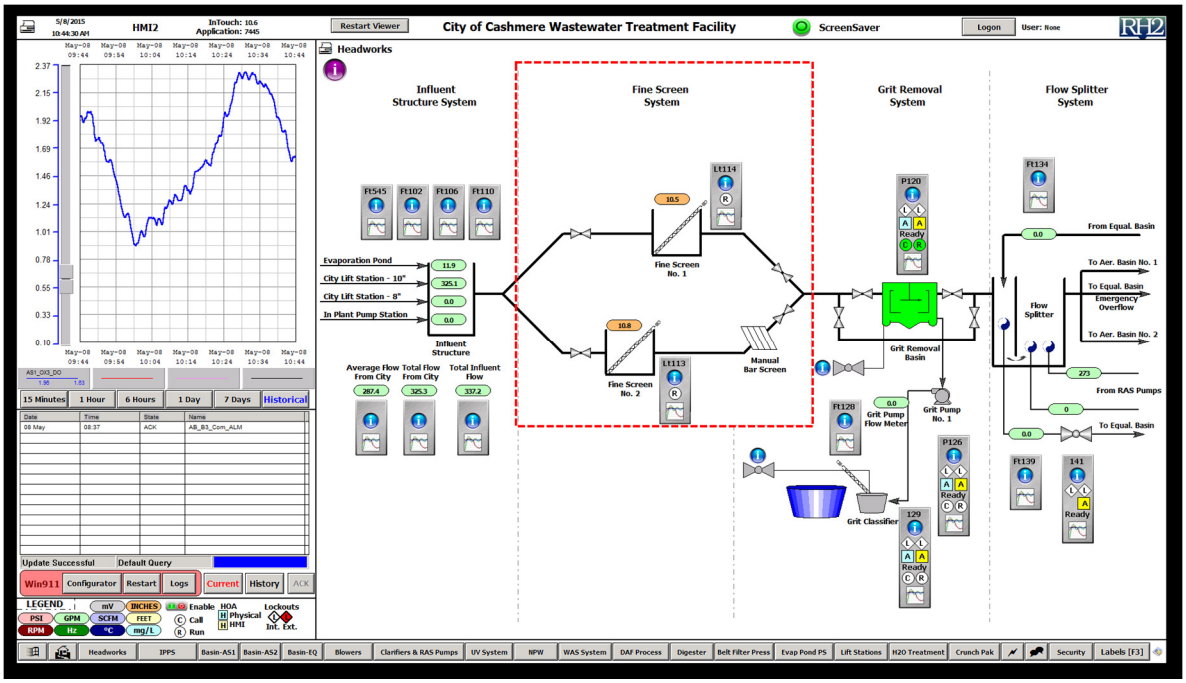
Fine Screen System Equipment Summary	
Equipment	**Equipment Type**
Fine Screen Control Panel 1	System Specific Control Object
Fine Screen Control Panel 2	System Specific Control Object
Ultrasonic Level Transmitter 1	Level Transmitter
Ultrasonic Level Transmitter 2	Level Transmitter

Each Fine Screen provides the following digital inputs to the telemetry system: “Screen Running,” Screen Overload Alarm,” and “High Water Level Alarm”.

The “Screen Running” signal is used to calculate today’s total, yesterday’s total and the grand total hours of operation. The “Screen Running” signal is also used to calculate today’s total, yesterday’s total and the grand total number of starts.

IMAGE 2-4

FINE SCREEN SYSTEM HMI OVERVIEW SCREEN



Equipment: Fine Screen Control System Data					
I/O Type: Name	**Setpoints**	**Data**	**Alarms**	**Summary Data**	
DI: Screen Running				Runtime Runtime Runtime Number of Starts Number of Starts	(Today) (Yesterday) (Cumulative) (Today) (Yesterday)

				Number of Starts	(Cumulative)
DI: Screen Overload Alarm	Screen Overload Alarm Delay		Screen Overload Alarm		
DI: High Water Level Alarm	High Water Level Alarm Delay		High Water Level Alarm		

Headworks - Grit Removal System

The Grit System consists of the grit removal basin, a grit unit drive mechanism (shaft, paddle assembly and speed reducer), a solenoid operated valve used to control the flow of flush water into the basin, a grit removal pump, a magnetic flow meter which indicates discharge though the 4" output piping from the grit pump, and the grit classifier. The grit classifier contains a solenoid operated wash water valve which is used to control the quantity of wash water introduced to the grit classifier.

The grit unit drive mechanism operates continuously while the solenoid operated flush water valve and the grit pump are operated by separate timers which can be adjusted by the operator.

Prior to the grit pump starting, the solenoid operated flush water valve opens for the amount of time selected by the operator. Once the timer times out, the solenoid operated flush water valve closes. Once the solenoid operated flush water valve is closed, the grit pump runs for the amount of time selected by the operator. Using the HMI computer, the operator will be able to set runtime and off time periods for the grit pump.

The grit classifier and grit classifier wash water solenoid operate whenever the grit pump is running. If the grit classifier fails to run, the grit pump will timeout and be shut down. The grit classifier and grit classifier wash water solenoid continue to operate for a fixed amount of time after the grit pump shuts off, to complete the grit removal for that cycle.

The grit system can be manually bypassed. The operator will be able to put the grit system in manual bypass mode which will shut down the entire grit system process.

Grit System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Description, Value or Range**
Grit Unit Drive Mechanism	GR-120	Across the Line Starter	Normal Operation: Mixer Runs 24/7

Flush Water Solenoid Valve	XV-118	Solenoid Operated Valve	Normal Operation: Opens for an operator adjustable amount of time and then closes just before the grit pump starts.
Grit Pump No. 1	P-126	Across the Line Starter	Normal Operation: On for a fixed time interval, then is off for a fixed time interval. Can also be called by hand.
			Run Time: Set by operator
Grit Pump Flow Meter	Ft-128	Flow Meter	Flow: xx-xx GPM
Grit Classifier	GCL-129		Normal Operation: Turns on with grit pump, runs X seconds after pump shutdown
Grit Classifier Wash Water Solenoid	XV-130	Solenoid Operated Valve	Normal Operation: Opens when grit classifier turns on, and remains open until the grit classifier shuts down.
Grit System Control Object	Co-119	System Specific Control Object	See Below

IMAGE 2-5

GRIT SYSTEM HMI OVERVIEW SCREEN

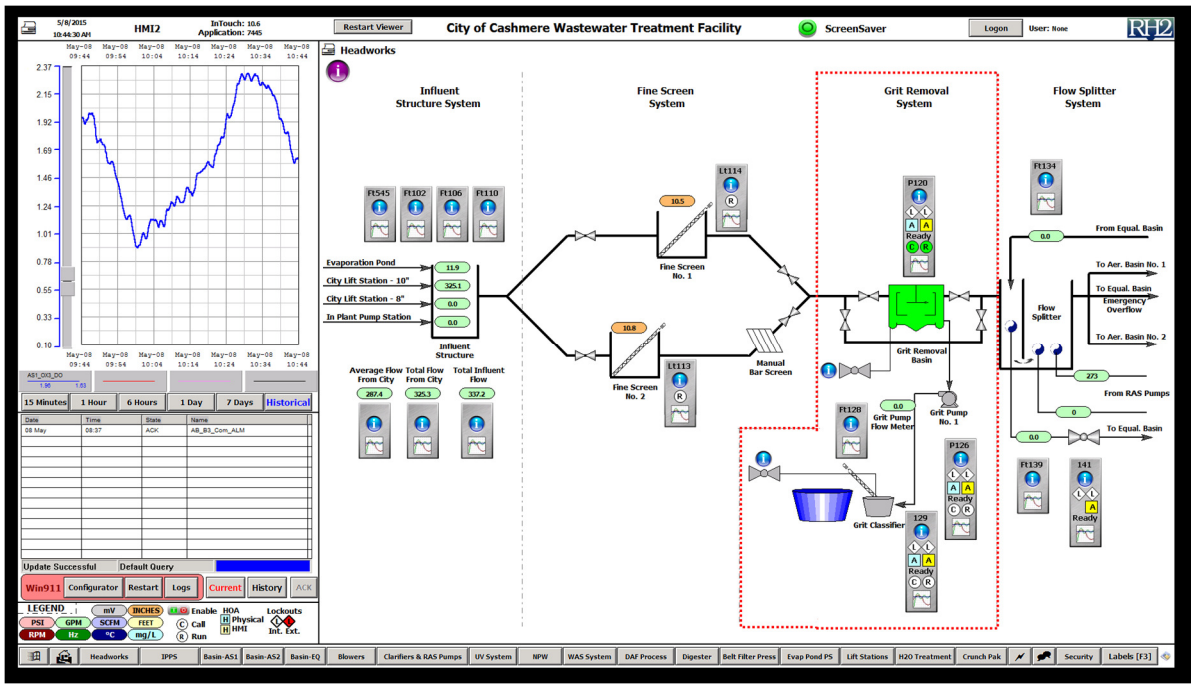
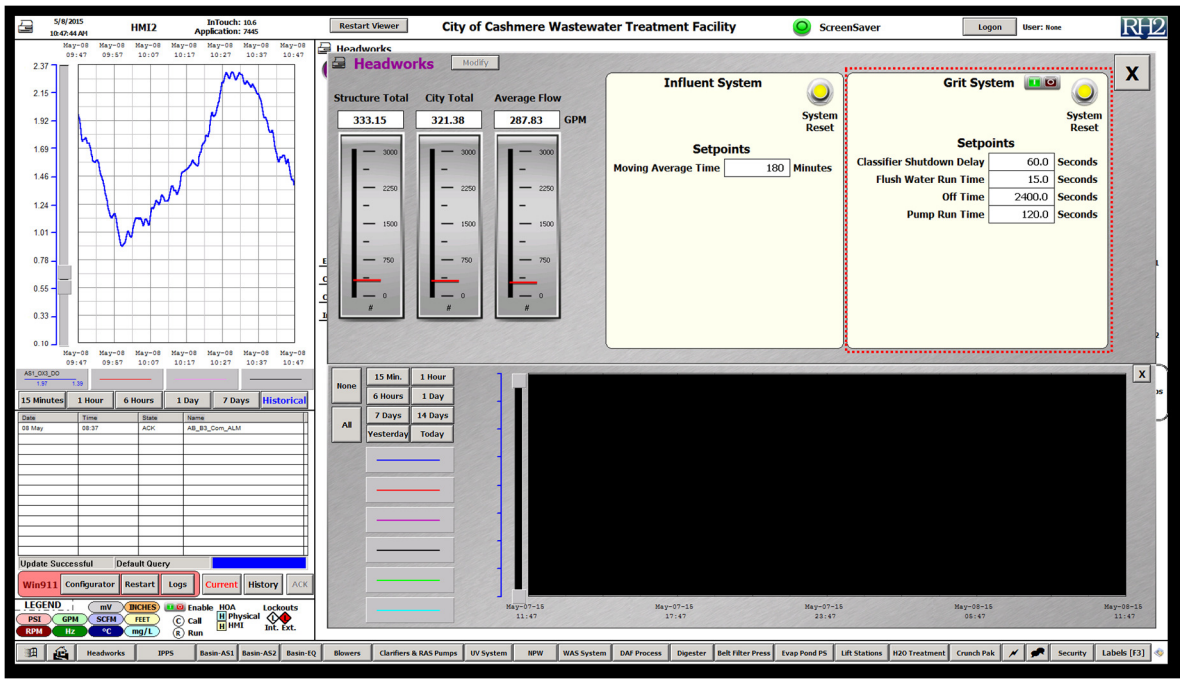


IMAGE 2-6

GRIT SYSTEM HMI CONTROL SCREEN



Grit System Control – Setpoints
Pump Run Time
Pump Off Time
Flush Water Run Time
Classifier Shutdown Delay

In Plant Pump Station (IPPS)

The IPPS consists of two submersible pumps, which are controlled by VFDs, four backup wet well level float switches, and a submersible level transmitter. The VFDs are located in the Equipment Building Motor Control Center. The hardwired relay control logic associated with the backup float system is located in the IPPS RTU. Plant Influent Flow Meter 3 measures the combined discharge of the pumps on a 6" force main near the influent structure (See Influent System Description).

Each of the pumps in the IPPS, is controlled by a Hand-Off-Auto (HOA) switch which is located on the front of the IPPS RTU. When the HOA switch for either pump is placed in "hand", the pump will run unless an over-temperature alarm condition exists for that pump. When the HOA switch is placed "off" the pump will not operate. When the HOA switches are placed in Auto, the pumps are controlled in one of three modes.

The IPPS has two normal operating modes and one backup operation mode. In all three operating modes the IPPS operates with a lead/lag pump control loop. The lead/lag pump sequence for the normal modes can be set at the PLC in the IPPS RTU. The lead and lag pumps will alternate ever other start. The lead/lag pump sequence for the backup float control mode is set by a switch on the front panel of the IPPS RTU. In the normal operating modes, pump starts are initiated by the IPPS PLC based on wet well level indication from the wet well level sensor. In the event of a failure of the normal control modes, the IPPS is operated by a hardwired relay control system, based on three of the wet well level float switches.

The IPPS operates in the "normal low" operating mode when the "Total Plant Influent From City" (see the Headworks System description) is less than maximum allowable influent. In the "normal low" operating mode, the lead pump is called to run at 100% speed when the level exceeds the "normal low lead pump start" setpoint. If the level continues to rise, and exceeds the "normal low lag pump start" setpoint, the lag pump is called to run at 100% speed. The pump(s) run until the wet well level drops to the "normal pump stop setpoint."

The IPPS operates in the "normal high" operating mode when the "Total Plant Influent From City" is greater than maximum allowable influent. In the "normal high" operating mode, the lead pump is called when the wet well level exceeds the "normal high lead pump start" setpoint (The normal high lead pump start setpoint is set at a higher level than the "normal low lead pump start" setpoint). When the lead pump is called in the "normal high" operating mode, the speed of the pump is controlled to prevent the "Total Influent to Influent Structure" (see the Headworks system description) from exceeding maximum allowable influent.

While the lead pump is running, if the wet well level continues to rise, and exceeds the "normal high lag pump start" setpoint (which is higher than the normal low lag pump start setpoint), and the lead pump is running at 100% speed, the lag pump will be called to run. The speed of both IPPS pumps will then be controlled to prevent the "Total Influent to Influent Structure" from exceeding maximum allowable influent.

The backup float control mode starts and stops pumps based on three wet well level float switches. When the wet well level exceeds the level of the “lead start float” the lead pump is called to run at 100% speed by the hardwired relay control logic. The “lead start float” level is higher than any of the normal operating mode level setpoints. If the level continues to rise, and exceeds the “Lag Start Float” level, the lag pump is called to run at 100% speed by the hardwired relay control logic. The pump(s) run until the wet well level drops below the “Stop/Emergency Float” level, which is set below the normal operating mode pump stop setpoint.

The hardwired relay control logic provides several discrete inputs to the telemetry system. The IPPS PLC receives inputs from the fourth wet well level float, which is set above the other wet well level floats, provides a wet well high level alarm. Each pump controller receives “Float Pump Call,” “Pump Overtemperature,” and “Pump Seal Fail” alarm inputs. “Hand” and “Auto” inputs from both HOA switches provide the status of each pump.

The IPPS also contains a panic button, intrusion switch and control panel, which all provide input to the telemetry system.

In Plant Pump Station Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Wet Well Level Transmitter	Lt-706	Level Transmitter	Measurement Range xx-xx FT
Stop/Emergency Float Switch	Ls-705A	Float Switch	Set at Wet Well Level Xx FT (lowest float, below all Level Transmitter pump stop setpoints)
Lead Start Float Switch	Ls-705B	Float Switch	Set at Wet Well Level,Xx FT (above Level Transmitter lag pump start setpoint)
Lag Start Float Switch	Ls-705C	Float Switch	Set at Wet Well Level Xx FT (above lead start float)
High Level Alarm Float Switch	Ls-705D	Float Switch	Set at Wet Well Level Xx FT (highest float)
IPPS Pump No. 1	P-707	Variable Frequency Drive	Normal Operation: Called to run at 100% based on wet well level in a lead/lag configuration
			Capacity: 150 GPM

IPPS Pump No. 2	P-708	Variable Frequency Drive	Normal Operation: Called to run at 100% based on wet well level in a lead/lag configuration Capacity: 150 GPM
IPPS Panic Button	PB_701	Panic Button	
IPPS RTU Intrusion Switch	Zs_701	Intrusion Switch	
IPPS Control Panel	Cp_700	Control Panel	
In-Plant Pump Station Control	Co-704	System Specific Control Object	See Below

In-Plant Pump Station Control – In-Plant Pump Station System

In Plant Pump Station Wet Well Level Control

The In-Plant Pump Station Control object controls the two IPPS pumps in a lead-lag control scheme, based on the wet well level, which is measured by the In-Plant Pump Station Level Transmitter. The pump start setpoints vary depending on the "Total Plant Influent From City" which is calculated by the Headworks Flow Splitter object. The "Pump Stop Level" setpoint is constant for both high and low flow modes

The "IPPS Lead Pump" can be set to either 1 or 2 by the operator to select the lead pump. The lead pump will also automatically alternate.

When the "Total Plant Influent From City" is below the "IPPS High Flow Mode Trigger" setpoint, the "IPPS Low Flow Mode=0 High Flow Mode=1" bit is set to 0. The "Lead Pump Start Level" and "Lag Pump Start Level" setpoints are equal to the "Low Flow Lead Pump Start Level" and "Low Flow Lag Pump Start Level" setpoints.

When the "Total Plant Influent From City" is above the "IPPS High Flow Mode Trigger" setpoint, the "IPPS Low Flow Mode=0 High Flow Mode=1" bit is set to 1. The "Lead Pump Start Level" and "Lag Pump Start Level" setpoints are equal to the "High Flow Lead Pump Start Level" and "High Flow Lag Pump Start Level" setpoints.

In Plant Pump Station Pump Speed Control

When the "IPPS Low Flow Mode=0 High Flow Mode=1" bit is set to 0, the pumps run at 100% speed when they are called based on the wet well level.

When the "IPPS Low Flow Mode=0 High Flow Mode=1" bit is set to 1, the speed of the operating pump(s) is(are) determined by the In-Plant Pump Station Control Object, to prevent the "Total Influent

to Influent Structure" from exceeding maximum allowable influent. In "High Flow Mode," The In-Plant Pump Station Control Object calculates the "Max Allowable IPPS Discharge" as follows:

Data	**Calculation**
Max Allowable IPPS Discharge	Max Allowable Influent to Influent (minus) Total Plant Influent From City (minus) Evaporation Pond Pump Discharge Flow Meter

The IPPS Pump Discharge PID loop controls the speed of the operating IPPS pump(s) to maintain the discharge measured by "Plant Influent Flow Meter No. 3" at the "Max Allowable IPPS Discharge." The IPPS Pump Discharge PID loop will not operate the IPPS pumps below the "IPPS pump minimum speed" setpoint, regardless of the "Max Allowable IPPS Discharge" calculation.

IMAGE 2-7

IPPS SYSTEM HMI OVERVIEW SCREEN

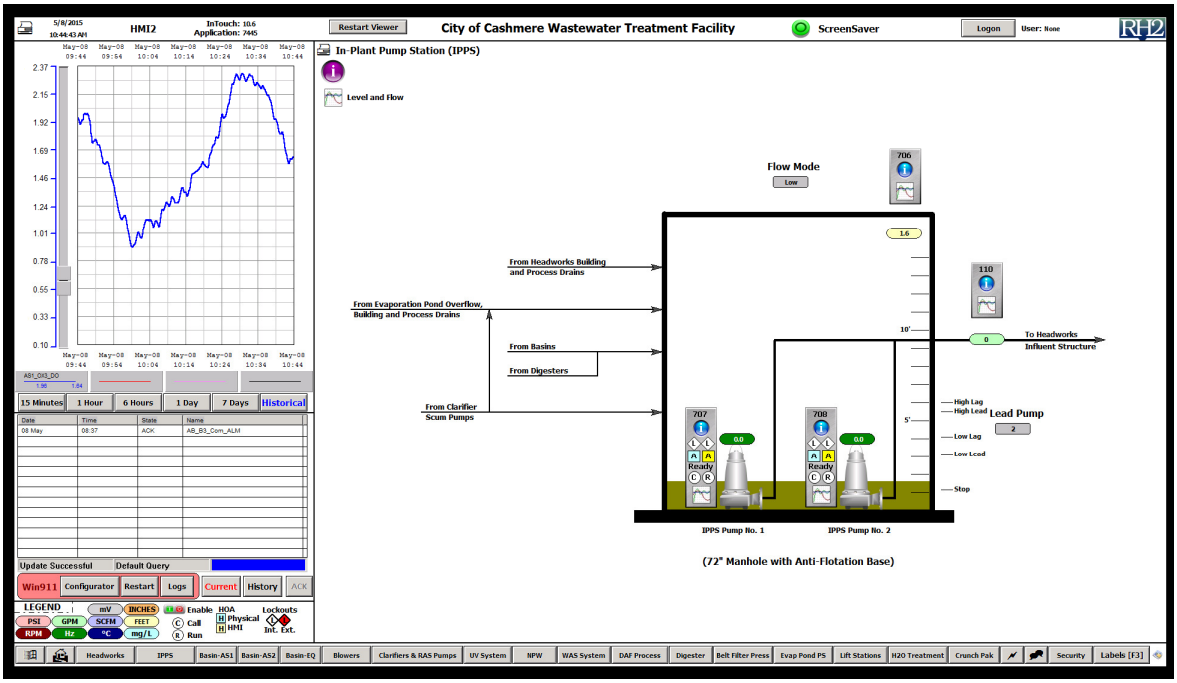
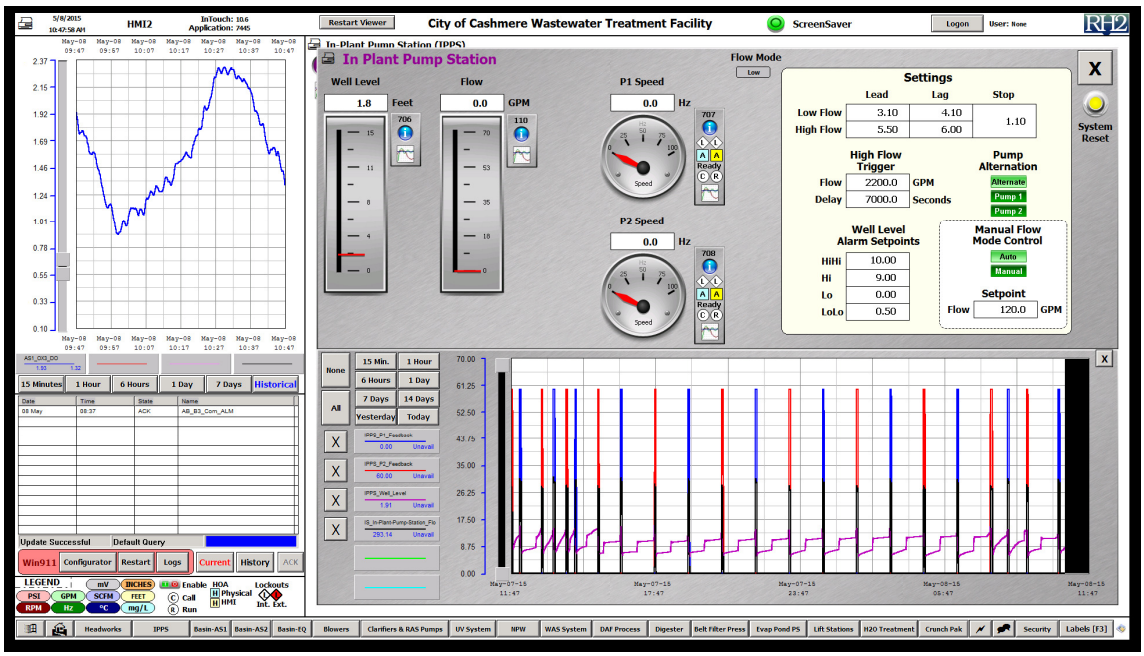


IMAGE 2-8

IPPS SYSTEM HMI CONTROL SCREEN



In-Plant Pump Station Control - Setpoints
Flow Control Auto/Manual Selection and Setpoint
IPPS High Flow Mode Trigger And Delay
Pump Alternation Options
Pump Stop Level
Low Flow Lead Pump Start Level
Low Flow Lag Pump Start Level
High Flow Lead Pump Start Level
High Flow Lag Pump Start Level

Headworks (Flow Splitter and Equalization Basin) System

This system consists of the Headworks Flow Splitter, the Equalization Basin which contains the Equalization Pump and two level Switches, the Equalization Basin Effluent Flow Meter, the Equalization Influent Flow Meter, and the motor actuated Equalization Basin Influent Control Valve.

The Headworks Flow Splitter receives flows from the Grit System, flows from the Equalization Basin, and flows from each of the 2 RAS pumps. Both RAS pumps have their own effluent flow meters (see the Aeration and RAS System Description). There is no instrumentation to measure flows into the Headworks Flow Splitter from the Grit System.

The Headworks Flow Splitter provides flows to Aeration Basin No. 1, Aeration Basin No. 2 and the Equalization Basin. During normal operation, the Equalization Basin is not used. A manual valve lineup determines if effluent flows to Aeration Basin No. 1, No. 2 or both. The telemetry system must be manually notified of the valve lineup.

During high flow levels, or when the dissolved oxygen sensors in the activated sludge basins (See Activated Sludge System description) indicate low dissolved oxygen levels, an “Equalization Basin Needed” alarm is triggered. After a delay, a controlled amount of flow is diverted from the activated sludge basins into the equalization basin.

Flow to the Equalization Basin is controlled by a motor-actuated valve, and measured by the Equalization Valve Influent Flow Meter. There is also an emergency overflow path from the Headworks Flow Splitter to the Equalization Basin. There is no instrumentation to measure flows from the Headworks Flow Splitter to the Aeration Basins, or emergency overflow to the Equalization Basin.

Once the high flow or low dissolved oxygen event is over, wastewater is pumped from the Equalization Basin back into the Headworks Flow Splitter. Flow from the Equalization Basin to the Headworks flow splitter is controlled by the Equalization Pump, and measured by the Equalization Basin Effluent Flow meter. The pump discharge rate is determined by the amount of flow the operating Activated Sludge Train(s) can accept, after accounting for influent flows from the other sources to the headworks flow splitter.

Headworks Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Equalization Basin Pump	P-245	Variable Frequency Drive	Normal Operation: Pumps the Equalization Basin down to the low level setpoint when there is no high influent flow or low dissolved oxygen condition. The pump speed is determined based on how much additional flow the operating Activated Sludge train(s) can accept.
			Capacity: 500 GPM
Equalization Basin Low Level Switch	Ls-246	Level Switch	Level: Xx FT
Equalization Basin High Level Switch	Ls-247	Level Switch	Level: Xx FT
Equalization Basin Effluent Flow Meter	Ft-134	Flow Meter	Flow: 0-500 GPM
Equalization Basin Influent Flow Meter	Ft-139	Flow Meter	Flow: 0-597 GPM
Equalization Influent Control Valve	MV-141	Motor Actuated Valve	Valve Size 8”
Headworks Flow Splitter	Co-133	System Specific Control Object	See Below
Equalization Basin	Co-248	System Specific Control Object	See Below

Headworks Flow Splitter – Headworks System

The Headworks Flow Splitter object obtains flow information from eight flow meters, and combines the information into several total flow values. The flow meters are described below:

Flow Meter Description	Tag	Flow From	Flow To	Pipe Size	Flow Range (GPM)
Plant Influent Flow Meter 1	Ft-102	City Lift Station	Influent Structure	10”	150-1200
Plant Influent Flow Meter 2	Ft-106	City Lift Station	Influent Structure	8”	150-950
Plant Influent Flow Meter 3	Ft-110	In Plant Pump Station	Influent Structure	6”	90-300
Evaporation Pond Pump Discharge Flow Meter	Ft-545	Evaporation Pond	Influent Structure	2”	14-36
Equalization Basin Influent Flow meter	Ft-139	Equalization Basin	Headworks Flow Splitter	8”	0-597
Equalization Basin Effluent Flow meter	Ft-134	Equalization Basin	Headworks Flow Splitter	6”	0-500
Clarifier No.1 RAS Flow Meter	Ft-446	Clarifier No. 1	Headworks Flow Splitter	6”	104-382
Clarifier No.2 RAS Flow Meter	Ft-448	Clarifier No. 2	Headworks Flow Splitter	6”	104-382

The Headworks Flow Splitter Object calculates the following totals from the flow meters:

Data	Calculation	
Total Plant Influent From City	+	Plant Influent Flow Meter 1 Plant Influent Flow Meter 2
Total Influent to Influent Structure	+ + +	Plant Influent Flow Meter 1 Plant Influent Flow Meter 2 Plant Influent Flow Meter 3 Evaporation Pond Pump Discharge Flow Meter
Total Influent to Headworks Flow Splitter	+ +	Plant Influent Flow Meter 1 Plant Influent Flow Meter 2

	+	Plant Influent Flow Meter 3
	+	Evaporation Pond Pump Discharge Flow Meter
	+	Equalization Basin Effluent Flow meter
	+	Clarifier No.1 RAS Flow Meter
		Clarifier No.2 RAS Flow Meter
Total Influent to Activated Sludge Basins		Plant Influent Flow Meter 1
	+	Plant Influent Flow Meter 2
	+	Plant Influent Flow Meter 3
	+	Evaporation Pond Pump Discharge Flow Meter
	+	Equalization Basin Effluent Flow meter
	+	Clarifier No.1 RAS Flow Meter
	+	Clarifier No.2 RAS Flow Meter
	-	Equalization Basin Influent Flow meter

Equalization Basin – Headworks System

The Equalization Basin object uses inputs to the telemetry system provided by the other objects to control the flow into and out of the Equalization Basin.

The Equalization Basin object calculates the "Activated Sludge Basin(s) Current Capacity" based on the "Number of Activated Sludge Basins Operating" setpoint, which is a manually entered value (1 or 2). The "Single Activated Sludge Basin Capacity" and the "Dual Activated Sludge Basin Capacity" setpoints are also used in the calculation of the "Activated Sludge Basin(s) Current Capacity" as shown below:

If "Number of Activated Sludge Basins Operating"= 1	"**Activated Sludge Basin(s) Current Capacity**"	=	"Single Activated Sludge Basin Capacity"
If "Number of Activated Sludge Basins Operating"= 2	"**Activated Sludge Basin(s) Current Capacity**"	=	"Dual Activated Sludge Basin Capacity"

The Equalization Basin object then compares the "Total Influent to Headworks Flow Splitter" to the "Activated Sludge Basin(s) Current Capacity." If the "Total Influent to Headworks Flow Splitter" exceeds "Activated Sludge Basin(s) Current Capacity," the "Equalization Basin Pre-Trigger Based on Flow Alarm"

is activated. If the "Total Influent to Headworks Flow Splitter " remains above the "Activated Sludge Basin(s) Current Capacity" for longer than the "Equalization Basin Pre-Trigger Based on Flow Delay" the "Equalization Basin Trigger Based on Flow Alarm" is activated and flow is diverted to the Equalization Basin by the motor actuated "Equalization Influent Control Valve."

