City of Pinole

Pinole/Hercules WPCP Project

Technical Memorandum 15

Hydraulic Profile

March 1, 2013

PRELIMINARY
FOR REVIEW ONLY

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No. 39819
Exp. 12/31/2013

CIVIL

REGISTERED PROFESSIONAL ENGINEER
STATE OF CALIFORNIA

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Technical Memorandum

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TM 15 – HYDRAULIC PROFILE

Pinole/Hercules WPCP Project   *March 1, 2012*

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Executive Summary

Purpose

The purpose of this technical memorandum (TM) is to prepare a detailed hydraulic profile analysis for the proposed process upgrades at the Pinole/Hercules Water Pollution Control Plant (WPCP). Additionally this TM will outline proposed modifications to address hydraulic issues.

Background

The WPCP was issued a renewed National Pollution Discharge Elimination System (NPDES) permit in August 2012, which contains new treatment and discharge requirements that become effective in 2017. Upgrades to the Headworks, secondary treatment and disinfection system are needed to meet renewed permit requirements. These upgrades will change the hydraulic capacity of the WPCP. This TM presents the hydraulic analysis of flow conditions developed in TM 1 and treatment scenarios developed in TM 8.

Conclusions

HDR reviewed four hydraulic scenarios:

◈ Average Dry Weather Flow (ADWF)

◈ Maximum Month Flow (MMF)

◈ Maximum Day Flow (MDF)

◈ Peak Wet Weather Flow (PWWF)

The existing primary clarifiers and Secondary Clarifier Distribution Box do not have capacity to handle wet weather flows. To mitigate hydraulic issues, flows greater than 12 million gallons per day (mgd) will bypass the primary clarifiers and discharge to the Primary Effluent Junction Box. A new Secondary Clarifier Distribution Box will be constructed to split flow between five secondary clarifiers. Weirs at both primary and secondary clarifiers will be reinstalled to confirm they are at the required elevation. Following construction of the upgrades the secondary system will be able to treat up to 20-

mgd. The costs for the hydraulic improvements discussed in this TM are included in the design costs for the upgrades treatment process they are most closely related to.

Introduction

Hydraulic analyses were performed to model proposed upgrades to the WPCP to determine if the proposed plant modifications will significantly alter the hydraulic profile of the plant. The NPDES permit requires that all influent flows receive secondary treatment prior to disinfection and discharge to the San Pablo Bay. Currently, the secondary treatment system does not have the hydraulic capacity to treat flows above approximately 11 mgd.

HDR used Visual Hydraulics, a commercial software program, to analyze the future hydraulic profiles. This model was developed using existing plant information and proposed dimensions and elevations for new plant processes. The following sections contain the design criteria used for the hydraulic analysis, a description of the hydraulic analysis and flow scenarios, hydraulic profile figures and a summary of the hydraulic modeling results.

Design Criteria

The following sections provide the design criteria that are used in the development of the WPCP hydraulic profile for the WPCP upgrades project.

Design Flows

The basis of hydraulic design flows were developed in TM 1. Flow scenarios include the ADWF, MMF, MDF, and PWWF. Table 15-1 presents the flow components for each design scenario. A description of each flow component can be found in TM 1.

Table 15-1. Design Flow Scenarios

Flow Component	ADWF (mgd)	MMF (mgd)	MDF (mgd)	PWWF (mgd)	Comment
Combined Influent Flow	4.06	6.09	11.3	20	
Return Activated Sludge (RAS)	3.25	4.87	5.65	10.00	80% of Influent, 50% during storm events
Mixed Liquor Recycle (MLR)	8.12	12.18	22.6	0	200% of Influent, no recycle during PWWF
Disinfected Effluent Flow	4.06	6.09	11.3	20	

Process Units in Service

The number of process units in service varies with the flow scenario. During ADWF at least one process unit from each treatment process was modeled as offline to ensure that a unit can be out of service for maintenance and cleaning. Table 15-2 provides a list of the major unit processes modeled and the number of units in service under each flow scenario.

Table 15-2. Number of Units in Service

Unit Process	ADWF	MMF	MDF	PWWF	Comment
Primary Clarifier Distribution Box	1	1	1	1	When influent exceeds 12-mgd, remaining flow is by-passed around the primary clarifiers
Primary Clarifiers	2	3	3	3	Hydraulic capacity of 12-mgd
Primary Effluent Junction Box	1	1	1	1	
Aeration Basins	1	2	2	2	Contact stabilization is utilized during storm events
Secondary Clarifier Distribution Box	1	1	1	1	
Secondary Clarifiers	4	5	5	5	Per new NPDES Permit all flow must receive secondary treatment
Chlorine Contact Basins	1	2	2	2	

Each flow scenario routes specific volumes of flow through each unit process. During ADWF, MMF, and MDF the biological treatment system will operate in a Modified Ludzack-Ettinger (MLE) configuration, with internal mixed liquor recycle. During storm events (prior to and during PWWF), the biological treatment system will operate in contact stabilization mode. This is necessary to stabilize the treatment process during high flow. Table 15-3 provides a list of flows modeled through each unit process for each of the flow scenarios.

Table 15-3. Flow Modeled Through Each Unit Process

Unit Process	ADWF	MMF	MDF	PWWF	Comment
Primary Clarifier Distribution Box	4.06	6.09	11.3	12	By-pass of Primary Clarifiers occurs when flows surpass 12-mgd
Primary Clarifier No. 2	1.35	2.03	3.77	4.00	
Primary Effluent Junction Box	7.31	10.96	16.95	20.00	RAS returned to AB Zone A During Storm Events
Aeration Basin 3/4	15.43	11.57	19.78	30.00	Contact Stabilization Mode
Secondary Clarifier Distribution Box	7.31	10.96	16.95	30.00	Distribution box weirs are fully submerged at all flow conditions.
Secondary Clarifier No. 2	2.41	3.62	5.59	9.90	
Chlorine Contact Basin No. 1	2.03	3.05	5.65	10.00	

The hydraulic profile calculations were completed using the longest hydraulic path to achieve conservative results. The ADWF, MMF, and MDF patterns are outlined in Figure 15-1. The following unit processes were used: Chlorine Contact Basin No. 1, Secondary Clarifier No. 2, Aeration Basin 3/4, and Primary Clarifier No. 2. The PWWF pattern is outlined in Figure 15-2.
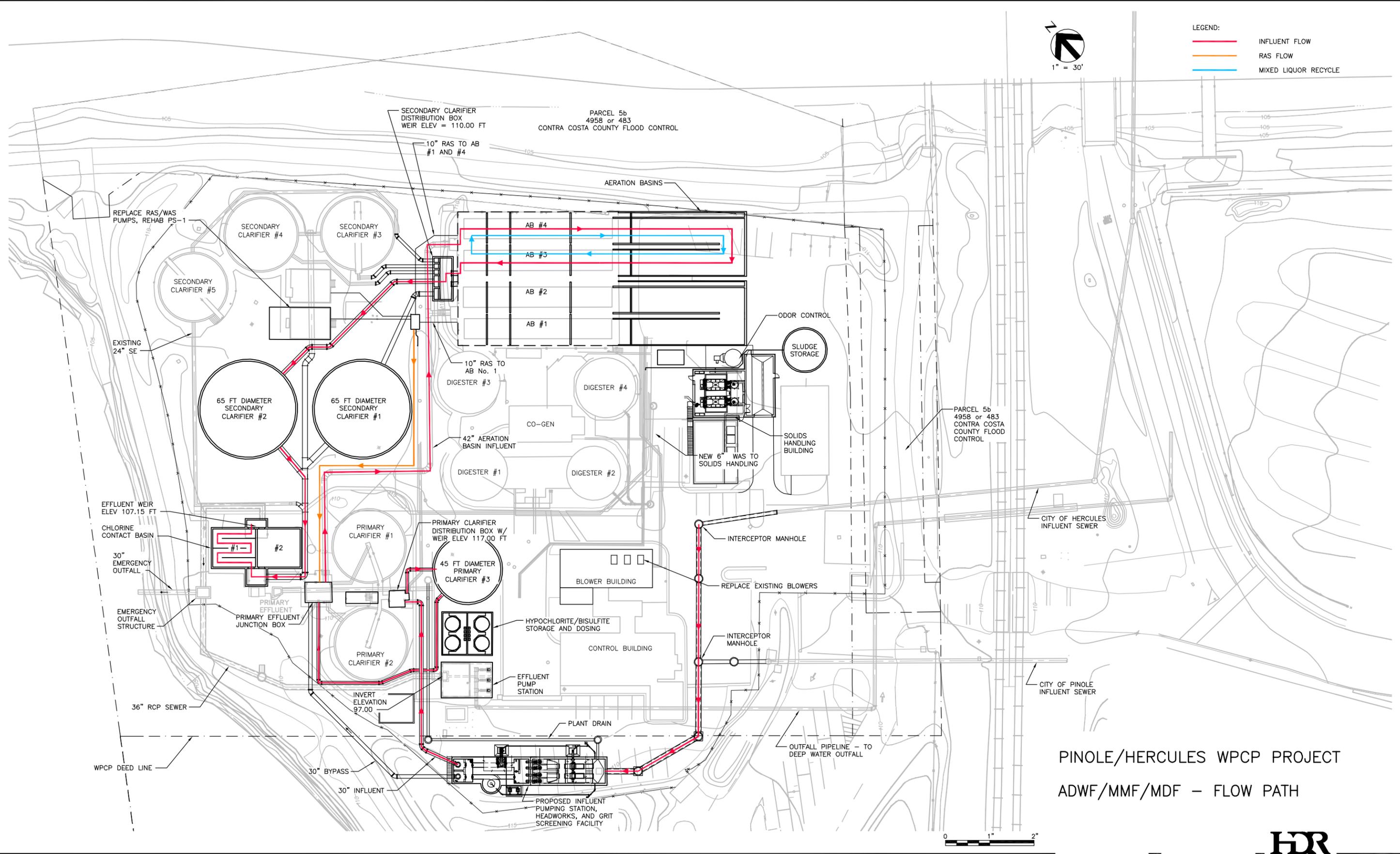
Figure 15-1
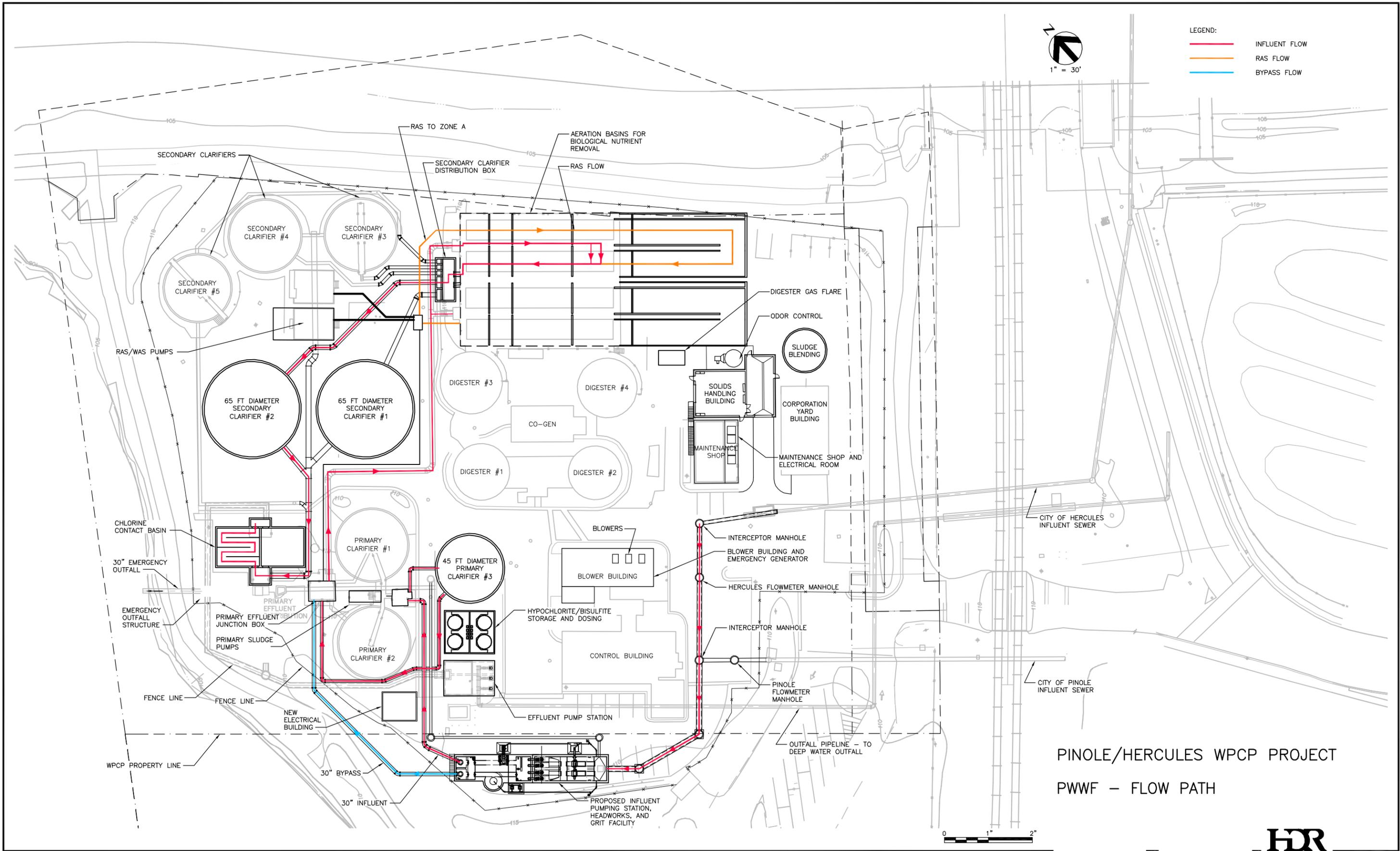
Figure 15-2

