ENGINEERING REPORT

PINOLE - HERCULES WATER POLLUTION CONTROL PLANT FACILITIES PLAN

JUNE 1, 2009

PINOLE - HERCULES
WATER POLLUTION CONTROL PLANT FACILITIES PLAN
ENGINEERING REPORT

SIGNATURE PAGE

This document has been prepared under the general supervision and direction of the following professional engineer, licensed in the State of California.

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5/28/09

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SECTION ONE

EXECUTIVE SUMMARY

Introduction

The Pinole-Hercules Water Pollution Control Plant (WPCP) Facilities Plan engineering report was prepared to comply with Regional Water Quality Control Board (RWQCB) Order No. R2-2007-0024, Provision C.2.c. Task 2. The provision mandates corrective measures to upgrade the WPCP to increase dry and wet weather treatment capacity, eliminate blending of partially treated wastewater transported to the deep water outfall 001, and to prevent discharge through the shallow water outfall 002. The RWQCB has set a compliance time schedule, as shown in Table 1-1, so that all facilities are completed and on line by June 1, 2016. Accordingly, Task 2 which requires an engineering report that describes the WPCP upgrades that will increase the treatment capacity of the facility, and shall also include a complete antidegradation analysis that fully addresses consistency with the State Water Resources Control Board Resolution 68-16, and 40 CFR 131.12 must be submitted by June 1, 2009. The antidegradation analysis and financial analysis will be submitted as separate reports.

TABLE 1-1. RWQCB COMPLIANCE TIME SCHEDULE

Task	Compliance Date
1. Submit a Collection System Master Plan	June 1, 2008
2. Submit an Engineering Report identifying proposed plant upgrades	June 1, 2009
3. Submit certified EIR for project identified in Task 2.	August 1, 2010
4. Secure funding for WPCP upgrades	August 1, 2011
5. Start design of WPCP facilities	August 1, 2012
6. Complete final design of WPCP facilities	August 1, 2013
7. Commence construction of WPCP facilities	June 1, 2014
8. Complete construction of WPCP facilities	November 1, 2015
9. Ensure WPCP facilities are online and operational	June 1, 2016
10. Status report of collection system projects and WPCP upgrades	Annually (due February 1)

Background

The existing Pinole-Hercules WPCP is owned and operated by the City of Pinole under a joint use agreement with the City of Hercules. The agreement creates a governing body, the joint powers authority (JPA), which includes officials from both cities. The JPA has been meeting over several years to discuss various options for upgrading the wastewater treatment plant to comply with the current RWQCB permit requirements.

In 2007, the JPA retained Brown and Caldwell to evaluate plant upgrades and disposal options at the existing WPCP and Carollo Engineers to evaluate sending wastewater generated by the Cities of Pinole and Hercules to West County Wastewater District (WCWD) for treatment and disposal to bring the WPCP into compliance. A total of eight (8) treatment and disposal options were developed.

Dodson Psomas, as an independent third party, was retained by the JPA in 2008 to conduct a peer review of the engineering studies prepared by Brown and Caldwell and Carollo on the various options. The peer review study recommended that the JPA proceed with a more detailed engineering report that evaluates not more than two options and develops a predesign for the selected option. The options suggested for further study were Option 2 (New Land Outfall) and Option 4 (Flow Equalization).

On December 10, 2008, City of Pinole representatives on the JPA recommended that additional engineering studies are required to meet the RWQCB deadline. On December 16, 2008, the Pinole City Council authorized this engineering report to further evaluate Option 2 and Option 4, and recommend the apparent best project and required WPCP upgrades.

Existing Facilities

The Pinole-Hercules Water Pollution Control Plant is located at the end of Tennent Avenue in the City of Pinole. Wastewater from the City of Pinole and Hercules is treated at this site and pumped to a joint outfall with Rodeo Sanitary District. Figure 1-1 is a site map showing the location of existing facilities and Figure 1-2 shows the layout of the existing WPCP.

Existing Plant Loadings

Historic plant loadings for Pinole have shown extreme variation for Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). Efforts by the WPCP have significantly reduced the extreme variation in samples and the overall loads since June 2008. Table 1-2 shows the current combined loadings for both Pinole and Hercules.

TABLE 1-2 CURRENT FLOWS AND LOADINGS

Parameter	Combined Influent
Average Dry Weather flow (mgd)	3.0
Peak Wet Weather flow (mgd)	22
Influent BOD (lb/day)	7,300
Influent TSS (lb/day)	8,000

Existing Treatment Process

Flow from Pinole and Hercules enters the headworks, is conveyed to a mechanical screen or through a manually cleaned bar screen, and then to the influent pump station wet well. The influent pump station has a firm capacity of 15 mgd. Ferrous chloride is added to the combined influent for odor control and digester gas hydrogen sulfide reduction.

Wastewater is pumped to the primary clarifier flow distribution box which distributes flow to three primary clarifiers that have a capacity of approximately 12 mgd. Hydraulically the clarifiers have handled flow in excess of 20 mgd during unusual wet weather events. Floatable material is removed and conveyed directly to the anaerobic digesters. Settleable material is removed from the flow stream by gravity and conveyed to the solids handling area.

ALIGNMENT FOR EXISTING 24-INCH LAND OUTFALL

PIPELINE IMPROVEMENT FOR EXISTING 24-INCH LAND OUTFALL (UNDER CONSTRUCTION)

DODSON PSOMAS

BAR IS ONE INCH AT FULL SCALE
IF NOT ONE INCH SCALE ACCORDINGLY

CITY OF PINOLE

PINOLE-HERCULES WASTEWATER TREATMENT PLANT

CIVIL

SITE MAP

Scale NONE

Figure No. 1-1

File Info. FIG_1-1.DWG HJH 5/2009

DODSON PSOMAS

BAR IS ONE INCH AT FULL SCALE
0 1"
IF NOT ONE INCH SCALE ACCORDINGLY

CITY OF PINOLE CALIFORNIA 1903

CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

WPCP EXISTING SITE PLAN

Scale 1"=30'

Figure No. 1–2

File Info. FIG_1-2.dwg DSW 5/2009

The secondary treatment process is a biological process referred to as the activated sludge process. Flow from the primary clarifiers which contains organic material is combined with microorganisms in the aeration basins. The combined flow is referred to as mixed liquor. The capacity of the aeration tank is based on several factors including detention time, organic loading, and the amount of microorganisms that can be maintained in the system. With existing influent BOD load of 7,300 lbs/day the aeration tanks are near capacity. Taking one of the aeration tanks out of service would severely strain the ability to treat the existing organic load.

The secondary clarifiers separate out the microorganisms from the mixed liquor by gravity settling and return them to the aeration tanks. The secondary clarifiers cannot be hydraulically overloaded because the microorganisms will be washed out of the system and the secondary treatment system will fail. The wet weather capacity of the five existing secondary clarifiers is approximately 8.6 mgd without chemical enhancement. Because of the limited secondary treatment capacity, peak flows above the secondary system capacity bypass secondary treatment and are blended with the secondary treated sewage before flowing to the chlorine contact tank for disinfection.

Chlorine (sodium hypochlorite) is added to the effluent flow for disinfection before it enters the chlorine contact tank. After the chlorine contact tank sodium bisulfite is added to remove the chlorine before it reaches the effluent pump station.

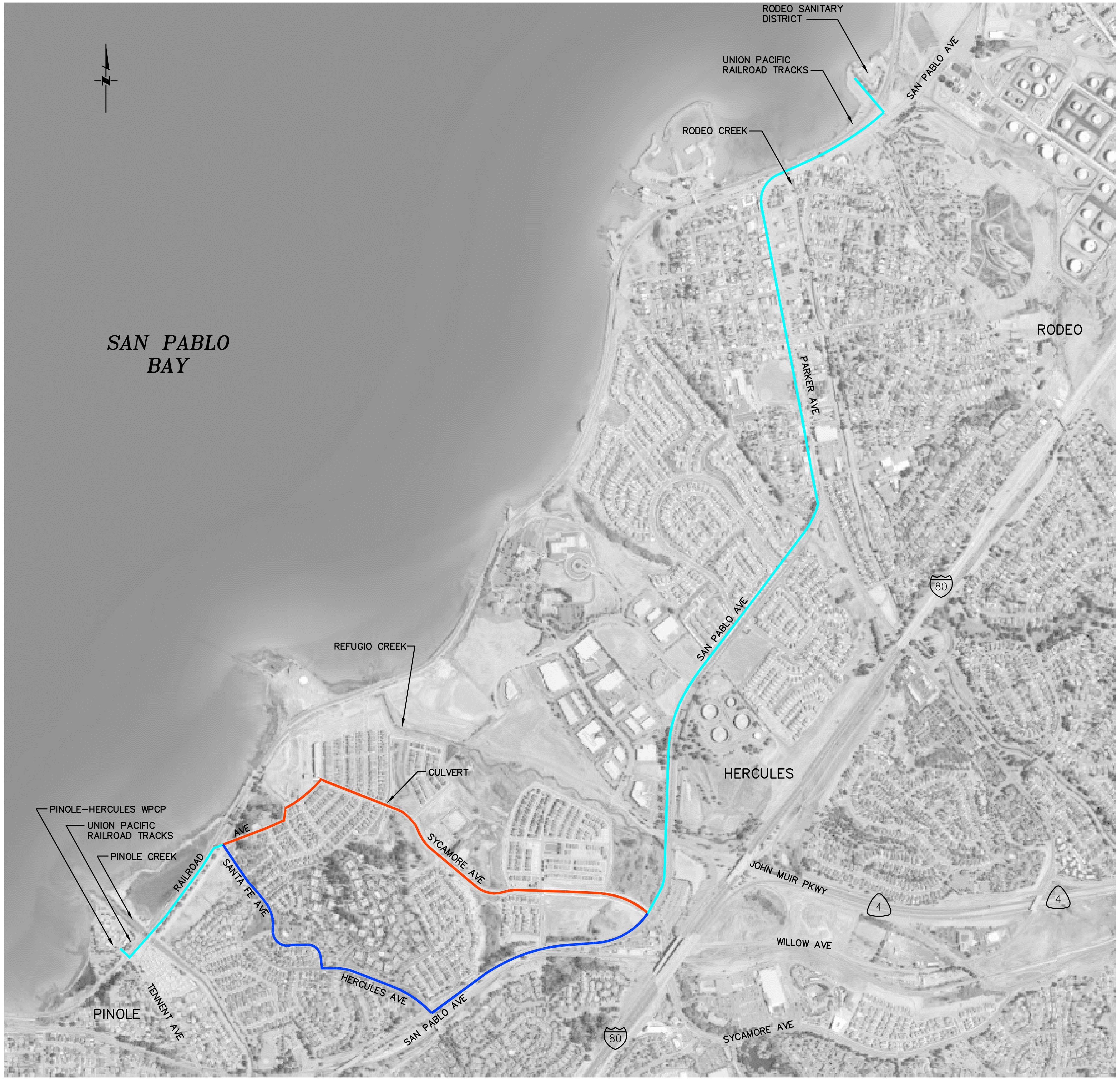
Disinfected and dechlorinated effluent is pumped to the deep water outfall shared with Rodeo Sanitary District. The effluent pump station has a firm capacity of approximately 10.5 mgd. Wet weather flow above 10.5 mgd is diverted to the near shore outfall at the Pinole Treatment Plant site. The deep water outfall is approximately 3600 feet off shore with a diffuser section approximately 120 feet in length. An analysis prepared by Brown and Caldwell indicated the existing diffuser meets or exceeds the minimum initial dilution of 45 to 1 under all discharge conditions.

Primary solids and secondary solids (waste activated sludge) are treated by anaerobic digestion in three anaerobic digesters. Grit solids are removed by centrifugal separation, washed, dewatered and hauled to a landfill. After the grit is removed, the primary solids are sent to a gravity belt thickener where they are co-thickened with waste activated sludge prior to being conveyed to the anaerobic digesters. Digested sludge is returned to the solids handling area where it is dewatered by centrifuge and hauled to landfill. The anaerobic solids treatment system was upgraded in 2008 with the addition of a fourth anaerobic digester which provides solids treatment capacity for the projected 2030 loads.

Pipeline Conveyance

As part of the treatment plant upgrades, a new land outfall pipeline from the WPCP to the deep-water outfall located at RSD is required. The pipeline conveyance analysis was performed on a conceptual level, so the route may require refinement upon further detailed analysis. Two options were developed to convey treated effluent from the WPCP to the deep water outfall located at RSD. The options are shown in Figure 1-3.

Option A: The pipeline is routed beneath the Union Pacific Railroad (UPRR) tracks, along Railroad Avenue parallel to the existing 24-inch land outfall, continues on Railroad Avenue, and



ALIGNMENT FOR NEW LAND OUTFALL, COMMON TO OPTION A AND OPTION B

ALIGNMENT FOR NEW LAND OUTFALL, OPTION A (APPROX 1.2 MILES)

ALIGNMENT FOR NEW LAND OUTFALL, OPTION B (APPROX 1.3 MILES)

DODSON PSOMAS

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0 1"
IF NOT ONE INCH SCALE ACCORDINGLY

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CITY OF PINOLE

PINOLE-HERCULES WASTEWATER TREATMENT PLANT

CIVIL

NEW LAND OUTFALL ROUTING OPTIONS

Scale NONE

Figure No. 1-3

File Info. FIG_1-3 HJH 5/2009

then heads south on Sycamore Avenue, northeast on San Pablo Avenue, north on Parker Avenue, east on San Pablo Avenue, and turns north, again crossing the UPRR tracks before entering the RSD treatment plant site.

Option B: The pipeline is routed beneath the UPRR tracks, along Railroad Avenue parallel to the existing 24-inch land outfall, continues south on Santa Fe Avenue and south on Hercules Avenue, then heads east on San Pablo Avenue, north on Parker Avenue, east on San Pablo Avenue, and turns north, again crossing the UPRR tracks before entering the RSD treatment plant site.

Although Option A and Option B coincide for a large portion of the pipeline route, there are factors to take into consideration for the area between the intersection of Railroad Avenue and Santa Fe Avenue to the intersection of Sycamore Avenue and San Pablo Avenue. In this area, Option A is approximately 1.2 miles in length, is required to cross a large culvert, and passes through residential, open space, and commercial areas. Option B which winds through an entirely residential area is approximately 1.3 miles in length of which 0.6 miles are on San Pablo Avenue, a busy thoroughfare that would require traffic control. Some non-economic factors to consider are creek crossings, sensitive habitats and endangered species, railroad crossings, potential Native American archaeological resources, and close proximity to the San Pablo Bay shoreline.

Based on the pipeline route analysis, Option A, WPCP to RSD via Sycamore Avenue, is the apparent best route, primarily due to its shorter length and reduced length of piping on San Pablo Avenue.

Treatment Plant Upgrade

Based on Regional Board requirements and previous evaluation of potential options, two options have been identified for detailed study, evaluation and selection. The two options are identified as follows:

- Option 2 – New Land Outfall
- Option 4 – Flow Equalization

Wastewater Flow and Loadings

Current wastewater flows and loadings were analyzed and projected loads were developed by the Cities of Pinole and Hercules based on each City's plans for future development to the year 2030. Each plant upgrade option was developed based on bringing the plant up to the permitted capacity of 4.06 mgd. Design flows and loadings shown in Table 1-3 assume that Pinole and Hercules will continue their I/I reduction programs and that peak wet weather flows into the plant will be maintained below 20 mgd.

TABLE 1-3. DESIGN FLOWS AND LOADINGS

Parameter	Combined Influent
Average Dry Weather Flow, mgd	4.06
Peak Wet Weather Flow, mgd	20.00
Peak Day Flow, mgd (with I/I Reduction)	14.60
Average BOD Loading, lbs/day	11,000
Average TSS Loading, lbs/day	12,500

Option 2 – New Land Outfall

Under this option, peak wet weather flow up to 20 mgd will receive secondary treatment and will be pumped through parallel 24-inch forcemains to the deep water outfall shared with Rodeo Sanitary District.