When the "Equalization Basin Trigger Based on Flow Alarm" is active, the "Target Equalization Basin Influent" flow rate is determined by subtracting the "Activated Sludge Basin(s) Current Capacity" from the "Total Influent to Headworks Flow Splitter."

Target Equalization Basin Influent	=	Total Influent to Headworks Flow Splitter	-	Activated Sludge Basin(s) Current Capacity

When the "Total Influent to Headworks Flow Splitter" drops below the "Activated Sludge Basin(s) Current Capacity" the "Equalization Basin Trigger Based on Flow Alarm" is deactivated. When the "Total Influent to Headworks Flow Splitter" drops below the "Trigger Equalization Basin Discharge Based on Flow" flow rate, the "Call Equalization Pump" bit is activated. The "Trigger Equalization Basin Discharge Based on Flow" depends on the "Number of Activated Sludge Basins Operating" (1 or 2) and the "Trigger Equalization Basin Discharge with 1 Operating Activated Sludge Basin" or "Trigger Equalization Basin Discharge with 2 Operating Activated Sludge Basins" setpoints as shown below:

If "Number of Activated Sludge Basins Operating"= 1	**"Trigger Equalization Basin Discharge Based on Flow"**	=	"Trigger Equalization Basin Discharge with 1 Operating Activated Sludge Basin"
If "Number of Activated Sludge Basins Operating"= 2	**"Trigger Equalization Basin Discharge Based on Flow"**	=	" Trigger Equalization Basin Discharge with 2 Operating Activated Sludge Basins"

The Equalization Basin Discharge Pump is VFD controlled, and the Equalization Basin Object calculates the "Target Equalization Basin Effluent Based on Flow" flow rate. The "Target Equalization Basin Effluent Based on Flow" is determined as follows:

Max Discharge from Equalization Basin	=	Activated Sludge Basin(s) Current Capacity	-	Equalization Basin Discharge Deadband

Target Equalization Basin Effluent Based on Flow	=	Max Discharge from Equalization Basin	+	Equalization Basin Discharge Flow	-	Total Influent to Activated Sludge Basins

IMAGE 2-8

EQUALIZATION BASIN HMI OVERVIEW SCREEN

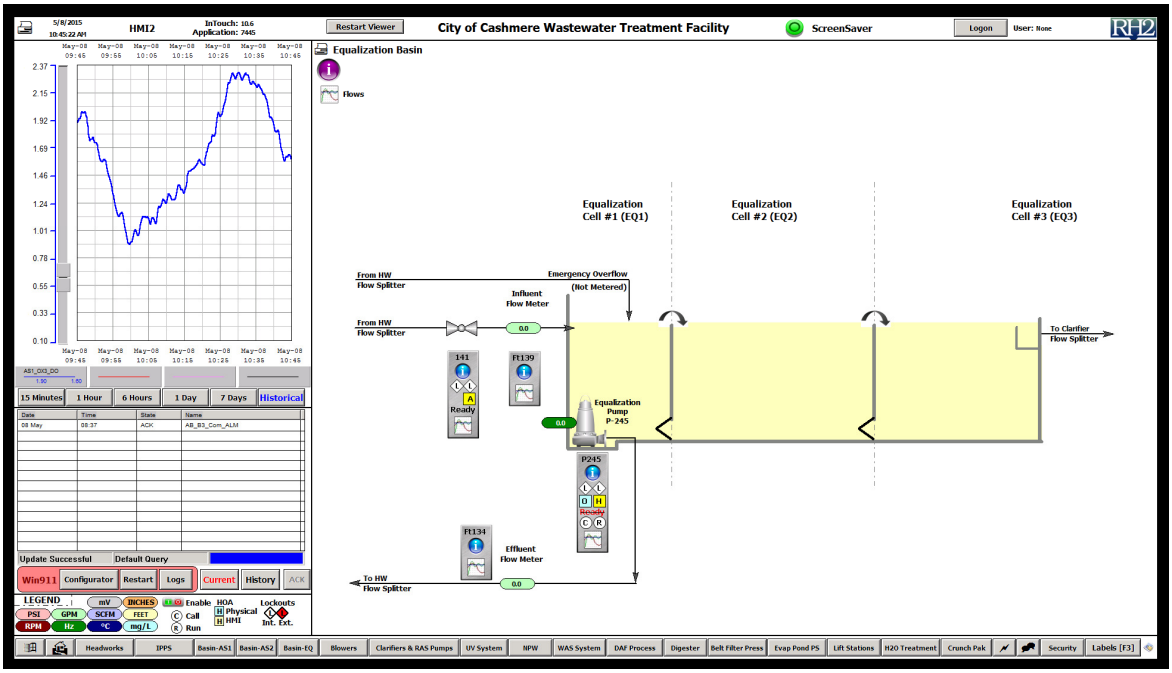
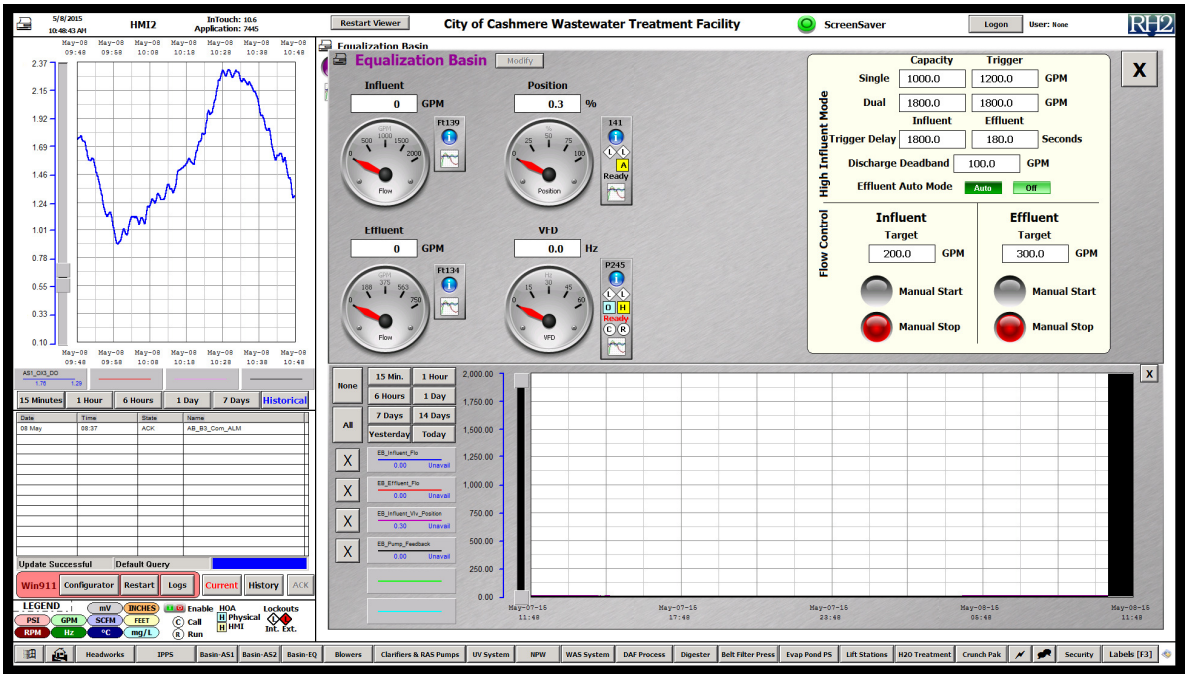


IMAGE 2-9

EQUALIZATION BASIN HMI CONTROL SCREEN



Equalization Basin Object - Setpoints
Single Activated Sludge Basin Flow Capacity and Trigger Setpoint and Delay
Dual Activated Sludge Basin Flow Capacity and Trigger Setpoint Delay
Equalization Basin Discharge Deadband
Effluent Auto Flow On/Off Mode
Influent/Effluent Manual Start/Stop Control
Equalization Basin Discharge Deadband

Activated Sludge Basin 1 System

There are two activated Sludge Basin systems; each system contains 1 Activated Sludge Basin. The Activated Sludge Basins may be operated in parallel or individually. Each Activated Sludge Basin contains seven zones, beginning with the Anaerobic Zone, next passing though Anoxic Zones No. 1, 2 and 3 before passing though Aerobic Zones No. 1, 2, and 3 before being discharged to the Clarifier Flow Splitter.

The Anaerobic Zone, and Anoxic Zones No. 1 and 2 each contain a mixer. The mixers are operated by an across the line starter, and typically run 24/7. Anoxic Zone No. 3 contains a mixer and an Aerator. Aeration is provided by the Aeration Blowers (See Aeration Blower System), though an air flow meter to a motor actuated aeration control valve which in combination with a variable frequency drive controls the rate of aeration.

Anoxic Zone No. 3 may be operated in either Anoxic or Aerobic mode. The operator manually selects the operating mode. In Anoxic mode, the mixer operates continuously, while the Aeration system remains "off". In Aerobic mode, the mixer remains "off," while the aeration system is "on". In Aerobic mode, the amount of aeration is set manually by the operator, as there is no dissolved oxygen sensor available for feedback.

Aerobic Zone No. 1 and 2 each contain aeration systems and dissolved oxygen sensors. The amount of aeration in each basin is controlled by a motor actuated valve in combination with a variable frequency drive.

Aerobic Zone No. 3 contains a mixer, aeration system, dissolved oxygen sensor, recycle pump basin level transmitter and surface waste gate actuator. The mixer is turned on at low air flows, and off at high air flows. There is a maximum air flow setpoint, but no minimum air flow setpoint.

The Recycle Pump pumps from Aerobic Zone No. 3 back into Anoxic Zone No. 1. These pumps are operated continuously when the train is running in either manual fixed flow or percentage of inflow. In manual fixed flow mode the flow is set by the operator. In percentage of influent flow mode, the influent flow (see headworks flow splitter system description) determines the output of the recycle pump. If two trains are running, each pump outputs half of the percent of influent flow. If one train is running, that train's recycle pump outputs all of the desired percentage of the influent flow.

Activated Sludge Basin No. 1 Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Description, Value or Range**
Anaerobic Zone Mixer	M-205	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 1 Mixer	M-206	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 2 Mixer	M-207	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 3 Mixer	M-208	Across the Line Starter	Runs continuously in anoxic mode Does not run in aerobic mode
Anoxic Zone Motorized Valve Actuator (Air Control)	A-209 V-209	Motorized Valve Actuator	Valve Size: 6” Normal Operation: Controls air flow based on a manual setpoint
Anoxic Zone Air Flow Meter	FT-210	Air Flow Meter	XX-XX CFM
Aerobic Zone No. 1 Valve Actuator	A-211 V-211	Motorized Valve Actuator	Valve Size: 8” Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow between a set minimum and maximum air flow.
Aerobic Zone No. 1 Air Flow Meter	FT-212	Air Flow Meter	XX-XX CFM
Aerobic Zone No. 1 Dissolved Oxygen Sensor	DOX-220	Dissolved Oxygen Sensor	Dissolved Oxygen Levels: XX-XX ppm
Aerobic Zone No. 2 Valve Actuator	A-213 V-213	Motorized Valve Actuator	Valve Size: 6” Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow

			between a set minimum and maximum air flow.
Aerobic Zone No. 2 Air Flow Meter	FT-214	Air Flow Meter	Air Flow: XX-XX CFM
Aerobic Zone No. 2 Dissolved Oxygen Sensor	DOX-221	Dissolved Oxygen Meter	Dissolved Oxygen Levels: XX-XX ppm
Aerobic Zone No. 3 Mixer	M-224	Across the Line Starter	Normal Operation: Runs when air flow is low, does not run at high air flows

Activated Sludge Basin No. 1 Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Description, Value or Range**
Aerobic Zone No. 3 Valve Actuator	A-215 V-215	Motorized Valve Actuator	Valve Size: 4” Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow below a set maximum air flow.
Aerobic Zone No. 3 Air Flow Meter	FT-216	Air Flow Meter	Air Flow: XX-XX CFM
Aerobic Zone No. 3 Dissolved Oxygen Sensor	DOX-222	Dissolved Oxygen Sensor	Dissolved Oxygen Levels: XX-XX ppm
Recycle Pump No. 1	P-218	Variable Frequency Drive	Normal Operation: Percent of Plant Influent Flow Mode: The total output from both recycle pumps to match a set percentage of the plant influent flow. Fixed Flow Mode:,The output from each pump is selected by the operator between 771 and 1500 GPM. Capacity: 2300 GPM
Recycle Flow Meter No. 1	Ft-142	Flow Meter	Flow Meter: 1150-2300 GPM
Recycle Pumps	Co-204	System Specific Control Object	See Below
Activated Sludge Basin No 1	Co-219	System Specific Control Object	See Below

Activated Sludge Basin 2 System

See description for Activated Sludge Basin 1 System.

Activated Sludge Basin No. 2 Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Description, Value or Range**
Anaerobic Zone Mixer	M-225	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 1 Mixer	M-226	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 2 Mixer	M-227	Across the Line Starter	Normal Operation: Runs continuously
Anoxic Zone No. 3 Mixer	M-228	Across the Line Starter	Runs continuously in anoxic mode Does not run in aerobic mode
Anoxic Zone Motorized Valve Actuator (Air Control)	A-229 V-229	Motorized Valve Actuator	Valve Size: 6” Normal Operation: Controls air flow based on a manual setpoint
Anoxic Zone Air Flow Meter	FT-230	Air Flow Meter	XX-XX CFM
Aerobic Zone No. 1 Valve Actuator	A-231 V-231	Motorized Valve Actuator	Valve Size: 8” Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow between a set minimum and maximum air flow.
Aerobic Zone No. 1 Air Flow Meter	FT-232	Air Flow Meter	XX-XX CFM
Aerobic Zone No. 1 Dissolved Oxygen Sensor	DOX-240	Dissolved Oxygen Sensor	Dissolved Oxygen Levels: XX-XX ppm
	A-233		Valve Size: 6”

Aerobic Zone No. 2 Valve Actuator	V-233	Motorized Valve Actuator	Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow between a set minimum and maximum air flow.
Aerobic Zone No. 2 Air Flow Meter	FT-234	Air Flow Meter	Air Flow: XX-XX CFM
Aerobic Zone No. 2 Dissolved Oxygen Sensor	DOX-241	Dissolved Oxygen Meter	Dissolved Oxygen Levels: XX-XX ppm
Aerobic Zone No. 3 Mixer	M-244	Across the Line Starter	Normal Operation: Runs when air flow is low, does not run at high air flows

Activated Sludge Basin No. 2 Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Description, Value or Range**
Aerobic Zone No. 3 Valve Actuator	A-235 V-235	Motorized Valve Actuator	Valve Size: 4” Normal Operation: Controls air flow to meet a set level of dissolved oxygen, while maintaining air flow below a set maximum air flow.
Aerobic Zone No. 3 Air Flow Meter	FT-236	Air Flow Meter	Air Flow: XX-XX CFM
Aerobic Zone No. 3 Dissolved Oxygen Sensor	DOX-242	Dissolved Oxygen Sensor	Dissolved Oxygen Levels: XX-XX ppm
Recycle Pump No. 1	P-238	Variable Frequency Drive	Normal Operation: Percent of Plant Influent Flow Mode: The total output from both recycle pumps to match a set percentage of the plant influent flow. Fixed Flow Mode:,The output from each pump is selected by the operator between 771 and 1500 GPM. Capacity: 2300 GPM
Recycle Flow Meter No. 1	Ft-144	Flow Meter	Flow Meter: 1150-2300 GPM
Recycle Pumps	Co-204	System Specific Control Object	See Below
Activated Sludge Basin No 2	Co-239	System Specific Control Object	See Below

IMAGE 2-10

ACTIVATED SLUDGE BASIN HMI OVERVIEW SCREEN

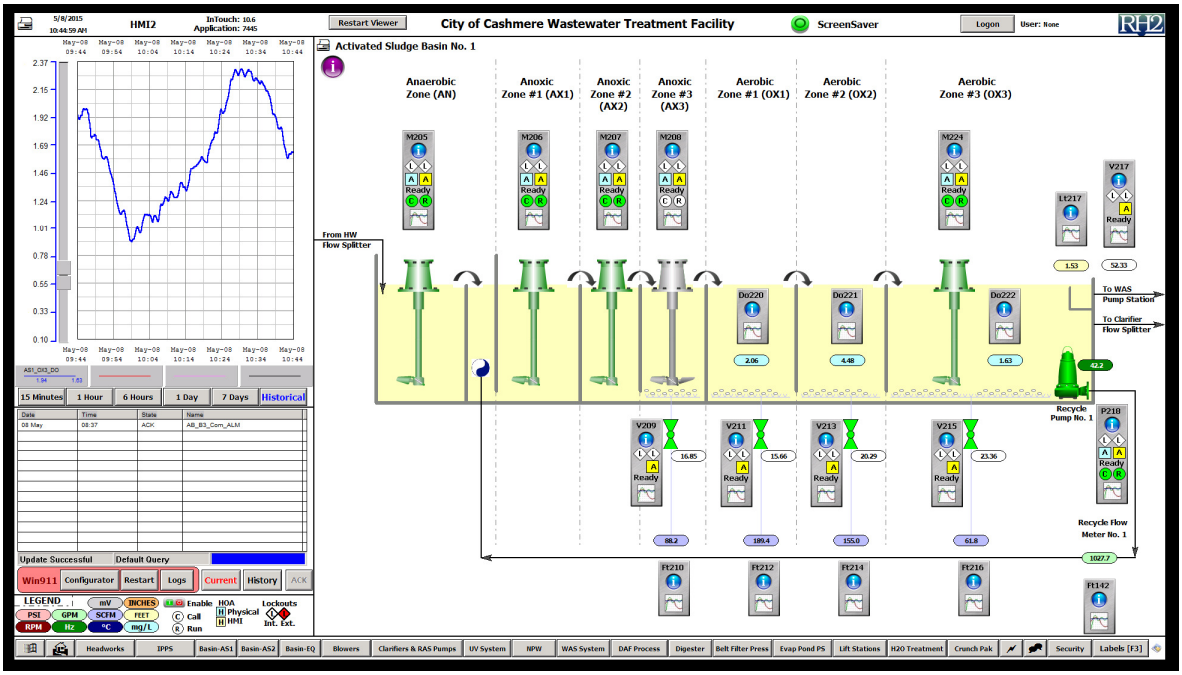
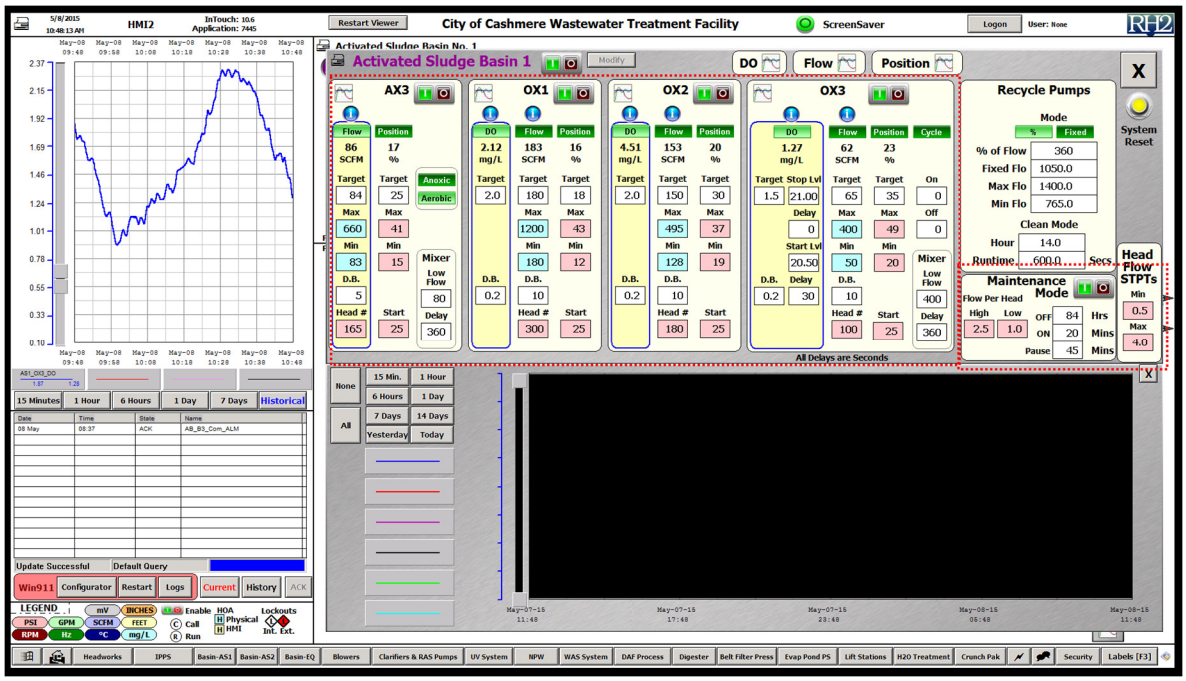


IMAGE 2-11

ACTIVATED SLUDGE BASIN HMI CONTROL SCREEN



Activated Sludge Basin Object - Setpoints
Enable/Disable Control Switches for Entire Basin and Each Zone
Minimum/Maximum Flow and Position Setpoints (To Protect Diffusers)
Valve Position/Flow Control Selection for AX3 Zone
Valve Position/Flow Control/DO Control Selection for OX1, OX2 and OX3 Zones
Target Position/Flow/DO Control Setpoints
Flow Control Deadband
Starting Valve Position (for when Zone goes from disabled to enabled)
Number of Diffuser Heads
OX3 On/Off Timer Delays

OX3 Mixer Low Flow Shutdown Trigger Flow and Delay
Maintenance Mode Enable/Disable
Maintenance Mode On/Off/Pause Delays
Minimum/Maximum Flows per Diffuser Head

Recycle Pumps – Activated Sludge Basin System

The Recycle Pumps object controls both recycle pumps (there is one pump per Activated Sludge Basin Train). Recycle pump 1 runs whenever the "Activated Sludge Basin 1 Run" bit is high. Recycle Pump 2 Runs whenever the "Activated Sludge Basin 2 Run" bit is high.

The Recycle Pumps can be controlled in fixed flow mode or percent of influent flow mode. In fixed flow mode, the operator manually activates the "Recycle Pump In Fixed Flow Mode" bit. The operator then manually sets the "Recycle Pump Fixed Flow Rate." The "Recycle Pump Fixed Flow Rate" must be between the "Maximum Recycle Pump Flow Rate" and the "Minimum Recycle Pump Flow Rate" setpoints. When the "Recycle Pump In Fixed Flow Mode" is active, the Recycle Pumps object calculates the "Recycle Pump 1 Target Discharge" and "Recycle Pump 2 Target Discharge" flow rates as shown below:

Fixed Flow Mode: Calculations When the "Recycle Pump In Fixed Flow Mode" bit = 1			
"Activated Sludge Basin 1 Run"= TRUE AND "Activated Sludge Basin 2 Run"= TRUE	Recycle Pump 1 Target Discharge	=	50% of the "Recycle Pump Fixed Flow Rate"
	Recycle Pump 2 Target Discharge	=	50% of the "Recycle Pump Fixed Flow Rate"
"Activated Sludge Basin 1 Run"= TRUE AND "Activated Sludge Basin 2 Run"= FALSE	Recycle Pump 1 Target Discharge	=	100% of the "Recycle Pump Fixed Flow Rate"
	Recycle Pump 2 Target Discharge	=	0% of the "Recycle Pump Fixed Flow Rate"
"Activated Sludge Basin 1 Run"= FALSE AND "Activated Sludge Basin 2 Run"= TRUE	Recycle Pump 1 Target Discharge	=	0% of the "Recycle Pump Fixed Flow Rate"
	Recycle Pump 2 Target Discharge	=	100% of the "Recycle Pump Fixed Flow Rate"

The Recycle Pumps are operated in percent of influent flow mode, when the operator manually deactivates the "Recycle Pump In Fixed Flow Mode" bit. The operator manually sets the "Percent of Activated Sludge Influent to Recycle" setpoint, which is used to calculate the "Recycle Pump 1 Target Discharge" and "Recycle Pump 2 Target Discharge" flow rates as shown below:

Percent of Influent Flow Mode: Calculations When the "Recycle Pump In Fixed Flow Mode" bit = 0			
"Activated Sludge Basin 1 Run"= TRUE	Recycle Pump 1 Target Discharge	=	½ × "Percent of Activated Sludge Influent to Recycle" × "Total Influent to Activated Sludge Basins"

AND "Activated Sludge Basin 2 Run"= TRUE	Recycle Pump 1 Target Discharge	=	½ × "Percent of Activated Sludge Influent to Recycle" × "Total Influent to Activated Sludge Basins"
"Activated Sludge Basin 1 Run"= TRUE AND "Activated Sludge Basin 2 Run"= FALSE	Recycle Pump 1 Target Discharge	=	"Percent of Activated Sludge Influent to Recycle" × "Total Influent to Activated Sludge Basins"
	Recycle Pump 2 Target Discharge	=	0
"Activated Sludge Basin 1 Run"= FALSE AND "Activated Sludge Basin 2 Run"= TRUE	Recycle Pump 1 Target Discharge	=	0
	Recycle Pump 2 Target Discharge	=	"Percent of Activated Sludge Influent to Recycle" × "Total Influent to Activated Sludge Basins"

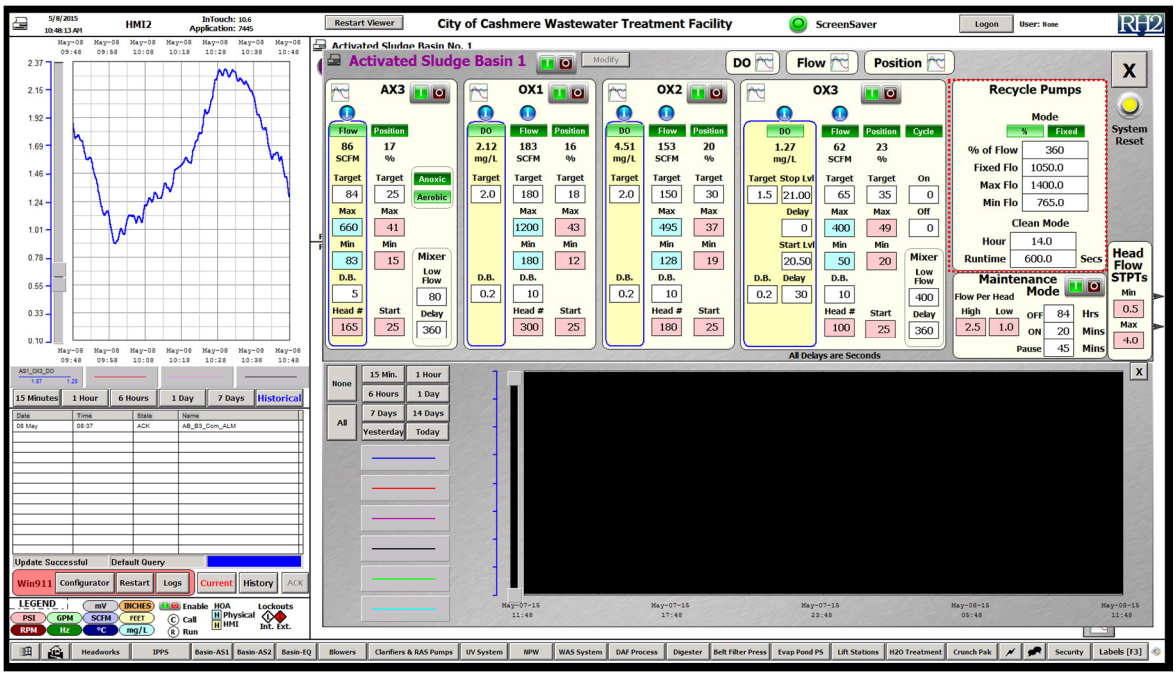
The "Recycle Pump 1 PID" loop controls the speed of the Recycle Pump 1 VFD by comparing the "Recycle Pump 1 Target Discharge" to the flow measured by the "Recycle Flow Meter No. 1."

The "Recycle Pump 2 PID" loop controls the speed of the Recycle Pump 2 VFD by comparing the "Recycle Pump 2 Target Discharge" to the flow measured by the "Recycle Flow Meter No. 2."

If the flow measured by the "Recycle Flow Meter (1 or 2)" is less than the "Recycle pump (1 or 2) Target Discharge" by more than the "Recycle Pump Allowable Target to Discharge Mismatch" the "Recycle Pump Discharge Flow Low" alarm is triggered.

IMAGE 2-12

RAS HMI CONTROL SCREEN



Recycle Pumps Object - Setpoints
Recycle Pump Percentage or Fixed Flow Mode Selection
Recycle Pump Percentage of Inflow Rate
Recycle Pump Fixed Flow Rate
Maximum Recycle Pump Flow Rate
Minimum Recycle Pump Flow Rate
Clean Mode Hour Trigger (Runs at 100% in Clean Mode)
Clean Mode Runtime in Seconds

Aeration System

The Aeration System consists of four blowers, each of which is controlled by a VFD and supplied with a high temperature switch.

Aeration blowers No. 1, 2, 3, and 4 supply Activated Sludge Basins No. 1 and 2. A discharge pressure transmitter and motor actuated blower discharge relief valve monitor and regulate the discharge from the three aeration blowers. In most operating conditions the blower discharge relief valve is closed, and the discharge pressure is regulated by varying the number of blowers called and the speed of the operating blowers. During periods of low air demand, when operating the blower(s) at minimum speed causes the discharge pressure to rise above the setpoint, the discharge relief valve is used to control the discharge pressure.

A maximum of 3 blowers will be used for normal operation. The fourth blower will be designated as the backup blower. The blowers will alternate every other start and based on time. The Backup Aeration Blower can be used to supply either the Aeration Basins or the Aerobic Digesters. When used to supply an Aerobic Digester, the Backup Aeration Blower must be operated at minimum speed.

The aerations system will be operated based on maintaining a constant discharge pressure setpoint. Additional blowers will be called when discharge pressure setpoint cannot be maintained for a certain amount of time. Fewer blowers will be called when discharge pressure is too high for a certain amount of time.

Aeration System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Aeration Blower No. 1	B-421	Variable Frequency Drive	Normal Operation: Blower speed adjusted to maintain discharge pressure at setpoint.
			Blower Capacity: 1160-300 SCFM
			Motor Size: 75 HP (Max)
Aeration Blower No. 2	B-425	Variable Frequency Drive	VFD
			Normal Operation: Blower speed adjusted to maintain discharge pressure at setpoint.
			Blower Capacity: 1160-300 SCFM
			Motor Size: 75 HP (Max)
Aeration Blower No. 3	B-429	Variable Frequency Drive	Normal Operation: Blower speed adjusted to maintain discharge pressure at setpoint.
			Blower Capacity: 1160-300 SCFM
			Motor Size: 75 HP (Max)
Aeration Blower No. 4	B-433	Variable Frequency Drive	Normal Operation: Blower speed adjusted to maintain discharge pressure at setpoint.
			Blower Capacity: 1160-300 SCFM
			Motor Size: 75 HP (Max)
Backup Aeration Blower	B-421, B-425,	Variable Frequency Drive	Normal Operation: Can be used to supply the Digesters if it is operated at minimum speed.

