Background

The Pinole-Hercules Water Pollution Control Plant (WPCP) provides treatment of wastewater for the Cities of Pinole and Hercules and operates under National Pollutant Discharge Elimination System (NPDES) Permit Number CA 0037796. The WPCP treats an annual average flow of approximately 3.5 million gallons per day (mgd), and peak wet weather flows up to 15 mgd. Currently, flows in excess of 10.3 mgd do not receive secondary treatment and are blended with secondary effluent, disinfected and discharged to San Pablo Bay via Rodeo Sanitary District's outfall (Deep Water Outfall) and the Emergency Outfall which is located west of the treatment plant site.

In August, 2012 the WPCP was issued a revised NPDES permit that requires the WPCP to:

- Provide full secondary treatment for influent flows up to 20 mgd, and
- Limit use of the Emergency Outfall to flows in excess of 14.6 mgd.

The compliance schedule in the NPDES permit requires upgrades to be operational by June 1, 2017.

In June 2012, the Cities of Pinole and Hercules began preparation of a Preliminary Design to identify the treatment and conveyance upgrades needed to meet the NPDES permit requirements. This Executive Summary provides an overview of the Preliminary Design and the recommended improvements. The detailed engineering analyses can be found in the attached technical memoranda.

Wastewater Characteristics

An evaluation of historical flows and loads to the WPCP was performed to establish design criteria for the treatment and conveyance facilities. Table ES-1 summarizes the influent flows and organic and solid loads that the preliminary design is based on.

Table ES- 1: Design Wastewater Characteristics

Condition	Flow (mgd)	BOD Load[1] (lbs/day)	TSS Load[2] (lbs/day)
Average Dry Weather (ADWF)	4.06	10,500	10,500
Annual Average (AA)	4.60	10,830	11,410
Maximum Month (MM)	6.09	12,300	13,260
Maximum Day (MD)	11.33	18,630	26,020
Maximum Hour[3]	20.00	NA	NA

1) BOD = Biochemical Oxygen Demand
2) TSS = Total Suspended Solids
3) The maximum hour flow identifies the hydraulic capacity of the plant. Hourly data to determine BOD and TSS loading to the plant is not available.

Influent Pumps and Headworks

Currently influent wastewater from the Cities of Pinole and Hercules are combined upstream of the influent pump station and headworks facility. The existing influent pump station and headworks facility is located to the east of Primary Clarifier 1 and 2 (PC 1 and PC 2) and to the south of the anaerobic digesters (Figure ES-1). Because the Cities of Pinole and Hercules share the operating costs of the WPCP, influent flow from each city is individually metered and recorded upstream of the influent pump station. The existing flow meters do not provide accurate readings at low flow conditions. A single mechanical bar screen treats influent flows up to 6 mgd and flows greater than 6 mgd pass through a manually raked bar screen. The spacing and configuration of the bar screens is not optimal and debris is carried through to downstream processes. Screened wastewater is pumped to the primary clarifiers. The existing influent pump station has a firm capacity of approximately 15 mgd and grit removal is not provided at the headworks.

A new influent pump station and headworks facility will be constructed to the south of the existing facility (Figure ES-2). The preliminary design includes new influent flow meters for the City of Pinole's and the City of Hercules' sewer lines to provide accurate measurements for flows up to 20 mgd. A self-cleaning wet well and new influent pump station will be constructed on the south side of the WPCP. Four influent pumps (three duty, one standby) will be installed to provide a firm pumping capacity of 20 mgd. Two perforated plate fine screens will be installed upstream of the pumps and a single vortex grit chamber will be provided to treat flows up to 20 mgd. The headworks facility will also include a screenings washer compactor to remove organics from the screenings and to dewater screenings prior to disposal. Two grit pumps, two grit cyclones, and a grit classifer will be provided to pump and dewater grit from the vortex chamber. The proposed headworks facilities will improve debris removal, protect the influent pumps, and will provide grit removal at the front of the plant. These features will reduce operations and maintenance requirements on downstream equipment by minimizing wear and tear on downstream pumps and by reducing grit and screening accumulations in downstream tanks.