Proposed Treatment Process

The existing Pinole and Hercules influent sewers will be routed to a new metering vault located east of the Control Building. The flow is combined after the meters and conveyed to a new headworks facility located south of the Control Building. The new headworks will include four pumps, two mechanical bar screens each rated for 20 mgd, a washer compactor, a grit removal system, a parshall flume for metering, and a diversion channel.

Flow up to 12 mgd will be conveyed from the new headworks to the existing primary distribution box where it will be equally distributed to the three existing primary clarifiers. Flow in excess of 12 mgd is diverted at the headworks and conveyed to the primary diversion structure. From the primary diversion structure the entire plant flow is conveyed to the aeration tanks.

Primary sludge is currently pumped to the solids handling area for grit removal and sludge thickening. With the new headworks and grit removal, primary sludge can be thickened in the primary clarifier and pumped directly to the anaerobic digesters. Floatables (scum) from the primary clarifiers will be pumped directly to the anaerobic digesters.

The existing aeration basins will be converted to four, single pass tanks and lengthened by approximately 85 feet. The aeration tanks will continue to use a fine bubble diffuser and two new blowers will be added. The influent ends of the aeration tanks will be modified so that return activated sludge can be blended with primary effluent or conveyed directly to the front of the aeration basin.

Three new secondary clarifiers will be constructed with a diameter of 80 feet and a sidewater depth of 16 feet. Two sludge pumps will be provided at each secondary clarifier to return activated sludge to the aeration tanks. Waste activated sludge and secondary scum will be conveyed to the solids handling area for thickening before going to the anaerobic digesters. Two secondary clarifiers are required up to a flow of approximately 13 mgd and three secondary clarifiers are required for flows above 13 mgd.

Flow from the secondary clarifiers is conveyed to two UV disinfection channels constructed at the east end of the aeration tanks. The existing chlorine contact tank disinfection and dechlorination systems will be abandoned.

Flow from the UV channels enters the effluent pump station wet well where four pumps convey peak flow through two 24-inch forcemains to the existing 30-inch outfall and diffuser. Three pumps are required to pump the peak wet weather flow of 20 mgd. The existing effluent pumping station will be abandoned.

A parallel 24-inch forcemain and land outfall will be constructed from the Pinole plant site to the connection to the 30-inch marine outfall and diffuser located at the Rodeo Sanitary District. Most of the new forcemain and land outfall routing will parallel the existing 24-inch pipeline except the routing will follow Railroad Avenue to Sycamore Avenue and then up to San Pablo Avenue from where it will parallel the existing 24-inch pipe to the Rodeo plant.

An outfall survey performed in 2005 indicated that the diffuser port diameter had increased due to corrosion and several ports were plugged. Diffuser improvements will include installation of 3-inch elastomer check valves on each diffuser port to provide enhanced jet velocity and improved initial dilution.

Solids Handling and Anaerobic Digestion

The existing secondary clarifiers will be demolished and solids handling will be relocated. The new solids handling facility will include waste activated sludge thickening utilizing rotary drum thickeners. Digested sludge will be returned from the anaerobic digesters to the solids handling facility where it will be dewatered by centrifuge and hauled to landfill.

The anaerobic digestion facility was upgraded in 2008 with the addition of a fourth digester, new sludge pumping mixing and heating systems. No additional work is anticipated in the anaerobic digestion area.

Electrical Building

A new electrical building to house a new plant electrical service and distribution panels will be constructed, housing a motor control center and standby generator.

Non-Economic Factors

Some non-economic factors which may impact the option include requirements related to construction within 100 feet of the shoreline, future regulations, training on the operation and maintenance of the UV system, higher energy demand and decrease in chemical demand.

Construction phasing is required to ensure continuous and effective operation of the WPCP. Coordination for construction of the new secondary clarifiers is necessary since the units are to be sited where the existing solids handling facilities are located. Tie-ins for pipelines and structures would require treatment plant shutdowns, preferably performed in the summer months when flows are reduced.

Cost

The estimated construction cost for Option 2 in 2009 dollars is $40,495,000. The RWQCB mandates that the facilities are completed and on-line by 2016. Thus, escalating the present cost by 2.5% per year to when construction is anticipated to occur, the estimated construction cost in

2015 dollars is $46,961,000. The estimate includes 15% for Contractor overhead and profit, 25% for engineering and administration, and a 25% contingency. The contingency is lower than the typical 30-35% contingency used for planning level estimates because budget costs for most of the major equipment and structures were obtained from the manufacturer and/or supplier.

Option 4 – Flow Equalization

Option 4 will reduce the peak hourly flow (20 mgd) through the biological process units to the peak day flow (14.6 mgd) by diverting flow to an underground equalizing storage facility. Flow above 14.6 mgd will be stored and then returned to the treatment process when flow drops below 14.6 mgd.

Proposed Treatment Process

The existing Pinole and Hercules influent sewers will be routed to a new metering vault located east of the Control Building. The flow is combined after the meters and conveyed to a new headworks facility located south of the Control Building. The new headworks will include four pumps, two mechanical bar screens each rated for 20 mgd, a washer compactor, a grit removal system, a parshall flume for metering, and a flow distribution structure.

Flow up to 12 mgd will be conveyed from the new headworks to the existing primary distribution box where it will be equally distributed to the three existing primary clarifiers. Flows above 12 mgd up to approximately 15 mgd will be conveyed to the primary effluent pipeline and on to the aeration tanks. Flows above 15 mgd will be conveyed to the underground equalizing storage facility. From the primary diversion structure flow up to 15 mgd is conveyed to the secondary treatment system.

The flow equalizing storage facility will be a buried concrete tank 152 feet in diameter with a bottom elevation approximately 30 feet below existing grade. Flow from the equalizing storage will be returned to the primary clarifier distribution structure when plant influent flow falls below 12 mgd.

Secondary treatment using the activated sludge process will be divided into two process trains. The existing aeration tanks, secondary clarifiers, and return activated sludge pumping system will form one train with the capacity to treat 8.6 mgd. A new secondary train will be constructed to treat 6.4 mgd. Primary effluent will be pumped with a new primary effluent pumping station to the new secondary treatment train. The new secondary treatment system will include construction of two, two pass aeration basins similar to the existing except with a length of 83 feet, two new secondary clarifiers with a diameter of 55 feet and a sidewater depth of 14 feet, and two sludge pumps at each secondary clarifier to return activated sludge to the new aeration tanks.

Flow from the existing secondary clarifiers will go to the existing chlorine contact tank for disinfection and dechlorination. Flow from the new secondary clarifiers will go to a new chlorine contact tank and dechlorination facility constructed as part of the aeration basin.

The existing effluent pump station will be retained to pump final effluent from the existing process train up to 8.6 mgd. A new effluent pump station will be constructed for the 6.4 mgd from the new secondary treatment train.

A parallel 18-inch forcemain and land outfall will be constructed from the Pinole plant site to the connection to the 30-inch marine outfall and diffuser located at the Rodeo Sanitary District. Most of the new forcemain and land outfall routing will parallel the existing 24-inch pipeline except the routing will follow Railroad Avenue to Sycamore Avenue and then up to San Pablo Avenue from where it will parallel the existing 24-inch pipe to the Rodeo plant.

An outfall survey performed in 2005 indicated that the diffuser port diameter had increased due to corrosion and several ports were plugged. Diffuser improvements will include installation of 3-inch elastomer check valves on each diffuser port to provide enhanced jet velocity and improved initial dilution.

Solids Handling and Anaerobic Digestion

Primary sludge is currently pumped to the solids handling area for grit removal and sludge thickening. The existing grit removal system and dissolve air flotation thickener will be abandoned. With the new headworks and grit removal, primary sludge can be thickened in the primary clarifier and pumped directly to the anaerobic digesters. Floatables (scum) from the primary clarifiers will be pumped directly to the anaerobic digesters.

Waste activated sludge and secondary scum will be conveyed to the solids handling area for thickening before going to the anaerobic digesters.

The existing solids handling facilities for thickening waste activated sludge and dewatering digested sludge will be retained. The anaerobic digestion facility was upgraded in 2008 with the addition of a fourth digester, new sludge pumping mixing and heating systems. No additional work is anticipated in the anaerobic digestion area.

Electrical Building

A new electrical building to house a new plant electrical service and distribution panels will be constructed, housing a motor control center and standby generator.

Non-Economic Factors

Some non-economic factors which may impact the option include requirements related to construction within 100 feet of the shoreline, future regulations, operating and maintaining two treatment trains, and higher chemical demand.

Construction should have minimal impact on the existing operations of the WPCP as no existing process facilities are to be demolished. Tie-ins for pipelines and structures would require treatment plant shutdowns, preferably performed in the summer months when flows are reduced. Construction of the storage facility will temporarily impact the park's availability for use by the public.

Cost

The estimated construction cost for Option 4 in 2009 dollars is $42,485,000. The RWQCB mandates that the facilities are completed and on-line by 2016. Thus, escalating the present cost by 2.5% per year to when construction is anticipated to occur, the estimated construction cost in 2015 dollars is $49,269,000. The estimate includes 15% for Contractor overhead and profit, 25% for engineering and administration, and a 25% contingency. The contingency is lower than the typical 30-35% contingency used for planning level estimates because budget costs for most of the major equipment and structures were obtained from the manufacturer and/or supplier.

Summary

Table 1-4 provides a matrix summarizing the factors to consider for the two options, including cost, reliability, environmental constraints, operation, maintenance, and construction. Relative values for the factors are shown in the table.

TABLE 1-4. SUMMARY COMPARISON OF OPTIONS

Factor	Option 2	Option 4
Cost	+	-
Reliability	+	-
Operation and Maintenance	+	-
Future Regulations	+	-
Environmental Constraints	0	0
Permitting	0	0
Energy and Chemical Demand	0	0
Constructability	-	+

0: Neutral, both options are relatively equal
+: Relatively more advantages
-: Relatively more disadvantages

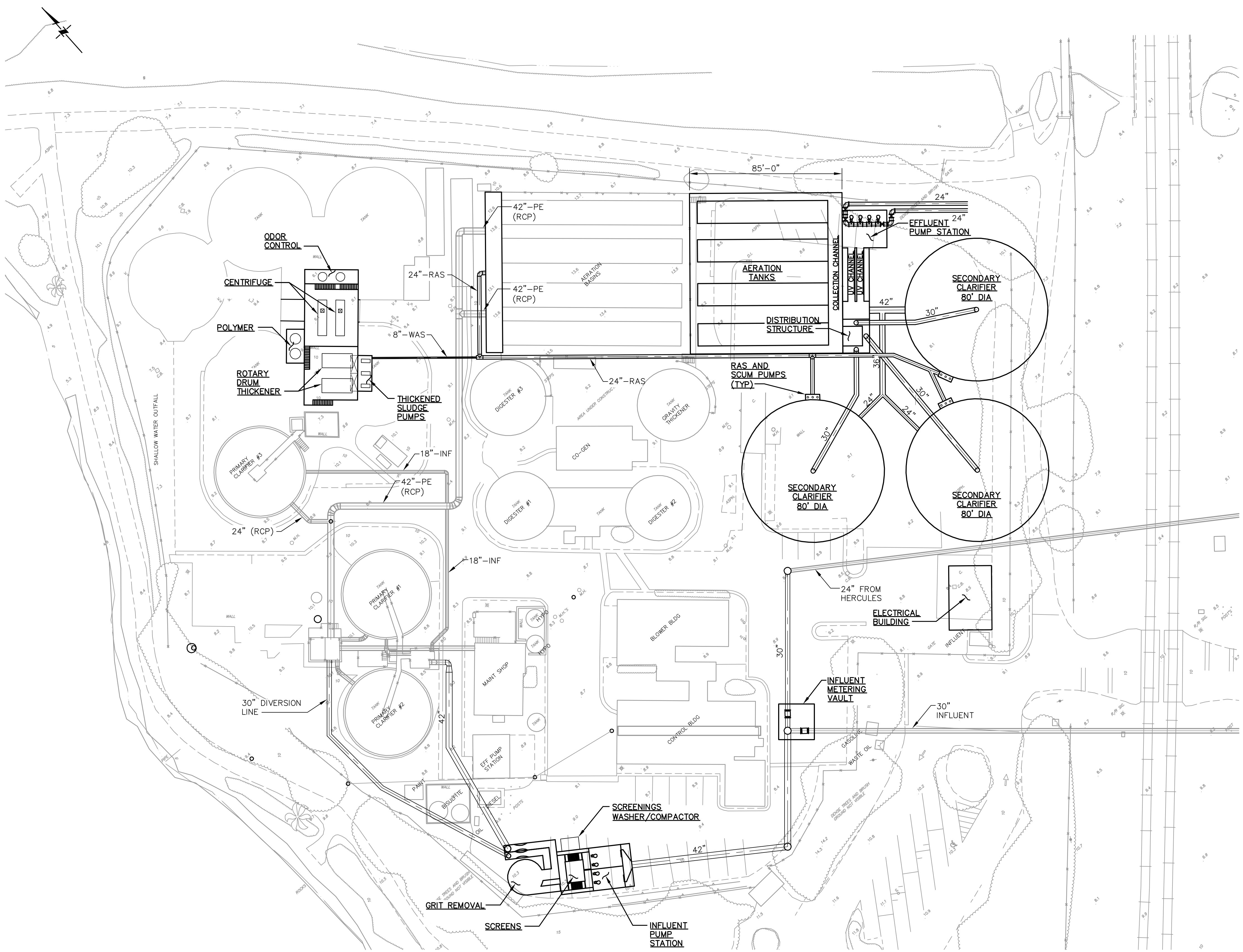
Apparent Best Option

Based on the summary matrix in Table 1-4 which shows that Option 2 has relatively more advantages than Option 4, the apparent best option to implement is Option 2, New Land Outfall.

Project Implementation

The apparent best option site plan and design data are shown in Figure 1-4. The JPA is continuing to refine the WPCP site layout and land outfall alignment to take advantage of construction staging and cost reducing opportunities. Option 2 will meet the discharge conditions set forth in Regional Water Quality Control Board Order No. R2-2007-0024 adopted on March 14, 2007, addresses the discharge prohibitions of near shore discharge to San Pablo Bay where initial dilution is less than 45 to 1, and eliminates blending of primary and secondary effluent discharged to the deep water outfall.

The existing Pinole treatment plant must continue to operate uninterrupted during a major upgrade. Due to the complexity of the design and the sequence of construction, a design, bid, and a construction period of approximately four years is required. In order to meet the Regional Board's compliance date of November 1, 2015 to complete construction of the necessary facilities, the Cities of Pinole and Hercules must start design by November 1, 2011. The schedule differences are shown in Table 1-5.