PINOLE/HERCULES WPCP PROJECT

PWWF — FLOW PATH

The starting water surface elevation for each flow scenario is calculated as the headloss over the effluent weir in Chlorine Contact Basin. The 2002 Secondary Clarifier Expansion record drawings indicate that the weir elevation is set at 107.15 ft. The final upstream elevation is set at the Primary Clarifier Distribution Box. Weir elevations in this box are manually set with stop logs. For the purpose of this analysis the weir Primary Clarifier Distribution Box weir elevation was assumed to be 117.00 ft.

Hydraulic Analysis

Four flow patterns were analyzed for this TM, ADWF scenario, MMF scenario, MDF scenario, and the PWWF scenario. All reference elevations for the models are based on the 1929 Datum per the 1971 WPCF drawings. (Yoder – Trotter – Orlob & Associates). A hydraulic profile of the proposed plant upgrades is provided in Figure 15-3. A detailed hydraulic element list for each flow scenario is provided in Appendix A. Descriptions of each flow pattern are presented in the following paragraphs.
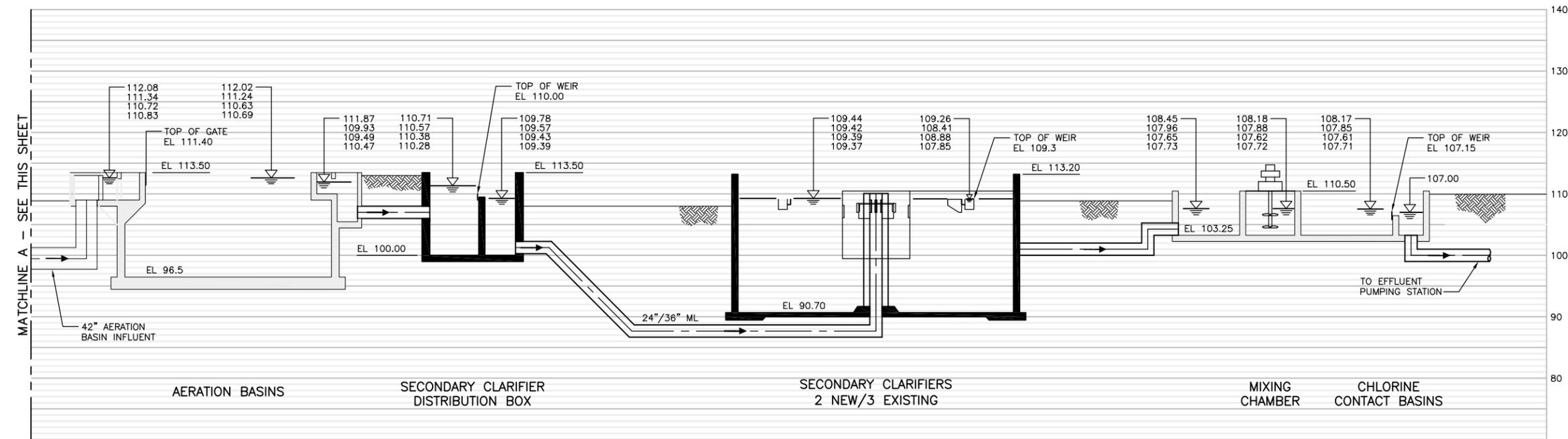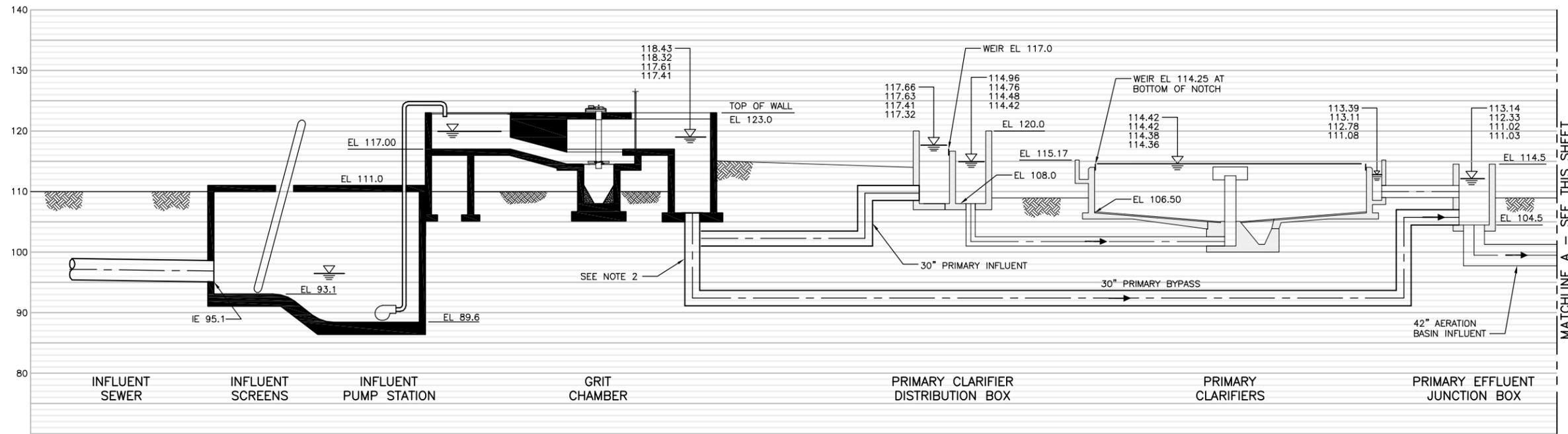
ADWF Scenario

Figure 15-1 illustrates the flow path for this flow scenario. Raw sewage from the Headworks is pumped to Primary Clarifier Distribution Box where it flows over one of three weirs to each of the Primary Clarifiers. Flow from the primary clarifiers is combined in the Primary Effluent Junction Box, where it is mixed with Return Activated Sludge (RAS) pumped from the secondary clarifiers.

Primary effluent and RAS flow by gravity through a 42-in diameter reinforced concrete pipe to the aeration basins. During ADWF, all flow will be routed to a single aeration basin train. Flow enters the aeration basins through a 36-in downward opening sluice gate. The basins operate in a wrap-around configuration with an internal MLR. Mixed liquor exits the center aeration basins through a 36-in gate and is conveyed by gravity to the Secondary Clarifier Distribution Box through a 30-in diameter concrete pipe.

Mixed liquor is split in the Secondary Clarifier Distribution Box by a series of weirs dedicated to each of the five secondary clarifiers. The new distribution box will consist of five weirs. Two of the five weirs are 7-ft long to feed new Secondary Clarifiers No. 1 and No. 2; the remaining three weirs are 2.5-ft long to feed existing Secondary Clarifiers No. 3, No. 4, and No. 5. This allows more flow to enter the larger 65-ft diameter clarifiers.

Flow feeding Secondary Clarifier No. 2 cascades over the weir and enters a drop box that feeds a 36-IN pipe. The pipe enters the clarifier through the center well, and exits through a peripheral v-notch weir. The effluent launders feed a drop box and 36-IN effluent pipe.

PINOLE/HERCULES WPCP PROJECT

HYDRAULIC PROFILE

Figure 15-3

Top Profile (left to right):

EL 117.00

EL 111.0

IE 95.1

EL 93.1

EL 89.6

118.43
118.32
117.61
117.41

TOP OF WALL
EL 123.0

SEE NOTE 2

WEIR EL 117.0

117.66
117.63
117.41
117.32

114.96
114.76
114.48
114.42

EL 120.0

EL 115.17

EL 108.0

WEIR EL 114.25 AT BOTTOM OF NOTCH

114.42
114.42
114.38
114.36

EL 106.50

30" PRIMARY INFLUENT

30" PRIMARY BYPASS

113.39
113.11
112.78
111.08

113.14
112.33
111.02
111.03

EL 114.5

EL 104.5

42" AERATION BASIN INFLUENT

MATCHLINE A - SEE THIS SHEET

INFLUENT SEWER | INFLUENT SCREENS | INFLUENT PUMP STATION | GRIT CHAMBER | PRIMARY CLARIFIER DISTRIBUTION BOX | PRIMARY CLARIFIERS | PRIMARY EFFLUENT JUNCTION BOX

Bottom Profile (left to right):

MATCHLINE A - SEE THIS SHEET

112.08
111.34
110.72
110.83

112.02
111.24
110.63
110.69

TOP OF GATE
EL 111.40

EL 113.50

111.87
109.93
109.49
110.47

110.71
110.57
110.38
110.28

TOP OF WEIR
EL 110.00

109.78
109.57
109.43
109.39

EL 113.50

EL 100.00

109.44
109.42
109.39
109.37

109.26
108.41
108.88
107.85

TOP OF WEIR
EL 109.3

EL 113.20

24"/36" ML

EL 90.70

108.45
107.96
107.65
107.73

108.18
107.88
107.62
107.72

108.17
107.85
107.61
107.71

TOP OF WEIR
EL 107.15

107.00

EL 110.50

EL 103.25

TO EFFLUENT PUMPING STATION

42" AERATION BASIN INFLUENT

EL 96.5

AERATION BASINS | SECONDARY CLARIFIER DISTRIBUTION BOX | SECONDARY CLARIFIERS 2 NEW/3 EXISTING | MIXING CHAMBER | CHLORINE CONTACT BASINS

NOTES:

1. ENERGY GRADE LINE ELEVATIONS ARE SHOWN AS FOLLOWS:

   PEAK WET WEATHER FLOW (PWWF)
   MAXIMUM DAY FLOW (MDF)
   MAXIMUM MONTH FLOW (MMF)
   AVERAGE DRY WEATHER FLOW (ADWF)

2. FLOWS ABOVE 12 MGD WILL BYPASS THE PRIMARY CLARIFIERS.

3. REFER TO FIGURES 15-1 AND 15-2 FOR THE FLOW PATH OF EACH SCENARIO.

4. REFER TO TABLE 15-1 FOR INFLUENT, RAS, MLR, AND EFFLUENT FLOW RATES IN EACH FLOW SCENARIO.

5. REFER TO TABLE 15-2 FOR THE NUMBER OF PROCESS UNITS ONLINE IN EACH FLOW SCENARIO.

6. WATER SURFACE ELEVATIONS IN THE INFLUENT PUMP STATION ARE DICTATED BY PUMP LEVEL CONTROL. REFER TO TM 5/6 FOR ADDITIONAL DETAILS ON THE HEADWORKS HYDRAULICS.