Primary Clarification

Existing Facility

The three existing primary clarifiers have an approximate capacity of 12 mgd. The age of the primary clarifiers ranges from over 50 years to 30 years old. There is no bypass around the primary clarifiers and flows greater than 12 mgd are currently routed to the primary clarifiers, which negatively impacts their performance. Solids removed at the primary clarifiers are pumped as primary sludge to the solids handling facilities. The primary sludge pumps require replacement due to age and wear and tear from grit and debris in the sludge. The weirs on Primary Clarifier 1 (PC 1) and Primary Clarifier 2 (PC 2) also need to be reset to improve performance.

1" = 30'

PARCEL 5b 4958 or 483
CONTRA COSTA COUNTY
FLOOD CONTROL

FLOOD CONTROL

SECONDARY CLARIFIER DISTRIBUTION BOX

SECONDARY CLARIFIER #3
SECONDARY CLARIFIER #4
SECONDARY CLARIFIER #5
SECONDARY CLARIFIER #2
SECONDARY CLARIFIER #1
PS-1
AERATION BASINS
DIGESTER #3
DIGESTER #4
DIGESTER #1
DIGESTER #2
AREA UNDER CONSTRUCTION
CO-GEN
TANK
PRIMARY CLARIFIER #3
PRIMARY CLARIFIER #1
PRIMARY CLARIFIER #2
CHLORINE CONTACT BASIN
PRIMARY EFFLUENT DISTRIBUTION BOX
EMERGENCY OUTFALL STRUCTURE
30" EMERGENCY OUTFALL
36" SEWER
SHALLOW WATER OUTFALL
AC PATH
SAN PABLO BAY
HEADWORKS
HYPO TANK
MAINT SHOP
PRIMARY CLARIFIER DISTRIBUTION BOX
EFF PUMP STATION
BLOWER BLDG
FERROUS TANK
CONTROL BLDG
AC PAVING
DEWATERING
ODOR CONTROL
GST
CITY PUBLIC WORKS BUILDING
CAUSTIC
POLYMER STORAGE
COORPORATION YARD BUILDING
FUEL STORAGE
GASOLINE
WASTE OIL
PAINT
BISULFITE
DIESEL
OIL
AC PARKING
OUTFALL PIPELINE – TO DEEP WATER OUTFALL
BAYFRONT PARK (CITY OWNED)
WPCP DEED LINE
WPCP FENCE LINE
PARCEL 5b 4958 or 483 CONTRA COSTA COUNTY FLOOD CONTROL
RAILROAD AVENUE
CITY OF HERCULES INFLUENT SEWER
CITY OF PINOLE INFLUENT SEWER
UNION PACIFIC RAILROAD
FENCE
GATE
RAMP
WALL
PIPE
DENSE TREES AND BRUSH
DENSE TREES AND BRUSH GROUND NOT VISIBLE
ASPH.
R/R SIG.
POST

0 1" 2"

PINOLE/HERCULES WPCP PROJECT

EXISTING SITE PLAN

Figure ES–1

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1" = 30'