	B-429, or B-433		Blower Capacity: 1160-300 SCFM Motor Size: 75 HP (Max)
Aeration Blower Discharge Pressure Transmitter	PT-454	Pressure Transmitter	Pressure Range: 0-15 psi
Aeration Blower Discharge Relief Motor Actuated Valve	A-453	Motor Actuated Valve	Valve Size: 2 ½” Capacity: 50-100 SCFM

IMAGE 2-13

BLOWER HMI OVERVIEW SCREEN

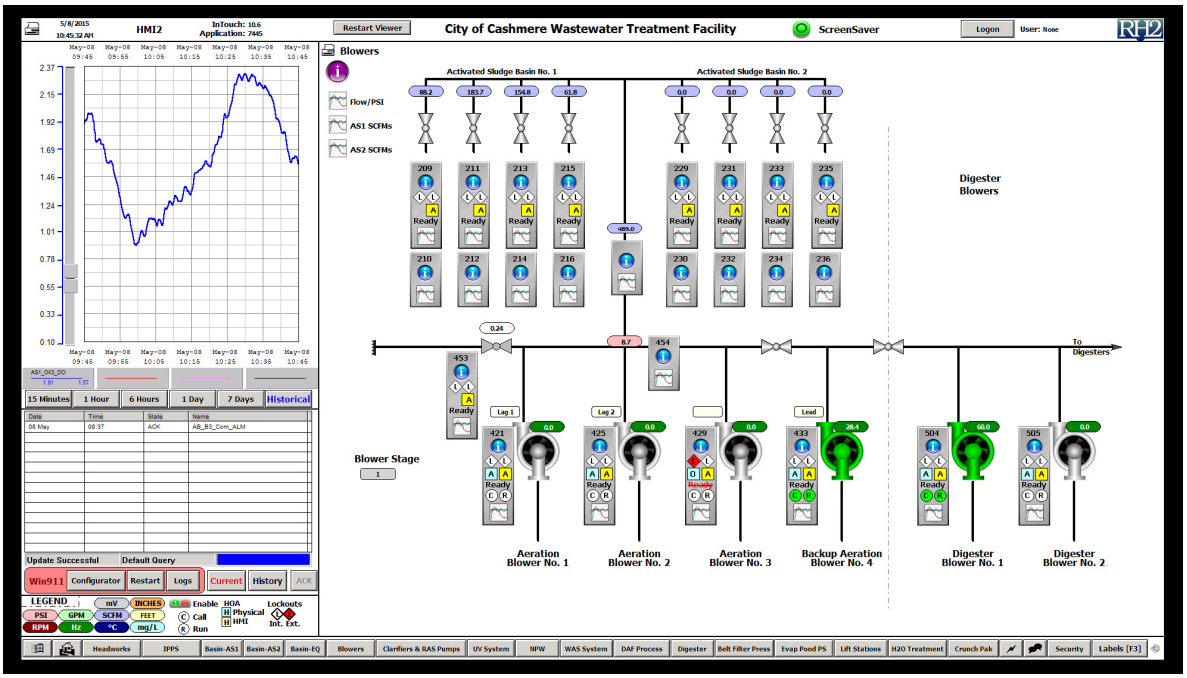
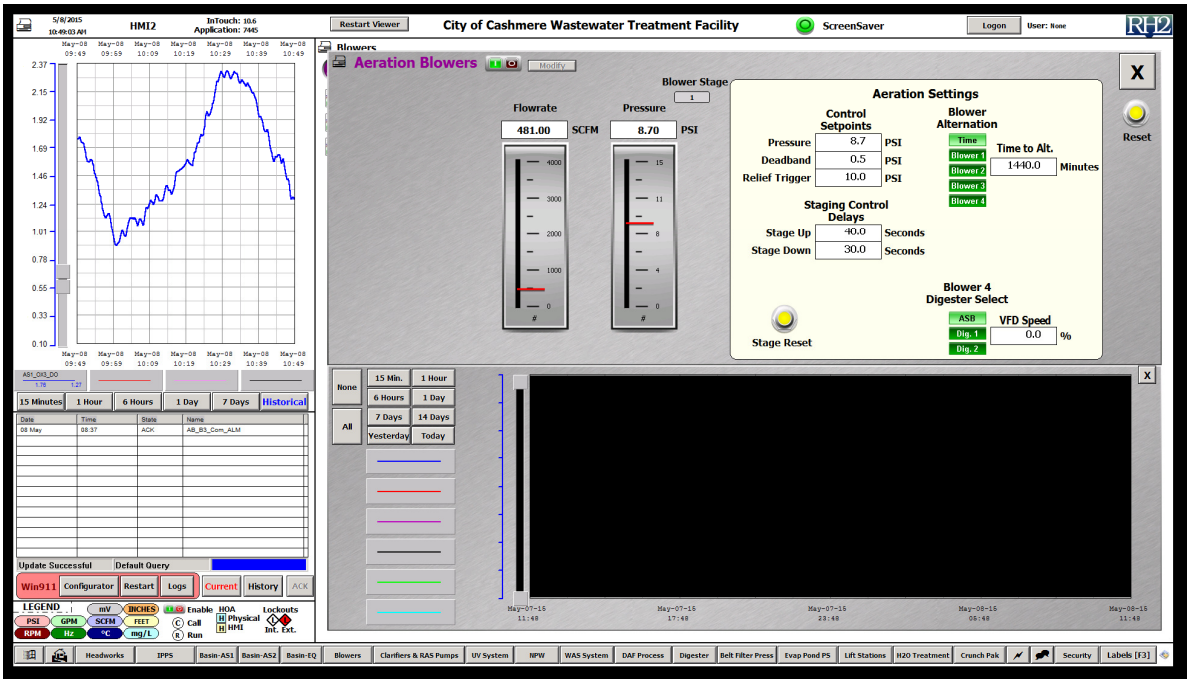


IMAGE 2-14

BLOWER HMI CONTROL SCREEN



Aeration Blowers - Setpoints
Discharge Pressure Setpoint
Discharge Pressure Deadband
Pressure Relief Trigger Setpoint
Stage Up Delay in Seconds
Stage Down Delay in Seconds
Alternation Selection Mode with Alternation Timer
Blower 4 System Selection – ASB/Digester 1/Digester2
State Reset Button

Clarifier System

The Clarifier System consists of the Clarifier Flow Splitter, Clarifier No. 1, and Clarifier No. 2.

The Clarifier Flow Splitter receives influent from Activated Sludge Basin No. 1 and No. 2 via two 18" mains. Influent from each main is controlled by a manually operated valve. Effluent from the Clarifier flow splitter is provided to Clarifiers No. 1 and 2 by 18" mains with manual flow control valves. The Clarifiers are called to run manually. There will normally be one Clarifier operating for each Waste Activated Sludge Train in operation.

Each Clarifier contains a rake, which is controlled by a VFD. The VFD speed is set manually by the operator. The rake drive contains an electromechanical overload control device, which senses the thrust on the worm drive shaft. At 40% torque (6,000 FT-lb) a high torque alarm is initiated. At 85% torque (12,750 FT-lb), motor power is cutout. At 100% torque (15,000 FT-lb) a backup motor cutout or slip clutch is initiated.

Torque switches attached to the rakes provide a "high torque alarm" and a "high torque cutout" signal directly to the VFD.

Effluent from each Clarifier is provided to the UV Treatment system via 16" lines. Each clarifier contains a scum sump pump, which pumps scum from the surface of the clarifiers to the In Plant Pumping Station via a 6" line. Settled sludge from the bottom of the clarifiers is pumped back to the Activated Sludge Basins by the Return Activated Sludge Pumps via 6" lines (See Return Activated Sludge (RAS) System).

Clarifier System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Clarifier Rake No. 1	M-301	Variable Frequency Drive	Normal Operation: Runs continuously while the clarifier is in operation.
High Torque Alarm Switch	UsH 301	Torque Switch	Torque: Xx
High Torque Cutout Switch	UsL 301	Torque Switch	Torque: Xx
Clarifier Rake No. 2	M-303	Variable Frequency Drive	Normal Operation: Runs continuously while the clarifier is in operation.
High Torque Alarm Switch	UsH 303	Part of Variable Frequency Drive Object	Torque: Xx
High Torque Cutout Switch	UsL 303	Part of Variable Frequency Drive Object	Torque: Xx

Clarifiers	Co-302	System Specific Control Object	See Below

Clarifiers – Clarifier System

The “Clarifier (1 or 2) VFD Target Speed” setpoints are manually set by the operator on VFD pop-up screens.

IMAGE 2-15

CLARIFIER HMI OVERVIEW SCREEN

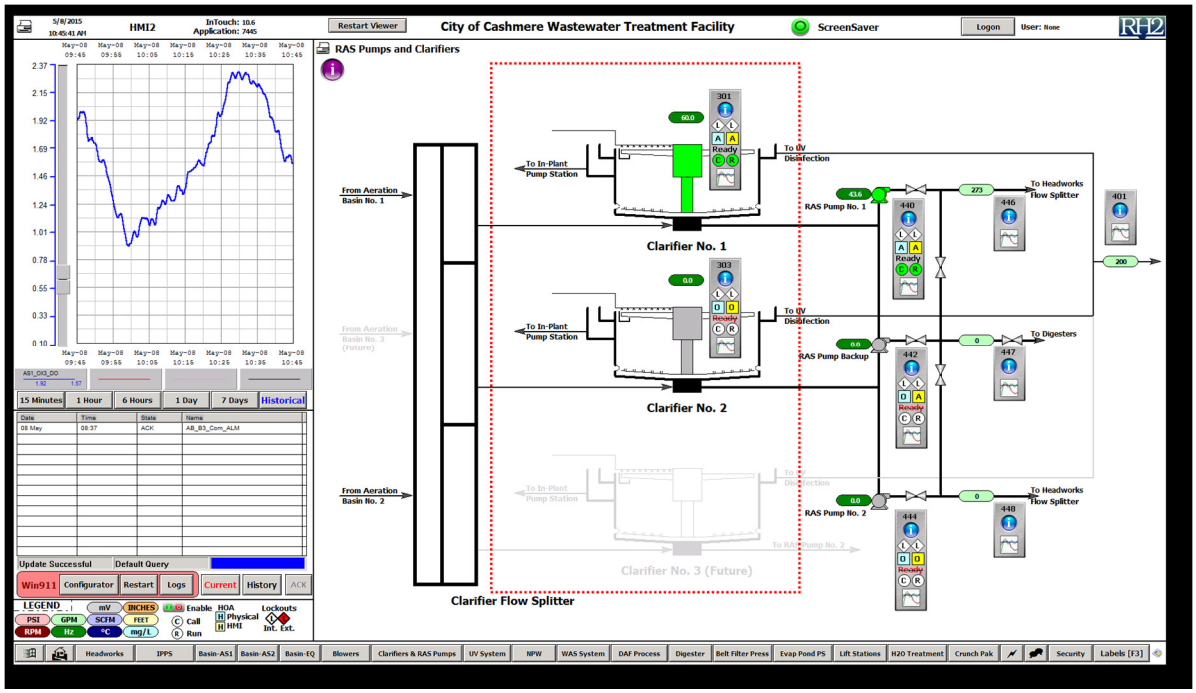
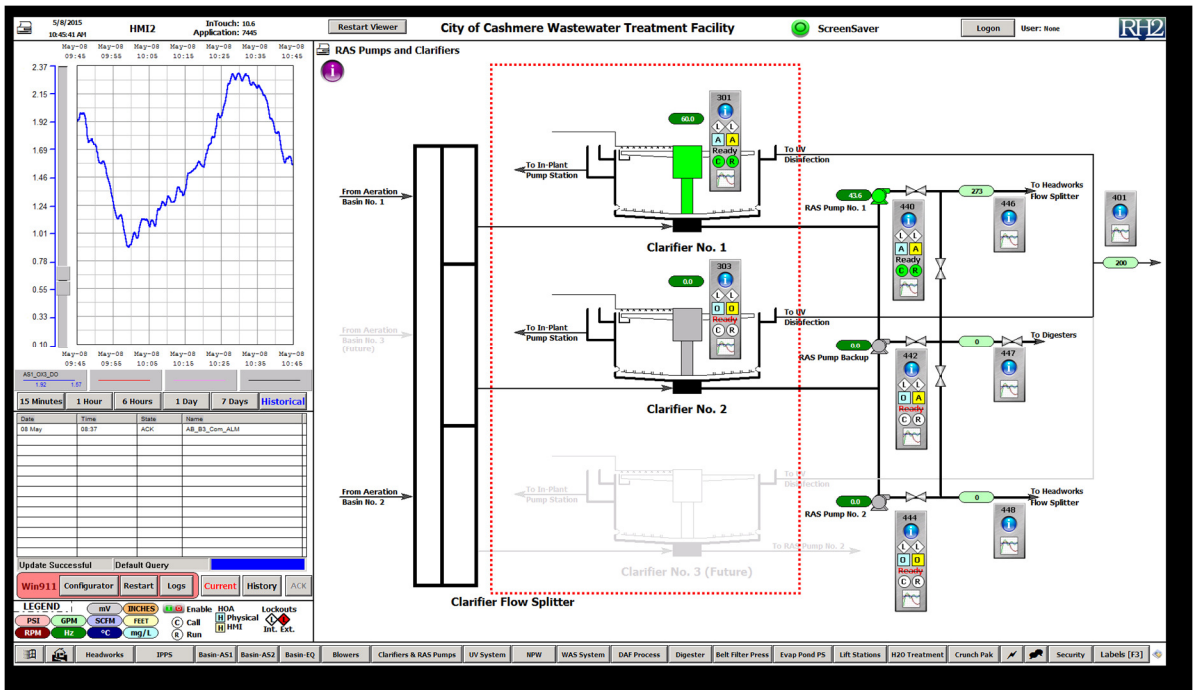


IMAGE 2-16

CLARIFIER HMI CONTROL SCREEN



Clarifiers Object - Setpoints
Clarifier 1 VFD Target Speed *
Clarifier 2 VFD Target Speed *

*Set with VFD Object

Disinfectant and Effluent Metering System

The Disinfectant and Effluent Metering System consists of a plant effluent flow meter, two UV lamp banks, a level probe, an ultrasonic level transmitter, and a composite sampler.

Influent to the system comes from Clarifiers No. 1 and 2 via 16" lines, which are reduced to 12" to allow flow monitoring by the Plant Effluent Flow Meter, which has a measurement range of 150-1,800 GPM. Influent passes though UV Bank A, then UV Bank B.

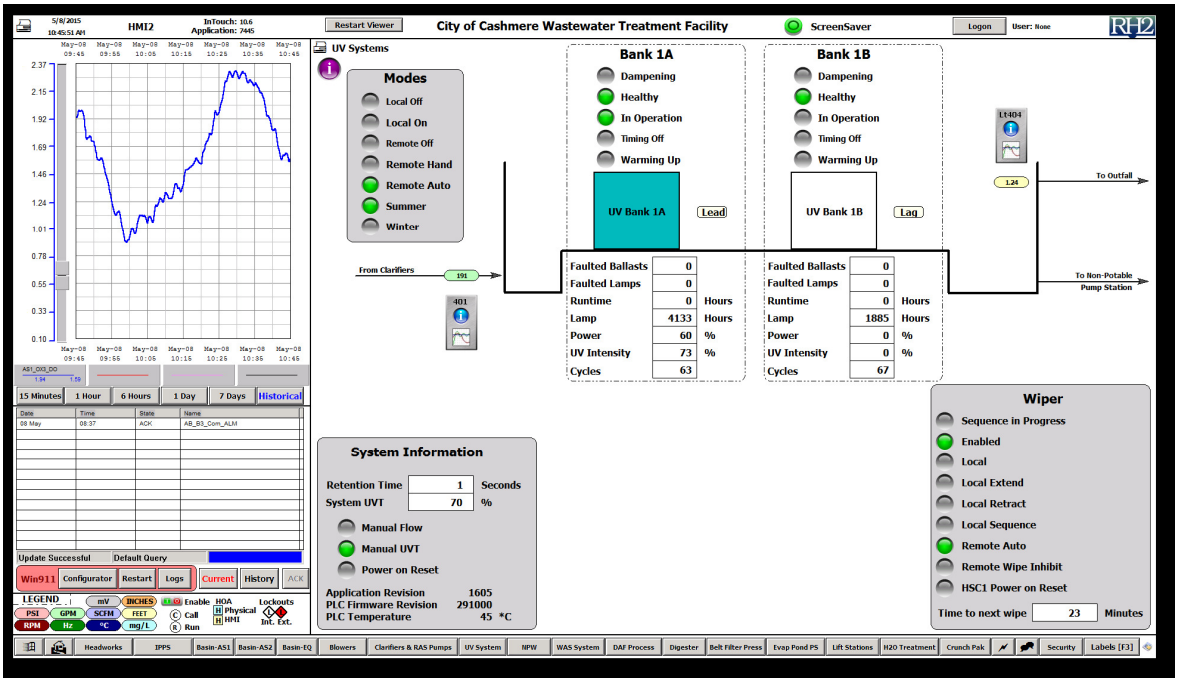
The level probe provides an analog input to the UV System Power Distribution Center "PDC2" The UV System Power Distribution Center "PDC1" provides an analog input to the Equipment Building RTU which is proportional to UV system power consumption. The ultrasonic level transmitter provide UV Channel level input to the Equipment Building RTU. Downstream of UV Bank B, a composite sampler provides "pump air full," "pump bottle full," "air distributer jammed," and "delay before sample inputs" to the Equipment Building RTU. The composite sampler varies its' sample rate based on the "plant effluent flow" signal it receives from the Equipment Building RTU.

A portion of the effluent from the UV Channel is provided to the non-potable pump station via an 8" line, while most of the effluent flows to the outfall on the Wenatchee River via an 18"line.

Disinfectant and Effluent Metering System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Plant Effluent Flow Meter	Ft-401	Flow Meter	Flow Range: 150-1,800 GPM
			Totalizer Quantity Per Pulse: xx
UV System Power Distribution Center 1	PDC1	Power Consumption Range	xx-xx kW
UV System Ultrasonic Level Transmitter	Lt-404	Level Transmitter	Max Level :xx
			Min Level: xx
Composite Sampler	SMP-405	Composite Sampler	Samples per KGAL: xx
UV Lamp Banks	Co-402	System Specific Control Object	See Below

IMAGE 2-17

UV SYSTEM HMI OVERVIEW SCREEN



Control of UV System is located on the UV control panel touch screen. Additional information regarding UV system control is located in the UV system O&M documentation.

Non-Potable Pump Station System

The Non-Potable Pump Station System consists of a package pump station containing three VFD controlled pumps, a pump discharge flow meter, mechanical screen, hydro pneumatic bladder tank and a water “low flow“ supply station from the city’s water system. The pump station will supply up to 250 GPM of non-potable water at 80 psi to the non-potable plumbing system.

The three pumps take suction from a basin which is supplied by the effluent from the UV treatment process. When the flow from the UV treatment system is too low to meet the non-potable water demand, a float switch will trigger the “low flow” supply station to provide potable water to the pumps’ suction basin.

The pump station will control the three pumps and mechanical screen. The pump station will provide the Equipment Building RTU with status input. The Equipment Building RTU will have the ability to remotely shutoff the non-potable pump station control with a manual on/off bit. The Equipment Building RTU will also provide the non-potable water pump station control panel with a remote pressure setpoint. This setpoint can also be set at the non-potable water pump station control panel operator interface.

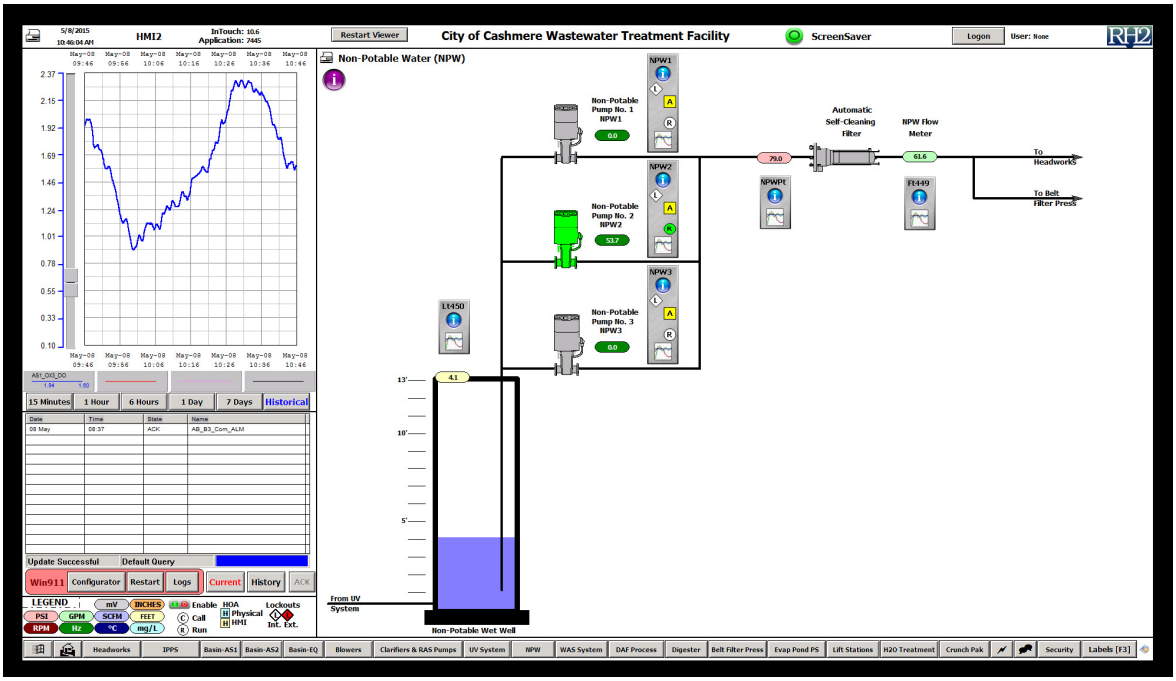
The mechanical screen will provide a fault signal to the Equipment Building RTU and will accept “reset” and “remote pause” inputs from the mechanical screen.

Non-Potable Pump Station System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Non-Potable Water Pump No. 1	N/A	Variable Frequency Drive	Controlled by Package Pump Station Panel to meet Non-potable water demand
			Capacity: 125 GPM
Non-Potable Water Pump No. 2	N/A	Variable Frequency Drive	Controlled by Package Pump Station Panel to meet Non-potable water demand
			Capacity: 125 GPM
Non-Potable Water Pump No. 3	N/A	Variable Frequency Drive	Controlled by Package Pump Station Panel to meet Non-potable water demand
			Capacity: 125 GPM
	N/A	Flow Meter	Flow: 0-250 GPM

Non-Potable Water Flowmeter			Totalizer Quantity Per Pulse:
Automated Self-Cleaning Filter Panel (Operates Mechanical Screen)	Co-411	System Specific Control Object	Normally Operated under local control. Accepts reset and remote pause commands. Provides Fault output.
Hydro Pneumatic Bladder Tank	N/A	N/A	Minimum Capacity: 80 gallons
Non-Potable Water Pump Station Control Panel	Co-410	System Specific Control Object	See Below
Non-Potable Plumbing System Flow Meter	Ft_449	Flow Meter	Flow: xx-xxx GPM
Low Flow Supply Station Flow Meter	Ft_452	Flow Meter	Flow: xx-xxx GPM

IMAGE 2-18

NON-POTABLE PUMP SYSTEM HMI OVERVIEW SCREEN



Control of Non-Potable Pump Station is located on its control panel touch screen. Additional information regarding Non-Potable Pump Station system control is located in its system O&M documentation.

Return Activated Sludge (RAS) System

The RAS System consists of three VFD controlled pumps, RAS Pump No. 1, RAS Pump No. 2, the Backup RAS Pump, and the three discharge flow meters associated with the pumps. RAS Pumps No. 1 and 2 receive Return Activated Sludge from drains in the bottom of Clarifiers No.1 and 2 respectively. The Return activated sludge from each pump is discharged to the Headworks Flow Splitter on separate 6" lines.

The Backup RAS pump can be manually aligned to take suction from either clarifier and discharge to the Headworks flow splitter, or to discharge Waste Activated Sludge directly to the Aerobic Digesters. Using the Backup RAS pump to discharge WAS directly to the Aerobic Digesters bypasses the Flocculator and DAF process.

The flow rates from each of the three RAS pumps are set manually. RAS pumps No. 1 and 2 operate continuously when the clarifier the pump takes suction from is running.

A 6" magnetic flow meter monitors flow from Clarifier No. 1 to the Headworks flow splitter (the discharge of either RAS Pump No. 1 or the Backup RAS pump depending on the valve lineup). A second 6" magnetic flow meter monitors flow from Clarifier No. 2 to the Headworks flow splitter (the discharge of either RAS Pump No. 2 or the Backup RAS pump depending on the valve lineup). A 4" magnetic flow meter measures any WAS discharge to the Aerobic Digesters.

Return Activated Sludge (RAS) System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
RAS Pump No. 1	P-440	Variable Frequency Drive	Normal Operation: Operates Continually. Flow Rate Set manually
			Flow Range: 104-382 GPM
Backup RAS Pump	P-442	Variable Frequency Drive	Normal Operation: Flow Rate Set manually
			Flow Range: 104-382 GPM
RAS Pump No. 2	P-444	Variable Frequency Drive	Normal Operation: Operates Continually. Flow Rate Set manually
			Flow Range: 104-382 GPM
Clarifier No. 1 RAS Flowmeter	Ft-446	Flow Meter	Flow Range: 104-382 GPM
			Totalizer Quantity Per Pulse

Clarifier WAS Flowmeter	Ft-447	Flow Meter	Flow: xx-xx GPM
			Totalizer Quantity Per Pulse: xx
Clarifier No. 2 RAS Flowmeter	Ft-448	Flow Meter	Flow: 104-382 GPM
			Totalizer Quantity Per Pulse: xx

IMAGE 2-19

RAS SYSTEM HMI OVERVIEW SCREEN

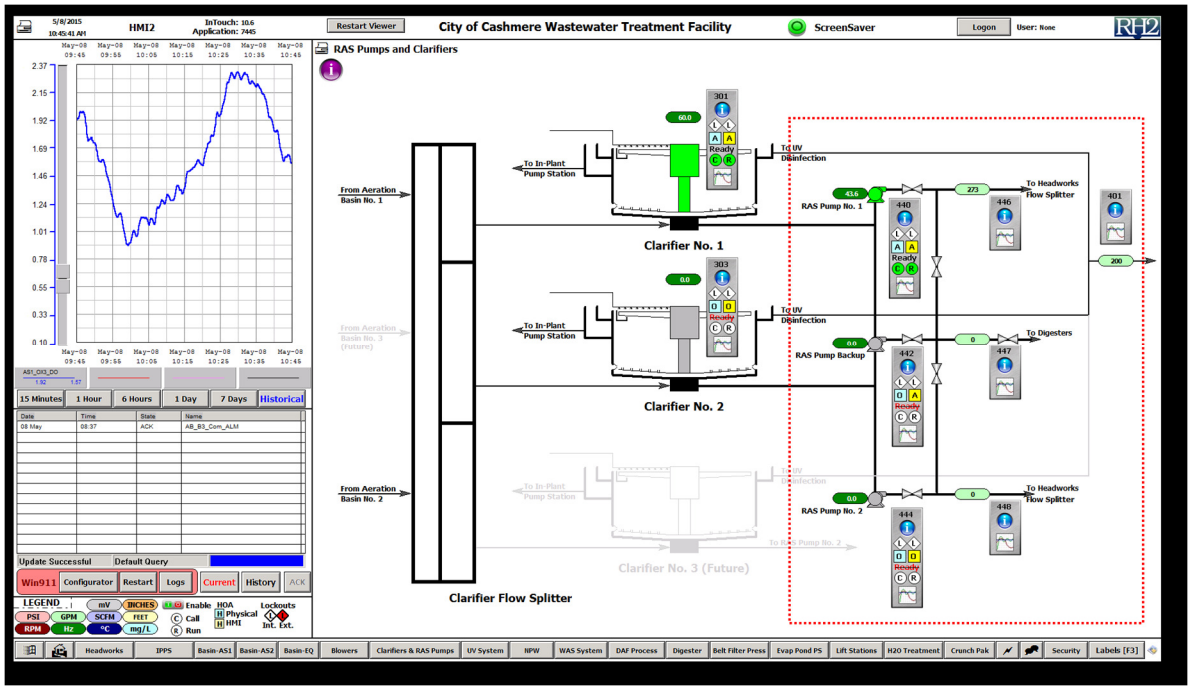
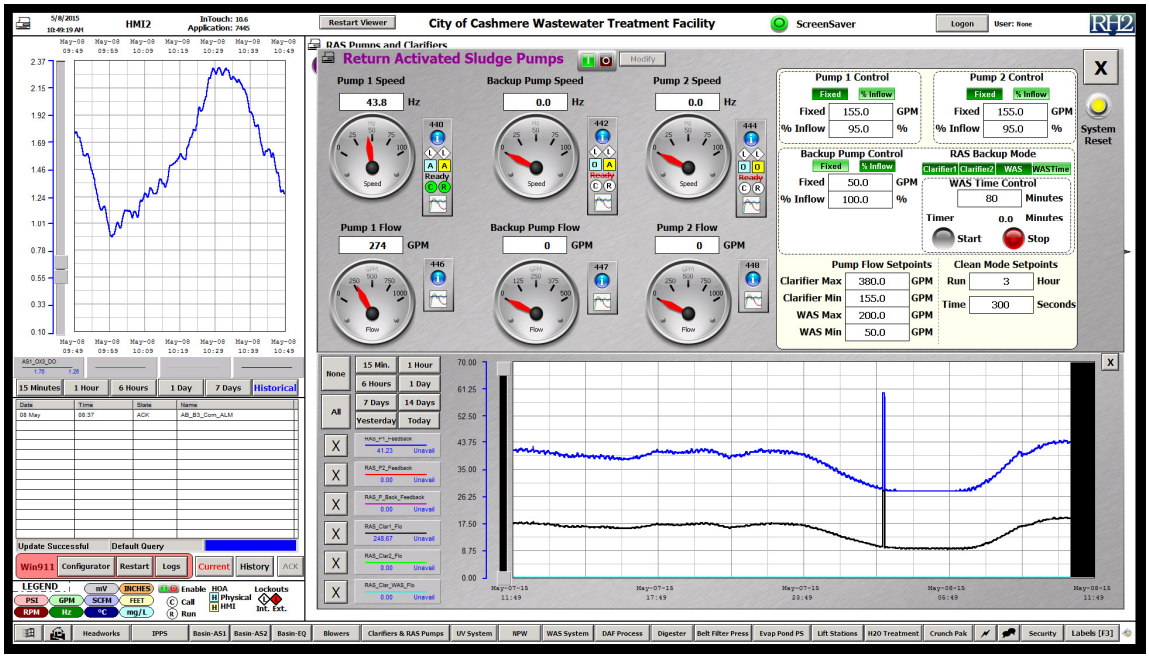


IMAGE 2-20

RAS SYSTEM HMI CONTROL SCREEN



RAS Object - Setpoints
RAS System Enable/Disable Mode Selection
RAS Pumps Fixed Flow or Percentage of Inflow Mode Selection
RAS Pumps Fixed Flow Rate
RAS Pumps Percentage of Inflow Rate
Backup RAS Pump Control Mode – Clarifier 1/Clarifier 2/WAS/WAS Time
Backup RAS Pump WAS Time Control and Manual Start/Stop
Minimum/Maximum Flows Allowed When in Clarifier or WAS Modes
Clean Mode Run Hour (RAS Pump Runs at 100%)
Clean Mode Run Time in Seconds

Thickening System

The Thickening System consists of two Waste Activated Sludge (WAS) pumps, two WAS pump discharge flowmeters, the Flocculator, the DAF Process, two Thickened Sludge Transfer Pumps and the Thickened Sludge Transfer Pump Discharge Flow meter.