DESIGN DATA

Design Loadings	
Influent Flows and Loading	
Average dry weather flow, mgd	4.06
Peak wet weather flow, mgd	20.0
Influent TSS, lbs./day (mg/l)	12,500 (370)
Influent BOD lbs/day (mg/l)	11,000 (325)
Effluent Quality	
Effluent BOD, mg/l	10
Effluent suspended solids, mg/l	15
Liquid Treatment Facilities	
Influent Pump Station	
Type	Submersible
Number	4
Capacity (ea), gpm (mgd)	4,630 (6.7)
Motor size hp (variable speed)	75
Bar Screens	
Duty	1
Standby	1
Capacity (ea), mgd	20
Washer/Compactor	1
Grit Chamber	
Type	Mechanical Vortex
Number	1
Capacity, mgd	20
Grit Pumps	
Type	Recessed Impeller
Number	2
Capacity, (ea), gpm	250
Grit Cyclone	
Type	Centrifugal
Number	1
Grit Classifier	
Type	Screw Conveyor
Number	1
Influent Metering	
Type	Parshall Flume
Influent meter, size (capacity)	18" (12 mgd)
Diversion meter, size (capacity)	12" (8 mgd)
Headworks Odor Control	
Type	Biofilter
Air flow rate, cfm	2,000
Primary Treatment	
Sedimentation Tanks	
Number	3 (existing)
Diameter, ft.	45
Area ft.2 each	1,590
Total area ft.2	4,770
Overflow rate @ 4.06 mgd, gpd/ft	2851
Overflow rate @ 12 mgd, gpd/ ft	22,515
Sludge Pumps	
Type	Progressive cavity
Number per tank	2
Capacity, gpm	20–50
Motor	Variable speed
Horsepower	5
Scum Pumps	
Existing	
Aeration Basins	
Number	4
Length, ft.	190
Width, ft.	20
Water depth, ft.	15
Detention time @ 4.06 mgd (3 basins), hr.	7.5
Loading, lbs. BOD/1,000 ft3/day (3 basins)	42
Blowers	
Type	High speed turbo
Number	2
Capacity ea., cfm	1,200
Existing Capacity, (3@ 1,100 cfm) cfm	3,300
Secondary Sedimentation	
Tanks	
Number	3
Diameter, ft.	80
Side water depth, ft.	16
Area ft2 each	5,026
Overflow rate, gpd/ft2 (2 tanks @ 4.06 mgd)	404
Overflow rate, gpd/ft2 (3 tanks @ 20 mgd)	1,326
Return Activated Sludge Pump	
Type	Variable speed vertical solids handling
Number	6
Capacity range, each, gpm	500–1,500
Scum Pumps	
Type	Progressive cavity
Capacity	35 gpm
UV Disinfection	
Design capacity, mgd	20
UV transmittance	55%
Disinfection limit, MPN (5 day median)	240
Disinfection limit, MPN (maximum)	10,000
Number of channels	2
Total number of UV lamps	448
Effluent Pump Station	
Pumps	
Type	Variable speed multi–stage vertical turbine
Number	4
Capacity, each, mgd	6.7
Motor horsepower, each	250
Solids Handling	
Anaerobic Digester (Existing)	
Number	3
No. 1, Vol. gallons	147,530
No. 3, Vol. gallons	233,287
No. 4, Vol. gallons	356,294
Estimated sludge vol., gallons/day	36,271
Estimated detention days	20.3
Volatile solids loading lbs/ft3/day	0.10
Sludge Storage (Existing)	
Digester No. 2	
Volume, ft3/gallons	19,723/147,530
Sludge Dewatering	
Type	Centrifugal
Capacity, gpm	100
Lbs/hour	1,750
Waste Activated Sludge Thickening	
ThickenerType	Rotary drum

DODSON PSOMAS

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CITY OF PINOLE CALIFORNIA 1903

CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

OPTION 2

SITE PLAN AND DESIGN DATA

Scale 1"=30'–0"

Figure No. 1–4

File Info. FIG_1–4.DWG DSW 5/2009

TABLE 1-5. COMPLIANCE SCHEDULE

Task	Compliance Date	
	Regional Board	Recommended
Engineering Report and Antidegredation Analysis	June 1, 2009	June 1, 2009
Certified Environmental Impact Report	August 1, 2010	August 1, 2010
Secure funding for WPCP upgrades	August 1, 2011	August 1, 2011
Start design of WPCP upgrades	August 1, 2012	November 1, 2011
Complete design of WPCP facilities	August 1, 2013	February 1, 2013
Commence construction of WPCP facilities	June 1, 2014	May 1, 2013
Complete construction of WPCP facilities	November 1, 2015	November 1, 2015

Planning Considerations

Nitrification and recycled water may be implemented in the future. Availability to site these additional facilities should be taken into consideration for planning purposes.

SECTION TWO
INTRODUCTION

The Pinole-Hercules Water Pollution Control Plant (WPCP) Facilities Plan engineering report was prepared to comply with Regional Water Quality Control Board (RWQCB) Order No. R2-2007-0024, Provision C.2.c. Task 2.

The Pinole-Hercules WPCP currently operates under Order No. R2-2007-0024 (Order) and NPDES Permit No. CA0037796, which was adopted by the RWQCB on March 14, 2007. The permit became effective on June 1, 2007. Provision C.2.c. of the Order mandates corrective measures to upgrade the WPCP to increase dry and wet weather treatment capacity, eliminate blending of partially treated wastewater transported to the deep water outfall 001, and to prevent discharge through the shallow water outfall 002. The RWQCB has set a compliance time schedule, as shown in Table 2-1, so that all facilities are completed and on line by June 1, 2016. Accordingly, Task 2 which requires an engineering report that describes the WPCP upgrades that will increase the treatment capacity of the facility, and shall also include a complete antidegradation analysis that fully addresses consistency with the State Water Resources Control Board Resolution 68-16, and 40 CFR 131.12 must be submitted by June 1, 2009. The antidegradation analysis and financial analysis will be submitted as separate reports.

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7. Commence construction of WPCP facilities	June 1, 2014
8. Complete construction of WPCP facilities	November 1, 2015
9. Ensure WPCP facilities are online and operational	June 1, 2016
10. Status report of collection system projects and WPCP upgrades	Annually (due February 1)

The engineering report provides background information on the Pinole-Hercules Joint Power Authority's (JPA) efforts to comply with RWQCB Order No. R2-2007-0024, Provision C.2.c. Task 2; provides background information on the existing wastewater treatment plant; presents two treatment and disposal options; determines the apparent best project and required WPCP upgrades; and discusses future planning considerations. For the apparent best project, the JPA is continuing to refine the WPCP site layout to take advantage of construction staging and cost reducing opportunities. This report may be amended to reflect those opportunities.

SECTION THREE
BACKGROUND

The existing Pinole-Hercules WPCP is owned and operated by the City of Pinole under a joint use agreement with the City of Hercules. The agreement creates a governing body, the joint powers authority (JPA), which includes officials from both cities. The JPA has been meeting over several years to discuss various options for upgrading the wastewater treatment plant to comply with the current RWQCB permit requirements.

In 2007, the JPA retained Brown and Caldwell to evaluate plant upgrades and disposal options at the existing WPCP and Carollo Engineers to evaluate sending wastewater generated by the Cities of Pinole and Hercules to West County Wastewater District (WCWD) for treatment and disposal to bring the WPCP into compliance. Treatment and disposal options included six (6) options for upgrading the existing Pinole-Hercules WPCP and disposal system and two (2) options for conveying raw wastewater to WCWD for treatment and disposal. The eight options include the following:

- Option 1: Full Tertiary Facilities – The option consists of adding full tertiary facilities using either (1a) membrane bioreactors (MBR) or (1b) tertiary filters; increasing the wet and dry capacities of the WPCP through upgrades; abandoning the existing outfall pipeline to Rodeo Sanitary District (RSD); and obtaining a new permitted shallow water outfall to either Pinole Creek or San Pablo Bay.
- Option 2: New Upsized Land Outfall – The option consists of constructing a new, upsized land outfall from the WPCP to RSD to handle 100 percent of the future peak wastewater flows; increasing the wet and dry capacities of the WPCP through minor upgrades; and abandoning the existing land outfall.
- Option 3: Rehabilitated Land Outfall and Smaller Tertiary Facility – The option consists of rehabilitating the existing land outfall to continue to convey secondary effluent to the deep water outfall at RSD; increasing the wet and dry capacities of the WPCP through minor upgrades; constructing a smaller tertiary facility (as compared to Option 1) using either (3a) MBR or (3b) tertiary filters, to treat wet weather flows; and obtaining a new permitted shallow water outfall to discharge tertiary effluent to either Pinole Creek or San Pablo Bay.
- Option 4: Primary Effluent Flow Equalization – The option consists of increasing the wet and dry capacities of the WPCP through minor upgrades; constructing a 4 million gallon storage facility to equalize primary effluent flow to the secondary treatment facilities; abandoning the existing shallow water outfall; and continuing to discharge secondary effluent through the existing land outfall and deep water outfall at RSD.
- Option 5: All Flows to WCWD – The option consists of decommissioning the existing WPCP; diverting all existing flows through a new pipeline to the WCWD facilities; expanding the WCWD treatment plant; and abandoning the existing land outfall pipeline to RSD.
- Option 6: City of Hercules Only to WCWD – The option consists of diverting and transporting wastewater flows generated by the City of Hercules to the WCWD; expanding the WCWD treatment plant to handle additional wet weather flows; operating the WPCP to

solely treat wastewater flows generated by the City of Pinole; constructing minor upgrades at the WPCP; and upgrading the existing land outfall to RSD.

Dodson Psomas, as an independent third party, was retained by the JPA in 2008 to conduct a peer review of the engineering studies prepared by Brown and Caldwell and Carollo on the various options. The purpose of the peer review was to offer opinions as to reasonableness of assumptions and approach and to assist the JPA on reaching a decision on which option(s) to pursue. Each option as well as its associated construction cost (at the conceptual planning level) was reviewed. Significant considerations indicated in the peer review study were:

- Option 2, downsize the new 36-inch land outfall to 24-inch and retain the existing 24-inch land outfall to provide redundancy and reliability for the outfall system.
- Option 4, assume 2.7 million gallons of storage based on assumptions used for Option 1a, Full Tertiary Facilities Membrane Bioreactors, where flow equalization was also indicated.

The peer review study recommended that the JPA proceed with a more detailed engineering report that evaluates not more than two options and develops a predesign for the selected option. The options suggested for further study were the revised Option 2 (New 24-inch Land Outfall) and revised Option 4 (Flow Equalization, 2.7 million gallons of storage).

On December 10, 2008, City of Pinole representatives on the JPA recommended that additional engineering studies are required to meet the RWQCB deadline. On December 16, 2008, the Pinole City Council authorized this engineering report to further evaluate the revised Option 2 and revised Option 4, and recommend the apparent best project and required WPCP upgrades.

SECTION 4
EXISTING FACILITIES

The Pinole-Hercules Water Pollution Control Plant (WPCP) is located at the end of Tennent Avenue in the City of Pinole. Wastewater from the City of Pinole and Hercules is treated at this site and pumped to a joint outfall with Rodeo Sanitary District. Figure 4-1 is a site map showing the location of existing facilities, Figure 4-2 shows the layout of the existing WPCP and Figure 4-3 is a wastewater flow diagram of the existing treatment system.

Existing Plant Loadings

Historic plant loadings for Pinole have shown extreme variation for Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS). Between 2005 and 2008 BOD samples have ranged as high as 3,048 milligrams per liter (mg/l) TSS and 2,500 mg/l BOD. The City hired two environmental compliance officers in 2005 to monitor commercial and industrial dischargers. This effort was beneficial in reducing BOD and TSS, however, loadings were still unusually high with extreme variations in loadings for a predominately residential community. Additional efforts were focused on sampling procurement including sampling location, pipeline cleaning and equipment maintenance. Since the beginning of June 2008, the extreme variations in samples and the overall loads have shown a significant reduction. Table 4-1 shows the current combined loadings for both Pinole and Hercules.

TABLE 4-1 CURRENT FLOWS AND LOADINGS

Parameter	Combined Influent
Average Dry Weather flow (mgd)	3.0
Peak Wet Weather flow (mgd)	22
Influent BOD (lb/day)	7,300
Influent TSS (lb/day)	8,000

Headworks

Flow from Pinole and Hercules enters the headworks and is conveyed to a mechanical screen with a capacity of 6 million gallons per day (mgd). Wet weather flow in excess of 6 mgd pass through a manually cleaned bar screen to the influent pump station wet well. Ferrous chloride is added to the combined influent for odor control and digester gas hydrogen sulfide reduction.

Influent Pumping Station

The influent pump station has four vertical mixed flow sewage pumps with a firm capacity of 15 mgd. All four influent pumps are driven by variable speed electric motors. Flow from the influent pump station passes through a magnetic flow meter to the primary clarifier distribution box.

ALIGNMENT FOR EXISTING 24-INCH LAND OUTFALL

PIPELINE IMPROVEMENT FOR EXISTING 24-INCH LAND OUTFALL (UNDER CONSTRUCTION)

DODSON PSOMAS File Info. FIG_4-1.DWG HJH 5/2009	BAR IS ONE INCH AT FULL SCALE 0 1" IF NOT ONE INCH SCALE ACCORDINGLY	CITY OF PINOLE CALIFORNIA 1903	CITY OF PINOLE	PINOLE-HERCULES WASTEWATER TREATMENT PLANT CIVIL SITE MAP	Scale NONE Figure No. 4-1

DODSON PSOMAS

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0 1"
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CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

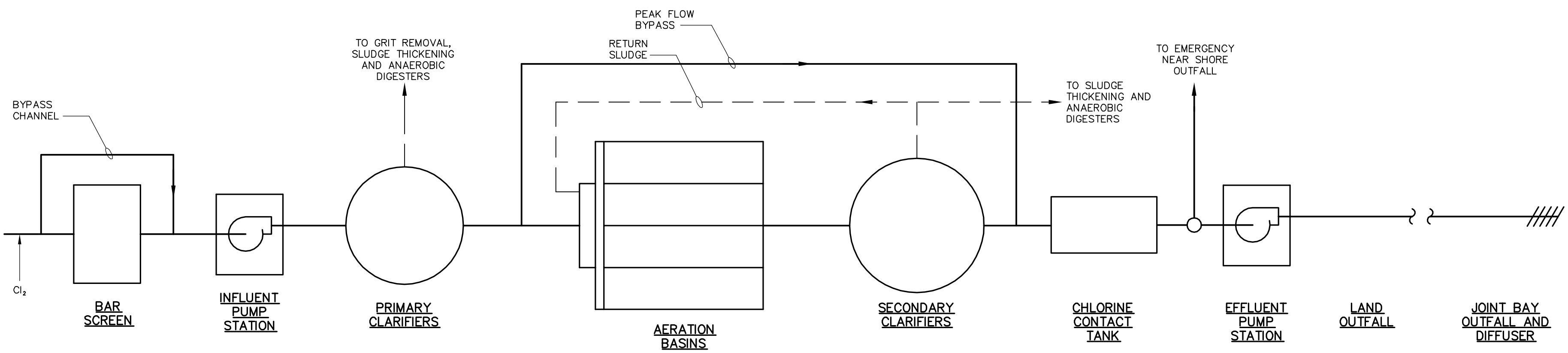
CIVIL

WPCP EXISTING SITE PLAN

Scale 1"=30'

Figure No. 4–2

File Info. FIG 4–2.dwg DSW 5/2009



DODSON PSOMAS

CITY OF PINOLE

PINOLE - HERCULES WASTEWATER TREATMENT PLANT

EXISTING FLOW DIAGRAM

FIGURE NO. 4-3

JOB NO. 6PIN0203

Primary Treatment

Wastewater pumped to the primary clarifier flow distribution box is distributed to three primary clarifiers. Settleable organic and inorganic material are removed from the flow stream by gravity settling. Floatable material is also removed. Settled organic and inorganic material are conveyed to the solids handling area where the inorganic material (grit) is removed by a centrifugal separator. After removing the inorganic material, the organic material is thickened in a gravity thickener and conveyed to the anaerobic digesters. Floatable material is conveyed directly to the anaerobic digesters.

Primary Clarifier No. 1

The three primary clarifiers have a capacity of approximately 12 mgd at an overflow rate of 2,500 gpd/ft of surface area. Hydraulically the clarifiers have handled flow in excess of 20 mgd during unusual wet weather events. At flows above 12 mgd, minimum organic solids are captured in the primary clarifiers and are carried over to the secondary treatment system.

Secondary Treatment Process

The secondary treatment process is a biological process referred to as the activated sludge process. Flow from the primary clarifiers contains soluble organic material and fine suspended organic material. This flow is combined with microorganisms in the aeration basins. The combined flow is referred to as mixed liquor. The aeration basins are aerated by fine bubble diffusers to maintain dissolved oxygen within the basin. This environment promotes consumption of the soluble organic material and incorporation of the fine suspended organic material into biological floc. The microorganisms oxidize the organic material and produce more microorganisms.