PARCEL 5b
4958 or 483
CONTRA COSTA COUNTY FLOOD CONTROL

EXTEND AERATION BASINS

REPLACE RAS/WAS PUMPS, REHAB PS-1

SECONDARY CLARIFIER #4

SECONDARY CLARIFIER #3

SECONDARY CLARIFIER #5

AB #4

AB #3

AB #2

AB #1

RELOCATED FLARE

ODOR CONTROL

SLUDGE STORAGE

NEW SECONDARY CLARIFIER DISTRIBUTION BOX

CONSTRUCT TWO NEW 65 FT DIAMETER CLARIFIER

65 FT DIAMETER SECONDARY CLARIFIER #2

65 FT DIAMETER SECONDARY CLARIFIER #1

DIGESTER #3

DIGESTER #4

CO-GEN

NEW SOLIDS HANDLING BUILDING

PARCEL 5b
4958 or 483
CONTRA COSTA COUNTY FLOOD CONTROL

DIGESTER #1

DIGESTER #2

CONVERT EXISTING POLYMER STORAGE AREA TO MAINTENANCE SHOP AND ELECTRICAL ROOM

EXISTING CHLORINE CONTACT BASIN

#1

#2

PRIMARY CLARIFIER #1

45 FT DIAMETER PRIMARY CLARIFIER #3

INTERCEPTOR MANHOLE

REPLACE EXISTING BLOWERS

BLOWER BUILDING

HERCULES FLOWMETER MANHOLE

CITY OF HERCULES INFLUENT SEWER

30" EMERGENCY OUTFALL

EMERGENCY OUTFALL STRUCTURE

PRIMARY EFFLUENT DISTRIBUTION BOX

PRIMARY EFFLUENT JUNCTION BOX

HYPOCHLORITE/BISULFITE STORAGE AND DOSING

CONTROL BUILDING

INTERCEPTOR MANHOLE

PRIMARY CLARIFIER #2

EFFLUENT PUMP STATION

PINOLE FLOWMETER MANHOLE

CITY OF PINOLE INFLUENT SEWER

OUTFALL PIPELINE

ELECTRICAL BUILDING

30" BYPASS

30" INFLUENT

FENCE LINE

INFLUENT PUMPING STATION, HEADWORKS, AND GRIT SCREENING FACILITY

BAY FRONT PARK (CITY OWNED)

0 1" 2"

PINOLE/HERCULES WPCP PROJECT
WATER PLANT UPGRADE
PRELIMINARY DESIGN SITE PLAN

Figure ES-2

C:\Jaworking\800\10448247\Figure ES-2.dwg
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To improve overall plant performance the Preliminary Design includes replacement of the primary sludge pumps and installation of a bypass pipeline around the primary clarifiers for flows greater than 12 mgd. The weirs on PC 1 and PC 2 will be reset. Providing grit removal at the headworks will reduce operations and maintenance issues with the primary sludge pumps and extend their useful life. To accommodate the secondary treatment facilities, PC 3 will be relocated to the east of PC 1 and PC 2 as shown in Figure ES-2.

Secondary Treatment

The secondary treatment facilities include the aeration basins, aeration blowers, secondary clarifiers and return activated sludge (RAS) /waste activated sludge (WAS) pumps. The existing facilities provide activated sludge treatment of primary effluent for flows up to 10.3 mgd. Peak flows greater than 10.3 mgd bypass secondary treatment and are routed to disinfection.

Flow equalization was reviewed during Preliminary Design as a way to minimize expansion of the secondary treatment facilities. Due to land constraints it was determined that flow equalization was not a feasible option. The secondary treatment upgrades will provide treatment and conveyance for flows up to 20 mgd. New facilities will be constructed within the WPCP deed line and will not encroach onto designated areas of the City of Pinole's Corporation Yard (currently located on the northeastern corner of the WPCP site).

Although the current WPCP discharge permit does not require ammonia or nitrogen removal, it is anticipated that future regulations may include tighter ammonia and/or nitrogen limits. Furthermore, providing nitrification and denitrification reduces annual disinfection costs (i.e., chemical consumption) because of the improved secondary effluent quality. A net present worth evaluation was performed taking into consideration construction and annual operating expenses for secondary treatment and disinfection with and without nitrification. Nitrification had the lowest net present worth and was included in the Preliminary Design. The recommended secondary treatment improvements are as follows:

- Aeration Basins: The aeration basins are designed to treat projected maximum month loads. The hydraulic capacity of the basins will be 20 mgd. The existing basins will be extended by 90 feet to the east and a total of two aeration trains will be provided. Each train will consist of two anoxic zones for denitrification (each installed with a submersible mixer to keep solids in suspension) and three aerobic zones (each installed with fine bubble diffusers). Internal mixed liquor recycle will be provided with a submersible propeller pump. During peak wet weather events, the trains are designed to operate in contact stabilization mode.

- Aeration Blowers: New, high speed turbo aeration blowers will be installed in the existing Blower Building and the existing blowers will be demolished. The aeration blowers can meet the air demands from maximum week loads.

- Secondary Clarifiers: Two new clarifiers will be constructed after demolition of existing Secondary Clarifier 1 (SC 1), Secondary Clarifier 2 (SC 2) and PC 3. The new secondary clarifiers will have a 65-ft diameter and will operate in parallel with existing Secondary Clarifiers 3, 4 and 5 (SC 3, SC 4 and SC 5). A new secondary clarifier splitter box will also be constructed on the west side of the aeration basins. Three new return activated sludge (RAS) pumps and two new waste activated sluge (WAS) pumps will be installed and the old pumps will be demolished. RAS will be routed to the Primary Effluent Distribution Box where it will mix with primary effluent prior to being routed to the aeration basins.