HDR
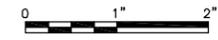
C:\pwworking\spc\d0436859\FIGURE 15-3.dwg
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Secondary effluent combined from all clarifiers enters a 42-in common header and is conveyed to the Chlorine Contact Basin for disinfection. Following disinfection, treated effluent passes over an effluent weir and into a 36-in effluent pipe to the Outfall Junction Structure. From the Outfall Junction Structure flows are diverted to the Effluent Pump Station or to the Emergency Outfall.

MMF and MDF Scenarios

The MMF and MDF scenarios are operated in a similar fashion the ADWF scenario; however, two aeration basins are online, as well as all primary and Secondary Clarifiers and both Chlorine Contact Basins. In the MDF scenario the RAS recycle is reduced to 50 percent of the influent flow as listed in Table 15-1.

PWWF Scenario

Figure 15-2 illustrates the flow path for the PWWF scenario. At PWWF the influent flow exceeds the hydraulic capacity of the primary clarifiers. Approximately 12 mgd will pass through the primary clarifiers and the remaining 8 mgd will flow from the Headworks directly to the Primary Effluent Junction Box. The biological treatment process will change to operate in contact stabilization mode.

In contact stabilization mode, RAS will be pumped directly to the aeration basins rather than to the Primary Effluent Junction Box. RAS will enter Aeration Basin Zone 1 through the existing 36-in downward opening sluice gate. Primary Effluent will flow through the 42-in diameter pipe, and enter the mixed liquor channel for Aeration Basin 3. Metal stop gates will be reconfigured so flow is conveyed down the existing step feed channel between Aeration Basins 1 and 2 and Aeration Basins 3 and 4. Flow will exit the step feed ports into Zones D and E. Aeration Basin zones are described in more detail TM 8. At PWWF the MLR pumps will be turned off and no internal recycle will occur.

Flow exits the aeration basins through the 36-in sluice gate and enters the Secondary Clarifier Distribution Box. To provide adequate flow split at PWWF, the weirs in the distribution box will be set at 110.00-ft. This analysis assumes the existing secondary clarifier weirs will be reinstalled, and the invert elevation raised 1.5-in to 109.3-ft. Flow follows the same path as described in the ADWF scenario for the remainder of the treatment process.

Recommended Project

Output from the Visual Hydraulics model is presented in Appendix B. The construction of a new Secondary Clarifier Distribution Box and two new Secondary Clarifiers will allow the WPCP to operate at all flow scenarios with no hydraulic issues. At least 1-ft of clearance between the water surface elevation and the top of the concrete is provided for each process unit at all flow conditions. The invert of the primary clarifier weirs is adequate; however, HDR recommends that the elevation be field verified as part of the construction project. Table 15-4 provides a list of design considerations for each hydraulic unit process.

Table 15-4. Unit Process Design Constraints

Unit Process	Comment
Primary Clarifier Distribution Box	• No modifications necessary
Primary Clarifiers	• Weir elevations field verified and reset if needed • By-pass flows at 12 mgd
Primary Effluent Junction Box	• Junction box provides mixing of RAS and primary effluent prior to biological treatment • At PWWFs RAS will not enter the junction box
Aeration Basins	• Step feed ports will need to be open/retrofitted • Operates in contact stabilization mode at during large storm events • RAS pumped to Zone A • Primary effluent enters basin at Zone D/E • 30-IN effluent pipe will be replaced with 36-IN pipe to minimize headloss.
Secondary Effluent Junction Box	• New box will provide correct flow split to five secondary clarifiers • New box will limit the headloss through the secondary system
Secondary Clarifiers	• Weir elevations will be raised to 109.30-FT, to handle 20 mgd • Two new 65-FT diameter clarifiers will be constructed to handle 60 percent of the flow.
Chlorine Contact Basin	• Re-use existing infrastructure, no hydraulic modifications

There are no costs included in this TM for the recommended improvements. The costs for the discussed improvements are included in the TMs for the associated treatment process.

Appendix A. Pinole/Hercules WPCP Hydraulic Element List

HYDRAULIC ELEMENTS LIST -ADWF
Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS* WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	DIMENSIONS LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH	LOSSES	FLOW — Average Dry Weather Flow FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	COMMENTS/OPERATION
Chlorine Contact Basin	2002 SC G-4	Effluent Weir	107.71		107.15	4.50						2.03	50%					
	1971 WPCF M-55.4	Basin	107.72	110.50	103.25	140.0 ft		4.0 ft			6 - 180 deg Bends 1-90 deg Bend	2.03	50%					
	1971 WPCF M-55.4	Slide Gate			103.25			24.0 in		36.0 in		2.03	50%					
	1971 WPCF M-55.4	Influent Box	107.73		103.25	8.0 ft		4.0 ft				4.06	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				3-90 deg bends Exit	4.06	100%					New Pipeline
	Figure C	SC #1 Effluent Connection	107.75				24.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 30" Effluent Pipe				70 ft	30.0 in				Entrance 2-90 deg Bends	1.22	30%		30%			30% to each new SC (1,2), 14% to each old SC (3.4.5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 529. 64' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft										
		SC # 1 Effluent Launder	107.84		107	100 ft		1.0 ft	0.004			0.61	15%		30%			
	Weir Elv. Increased by 4"	SC # 1Effluent Weir	109.37		109.3							1.22	30%		30%			
		SC # 1	109.37	112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		1.22	30%	0.97	30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	1.22	30%	0.97	30%			
		SC #1 Influent Line		--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	1.22	30%	0.97	30%			
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box	109.39	113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	1.22	30%	0.97	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir	110.28		110.00	7.0 ft						1.22	30%	0.97	30%			
	See TM	SC Distribution Box	110.28	113.50	100.00	9.0 ft		30.0 ft		13.50 ft		4.06	100%	3.25	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	4.06	100%	3.25	100%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					4.06	100%	3.25	100%			
	1983 Exp. S-4	AB 3 ML Drop Box	110.46	113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		4.06	100%	3.25	100%			
	1983 Exp. S-4	AB 3 ML Effluent Channel	110.47		109.25 ft	5.5 ft		3.0 ft		4.3 ft		4.06	100%	3.25	100%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--		36.0 in		30.0 in		4.06	100%	3.25	100%			Oriface DS control
	Figure 10	AB No. 3 Zone E	110.57		96.5 ft	95.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	AB No. 3 Zone D	110.60		96.5 ft	95.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS. and 145% is MLR.
	Figure 10	AB No. 4 Zone C	110.63		96.5 ft	130.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	AB No 4. Zone B	110.66		96.5 ft	30.0 ft		20.0 in		17.0 in		4.06	100%	3.25	100%	8.12	100%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		4.06	100%	3.25	100%	8.12	100%	
	1983 Exp. S-4	AB 4 Zone A	110.69		96.5 ft	30.0 ft		20.0 ft		17.0 ft		4.06	100%	3.25	100%	8.12	100%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	4.06	100%	3.25	100%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channe	110.72		109.25 ft	4.0 ft		3.0 ft		4.0 ft		4.06	100%	3.25	100%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			4.06	100%	3.25	100%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channel	110.83		110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	4.06	100%	3.25	100%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				exit 2 - 90 deg bends	4.06	100%	3.25	100%			
	1983 Exp.	42-IN RCP Tee Line to Branch	110.88				42.0 in				Tee	4.06	100%	3.25	100%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in					4.06	100%	3.248	100%			May cause hydraulic issues if SC Dist. Box Weir Elve. Is raised
	1971 EXP M 30.2	PE Junction Box	111.03	114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		4.06	100%	3.248	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends 2-90 deg bends exit	1.34	33%					Pipe assumed to go all the way to the new PC#3
	1971 WPCF M 30.1	PC # 2 Effluent Box	111.03	116.00	112.00	4		1.5 ft				1.34	33%					
	1971 WPCF M 30.1	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			0.67	17%					
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						1.34	33%					V-notch weir 8" Spacing 90 deg angle, 212 notches Invert = 114.25
	1971 WPCF M 30.1	PC # 2 Basin	114.36		106.00		45.0 ft					1.34	33%					
	1971 WPCF M 30.1	PC # 2 18-IN Influent wel				7 ft	18.0 in					1.34	33%					
	1971 WPCF M 30.1	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	1.34	33%					
	1971 WPCF M 30.1	36-In Influent pipe				32 ft	36.0 in				90 Bend Entrance	1.34	33%					
PC Flow Split Structure	1971 WPCF M 30.1	Drop Box to Primary Clarifier No.2	114.42			40.0 in		40.0 in				1.34	33%					Flow is pumped to this location.
	1971 WPCF M 30.2	Primary Clarifier Distribution Box Weir	117.32	120.00	117.00	4.0 ft						1.34	33%					

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD) INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Average Dry Weather	4.06	3.25	8.12
	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	10.74	13.56
	Peak Wet Weather	20.00	10.00	5.50