The capacity of the aeration tank is based on several factors including detention time, organic loading, and the amount of microorganisms that can be maintained in the system. With both aeration basins in service, they have a capacity to reliably treat an influent organic load (BOD) of approximately 7,200 to 8,500 pounds per day (lbs/day). With existing influent BOD load of 7,300 lbs/day the aeration tanks are near capacity. Taking one of the aeration tanks out of service would severely strain the ability to treat the existing organic load.

The secondary clarifiers separate out the microorganisms from the mixed liquor and return them to the aeration tanks. Similar to the primary clarifier, separation of the microorganisms is by gravity settling. The capacity of the secondary clarifiers is governed by overflow rate. Unlike the primary clarifiers, the secondary clarifiers cannot be hydraulically overloaded because the microorganisms will be washed out of the system and the secondary treatment system will fail. The wet weather capacity of the five existing secondary clarifiers is approximately 8.6 mgd without chemical enhancement. Because of the limited secondary treatment capacity, peak flows above the secondary system capacity bypass secondary treatment and are blended with the secondary treated sewage before flowing to the chlorine contact tank for disinfection.

Because the biological oxidation of organic matter produces more microorganisms, not all of the microorganisms are returned to the aeration tanks. The waste activated sludge (WAS) goes to the solids handling area for thickening and then to the anaerobic digesters.

The disinfection system uses chlorine (sodium hypochlorite) to disinfect effluent. Chlorine is added to the effluent flow before it enters the chlorine contact tank. After the chlorine contact tank sodium bisulfite is added to remove the chlorine before it reaches the effluent pump station.

The capacity of the disinfection system is based on chlorine concentration and contact time. The existing chlorine contact tank provides about 24 minutes detention time at 3 mgd, but less than 4 minutes at 20 mgd. In order to meet Regional Board requirements, high chemical usage is required during high wet weather flows.

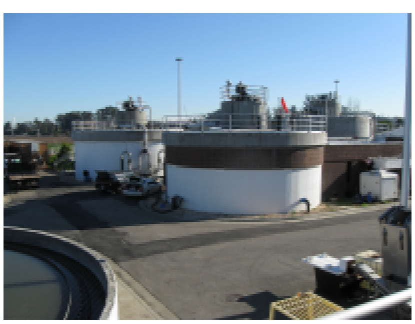
Effluent Disposal


Effluent Pump Station

Disinfected and dechlorinated effluent is pumped to the deep water outfall shared with Rodeo Sanitary District. The effluent pump station has three vertical turbine pumps with a firm capacity of approximately 10.5 mgd. Wet weather flow above 10.5 mgd is diverted to the near shore outfall at the Pinole Treatment Plant site.

The deep water outfall is approximately 3600 feet off shore and approximately 18 feet below mean lower low water. The diffuser section is 120 feet in length with 15 pairs of 2.5 inch diffuser ports. Recent inspection indicates that two of the ports are plugged and that erosion has enlarged some of the ports. The 1994 Effluent Outfall Dilution Analysis prepared by Brown and Caldwell indicated the existing diffuser meets or exceeds the minimum initial dilution of 45 to 1 under all discharge conditions.

Solids Treatment


Anaerobic Digesters

Primary solids and secondary solids (waste activated sludge) are treated by anaerobic digestion in three anaerobic digesters. Primary solids and grit are conveyed to the solids handling area where grit is removed by a vortex type system. Grit is washed and dewatered and hauled to a landfill. After the grit is removed, the primary solids are sent to a gravity belt thickener where they are co-thickened with waste activated sludge prior to being conveyed to the anaerobic digesters. Digested sludge is returned to the solids handling area where it is dewatered by centrifuge and hauled to landfill.

The anaerobic solids treatment system has recently (2008) been upgraded with the addition of a fourth anaerobic digester. This recent upgrade provides solids treatment capacity for the projected 2030 loads.

SECTION FIVE
PIPELINE CONVEYANCE

As part of the treatment plant upgrades discussed in Section Six, Treatment Plant Upgrade, a new land outfall pipeline from the WPCP to the deep-water outfall located at RSD is required. This section discusses the proposed routing options developed and evaluated for the new land outfall and determines an apparent best route. The pipeline conveyance analysis was performed on a conceptual level. There was no detailed information about location of existing utilities and structures or soils information, so the route may require refinement upon further detailed analysis. Pipeline construction was assumed to be within the road right-of-way by means of open cut construction except at the railroad track and creek crossings where jack and bore or directional drilling methods would be used. Environmental constraints related to biological resources, cultural resources, and land use are summarized from the report "Draft Constraints and Opportunities Analysis: Pinole-Hercules Water Pollution Control Plant" (hereinafter referred to as "environmental constraints report") prepared by EDAW in November 2008, a copy of which is included in the Appendix.

Options

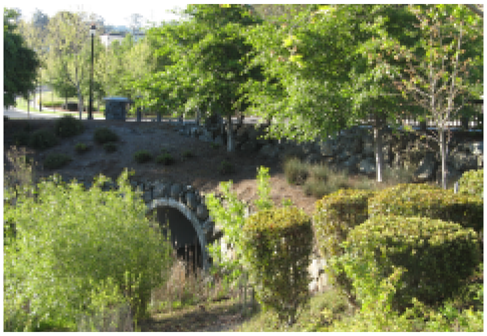
Two options were developed to convey treated effluent from the WPCP to the deep water outfall located at RSD. The options are shown in Figure 5-1.

Option A: The pipeline is routed beneath the Union Pacific Railroad (UPRR) tracks, along Railroad Avenue parallel to the existing 24-inch land outfall, continues on Railroad Avenue, and then heads south on Sycamore Avenue, northeast on San Pablo Avenue, north on Parker Avenue, east on San Pablo Avenue, and turns north, again crossing the UPRR tracks before entering the RSD treatment plant site.

Option B: The pipeline is routed beneath the UPRR tracks, along Railroad Avenue parallel to the existing 24-inch land outfall, continues south on Santa Fe Avenue and south on Hercules Avenue, then heads east on San Pablo Avenue, north on Parker Avenue, east on San Pablo Avenue, and turns north, again crossing the UPRR tracks before entering the RSD treatment plant site.

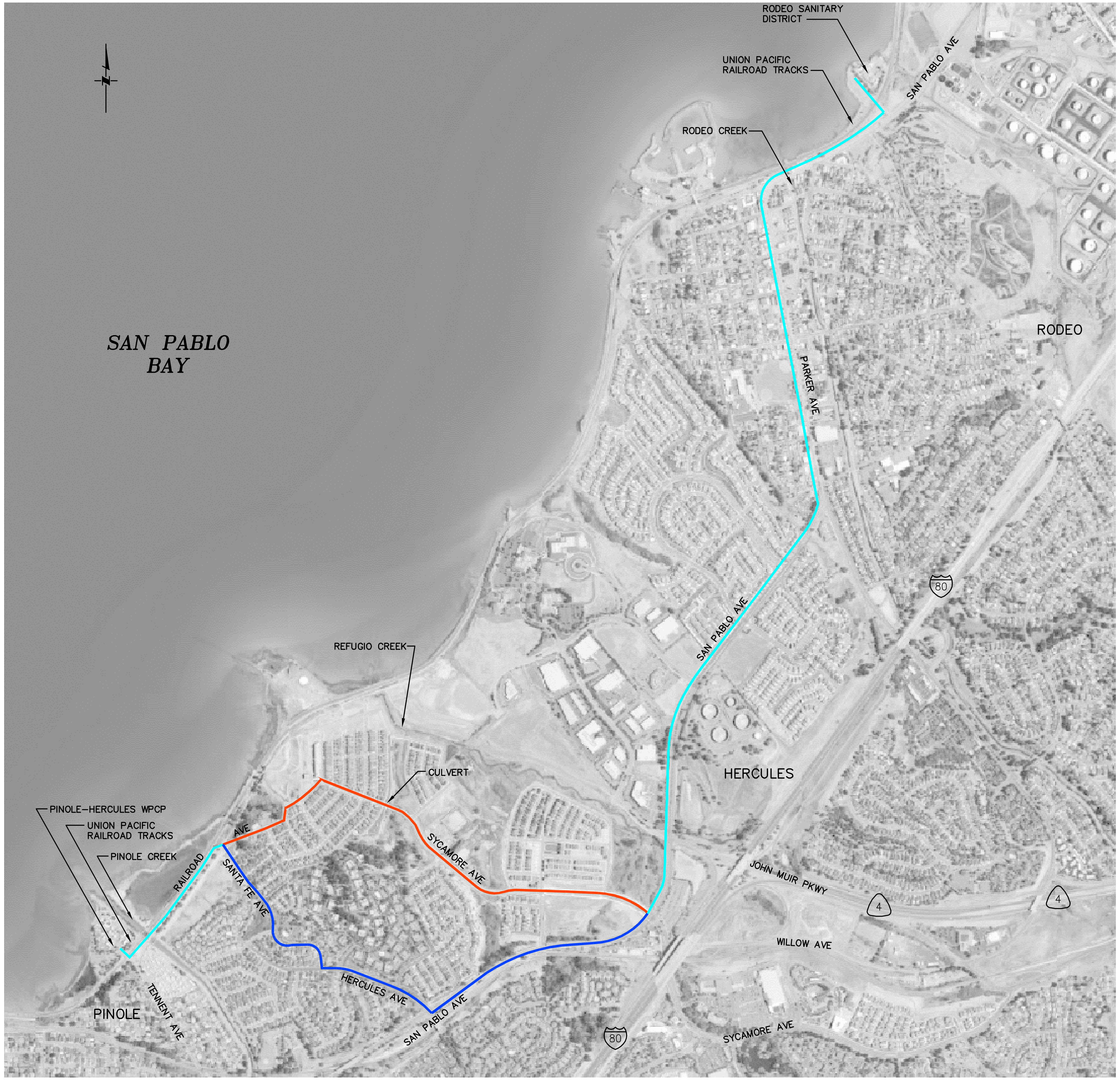
Discussion

Although Option A and Option B coincide for a large portion of the pipeline route, there are factors to take into consideration for the area between the intersection of Railroad Avenue and Santa Fe Avenue to the intersection of Sycamore Avenue and San Pablo Avenue. Following is a discussion regarding the two routes in this area.



Culvert

Option A is approximately 1.2 miles in length. Near Taraya Way, there is a large culvert (see Figure 5-1) which appears to convey flow from a tributary to Refugio



ALIGNMENT FOR NEW LAND OUTFALL, COMMON TO OPTION A AND OPTION B

ALIGNMENT FOR NEW LAND OUTFALL, OPTION A (APPROX 1.2 MILES)

ALIGNMENT FOR NEW LAND OUTFALL, OPTION B (APPROX 1.3 MILES)

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PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

NEW LAND OUTFALL ROUTING OPTIONS

Scale NONE

Figure No. 5–1

File Info. FIG_5–1 HJH 5/2009

Creek running beneath Sycamore Avenue. The route passes through some residential area, but there is also a fair amount of open space adjacent to the road. On Sycamore Avenue near Front Street there is some commercial development and the road widens and includes a shoulder.

Option B is approximately 1.3 miles in length of which 0.6 miles are on San Pablo Avenue. Although the total distance of Option B is not much longer than Option A, a large segment of the pipeline is located on San Pablo Avenue which is a busy thoroughfare and would require traffic control. Option B winds through an entirely residential area.

For the portion of pipeline where Option A and Option B coincide, some of the non-economic factors to consider are discussed below.

Biological Resources

Because the pipeline will be crossing three creeks (Pinole Creek, Refugio Creek, and Rodeo Creek), there is the potential that a Section 1602 Streambed Alteration Agreement with the California Department of Fish and Game (DFG) may be required. Section 1602 states that any person, state or local governmental agency, or public utility must notify DFG before beginning any activity that will substantially divert or obstruct the natural flow of any river, stream or lake; substantially change or use any material from the bed, channel, or bank of any river, stream, or lake; or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake. Section 1602 applies to all perennial, intermittent, and ephemeral rivers, streams, and lakes in California. Although it is anticipated that the pipeline construction will not cause and/or create any of the situations addressed in Section 1602, DFG recommends that a notification be submitted.

The portion of pipeline that runs east along Railroad Avenue is located adjacent to an area classified as Northern Coastal Salt Marsh, a sensitive habitat for the salt marsh harvest mouse which is currently listed as endangered under the federal Endangered Species Act. If construction activities temporarily or permanently impact the salt marsh harvest mouse habitat or occur in areas where salt marsh harvest mouse could be present, consultation with the U.S. Fish and Wildlife Service (USFWS) would be required.

In addition, the California red-legged frog, a threatened species under the federal Endangered Species Act, has been documented in a tributary of Refugio Creek within a half mile of the pipeline creek crossing on San Pablo Avenue. Any disturbance to red-legged frog habitats also requires consultation with the USFWS.

Land Use and Planning

Two portions of the pipeline route, Railroad Avenue near the WPCP and San Pablo Avenue near RSD, are in close proximity to the San Pablo Bay shoreline. If work must be performed within 100 feet of the shoreline, a permit from the San Francisco Bay Conservation and Development Commission (BCDC), an entity which regulates a number of activities within and adjacent to San Pablo Bay, is required.

Pipeline construction is subject to and must be consistent with the Contra Costa County, City of Pinole, and City of Hercules General Plans. Because the pipeline crosses under and runs parallel to the railroad tracks, coordination with UPRR would be required to ensure compliance with right-of-way procedures, safety measures, and other planning guidelines.

Cultural Resources

The San Pablo Bay shoreline is highly sensitive for containing early Native American archaeological resources such as subsurface traces of prehistoric activities and/or human remains. Native American populations tended to settle and engage in subsistence activities along and in the vicinity of waterways. Many shell mound sites have been located in the general area; however, none have been identified in the immediate vicinity of the pipeline route. These findings suggest that similar and previously undocumented sites could be encountered during construction activities.

The advantages and disadvantages of the two routing options are summarized in Table 5-1.