Disinfection

Chlorine disinfection is currently used at the WPCP to meet total coliform and enterrococcus bacteria permit limits. Two chlorine contact basins are located on the west side of the plant near the Effluent Pump Station and Emergency Outfall. During peak wet weather events, primary effluent and secondary effluent are blended upstream of the contact basins. Prior to discharge all treated effluent is dechlorinated as required by the NPDES permit.

Chlorine and ultraviolet (UV) disinfection were considered for the WPCP disinfection upgrades. The net present value of both disinfection systems was determined to be less if nitrification is provided upstream of disinfection. The recommended option at the WPCP is to provide nitrification upstream of disinfection and continue to use chlorine disinfection for the following reasons:

- Chlorine disinfection has a lower construction cost than UV disinfection because the existing chlorine contact basin will be retained.
- Labor requirements for UV lamp replacement and cleaning are estimates and are uncertain because UV disinfection would be a new process at the WPCP.
- In near term, permit limitations for disinfection byproducts are not expected. If regulations change and UV disinfection is required, UV disinfection can be accommodated because nitrification is being implemented now.

The existing chlorine contact basin will be used after the plant upgrades are completed. The sodium hypochlorite and sodium bisulfite storage tanks will be relocated to the north of the Effluent Pump Station to accommodate the new Electrical Building and the relocated PC 3. New chemical dosing equipment will be installed adjacent to the chemical storage tanks.

Solids Handling

The existing solids handling facilities include a gravity sludge thickener, grit removal of primary sludge, a single rotary drum thickener for additional sludge thickening, anaerobic digestion, and two dewatering centrifuges. The WPCP has adequate anaerobic sludge digestion

capacity and therefore improvements to this system are not required and are not within the scope of the Preliminary Design. Portions of the sludge thickening and dewatering equipment are aged and in need of replacement and/or are undersized. Furthermore, the existing solids thickening and dewatering facilities need to be relocated to accommodate the expansion of the aeration basins.

The Preliminary Design will provide a new Solids Handling Facility to the east of the anaerobic digesters. An enclosed building that will house polymer storage and dosing pumps, sludge thickening equipment, and a biosolids truck loadout area will be provided. The building will have a second story above the biosolids truck loadout area. Two dewatering centrifuges will be installed on the second story under a metal canopy. Odor control will be provided for the first floor building air to minimize odors to adjacent property owners. By enclosing the solids facilities that generate odors, complaints from the public and adjacent landowners will be minimized. The existing rotary drum thickener and one of the dewatering centrifuges are in good condition and will be reused. To provide adequate redundancy a standby rotary drum thickener and dewatering centrifuge will be provided. The gravity sludge thickener will be replaced with a solids holding/blend tank that will provide operations with adequate capacity and operational control for the secondary system and the anaerobic digesters.

Effluent Pump Station

The existing effluent pump station consists of three, 200 horsepower, vertical turbine pumps (two duty and one standby) with a firm capacity of approximately 10.3 mgd. The Effluent Pump Station pumps treated effluent to the Deep Water Outfall via a 24-inch Outfall Pipeline. The Deep Water Outfall is over four miles from the WPCP.

The NPDES permit requires the WPCP to discharge treated effluent up to 14.6 mgd to the Deep Water Outfall. The intent of the requirement was to avoid construction of a parallel Outfall Pipeline, and to only use the existing Outfall Pipeline for conveyance to the Deep Water Outfall. The Preliminary Design effort determined that the pressure rating of the Outfall Pipeline limits the flow that can be delivered to the Deep Water Outfall. Depending on sea level elevation at the time of discharge, the peak flow that can be pumped to the Deep Water Outfall in the existing Outfall Pipeline is 13.9 to 14.2 mgd.

Based on the capacity limitation of the Outfall Pipeline, the recommended approach is to reuse the existing Effluent Pump Station structure. The existing pumps will be replaced with three new pumps (2 duty, 1 standby). The new pumps (400 horsepower each) will pump 13.9 to 14.2 mgd of treated effluent to the Deep Water Outfall. It is also recommended that WPCP Staff initiate discussions with the RWQCB to amend the NPDES permit so that use of the Emergency Outfall is permitted for flows greater than 13.9 mgd versus 14.6 mgd.