HYDRAULIC ELEMENTS LIST - MM
Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	WSE (ft)	TOP/ROOF (ft)	INVERT (ft)	LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH	LOSSES	FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	COMMENTS/OPERATION
Chlorine Contact Basin	2002 SC G-4	Effluent Weir			107.15	4.50						3.045	50%					
	1971 WPCF M-55	Basin		110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	3.045	50%					
	1971 WPCF M-55	Slide Gate			103.25			24.0 in		36.0 in		3.045	50%					
	1971 WPCF M-55	Influent Box			103.25	8.0 ft		4.0 ft				6.09	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Exit	6.09	100%					
	Figure C	SC #1 Effluent Connection					24.0 in				Wye 24" to 42"							
Secondary Clarifier #1	Not yet produced	SC # 1 30" Effluent Pipe				70 ft	30.0 in				Entrance 2-90 deg Bends	1.83	30%			30%		30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft				1.83	30%			30%		
		SC # 1 Effluent Launder			100	100 ft		1.0 ft	0.004			0.91	15%			30%		
	Weir Elv. Increased by 4"	SC # 1Effluent Weir			200							1.83	30%			30%		
		SC #1		112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		1.83	30%	1.46	30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	1.83	30%	1.46	30%			
		SC #1 Influent Line		--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	1.83	30%	1.46	30%			
Secondary Clarifier Distribution Box	See TM	SC # 1 Influent Box		113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	1.83	30%	1.46	30%			New splitter box required,
	See TM	Weir to SC #1			110.00	7.0 ft						1.83	30%	1.46	30%			
	See TM	SC Distribution Box		113.50	100.00	9.0 ft		30.0 ft		13.50 ft		6.09	100%	4.87	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	3.045	50%	2.436	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					3.045	50%	2.436	50%			
	1983 Exp. S-4	AB 3 ML Drop Box		113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		3.045	50%	2.436	50%			
	1983 Exp. S-4	AB 3 ML Effluent Channel			109.25 ft	5.5 ft		3.0 ft		4.3 ft		3.045	50%	2.436	50%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--	36.0 in			30.0 in		3.045	50%	2.436	50%			Orifice DS control
	Figure 10	AB No. 3 Zone E			96.5 ft	95.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No. 3 Zone D			96.5 ft	95.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No. 4 Zone C			96.5 ft	130.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS. and 145% is MLR.
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	AB No 4. Zone B			96.5 ft	30.0 ft		20.0 in		17.0 in		3.045	50%	2.436	50%	6.09	50%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		3.045	50%	2.436	50%	6.09	50%	
	1983 Exp. S-4	AB 4 Zone A			96.5 ft	30.0 ft		20.0 ft		17.0 ft		3.045	50%	2.436	50%	6.09	50%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	3.045	50%	2.436	50%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channel			109.25 ft	4.0 ft		3.0 ft		4.0 ft		3.045	50%	2.436	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			3.045	50%	2.436	50%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channel			110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	3.045	50%	2.436	50%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				exit 2 - 90 deg bends	3.045	50%	2.436	50%			
	1983 Exp.	42-IN RCP Tee Line to Branch					42.0 in				Tee	3.045	50%	2.436	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in				2-90deg bends entrance	6.09	100%	4.872	100%			May cause hydraulic issues if SC Dist. Box Weir Elve. Is raised
	1971 EXP M 30.2	PE Junction Box		114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		6.09	100%	4.872	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends	2.01	33%					Pipe assumed to go all the
	1971 WPCF M 30	PC # 2 Effluent Box		116.00	112.00	4		1.5 ft				2.01	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			1.00	17%					
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						2.01	33%					V-notch weir 8" Spacing 90 deg angle, 212 notches
	1971 WPCF M 30	PC # 2 Basin			106.00		45.0 ft					2.01	33%					
	1971 WPCF M 30	PC #2Influent well				7 ft	18.0 in					2.01	33%					
	1971 WPCF M 30	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	2.01	33%					
	1971 WPCF M 30	36-In Influent pipe				32 ft	36.0 in				90 Bend Entrance	2.01	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2			108.00	40.0 in		40.0 in				2.01	33%					
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir		120.00	117.00	4.0 ft						2.01	33%					Flow is pumped to this location.

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	10.74	13.56
	Peak Wet Weather	20.00	10.00	5.50

HYDRAULIC ELEMENTS LIST - MD
Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	ELEVATIONS*			DIMENSIONS					LOSSES	FLOW						COMMENTS/OPERATION
			WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH	DIAMETER	WIDTH	SLOPE (ft/ft)	DEPTH		Max Day Flow						
												FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	
Chlorine Contact Basin	2002 SC G-4	Effluent Weir			107.15	4.50						5.65	50%					
	1971 WPCF M-5	Basin		110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	5.65	50%					
	1971 WPCF M-5	Slide Gate			103.25			24.0 in		36.0 in		5.65	50%					
	1971 WPCF M-5	Influent Box			103.25	8.0 ft		4.0 ft				11.3	100%					
	Figure C	42 - IN SCE				116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Exit	11.3	100%					
	Figure C	SC #1 Effluent Connection					36.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 36" Effluent Pipe				70 ft	36.0 in				Entrance 2-90 deg Bends	3.39	30%		30%			30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir.90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box			90	4 ft		4 ft				3.39	30%					
		SC # 1 Effluent Launder			107	100 ft		1.0 ft	0.004			3.39	30%					
	Weir Elv.	SC # 1Effluent Weir			109.3							1.70	15%		15%			
		SC #1		112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		3.39	30%		30%			
		SC # 1 Inlet Ports		109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	3.39	30%	2.71	30%			
		SC #1 Influent Line		--		200 ft	36.0 in				3-45 bends	3.39	30%	2.71	30%			
												3.39	30%	2.71				
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box	113.50		100.00	3.0 ft		7.5		13.5 ft		3.39	30%	2.71	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir			110.00	7.0 ft					High headloss over short weir	3.39	30%	2.71	30%			
	See TM	SC Distribution Box	113.50		100.00	9.0 ft		30.0 ft		13.50 ft		11.30	100%	9.04	100%			
AB # 3,4	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	5.65	50%	4.52	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					5.65	50%	4.52	50%			
	1983 Exp. S-4	AB 3 ML Drop Box		113.5 ft	105.5 ft	3.0 ft		3.0 ft		5.5 ft		5.65	50%	4.52	50%			
	1983 Exp. S-4	AB 3 ML Effluent Channel			109.25 ft	5.5 ft		3.0 ft		4.3 ft		5.65	50%	4.52	50%			High headloss
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate			109.25 ft	--	36.0 in			30.0 in		5.65	50%	4.52	50%			Oriface DS control
	Figure 10	AB No. 3 Zone E			96.5 ft	95.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	190' is total length of Abs.
	Figure 10	Baffle Zone E to D			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	AB No. 3 Zone D			96.5 ft	95.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	Baffle Zone D to C			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	AB No. 4 Zone C			96.5 ft	130.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	Baffle Zone C to B			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	AB No 4. Zone B			96.5 ft	30.0 ft		20.0 in		17.0 in		5.65	50%	4.52	50%	11.3	50%	
	Figure 10	Baffle Zone B to A			109.0 ft	--		20.0 ft		--		5.65	50%	4.52	50%	11.3	50%	
	1983 Exp. S-4	AB 4 Zone A			96.5 ft	30.0 ft		20.0 ft		17.0 ft		5.65	50%	4.52	50%	11.3	50%	
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate			110.00 ft	--		36.0 in		30.0 in	3 gates	5.65	50%	4.52	50%			3 gates modeled @ Inv 110.004
	1983 Exp. S-4	AB No. 4 Influent Channel			109.25 ft	4.0 ft		3.0 ft		4.0 ft		5.65	50%	4.52	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel			109.25 ft	5.3 ft		3.0 ft	0.141 ft			5.65	50%	4.52	50%			
	1983 Exp S-5	AB No. 3/4 Splitter Box/Channel			110.0 ft	12.0 ft		4.5 ft		3.0 ft	2 90-deg bends	5.65	50%	4.52	50%			High headloss
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4				58.0 ft	42.0 in				Exit 2 -90 deg bends	5.65	50%	4.52	50%			
	1983 Exp.	42-IN RCP Tee Line to Branch					42.0 in				Tee	5.65	50%	4.52	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box				224 ft	45.0 in				2-90deg bends entrance	11.30	100%	9.04	100%			
	1971 EXP M 30.2	PE Junction Box	114.5 ft		104.5 ft	16.5 ft		7.0 ft		10.0 ft		11.30	100%	9.04	100%			
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent				120					4-45 deg bends	3.73	33%					
	1971 WPCF M 30	PC # 2 Effluent Box	116.00		112.00	4		1.5 ft				3.73	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder			112.00	78		1.0 ft	-0.0094			1.86	17%					V-notch weir 4" Spacing 90 deg angle, 212 notches Invert = 114.25
	2002 SC G4	PC # 2 Effluent Weir			114.25	135						3.73	33%					
	1971 WPCF M 30	PC # 2 Basin			106.00		45.0 ft					3.73	33%					
	1971 WPCF M 30	PC # 2 Influent well				7 ft	18.0 in					3.73	33%					
	1971 WPCF M 30	PC # 2 24-In Influent				18 ft	24.0 in				90 bend Bend	3.73	33%					
	1971 WPCF M 30	36-In Influent pipe				32 ft	36.0 in				90 Bend	3.73	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2			108.00	40.0 in		40.0 in				3.73	33%					
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir	120.00		117.00	4.0 ft						3.73	33%					Flow is pumped to this location.

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		FLOW (MGD)		
		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	--
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	4.87	12.18
	Maximum Day	11.30	9.04	22.6
	Peak Wet Weather	20.00	10.00	