The DAF Process consists of an air compressor, which is used to aerate the train, a skimmer, which directs thickened sludge to the Thickened Sludge Transfer Pumps, an Auger, which sends settled solids to the In Plant Pump Station, and two recycle pumps, which recirculate WAS from the downstream end of the train back though the train. Two pressure switches are used for process control and alarming.

The Waste Activated Sludge (WAS) surface wasting system operates 24/7. The WAS pumps are VFD controlled, and the fixed flow rate from each WAS pump is set by the operator. The surface waste gate actuator maintains the fluid level in the WAS pump inlet basin using feedback from the level input received from the WAS Pump Inlet Basin Level Transmitter. Flow into the WAS pump inlet basin is controlled by adjusting the position of the gate.

Each WAS pump receives 16-35 GPM of surface waste from one of the Activated Sludge Basins. Discharge from each of the WAS pumps is monitored by individual WAS pump flow meters. During normal operation, discharge from the WAS pumps is directed to the Flocculator. The WAS pumps can also be aligned manually to discharge directly into the Aerobic Digesters, bypassing the Flocculator, DAF Process and Thickened Sludge Transfer Pumps.

The Flocculator receives influent flows of 33-69 GPM from the WAS pumps. Several ½" lines containing air-saturated water are combined with the influent in the Flocculator. The pressurized air, water and sludge combination is called "whitewater". The whitewater is then passed to the DAF process, where the hydrostatic pressure is lower, and the air comes out of solution. The air bubbles attach to the floc (clumps of suspended solid) and cause it to float. The floc is removed from the surface of the DAF train by a skimmer, and passed to the digesters by one of the Thickened Sludge Transfer Pumps.

The Thickened Sludge Transfer Pumps are operated one at a time. The operating pump may be selected manually or an automatic control scheme alternates between pumps. The operating pump discharges 3.1-6.2 GPM of thickened sludge containing 4% MLSS to the digesters. The discharge from either pump is monitored by the Thickened Sludge Transfer Pump Flow meter.

Solids that settle to the bottom of the DAF train are removed by an auger, which runs on a timer. When the auger runs, a solenoid operated valve opens a drain to the In Plant Pump Station. The settled solids and a large slug of water are drained before the auger shuts down and the drain closes. A separate, 6" drain line carries 32-63 GPM from the DAF Process train to the In Plant Pump Station.

Two Recycle pumps, each with ½" suction lines, pull 26 GPM from the downstream end of the DAF Process Train. The Recycle Pumps discharge to an air mixing station, where water is saturated with dissolve air before being directed into the Flocculator and DAF Process Train by several ½" lines.

Flocculator and DAF Process control sequencing description

The Flocculator and DAF Process startup sequence begins with starting the skimmer, auger and both recirculation pumps. After an “on” delay (adjustable 1-10 minutes), the drain valve opens for 1-9.9 seconds. Once the discharge pressure from the recirculation pumps exceeds 75 psi, the pressure switch at the Pneumatic Panel opens. When the Pneumatic pressure switch opens, the DAF Pneumatic Panel (aeration) solenoid control valve opens, which allows air saturated water to be provided to the Flocculator and the DAF Process.

During normal operation, the skimmer, the auger and the sludge drain valve all operate in a pulse/pause mode. The drain valve cycle consists of 3 seconds open followed by 30 minutes closed. The DAF skimmer cycle consists of 10 minutes running followed by 4 minutes off. The auger drive cycle consists of 5 minutes running followed by 5 minutes off.

During shutdown, the aeration valve and drain valves are closed, but the recirculation pumps, auger and skimmer continue to run for 1-10 minutes before turning off.

Thickening System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
ASB 1 Surface Waste Gate Actuator	A-217 G-217	Motor Actuated Gate	Normal Operation: Sets gate position to maintain fluid level in the WAS pump inlet basin, based on feedback from the WAS pump inlet basin level transmitter, to allow flow into the WAS pump Station.
ASB 1 WAS Pump Inlet Basin Level Transmitter	LT-217	Level Transmitter	Level: XX-XX INCHES
ASB 2 Surface Waste Gate Actuator	A-237 G-237	Motor Actuated Gate	Normal Operation: Sets gate position to maintain fluid level in the WAS pump inlet basin, based on feedback from the WAS pump inlet basin level transmitter, to allow flow into the WAS pump Station.
ASB 2 WAS Pump Inlet Basin Level Transmitter	LT-237	Level Transmitter	Level: XX-XX INCHES

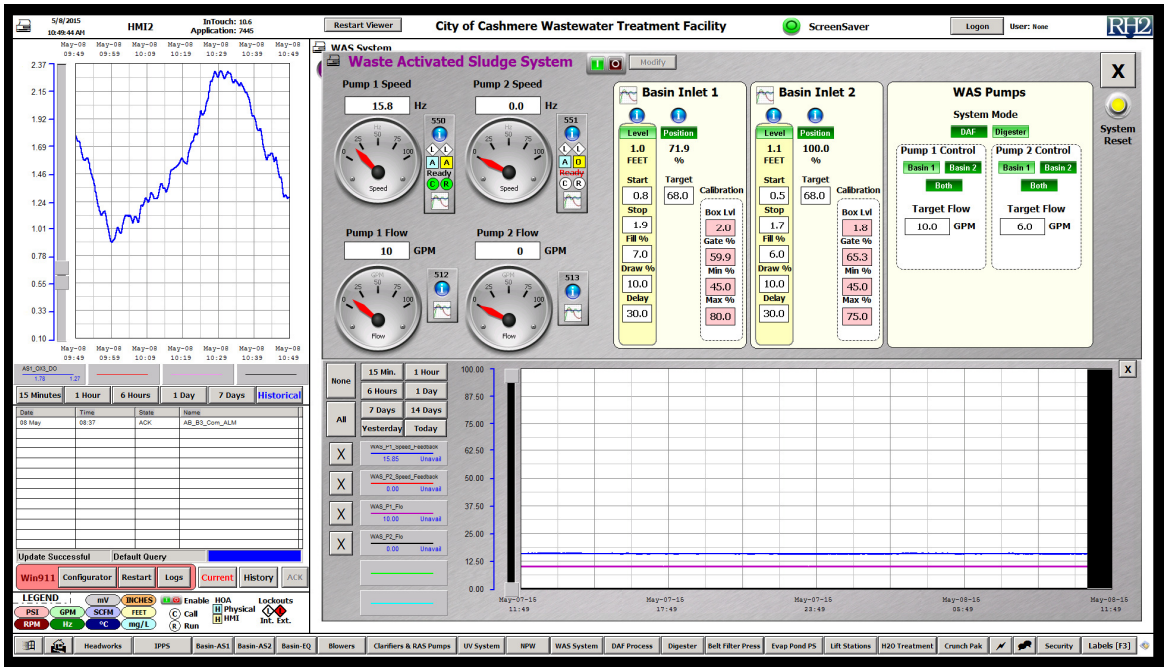
Waste Activated Sludge Pump No. 1	P-550	Variable Frequency Drive	Normal Operation: Runs continuously at a manually selected flow rate.
			Pumping Rate : 16-35 GPM
Waste Activated Sludge Pump No. 2	P-551	Variable Frequency Drive	Normal Operation: Runs continuously at a manually selected flow rate.
			Pumping Rate : 16-35 GPM
Waste Activated Sludge Pump No. 1 Flowmeter	Ft-512	Flow Meter	Flow: 16-35 GPM
			Totalizer Pulse Quantity:
Waste Activated Sludge Pump No. 2 Flowmeter	Ft-513	Flow Meter	Flow: 16-35 GPM
			Totalizer Pulse Quantity:
Thickened Sludge Transfer Pump Discharge Flow Meter	Ft-546	Flow Meter	Flow: xx-xxx GPM
			Totalizer Pulse Quantity:
Flocculator	FLC-515	N/A	Normal Operation: Runs continuously, 30-58 GPM
Air Compressor	C-514	N/A	Normal Operation: Runs as needed to maintain air pressure at 100 psi
			Capacity: 25.3 SCFM at 100 psi
DAF Low Air Panel Pressure Switch	PSL2-516	Pressure Switch	Pressure Setting: 90 psi
DAF Pneumatic Panel Low Air Pressure Switch	PSL1-517	Pressure Switch	Pressure Setting: 75 psi
DAF Pneumatic Panel Solenoid	XV-518	Solenoid Operated Valve	Valve Size: ?
			Normal Operation : Opens after a delay of xx minutes recirculation pump startup. Turns off with recirculation pumps.

DAF Drain Valve Solenoid	XV-524	Solenoid Operated Valve	Valve Size: 8” Normal Operation: Opens for 1-9.9 seconds after a delay when the recirculation pumps start. Cycles open for 3 seconds then closed for 30 minutes as long as the recirculation pumps are running.
DAF Auger	DAF-525	Across the Line Starter	Normal Operation: Runs 5 minutes on, then 5 minutes off while the recirculation pumps are running. Continues to run for xx (1-10) minutes after the recirculation pumps shut down.
DAF Recycle Pump No. 1	P-529	Across the Line Starter	Normal Operation: Runs continuously. When the DAF process is shut down, the pump continues to run for xx (1-10) minutes
DAF Recycle Pump No. 2	P-528	Across the Line Starter	Normal Operation: Runs continuously. When the DAF process is shut down, the pump continues to run for xx (1-10) minutes
DAF Skimmer	DAF-527	Variable Frequency Drive	Normal Operation: Starts with the recirculating pumps. While the recirculating pumps are on, the skimmer cycles on for 10 minutes, then off for 4 minutes. When the DAF process is shut down, the skimmer continues to run for xx (1-10) minutes
	P-522	Across the Line Starter	Normal Operation: Operates when Thickened Sludge Pump No. 2 is not operating. Pumping Rate: 3.1-6.2 GPM

Thickened Sludge Transfer Pump No. 2	P-523	Across the Line Starter	Normal Operation: Operates when Thickened Sludge Pump No. 1 is not operating. Pumping Rate: 3.1-6.2 GPM
WAS Pump 1 Control	Co-550	System Specific Control Object	See Below
WAS Pump 2 Control	Co-551	System Specific Control Object	See Below
Thickening System Control	Co-520	System Specific Control Object	See Below

IMAGE 2-22

WAS SYSTEM HMI CONTROL SCREEN



WAS Gate Objects - Setpoints
ASB Basin WAS Gate Enable/Disable Control Selection
ASB Basin 1&2 WAS Gate Level/Position Control Selection
ASB Basin 1&2 WAS Gate Level Mode Maximum Start/Stop Level Setpoints in Feet
ASB Basin 1&2 WAS Gate Level Mode Fill WAS Box %
ASB Basin 1&2 WAS Gate Level Mode Draw WAS Box %
ASB Basin 1&2 WAS Gate Level Mode Fill/Draw Delay
ASB Basin 1&2 WAS Gate Position Mode Target
ASB Basin 1&2 WAS Gate Calibration Setpoints

WAS Pump Objects - Setpoints
WAS Pump DAF or Digester Output Selector
WAS Pump 1&2 ASB Inflow Selector
WAS Pump 1&2 Target Flow Rate

IMAGE 2-23

DAF SYSTEM HMI OVERVIEW SCREEN

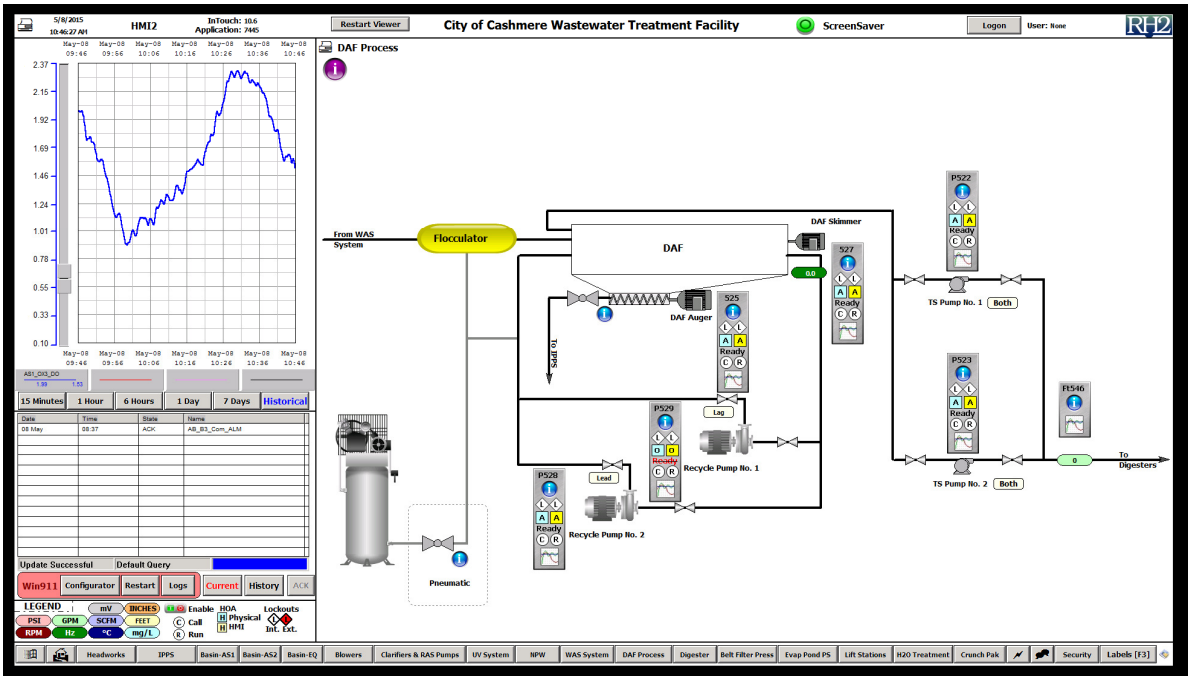
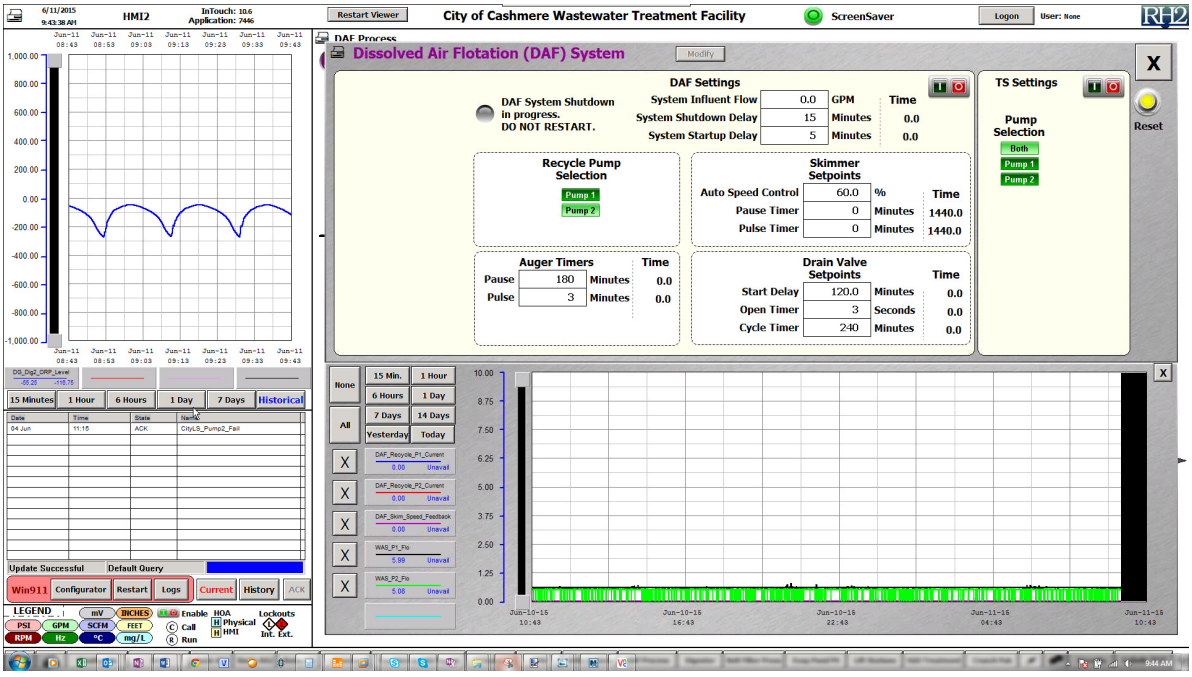


IMAGE 2-24

DAF SYSTEM HMI CONTROL SCREEN



DAF Object - Setpoints
DAF System Enable/Disable Mode Selection
DAF System Influent Flow
DAF System Shutdown Delay
DAF System Startup Delay
Recycle Pump 1 or 2 Selection
Auger Pause/Pulse Timer
Skimmer Speed Control and Pause/Pulse Timers
Drain Valve Start Delay and Open/Close Timers
TS Pump Enable/Disable Mode Selection
TS Pump Selection

Aerobic Digester System

The Aerobic Digester System consists of two digester blowers and two aerobic digesters. Each aerobic digester contains a mixer, aeration system, blower discharge valve, level transmitter and an Oxidation Reduction Potential (ORP) sensor. The digester blowers are each controlled by a VFD, and are each supplied with a high temperature switch.

The aerobic digesters are manually alternated between receiving influent and digesting. The digester which is set to receive influent normally receives influent from the Thickened Sludge Transfer Pump. Waste Activated Sludge may also be pumped into the digester directly from the Backup Return Activated Sludge Pump, but this is not a normal source of influent.

The mixer in each digester runs whenever the digester's level is above the minimum mixer run setpoint. The digester blowers are operated independently of each other, with each blower supplying air to one of the digesters. When the digester's level is above the minimum blower run setpoint, the blower can be operated in ORP control or time control mode.

In ORP control mode, the blower is controlled based on the ORP for that digester. When the ORP drops below the blower run setpoint, the blower runs until the ORP setpoint has been exceeded. When ORP setpoint is reached, the blower continues to operate for a set time delay before shutting down. The solenoid operated blower discharge valve is in the normally open position before the blower starts. When the blower turns on the solenoid valve is called to close. When the blower is called to stop, the solenoid valve is called to open before the blower shuts off and remains open until the blower is called to start again. In time control mode, the blowers can be set to run based on the time of day in any combination of 30 minute increments.

Once one of the digesters completes a digestion cycle, a manual valve line up allows the effluent from the digester to be pumped to the belt filter press by the dewatered sludge transfer pump.

Aerobic Digester System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Notes**
Aerobic Digester Blower No. 1	B-504	Variable Frequency Drive	Blower Capacity: 400-120 SCFM Motor Size: 30 HP (Max)
Aerobic Digester Blower No. 2	B-505	Variable Frequency Drive	Blower Capacity: 400-120 SCFM Motor Size: 30 HP (Max)
Aerobic Digester Mixer No. 1	M-507	Across the Line Starter	Operates continuously, unless digester level is below the minimum mixer run setpoint (occurs during drawdown by dewatered sludge transfer pump)
Aerobic Digester Mixer No. 2	M-508	Across the Line Starter	Operates continuously, unless digester level is below the minimum mixer run setpoint (occurs during drawdown by dewatered sludge transfer pump)
Aerobic Digester No. 1 Level Transmitter	Lt-506	Level Transmitter	Range: xx-xx FT
Aerobic Digester No. 2 Level Transmitter	Lt-509	Level Transmitter	Range: xx-xx FT
Oxidation Reduction Potential Sensor No. 1	ORP-548	Oxidation Reduction Potential Sensor	Range xx-xx
Oxidation Reduction Potential Sensor No. 2	ORP-549	Oxidation Reduction Potential Sensor	Range xx-xx
Blower Discharge Solenoid No. 1	XV-552	Solenoid Operated Valve	Normal Operation: Normally open before blower starts, Closes when blower starts, Opens before blower stops

Blower Discharge Solenoid No. 2	XV-553	Solenoid Operated Valve	Normal Operation: Normally open before blower starts, Closes when blower starts, Opens before blower stops
Aerobic Digester No. 1	Co-531	System Specific Control Object	See Below
Aerobic Digester No. 2	Co-532	System Specific Control Object	See Below

IMAGE 2-25

AEROBIC DIGESTER HMI OVERVIEW SCREEN

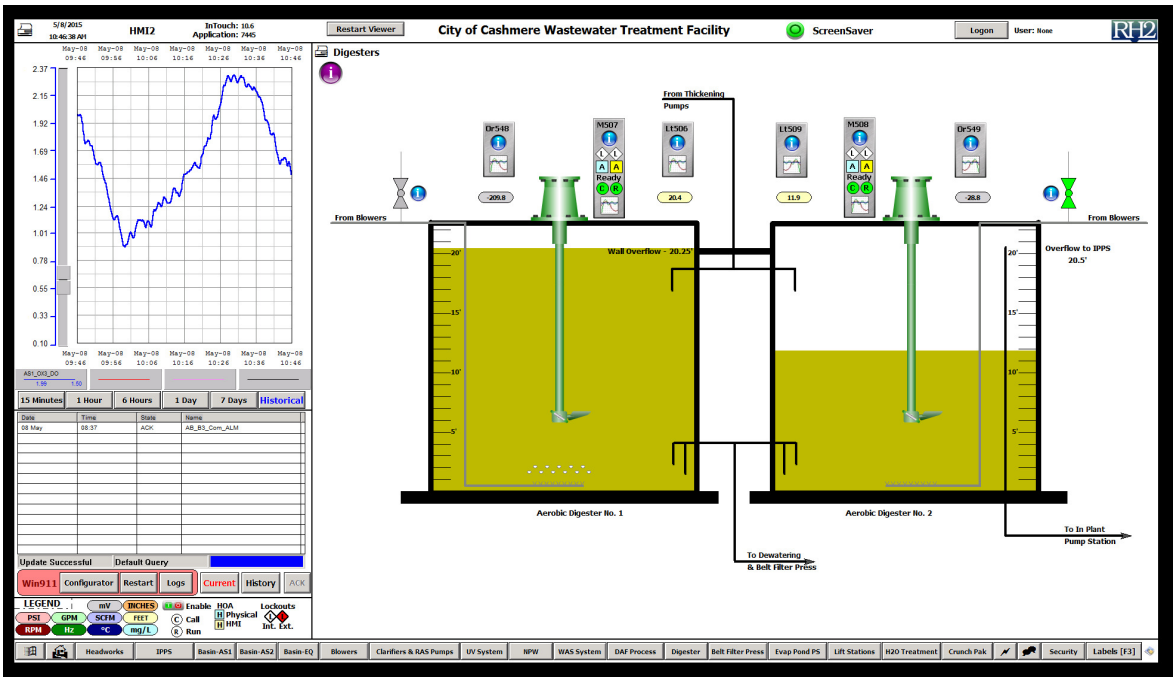
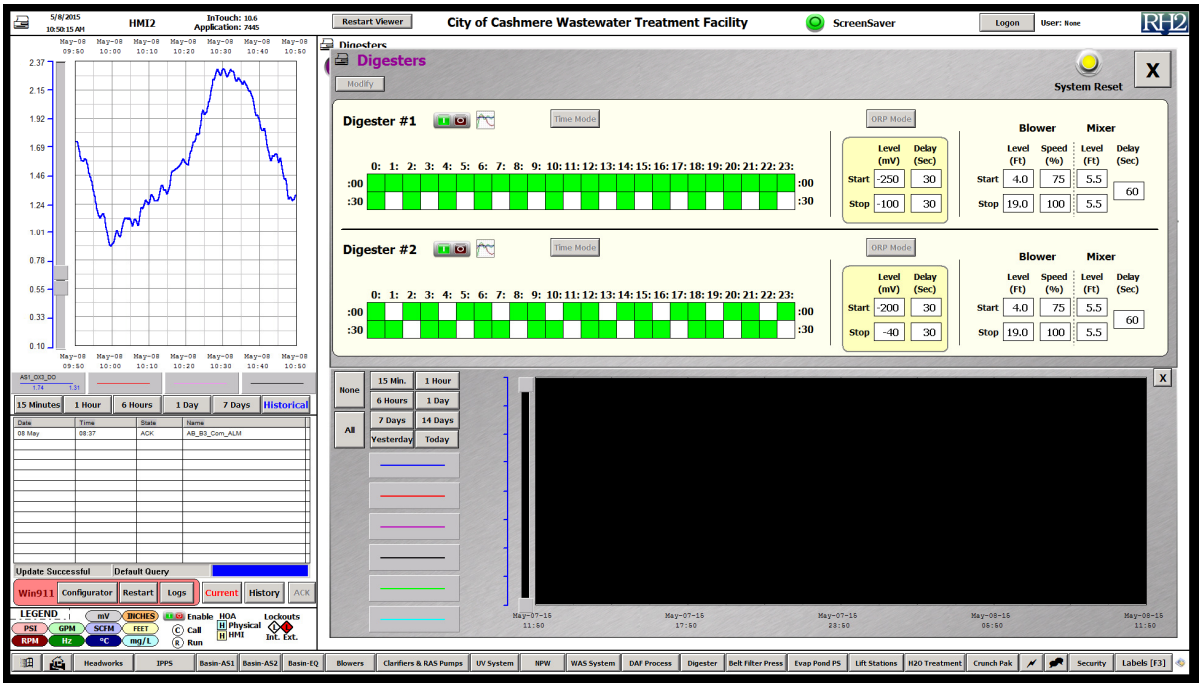


IMAGE 2-26

AEROBIC DIGESTER HMI CONTROL SCREEN



Aerobic Digester Object - Setpoints
Digester 1&2 Enable/Disable Selection Control
Digester 1&2 Blower/Time Mode Selection
Digester 1&2 Time Mode Daily Blower Run Selection in Daily 30 Minute Increments
Digester 1&2 ORP Mode Blower Start/Stop Level and Delay Setpoints
Digester 1&2 Blower Level/Flow Rate Linear Control Setpoints
Digester 1&2 Mixer Start/Stop Level and Delay Setpoints

Dewatering System

The Dewatering System consists of the Dewatered Sludge Transfer Pump, the Dewatered Sludge Transfer Pump Flow Meter, a Polymer Feed System, a Static Mixer, the Belt Filter Press, the Belt Filter Press Water Supply Flow Meter, the Belt Filter Press Water Supply Valve, the Cake Solids Transfer Pump, an air compressor, and a dumpster.

The Dewatered Sludge Transfer Pump can be aligned to transfer biosolids from an Aerobic Digester to the Belt Filer Press, or to transfer biosolids from one Aerobic Digester to the other.

When either of the two Aerobic Digesters (see the Aerobic Digester System) have completed a digestion cycle, the digester is connected to the suction of the Dewatered Sludge Transfer Pump by a manual valve lineup. The Dewatered Sludge Transfer Pump discharges between 33 and 44 GPM of biosolids to a 4” line where the biosolids are mixed with polymer feed. The mixture then travels to the Belt Filter Press. The flow rate of the biosolid and polymer mixture is measured by the Dewatered Sludge Transfer Pump Discharge Flow Meter.

The Belt Filter Press dewaters the aerobically digested solids from 2.5% to a 16-18% cake. Solids are passed to the Cake Solids Transfer Pump, which is controlled by a VFD. The Cake Solids Transfer pump discharges up to 625 lbs per hour to a 30 yard dumpster.

The Belt Filter Press is supplied with non-potable washwater on a 1 ½” line which is controlled by a solenoid valve. The washwater flow rate is 24-45 GPM, and is measured by a magnetic flowmeter. Filtrate and washwater from the Belt Filter Transfer Press can be directed to either the Evaporation Pond or the In Plant Pump Station by manually altering the valve lineup.

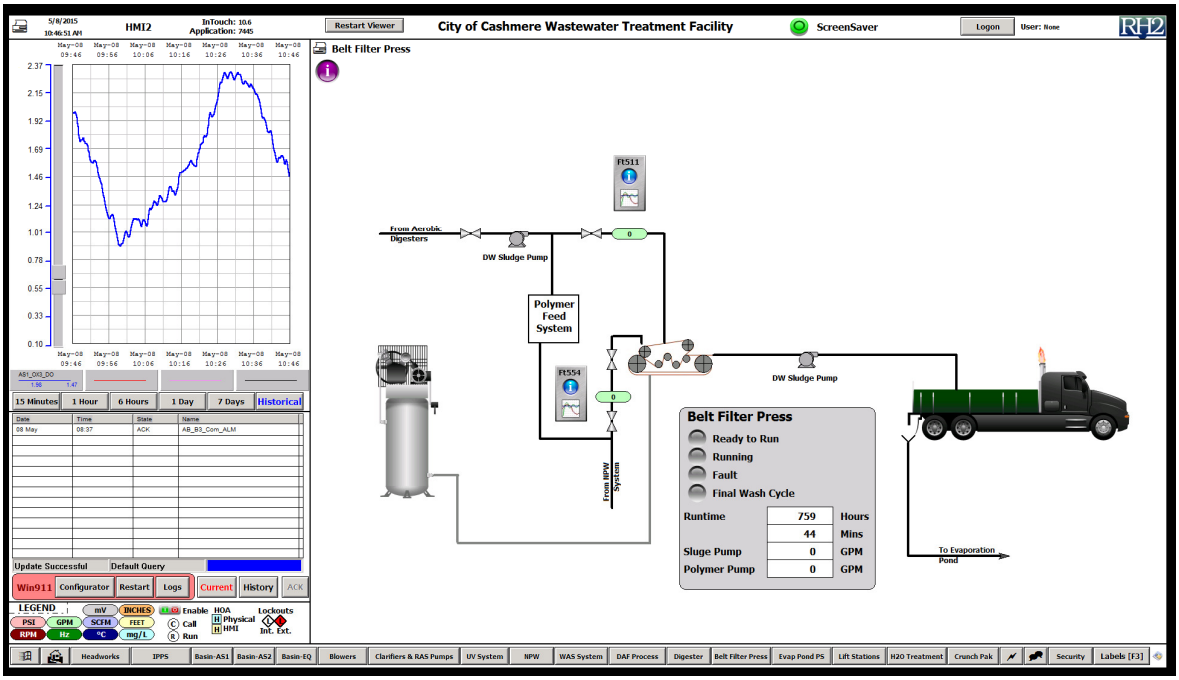
The Belt Filter Control Panel operates the Belt Filter Press, Air Compressor and Cake Solids Pump without receiving any control signals from the plant SCADA system.