Outfall Pipeline

Several improvements are needed to increase the capacity of the discharge conveyance system to 13.9 mgd:

- A single manhole will be modified because under the new operation the pipeline will be pressurized at this location.
- Surge protection will be provided to protect the pipeline.
- Approximately 26 feet of pipe will be replaced to reduce headloss in the system and maximize the flow that can be conveyed to the Deep Water Outfall.

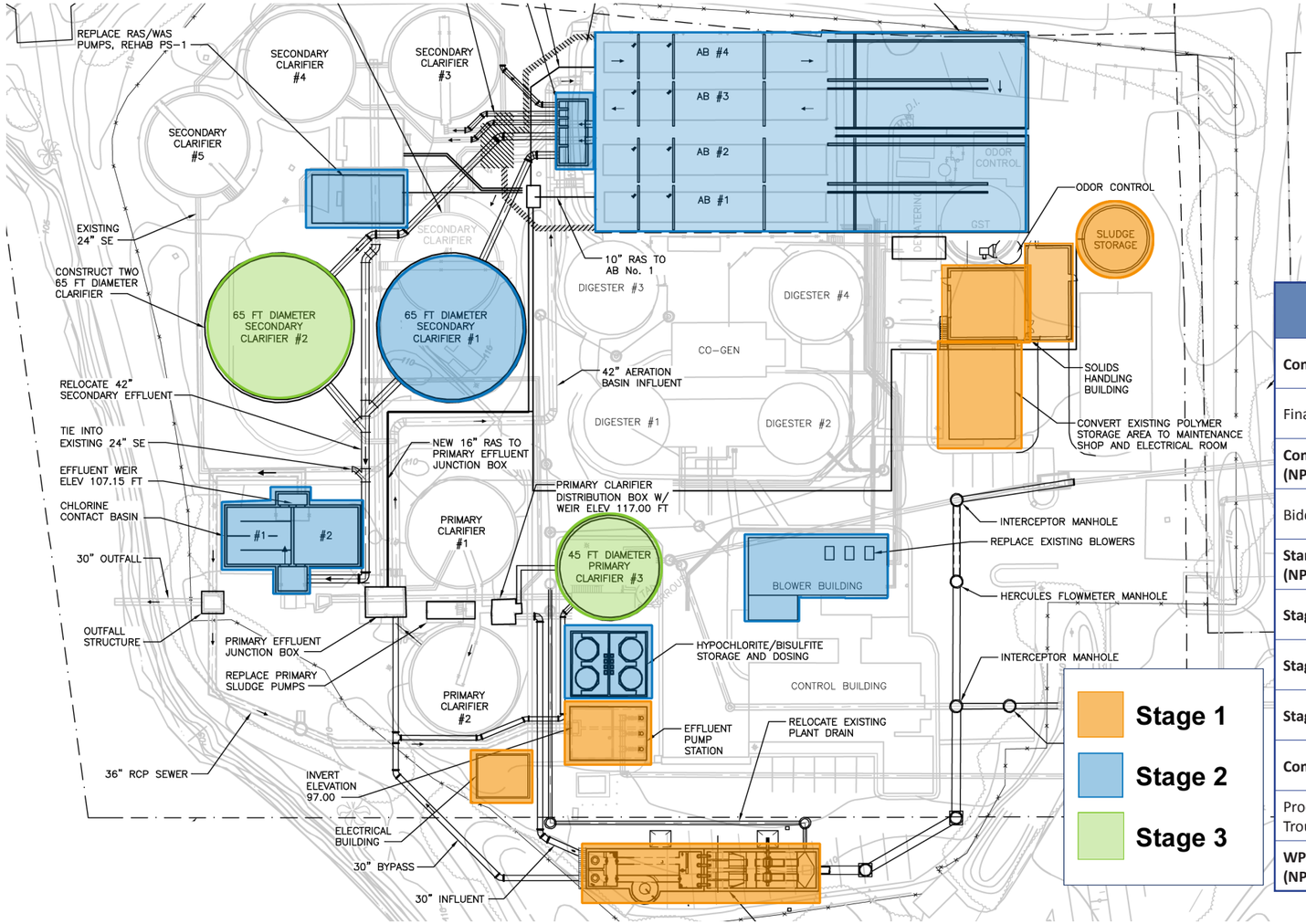
Electrical Facilities

The existing electrical demands at the WPCP are within the capacity of the existing electrical system. Under the planned upgrades, the electrical loads will increase and a new electrical service is needed. The preliminary design includes provisions for a new primary electrical service at the WPCP. The existing electrical service connections will be maintained and the new service will be in addition to the existing service connections. A new electrical room and standby generator will be needed primarily for the new effluent pumps. The standby generator will operate in parallel with the existing generators at the WPCP. The new switchgear for the new electrical service and the new generator will be located west of the Effluent Pump Station.

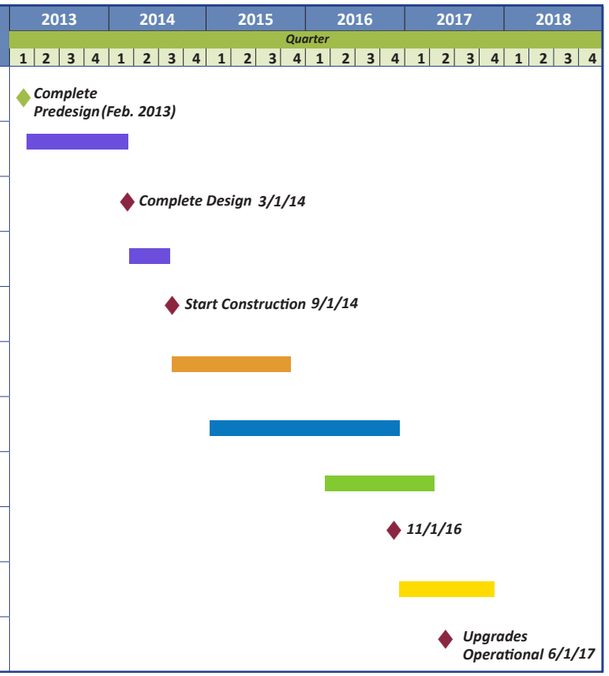
Construction Schedule