HYDRAULIC ELEMENTS LIST - PWWF
Pinole/Hercules WPCP Predesign

FACILITY	DWG. NO.	COMPONENT	WSE (ft)	TOP / ROOF (ft)	INVERT (ft)	LENGTH (ft)	DIAMETER	WIDTH (ft)	SLOPE (ft/ft)	DEPTH (ft)	LOSSES	FORWARD FLOW	PERCENT (%)	RAS FLOW	PERCENT (%)	MLS FLOW	PERCENT (%)	EXTENDED DESCRIPTION
Chlorine Contact Basin	2002 SC G-4	Effluent Weir	107.54		107.15	4.50						10.00	50%					
	1971 WPCF M-55	Basin	107.55	110.50	103.25	140.0 ft		4.0 ft			6 - 90 deg Bends	10.00	50%					
	1971 WPCF M-55	Slide Gate	107.82		103.25		24.0 in			36.0 in		10.00	50%					
	1971 WPCF M-55	Influent Box	107.82		103.25	8.0 ft		4.0 ft				20.00	100%					
	Figure C	42 - IN SCE	108.20			116.0 ft	42.0 in				Wye - Branch to line 3 - 90 deg bend Entrance	20.00	100%					
	Figure C	SC #1 Effluent Connection	108.48				30.0 in				Wye 24" to 42"							
Secondary Clarifier # 1	Not yet produced	SC # 1 36" Effluent Pipe	108.77			70 ft	30.0 in				Entrance 2-90 deg Bends	6.00	30%					30% to each new SC (1,2), 14% to each old SC (3,4,5) Assumptions made for design of a 65' Ø central feed / peripheral take off clarifier, with v notch weir. 90 deg V-Notches, spaced 4.5" O.C. = 594. 63' diameter No drawings produced yet
		SC # 1 Effluent Box	108.77		90	4 ft		4 ft				6.00	30%					
		SC # 1 Effluent Launder	109.25		107	100 ft		1.0 ft	0.004			3.00	15%	1.50	15%			
	Weir Elv. Increased by 4"	SC # 1 Effluent Weir			109.3	204 ft					Wer	6.00	30%					
		SC #1	109.30	112.00	90.00		65.0 ft		0.00522222	22.5 ft -22.03 ft		6.00	30%	3.00	30%			
		SC #1 Inlet Ports	109.47	109.8 ft	106.00 ft			0.5 ft		2.5 ft	6 Inlet ports	6.00	30%	3.00	30%			
		SC #1 Influent Line	110.83	--		200 ft	24.0 in				2 - 90 deg bends 5 - 45 deg bends Entrance	6.00	30%	3.00	30%			
Secondary Clarifier Distribution Box	See TM	SC #2 Influent Box		113.50	100.00	3.0 ft		7.5		13.5 ft	High headloss over short weir	6.00	30%	3.00	30%			New splitter box required,
	See TM	Submerged Weir SC 5 Dist. Box Weir			110.00	7.0 ft						6.00	30%	3.00	30%			
	See TM	SC Distribution Box		113.50	100.00	9.0 ft		30.0 ft		13.50 ft		20.00	100%	10.00	100%			
AB # 3,4 Zone E Contact Stabilization	Not yet produced	AB No. 3 36-IN Effluent				5.0 ft	36.0 in				exit 2 - 11.25 deg bends entrance	10.00	50%	5.00	50%			
	Not yet produced	AB No. 3 36-IN Gate			105.50		36.0 in					10.00	50%	5.00	50%			
	1983 Exp. S-4	AB No. 3 ML Drop Box	112.49	113.5 ft	105.5 ft	3.0 ft		3.0 ft		16.0 ft		10.00	50%	5.00	50%			
	1983 Exp. S-4	ML Effluent Channel	112.50	113.5 ft	109.25 ft	5.5 ft		3.0 ft		4.0 ft		10.00	50%	5.00	50%			
	1983 Exp. M-7	AB No. 3 - Effluent Sluice Gate	112.88	113.5 ft	109.25 ft		36.0 in			30.0 ft		10.00	50%	5.00	50%			High headloss
	Figure 10	AB No. 3 Zone E	112.89	113.5 ft	96.5 ft	95.0 ft		20.0 ft		17.0 ft		10.00	50%	5.00	50%			Oriface DS control
PWWF Contact Stabilization	1983 Exp. S-4	AB No. 3 Step Feed Disharge Gates	112.92	113.50	110.50			2.0 ft		3.0 ft	3 gates ppem	10.00	50%					
	1983 Exp S-4	AB No. 3 Step Feed Channel	112.96	113.5 ft	110.0 ft	108.0 ft		3.0 ft				10.00	50%					High headloss
	1984 Exp S-4	AB No. 3 Step Feed Channel	112.98		110.0 ft	8.0 ft		3.0 ft			Bend							
	1983 Exp.	42-IN RCP Influent Pipe AB No. 3/4	113.10			58.0 ft	42.0 in				exit 2 - 90 deg bends	10.00	50%					
	1983 Exp.	42-IN RCP Tee Line to Branch	113.20				42.0 in				Tee	10.00	50%					
AB # 3,4 Contact Stabilization	Figure 10	Baffle Zone E to D			96.5 ft	--	24.0 in			24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	Figure 10	AB No. 3 Zone 1D	112.91	113.5 ft	109.0 ft	95.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			During MM flow conditions, 100% of influent is sent to Aeration Basins, 90% is RAS, and 145% is MLR.
	Figure 10	Baffle Zone D to C			96.5 ft	--	24.0 in			24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	Figure 10	AB No. 4 Zone 1C	112.93	113.5 ft	109.0 ft	130.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			
	Figure 10	Baffle Zone C to B			96.5 ft	--	24.0 in			24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	Figure 10	AB No. 4. Zone 1B	112.95	113.5 ft	109.0 ft	30.0 ft		20.0 in		17.0 in		0.00	0%	5.00	50%			
	Figure 10	Baffle Zone B to A			96.5 ft	--	24.0 in			24.0 in	Assume 4 Ports	0.00	0%	5.00	50%			
	1983 Exp. S-4	AB No. 4 Zone 1A	112.97	113.5 ft	96.5 ft	30.0 ft		20.0 ft		17.0 ft		0.00	0%	5.00	50%			
	1983 Exp. M-7	AB No. 4 - Influent Sluice Gate		113.5 ft	109.25 ft	--	36.0 in			30.0 in		0.00	0%	5.00	50%			Oriface DS control
	1983 Exp. S-4	AB No. 4 Influent Channel	113.00	113.5 ft	109.25 ft	18.0 ft		3.0 ft		4.0 ft		0.00	0%	5.00	50%			
	1983 Exp. S-4	AB No. 4 Sloped Channel		113.5 ft	109.25 ft	5.3 ft		3.0 ft	0.141 ft			0.00	0%	5.00	50%			
Primary Effluent Junction Box	1971 EXP M 30.2	42-IN RCP PC Effluent Pipe to Junction Box	114.05			224 ft	45.0 in					20.00	100%					
	1971 EXP M 30.2	PE Junction Box	114.05	114.5 ft	104.5 ft	16.5 ft		7.0 ft		10.0 ft		20.00	100%					
Primary Clarifier #2	1983 - S.2	PC # 2 24 -IN RCP Effluent	114.19			120					4-45 deg bends	3.96	33%					
	1971 WPCF M 30	PC # 2 Effluent Box	114.19	116.00	112.00	4		1.5 ft				3.96	33%					
	1971 WPCF M 30	PC # 2 Effluent Trough/Launder	114.25		112.00	78		1.0 ft	-0.0094			1.98	17%					
	2002 SC G4	PC # 2 Effluent Weir	114.22		114.25	135						3.96	33%					
	1971 WPCF M 30	PC # 2 Basin	114.42		106.00		45.0 ft					3.96	33%					V-notch weir 4" Spacing 90 deg angle, 212 notches Inver = 114.25
	1971 WPCF M 30	PC # 2 18-IN Influent wel	114.42			7 ft	18.0 in					3.96	33%					
	1971 WPCF M 30	PC # 2 24-In Influent	114.72			18 ft	24.0 in				90 bend Bend Exit Reducer 36" to 24"	3.96	33%					
	1971 WPCF M 30	36-In Influent pipe	114.79			32 ft	36.0 in				90 Bend Entrance	3.96	33%					
PC Flow Split Structure	1971 WPCF M 30	Drop Box to Primary Clarifier No.2	114.87			40.0 in	40.0 in					3.96	33%					
	1971 WPCF M 30	Primary Clarifier Distribution Box Weir	117.66	120.00	117.00	4.0 ft						3.96	33%					Flow is pumped to this location.

*All elevations on the 1929 Datum per 1971 WPCF Drawings

Drawing Sets Used to Develop Hydraulic Elements List

YEAR	DRAWING SET	Abbr.
2002	B&C Secondary Clarifier # 5 Expansion	2002 SC
1983	M&E Plant Expansion	1983 Exp.
1971	Yoder - Trotter - Orlob & Associates WPCF	1971 WPCF

Input Flows

CONDITION		INFLUENT	RAS	MLR
2010	Average	4.05	3.85	5.8725
	Peak Wet Weather	10.00	5.00	--
2030	Maximum Month	6.09	5.79	8.8305
	Maximum Day	11.30	10.74	16.385
	Peak Wet Weather	20.00	10.00	0.00

FLOW (MGD)

Appendix B. Pinole/Hercules WPCP VH Output

Pinole ADWF Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
4.06 mgd	3.25 mgd	8.12 mgd	-----

Section Description	**Water Surface Elevation**
Starting water surface elevation	**107**

Effluent Weir   **107.71**
      Weir invert (top of weir) = 107.15
      Weir length = 4.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 4.06 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.56 ft

Chlorine Contact Basin   **107.72**
      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 140 ft
      Channel width/diameter = 4 ft
      Flow = 2.03 mgd
      Downstream channel invert = 103.25
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 17.84 ft^2
      Hydraulic radius = 1.381
      Normal depth = infinite
      Critical depth = 0.27 ft
      Depth downstream = 4.46 ft
      Bend loss = 0 ft
      Depth upstream = 4.47 ft
      Velocity = 0.18 ft/s
      Flow profile = Horizontal

Slide Gate   **107.73**
      Opening type = rectangular gate
      Opening diameter/width = 24 in
      Gate height = 36 in
      Invert = 103.25
      Number of gates = 1
      Flow through gate(s) = 2.03 mgd

Section Description	Water Surface Elevation

    Total area of opening(s) = 6 ft^2
    Velocity through gate(s) = 0.52 ft/s
    Flow behavior = orifice, downstream control
    Gate loss = 0.01 ft
    Downstream water level = 107.72
    Upstream water level = 107.73

CC Basin Influent Box   **107.73**
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 8 ft
    Channel width/diameter = 4 ft
    Flow = 4.06 mgd
    Downstream channel invert = 103.25
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 17.91 ft^2
    Hydraulic radius = 1.382
    Normal depth = infinite
    Critical depth = 0.43 ft
    Depth downstream = 4.48 ft
    Bend loss = 0 ft
    Depth upstream = 4.48 ft
    Velocity = 0.35 ft/s
    Flow profile = Horizontal

42-IN SC Effluent   **107.75**
    Pipe shape = Circular
    Diameter = 42 in
    Length = 116 ft
    Flow = 4.06 mgd
    Friction method = Hazen Williams
    Friction factor = 120
    Total fitting K value = 1.75
    Pipe area = 9.62 ft²
    Pipe hydraulic radius = 0.875
    Age factor = 1
    Solids factor = 1
    Velocity = 0.65 ft/s
    Friction loss = 0.01 ft
    Fitting loss = 0.01 ft
    Total loss = 0.02 ft

SC #2 Effluent Connection   **107.75**
    Tee type = branch to line
    Diameter of pipe line = 42 in
    Diameter of pipe branch = 30 in

Section Description	Water Surface Elevation

Flow through tee = 1.22 mgd
Velocity through tee = 0.38 ft/s
Total tee K value = 1.69
Overall head loss = 0 ft

SC #2 - 30-IN Effluent   **107.76**

Pipe shape = Circular
Diameter = 30 in
Length = 70 ft
Flow = 1.22 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1
Pipe area = 4.91 ft²
Pipe hydraulic radius = 0.625
Age factor = 1
Solids factor = 1
Velocity = 0.38 ft/s
Friction loss = 0 ft
Fitting loss = 0 ft
Total loss = 0 ft

SC #2 Effluent Box   **107.76**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 4 ft
Flow = 1.22 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 71.04 ft^2
Hydraulic radius = 1.798
Normal depth = infinite
Critical depth = 0.19 ft
Depth downstream = 17.76 ft
Bend loss = 0 ft
Depth upstream = 17.76 ft
Velocity = 0.03 ft/s
Flow profile = Horizontal

SC #2 Effluent Launder   **107.85**

Launder invert = 107
Launder length = 100 ft
Launder width = 1 ft
Launder slope = 0.004 ft/ft
Flow through launder = 0.61 mgd

Section Description	Water Surface Elevation

Critical depth = 0.3 ft
Downstream depth = 0.76 ft
Upstream depth = 0.45 ft

SC #2 Effluent Weir   **109.37**

Invert of V notch = 109.3
Angle of V notch = 90 degrees
Number of notches = 594
Total flow over weir = 1.22 mgd
Weir submergence = unsubmerged
Head over weir = 0.07 ft

SC #2   **109.37**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 75 ft
Channel width/diameter = 75 ft
Flow = 2.2 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 1452.75 ft^2
Hydraulic radius = 12.773
Normal depth = infinite
Critical depth = 0.04 ft
Depth downstream = 19.37 ft
Bend loss = 0 ft
Depth upstream = 19.37 ft
Velocity = 0 ft/s
Flow profile = Horizontal

SC #2 Inlet Ports   **109.38**

Opening type = rectangular orifice
Opening diameter/width = 6 in
Opening height = 30 in
Invert = 106
Number of openings = 6
Flow through opening(s) = 2.421 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through opening(s) = 0.5 ft/s
Flow behavior = orifice, downstream control
Orifice loss = 0.01 ft
Downstream water level = 109.37
Upstream water level = 109.38

SC #2 - 36-IN Influent   **109.39**

Pipe shape = Circular
Diameter = 36 in

Section Description	Water Surface Elevation

Length = 200 ft
Flow = 2.2 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 2
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 0.48 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.01 ft
Total loss = 0.01 ft