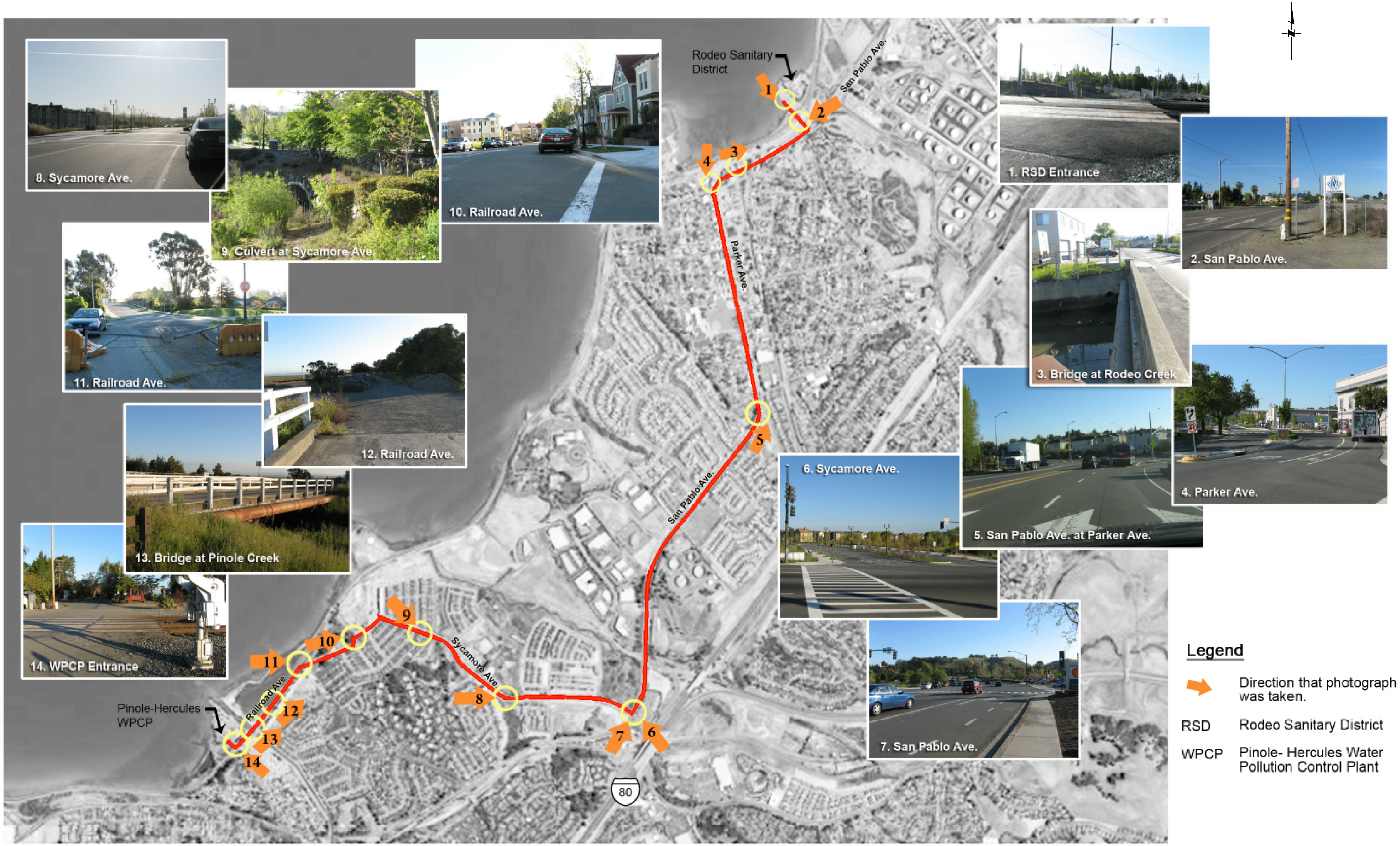
TABLE 5-1. CONVEYANCE OPTIONS SUMMARY

Option	Advantages	Disadvantages
A. WPCP to RSD via Sycamore Avenue	• Shorter route • Shorter length of pipeline on San Pablo Avenue • Wider road with shoulder on portion of Sycamore Avenue	• Large culvert to cross at Sycamore Avenue near Taraya Terrace • Railroad track and creek crossings • Potential archaeological resources
B. WPCP to RSD via Santa Fe and Hercules Avenue	• No culvert to cross	• Longer route • Longer length of pipeline on San Pablo Avenue • Railroad track and creek crossings • Potential archaeological resources

Apparent Best Conveyance Option

Based on the pipeline route analysis, Option A, WPCP to RSD via Sycamore Avenue, is the apparent best route, primarily due to its shorter length and reduced length of piping on San Pablo Avenue. Figure 5-2 shows in greater detail the surrounding areas along the route.

After the pipeline leaves the WPCP site, it crosses beneath the UPRR tracks and then turns east onto Railroad Avenue. Railroad Avenue is a paved road up to Pinole Creek after which it becomes a dirt road that is inaccessible to vehicular traffic. There is a bridge crossing Pinole Creek at Railroad Avenue which has pipes, including the existing 24-inch land outfall pipeline, supported off of its side. The new land outfall pipeline could also be supported off the side of the bridge or could be installed by directional drilling under the channel. The pipeline would continue east on the unpaved Railroad Avenue. At Santa Fe Avenue, Railroad Avenue becomes paved again and winds through a residential area. The pipeline would turn south on Sycamore Avenue which is also a predominantly residential area. Near Taraya Way, there is a large culvert which appears to convey flow from a tributary to Refugio Creek running beneath Sycamore Avenue. The pipeline would either have to cross over the culvert within the roadway or be located on the side of the bridge. Continuing south on Sycamore Avenue, the road widens. Heading north on San Pablo Avenue, a major thoroughfare that is multiple lanes wide, there is a



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CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

GENERAL

PROPOSED LAND OUTFALL ROUTE

Scale NNOE

Figure No. 5–2

File Info. FIG_5–2.DWG DSW 5/2009

steep hill which peaks near Linus Pauling Drive. The pipeline would turn north on Parker Avenue, which is the beginning of the commercial area in downtown Rodeo. Heading east on San Pablo Avenue, there is a bridge which crosses Rodeo Creek which also currently has some pipes supported off of its side. The new outfall pipeline could be supported off the side of the bridge or directionally drilled beneath the creek. From San Pablo Avenue, the pipeline would turn north into RSD's driveway, crossing under UPRR tracks again, and head through RSD's treatment plant to the joint deep water outfall.

SECTION SIX

TREATMENT PLANT UPGRADE

Based on Regional Board requirements and previous evaluation of potential options, two options have been identified for detailed study, evaluation and selection. The two options are identified as follows:

- Option 2 – New Land Outfall
- Option 4 – Flow Equalization

The Regional Board in Order No. R2-2007-0024 dated March 14, 2007 requires corrective measures to eliminate blending of primary and secondary effluent prior to discharge to the deep water outfall and prevention of discharge to the near shore outfall. The conventional activated sludge treatment process at the existing treatment plant complies with the following effluent limitations shown in Table 6-1.

TABLE 6-1. EFFLUENT LIMITATIONS FOR CONVENTIONAL AND NON-CONVENTIONAL POLLUTANTS

Parameter	Units	Effluent Limitations				
		Average Monthly	Average Weekly	Maximum Daily	Instantaneous Minimum	Instantaneous Maximum
Carbonaceous Biochemical Oxygen Demand 5-day ($CBOD_5$ @ 20°C)	Mg/L	25	40	--	--	--
$CBOD_5$ percent removal[1]	%	85	--	--	--	--
Total Suspended Solids (TSS)	Mg/L	30	45	--	--	--
TSS percent removal[1]	%	85	--	--	--	--
pH[2]	Standard units (s.u.)	--	--	--	6.0	9.0
Oil and Grease	Mg/L	10	--	20	--	--
Chlorine Residual[3]	Mg/L	--	--	--	--	0.0

In addition, the existing treatment plant consistently meets its total coliform bacteria limitation of 240 MPN per 100 ml in any five consecutive samples with a maximum MPN of 10,000 for any single sample. The existing plant also meets limitations on toxic pollutants and acute toxicity.

The treatment plant upgrades will continue to use the conventional activated sludge process to address Regional Board requirements and to provide the Cities of Pinole and Hercules adequate treatment capacity of wastewater flow and loadings projected to the year 2030.

Wastewater Flow and Loadings

Current wastewater flows and loadings were analyzed and projected loads were developed by the Cities of Pinole and Hercules based on each City's plans for future development to the year 2030. Estimated combined flow was 3.93 mgd which is slightly less than the existing Regional Board permitted plant capacity of 4.06 mgd. Each plant upgrade option was developed based on bringing the plant up to the permitted capacity of 4.06 mgd. Based on a per capita flow of 75 gallons, the plant will be able to treat an equivalent population of slightly more than 54,000. A BOD loading of slightly more than 0.20 lbs per capita results in 11,000 lbs of BOD per day which is consistent with previous studies.

Wet weather flows have exceeded the capacity of the treatment plant and have resulted in blending of primary and secondary effluent and use of the near shore outfall. Reliable capacity of the influent pumping station is approximately 15 mgd. Plant personnel have indicated that they have pumped up to 20 mgd with all pumps operating. Individual influent meters for Pinole and Hercules are limited to 10 mgd and 10.4 mgd respectively. Each meter recorded maximum flow during the December 30 - January 1 storm of 2005/2006. It was speculated that flow into the plant may have reached 22 mgd.

Both Pinole and Hercules have an ongoing infiltration/inflow (I/I) reduction program to reduce peak flows to the treatment plant. Design flows and loadings shown in Table 6-2 assume that Pinole and Hercules will continue their I/I reduction programs and that peak wet weather flows into the plant will be maintained below 20 mgd.

TABLE 6-2. DESIGN FLOWS AND LOADINGS

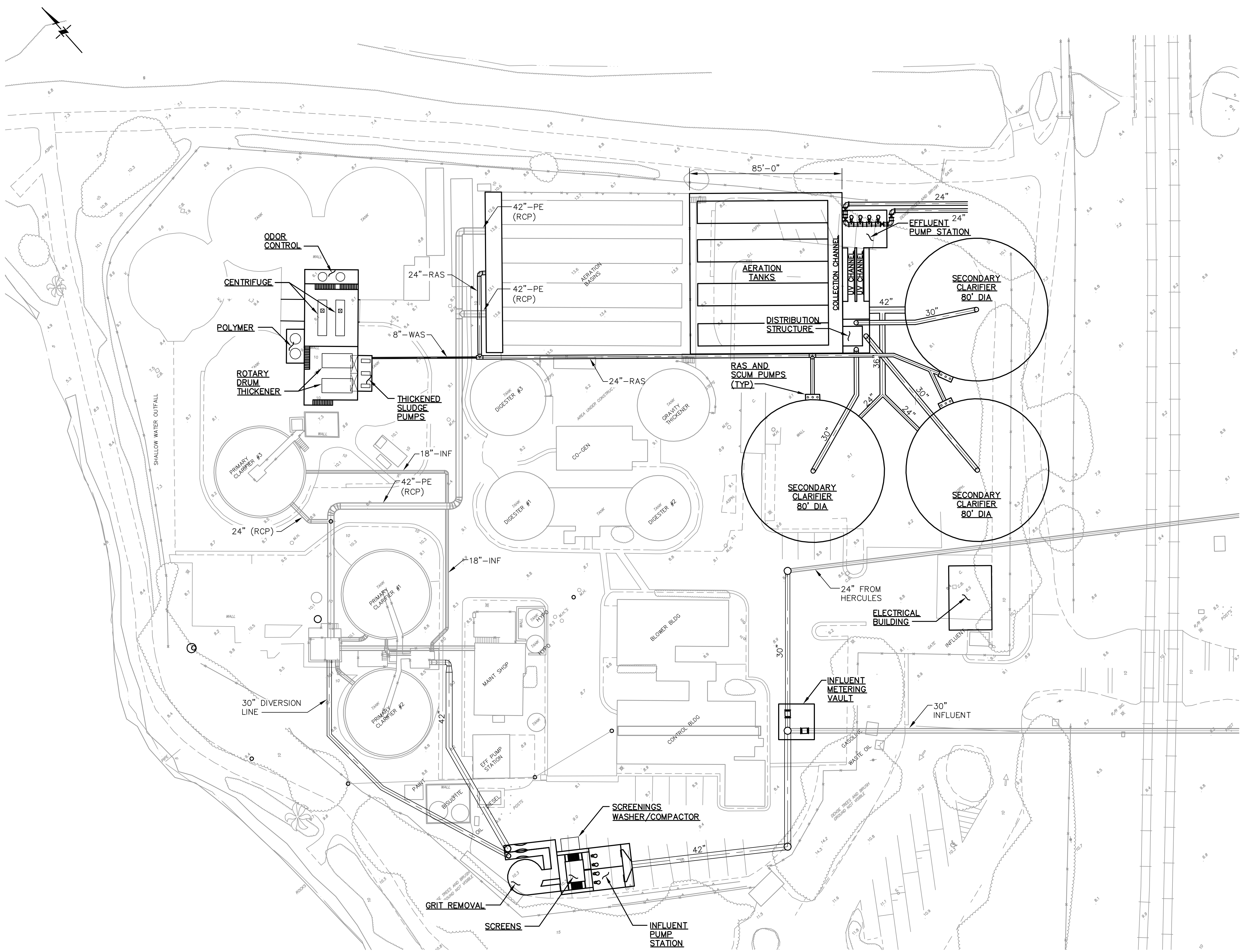
Parameter	Combined Influent
Average Dry Weather Flow, mgd	4.06
Peak Wet Weather Flow, mgd	20.00
Peak Day Flow, mgd (with I/I Reduction)	14.60
Average BOD Loading, lbs/day	11,000
Average TSS Loading, lbs/day	12,500

Option 2 – New Land Outfall

Under this option, peak wet weather flow up to 20 mgd will receive secondary treatment and will be pumped through parallel 24-inch forcemains to the deep water outfall shared with Rodeo Sanitary District. The layout of the new facilities on the existing Pinole site is shown on Figure 6-1.

Influent Sewer

The existing Pinole and Hercules influent sewers will be routed to a new headworks located south of the Control Building. Flow from Hercules will be routed in a 30-inch pipeline east of the



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CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

OPTION 2 SITE PLAN

Scale 1"=30'-0"

Figure No. 6–1

File Info. FIG_6-1.DWG DSW 5/2009

Control Building to a point where it intersects the Pinole influent sewer. At this location a new metering vault with parshall flumes will be constructed. Combined flow will be conveyed to a new headworks facility. The existing 30-inch influent sewer under the Control Building will be abandoned. The new 42-inch sewer will be set low enough at the metering structure to insure free flow through the meters. Influent sampling for Pinole and Hercules will be relocated to the new metering vault.

Headworks

The new headworks will include four submersible wastewater pumps in a divided wet well. Discharge from the submersible pump can be directed to either of two mechanical bar screens each rated for 20 mgd. Screenings will be sluiced to a washer compactor and discharged to a dumpster for hauling to landfill. Flow from the screens will be conveyed to a vortex type grit removal system. Grit will be washed, dewatered and discharged to a dumpster for hauling to landfill. Flow out of the vortex grit removal system will be conveyed to a parshall flume for metering and then on to the existing primary distribution structure. When flow reaches approximately 10 mgd it will begin to overflow the parshall flume metering channel into the diversion channel where it is metered by a parshall flume and conveyed to the primary effluent pipeline and on to the aeration tanks.

Primary Treatment

Flow up to 12 mgd will be conveyed from the new headworks to the existing primary distribution box where it will be equally distributed to the three existing primary clarifiers. Flow from primary clarifiers No. 1 and No. 2 discharges to the existing diversion box (east half) which contains an overflow weir for blending primary effluent with secondary effluent (west half). The overflow weir and the west half of the diversion box will be abandoned. Flow in excess of 12 mgd is diverted at the headworks and conveyed to the east half of the primary diversion structure. From the primary diversion structure the entire plant flow is conveyed to the aeration tanks.

Primary sludge is currently pumped to the solids handling area for grit removal and sludge thickening. With the new headworks and grit removal, primary sludge can be thickened in the primary clarifier and pumped directly to the anaerobic digesters. The existing sludge pumps will be replaced by variable speed progressive cavity pumps which will allow for optimum thickening of the primary sludge. Floatables (scum) from the primary clarifiers will be pumped directly to the anaerobic digesters.

Aeration Tanks

The existing aeration basins which consist of two, two pass tanks will be converted to four, single pass tanks and lengthened by approximately 85 feet to provide a total aeration volume of 220,000 cubic feet and a detention time of 7 hours at the design flow of 4.06 mgd and one tank out of service. The aeration tanks will continue to use a fine bubble diffuser and two new 1200 cfm blowers will be added.

The influent ends of the aeration tanks will be modified so that return activated sludge can be blended with primary effluent or conveyed directly to the front of the aeration basin. The feed distribution system will be designed to utilize an anoxic zone, contact stabilization plug flow, or step feed.

Secondary Clarifiers

Three new secondary clarifiers will be constructed with a diameter of 80 feet and a sidewater depth of 16 feet. The new secondary clarifiers will be center feed with vacuum sludge pickup arms. Two vertical solids handling sludge pumps will be provided at each secondary clarifier to return activated sludge to the aeration tanks. Waste activated sludge and secondary scum will be conveyed to the solids handling area for thickening before going to the anaerobic digesters.

Two secondary clarifiers are required up to a flow of approximately 13 mgd and three secondary clarifiers are required for flows above 13 mgd.

Disinfection

Flow from the secondary clarifiers is conveyed to two UV disinfection channels constructed at the east end of the aeration tanks. The UV disinfection system is designed to meet a disinfection limit of 240 total coliform per 100 milliliters based on a 5 day median at 20 mgd with a UV transmittance of 55%. The existing chlorine contact tank disinfection and dechlorination systems will be abandoned.