The WPCP's NPDES permit includes a schedule for the design, construction and startup of the new treatment and conveyance facilities. A construction phasing schedule was developed to address constraints associated with keeping the existing facilities operational and in compliance during construction, startup and commissioning. Construction was assumed to start on September 1, 2014 per the NPDES permit compliance schedule. The construction phasing plan consists of three phases or stages as shown in Figure ES-3. Construction and commissioning of the upgrades will be completed by June 1, 2017. Additional time was allocated for process optimization and troubleshooting.

Construction Schedule & Sequencing



Task Name	Start	Finish
Complete Preliminary Design	2/28/13	2/28/13
Final Design of WPCP Upgrades	3/1/13	3/1/14
Complete Final Design (NPDES Permit Compliance Date)	3/1/14	3/1/14
Bidding and Award	3/1/14	8/28/14
Start Construction (NPDES Permit Compliance Date)	9/1/14	9/1/14
Stage 1 Construction	9/1/14	12/4/15
Stage 2 Construction	1/19/15	11/18/16
Stage 3 Construction	3/28/16	4/21/17
Complete Construction	11/1/16	11/1/16
Process Optimization and Troubleshooting	11/18/16	11/1/17
WPCP Upgrades Operational (NPDES Permit Compliance Date)	6/1/17	6/1/17



Construction Costs

The preliminary design construction and project cost estimate is summarized in Table ES-2. Construction costs were escalated to the midpoint of construction (January 2016) and a 25 percent allowance was included for engineering and administrative costs.