SC #2 Influent Box   **109.39**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3 ft
Channel width/diameter = 7.5 ft
Flow = 2.2 mgd
Downstream channel invert = 100
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 70.43 ft^2
Hydraulic radius = 2.68
Normal depth = infinite
Critical depth = 0.19 ft
Depth downstream = 9.39 ft
Bend loss = 0 ft
Depth upstream = 9.39 ft
Velocity = 0.05 ft/s
Flow profile = Horizontal

SC Dist Box Weir #2   **110.28**
Weir invert (top of weir) = 110
Weir length = 7 ft
Weir 'C' coefficient = 3.33
Flow over weir = 2.2 mgd
Weir submergence = unsubmerged
Head over weir = 0.28 ft

SC Distribution Box   **110.28**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 9 ft
Channel width/diameter = 30 ft
Flow = 7.31 mgd

Section Description	Water Surface Elevation

Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 143.33 ft^2
Hydraulic radius = 3.623
Normal depth = infinite
Critical depth = 0.16 ft
Depth downstream = 4.78 ft
Bend loss = 0 ft
Depth upstream = 4.78 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

AB 36-IN Effluent   110.35

Pipe shape = Circular
Diameter = 36 in
Length = 5 ft
Flow = 7.31 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.76
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 1.6 ft/s
Friction loss = 0 ft
Fitting loss = 0.07 ft
Total loss = 0.07 ft

AB Exit Gate   110.46

Opening type = circular gate
Opening diameter/width = 36 in
Gate height = 36 in
Invert = 105.5
Number of gates = 1
Flow through gate(s) = 7.31 mgd
Total area of opening(s) = 7.07 ft^2
Velocity through gate(s) = 1.6 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.11 ft
Downstream water level = 110.35
Upstream water level = 110.46

AB 3 ML Drop Box   110.46

Channel shape = Rectangular
Manning's 'n' = 0.012

Section Description	Water Surface Elevation

Channel length = 3 ft
Channel width/diameter = 3 ft
Flow = 7.31 mgd
Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 14.88 ft^2
Hydraulic radius = 1.152
Normal depth = infinite
Critical depth = 0.76 ft
Depth downstream = 4.96 ft
Bend loss = 0 ft
Depth upstream = 4.96 ft
Velocity = 0.76 ft/s
Flow profile = Horizontal

AB 3 ML Effluent Channel   **110.47**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 5.5 ft
Channel width/diameter = 3 ft
Flow = 7.31 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 3.65 ft^2
Hydraulic radius = 0.672
Normal depth = infinite
Critical depth = 0.76 ft
Depth downstream = 1.21 ft
Bend loss = 0 ft
Depth upstream = 1.22 ft
Velocity = 3.11 ft/s
Flow profile = Horizontal

AB 3 Effluent Sluice Gate   **110.56**

Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 109.25
Number of gates = 1
Flow through gate(s) = 7.31 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through gate(s) = 1.51 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.09 ft
Downstream water level = 110.47

Section Description	Water Surface Elevation

Upstream water level = 110.56

AB 3 Zone E   **110.57**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 95 ft
Channel width/diameter = 20 ft
Flow = 15.43 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 281.27 ft^2
Hydraulic radius = 5.844
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 14.06 ft
Bend loss = 0 ft
Depth upstream = 14.07 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall E to D   **110.6**

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 15.43 mgd
Weir submergence = fully submerged
Head over weir = 1.6 ft

Contact Stabilization Influent Pipe   **110.63**

Pipe shape = Circular
Diameter = 24 in
Length = 100 ft
Flow = 4.06 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 0
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 1
Solids factor = 1
Velocity = 2 ft/s
Friction loss = 0.07 ft
Fitting loss = 0 ft
Total loss = 0.07 ft

AB 3 Zone D   **110.6**

Section Description	Water Surface Elevation

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 95 ft
Channel width/diameter = 20 ft
Flow = 15.43 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 281.91 ft^2
Hydraulic radius = 5.85
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 14.1 ft
Bend loss = 0 ft
Depth upstream = 14.1 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall D to C   **110.63**

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 15.43 mgd
Weir submergence = fully submerged
Head over weir = 1.63 ft

AB 4 Zone C   **110.63**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 130 ft
Channel width/diameter = 20 ft
Flow = 15.43 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 282.55 ft^2
Hydraulic radius = 5.855
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 14.13 ft
Bend loss = 0 ft
Depth upstream = 14.13 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall C to B   **110.66**

Weir invert (top of weir) = 109

Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 15.43 mgd
Weir submergence = fully submerged
Head over weir = 1.66 ft

AB Zone B   **110.66**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 15.43 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 283.19 ft^2
Hydraulic radius = 5.861
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 14.16 ft
Bend loss = 0 ft
Depth upstream = 14.16 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall B to A   **110.69**

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 15.43 mgd
Weir submergence = fully submerged
Head over weir = 1.69 ft

AB Zone A   **110.69**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 15.43 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 283.83 ft^2
Hydraulic radius = 5.866
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 14.19 ft
Bend loss = 0 ft

Section Description	**Water Surface Elevation**

Depth upstream = 14.19 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

AB 4 Influent Sluice Gate   **110.72**

    Opening type = rectangular gate
    Opening diameter/width = 36 in
    Gate height = 30 in
    Invert = 110
    Number of gates = 2
    Flow through gate(s) = 7.31 mgd
    Total area of opening(s) = 15 ft^2
    Velocity through gate(s) = 0.75 ft/s
    Flow behavior = orifice, downstream control
    Gate loss = 0.02 ft
    Downstream water level = 110.69
    Upstream water level = 110.72

AB 4 Influent Channel   **110.72**

    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 3 ft
    Channel width/diameter = 3 ft
    Flow = 7.31 mgd
    Downstream channel invert = 109.25
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 4.4 ft^2
    Hydraulic radius = 0.742
    Normal depth = infinite
    Critical depth = 0.76 ft
    Depth downstream = 1.47 ft
    Bend loss = 0 ft
    Depth upstream = 1.47 ft
    Velocity = 2.57 ft/s
    Flow profile = Horizontal

AB 4 Influent Slopped Channel   **110.71**

    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 5.3 ft
    Channel width/diameter = 3 ft
    Flow = 7.31 mgd
    Downstream channel invert = 109.25
    Channel slope = 0.0141 ft/ft
    Channel side slope = not applicable
    Area of flow = 4.28 ft^2
    Hydraulic radius = 0.732

Normal depth = 0.5 ft
Critical depth = 0.76 ft
Depth downstream = 1.47 ft
Bend loss = 0 ft
Depth upstream = 1.39 ft
Velocity = 2.56 ft/s
Flow profile = Steep

AB 4 Influent Split Box-Channel   **110.83**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 12.7 ft
Channel width/diameter = 4.5 ft
Flow = 7.31 mgd
Downstream channel invert = 110
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 3.29 ft^2
Hydraulic radius = 0.552
Normal depth = infinite
Critical depth = 0.58 ft
Depth downstream = 0.71 ft
Bend loss = 0.08 ft
Depth upstream = 0.83 ft
Velocity = 3.54 ft/s
Flow profile = Horizontal

AB 3/4 42-IN Influent Pipe   **110.87**

Pipe shape = Circular
Diameter = 42 in
Length = 58 ft
Flow = 7.31 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.5
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 1.18 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.03 ft
Total loss = 0.04 ft

42-IN Tee to AB 3/4   **110.88**

Tee type = run of tee
Diameter of pipe run past tee = 42 in

Section Description	Water Surface Elevation

Flow through tee = 7.31 mgd
Velocity through tee = 1.18 ft/s
Total tee K value = 0.6
Overall head loss = 0.01 ft

42-IN PC Effluent to PC Junction Box   **111.03**
Pipe shape = Circular
Diameter = 42 in
Length = 244 ft
Flow = 7.31 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 2
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 2.348
Solids factor = 1
Velocity = 1.18 ft/s
Friction loss = 0.11 ft
Fitting loss = 0.04 ft
Total loss = 0.15 ft

Prim. Eff. Junction Box   **111.03**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 16.5 ft
Channel width/diameter = 7 ft
Flow = 7.31 mgd
Downstream channel invert = 104.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 45.71 ft^2
Hydraulic radius = 2.279
Normal depth = infinite
Critical depth = 0.43 ft
Depth downstream = 6.53 ft
Bend loss = 0 ft
Depth upstream = 6.53 ft
Velocity = 0.25 ft/s
Flow profile = Horizontal

PC 2 24-IN Effluent   **111.08**
Pipe shape = Circular
Diameter = 24 in
Length = 120 ft
Flow = 1.353 mgd
Friction method = Hazen Williams

Section Description	Water Surface Elevation

Friction factor = 100
Total fitting K value = 2.4
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 0.67 ft/s
Friction loss = 0.04 ft
Fitting loss = 0.02 ft
Total loss = 0.05 ft

PC 2 Effluent Box   **111.08**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 1.5 ft
Channel width/diameter = 4 ft
Flow = 1.353 mgd
Downstream channel invert = 106
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 20.32 ft^2
Hydraulic radius = 1.435
Normal depth = infinite
Critical depth = 0.2 ft
Depth downstream = 5.08 ft
Bend loss = 0 ft
Depth upstream = 5.08 ft
Velocity = 0.1 ft/s
Flow profile = Horizontal

PC 2 Effluent Launder   **112.64**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 78 ft
Channel width/diameter = 1 ft
Flow = 0.677 mgd
Downstream channel invert = 112
Channel slope = 0.0015 ft/ft
Channel side slope = not applicable
Area of flow = 0.43 ft^2
Hydraulic radius = 0.23
Normal depth = 0.54 ft
Critical depth = 0.32 ft
Depth downstream = 0.32 ft
Bend loss = 0 ft
Depth upstream = 0.53 ft
Velocity = 3.23 ft/s

Section Description	Water Surface Elevation

Flow profile = Mild

PC 2 Effluent Weir   **114.36**

Invert of V notch = 114.25
Angle of V notch = 90 degrees
Number of notches = 212
Total flow over weir = 1.353 mgd
Weir submergence = unsubmerged
Head over weir = 0.11 ft

PC 2 Basin   **114.36**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 45 ft
Channel width/diameter = 45 ft
Flow = 1.353 mgd
Downstream channel invert = 106
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 376.19 ft^2
Hydraulic radius = 6.095
Normal depth = infinite
Critical depth = 0.04 ft
Depth downstream = 8.36 ft
Bend loss = 0 ft
Depth upstream = 8.36 ft
Velocity = 0.01 ft/s
Flow profile = Horizontal

PC 2 Influent Well   **114.4**

Pipe shape = Circular
Diameter = 18 in
Length = 7 ft
Flow = 1.353 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 1.25
Pipe area = 1.77 ft²
Pipe hydraulic radius = 0.375
Age factor = 2.348
Solids factor = 1
Velocity = 1.18 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.03 ft
Total loss = 0.04 ft

24-IN Influent Pipe   **114.41**

Pipe shape = Circular

     Diameter = 24 in
     Length = 10 ft
     Flow = 1.353 mgd
     Friction method = Hazen Williams
     Friction factor = 100
     Total fitting K value = 0.42
     Pipe area = 3.14 ft²
     Pipe hydraulic radius = 0.5
     Age factor = 2.348
     Solids factor = 1
     Velocity = 0.67 ft/s
     Friction loss = 0 ft
     Fitting loss = 0 ft
     Total loss = 0.01 ft