Dewatering System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Value or Range**
Dewatered Sludge Transfer Pump	P-510	Unknown	Pumping Rate: 33-44 GPM
Dewatered Sludge Transfer Pump Flow Meter	Ft-511	Flow Meter	Flow: 33-44 GPM
			Totalizer Quantity per pulse:
Belt Filter Press Control Panel	Cp-502	Belt Filter Press Control Panel	Controls the Belt Filter Press, Air Compressor, and Cake Solids Transfer Pump
			The Belt Filter Press normally runs 8 hours per day 2 days per week.
			Throughput (Startup-2014): 4496 gpd
Belt Filter Press	BFP-538,	N/A	Supplied with and controlled by the Belt Filter Press Control Panel
			Normal Operation: Runs 8 hours per day, 2 days per week
			Throughput (Startup-2014): 4496 gpd
Air Compressor	C-539,	N/A	Supplied with and controlled by the Belt Filter Press Control Panel
			Normal Operation: Runs as needed to operate the belt filter press
Cake Solids Transfer Pump	P-542	N/A	Supplied with and controlled by the Belt Filter Press Control Panel
			Capacity: 625 lbs per hour

Belt Filter Press Water Supply Valve Solenoid	XV-541	Solenoid Operated Valve	Size 1 ½”
Belt Filter Press Flow Meter	Ft-554	Flow Meter	Flow: 24-45 GPM Totalizer Quantity Per Pulse:
Belt Filter Press Control Panel	Co-502	System Specific Control Object	See Below

IMAGE 2-27

BELT FILTER DEWATERING HMI OVERVIEW SCREEN



Control of Belt Filter system is located on its control panel touch screen. Additional information regarding the Belt Filter system control is located in its system O&M documentation.

Evaporation Pond System

The Evaporation Pond System consists of the evaporation pond, an overflow manhole, a floating mixer, the evaporation pond pump station, the evaporation pond pump discharge flow meter.

The Evaporation Pond receives filtrate or wash water from the belt filter press as influent. The floating (aspirating) mixer runs continuously. The Evaporation Pond Pump Station consist of a manually operated, 3 HP pump, which pumps from the evaporation pond to the influent structure. A flow meter, which has a range of 14-36 GPM, measures the discharge of the evaporation pond pump. The overflow manhole drains to the In Plant Pump Station.

Evaporation Pond System Equipment Summary			
Equipment	**Tag**	**Equipment Type**	**Note**
Floating (Aspirating) Mixer	M-501	Across the Line Starter	Normal Operation: Runs continuously
			Motor Size: 5 Hp
Evaporation Pond Pump	P-502	Across the Line Starter	Normal Operation: Manually Controlled, or Run at certain times of day based on a timer.
			Motor Size: 3 Hp
Evaporation Pond Pump Discharge Flow Meter	Ft-545	Flow Meter	Flow Range: 14-36 GPM
			Totalizer Quantity Per Pulse:
Evaporation Pond Control	Co-546	System Specific Control Object	See Below

IMAGE 2-28

EVAPORATION POND HMI OVERVIEW SCREEN

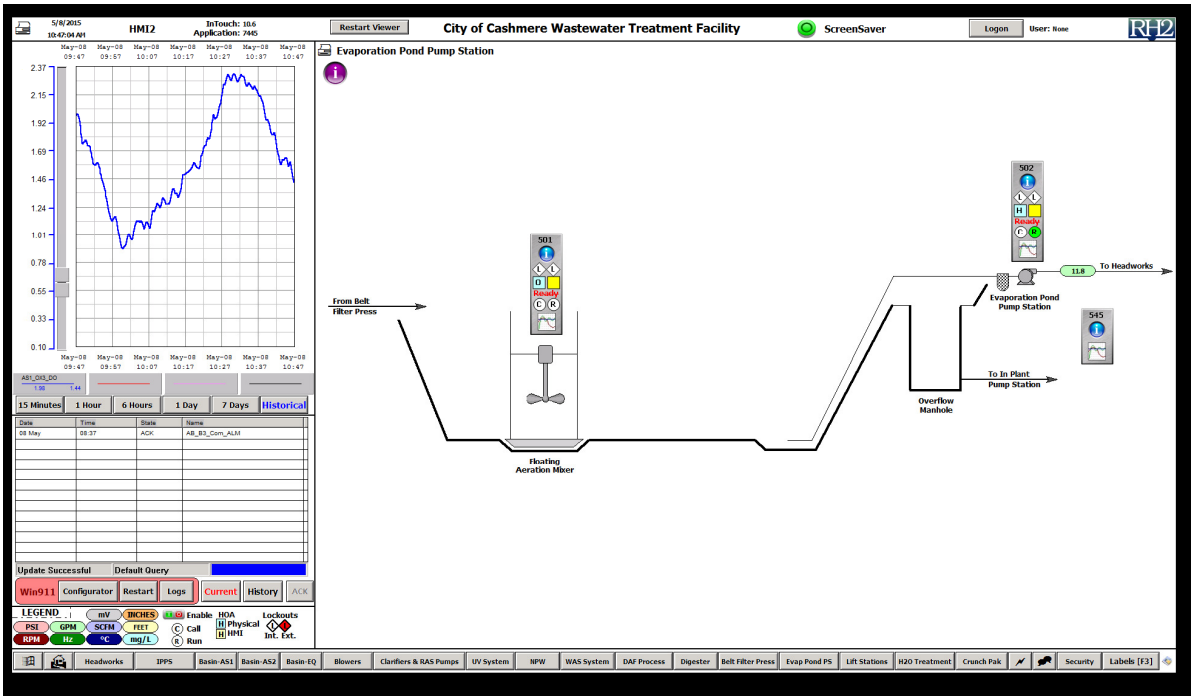
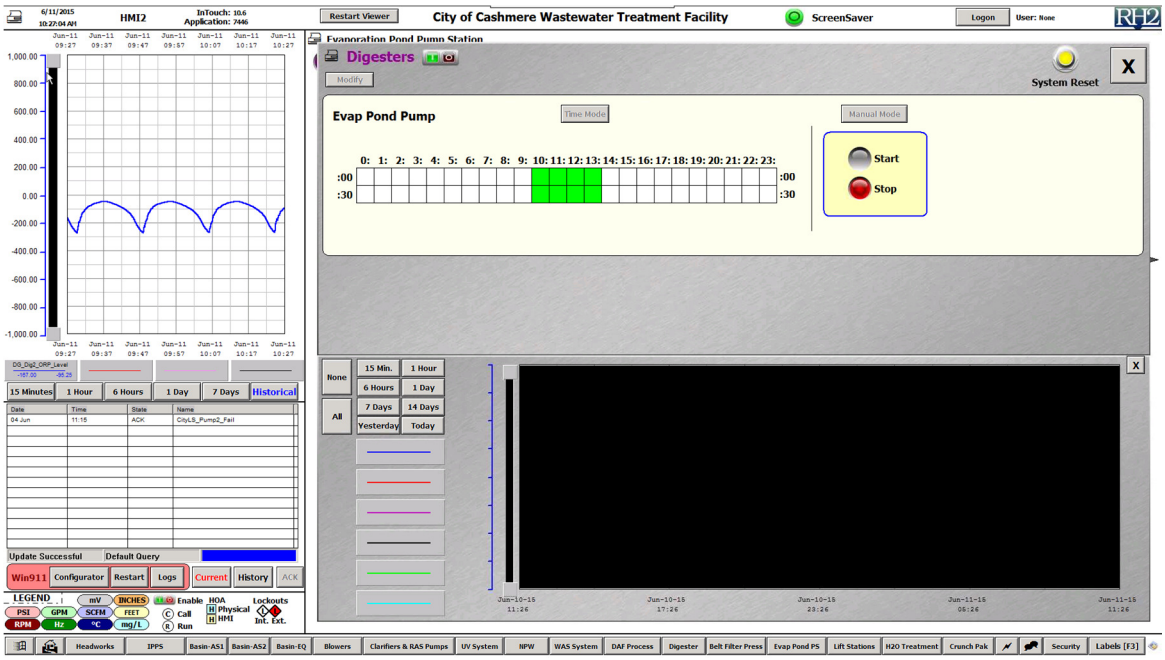


IMAGE 2-29

EVAPORATION POND HMI CONTROL SCREEN



Evaporation Pond Control Object - Setpoints
Evaporation Pond Pump Enable/Disable Selection Control
Evaporation Pond Pump Time/Manual Control Selection
Evaporation Pond Pump Run Selection in Daily 30 Minute Increments
Evaporation Pond Pump Manual Start/Stop Control

Crunch-Pak Wastewater Storage System

The local Crunch-Pak fruit packing factory is currently using two wastewater holding tanks to provide a constant waste flow to the treatment plant. This was necessary to prevent large wastewater loads from causing process issues due to the high nutrient content of the wastewater. The SCADA system is monitoring the holding tank levels and flow values over a high speed network connection between the City and the Crunch Pak control system.

The WWTP operations staff has the ability to control when the holding tanks are releasing wastewater flow and the quantity of flow per minute.

IMAGE 2-30

CRUNCH-PAK HMI OVERVIEW SCREEN

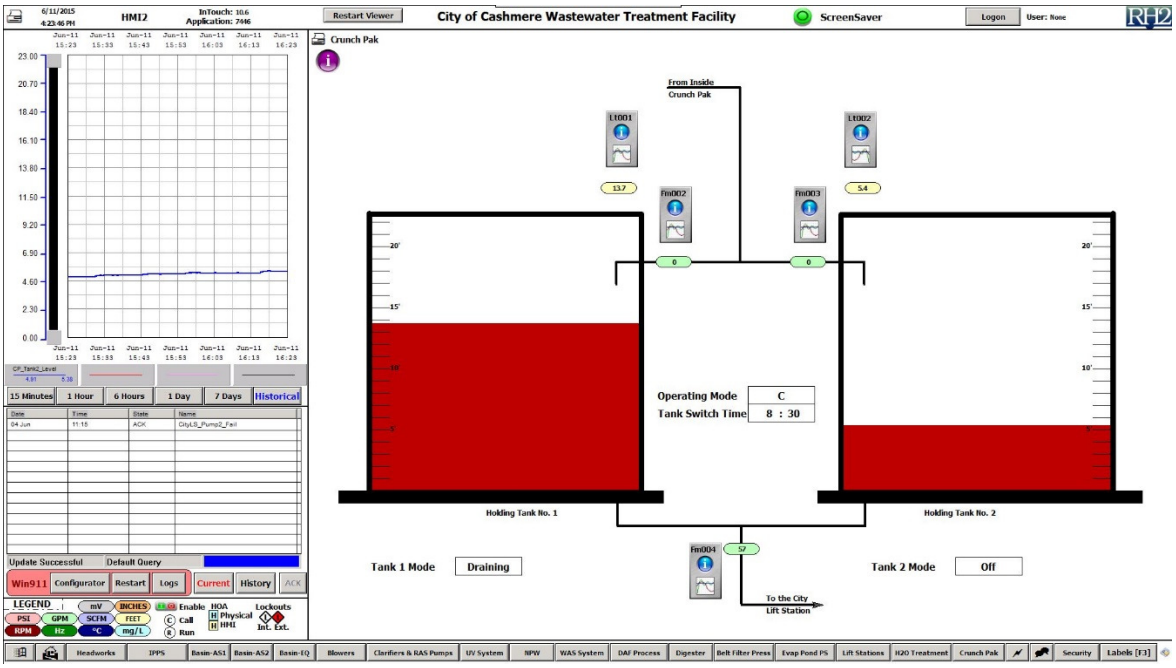
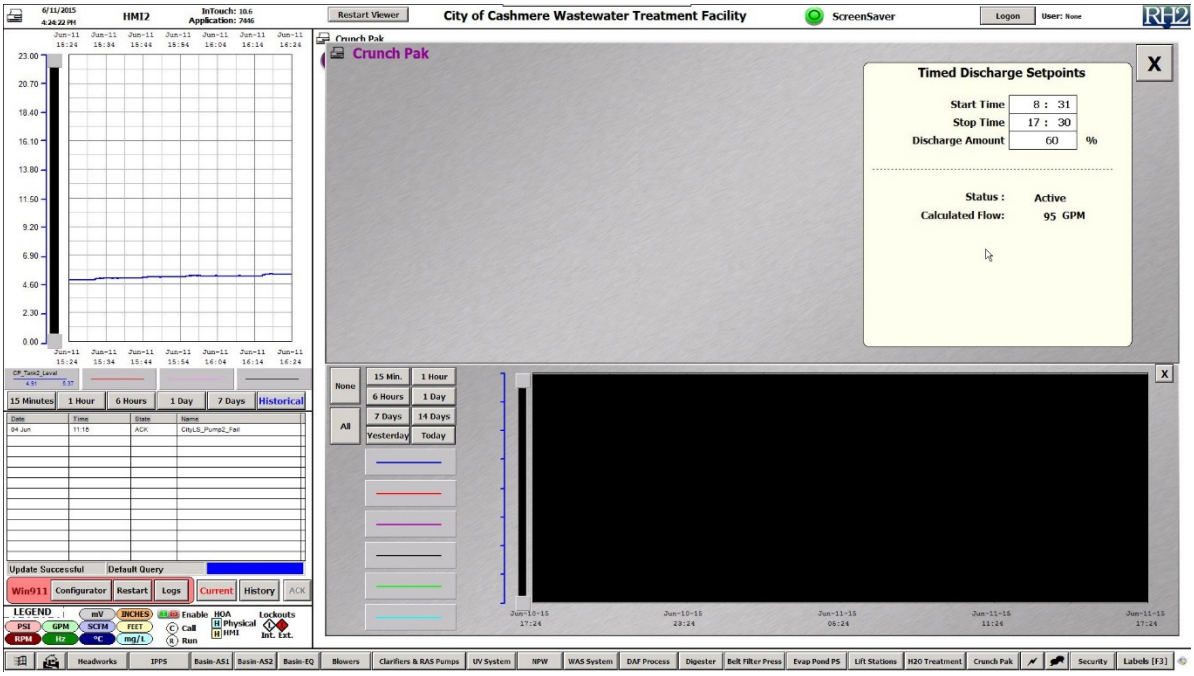


IMAGE 2-31

CRUNCH-PAK HMI CONTROL SCREEN

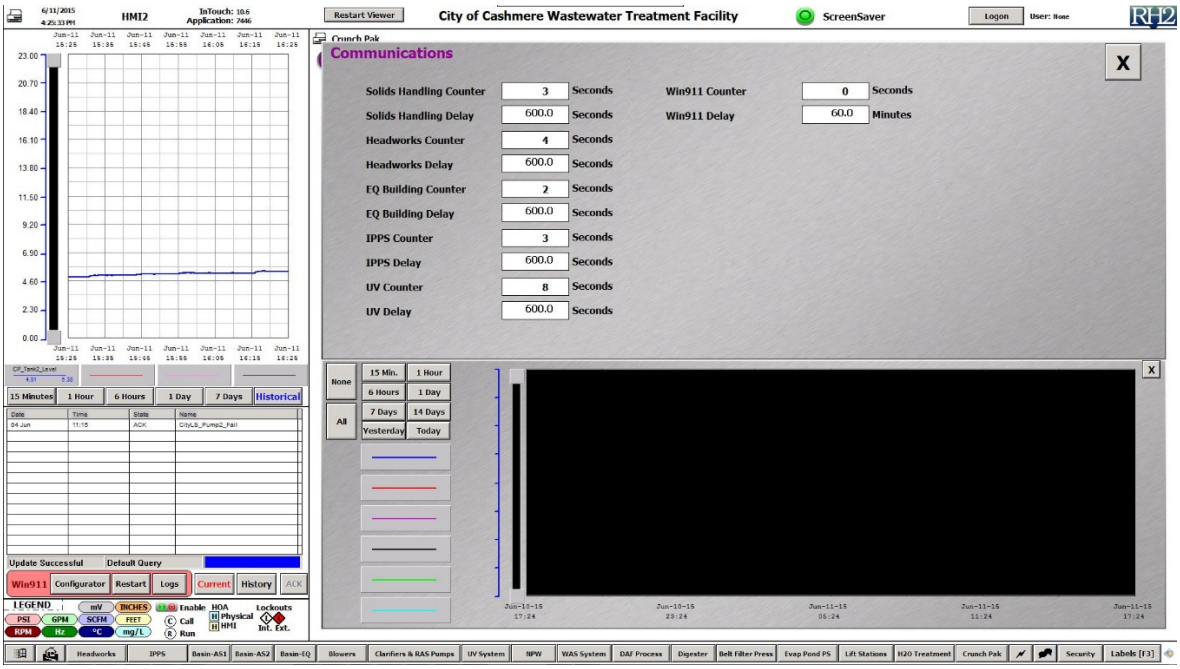


Crunch-Pak Control Object - Setpoints
Crunch-Pak Holding Tank Discharge Start Time
Crunch-Pak Holding Tank Discharge Stop Time
Discharge Quantity in Percentage

PLC Communications

IMAGE 2-32

PLC COMMUNICATIONS HMI OVERVIEW/CONTROL SCREEN



Communications Control Object - Setpoints
Solids Handling PLC Communications Fail Delay
Headworks PLC Communications Fail Delay
EQ PLC Communications Fail Delay
IPPS PLC Communications Fail Delay
Win911 Software Communications Fail Delay

Miscellaneous SCADA System Devices

Each automatic control panel monitors a number of internal and external system device statuses. These include the following:

Control Panel Miscellaneous Internal Alarms
Communications Failure to WWTP Control Panel PLC
Communications Failure Between WWTP Control Panel PLC's
Communications Failure to HMI Computer System
Communications Failure to Motor Control System
DC Power Failure
AC Power Failure
Programmable Logic Controller Failure

Control Panel Miscellaneous External Alarms
Intrusion Alarms to WWTP Facilities and Control Panels
Facility Flood Alarms
Facility Smoke Alarms
DC Power Failure
AC Power Failure
Programmable Logic Controller Failure

3. Alarm and Historian System

Alarm System – Alarm Summary

The WWTP SCADA computer system logs all system alarms and events to a database. The alarms that currently exist are always listed in the Alarm Summary screen. The HMI system has two summary screen displays. A small alarm summary screen is usually always displayed in the lower left corner of the screen. A larger version is displayed when an operator presses the red "Current" button under this summary screen.

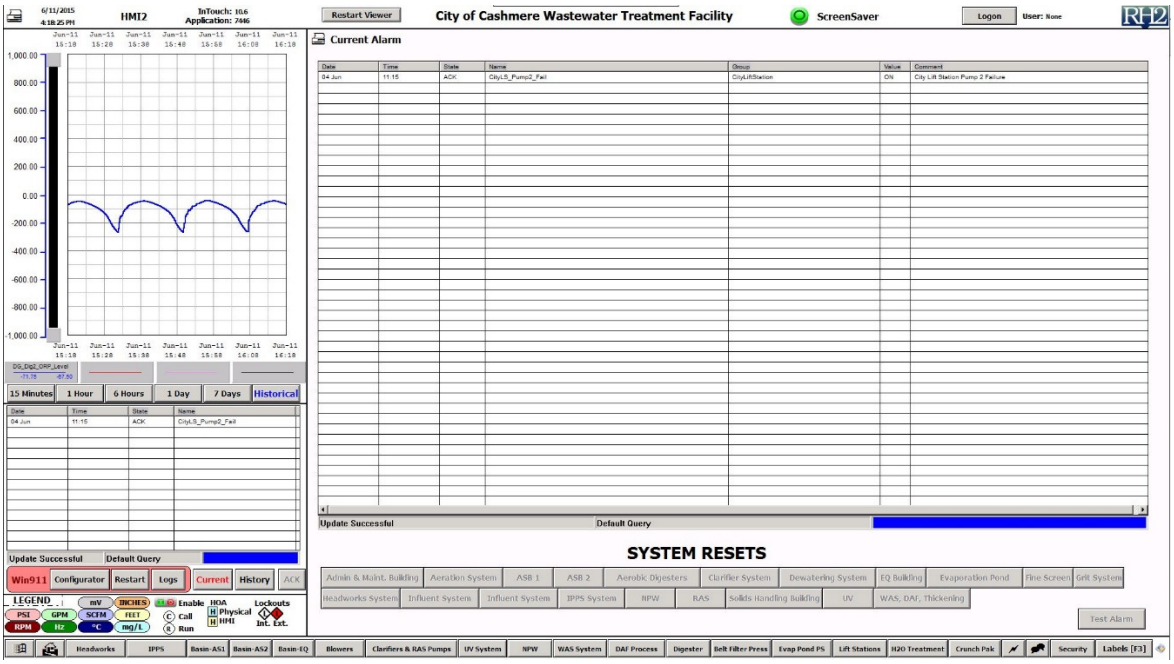
The Alarm summary screen only displays existing alarm conditions or alarms that are latched. A latched alarm is one that was triggered and has latched itself to an "on" state until an operator resets the alarm. An unlatched alarm is one that will reset itself when the alarm condition is clear. A power failure would be considered an unlatched alarm. A pump Call No Run alarm, however, would be considered a latched alarm. This type of alarm requires a manual alarm reset from the HMI computer system. An operator must be logged into the system to reset alarms. Alarm resets can be implemented from a number of locations.

Device Alarm Reset – A device alarm reset is when an operator only wants to reset one device at a time. This type of alarm is reset from the device pop-up property screen. As an example, all pumps systems have alarm resets on their property screens.
Subsystem Alarm Reset – If more than one alarms has occurred in a subsystem, they can be simultaneously reset using the **System Reset** alarm buttons on the bottom of the Alarm Summary screen.

The Alarm Summary screen also has a **Test Alarm** button located on the alarm summary screen. This is a toggle type button that allows the facility operators to test their alarm notification system without causing a real alarm to be triggered. Pressing this button once triggers the alarm. Pressing it again clears the alarm.

IMAGE 3-1

ALARM SUMMARY HMI SCREEN



Alarm System – Alarm/Event History

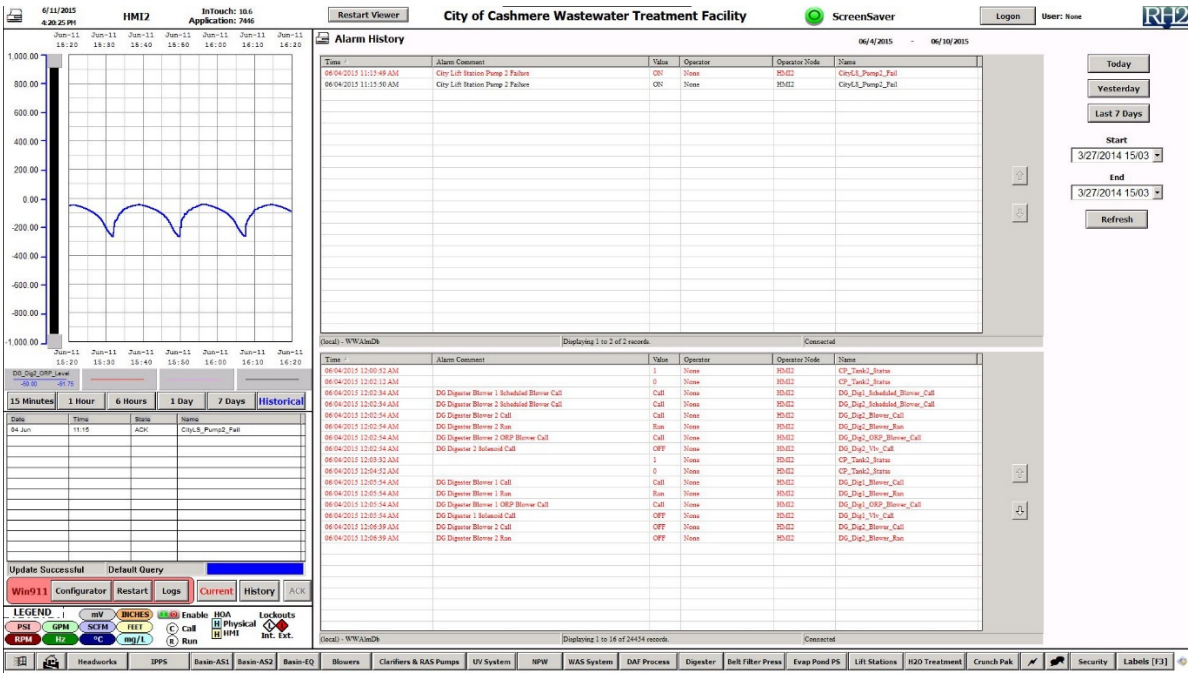
To view alarms and events that have occurred in the past, the HMI system has an Alarm/Event History screen. This screen is displayed when pressing the "History" button under the small Alarm Summary list on the lower left of the HMI screen. The Alarm/Event History screen allows staff to view all of the alarms and events that occurred between two specified time frames. There are four different methods for selecting a time frame to view.

1. **Today** – Displays all of the alarms and events since midnight last night.
2. **Yesterday** – Displays all of the alarms and events that occurred yesterday.
3. **Last 7 Days** – Displays all of the alarms and events that occurred in the last 7 days.
4. **Custom Time** - Displays all of the alarms and events that occurred between a start and end date and time.

Alarms are displays on the top grid and show when an alarm was triggered, when it cleared, when/if it was acknowledged and who acknowledged it. Events are located in the bottom grid and display event information such as pump calls, pump runs or valve closures. This information is time stamped so that staff understand when events occurred and in what order.

IMAGE 3-2

ALARM HISTORY HMI SCREEN



Historian System

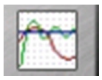
The WWTP HMI system will also log critical system tags to a real time database. This database will be able to display historical system values with a resolution of about one second with years of stored data available. Because historical trending is so critical to the operations of a WWTP, the HMI screens have been designed so that operators can display trending very easily. This historical trending information can be displayed on three separate HMI screens.

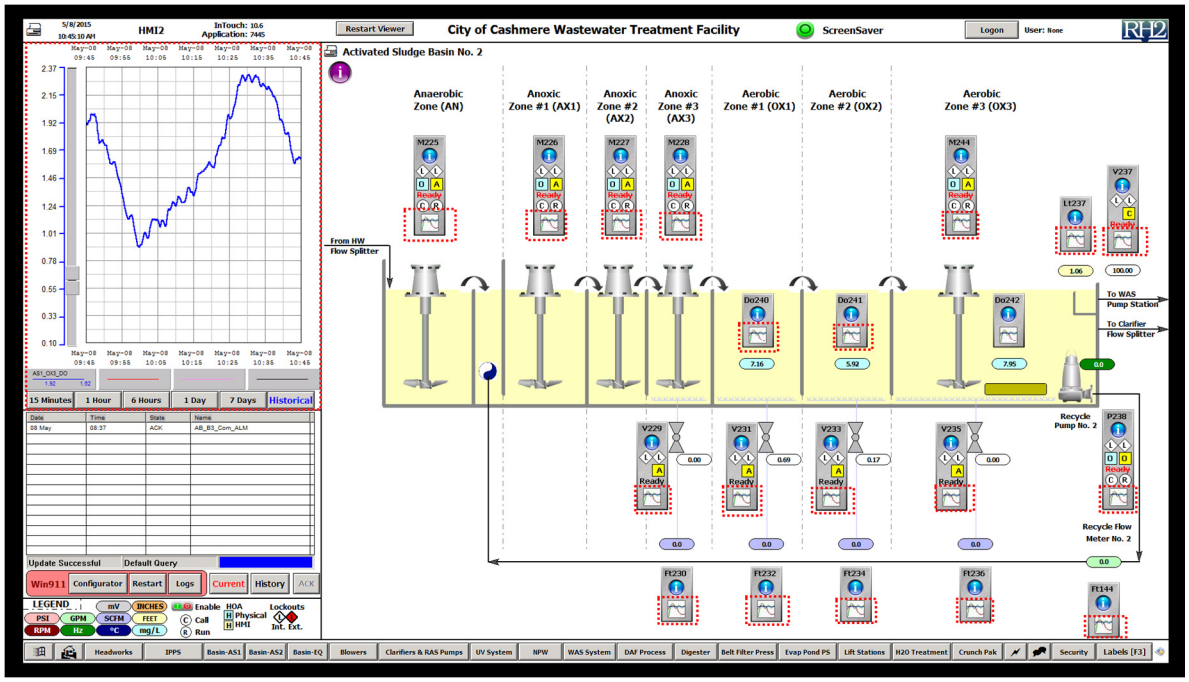
1. Upper Left Device Historian
2. Pop-Up Historian
3. Full Screen Historian

The Upper Left Device historian is displayed in the upper left side of most of the HMI screens. Almost every overview screen has historical data has a small trend icon located on its display. Selecting these trend icons will display the data associated with it on the upper left historical trend for the last 24 hours on this trend screen. This may be one or more analog values depending on the complexity of the trend icon. In the example on Image 3-3, the trend will display only one analog value. On other screens, more complex trend icons will display multiple analog values that are related to each other such as DO and blower pressure. Timeframe buttons on the bottom of this small trend screen allow operators to change the time frame from anywhere between 15 minutes to 7 days.