Effluent Pumping

Flow from the UV channels enters the effluent pump station wet well where four variable speed, vertical multistage centrifugal turbine pumps convey peak flow through two 24-inch forcemains to the existing 30-inch outfall and diffuser.

Three pumps are required to pump the peak wet weather flow of 20 mgd. Each forcemain will have a flow meter to measure plant effluent flow. The existing effluent pumping station will be abandoned.

Forcemain and Land Outfall

A parallel 24-inch forcemain and land outfall will be constructed from the Pinole plant site to the connection to the 30-inch marine outfall and diffuser located at the Rodeo Sanitary District. Most of the new forcemain and land outfall routing will parallel the existing 24-inch pipeline except the routing will follow Railroad Avenue to Sycamore Avenue and then up to San Pablo Avenue from where it will parallel the existing 24-inch pipe to the Rodeo plant.

Outfall Diffuser

The 2005 outfall survey prepared by Underwater Resources indicated that the port diameter had increased due to corrosion and several ports were plugged. Diffuser improvements will include installation of 3-inch elastomer check valves on each diffuser port. The elastomer check valves will be held in place by stainless steel bands around the existing outfall pipe. The elastomer check valves will provide enhanced jet velocity and improved initial dilution.

Solids Handling

As shown in Figure 6-1, the existing secondary clarifiers will be demolished and solids handling will be relocated. The new solids handling facility will include waste activated sludge thickening utilizing rotary drum thickeners. Waste activated sludge will be thickened to approximately four percent and sent to the anaerobic digesters. Digested sludge will be returned from the anaerobic digesters to the solids handling facility where it will be dewatered by centrifuge and hauled to landfill.

The solids building will be approximately 30 feet by 70 feet with the rotary drum thickeners located at grade and the dewatering centrifuges located fifteen feet above grade so that dewatered sludge can be dropped directly into a sludge truck or dumpster. The solids building will be enclosed and ventilated with odor control facilities for exhaust air.

Anaerobic Digestion

The anaerobic digestion facility has recently (2008) been upgraded with the addition of a fourth digester, new sludge pumping mixing and heating systems. The recent upgrades provide anaerobic digestion capacity for the projected 2030 loads. No additional work is anticipated in the anaerobic digestion area.

Electrical Building

A new electrical building to house a new plant electrical service and distribution panels will be constructed. The new electrical building will house the motor control center for the new secondary treatment facilities, UV disinfection system, and effluent pump station. The new electrical building will also house a 750 kW standby generator to power the new secondary facilities and effluent pump station.

Non-Economic Factors

Since the treatment plant upgrades are proposed to be confined to areas currently within the property boundaries of the existing facilities, there are minimal to no potential impacts to sensitive biological resources such as sensitive habitats and special-status species.

If work must be performed within 100 feet of the shoreline, a permit from the San Francisco Bay BCDC, an entity which regulates a number of activities within and adjacent to San Pablo Bay, is required.

The option proposes that flows exceeding 11.9 MGD bypass primary treatment. The environmental constraints report indicated that the RWQCB may not approve the flow regime because current Environmental Protection Agency (EPA) Policy on Peak Wet Weather Discharges from Municipal Sewage Treatment Facilities (January 2006) specifies that all flows must at least have primary clarification. However, further research clarifies that under the policy, "…all flows that will be diverted from the secondary treatment units in peak wet weather events receive a minimum of primary treatment…" In this option, flows that bypass primary treatment are diverted to secondary treatment facilities and are therefore, not in conflict with the EPA policy.

Future regulations may be met if expanded facilities are required. Although there is no additional space on the WPCP site, Bay Park, which is located adjacent to the WPCP, is situated on land owned by the WPCP. Any facility expansions required could be constructed at Bay Park.

Plant operation and maintenance should be similar to that of the existing facility. The processes are the same although the facilities are expanded in capacity. There may be less maintenance since the number of secondary clarifiers and associated equipment are being reduced. Staff will require training on the operation and maintenance of UV since the existing facility currently utilizes chlorine for disinfection. The UV system will create a higher energy demand and decrease the chemical demand.

Construction phasing is required to ensure continuous and effective operation of the WPCP. Coordination for construction of the new secondary clarifiers is necessary since the units are to be sited where the existing solids handling facilities are located. Temporary belt thickeners or temporary installation of new solids handling equipment would be utilized when the existing solids handling facilities are demolished and the new secondary clarifiers are constructed. After the new secondary clarifiers are built, the existing ones would be demolished and the new solids handling facility constructed. Tie-ins for pipelines and structures would require treatment plant shutdowns, preferably performed in the summer months when flows are reduced.

Cost

The estimated construction cost for Option 2 in 2009 dollars is $40,495,000. The RWQCB mandates that the facilities are completed and on-line by 2016. Thus, escalating the present cost by 2.5% per year to when construction is anticipated to occur, the estimated construction cost in 2015 dollars is $46,961,000. A summary of the cost by facility is outlined in Table 6-3. Detailed cost breakdowns for each facility by specification section are included in the Appendix. The estimate includes 15% for Contractor overhead and profit, 25% for engineering and administration, and a 25% contingency. The contingency is lower than the typical 30-35% contingency used for planning level estimates because budget costs for most of the major equipment and structures were obtained from the manufacturer and/or supplier.

TABLE 6-3. OPINION OF PROBABLE COST SUMMARY – OPTION 2 (NEW LAND OUTFALL)

Description	Total	
	2009	2015*
General Costs	$2,643,620	$3,065,789
Site Work, Site Piping, and Demolition	$4,346,860	$5,041,025
Headworks	$2,649,941	$3,073,119
Primary Treatment	$227,640	$263,993
Electrical Building	$1,151,640	$1,335,549
Secondary System	$10,937,723	$12,684,405
Solids Handling	$3,031,075	$3,515,118
Outfall	$7,407,275	$8,590,168
Estimated Construction Cost	**$32,395,774**	**$37,569,165**
Engineering and Administration (25%)	$8,098,943	$9,392,291
Total Project Cost	**$40,494,717**	**$46,961,457**
TOTAL PROJECT COST, ROUNDED	**$40,495,000**	**$46,961,000**

*2.5% Escalation per year.

Option 4 – Flow Equalization

Option 4 will reduce the peak hourly flow (20 mgd) through the biological process units to the peak day flow (14.6 mgd) by diverting flow to an underground equalizing storage facility. Option 4 biological treatment capacity will be 14.6 mgd. Flow above 14.6 mgd will be stored and then returned to the treatment process when flow drops below 14.6 mgd. The equalizing storage facility will be empty except during severe storm events. During the peak storm event, the equalizing storage facility will be filled and emptied within a 24 hour period. Layout of facilities for Option 4 are shown in Figure 6-2.

Influent Sewer

The existing Pinole and Hercules influent sewers will be routed to a new headworks located south of the Control Building. Flow from Hercules will be routed in a 30-inch pipeline east of the Control Building to a point where it intersects the Pinole influent sewer. At this location a new metering vault with parshall flumes will be constructed. Combined flow will be conveyed to a new headworks facility. The existing 30-inch influent sewer under the Control Building will be abandoned. The new 42-inch sewer will be set low enough at the metering structure to insure free flow through the meters. Influent sampling for Pinole and Hercules will be relocated to the new metering vault.

Headworks

The new headworks will include four submersible wastewater pumps in a divided wet well. Discharge from the submersible pump can be directed to either of two mechanical bar screens each rated for 20 mgd. Screenings will be sluiced to a washer compactor and discharged to a dumpster for hauling to landfill. Flow from the screens will be conveyed to a vortex type grit removal system. Grit will be washed, dewatered and discharged to a dumpster for hauling to landfill. Flow out of the vortex grit removal system will be conveyed to a parshall flume for metering and then on to a flow distribution structure. Flow up to 12 mgd will be conveyed to the existing primary distribution structure. Flows above 12 mgd up to approximately 15 mgd will be conveyed to the primary effluent pipeline and on to the aeration tanks. Flows above 15 mgd will be conveyed to the underground equalizing storage facility.

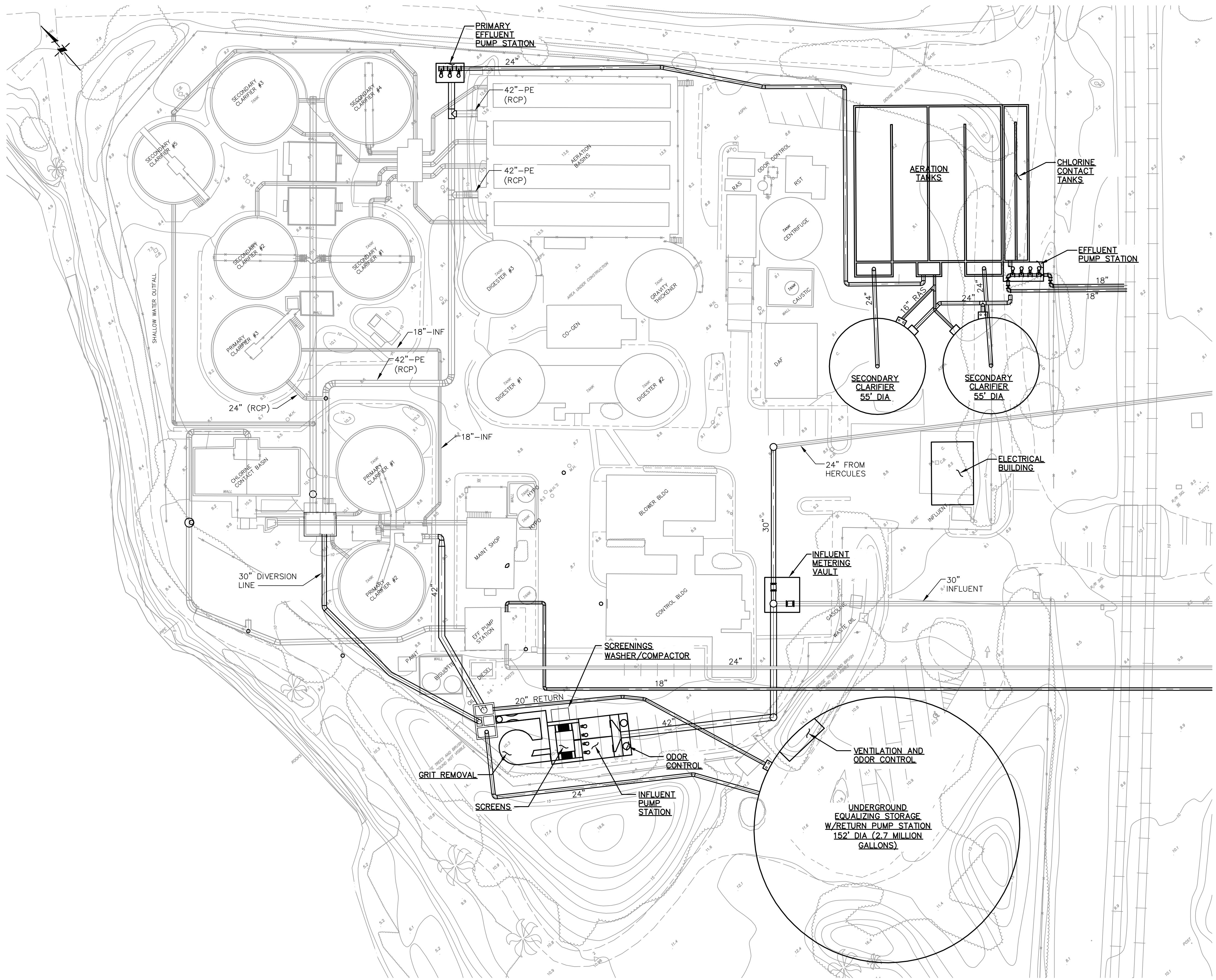
Flow Equalizing Storage

The flow equalizing storage facility will be a buried concrete tank 152 feet in diameter with a bottom elevation approximately 30 feet below existing grade. The top of the tank will be at grade and can be utilized for parking or be covered with soil and landscaped. The bottom of the tank will be 6 feet of concrete to prevent floatation.

Flow from the equalizing storage will be returned to the primary clarifier distribution structure when plant influent flow falls below 12 mgd. When the equalizing storage tank is emptied, any settled solids will be flushed to the return pumps using four high pressure water monitors. During the wash down operation the storage tank will be ventilated with the ventilation air passing through odor control units before release to the atmosphere.

Primary Treatment

Flow up to 12 mgd will be conveyed from the new headworks to the existing primary distribution box where it will be equally distributed to the three existing primary clarifiers. Flow from primary clarifiers No. 1 and No. 2 discharge to the existing diversion box (east half) which contains an overflow weir for blending primary effluent with secondary effluent (west half). The overflow weir and the west half of the diversion box will be abandoned. Flow in excess of 12 mgd up to 15 mgd is diverted at the headworks and conveyed to the east half of the primary diversion structure. From the primary diversion structure flow up to 15 mgd is conveyed to the secondary treatment system.



DODSON PSOMAS	BAR IS ONE INCH AT FULL SCALE 0 1" IF NOT ONE INCH SCALE ACCORDINGLY	CITY OF PINOLE CALIFORNIA 1903 — CITY OF PINOLE	PINOLE-HERCULES WASTEWATER TREATMENT PLANT
File Info. FIG_6-2.DWG DSW 5/2009			CIVIL
			OPTION 4 SITE PLAN

Scale 1"=30'

Figure No. 6-2

Primary sludge is currently pumped to the solids handling area for grit removal and sludge thickening. With the new headworks and grit removal, primary sludge can be thickened in the primary clarifier and pumped directly to the anaerobic digesters. The existing sludge pumps will be replaced by variable speed progressive cavity pumps which will allow for optimum thickening of the primary sludge. Floatables (scum) from the primary clarifiers will be pumped directly to the anaerobic digesters.

Aeration Tanks

Secondary treatment using the activated sludge process will be divided into two process trains. The existing aeration tanks and secondary clarifiers will form one train with the capacity to treat 8.6 mgd and a new secondary train will be constructed to treat 6.4 mgd. Primary effluent will be pumped with a new primary effluent pumping station to the new secondary treatment train.

The existing aeration tanks and clarifiers will not be modified. The existing aeration tanks will be able to treat flows up to 8.6 mgd. The new secondary treatment system will include two, two pass aeration basins similar to the existing except with a length of 83 feet instead of 100 feet. The new aeration basins will be able to treat flows up to 6.4 mgd.

Secondary Clarifiers

The existing secondary clarifiers will remain in service along with the return activated sludge pumping system. Return activated sludge from the existing secondary clarifiers will be returned to the existing aeration plant.

Two new secondary clarifiers will be constructed with a diameter of 55 feet and a sidewater depth of 14 feet. The new secondary clarifiers will be center feed with vacuum sludge pickup arms. Two vertical solids handling sludge pumps will be provided at each secondary clarifier to return activated sludge to the new aeration tanks. Waste activated sludge and secondary scum will be conveyed to the solids handling area for thickening before going to the anaerobic digesters.

Disinfection

Flow from the existing secondary clarifiers will go to the existing chlorine contact tank for disinfection and dechlorination.

Flow from the new secondary clarifiers will go to a new chlorine contact tank and dechlorination facility constructed as part of the aeration basin.

Effluent Pump Station

The existing effluent pump station will be retained to pump final effluent from the existing process train up to 8.6 mgd. The existing overflow weir to the near shore outfall will be removed and the outfall plugged. A parallel 18-inch forcemain will be constructed from the existing effluent pump station to the 30-inch outfall at Rodeo Sanitary District.

A new effluent pump station will be constructed for the 6.4 mgd from the new secondary treatment train. The new pump station will have three variable speed multistage centrifugal pumps rated at 3.2 mgd each. Dual 18-inch forcemains will connect to the 18-inch forcemain and 24-inch forcemain from the existing effluent pump station. A valve vault will be provided at the intertie to facilitate selection and isolation of individual forcemains.