Table ES- 2: Total Construction and Project Costs

No.	Description	Cost
1	Headworks[1]	$ 4,990,000
2	Electrical [1,2]	$ 2,120,000
3	Secondary Treatment [1,3]	$ 13,001,000
4	Chlorine Disinfection[1]	$ 785,000
5	Effluent Pump Station[1]	$ 1,031,000
6	Solids Handling[1]	$ 3,336,000
7	Outfall Pipeline Improvements[1]	$ 254,000
	Subtotal in 2012 dollars [1]	$ 25,517,000
	Construction Contingency [1,4]	$ 4,514,000
	Total Construction Costs in 2012 dollars	$ 30,031,000
	Total Construction Costs in 2016 dollars [5] (escalated to midpoint of construction)	**$ 33,148,000**
	Engineering and Administration [6]	$ 8,287,000
	Total Project Costs in 2016 dollars	**$ 41,435,000**

(1) Construction costs in 2012 dollars.
(2) Includes costs for new primary service, new standby generator and new electrical building.
(3) Secondary treatment includes costs for aeration basin and blower upgrades, new secondary clarifiers, and primary clarifier improvements and relocation.
(4) 20 percent construction contingency on Divisions 2 through 16.
(5) Costs escalated to 2016 dollars using a rate of 2.5 percent per year.
(6) Engineering and administration cost is 25 percent of total construction cost. Costs are presented in 2016 dollars.

Table ES- 3: Summary of Preliminary Design Facilities

Facility	Existing Facility Overview	Issues with Existing Facilities	Preliminary Design Features
Influent Pump Station	• Firm pump capacity of 15 mgd	• Existing facility can not handle influent flows up to 20 mgd	• Firm pump capacity of 20 mgd
Headworks	• Coarse screening for flows up to 15 mgd • One mechanical bar screen for up to 6 mgd • Manual bar screen for flows greater than 6 mgd. • No grit removal	• Poor screening and lack of grit removal increase O&M requirements of downstream equipment	• Fine screening for flows up to 20 mgd • Grit removal for flows up to 20 mgd
Primary Clarifiers	• Capacity of 12 mgd • No bypass around primary clarifiers for flows greater than 12 mgd • Primary sludge pumps need replacement • PC 1 and PC 2 weirs need to be reset.	• Primary clarifier performance is impacted when flows greater than 12 mgd are routed to the clarifiers • Primary sludge pumps require replacement due to age and wear and tear from grit	• Relocation of one primary clarifier and ancillary facilities • Replacement of primary sludge pumps • Bypass line around primary clarifiers for flows greater than 12 mgd
Secondary System Aeration Basins Aeration Blowers Secondary Clarifiers	• Peak wet weather capacity up to 10.3 mgd	• Hydraulic capacity of existing facilities is 10.3 mgd • Poor sludge settleability requires polymer use • Poor secondary effluent quality requires more disinfection chemicals • Future regulations may require ammonia and/or nitrogen removal to be provided	• Peak wet weather capacity up to 20 mgd • Reuse existing aeration basins and increase volume • Reuse three existing secondary clarifiers and construct two new clarifiers • New blowers in existing building • Provide ammonia and nitrogen removal
Solids Handling Facilities (Thickening and Dewatering)	• Gravity sludge thickener and single rotary drum thickener • Dewatering centrifuges (2); one centrifuge and feed pump requires replacement • Outdoor facility, no odor control provided	• Outdoor thickening and solids truck loadout area result in odor complaints from the public • Anaerobic digester performance is impacted by inconsistent feed system	• Relocate thickening and dewatering facility • Solids blend tank to facilitate operation of secondary system, solids thickening system and anaerobic digesters • Indoor thickening and solids truck loadout area with odor control
Disinfection	• Chlorine contact basin and chemical addition facilities for chlorine and dechlorination	• Poor secondary effluent quality results in higher chemical consumption	• Reuse existing chlorine contact basin • Relocation of chemical storage and dosing equipment • Replace chlorine dosing equipment to improve performance
Effluent Pump Station (to Deep Water Outfall)	• Firm capacity of 10.5 mgd • Flows in excess of 10.5 mgd discharge to Emergency Outfall	• Existing pumps can not deliver more than 10.5 mgd to the Deep Water Outfall	• Reuse existing wet well • Replace existing pumps and provide firm capacity of 13.9 mgd
Outfall Pipeline	• Single 24-inch pipeline • Part of pipeline is gravity flow • Pressure rating of 100 psi	• Pressure rating limits amount of flow that can be pumped to the Deep Water Outfall • Modifications are needed to pump 13.9 mgd to the Deep Water Outfall	• Modify manhole at highest elevation • Surge protection to protect pipeline • Replace 26 ft of pipeline at the former Eductor Station