36-IN PC Influent Pipe   **114.42**
     Pipe shape = Circular
     Diameter = 24 in
     Length = 10 ft
     Flow = 1.353 mgd
     Friction method = Hazen Williams
     Friction factor = 100
     Total fitting K value = 0.42
     Pipe area = 3.14 ft²
     Pipe hydraulic radius = 0.5
     Age factor = 2.348
     Solids factor = 1
     Velocity = 0.67 ft/s
     Friction loss = 0 ft
     Fitting loss = 0 ft
     Total loss = 0.01 ft

Drop Box to Primary Clarifier No 2   **114.42**
     Channel shape = Rectangular
     Manning's 'n' = 0.012
     Channel length = 3.5 ft
     Channel width/diameter = 3.5 ft
     Flow = 1.353 mgd
     Downstream channel invert = 108
     Channel slope = 0 ft/ft
     Channel side slope = not applicable
     Area of flow = 22.47 ft^2
     Hydraulic radius = 1.375
     Normal depth = infinite
     Critical depth = 0.22 ft
     Depth downstream = 6.42 ft
     Bend loss = 0 ft

Section Description	**Water Surface Elevation**

       Depth upstream = 6.42 ft
       Velocity = 0.09 ft/s
       Flow profile = Horizontal

Primary Clarifier Distribution Box Weir   **117.32**
       Weir invert (top of weir) = 117
       Weir length = 3.5 ft
       Weir 'C' coefficient = 3.33
       Flow over weir = 1.347 mgd
       Weir submergence = unsubmerged
       Head over weir = 0.32 ft

Pinole MM-MD Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
11.3 mgd	9.04 mgd	22.6 mgd	-----

Section Description	Water Surface Elevation
Starting water surface elevation	**107**

Effluent Weir   **107.85**

      Weir invert (top of weir) = 107.15
      Weir length = 4.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 5.65 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.7 ft

Chlorine Contact Basin   **107.88**

      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 140 ft
      Channel width/diameter = 4 ft
      Flow = 5.65 mgd
      Downstream channel invert = 103.25
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 18.4 ft^2
      Hydraulic radius = 1.394
      Normal depth = infinite
      Critical depth = 0.53 ft
      Depth downstream = 4.6 ft
      Bend loss = 0.03 ft
      Depth upstream = 4.63 ft
      Velocity = 0.48 ft/s
      Flow profile = Horizontal

Slide Gate   **107.96**

      Opening type = rectangular gate
      Opening diameter/width = 36 in
      Gate height = 24 in
      Invert = 103.25
      Number of gates = 1
      Flow through gate(s) = 5.65 mgd

Total area of opening(s) = 6 ft^2
Velocity through gate(s) = 1.46 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.09 ft
Downstream water level = 107.88
Upstream water level = 107.96

CC Basin Influent Box   **107.96**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 8 ft
Channel width/diameter = 4 ft
Flow = 11.3 mgd
Downstream channel invert = 103.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 18.85 ft^2
Hydraulic radius = 1.404
Normal depth = infinite
Critical depth = 0.84 ft
Depth downstream = 4.71 ft
Bend loss = 0 ft
Depth upstream = 4.71 ft
Velocity = 0.93 ft/s
Flow profile = Horizontal

42-IN SC Effluent   **108.09**

Pipe shape = Circular
Diameter = 42 in
Length = 116 ft
Flow = 11.3 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.75
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 1.82 ft/s
Friction loss = 0.03 ft
Fitting loss = 0.09 ft
Total loss = 0.12 ft

SC #2 Effluent Connection   **108.12**

Tee type = branch to line
Diameter of pipe line = 42 in
Diameter of pipe branch = 30 in

Section Description	Water Surface Elevation

Flow through tee = 3.39 mgd
Velocity through tee = 1.07 ft/s
Total tee K value = 1.69
Overall head loss = 0.03 ft

SC #2 - 36-IN Effluent   108.13

Pipe shape = Circular
Diameter = 36 in
Length = 70 ft
Flow = 3.39 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 0.74 ft/s
Friction loss = 0 ft
Fitting loss = 0.01 ft
Total loss = 0.01 ft

SC #2 Effluent Box   108.13

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 4 ft
Flow = 3.748 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 72.52 ft^2
Hydraulic radius = 1.801
Normal depth = infinite
Critical depth = 0.4 ft
Depth downstream = 18.13 ft
Bend loss = 0 ft
Depth upstream = 18.13 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

SC #2 Effluent Launder   108.45

Launder invert = 107
Launder length = 100 ft
Launder width = 1 ft
Launder slope = 0.004 ft/ft
Flow through launder = 1.7 mgd

Section Description	Water Surface Elevation

Critical depth = 0.6 ft
Downstream depth = 1.13 ft
Upstream depth = 1.05 ft

SC #2 Effluent Weir   **109.41**
Invert of V notch = 109.3
Angle of V notch = 90 degrees
Number of notches = 594
Total flow over weir = 3.748 mgd
Weir submergence = unsubmerged
Head over weir = 0.11 ft

SC #2   **109.41**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 75 ft
Channel width/diameter = 75 ft
Flow = 6.1 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 1455.7 ft^2
Hydraulic radius = 12.79
Normal depth = infinite
Critical depth = 0.08 ft
Depth downstream = 19.41 ft
Bend loss = 0 ft
Depth upstream = 19.41 ft
Velocity = 0.01 ft/s
Flow profile = Horizontal

SC #2 Inlet Ports   **109.48**
Opening type = rectangular orifice
Opening diameter/width = 6 in
Opening height = 30 in
Invert = 106
Number of openings = 6
Flow through opening(s) = 6.2 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through opening(s) = 1.28 ft/s
Flow behavior = orifice, downstream control
Orifice loss = 0.07 ft
Downstream water level = 109.41
Upstream water level = 109.48

SC #2 - 36-IN Influent   **109.57**
Pipe shape = Circular
Diameter = 36 in

      Length = 200 ft
Flow = 6.1 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 2
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 1.34 ft/s
Friction loss = 0.04 ft
Fitting loss = 0.06 ft
Total loss = 0.1 ft

SC #2 Influent Box   **109.57**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3 ft
Channel width/diameter = 7 ft
Flow = 6.1 mgd
Downstream channel invert = 100
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 66.99 ft^2
Hydraulic radius = 2.563
Normal depth = infinite
Critical depth = 0.38 ft
Depth downstream = 9.57 ft
Bend loss = 0 ft
Depth upstream = 9.57 ft
Velocity = 0.14 ft/s
Flow profile = Horizontal

SC Dist Box Weir #5   **110.57**
Weir invert (top of weir) = 110
Weir length = 7 ft
Weir 'C' coefficient = 3.33
Flow over weir = 6.458 mgd
Weir submergence = unsubmerged
Head over weir = 0.57 ft

SC Distribution Box   **110.57**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 9 ft
Channel width/diameter = 35 ft
Flow = 20.34 mgd

Section Description	Water Surface Elevation

Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 177.41 ft^2
Hydraulic radius = 3.93
Normal depth = infinite
Critical depth = 0.29 ft
Depth downstream = 5.07 ft
Bend loss = 0 ft
Depth upstream = 5.07 ft
Velocity = 0.18 ft/s
Flow profile = Horizontal

AB 36-IN Effluent   **110.71**

Pipe shape = Circular
Diameter = 36 in
Length = 5 ft
Flow = 10.17 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.76
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 2.23 ft/s
Friction loss = 0 ft
Fitting loss = 0.14 ft
Total loss = 0.14 ft

Effluent Gate   **110.92**

Opening type = circular gate
Opening diameter/width = 36 in
Gate height = 36 in
Invert = 106
Number of gates = 1
Flow through gate(s) = 10.179 mgd
Total area of opening(s) = 7.07 ft^2
Velocity through gate(s) = 2.23 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.21 ft
Downstream water level = 110.71
Upstream water level = 110.92

AB 3 ML Drop Box   **110.93**

Channel shape = Rectangular
Manning's 'n' = 0.012

Section Description	Water Surface Elevation

Channel length = 3 ft
Channel width/diameter = 3 ft
Flow = 10.179 mgd
Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 16.27 ft^2
Hydraulic radius = 1.175
Normal depth = infinite
Critical depth = 0.95 ft
Depth downstream = 5.42 ft
Bend loss = 0 ft
Depth upstream = 5.43 ft
Velocity = 0.97 ft/s
Flow profile = Horizontal

AB 3 ML Effluent Channel   **110.93**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 5.5 ft
Channel width/diameter = 3 ft
Flow = 10.179 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 5.04 ft^2
Hydraulic radius = 0.792
Normal depth = infinite
Critical depth = 0.95 ft
Depth downstream = 1.68 ft
Bend loss = 0 ft
Depth upstream = 1.68 ft
Velocity = 3.13 ft/s
Flow profile = Horizontal

AB 3 Effluent Sluice Gate   **111.11**

Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 109.25
Number of gates = 1
Flow through gate(s) = 10.179 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through gate(s) = 2.1 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.18 ft
Downstream water level = 110.93

Section Description	**Water Surface Elevation**

Upstream water level = 111.11

AB 3 Zone E   **111.11**

    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 95 ft
    Channel width/diameter = 20 ft
    Flow = 21.479 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 292.23 ft^2
    Hydraulic radius = 5.937
    Normal depth = infinite
    Critical depth = 0.44 ft
    Depth downstream = 14.61 ft
    Bend loss = 0 ft
    Depth upstream = 14.61 ft
    Velocity = 0.11 ft/s
    Flow profile = Horizontal

Baffle Wall E to D   **111.14**

    Weir invert (top of weir) = 109
    Weir length = 20 ft
    Weir 'C' coefficient = 3.33
    Flow over weir = 21.479 mgd
    Weir submergence = fully submerged
    Head over weir = 2.14 ft

Contact Stabilization Influent Pipe   **111.57**

    Pipe shape = Circular
    Diameter = 24 in
    Length = 100 ft
    Flow = 11.3 mgd
    Friction method = Hazen Williams
    Friction factor = 120
    Total fitting K value = 0
    Pipe area = 3.14 ft²
    Pipe hydraulic radius = 0.5
    Age factor = 1
    Solids factor = 1
    Velocity = 5.56 ft/s
    Friction loss = 0.46 ft
    Fitting loss = 0 ft
    Total loss = 0.46 ft

AB 3 Zone D   **111.15**

| **Section Description** | **Water Surface Elevation** |

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 95 ft
Channel width/diameter = 20 ft
Flow = 21.479 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 292.87 ft^2
Hydraulic radius = 5.942
Normal depth = infinite
Critical depth = 0.44 ft
Depth downstream = 14.64 ft
Bend loss = 0 ft
Depth upstream = 14.65 ft
Velocity = 0.11 ft/s
Flow profile = Horizontal

Baffle Wall D to C   111.18
Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 21.479 mgd
Weir submergence = fully submerged
Head over weir = 2.18 ft

AB 4 Zone C   111.18
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 130 ft
Channel width/diameter = 20 ft
Flow = 21.479 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 293.51 ft^2
Hydraulic radius = 5.947
Normal depth = infinite
Critical depth = 0.44 ft
Depth downstream = 14.68 ft
Bend loss = 0 ft
Depth upstream = 14.68 ft
Velocity = 0.11 ft/s
Flow profile = Horizontal

Baffle Wall C to B   111.21
Weir invert (top of weir) = 109

Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 21.479 mgd
Weir submergence = fully submerged
Head over weir = 2.21 ft

AB Zone B   111.21

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 21.479 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 294.15 ft^2
Hydraulic radius = 5.953
Normal depth = infinite
Critical depth = 0.44 ft
Depth downstream = 14.71 ft
Bend loss = 0 ft
Depth upstream = 14.71 ft
Velocity = 0.11 ft/s
Flow profile = Horizontal