IMAGE 3-3

UPPER LEFT HISTORIAN HMI SCREEN

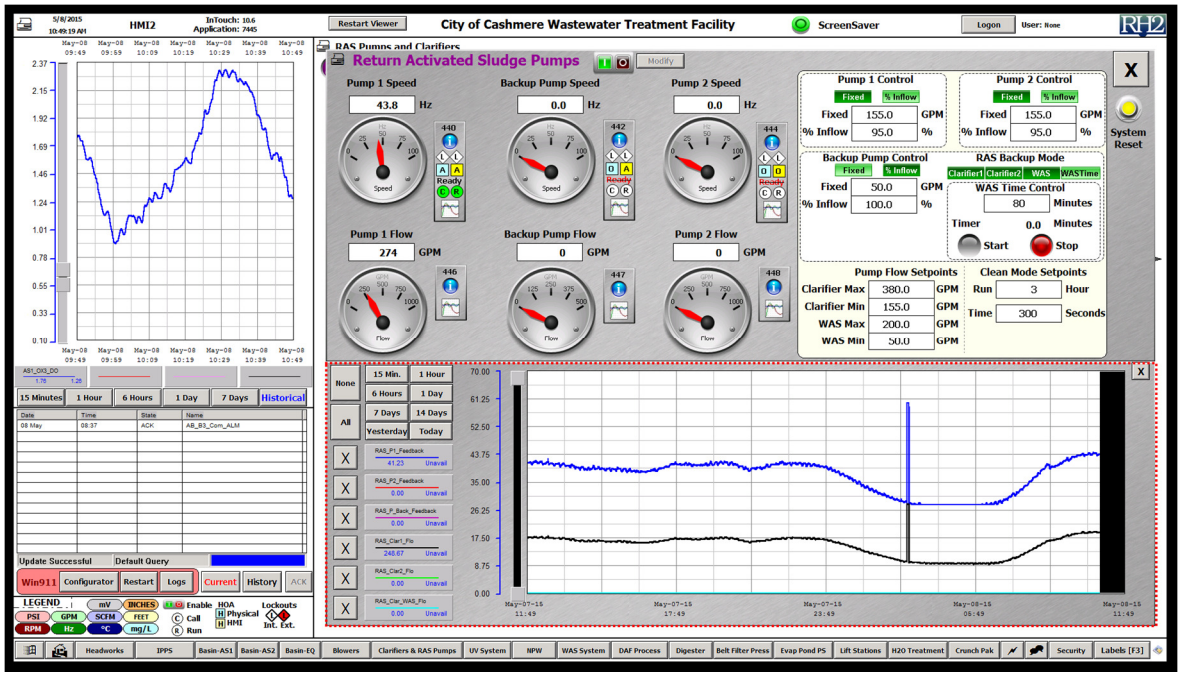




The Pop-Up Historian is always displayed with device or control system pop-up screens. It is located at the bottom of the pop-up screen and is designed to give the operators the last 24 hours of historical data when first displayed. This information can be changed with the time selection buttons on the left side of the historical trending screen. In addition, when multiple values are trended, the trend values can be turned on and off with the selector buttons on the lower left side of trending graph. This allows users to isolate specific trends values.

IMAGE 3-4

POP-UP HISTORIAN HMI SCREEN



The Full Screen Historian is displayed by selecting the “History” button on the bottom of the lower left screen historian. This is considered the full historian will all of the options for viewing and exporting historical trend data. The screen is broken into 5 sections.

1. Trending Graph
2. Tag Selector
3. Time Frame Selector
4. Reports
5. Data Export

Trending Graph – The trending graph is similar to the previous two historian displays except that a control bar across the lower left of the graph allows for more control of viewing the data. This control bar allows for zooming in/out of data or viewing data at different times.

Tag Selector – The tag selector is located in the upper right part of the screen next to the trending graph. This section toggles the display of data tags on the trending graph. This is used to reduce the clutter of the trending graph when only a one or two data trends need to be viewed.

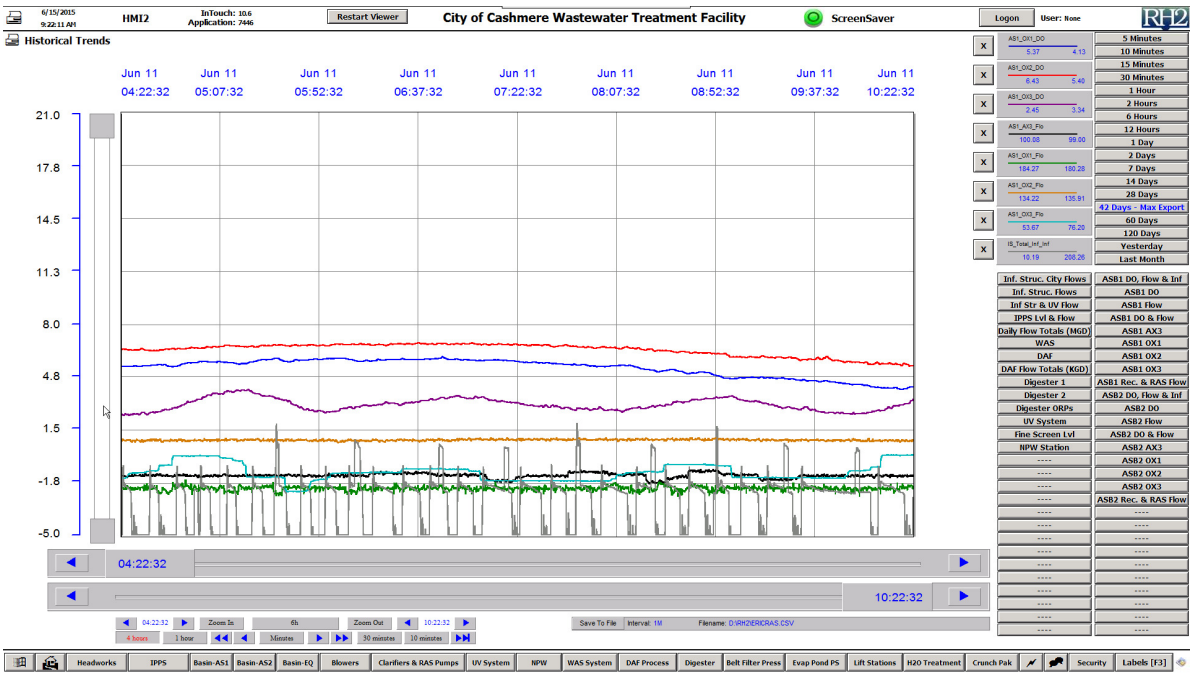
Time Frame Selector – Timeframe buttons on the far upper right side of this screen allow operators to change the time frame from anywhere between 5 minutes to the last month.

Reports – There are a number of pre-programmed reports on the historical trending screen that allows the operators to quickly view system data. These are currently broken out into system flows, aeration data, levels and flow totals. These reports were added based on feedback from the operations staff during facility startup.

Data Export – There is a data export option located below the trending graph on the right side. This allows the users to export data to a .CSV text file from the data currently displayed on the trending graph. These types of files can be easily opened in programs such as Excel for more advanced analysis.

IMAGE 3-4

FULL SCREEN HISTORIAN HMI SCREEN



Appendix A – WWTP Alarm List

The following list contains all of the facility alarms that are displayed in the HMI Alarm system.

Alarm Tagnames	Alarm Descriptions
AB_B1_CNR_ALM	AB B1 Pump Call No Run Alarm
AB_B1_Com_ALM	AB B1 Pump Com Fail
AB_B1_Disch_Overtemp_ALM	AB B1 Pump Discharge Overtemperature
AB_B1_Max_Starts_ALM	AB B1 Pump Maximum Starts Fail
AB_B1_Motor_ALM	AB B1 Pump Motor Fail
AB_B1_Overtemp_ALM	AB B1 Pump Overtemp Alarm
AB_B1_Phase_ALM	AB B1 Pump Phase Fail
AB_B1_RNC_ALM	AB B1 Pump Run No Call Alarm
AB_B1_Seal_ALM	AB B1 Pump Seal Fail
AB_B1_Torque_Hi_ALM	AB B1 Pump Torque High
AB_B1_Torque_HiHi_ALM	AB B1 Pump Torque High High
AB_B1_VFD_ALM	AB B1 Pump VFD Fail
AB_B2_CNR_ALM	AB B2 Pump Call No Run Alarm
AB_B2_Com_ALM	AB B2 Pump Com Fail
AB_B2_Disch_Overtemp_ALM	AB B2 Pump Discharge Overtemperature
AB_B2_Max_Starts_ALM	AB B2 Pump Maximum Starts Fail
AB_B2_Motor_ALM	AB B2 Pump Motor Fail
AB_B2_Overtemp_ALM	AB B2 Pump Overtemp Alarm
AB_B2_Phase_ALM	AB B2 Pump Phase Fail
AB_B2_RNC_ALM	AB B2 Pump Run No Call Alarm
AB_B2_Seal_ALM	AB B2 Pump Seal Fail
AB_B2_Torque_Hi_ALM	AB B2 Pump Torque High
AB_B2_Torque_HiHi_ALM	AB B2 Pump Torque High High
AB_B2_VFD_ALM	AB B2 Pump VFD Fail
AB_B3_CNR_ALM	AB B3 Pump Call No Run Alarm
AB_B3_Com_ALM	AB B3 Pump Com Fail
AB_B3_Disch_Overtemp_ALM	AB B3 Pump Discharge Overtemperature
AB_B3_Max_Starts_ALM	AB B3 Pump Maximum Starts Fail
AB_B3_Motor_ALM	AB B3 Pump Motor Fail
AB_B3_Overtemp_ALM	AB B3 Pump Overtemp Alarm
AB_B3_Phase_ALM	AB B3 Pump Phase Fail
AB_B3_RNC_ALM	AB B3 Pump Run No Call Alarm
AB_B3_Seal_ALM	AB B3 Pump Seal Fail
AB_B3_Torque_Hi_ALM	AB B3 Pump Torque High
AB_B3_Torque_HiHi_ALM	AB B3 Pump Torque High High
AB_B3_VFD_ALM	AB B3 Pump VFD Fail

Alarm Tagnames	Alarm Descriptions
AB_B4_CNR_ALM	AB B3 Pump Call No Run Alarm
AB_B4_Com_ALM	AB B3 Pump Com Fail
AB_B4_Disch_Overtemp_ALM	AB B3 Pump Discharge Overtemperature
AB_B4_Max_Starts_ALM	AB B3 Pump Maximum Starts Fail
AB_B4_Motor_ALM	AB B3 Pump Motor Fail
AB_B4_Overtemp_ALM	AB B3 Pump Overtemp Alarm
AB_B4_Phase_ALM	AB B3 Pump Phase Fail
AB_B4_RNC_ALM	AB B3 Pump Run No Call Alarm
AB_B4_Seal_ALM	AB B3 Pump Seal Fail
AB_B4_Torque_Hi_ALM	AB B3 Pump Torque High
AB_B4_Torque_HiHi_ALM	AB B3 Pump Torque High High
AB_B4_VFD_ALM	AB B3 Pump VFD Fail
AB_Dis_Press_Hi_ALM	AB Discharge Pressure High Alarm
AB_Dis_Press_HiHi_ALM	AB Discharge Pressure High High Alarm
AB_Dis_Press_Instrument_ALM	AB Discharge Pressure Instrument Fail
AB_Dis_Press_Lo_ALM	AB Discharge Pressure Low Alarm
AB_Dis_Press_LoLo_ALM	AB Discharge Pressure Low Low Alarm
AB_Dis_Vlv_ALM	AB Discharge Pressure Actuator Alarm
AB_Dis_Vlv_Sensor_ALM	AB Discharge Pressure Actuator Instrument Fail
ADMIN_AC_Power_ALM	Control Panel 100 AC Power Fail
ADMIN_DC_Power_ALM	Control Panel 100 DC Power Fail
AS1_AN_Mix_CNR_ALM	AS1 AN Mixer Call No Run Alarm
AS1_AN_Mix_Com_ALM	AS1 AN Mixer Com Fail
AS1_AN_Mix_Max_Starts_ALM	AS1 AN Mixer Maximum Starts Fail
AS1_AN_Mix_Motor_ALM	AS1 AN Mixer Motor Fail
AS1_AN_Mix_Overtemp_ALM	AS1 AN Mixer Overtemp Alarm
AS1_AN_Mix_Phase_ALM	AS1 AN Mixer Phase Fail
AS1_AN_Mix_RNC_ALM	AS1 AN Mixer Run No Call Alarm
AS1_AX1_Mix_CNR_ALM	AS1 AX1 Mixer Call No Run Alarm
AS1_AX1_Mix_Com_ALM	AS1 AX1 Mixer Com Fail
AS1_AX1_Mix_Max_Starts_ALM	AS1 AX1 Mixer Maximum Starts Fail
AS1_AX1_Mix_Motor_ALM	AS1 AX1 Mixer Motor Fail
AS1_AX1_Mix_Overtemp_ALM	AS1 AX1 Mixer Overtemp Alarm
AS1_AX1_Mix_Phase_ALM	AS1 AX1 Mixer Phase Fail
AS1_AX1_Mix_RNC_ALM	AS1 AX1 Mixer Run No Call Alarm
AS1_AX2_Mix_CNR_ALM	AS1 AX2 Mixer Call No Run Alarm
AS1_AX2_Mix_Com_ALM	AS1 AX2 Mixer Com Fail
AS1_AX2_Mix_Max_Starts_ALM	AS1 AX2 Mixer Maximum Starts Fail
AS1_AX2_Mix_Motor_ALM	AS1 AX2 Mixer Motor Fail
AS1_AX2_Mix_Overtemp_ALM	AS1 AX2 Mixer Overtemp Alarm

Alarm Tagnames	Alarm Descriptions
AS1_AX2_Mix_Phase_ALM	AS1 AX2 Mixer Phase Fail
AS1_AX2_Mix_RNC_ALM	AS1 AX2 Mixer Run No Call Alarm
AS1_AX3_Flo	AS1 Basin 1 AX3 Flow
AS1_AX3_Flo_Hi_ALM	AS1 AX3 Flow High Alarm
AS1_AX3_Flo_HiHi_ALM	AS1 AX3 Flow High High Alarm
AS1_AX3_Flo_Lo_ALM	AS1 AX3 Flow Low Alarm
AS1_AX3_Flo_LoLo_ALM	AS1 AX3 Flow Low Low Alarm
AS1_AX3_Flo_Sensor_ALM	AS1 AX3 Flow Instrument Fail
AS1_AX3_Mix_CNR_ALM	AS1 AX3 Mixer Call No Run Alarm
AS1_AX3_Mix_Com_ALM	AS1 AX3 Mixer Com Fail
AS1_AX3_Mix_Max_Starts_ALM	AS1 AX3 Mixer Maximum Starts Fail
AS1_AX3_Mix_Motor_ALM	AS1 AX3 Mixer Motor Fail
AS1_AX3_Mix_Overtemp_ALM	AS1 AX3 Mixer Overtemp Alarm
AS1_AX3_Mix_Phase_ALM	AS1 AX3 Mixer Phase Fail
AS1_AX3_Mix_RNC_ALM	AS1 AX3 Mixer Run No Call Alarm
AS1_AX3_Vlv_ALM	AS1 AX3 Flow Actuator Alarm
AS1_AX3_Vlv_Sensor_ALM	AS1 AX3 Flow Actuator Instrument Fail
AS1_OX1_DO	AS1 OX1 DO
AS1_OX1_DO_Hi_ALM	AS1 OX1 DO High Alarm
AS1_OX1_DO_HiHi_ALM	AS1 OX1 DO High High Alarm
AS1_OX1_DO_Lo_ALM	AS1 OX1 DO Low Alarm
AS1_OX1_DO_LoLo_ALM	AS1 OX1 DO Low Low Alarm
AS1_OX1_DO_Sensor_ALM	AS1 OX1 DO Instrument Fail
AS1_OX1_Flo	AS1 OX1 Flow
AS1_OX1_Flo_Hi_ALM	AS1 OX1 Flow High Alarm
AS1_OX1_Flo_HiHi_ALM	AS1 OX1 Flow High High Alarm
AS1_OX1_Flo_Lo_ALM	AS1 OX1 Flow Low Alarm
AS1_OX1_Flo_LoLo_ALM	AS1 OX1 Flow Low Low Alarm
AS1_OX1_Flo_Sensor_ALM	AS1 OX1 Flow Instrument Fail
AS1_OX1_Vlv_ALM	AS1 OX1 Flow Actuator Alarm
AS1_OX1_Vlv_Sensor_ALM	AS1 OX1 Flow Actuator Instrument Fail
AS1_OX2_DO	AS1 OX2 DO
AS1_OX2_DO_Hi_ALM	AS1 OX2 DO High Alarm
AS1_OX2_DO_HiHi_ALM	AS1 OX2 DO High High Alarm
AS1_OX2_DO_Lo_ALM	AS1 OX2 DO Low Alarm
AS1_OX2_DO_LoLo_ALM	AS1 OX2 DO Low Low Alarm
AS1_OX2_DO_Sensor_ALM	AS1 OX2 DO Instrument Fail
AS1_OX2_Flo	AS1 OX2 Flow
AS1_OX2_Flo_Hi_ALM	AS1 OX2 Flow High Alarm
AS1_OX2_Flo_HiHi_ALM	AS1 OX2 Flow High High Alarm

Alarm Tagnames	Alarm Descriptions
AS1_OX2_Flo_Lo_ALM	AS1 OX2 Flow Low Alarm
AS1_OX2_Flo_LoLo_ALM	AS1 OX2 Flow Low Low Alarm
AS1_OX2_Flo_Sensor_ALM	AS1 OX2 Flow Instrument Fail
AS1_OX2_Vlv_ALM	AS1 OX2 Flow Actuator Alarm
AS1_OX2_Vlv_Sensor_ALM	AS1 OX2 Flow Actuator Instrument Fail
AS1_OX3_DO	AS1 OX3 DO
AS1_OX3_DO_Hi_ALM	AS1 OX3 DO High Alarm
AS1_OX3_DO_HiHi_ALM	AS1 OX3 DO High High Alarm
AS1_OX3_DO_Lo_ALM	AS1 OX3 DO Low Alarm
AS1_OX3_DO_LoLo_ALM	AS1 OX3 DO Low Low Alarm
AS1_OX3_DO_Sensor_ALM	AS1 OX3 DO Instrument Fail
AS1_OX3_Flo	AS1 OX3 Flow
AS1_OX3_Flo_Hi_ALM	AS1 OX3 Flow High Alarm
AS1_OX3_Flo_HiHi_ALM	AS1 OX3 Flow High High Alarm
AS1_OX3_Flo_Lo_ALM	AS1 OX3 Flow Low Alarm
AS1_OX3_Flo_LoLo_ALM	AS1 OX3 Flow Low Low Alarm
AS1_OX3_Flo_Sensor_ALM	AS1 OX3 Flow Instrument Fail
AS1_OX3_Mix_CNR_ALM	AS1 OX3 Mixer Call No Run Alarm
AS1_OX3_Mix_Com_ALM	AS1 OX3 Mixer Com Fail
AS1_OX3_Mix_Max_Starts_ALM	AS1 OX3 Mixer Maximum Starts Fail
AS1_OX3_Mix_Motor_ALM	AS1 OX3 Mixer Motor Fail
AS1_OX3_Mix_Overtemp_ALM	AS1 OX3 Mixer Overtemp Alarm
AS1_OX3_Mix_Phase_ALM	AS1 OX3 Mixer Phase Fail
AS1_OX3_Mix_RNC_ALM	AS1 OX3 Mixer Run No Call Alarm
AS1_OX3_Vlv_ALM	AS1 OX3 Flow Actuator Alarm
AS1_OX3_Vlv_Sensor_ALM	AS1 OX3 Flow Actuator Instrument Fail
AS1_Recycle_CNR_ALM	AS1 Recycle Pump Call No Run Alarm
AS1_Recycle_Com_ALM	AS1 Recycle Pump Com Fail
AS1_Recycle_Disch_Overtemp_ALM	AS1 Recycle Pump Discharge Overtemperature
AS1_Recycle_Flo_Hi_ALM	AS1 Recycle Flow High Alarm
AS1_Recycle_Flo_Lo_ALM	AS1 Recycle Flow Low Alarm
AS1_Recycle_Flo_Sensor_ALM	AS1 Recycle Flow Instrument Fail
AS1_Recycle_Max_Starts_ALM	AS1 Recycle Pump Maximum Starts Fail
AS1_Recycle_Motor_ALM	AS1 Recycle Pump Motor Fail
AS1_Recycle_Overtemp_ALM	AS1 Recycle Pump Overtemp Alarm
AS1_Recycle_Phase_ALM	AS1 Recycle Pump Phase Fail
AS1_Recycle_RNC_ALM	AS1 Recycle Pump Run No Call Alarm
AS1_Recycle_Seal_ALM	AS1 Recycle Pump Seal Fail
AS1_Recycle_Torque_Hi_ALM	AS1 Recycle Pump Torque High
AS1_Recycle_Torque_HiHi_ALM	AS1 Recycle Pump Torque High High

Alarm Tagnames	Alarm Descriptions
AS1_Recycle_VFD_ALM	AS1 Recycle Pump VFD Fail
AS1_WAS_Inlet_Lvl_Hi_ALM	AS1 WAS Inlet Basin Level High Alarm
AS1_WAS_Inlet_Lvl_HiHi_ALM	AS1 WAS Inlet Basin Level High HIgh Alarm
AS1_WAS_Inlet_Lvl_Lo_ALM	AS1 WAS Inlet Basin Level Low Alarm
AS1_WAS_Inlet_Lvl_LoLo_ALM	AS1 WAS Inlet Basin Level Low Low Alarm
AS1_WAS_Inlet_Lvl_Sensor_ALM	AS1 WAS Inlet Basin Level Instrument Fail
AS1_Waste_Vlv_ALM	AS1 Waste Actuator Alarm
AS1_Waste_Vlv_Sensor_ALM	AS1 Waste Actuator Instrument Fail
AS2_AN_Mix_CNR_ALM	AS2 AN Mixer Call No Run Alarm
AS2_AN_Mix_Com_ALM	AS2 AN Mixer Com Fail
AS2_AN_Mix_Max_Starts_ALM	AS2 AN Mixer Maximum Starts Fail
AS2_AN_Mix_Motor_ALM	AS2 AN Mixer Motor Fail
AS2_AN_Mix_Overtemp_ALM	AS2 AN Mixer Overtemp Alarm
AS2_AN_Mix_Phase_ALM	AS2 AN Mixer Phase Fail
AS2_AN_Mix_RNC_ALM	AS2 AN Mixer Run No Call Alarm
AS2_AX1_Mix_CNR_ALM	AS2 AX1 Mixer Call No Run Alarm
AS2_AX1_Mix_Com_ALM	AS2 AX1 Mixer Com Fail
AS2_AX1_Mix_Max_Starts_ALM	AS2 AX1 Mixer Maximum Starts Fail
AS2_AX1_Mix_Motor_ALM	AS2 AX1 Mixer Motor Fail
AS2_AX1_Mix_Overtemp_ALM	AS2 AX1 Mixer Overtemp Alarm
AS2_AX1_Mix_Phase_ALM	AS2 AX1 Mixer Phase Fail
AS2_AX1_Mix_RNC_ALM	AS2 AX1 Mixer Run No Call Alarm
AS2_AX2_Mix_CNR_ALM	AS2 AX2 Mixer Call No Run Alarm
AS2_AX2_Mix_Com_ALM	AS2 AX2 Mixer Com Fail
AS2_AX2_Mix_Max_Starts_ALM	AS2 AX2 Mixer Maximum Starts Fail
AS2_AX2_Mix_Motor_ALM	AS2 AX2 Mixer Motor Fail
AS2_AX2_Mix_Overtemp_ALM	AS2 AX2 Mixer Overtemp Alarm
AS2_AX2_Mix_Phase_ALM	AS2 AX2 Mixer Phase Fail
AS2_AX2_Mix_RNC_ALM	AS2 AX2 Mixer Run No Call Alarm
AS2_AX3_Flo	AS2 Basin 1 AX3 Flow
AS2_AX3_Flo_Hi_ALM	AS2 AX3 Flow High Alarm
AS2_AX3_Flo_HiHi_ALM	AS2 AX3 Flow High High Alarm
AS2_AX3_Flo_Lo_ALM	AS2 AX3 Flow Low Alarm
AS2_AX3_Flo_LoLo_ALM	AS2 AX3 Flow Low Low Alarm
AS2_AX3_Flo_Sensor_ALM	AS2 AX3 Flow Instrument Fail
AS2_AX3_Mix_CNR_ALM	AS2 AX3 Mixer Call No Run Alarm
AS2_AX3_Mix_Com_ALM	AS2 AX3 Mixer Com Fail
AS2_AX3_Mix_Max_Starts_ALM	AS2 AX3 Mixer Maximum Starts Fail
AS2_AX3_Mix_Motor_ALM	AS2 AX3 Mixer Motor Fail
AS2_AX3_Mix_Overtemp_ALM	AS2 AX3 Mixer Overtemp Alarm

Alarm Tagnames	Alarm Descriptions
AS2_AX3_Mix_Phase_ALM	AS2 AX3 Mixer Phase Fail
AS2_AX3_Mix_RNC_ALM	AS2 AX3 Mixer Run No Call Alarm
AS2_AX3_Vlv_ALM	AS2 AX3 Flow Actuator Alarm
AS2_AX3_Vlv_Sensor_ALM	AS2 AX3 Flow Actuator Instrument Fail
AS2_OX1_DO	AS2 OX1 DO
AS2_OX1_DO_Hi_ALM	AS2 OX1 DO High Alarm
AS2_OX1_DO_HiHi_ALM	AS2 OX1 DO High High Alarm
AS2_OX1_DO_Lo_ALM	AS2 OX1 DO Low Alarm
AS2_OX1_DO_LoLo_ALM	AS2 OX1 DO Low Low Alarm
AS2_OX1_DO_Sensor_ALM	AS2 OX1 DO Instrument Fail
AS2_OX1_Flo	AS2 OX1 Flow
AS2_OX1_Flo_Hi_ALM	AS2 OX1 Flow High Alarm
AS2_OX1_Flo_HiHi_ALM	AS2 OX1 Flow High High Alarm
AS2_OX1_Flo_Lo_ALM	AS2 OX1 Flow Low Alarm
AS2_OX1_Flo_LoLo_ALM	AS2 OX1 Flow Low Low Alarm
AS2_OX1_Flo_Sensor_ALM	AS2 OX1 Flow Instrument Fail
AS2_OX1_Vlv_ALM	AS2 OX1 Flow Actuator Alarm
AS2_OX1_Vlv_Sensor_ALM	AS2 OX1 Flow Actuator Instrument Fail
AS2_OX2_DO	AS2 OX2 DO
AS2_OX2_DO_Hi_ALM	AS2 OX2 DO High Alarm
AS2_OX2_DO_HiHi_ALM	AS2 OX2 DO High High Alarm
AS2_OX2_DO_Lo_ALM	AS2 OX2 DO Low Alarm
AS2_OX2_DO_LoLo_ALM	AS2 OX2 DO Low Low Alarm
AS2_OX2_DO_Sensor_ALM	AS2 OX2 DO Instrument Fail
AS2_OX2_Flo	AS2 OX2 Flow
AS2_OX2_Flo_Hi_ALM	AS2 OX2 Flow High Alarm
AS2_OX2_Flo_HiHi_ALM	AS2 OX2 Flow High High Alarm
AS2_OX2_Flo_Lo_ALM	AS2 OX2 Flow Low Alarm
AS2_OX2_Flo_LoLo_ALM	AS2 OX2 Flow Low Low Alarm
AS2_OX2_Flo_Sensor_ALM	AS2 OX2 Flow Instrument Fail
AS2_OX2_Vlv_ALM	AS2 OX2 Flow Actuator Alarm
AS2_OX2_Vlv_Sensor_ALM	AS2 OX2 Flow Actuator Instrument Fail
AS2_OX3_DO	AS2 OX3 DO
AS2_OX3_DO_Hi_ALM	AS2 OX3 DO High Alarm
AS2_OX3_DO_HiHi_ALM	AS2 OX3 DO High High Alarm
AS2_OX3_DO_Lo_ALM	AS2 OX3 DO Low Alarm
AS2_OX3_DO_LoLo_ALM	AS2 OX3 DO Low Low Alarm
AS2_OX3_DO_Sensor_ALM	AS2 OX3 DO Instrument Fail
AS2_OX3_Flo	AS2 OX3 Flow
AS2_OX3_Flo_Hi_ALM	AS2 OX3 Flow High Alarm

Alarm Tagnames	Alarm Descriptions
AS2_OX3_Flo_HiHi_ALM	AS2 OX3 Flow High High Alarm
AS2_OX3_Flo_Lo_ALM	AS2 OX3 Flow Low Alarm
AS2_OX3_Flo_LoLo_ALM	AS2 OX3 Flow Low Low Alarm
AS2_OX3_Flo_Sensor_ALM	AS2 OX3 Flow Instrument Fail
AS2_OX3_Mix_CNR_ALM	AS2 OX3 Mixer Call No Run Alarm
AS2_OX3_Mix_Com_ALM	AS2 OX3 Mixer Com Fail
AS2_OX3_Mix_Max_Starts_ALM	AS2 OX3 Mixer Maximum Starts Fail
AS2_OX3_Mix_Motor_ALM	AS2 OX3 Mixer Motor Fail
AS2_OX3_Mix_Overtemp_ALM	AS2 OX3 Mixer Overtemp Alarm
AS2_OX3_Mix_Phase_ALM	AS2 OX3 Mixer Phase Fail
AS2_OX3_Mix_RNC_ALM	AS2 OX3 Mixer Run No Call Alarm
AS2_OX3_Vlv_ALM	AS2 OX3 Flow Actuator Alarm
AS2_OX3_Vlv_Sensor_ALM	AS2 OX3 Flow Actuator Instrument Fail
AS2_Recycle_CNR_ALM	AS2 Recycle Pump Call No Run Alarm
AS2_Recycle_Com_ALM	AS2 Recycle Pump Com Fail
AS2_Recycle_Disch_Overtemp_ALM	AS2 Recycle Pump Discharge Overtemperature
AS2_Recycle_Flo_Hi_ALM	AS2 Recycle Flow High Alarm
AS2_Recycle_Flo_Lo_ALM	AS2 Recycle Flow Low Alarm
AS2_Recycle_Flo_Sensor_ALM	AS2 Recycle Flow Instrument Fail
AS2_Recycle_Max_Starts_ALM	AS2 Recycle Pump Maximum Starts Fail
AS2_Recycle_Motor_ALM	AS2 Recycle Pump Motor Fail
AS2_Recycle_Overtemp_ALM	AS2 Recycle Pump Overtemp Alarm
AS2_Recycle_Phase_ALM	AS2 Recycle Pump Phase Fail
AS2_Recycle_RNC_ALM	AS2 Recycle Pump Run No Call Alarm
AS2_Recycle_Seal_ALM	AS2 Recycle Pump Seal Fail
AS2_Recycle_Torque_Hi_ALM	AS2 Recycle Pump Torque High
AS2_Recycle_Torque_HiHi_ALM	AS2 Recycle Pump Torque High High
AS2_Recycle_VFD_ALM	AS2 Recycle Pump VFD Fail
AS2_WAS_Inlet_Lvl_Hi_ALM	AS2 WAS Inlet Basin Level High Alarm
AS2_WAS_Inlet_Lvl_HiHi_ALM	AS2 WAS Inlet Basin Level High HIgh Alarm
AS2_WAS_Inlet_Lvl_Lo_ALM	AS2 WAS Inlet Basin Level Low Alarm
AS2_WAS_Inlet_Lvl_LoLo_ALM	AS2 WAS Inlet Basin Level Low Low Alarm
AS2_WAS_Inlet_Lvl_Sensor_ALM	AS2 WAS Inlet Basin Level Instrument Fail
AS2_Waste_Vlv_ALM	AS2 Waste Actuator Alarm
AS2_Waste_Vlv_Sensor_ALM	AS2 Waste Actuator Instrument Fail
CL_Clarifier1_CNR_ALM	CL Clarifier 1 Call No Run Alarm
CL_Clarifier1_Com_ALM	CL Clarifier 1 Com Fail
CL_Clarifier1_Disch_Temp_ALM	CL Clarifier 1 Discharge Overtemperature
CL_Clarifier1_Max_Starts_ALM	CL Clarifier 1 Maximum Starts Fail
CL_Clarifier1_Motor_ALM	CL Clarifier 1 Motor Fail