Forcemain and Land Outfall

A parallel 18-inch forcemain and land outfall will be constructed from the Pinole plant site to the connection to the 30-inch marine outfall and diffuser located at the Rodeo Sanitary District. Most of the new forcemain and land outfall routing will parallel the existing 24-inch pipeline except the routing will follow Railroad Avenue to Sycamore Avenue and then up to San Pablo Avenue from where it will parallel the existing 24-inch pipe to the Rodeo plant.

Outfall Diffuser

The 2005 outfall survey prepared by Underwater Resources indicated that the port diameter had increased due to corrosion and several ports were plugged. Diffuser improvements will include installation of 3-inch elastomer check valves on each diffuser port. The elastomer check valves will be held in place by stainless steel bands around the existing outfall pipe. The elastomer check valves will provide enhanced jet velocity and improved initial dilution.

Solids Handling

The existing solids handling facilities for thickening waste activated sludge and dewatering digested sludge will be retained. The existing grit removal system and dissolve air flotation thickener will be abandoned.

Anaerobic Digestion

The anaerobic digestion facility has recently (2008) been upgraded with the addition of a fourth digester, new sludge pumping mixing and heating systems. The recent upgrades provide anaerobic digestion capacity for the projected 2030 loads. No additional work is anticipated in the anaerobic digestion area.

Electrical Building

A new electrical building to house a new plant electrical service and distribution panels will be constructed. The new electrical building will house the motor control center for the new secondary treatment facilities and effluent pump station. The new electrical building will also house a standby generator to power the new secondary facilities and effluent pump station.

Non-Economic factors

Since the treatment plant upgrades are proposed to be confined to areas currently within the property boundaries of the existing facilities, there are minimal to no potential impacts to sensitive biological resources such as sensitive habitats and special-status species.

Installation of the flow equalization tank at Bay Park requires removal of the existing paved parking lot, a portion of the grass area and some trees within the park. Following construction, the top of the tank will serve as a parking lot. Grass will be restored to the remaining disturbed areas. There is a wetland area on the west side of the grass area adjacent to the shoreline; however, it will not be disturbed. Therefore, biological impacts for the tank construction would be minimal.

If work must be performed within 100 feet of the shoreline, a permit from the San Francisco BCDC, an entity which regulates a number of activities within and adjacent to San Pablo Bay, is required.

Future regulations may be difficult to meet if expanded facilities are required. There is no additional space on the WPCP site and space at Bay Park is limited because of the flow equalization tank.

Plant operation and maintenance will be more complex and require greater staff effort than the existing facility. The site will essentially have two different treatment plants operating following primary treatment. There is a greater number of structures and equipment to maintain. If flow conditions change, there is a greater likelihood with two treatment plants operating that there may be a process upset which compromises plant reliability.

The existing facility uses chlorine for disinfection. Chemical demand will increase due to an increased flow being treated.

Construction should have minimal impact on the existing operations of the WPCP as no existing process facilities are to be demolished. The only structures anticipated to be demolished are the corporation yard. Tie-ins for pipelines and structures would require treatment plant shutdowns, preferably performed in the summer months when flows are reduced. Construction of the storage facility will temporarily impact the park's availability for use by the public. As Bay Park is constructed on land owned by the WPCP, there should be minimal permitting and/or property rights issues.

Cost

The estimated construction cost for Option 4 in 2009 dollars is $42,485,000. The RWQCB mandates that the facilities are completed and on-line by 2016. Thus, escalating the present cost by 2.5% per year to when construction is anticipated to occur, the estimated construction cost in 2015 dollars is $49,269,000. A summary of the cost by facility is outlined in Table 6-4. Detailed cost breakdowns for each facility by specification section are included in the Appendix. The estimate includes 15% for Contractor overhead and profit, 25% for engineering and administration, and a 25% contingency. The contingency is lower than the typical 30-35% contingency used for planning level estimates because budget costs for most of the major equipment and structures were obtained from the manufacturer and/or supplier.

TABLE 6-4. OPINION OF PROBABLE COST SUMMARY – OPTION 4 (FLOW EQUALIZATION)

Description	Total	
	2009	2015*
General Costs	$2,705,360	$3,137,388
Site Work, Site Piping, and Demolition	$3,895,360	$4,517,423
Headworks	$2,758,301	$3,198,784
Primary Treatment	$227,640	$263,993
Primary Effluent Pump Station	$601,860	$697,973
Electrical Building	$1,125,320	$1,305,026
Secondary System	$7,457,800	$8,648,762
Solids Handling	$1,032,500	$1,197,383
Storage Tank	$8,389,500	$9,729,248
Outfall	$6,826,569	$7,916,727
Estimated Construction Cost	**$35,020,210**	**$40,612,707**
Engineering and Administration (25%)	$8,755,052	$10,153,177
Total Project Cost	**$43,775,262**	**$50,765,883**
TOTAL PROJECT COST, ROUNDED	**$43,775,000**	**$ 50,766,000**

*2.5% Escalation per year.

Summary

Table 6-5 provides a matrix summarizing the factors to consider for the two options, including cost, reliability, environmental constraints, operation, maintenance, and construction. Relative values for the factors are shown in the table.

TABLE 6-5. SUMMARY COMPARISON OF OPTIONS

Factor	Option 2	Option 4
Cost	+	-
Reliability	+	-
Operation and Maintenance	+	-
Future Regulations	+	-
Environmental Constraints	0	0
Permitting	0	0
Energy and Chemical Demand	0	0
Constructability	-	+

0: Neutral, both options are relatively equal
+: Relatively more advantages
-: Relatively more disadvantages

Apparent Best Option

Based on the summary matrix in Table 6-5 which shows that Option 2 has relatively more advantages than Option 4, the apparent best option to implement is Option 2, New Land Outfall.

SECTION SEVEN
PROJECT IMPLEMENTATION

The evaluation conducted in this report indicates Option 2 – New Land Outfall as the apparent best option. The site plan and Design Data are shown in Figure 7-1. The JPA is continuing to refine the WPCP site layout and land outfall alignment to take advantage of construction staging and cost reducing opportunities. Figure 7-2 shows the Liquid Flow Diagram along with the plant hydraulic profile. Figure 7-3 shows the Solids Handling Flow Diagram and Figure 7-4 shows the preferred alignment for the new forcemain.

Option 2 will meet the discharge conditions set forth in Regional Water Quality Control Board Order No. R2-2007-0024 adopted on March 14, 2007. Option 2 addresses the discharge prohibitions of near shore discharge to San Pablo Bay where initial dilution is less than 45 to 1. Option 2 also eliminates blending of primary and secondary effluent discharged to the deep water outfall.

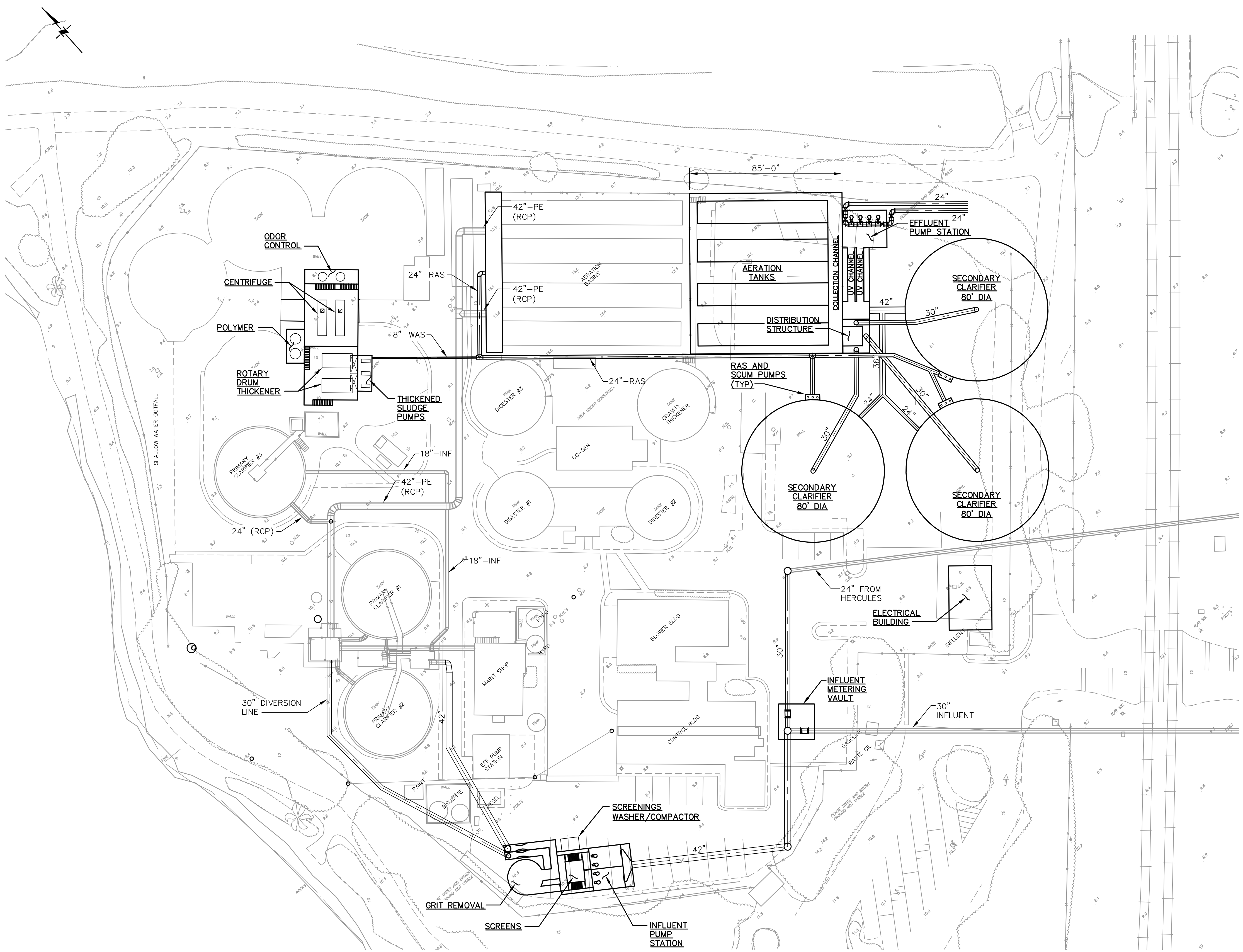
Process units are sized to handle peak wet weather flow of 20 mgd and the total suspended solids and BOD loadings from an average dry weather flow of 4.06 mgd with TSS and BOD concentration of 370 mg/l and 325 mg/l respectively. Option 2 is capable of producing a final effluent of 10 mg/l BOD and 15 mg/l TSS.

The Cities of Pinole and Hercules must comply with the Regional Board's compliance date of November 1, 2015 to complete construction of the necessary facilities to eliminate blending and prevent discharge to the near shore outfall. In order to confirm that the Cities can comply with that date, the following time line has been developed beginning with the construction schedule.

Construction Schedule

The existing Pinole treatment plant must continue to operate uninterrupted during a major upgrade. In order to verify that construction could be accomplished without interruption to the treatment process, the following sequence of construction was developed.

The new headworks which include influent pumping, screening, grit removal and metering will be constructed first. Solids handling equipment including rotary drum thickness and dewatering centrifuges will be ordered early so that they may be temporarily installed to allow demolition of the existing solids handling facilities and construction of the secondary treatment system. Once the new secondary treatment system is on line, the existing secondary clarifiers can be demolished and the permanent solids handling facilities constructed. The sequence and estimated time of construction is shown in Table 7-1.



DESIGN DATA

Design Loadings	
Influent Flows and Loading	
Average dry weather flow, mgd	4.06
Peak wet weather flow, mgd	20.0
Influent TSS, lbs./day (mg/l)	12,500 (370)
Influent BOD lbs/day (mg/l)	11,000 (325)
Effluent Quality	
Effluent BOD, mg/l	10
Effluent suspended solids, mg/l	15
Liquid Treatment Facilities	
Influent Pump Station	
Type	Submersible
Number	4
Capacity (ea), gpm (mgd)	4,630 (6.7)
Motor size hp (variable speed)	75
Bar Screens	
Duty	1
Standby	1
Capacity (ea), mgd	20
Washer/Compactor	1
Grit Chamber	
Type	Mechanical Vortex
Number	1
Capacity, mgd	20
Grit Pumps	
Type	Recessed Impeller
Number	2
Capacity, (ea), gpm	250
Grit Cyclone	
Type	Centrifugal
Number	1
Grit Classifier	
Type	Screw Conveyor
Number	1
Influent Metering	
Type	Parshall Flume
Influent meter, size (capacity)	18" (12 mgd)
Diversion meter, size (capacity)	12" (8 mgd)
Headworks Odor Control	
Type	Biofilter
Air flow rate, cfm	2,000
Primary Treatment	
Sedimentation Tanks	
Number	3 (existing)
Diameter, ft.	45
Area ft.2 each	1,590
Total area ft.2	4,770
Overflow rate @ 4.06 mgd, gpd/ft	2851
Overflow rate @ 12 mgd, gpd/ ft	22,515
Sludge Pumps	
Type	Progressive cavity
Number per tank	2
Capacity, gpm	20–50
Motor	Variable speed
Horsepower	5
Scum Pumps	
Existing	
Aeration Basins	
Number	4
Length, ft.	190
Width, ft.	20
Water depth, ft.	15
Detention time @ 4.06 mgd (3 basins), hr.	7.5
Loading, lbs. BOD/1,000 ft3/day (3 basins)	42
Blowers	
Type	High speed turbo
Number	2
Capacity ea., cfm	1,200
Existing Capacity, (3@ 1,100 cfm) cfm	3,300
Secondary Sedimentation	
Tanks	
Number	3
Diameter, ft.	80
Side water depth, ft.	16
Area ft2 each	5,026
Overflow rate, gpd/ft2 (2 tanks @ 4.06 mgd)	404
Overflow rate, gpd/ft2 (3 tanks @ 20 mgd)	1,326
Return Activated Sludge Pump	
Type	Variable speed vertical solids handling
Number	6
Capacity range, each, gpm	500–1,500
Scum Pumps	
Type	Progressive cavity
Capacity	35 gpm
UV Disinfection	
Design capacity, mgd	20
UV transmittance	55%
Disinfection limit, MPN (5 day median)	240
Disinfection limit, MPN (maximum)	10,000
Number of channels	2
Total number of UV lamps	448
Effluent Pump Station	
Pumps	
Type	Variable speed multi–stage vertical turbine
Number	4
Capacity, each, mgd	6.7
Motor horsepower, each	250
Solids Handling	
Anaerobic Digester (Existing)	
Number	3
No. 1, Vol. gallons	147,530
No. 3, Vol. gallons	233,287
No. 4, Vol. gallons	356,294
Estimated sludge vol., gallons/day	36,271
Estimated detention days	20.3
Volatile solids loading lbs/ft3/day	0.10
Sludge Storage (Existing)	
Digester No. 2	
Volume, ft3/gallons	19,723/147,530
Sludge Dewatering	
Type	Centrifugal
Capacity, gpm	100
Lbs/hour	1,750
Waste Activated Sludge Thickening	
ThickenerType	Rotary drum