Alarm Tagnames	Alarm Descriptions
CL_Clarifier1_Overtemp_ALM	CL Clarifier 1 Overtemp Alarm
CL_Clarifier1_Phase_ALM	CL Clarifier 1 Phase Fail
CL_Clarifier1_RNC_ALM	CL Clarifier 1 Run No Call Alarm
CL_Clarifier1_Seal_ALM	CL Clarifier 1 Seal Fail
CL_Clarifier1_Torque_Hi_ALM	CL Clarifier 1 Torque High
CL_Clarifier1_Torque_Hi_Hi_ALM	CL Clarifier 1 Torque High High
CL_Clarifier1_VFD_ALM	CL Clarifier 1 VFD Fail
CL_Clarifier2_CNR_ALM	CL Clarifier 2 Call No Run Alarm
CL_Clarifier2_Com_ALM	CL Clarifier 2 Com Fail
CL_Clarifier2_Disch_Temp_ALM	CL Clarifier 2 Discharge Overtemperature
CL_Clarifier2_Max_Starts_ALM	CL Clarifier 2 Maximum Starts Fail
CL_Clarifier2_Motor_ALM	CL Clarifier 2 Motor Fail
CL_Clarifier2_Overtemp_ALM	CL Clarifier 2 Overtemp Alarm
CL_Clarifier2_Phase_ALM	CL Clarifier 2 Phase Fail
CL_Clarifier2_RNC_ALM	CL Clarifier 2 Run No Call Alarm
CL_Clarifier2_Seal_ALM	CL Clarifier 2 Seal Fail
CL_Clarifier2_Torque_Hi_ALM	CL Clarifier 2 Torque High
CL_Clarifier2_Torque_Hi_Hi_ALM	CL Clarifier 2 Torque High High
CL_Clarifier2_VFD_ALM	CL Clarifier 2 VFD Fail
DAF_Air_Press_Lo_ALM	DAF Compressed Air Pressure Low Alarm
DAF_Auger_CNR_ALM	DAF Auger Call No Run Alarm
DAF_Auger_Com_ALM	DAF Auger Com Fail
DAF_Auger_Max_Starts_ALM	DAF Auger Maximum Starts Fail
DAF_Auger_Motor_ALM	DAF Auger Motor Fail
DAF_Auger_Phase_ALM	DAF Auger Phase Fail
DAF_Auger_RNC_ALM	DAF Auger Run No Call Alarm
DAF_Recycle_P1_CNR_ALM	DAF Recycle Pump 1 Call No Run Alarm
DAF_Recycle_P1_Com_ALM	DAF Recycle Pump 1 Com Fail
DAF_Recycle_P1_Max_Starts_ALM	DAF Recycle Pump 1 Maximum Starts Fail
DAF_Recycle_P1_Motor_ALM	DAF Recycle Pump 1 Motor Fail
DAF_Recycle_P1_Phase_ALM	DAF Recycle Pump 1 Phase Fail
DAF_Recycle_P1_RNC_ALM	DAF Recycle Pump 1 Run No Call Alarm
DAF_Recycle_P2_CNR_ALM	DAF Recycle Pump 2 Call No Run Alarm
DAF_Recycle_P2_Com_ALM	DAF Recycle Pump 2 Com Fail
DAF_Recycle_P2_Max_Starts_ALM	DAF Recycle Pump 2 Maximum Starts Fail
DAF_Recycle_P2_Motor_ALM	DAF Recycle Pump 2 Motor Fail
DAF_Recycle_P2_Phase_ALM	DAF Recycle Pump 2 Phase Fail
DAF_Recycle_P2_RNC_ALM	DAF Recycle Pump 2 Run No Call Alarm
DAF_Recycle_Press_Lo_ALM	DAF Recycle Pressure Low Alarm
DAF_Skim_CNR_ALM	DAF Skimmer Call No Run Alarm

Alarm Tagnames	Alarm Descriptions
DAF_Skim_Com_ALM	DAF Skimmer Com Fail
DAF_Skim_Max_Starts_ALM	DAF Skimmer Maximum Starts Fail
DAF_Skim_Motor_ALM	DAF Skimmer Motor Fail
DAF_Skim_Phase_ALM	DAF Skimmer Phase Fail
DAF_Skim_RNC_ALM	DAF Skimmer Run No Call Alarm
DAF_Skim_VFD_ALM	DAF Skimmer VFD Fail
DG_Dig1_Blower_CNR_ALM	DG Digester Blower 1 Call No Run Alarm
DG_Dig1_Blower_Com_ALM	DG Digester Blower 1 Com Fail
DG_Dig1_Blower_Disch_Temp_ALM	DG Digester Blower 1 Discharge Overtemperature
DG_Dig1_Blower_Max_Starts_ALM	DG Digester Blower 1 Maximum Starts Fail
DG_Dig1_Blower_Motor_ALM	DG Digester Blower 1 Motor Fail
DG_Dig1_Blower_Overtemp_ALM	DG Digester Blower 1 Overtemp Alarm
DG_Dig1_Blower_Phase_ALM	DG Digester Blower 1 Phase Fail
DG_Dig1_Blower_RNC_ALM	DG Digester Blower 1 Run No Call Alarm
DG_Dig1_Blower_Seal_ALM	DG Digester Blower 1 Seal Fail
DG_Dig1_Blower_Torque_Hi_ALM	DG Digester Blower 1 Torque High
DG_Dig1_Blower_Torque_Hi_Hi_ALM	DG Digester Blower 1 Torque High High
DG_Dig1_Blower_VFD_ALM	DG Digester Blower 1 VFD Fail
DG_Dig1_Level_Hi_ALM	DG Digester 1 Level High Alarm
DG_Dig1_Level_Lo_ALM	DG Digester 1 Level Low Alarm
DG_Dig1_Level_Sensor_ALM	DG Digester 1 Level Instrument Fail
DG_Dig1_Mix_Call_No_Run_ALM	DG Digester Mixer 1 Call No Run Alarm
DG_Dig1_Mix_Com_ALM	DG Digester Mixer 1 Com Fail
DG_Dig1_Mix_Maximum_Starts_ALM	DG Digester Mixer 1 Maximum Starts Fail
DG_Dig1_Mix_Motor_ALM	DG Digester Mixer 1 Motor Fail
DG_Dig1_Mix_Overtemp_ALM	DG Digester Mixer 1 Overtemp Alarm
DG_Dig1_Mix_Phase_ALM	DG Digester Mixer 1 Phase Fail
DG_Dig1_Mix_Run_No_Call_ALM	DG Digester Mixer 1 Run No Call Alarm
DG_Dig1_ORP_Level_Hi_ALM	DG Digester 1 ORP Level High Alarm
DG_Dig1_ORP_Level_Lo_ALM	DG Digester 1 ORP Level Low Alarm
DG_Dig1_ORP_Sensor_ALM	DG Digester 1 ORP Instrument Fail
DG_Dig2_Blower_CNR_ALM	DG Digester Blower 2 Call No Run Alarm
DG_Dig2_Blower_Com_ALM	DG Digester Blower 2 Com Fail
DG_Dig2_Blower_Disch_Temp_ALM	DG Digester Blower 2 Discharge Overtemperature
DG_Dig2_Blower_Max_Starts_ALM	DG Digester Blower 2 Maximum Starts Fail
DG_Dig2_Blower_Motor_ALM	DG Digester Blower 2 Motor Fail
DG_Dig2_Blower_Overtemp_ALM	DG Digester Blower 2 Overtemp Alarm
DG_Dig2_Blower_Phase_ALM	DG Digester Blower 2 Phase Fail
DG_Dig2_Blower_RNC_ALM	DG Digester Blower 2 Run No Call Alarm
DG_Dig2_Blower_Seal_ALM	DG Digester Blower 2 Seal Fail

Alarm Tagnames	Alarm Descriptions
DG_Dig2_Blower_Torque_Hi_ALM	DG Digester Blower 2 Torque High
DG_Dig2_Blower_Torque_Hi_Hi_ALM	DG Digester Blower 2 Torque High High
DG_Dig2_Blower_VFD_ALM	DG Digester Blower 2 VFD Fail
DG_Dig2_Level_Hi_ALM	DG Digester 2 Level High Alarm
DG_Dig2_Level_Lo_ALM	DG Digester 2 Level Low Alarm
DG_Dig2_Level_Sensor_ALM	DG Digester 2 Level Instrument Fail
DG_Dig2_Mix_Call_No_Run_ALM	DG Digester Mixer 2 Call No Run Alarm
DG_Dig2_Mix_Com_ALM	DG Digester Mixer 2 Com Fail
DG_Dig2_Mix_Maximum_Starts_ALM	DG Digester Mixer 2 Maximum Starts Fail
DG_Dig2_Mix_Motor_ALM	DG Digester Mixer 2 Motor Fail
DG_Dig2_Mix_Overtemp_ALM	DG Digester Mixer 2 Overtemp Alarm
DG_Dig2_Mix_Phase_ALM	DG Digester Mixer 2 Phase Fail
DG_Dig2_Mix_Run_No_Call_ALM	DG Digester Mixer 2 Run No Call Alarm
DG_Dig2_ORP_Level_Hi_ALM	DG Digester 2 ORP Level High Alarm
DG_Dig2_ORP_Level_Lo_ALM	DG Digester 2 ORP Level Low Alarm
DG_Dig2_ORP_Sensor_ALM	DG Digester 2 ORP Instrument Fail
EB_Effluent_Flo_Hi_ALM	EB Effluent Flow High Alarm
EB_Effluent_Flo_HiHi_ALM	EB Effluent Flow High High Alarm
EB_Effluent_Flo_Lo_ALM	EB Effluent Flow Low Alarm
EB_Effluent_Flo_LoLo_ALM	EB Effluent Flow Low Low Alarm
EB_Effluent_Flo_Sensor_ALM	EB Effluent Flow Instrument Fail
EB_Influent_Flo_Hi_ALM	EB Influent Flow High Alarm
EB_Influent_Flo_HiHi_ALM	EB Influent Flow High High Alarm
EB_Influent_Flo_Lo_ALM	EB Influent Flow Low Alarm
EB_Influent_Flo_LoLo_ALM	EB Influent Flow Low Low Alarm
EB_Influent_Flo_Sensor_ALM	EB Influent Flow Instrument Fail
EB_Influent_Vlv_ALM	EB Influent Actuator Alarm
EB_Influent_Vlv_Sensor_ALM	EB Influent Flow Actuator Instrument Fail
EB_Level_Hi_ALM	EB High Level Switch Alarm
EB_Level_Lo_ALM	EB Low Level Switch Alarm
EB_Pump_CNR_ALM	EB Pump Call No Run Alarm
EB_Pump_Com_ALM	EB Pump Com Fail
EB_Pump_Discharge_Temp_ALM	EB Pump Discharge Overtemperature
EB_Pump_Max_Starts_ALM	EB Pump Maximum Starts Fail
EB_Pump_Motor_ALM	EB Pump Motor Fail
EB_Pump_Overtemp_ALM	EB Pump Overtemp Alarm
EB_Pump_Phase_ALM	EB Pump Phase Fail
EB_Pump_RNC_ALM	EB Pump Run No Call Alarm
EB_Pump_Seal_ALM	EB Pump Seal Fail
EB_Pump_Torque_Hi_ALM	EB Pump Torque High

Alarm Tagnames	Alarm Descriptions
EB_Pump_Torque_Hi_Hi_ALM	EB Pump Torque High High
EB_Pump_VFD_ALM	EB Pump VFD Fail
EP_Float_Mix_CNR_ALM	EP Floating Mixer Call No Run Alarm
EP_Float_Mix_Com_ALM	EP Floating Mixer Com Fail
EP_Float_Mix_Max_Starts_ALM	EP Floating Mixer Maximum Starts Fail
EP_Float_Mix_Motor_ALM	EP Floating Mixer Motor Fail
EP_Float_Mix_Overtemp_ALM	EP Floating Mixer Overtemp Alarm
EP_Float_Mix_Phase_ALM	EP Floating Mixer Phase Fail
EP_Float_Mix_RNC_ALM	EP Floating Mixer Run No Call Alarm
EP_Pump_CNR_ALM	EP Evaporation Pond Pump Call No Run Alarm
EP_Pump_Com_ALM	EP Evaporation Pond Pump Com Fail
EP_Pump_Max_Starts_ALM	EP Evaporation Pond Pump Maximum Starts Fail
EP_Pump_Motor_ALM	EP Evaporation Pond Pump Motor Fail
EP_Pump_Overtemp_ALM	EP Evaporation Pond Pump Overtemp Alarm
EP_Pump_Phase_ALM	EP Evaporation Pond Pump Phase Fail
EP_Pump_RNC_ALM	EP Evaporation Pond Pump Run No Call Alarm
EQ_AC_Power_ALM	Control Panel 400 AC Power Fail
EQ_DC_Power_ALM	Control Panel 400 DC Power Fail
EQ_HW_Com_ALM	HW-CP 600 PLC Com Fail at EQ-CP 400 PLC
EQ_IPPS_Com_ALM	IPPS-CP 700 PLC Com Fail at EQ-CP 400 PLC
EQ_Panel_Intrusion_ALM	Control Panel 400 Intrusion Alarm
EQ_PLC_ALM	Control Panel 400 PLC Fail
EQ_SH_Com_ALM	SH-CP 500 PLC Com Fail at EQ-CP 400 PLC
FS_Screen_1_Level_Hi_ALM	FS Fine Screen 1 Level High Alarm
FS_Screen_1_Level_Inst_Fail_ALM	FS Fine Screen 1 Level Instrument Fail Alarm
FS_Screen_1_Overload_ALM	FS Fine Screen 1 Overload Alarm
FS_Screen_1_Water_Level_Hi_ALM	FS Fine Screen 1 High Water Level Alarm
FS_Screen_2_Level_Hi_ALM	FS Fine Screen 2 Level High Alarm
FS_Screen_2_Level_Inst_Fail_ALM	FS Fine Screen 2 Level Instrument Fail Alarm
FS_Screen_2_Overload_ALM	FS Fine Screen 2 Overload Alarm
FS_Screen_2_Water_Level_Hi_ALM	FS Fine Screen 2 High Water Level Alarm
FS_Ttl_Inf_To_Basins_Hi_ALM	FS Total Influent To Activated Sludge Basins High
FS_Ttl_Inf_To_Basins_HiHi_ALM	FS Total Influent To Activated Sludge Basins High
FS_Ttl_Infl_To_FS_Split_Hi_ALM	FS Total Influent To Headworks Flow Splitter High
FS_Ttl_Infl_To_FS_Split_HiHi_ALM	FS Total Influent To Headworks Flow Splitter High
GR_Classifier_CNR_ALM	GR Grit Classifier Call No Run Alarm
GR_Classifier_Com_ALM	GR Grit Classifier Com Fail
GR_Classifier_Max_Starts_ALM	GR Grit Classifier Maximum Starts Fail
GR_Classifier_Motor_ALM	GR Grit Classifier Motor Fail
GR_Classifier_Overtemp_ALM	GR Grit Classifier Overtemp Alarm

Alarm Tagnames	Alarm Descriptions
GR_Classifier_Phase_ALM	GR Grit Classifier Phase Fail
GR_Classifier_RNC_ALM	GR Grit Classifier Run No Call Alarm
GR_Drive_CNR_ALM	GR Grit Drive Call No Run Alarm
GR_Drive_Com_ALM	GR Grit Drive Com Fail
GR_Drive_Max_Starts_ALM	GR Grit Drive Maximum Starts Fail
GR_Drive_Motor_ALM	GR Grit Drive Motor Fail
GR_Drive_Overtemp_ALM	GR Grit Drive Overtemp Alarm
GR_Drive_Phase_ALM	GR Grit Drive Phase Fail
GR_Drive_RNC_ALM	GR Grit Drive Run No Call Alarm
GR_Pump_Flow_Hi_ALM	GR Grit Pump Flow High Alarm
GR_Pump_Flow_Instrument_ALM	GR Grit Pump Flow Instrument Fail
GR_Pump_Flow_Lo_ALM	GR Grit Pump Flow Low Alarm
GR_Pump_Without_Classifier_ALM	GR Grit Pump Without Grit Classifier Alarm
GR_Pump1_CNR_ALM	GR Grit Pump 1 Call No Run Alarm
GR_Pump1_Com_ALM	GR Grit Pump 1 Com Fail
GR_Pump1_Max_Starts_ALM	GR Grit Pump 1 Maximum Starts Fail
GR_Pump1_Motor_ALM	GR Grit Pump 1 Motor Fail
GR_Pump1_Overtemp_ALM	GR Grit Pump 1 Overtemp Alarm
GR_Pump1_Phase_ALM	GR Grit Pump 1 Phase Fail
GR_Pump1_RNC_ALM	GR Grit Pump 1 Run No Call Alarm
HW_AC_Power_ALM	Control Panel 600 AC Power Fail
HW_DC_Power_ALM	Control Panel 600 DC Power Fail
HW_EQ_Com_ALM	EQ-CP 400 PLC Com Fail at HW-CP 600 PLC
HW_IPPS_Com_ALM	IPPS-CP 700 PLC Com Fail at HW-CP 600 PLC
HW_Panel_Intrusion_ALM	Control Panel 600 Intrusion Alarm
HW_PLC_ALM	Control Panel 600 PLC Fail
HW_SH_Com_ALM	SH-CP 500 PLC Com Fail at HW-CP 600 PLC
IPPS_AC_Power_ALM	Control Panel 700 AC Power Fail
IPPS_DC_Power_ALM	Control Panel 700 DC Power Fail
IPPS_Emergency_Float_ALM	IPPS Emergency Float Control
IPPS_EQ_Com_ALM	EQ-CP 400 PLC Com Fail at IPPS-CP 700 PLC
IPPS_Hi_Float_ALM	IPPS High Float Alarm
IPPS_HW_Com_ALM	HW-CP 600 PLC Com Fail at IPPS-CP 700 PLC
IPPS_P1_CNR_ALM	IPPS Pump 1 Call No Run Alarm
IPPS_P1_Com_ALM	IPPS Pump 1 Com Fail
IPPS_P1_Disch_Overtemp_ALM	IPPS Pump 1 Discharge Overtemperature
IPPS_P1_Max_Starts_ALM	IPPS Pump 1 Maximum Starts Fail
IPPS_P1_Motor_ALM	IPPS Pump 1 Motor Fail
IPPS_P1_Overtemp_ALM	IPPS Pump 1 Overtemp Alarm
IPPS_P1_Phase_ALM	IPPS Pump 1 Phase Fail

Alarm Tagnames	Alarm Descriptions
IPPS_P1_RNC_ALM	IPPS Pump 1 Run No Call Alarm
IPPS_P1_Seal_ALM	IPPS Pump 1 Seal Fail
IPPS_P1_Torque_Hi_ALM	IPPS Pump 1 Torque High
IPPS_P1_Torque_HiHi_ALM	IPPS Pump 1 Torque High High
IPPS_P1_VFD_ALM	IPPS Pump 1 VFD Fail
IPPS_P2_CNR_ALM	IPPS Pump 2 Call No Run Alarm
IPPS_P2_Com_ALM	IPPS Pump 2 Com Fail
IPPS_P2_Disch_Overtemp_ALM	IPPS Pump 2 Discharge Overtemperature
IPPS_P2_Max_Starts_ALM	IPPS Pump 2 Maximum Starts Fail
IPPS_P2_Motor_ALM	IPPS Pump 2 Motor Fail
IPPS_P2_Overtemp_ALM	IPPS Pump 2 Overtemp Alarm
IPPS_P2_Phase_ALM	IPPS Pump 2 Phase Fail
IPPS_P2_RNC_ALM	IPPS Pump 2 Run No Call Alarm
IPPS_P2_Seal_ALM	IPPS Pump 2 Seal Fail
IPPS_P2_Torque_Hi_ALM	IPPS Pump 2 Torque High
IPPS_P2_Torque_HiHi_ALM	IPPS Pump 2 Torque High High
IPPS_P2_VFD_ALM	IPPS Pump 2 VFD Fail
IPPS_Panel_Intrusion_ALM	Control Panel 700 Intrusion Alarm
IPPS_Panic_Switch_ALM	IPPS Panic Switch Alarm
IPPS_PLC_ALM	Control Panel 700 PLC Fail
IPPS_SH_Com_ALM	SH-CP 500 PLC Com Fail at IPPS-CP 700 PLC
IPPS_Well_Hi_ALM	IPPS Wet Well High Alarm
IPPS_Well_HiHi_ALM	IPPS Wet Well High High Alarm
IPPS_Well_Instrument_ALM	IPPS Wet Well Instrument Fail
IPPS_Well_Lo_ALM	IPPS Wet Well Low Alarm
IPPS_Well_LoLo_ALM	IPPS Wet Well Low Low Alarm
IS_Equipment_Com_ALM	IS Equipment Com Alarm
IS_Evap_Pond_Flo_Hi_ALM	IS Evap Pond Flow High Alarm
IS_Evap_Pond_Flo_Lo_ALM	IS Evap Pond Flow Low Alarm
IS_Evap_Pond_Flo_Sensor_ALM	IS Evap Pond Flow Instrument Fail
IS_Influent_Flo_City_AVG	IS InFluent Flow from City Moving Average
IS_Influent_Flo1_Hi_ALM	IS InFluent Flow 1 High Alarm
IS_Influent_Flo1_Lo_ALM	IS InFluent Flow 1 Low Alarm
IS_Influent_Flo1_Sensor_ALM	IS Influent Flow 1 Instrument Fail
IS_Influent_Flo2_Hi_ALM	IS InFluent Flow 2 High Alarm
IS_Influent_Flo2_Lo_ALM	IS InFluent Flow 2 Low Alarm
IS_Influent_Flo2_Sensor_ALM	IS Influent Flow 2 Instrument Fail
IS_IPPS_Com_ALM	IS In Plant Pump Station Com Alarm
IS_IPPS_Flo_Hi_ALM	IS IPPS Flow High Alarm
IS_IPPS_Flo_Lo_ALM	IS IPPS Flow Low Alarm

Alarm Tagnames	Alarm Descriptions
IS_IPPS_Sensor_ALM	IS IPPS Flow Instrument Fail
IS_Sample_Air_Jammed_ALM	IS Sample Air Distributer Jammed Alarm
IS_Sample_Pump_Air_Full_ALM	IS Sample Pump Air Full Alarm
IS_Sample_Pump_Bottle_Full_ALM	IS Sample Pump Bottle Full Alarm
IS_Solids_Handling_Com_ALM	IS Solids Handling Com Alarm
IS_Total_Inf_City	IS Total Plant Influent From City
IS_Total_Inf_City_Hi_ALM	IS Total Plant Influent From City High Alarm
IS_Total_Inf_City_HiHi_ALM	IS Total Plant Influent From City High High Alarm
IS_Total_Inf_City_Lo_ALM	IS Total Plant Influent From City Lo Alarm
IS_Total_Inf_City_LoLo_ALM	IS Total Plant Influent From City LoLo Alarm
IS_Total_Inf_Inf	IS Total Plant Influent to Influent Structure
IS_Total_Inf_Inf_Hi_ALM	IS Total Plant Influent Sturcture High Alarm
IS_Total_Inf_Inf_HiHi_ALM	IS Total Plant Influent Structure High High Alarm
NPW_Disch_PRESSURE_HI	NPW HIGH DISCHARGE PRESSURE
NPW_Disch_PRESSURE_LO	NPW LOW DISCHARGE PRESSURE
NPW_P1_FAIL	NPW PUMP 1 FAIL
NPW_P2_FAIL	NPW PUMP 2 FAIL
NPW_P3_FAIL	NPW PUMP 3 FAIL
NPW_Screen_Fault	NPW Screen Fault
NPW_TRANSDUCER_FAIL	NPW TRANSDUCER FAIL
NPW_VFD_1_FAIL	NPW VFD 1 FAIL
NPW_VFD_1_MODBUS_FAIL	NPW VFD 1 MODBUS FAIL
NPW_VFD_1_OVERTEMP	NPW VFD 1 OVERTEMP
NPW_VFD_2_FAIL	NPW VFD 2 FAIL
NPW_VFD_2_MODBUS_FAIL	NPW VFD 2 MODBUS FAIL
NPW_VFD_2_OVERTEMP	NPW VFD 2 OVERTEMP
NPW_VFD_3_FAIL	NPW VFD 3 FAIL
NPW_VFD_3_MODBUS_FAIL	NPW VFD 3 MODBUS FAIL
NPW_VFD_3_OVERTEMP	NPW VFD 3 OVERTEMP
PW_ATS1_Fail_ALM	PW ATS1 Internal Failure
PW_ATS1_Utility_Fail_ALM	PW ATS1 Has Lost Utility Power
PW_ATS2_Fail_ALM	PW ATS2 Internal Failure
PW_ATS2_Utility_Fail_ALM	PW ATS2 Has Lost Utility Power
PW_EG_Fail_ALM	PW Emergency Generator Fail
PW_EG_Low_Fuel_ALM	PW Emergency Generator Low Fuel
PW_EG_Not_in_Auto_ALM	PW Emergency Generator Not in Auto
PW_EG_Trouble_ALM	PW Emergency Generator Trouble
RAS_Clar_WAS_Flo_Hi_ALM	RAS Clarifier WAS Flow High Alarm
RAS_Clar_WAS_Flo_Hi_Hi_ALM	RAS Clarifier WAS Flow High High Alarm
RAS_Clar_WAS_Flo_Lo_ALM	RAS Clarifier WAS Flow Low Low Alarm

Alarm Tagnames	Alarm Descriptions
RAS_Clar_WAS_Flo_Lo_Lo_ALM	RAS Clarifier WAS Flow Low Alarm
RAS_Clar_WAS_Flo_Sensor_ALM	RAS Clarifier WAS Flow Instrument Fail
RAS_Clar1_Flo_Hi_ALM	RAS Clarifier 1 Flow High Alarm
RAS_Clar1_Flo_Hi_Hi_ALM	RAS Clarifier 1 Flow High High Alarm
RAS_Clar1_Flo_Lo_ALM	RAS Clarifier 1 Flow Low Low Alarm
RAS_Clar1_Flo_Lo_Lo_ALM	RAS Clarifier 1 Flow Low Alarm
RAS_Clar1_Flo_Sensor_ALM	RAS Clarifier 1 Flow Instrument Fail
RAS_Clar2_Flo_Hi_ALM	RAS Clarifier 2 Flow High Alarm
RAS_Clar2_Flo_Hi_Hi_ALM	RAS Clarifier 2 Flow High High Alarm
RAS_Clar2_Flo_Lo_ALM	RAS Clarifier 2 Flow Low Low Alarm
RAS_Clar2_Flo_Lo_Lo_ALM	RAS Clarifier 2 Flow Low Alarm
RAS_Clar2_Flo_Sensor_ALM	RAS Clarifier 2 Flow Instrument Fail
RAS_P_Back_CNR_ALM	RAS Backup Pump Call No Run Alarm
RAS_P_Back_Com_ALM	RAS Backup Pump Com Fail
RAS_P_Back_Disc_Overtemp_ALM	RAS Backup Pump Discharge Overtemperature
RAS_P_Back_Max_Starts_ALM	RAS Backup Pump Maximum Starts Fail
RAS_P_Back_Motor_ALM	RAS Backup Pump Motor Fail
RAS_P_Back_Overtemp_ALM	RAS Backup Pump Overtemp Alarm
RAS_P_Back_Phase_ALM	RAS Backup Pump Phase Fail
RAS_P_Back_RNC_ALM	RAS Backup Pump Run No Call Alarm
RAS_P_Back_Seal_ALM	RAS Backup Pump Seal Fail
RAS_P_Back_Torque_Hi_ALM	RAS Backup Pump Torque High
RAS_P_Back_Torque_HiHi_ALM	RAS Backup Pump Torque High High
RAS_P_Back_VFD_ALM	RAS Backup Pump VFD Fail
RAS_P1_CNR_ALM	RAS Pump 1 Call No Run Alarm
RAS_P1_Com_ALM	RAS Pump 1 Com Fail
RAS_P1_Disc_Overtemp_ALM	RAS Pump 1 Discharge Overtemperature
RAS_P1_Max_Starts_ALM	RAS Pump 1 Maximum Starts Fail
RAS_P1_Motor_ALM	RAS Pump 1 Motor Fail
RAS_P1_Overtemp_ALM	RAS Pump 1 Overtemp Alarm
RAS_P1_Phase_ALM	RAS Pump 1 Phase Fail
RAS_P1_RNC_ALM	RAS Pump 1 Run No Call Alarm
RAS_P1_Seal_ALM	RAS Pump 1 Seal Fail
RAS_P1_Torque_Hi_ALM	RAS Pump 1 Torque High
RAS_P1_Torque_HiHi_ALM	RAS Pump 1 Torque High High
RAS_P1_VFD_ALM	RAS Pump 1 VFD Fail
RAS_P2_CNR_ALM	RAS Pump 2 Call No Run Alarm
RAS_P2_Com_ALM	RAS Pump 2 Com Fail
RAS_P2_Disc_Overtemp_ALM	RAS Pump 2 Discharge Overtemperature
RAS_P2_Max_Starts_ALM	RAS Pump 2 Maximum Starts Fail

Alarm Tagnames	Alarm Descriptions
RAS_P2_Motor_ALM	RAS Pump 2 Motor Fail
RAS_P2_Overtemp_ALM	RAS Pump 2 Overtemp Alarm
RAS_P2_Phase_ALM	RAS Pump 2 Phase Fail
RAS_P2_RNC_ALM	RAS Pump 2 Run No Call Alarm
RAS_P2_Seal_ALM	RAS Pump 2 Seal Fail
RAS_P2_Torque_Hi_ALM	RAS Pump 2 Torque High
RAS_P2_Torque_HiHi_ALM	RAS Pump 2 Torque High High
RAS_P2_VFD_ALM	RAS Pump 2 VFD Fail
SH_AC_Power_ALM	Control Panel 500 AC Power Fail
SH_DC_Power_ALM	Control Panel 500 DC Power Fail
SH_EQ_Com_ALM	EQ-CP 400 PLC Com Fail at SH-CP 500 PLC
SH_HW_Com_ALM	HW-CP 600 PLC Com Fail at SH-CP 500 PLC
SH_IPPS_Com_ALM	IPPS-CP 700 PLC Com Fail at SH-CP 500 PLC
SH_Panel_Intrusion_ALM	Control Panel 500 Intrusion Alarm
SH_PLC_ALM	Control Panel 500 PLC Fail
Test_alarm	Test Alarm
TS_P1_CNR_ALM	TWAS Pump 1 Call No Run Alarm
TS_P1_Com_ALM	TWAS Pump 1 Com Fail
TS_P1_Max_Starts_ALM	TWAS Pump 1 Maximum Starts Fail
TS_P1_Motor_ALM	TWAS Pump 1 Motor Fail
TS_P1_Phase_ALM	TWAS Pump 1 Phase Fail
TS_P1_RNC_ALM	TWAS Pump 1 Run No Call Alarm
TS_P2_CNR_ALM	TWAS Pump 2 Call No Run Alarm
TS_P2_Com_ALM	TWAS Pump 2 Com Fail
TS_P2_Max_Starts_ALM	TWAS Pump 2 Maximum Starts Fail
TS_P2_Motor_ALM	TWAS Pump 2 Motor Fail
TS_P2_Phase_ALM	TWAS Pump 2 Phase Fail
TS_P2_RNC_ALM	TWAS Pump 2 Run No Call Alarm
TS_Pump_Flo_Hi_ALM	TWAS Pump Flow High Alarm
TS_Pump_Flo_Instrument_ALM	TWAS Pump Flow Instrument Fail
TS_Pump_Flo_Lo_ALM	TWAS Pump Flow Low Alarm
UV_ANALOG_INPUT_NOT_CALIBRATED	UV ANALOG INPUT NOT CALIBRATED
UV_BANK_COMM_FAULT	UV BANK COMM FAULT
UV_BANK_MAJOR_ALARM	UV BANK MAJOR ALARM
UV_CHAN1_HIGH_FLOW_WIPING_LOCK	UV CHANNEL 1 HIGH FLOW WIPING SUSPENDED
UV_CHAN1_LOW_WATER_WIPING_LOCK	UV CHANNEL 1 LOW WATER WIPING SUSPENDED
UV_COMMON_CRITICAL_ALARM	UV COMMON CRITICAL ALARM
UV_COMMON_MAJOR_ALARM	UV COMMON MAJOR ALARM
UV_COMMON_MINOR_ALARM	UV COMMON MINOR ALARM
UV_FLOW_SIGNAL_FAULT	UV FLOW SIGNAL FAULT

Alarm Tagnames	Alarm Descriptions
UV_Heartbeat_ALM	UV_Heartbeat_ALM
UV_HIGH_FLOW_VALID_RANGE_FAIL	UV HIGH FLOW OUT OF VALIDATION RANGE
UV_HYDRAULIC_FLOW_MAX_EXCEEDED	UV HYDRAULIC FLOW MAXIMUM EXCEEDED
UV_LOW_FLOW	UV LOW FLOW
UV_LOW_FLOW_VALID_RANGE_FAIL	UV LOW FLOW OUT OF VALIDATION RANGE
UV_LOW_UV_DOSE	UV LOW UV DOSE
UV_LOW_UV_INTENSITY_FAULT	UV LOW UV INTENSITY FAULT
UV_LOW_WATER_FAULT	UV LOW WATER FAULT
UV_MOD1_BALLAST1_FAIL	UV MODULE 1 BALLAST 1 FAILURE
UV_MOD1_BALLAST2_FAIL	UV MODULE 1 BALLAST 2 FAILURE
UV_MOD1_LAMP1_FAIL	UV MODULE 1 LAMP 1 FAILURE
UV_MOD1_LAMP2_FAIL	UV MODULE 1 LAMP 2 FAILURE
UV_MOD1_LAMP3_FAIL	UV MODULE 1 LAMP 3 FAILURE
UV_MOD1_LAMP4_FAIL	UV MODULE 1 LAMP 4 FAILURE
UV_MOD2_BALLAST1_FAIL	UV MODULE 2 BALLAST 1 FAILURE
UV_MOD2_BALLAST2_FAIL	UV MODULE 2 BALLAST 2 FAILURE
UV_MOD2_LAMP1_FAIL	UV MODULE 2 LAMP 1 FAILURE
UV_MOD2_LAMP2_FAIL	UV MODULE 2 LAMP 2 FAILURE
UV_MOD2_LAMP3_FAIL	UV MODULE 2 LAMP 3 FAILURE
UV_MOD2_LAMP4_FAIL	UV MODULE 2 LAMP 4 FAILURE
UV_MULTIPLE_BALLAST_FAULT_	UV MULTIPLE BALLAST FAULT
UV_MULTIPLE_LAMP_FAULT_	UV MULTIPLE LAMP FAULT
UV_NOT_ENOUGH_HEALTHY_BANKS	UV NOT ENOUGH HEALTHY BANKS
UV_POWER_LOSS_FAULT_	UV POWER LOSS FAULT
UV_POWER_ON_RESET_PRESENT	UV POWER ON RESET CONDITION PRESENT
UV_SYSTEM_FLOW	UV SYSTEM FLOW
UV_WIPER_GENERAL_PUMP_FAULT	UV WIPER GENERAL PUMP FAULT
UV_WIPER_HIGH_PRESSURE_FAULT	UV WIPER HIGH PRESSURE FAULT
UV_WIPER_HSC1_COMM_FAULT	UV WIPER HSC1 COMM FAULT
UV_WIPER_HSC1_POWER_ON_RESET	UV WIPER HSC1 POWER ON RESET
UV_WIPER_LOW_LEVEL_FAULT	UV WIPER LOW LEVEL FAULT
UV_WIPER_MOTOR_RUN_FAULT	UV WIPER MOTOR RUN FAULT
WAS_P1_ALM	WAS Pump 1 Motor Fail
WAS_P1_CNR_ALM	WAS Pump 1 Call No Run Alarm
WAS_P1_Com_ALM	WAS Pump 1 Com Fail
WAS_P1_Flo_Hi_ALM	WAS Pump 1 Flow High Alarm
WAS_P1_Flo_Instrument_ALM	WAS Pump 1 Flow Instrument Fail
WAS_P1_Flo_Lo_ALM	WAS Pump 1 Flow Low Alarm
WAS_P1_Max_Starts_ALM	WAS Pump 1 Maximum Starts Fail
WAS_P1_Overtemp_ALM	WAS Pump 1 Motor Overtemperature Alarm

Alarm Tagnames	Alarm Descriptions
WAS_P1_Phase_ALM	WAS Pump 1 Phase Fail
WAS_P1_RNC_ALM	WAS Pump 1 Run No Call Alarm
WAS_P1_VFD_ALM	WAS Pump 1 VFD Fail
WAS_P2_ALM	WAS Pump 2 Motor Fail
WAS_P2_CNR_ALM	WAS Pump 2 Call No Run Alarm
WAS_P2_Com_ALM	WAS Pump 2 Com Fail
WAS_P2_Flo_Hi_ALM	WAS Pump 2 Flow High Alarm
WAS_P2_Flo_Instrument_ALM	WAS Pump 2 Flow Instrument Fail
WAS_P2_Flo_Lo_ALM	WAS Pump 2 Flow Low Alarm
WAS_P2_Max_Starts_ALM	WAS Pump 2 Maximum Starts Fail
WAS_P2_Overtemp_ALM	WAS Pump 2 Motor Overtemperature Alarm
WAS_P2_Phase_ALM	WAS Pump 2 Phase Fail
WAS_P2_RNC_ALM	WAS Pump 2 Run No Call Alarm
WAS_P2_VFD_ALM	WAS Pump 2 VFD Fail

Appendix H
Plantwide Emergency Response Plan

PLANT-WIDE EMERGENCY RESPONSE PLAN

This plant-wide emergency response plan outlines various potential situations that could warrant emergency actions or procedures by WWTF staff. Primary contact information related to emergency events are as follows:

Public Safety Answering Point (PSAP)
RiverCom 911
Dial 911

Emergency Rooms
Cascade Medical
817 Commercial Street
Leavenworth, WA 98826
(509) 548-5815

Central Washington Hospital & Clinics
1201 S Miller St,
Wenatchee, WA 98801
(509) 662-1511

Local Health Care Clinic
Confluence Health | Cashmere Clinic
303 Cottage Ave,
Cashmere, WA 98815
(509) 782-1541

Department of Ecology
Central Regional Office
1250 Alder St,
Union Gap, WA 98903
(509) 575-2490

Local Health District
Chelan-Douglas Health District
200 Valley Mall Pkwy,
East Wenatchee, WA 98802
(509) 886-6400

Equipment, Process and Unit Process Failures

Emergency operation of unit processes related to individual process failures is included within the O&M manual chapters.

Power Failure

Emergency

Outage of primary electrical power to the WWTF.

Response

The WWTF as a single primary power service from Chelan County Public Utility District No. 1. Electrical outages in this area are historically short and infrequent. The WWTF has an onsite back-up generator and automatic transfer switch should there be a loss of primary power. During a sustained power outage, operators should visit the WWTF to ensure adequate fuel is available for the generator and limit non-essential electrical loads on the generator. Operators should ensure that primary plant functions are maintained during the outage as required by the NPDES permit.

Flooding

Emergency

The WWTF is located above the 100-year flood level for the Wenatchee River. Floods larger than this could pose a flooding risk to the WWTP.

Response

Should a flood larger than the 100-year event occur, the lowest lying process areas should be protected via sandbags or other measures. The primary low-lying areas are:

- The lower level of the Headworks
- The RAS pump room
- The in-plant pump station

Hydraulic overload to the WWTF

Emergency

A break in the City potable water system or other flood could create a hydraulic overload situation for the WWTF.

Response

The WWTF control system will automatically divert sustained high influent flows to the influent equalization basin. During a sustained high flow event, operators should verify that the EQ system is operating properly. In the unlikely event that hydraulic overloading occurs beyond the capacity of EQ system, the operators should bring both basins and clarifiers online and ensure the UV system is operating at full capacity.

Should effluent quality be affect, **report the bypass or discharge to Ecology in accordance with the Section S3.E of the NPDES permit included in Appendix D.**

Wildfire

Emergency

Wildfires occur frequently in the Wenatchee Valley. A wildfire could potentially threaten the Cashmere WWTF if it follows along adjacent hill sides or the riparian area along the Wenatchee River as shown in the attached figure.

Response

If a wildfire blocks the primary access to the WWTF, utilize the secondary access as shown on the attached figure. Fire hydrants within the WWTF are also shown in the attached figure which may be used for fighting fire adjacent to the WWTF. For sustained periods of poor air quality due to nearby wildfires, operators should utilize masks that reduce particulate inhalation as recommended by the local health department. In order to prevent wildfire risks to the WWTF, operators should reduce fuels adjacent to the WWTF that are located on City property.

Fire within WWTP

Emergency

Structure fire within the WWTF.

Response

All buildings within the WWTF include fire detection systems that call out to operators through the WWTF control system. Operators should immediately alert the local fire department of any fire within the WWTF. Fire hydrants within the WWTF are also shown in the attached figure which may be used for fighting fire within the WWTF. The Headworks, Equipment building, Solids Handling and Administration buildings include wood-framed roof construction. The Administration building also contains wood-framed interior walls. The other structures in the WWTF are concrete, CMU or steel and pose lower fire risks. None of the buildings within the WWTF include automatic fire suppression systems.

Chemical Spills with the WWTP

Emergency

Chemical spill within a WWTF structure or on the WWTF site.

Response

Operators should contain the spill immediately with sand bags or other measure. Limit chemical spills from entering floor drains, which drain to the WWTF in-plant pump station. Should chemicals enter the in-plant pump station, isolate the chemical at that location or divert flows to equalization basin during in-plant pump runs. Pending the nature of the chemical, clean-up procedures may vary.

Report spill to Ecology in accordance with the Section S3.E of the NPDES permit included in Appendix D.

Chemical Spills in the influent to the WWTP

Emergency

Response

In the event of a severe chemical spill within the collection system, operators should divert influent flows to the equalization basin and respond to the spill location to verify chemical properties, isolation and clean-up procedures. If possible, continue to equalize influent flows during all clean-up related to the spill.

Report spill to Ecology in accordance with the Section S3.E of the NPDES permit included in Appendix D.

Severe Winter Weather

Emergency

Extreme winter weather in terms of snowfall, ice and freezing temperatures is a possibility at the WWTP.

Response

During normal shifts, ensure all building and equipment heaters and pipe insulation and heating are functioning adequately. Remove ice build-up at surface water locations, especially in the clarifiers. Remove snow from WWTP roadways, walkways and other points of access.

External Communication to WWTP Down

Emergency

External communications from the WWTP are out of service.

Response

The on-call operator should visit the WWTP to ensure processes continue to function adequately during the communication outage and ensure that alarms and statuses are correctly cleared as external communication is restored.

Blocked Primary Access to WWTP

Emergency

The primary access to the WWTP from Cashmere along Riverfront Drive is blocked.

Response

A secondary access to the WWTP from Monitor is shown on the attached figure.

Emergency generator
Primary electrical service to WWTP is aerial over river
Fire hydrant locations
Admin building contains wood-framed interior. Other structures are primarily concrete, wood or steel.
River, roadway and existing dry lagoons provide fire break and defensible space
Riverfront Dr
Primary access to WWTP from Cashmere
Secondary access to WWTP from Monitor
U.S. Highway 2
Railroad Ave
Maple St
Vine St
Parkhill St
S Douglas St
Museum St
E Cashmere Rd
Titchenal Rd
Apple Annie Ave
Titchenal Way
Mt Stuart Dr
Blue Star Way
S Division St
Birch St
Chase Ave
Cedar St
Valley St
Phillips Rd
Olive St
Kennedy Rd
Cascade Pl
Rank Rd
Moody Rd
Harden Rd
Butler Rd
Carey's Corner
Red Apple Rd
Kenyon Rd
2

Appendix I
Plant Staffing

PLANT STAFFING

CURRENT PUBLIC WORKS STAFF

The current Public Works staff responsible for operation and maintenance of the wastewater treatment facility and collections system, as well as the water treatment plant and distribution system, are listed below. Included for each staff position are the current certifications as well as the recommended minimum certifications for future staff in each position.

- Water Resources Department Foreman
  - Primary responsibilities: administration of water and wastewater departments; on-call operator
  - **Current staff wastewater certification: Group II WWTP**
  - Recommended minimum wastewater certification for this position: Group II WWTP
  - Other certifications of current staff: WDM II; WTPO II; CCS; BTO
- WWTP Operator in Charge
  - Primary responsibilities: WWTP lead operator; permit compliance
  - **Current staff wastewater certification: Group III WWTP**
  - Recommended minimum wastewater certification for this position: Group III WWTP as required for Class 3 facility
- Operator
  - Primary responsibilities: laboratory technician; water/wastewater crewman; on-call operator
  - **Current staff wastewater certification: Group II WWTP**
  - Recommended minimum wastewater certification for this position: Group II WWTP
- Operator
  - Primary responsibilities: water/wastewater crewman; on-call operator
  - **Current staff wastewater certification: Group I WWTP**
  - Recommended minimum wastewater certification for this position: Group I WWTP
  - Other certifications of current staff: WDM 2; WTPO 1; CCS/BAT
- Crewman
  - Primary responsibilities: water/wastewater crewman; lab assistant; on-call operator
  - Other certifications of current staff: WDM II

RECOMMENDED WWTF STAFF

The draft permit for the Cashmere WWTF classifies the plant as a Class 3 facility. As such, the operator-in-charge shall be certified by the State of Washington as a Group III operator, or higher, as is currently the case for the Cashmere WWTF. The *2009 General Sewer Plan, Section 9-5 Staffing*, recommended the following staffing for the WWTF and sewer collection system once all improvements related to phosphorus removal are on line (including tertiary filtration).

Task/Duty Assignment	Recommended Full-time Employees
Supervisory	0.75
WWTF Operations	3
Collection system	1.5
Pretreatment Program	1

NORMAL WORKING-DAY STAFFING

The WWTF operates continually 24 hours per day, seven days per week. The WWTF is recommended to be manned for a minimum of 8 hours per day on normal working days. These shifts are responsible for completing the following work:

- Laboratory testing and reporting as required by the NPDES permit (see attached draft permit and factsheet in Appendix D)
- Process control testing and monitoring (see attached sheets in Appendix H)
- General operational procedures related to unit processes
- Equipment maintenance work (either routine or emergency repairs)
- Housekeeping and general facility maintenance
- Administration, record-keeping, training and general staff procedures

NON-WORKING DAY STAFFING

Additionally, one operator should visit the WWTF during each non-working day to perform the following work:

- Complete sampling or laboratory procedures as required by the NPDES permit
- Inspect continuously operating equipment throughout the WWTF, which includes:
    - Headworks screening and grit removal
    - Pumping, mixing and aeration of the activated sludge basins
    - Clarifier operation
    - Thickening system operation
    - Digester aeration and mixing equipment
    - Equipment and sensors that support primary functions
- Acknowledge, and if necessary, act upon minor alarms

It is expected that daily rounds on each non-working day consist of 4 hours of work for a single operator. This estimate is variable based upon the pending permit requirements and infrequent or emergency operation or maintenance procedures required during a non-working day shift.

ON-CALL STAFFING

One operator should be designated to be “on-call” at all times. Typically, call is rotated weekly between operators. The on-call operator shall be available to respond to emergent issues as identified by the WWTF

alarming system. Alarms are directed to the on-call operator's phone, and cascade to other operator's phones if unacknowledged. As such, the on-call operator shall remain within cell phone service and within a reasonable distance to the WWTF in order to visit the WWTF if necessitated by a major/critical alarm. Each operator has remote access the WWTF SCADA system, and can acknowledge minor alarms or make remote process adjustments if necessary, as described in Appendix G.

Appendix J
Equipment Representation, Suppliers and Spare Parts

EQUIPMENT REPRESENTATION, PARTS AND MAINTENANCE

Equipment representation and service changes periodically. The representatives shown below are accurate as of December 2018.

HEADWORKS

Mechanical Fine Screens (Lakeside)

Lakeside Equipment Corporation
1022 E. Devon, P.O. Box 8448, Bartlett, IL 60103
(630) 837-5640

Grit Unit and Grit Classifier (Schloss Engineered Equipment Inc. is now Smith and Loveless)

APSCO, LLC
P.O. Box 2639, Kirkland, WA 98083
(425) 822-3335

Grit Pump (Wemco)

APSCO, LLC
P.O. Box 2639, Kirkland, WA 98083
(425) 822-3335

Gates and Stop Logs (Golden Harvest)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

BASINS

Mixers (Invent)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

Aeration Diffuser System (Sanitaire)

Beaver Equipment
15112 NE 198th Street, Woodinville, WA 98072
(425) 398-8082

D.O. Sensors (Hach)

Hach
P.O. Box 389
Loveland, Colorado 80539-0389
(866) 450-4248

Air Flow Meters (FCI)

Coast Controls and Automation, Inc.
1920 Summit Lake SH RD NW, Olympia, WA 98502
(360) 310-0107

Recycle and EQ Pumps (ABS)

Pump Tech, Inc.
209 S Hamilton Rd., Moses Lake, WA 98837
(509) 766-6330

APSCO, LLC
P.O. Box 2639, Kirkland, WA 98083
(425) 822-3335

Gates and Actuators (Golden Harvest/AUMA)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

Aeration Valves and Actuators (Pratt/Limitorque)

KGS Northwest
12509 Bel-Red Rd # 202, Bellevue, WA 98005
(425) 451-0667

CLARIFIERS (ENVIRODYNE)

Envirodyne Systems, Inc.
75 Zimmerman Drive, Camp Hill, PA 17011-6822
(717) 763-0500

EQUIPMENT BUILDING

DAF Unit (FRC)

FRC Systems
PO Box 314, Cumming, Georgia 30028
(770) 534-3681

Metering Pumps

TMG Services
3216 E Portland Ave, Tacoma, WA 98404
(253) 779-4160

RAS Pumps (Wemco)

APSCO, LLC
P.O. Box 2639, Kirkland, WA 98083
(425) 822-3335

WAS and TS Pumps (Moyno)

APSCO, LLC
P.O. Box 2639, Kirkland, WA 98083
(425) 822-3335

Blowers (Aerzen)

Treatment Equipment Co
14400 Bel-Red Rd # 101C, Bellevue, WA 98007
(425) 641-4306

NPW Pump Station (Pump Tech/Grundfos)

Pump Tech, Inc.
209 S Hamilton Rd., Moses Lake, WA 98837
(509) 766-6330

NPW Screen (Amiad)

S&W Irrigation Supply
920 Walla Walla Ave., Wenatchee, WA 98801
(509) 662-7512

UV DISINFECTION (TROJAN)

Western States Engineering
7088 Red Hawk Drive, Highland, UT 84003
801-376-7262

Wm. H. Reilly & Company
910 SW 18th Ave, Portland, OR 97205
(503) 223-6197

SOLIDS HANDLING BUILDING

Blowers (Aerzen)

Treatment Equipment Co
14400 Bel-Red Rd # 101C, Bellevue, WA 98007
(425) 641-4306

Mixer Aerators (Invent)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

Belt Filter Press (AEROMOD)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

FILTER BUILDING

Cloth Filter (Aqua-Aerobics)

Goble Sampson
22526 SE 64th Place, Suite 240, Issaquah, WA 98027
(425) 392-0491

MISCELLANEOUS (PLANT-WIDE)

Generator

Cummins
3717 McDougall Ave, Everett, WA 98201
(425) 252-7770

NC Power Systems
17900 W Valley Hwy, Tukwila, WA 98188
(425) 251-5877

Flow Meters

Quality Controls Corporation
5015 208th St SW, Lynnwood, WA 98036
(425) 778-8280

Control Valves

GC Systems Inc.
3423, 2310 Inter Ave, Puyallup, WA 98372
(800) 525-9425

Pipe and Fittings

H.D. Fowler Company
5544 Nelpar Drive, East Wenatchee, WA 98802
(509) 886-8804

HVAC Equipment

Wells and Wade Mechanical
218 S Columbia St, Wenatchee, WA 98801
(509) 662-3412

Electrical System

Beckstead Electric, Inc.
92 9th St E, Wenatchee, WA 98801
(509) 663-1148

Control System

RH2 Engineering, Inc.
300 Simon Street SE, Suite 5
(509) 886-2900

Quality Controls Corporation
5015 208th St SW, Lynnwood, WA 98036
(425) 778-8280

EQUIPMENT SPARE PARTS, TOOLS AND WARRANTIES

Primary equipment spare parts and tools are listed herein as well as major warranties.

SPARE PARTS

Headworks

Mechanical Fine Screens (Lakeside)

- Set of brushes
- Set of spacers

Grit Unit and Grit Classifier (Schloss Engineered Equipment Inc. is now Smith and Loveless)

- Oil and grease

Grit Pump (Wemco)

- Oil and grease

Gates and Stop Logs (Golden Harvest)

- None

Basins

Mixers (Invent)

- Oil and grease

Aeration Diffuser System (Sanitaire)

- Diffuser heads and laterals
- Membranes
- Diffuser plugs
- Supports

D.O. Sensors (Hach)

- None (if DO probes out of service, basins may be switched, or airflow mode can be enabled)

Air Flow Meters (FCI)

- None (if airflow meters out of service, basins may be switched, or air flow mode can be enabled)

Recycle and EQ Pumps (ABS)

- Spare recycle pump
- Spare EQ pump

Gates and Actuators (Golden Harvest/AUMA)

- None

Aeration Valves and Actuators (Pratt/Limitorque)

- None

Clarifiers (Envirodyne)

- Oil and grease
- Spare rubber skimmers
- Clarifiers are redundant should one be out of service
- General equipment is warranted for 5 years (Sept of 2019)
- Main gear and bearing is warranted for 10 years (Sept of 2024)

Equipment Building

DAF Unit (FRC)

- Redundant recycle and TS pumps
- DAF may be offline for extended period while digesters are decanted
- Polymer system miscellaneous parts and fittings
- DAF tankage is warranted for 5 years (Sept of 2019)

Metering Pumps

- General pump parts

RAS Pumps (Wemco)

- General pump parts
- Oil and grease

WAS and TS Pumps (Moyno)

- Spare rotors and stators for each size
- General pump parts
- Oil and grease

Blowers (Aerzen)

- Filters, belts and gauges
- Oil and grease

NPW Pump Station (Pump Tech/Grundfos)

- General pump parts
- Oil and grease

NPW Screen (Amiad)

- Oil and grease

UV Disinfection (Trojan)

- Lamps and ballasts
- Cleaning solution for automatic cleaning system

Solids Handling Building

Blowers (Aerzen)

- Filters, belts and gauges
- Oil and grease

Mixer Aerators (Invent)

- Oil and grease

Belt Filter Press (AEROMOD)

- Miscellaneous minor equipment parts and fittings
- Polymer system miscellaneous parts and fittings
- Oil and grease

Filter Building

- Filter cloth and frame assembly
- Effluent lip seal
- 2" ball valve and actuator
-

WARRANTIES

HVAC Equipment

- Admin building heat pump is warranted for 5 years (Sept of 2019)

Standing Seam Metal Roofing

- Standing seam metal roofing (Headworks, Admin, Equipment and Solids Handling Buildings) is warranted for 20 years (Sept of 2034)

Sheet Metal Siding

- Sheet metal siding coating is warranted for 25 years (Sept of 2039)

Vinyl Windows

- Warranted for 10 years (Sept of 2024)

Pipe Heat Tracing Systems

- Warranted for 10 years (Sept of 2024)

Evaporation Pond Liner

- Warranted for 5 years (Sept of 2019)

MAJOR TOOLS ONSITE

1. Welding equipment
2. Hoist, retrieval and removal equipment
3. General mechanical and carpentry tools and equipment
4. Compressed air system

Appendix K
Operator Recordkeeping and Lab Forms

1. BOD BENCHSHEET
2. DO BENCH SHEET
3. FECAL COLIFORM
4. PH BENCH SHEET
5. TSS BENCH SHEET
6. OPERATORS DAILY LOG SHEET
7. FILTER BELT PRESS LOG
8. EQUIPMENT MAINTENANCE LOG

BOD Benchsheet

Facility:	

Method Number:	SM 5210B	Edition:	

Lot Code Information	
Powder pillow	
Phosphate buffer	
Magnesium sulfate	
Calcium chloride	
Ferric chloride	
Nitrification Inhibitor	
GGA	
Seed	
Source of dilution water	

Initial Calibration	
Analyst	
DO Cal. Temp. (°C)	
Cal. pressure (mm Hg)	
Cal. value (mg/L)	
Cal. value from table	
Date	
Time	
Incubator Temp.	

Final Calibration	
Analyst	
DO Cal. Temp. (°C)	
Cal. pressure (mm Hg)	
Cal. value (mg/L)	
Cal. value from table	
Date	
Time	
Incubator Temp.	

Quality Control
Blanks ≤ 0.2 mg/L
GGA = 167.5 - 228.5
Residual DO ≥ 1.0 mg/L
DO depletion ≥ 2.0 mg/L

Depletion due to sample (J) = H - I

BOD (K) = J x D

A	B	C	D	E	F	G	H	I	J	K	L
Sample ID	Bottle #	Sample (mL)	Dilution Factor	Seed (mL)	Initial DO (mg/L)	Final DO (mg/L)	DO Depletion (mg/L)	DO depl. due to Seed (mg/L)	DO depl. due to Sample (mg/L)	BOD (mg/L)	Comments
Blank #1											
Blank #2											
Blank #3											
GGA #1											
GGA #2											
GGA #3											
Seed Control #1											Dep. per ml of seed =
Seed Control #2											Dep. per ml of seed =
Seed Control #3											Dep. per ml of seed =

City of Cashmere Wastewater Treatment Plant

DO Bench Sheet

SM 4500-0 G-01

Initials	Date of Sample	Date of Analysis	mmHg	%	Temp	Sample ID	DO mg/l

City of Cashmere Wastewater Treatment Plant

Fecal Coliform

SM 9222D

Started		Finished	
Date			
Analyst			
Time In		Time Out	
Incubator Temp			
Sample Date			

Sample ID:

Plate #		mL Filtered	Fecal Colonies Counted	DFU/100 mL
1	Blank	100		
2	Effluent			
3	Effluent			
4	Effluent			
5	Blank	100		

Report CFU/100mL:*	

Date Data Reviewed

Signature of Reviewer

City of Cashmere Wastewater Treatment Plant

pH Bench Sheet

SM 4500 H+B-00

Initials	Date	Time	Analyst	Sample ID	Cal Std 4	Cal Std 7	Cal Std 10	Cal Slope	Cal Std 5	Sample Temp	Sample pH

City of Cashmere Wastewater Treatment Plant

TSS Bench Sheet

SM 2540 D-97

Initial	Date Sampled	Date Analyzed	Sample ID	Wet Filter Weight	Dry Filter Weight	Dry Residue Weight	ml of Sample	Sample Volume	Placed in Oven			Removed from Oven		
									Date	Time	Temp	Date	Time	Temp

CASHMERE WWTF OPERATORS DAILY LOG SHEET

Date:	Time:	Operator:	Rainfall:

HEAD WORKS

Influent Temperature							
Raw Sampler							
Fine Screens		Dumpster Level		Heat Trace		OH Heaters	
Grit Removal Basin							
EQ Basin & Splitter							
Grit Pump							
Grit Classifier		Dumpster Level					

(October thru April)

AERATION BASIN NO. 1

AN	MIXER		ORP		pH	
AX1	MIXER					
AX2	MIXER		ORP		pH	
AX3	MIXER		(basin meter)		(hand held)	
OX1			DO/T°	/	DO	
OX2	Ph		DO/T°	/	DO	
OX3	MIXER		DO/T°	/	DO	
Purge Water						
Aeration Pattern						

AERATION BASIN NO. 2

AN	MIXER		ORP		pH	
AX1	MIXER					
AX2	MIXER		ORP		pH	
AX3	MIXER		(basin meter)		(hand held)	
OX1			DO/T°	/	DO	
OX2	Ph		DO/T°	/	DO	
OX3	MIXER		DO/T°	/	DO	
Purge Water						
Aeration Pattern						

CLARIFIER NO. 1

Blanket Depth	
Drive	
Surface	

CLARIFIER NO. 2

Blanket Depth	
Drive	
Surface	

RAS PUMPS

RAS Pump No. 1	
RAS Pump No. 2	
RAS Backup	

WAS PUMPS

WAS Pump No. 1	
WAS Pump No. 2	

DAF Unit

DAF Unit	
Compressor (blower Room)	

BELT FILTER PRESS

Polymer Feed	

UV DISINFECTION

Effluent Temperature	
UV Banks Operating	
Cleaning System	
Sampler	

DIGESTER NO. 1

Digester Blower No. 1	
Digester Blower No. 2	
Mixer	

DIGESTER NO. 2

Digester Blower No. 1	
Digester Blower No. 2	
Mixer	

CAT GENERATOR

Fuel	

Notes:

Filter Belt Press Log

Date	gpm	total gallons	polymer used	digester 1 level before/after	digester 2 level before/after	total yards solids	notes

Equipment Maintenance Log

Equipment description: _____

Serial Number: _____ **Model Number:** _____

Date:	Action Taken/Comments:	Initials