DODSON PSOMAS

BAR IS ONE INCH AT FULL SCALE
0 1"
IF NOT ONE INCH SCALE ACCORDINGLY

CITY OF PINOLE CALIFORNIA 1903

CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

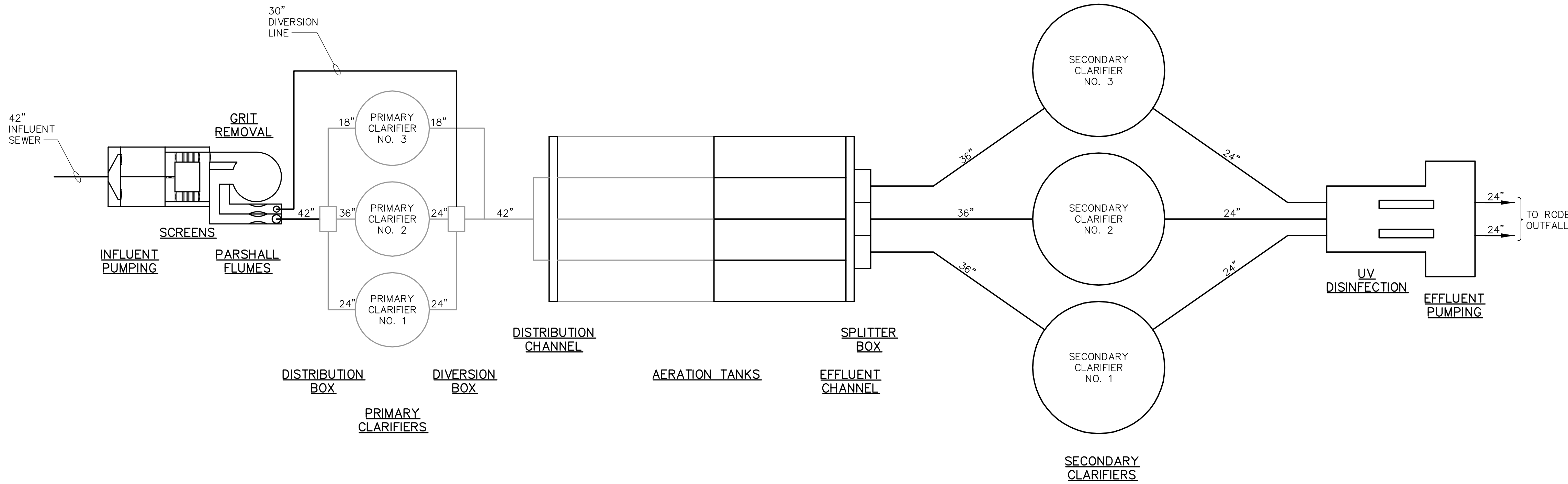
OPTION 2

SITE PLAN AND DESIGN DATA

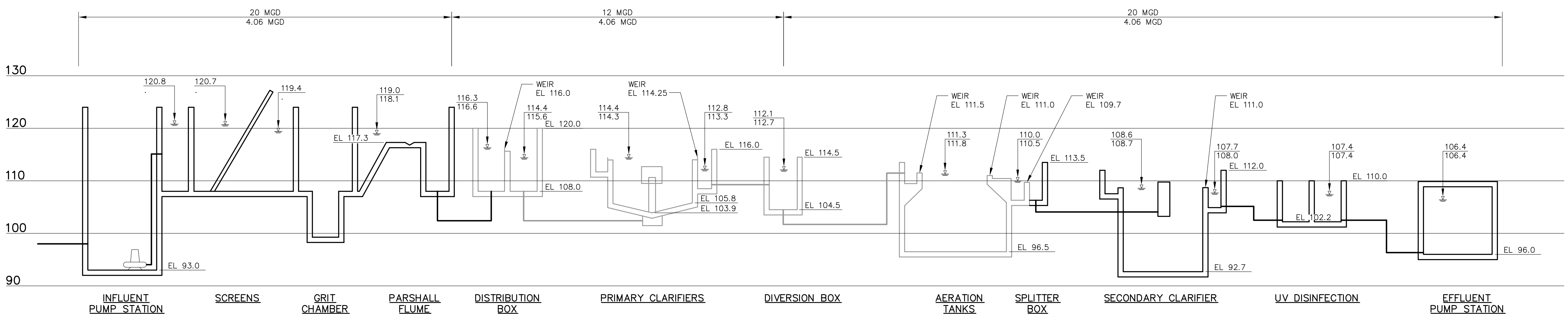
Scale 1"=30'-0"

Figure No. 7–1

File Info. FIG_7-1.DWG DSW 5/2009

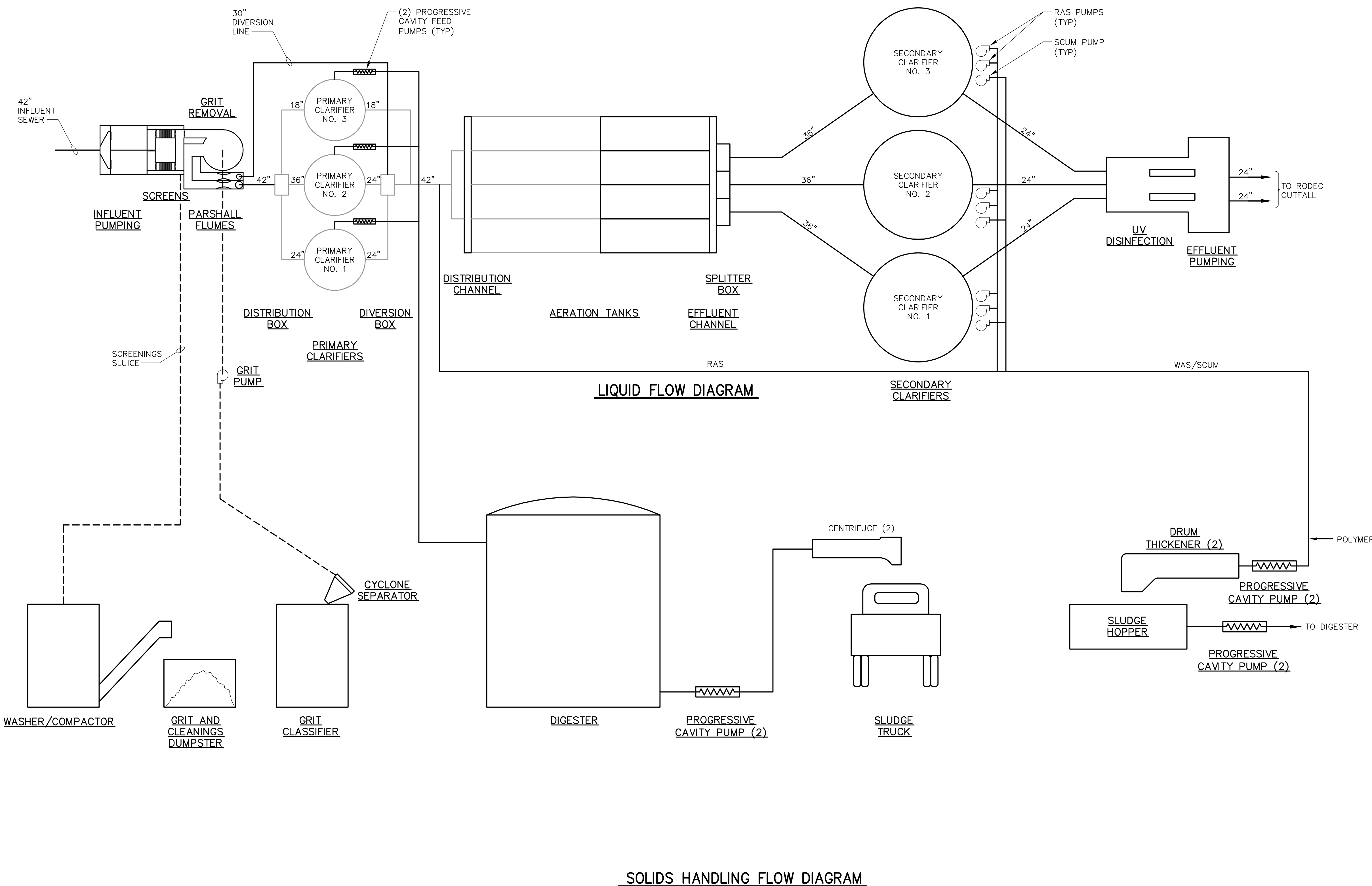


LIQUID FLOW DIAGRAM



HYDRAULIC PROFILE

DODSON PSOMAS	BAR IS ONE INCH AT FULL SCALE 0 1" IF NOT ONE INCH SCALE ACCORDINGLY	CITY OF PINOLE CALIFORNIA 1903 — CITY OF PINOLE	PINOLE–HERCULES WASTEWATER TREATMENT PLANT GENERAL OPTION 2 LIQUID FLOW DIAGRAM & HYDRAULIC PROFILE
File Info. FIG 7-2.DWG DSW 5/2009			Scale NONE Figure No. 7-2



DODSON PSOMAS

BAR IS ONE INCH AT FULL SCALE 0 1"
IF NOT ONE INCH SCALE ACCORDINGLY

CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

GENERAL

OPTION 2

SOLIDS HANDLING FLOW DIAGRAM

Scale NONE

Figure No. 7–3

File Info. FIG 7–3 DSW 5/2009

ALIGNMENT FOR NEW LAND OUTFALL

DODSON PSOMAS	BAR IS ONE INCH AT FULL SCALE 0 1" IF NOT ONE INCH SCALE ACCORDINGLY	CITY OF PINOLE CALIFORNIA 1903	CITY OF PINOLE	PINOLE–HERCULES WASTEWATER TREATMENT PLANT CIVIL NEW LAND OUTFALL ALIGNMENT	Scale NONE Figure No. 7–4
File Info. FIG_7-4.DWG HJH 5/2009					

TABLE 7-1. CONSTRUCTION SEQUENCE

Item	Time to Construct , Months	Cumulative Time, Months
Construct influent sewers, headworks and install temporary solids dewatering equipment	10	10
Relocate corporation yard, demolish solids handling area and construct secondary treatment facilities, forcemain and diffuser modifications	12	22
Demolish secondary clarifiers and construct permanent solids handling facilities	8	30
TOTAL CONSTRUCTION TIME, MONTHS		**30**

Design, advertising, bidding, and award for construction of the project will require another 18 months. In order to meet the Regional Board's mandated schedule of completing construction of facilities by November 1, 2015, the notice to proceed for design should be issued by November 1, 2011. The only significant difference between the Regional Board and the recommended compliance schedule is that the complexity of the design and the sequence of construction will require a design, bid, and a construction period of approximately four years. This means that the recommended start of design would be November 1, 2011. The schedule differences are shown in Table 7-2.

TABLE 7-2. COMPLIANCE SCHEDULE

Task	Compliance Date	
	Regional Board	Recommended
Engineering Report and Antidegredation Analysis	June 1, 2009	June 1, 2009
Certified Environmental Impact Report	August 1, 2010	August 1, 2010
Secure funding for WPCP upgrades	August 1, 2011	August 1, 2011
Start design of WPCP upgrades	August 1, 2012	November 1, 2011
Complete design of WPCP facilities	August 1, 2013	February 1, 2013
Commence construction of WPCP facilities	June 1, 2014	May 1, 2013
Complete construction of WPCP facilities	November 1, 2015	November 1, 2015

SECTION EIGHT
PLANNING CONSIDERATIONS

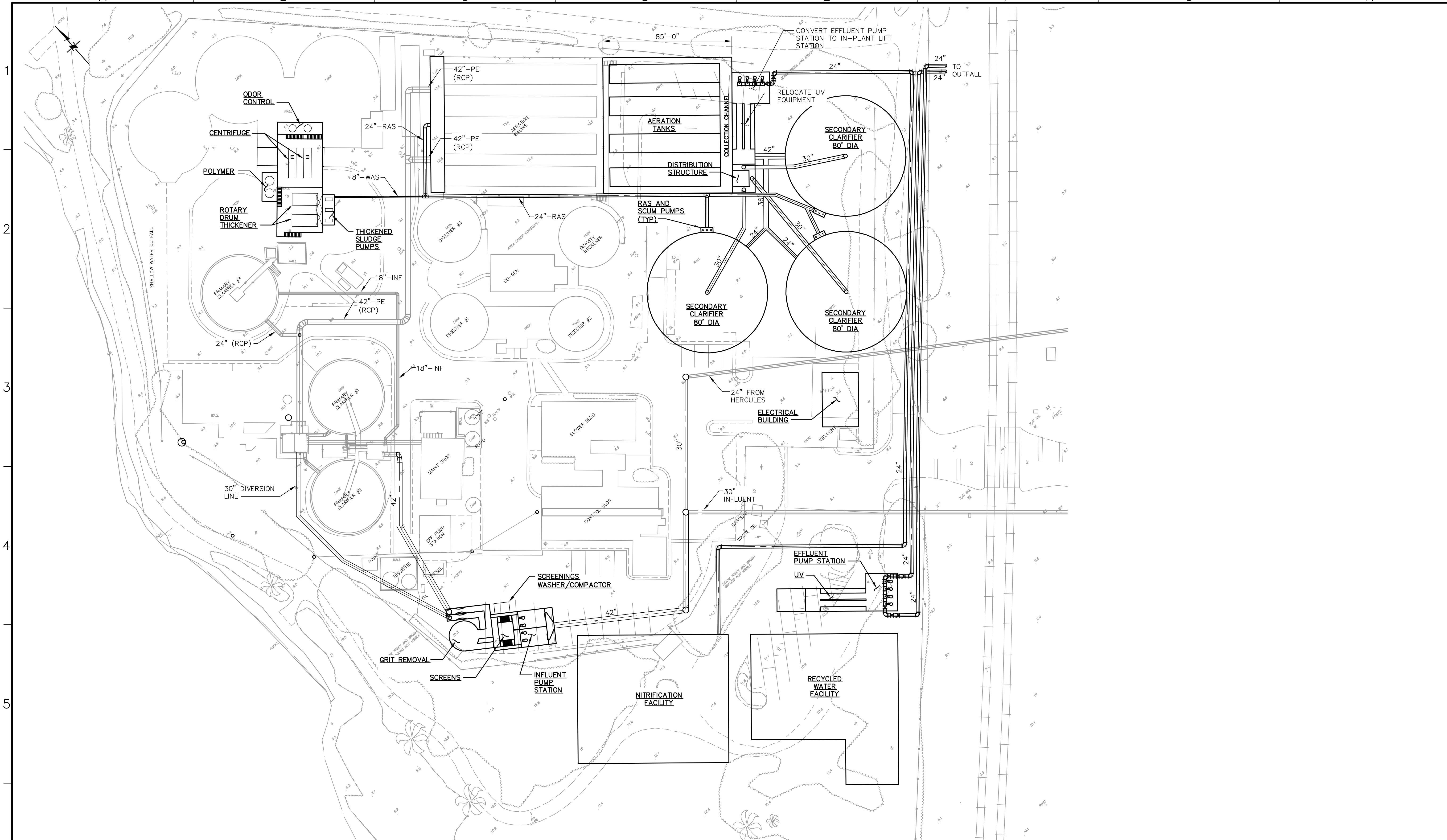
Processes which may be implemented in the future at the WPCP should be taken into consideration for planning purposes.

Nitrification

Regulations are becoming more stringent. Nitrification, or ammonia removal from wastewater, may be required in the future. Additional facilities would be necessary to oxygenate the wastewater to remove ammonia. There is not sufficient space on the existing WPCP site for additional facilities; however, land within Bayfront Park, which is owned by the WPCP, is available. Figure 8-1 shows a potential location for nitrification facilities should the process be required.

Recycled Water

Production of recycled water is an opportunity to utilize secondary effluent and reduce discharge to San Pablo Bay. Recycled water is becoming more attractive to municipalities and processing plants because it offsets potable water use and reduces the threat of severe rationing during droughts. Although recycled water opportunities for the WPCP have been previously considered, there are currently no defined users or plans to implement. However, should the WPCP become a producer of recycled water, tertiary treatment facilities and additional piping to distribute recycled water to its users would be required. There is not sufficient space available on the existing WPCP site; however, land within Bayfront Park, which is owned by the WPCP, is available. Figure 8-1 shows a potential location for tertiary treatment facilities. A recycled water permit would also be required if recycled water is used for irrigation at areas outside the WPCP.



DODSON PSOMAS

BAR IS ONE INCH AT FULL SCALE
0 1"
IF NOT ONE INCH SCALE ACCORDINGLY

CITY OF PINOLE CALIFORNIA 1903

CITY OF PINOLE

PINOLE–HERCULES WASTEWATER TREATMENT PLANT

CIVIL

NITRIFICATION AND RECYCLED WATER FACILITIES

Scale 1"=30'-0"

Figure No. 8-1

File Info. FIG_8-1 DSW 5/2009