Baffle Wall B to A   111.24

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 21.479 mgd
Weir submergence = fully submerged
Head over weir = 2.24 ft

AB Zone A   111.24

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 21.479 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 294.79 ft^2
Hydraulic radius = 5.958
Normal depth = infinite
Critical depth = 0.44 ft
Depth downstream = 14.74 ft
Bend loss = 0 ft

Depth upstream = 14.74 ft
Velocity = 0.11 ft/s
Flow profile = Horizontal

AB 4 Influent Sluice Gate   **111.29**
Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 110
Number of gates = 2
Flow through gate(s) = 10.179 mgd
Total area of opening(s) = 15 ft^2
Velocity through gate(s) = 1.05 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.04 ft
Downstream water level = 111.24
Upstream water level = 111.29

AB 4 Influent Channel   **111.29**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 3 ft
Flow = 10.179 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 6.11 ft^2
Hydraulic radius = 0.864
Normal depth = infinite
Critical depth = 0.95 ft
Depth downstream = 2.04 ft
Bend loss = 0 ft
Depth upstream = 2.04 ft
Velocity = 2.58 ft/s
Flow profile = Horizontal

AB 4 Influent Sloped Channel   **111.28**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 5.3 ft
Channel width/diameter = 3 ft
Flow = 10.179 mgd
Downstream channel invert = 109.25
Channel slope = 0.0141 ft/ft
Channel side slope = not applicable
Area of flow = 6 ft^2
Hydraulic radius = 0.857

      Normal depth = 0.62 ft
      Critical depth = 0.95 ft
      Depth downstream = 2.04 ft
      Bend loss = 0 ft
      Depth upstream = 1.96 ft
      Velocity = 2.57 ft/s
      Flow profile = Steep

AB 4 Influent Split Box-Channel   **111.34**
      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 12 ft
      Channel width/diameter = 4.5 ft
      Flow = 10.179 mgd
      Downstream channel invert = 110
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 5.79 ft^2
      Hydraulic radius = 0.819
      Normal depth = infinite
      Critical depth = 0.72 ft
      Depth downstream = 1.28 ft
      Bend loss = 0.05 ft
      Depth upstream = 1.34 ft
      Velocity = 2.73 ft/s
      Flow profile = Horizontal

AB 3/4 42-IN Influent Pipe   **111.42**
      Pipe shape = Circular
      Diameter = 42 in
      Length = 58 ft
      Flow = 10.179 mgd
      Friction method = Hazen Williams
      Friction factor = 120
      Total fitting K value = 1.5
      Pipe area = 9.62 ft²
      Pipe hydraulic radius = 0.875
      Age factor = 1
      Solids factor = 1
      Velocity = 1.64 ft/s
      Friction loss = 0.01 ft
      Fitting loss = 0.06 ft
      Total loss = 0.08 ft

42-IN Tee to AB 3/4   **111.44**
      Tee type = run of tee
      Diameter of pipe run past tee = 42 in

Section Description	Water Surface Elevation

Flow through tee = 10.179 mgd
Velocity through tee = 1.64 ft/s
Total tee K value = 0.6
Overall head loss = 0.02 ft

42-IN PC Effluent to PC Junction Box   112.33
    Pipe shape = Circular
    Diameter = 42 in
    Length = 244 ft
    Flow = 20.34 mgd
    Friction method = Hazen Williams
    Friction factor = 100
    Total fitting K value = 1
    Pipe area = 9.62 ft²
    Pipe hydraulic radius = 0.875
    Age factor = 2.348
    Solids factor = 1
    Velocity = 3.27 ft/s
    Friction loss = 0.72 ft
    Fitting loss = 0.17 ft
    Total loss = 0.88 ft

Prim. Eff. Junction Box   112.33
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 16.5 ft
    Channel width/diameter = 7 ft
    Flow = 20.34 mgd
    Downstream channel invert = 104.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 54.81 ft^2
    Hydraulic radius = 2.419
    Normal depth = infinite
    Critical depth = 0.86 ft
    Depth downstream = 7.83 ft
    Bend loss = 0 ft
    Depth upstream = 7.83 ft
    Velocity = 0.57 ft/s
    Flow profile = Horizontal

PC 2 24-IN Effluent   112.48
    Pipe shape = Circular
    Diameter = 24 in
    Length = 15 ft
    Flow = 3.767 mgd
    Friction method = Hazen Williams

Section Description	**Water Surface Elevation**

      Friction factor = 100
      Total fitting K value = 2.2
      Pipe area = 3.14 ft²
      Pipe hydraulic radius = 0.5
      Age factor = 2.348
      Solids factor = 1
      Velocity = 1.85 ft/s
      Friction loss = 0.03 ft
      Fitting loss = 0.12 ft
      Total loss = 0.15 ft

PC 2 Effluent Box   112.48

      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 1.5 ft
      Channel width/diameter = 4 ft
      Flow = 3.767 mgd
      Downstream channel invert = 106
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 25.92 ft^2
      Hydraulic radius = 1.528
      Normal depth = infinite
      Critical depth = 0.4 ft
      Depth downstream = 6.48 ft
      Bend loss = 0 ft
      Depth upstream = 6.48 ft
      Velocity = 0.22 ft/s
      Flow profile = Horizontal

PC 2 Effluent Launder   113.11

      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 71 ft
      Channel width/diameter = 1 ft
      Flow = 1.883 mgd
      Downstream channel invert = 112
      Channel slope = 0.0015 ft/ft
      Channel side slope = not applicable
      Area of flow = 0.82 ft^2
      Hydraulic radius = 0.311
      Normal depth = 1.22 ft
      Critical depth = 0.64 ft
      Depth downstream = 0.64 ft
      Bend loss = 0 ft
      Depth upstream = 1 ft
      Velocity = 4.54 ft/s

Section Description	Water Surface Elevation

Flow profile = Mild

PC 2 Effluent Weir   114.41

Invert of V notch = 114.25
Angle of V notch = 90 degrees
Number of notches = 212
Total flow over weir = 3.767 mgd
Weir submergence = unsubmerged
Head over weir = 0.16 ft

PC 2 Basin   114.42

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 45 ft
Channel width/diameter = 45 ft
Flow = 3.767 mgd
Downstream channel invert = 106
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 378.68 ft^2
Hydraulic radius = 6.125
Normal depth = infinite
Critical depth = 0.08 ft
Depth downstream = 8.41 ft
Bend loss = 0 ft
Depth upstream = 8.42 ft
Velocity = 0.02 ft/s
Flow profile = Horizontal

PC 2 Influent Well   114.68

Pipe shape = Circular
Diameter = 18 in
Length = 7 ft
Flow = 3.767 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 1.25
Pipe area = 1.77 ft²
Pipe hydraulic radius = 0.375
Age factor = 2.348
Solids factor = 1
Velocity = 3.3 ft/s
Friction loss = 0.06 ft
Fitting loss = 0.21 ft
Total loss = 0.27 ft

24-IN Influent Pipe   114.72

Pipe shape = Circular

Section Description	Water Surface Elevation

     Diameter = 24 in
     Length = 10 ft
     Flow = 3.767 mgd
     Friction method = Hazen Williams
     Friction factor = 100
     Total fitting K value = 0.42
     Pipe area = 3.14 ft²
     Pipe hydraulic radius = 0.5
     Age factor = 2.348
     Solids factor = 1
     Velocity = 1.85 ft/s
     Friction loss = 0.02 ft
     Fitting loss = 0.02 ft
     Total loss = 0.04 ft

36-IN PC Influent Pipe　　　　　　　　　　　　　　　　**114.83**
     Pipe shape = Circular
     Diameter = 24 in
     Length = 10 ft
     Flow = 3.767 mgd
     Friction method = Hazen Williams
     Friction factor = 100
     Total fitting K value = 1.67
     Pipe area = 3.14 ft²
     Pipe hydraulic radius = 0.5
     Age factor = 2.348
     Solids factor = 1
     Velocity = 1.85 ft/s
     Friction loss = 0.02 ft
     Fitting loss = 0.09 ft
     Total loss = 0.11 ft

Drop Box to Primary Clarifier No 2　　　　　　　　　**114.83**
     Channel shape = Rectangular
     Manning's 'n' = 0.012
     Channel length = 3.5 ft
     Channel width/diameter = 3.5 ft
     Flow = 3.767 mgd
     Downstream channel invert = 108
     Channel slope = 0 ft/ft
     Channel side slope = not applicable
     Area of flow = 23.91 ft^2
     Hydraulic radius = 1.393
     Normal depth = infinite
     Critical depth = 0.44 ft
     Depth downstream = 6.83 ft
     Bend loss = 0 ft

Section Description	**Water Surface Elevation**

      Depth upstream = 6.83 ft
      Velocity = 0.24 ft/s
      Flow profile = Horizontal

Primary Clarifier Distribution Box Weir   **117.63**
      Weir invert (top of weir) = 117
      Weir length = 3.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 3.748 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.63 ft

Pinole MM-MD Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
6.06 mgd	4.87 mgd	12.18 mgd	-----

Section Description	**Water Surface Elevation**
Starting water surface elevation	**107**

Effluent Weir   **107.61**
      Weir invert (top of weir) = 107.15
      Weir length = 4.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 3.03 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.46 ft

Chlorine Contact Basin   **107.62**
      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 140 ft
      Channel width/diameter = 4 ft
      Flow = 3.03 mgd
      Downstream channel invert = 103.25
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 17.44 ft^2
      Hydraulic radius = 1.371
      Normal depth = infinite
      Critical depth = 0.35 ft
      Depth downstream = 4.36 ft
      Bend loss = 0.01 ft
      Depth upstream = 4.37 ft
      Velocity = 0.27 ft/s
      Flow profile = Horizontal

Slide Gate   **107.65**
      Opening type = rectangular gate
      Opening diameter/width = 36 in
      Gate height = 24 in
      Invert = 103.25
      Number of gates = 1
      Flow through gate(s) = 3.03 mgd

Section Description	Water Surface Elevation

Total area of opening(s) = 6 ft^2
Velocity through gate(s) = 0.78 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.02 ft
Downstream water level = 107.62
Upstream water level = 107.65

CC Basin Influent Box   **107.65**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 8 ft
Channel width/diameter = 4 ft
Flow = 6.06 mgd
Downstream channel invert = 103.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 17.58 ft^2
Hydraulic radius = 1.375
Normal depth = infinite
Critical depth = 0.55 ft
Depth downstream = 4.4 ft
Bend loss = 0 ft
Depth upstream = 4.4 ft
Velocity = 0.53 ft/s
Flow profile = Horizontal

42-IN SC Effluent   **107.68**

Pipe shape = Circular
Diameter = 42 in
Length = 116 ft
Flow = 6.06 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.75
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 0.97 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.03 ft
Total loss = 0.04 ft

SC #2 Effluent Connection   **107.69**

Tee type = branch to line
Diameter of pipe line = 42 in
Diameter of pipe branch = 30 in

Section Description	Water Surface Elevation

Flow through tee = 1.818 mgd
Velocity through tee = 0.57 ft/s
Total tee K value = 1.69
Overall head loss = 0.01 ft

SC #2 - 36-IN Effluent   **107.69**

Pipe shape = Circular
Diameter = 36 in
Length = 70 ft
Flow = 1.818 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 0.4 ft/s
Friction loss = 0 ft
Fitting loss = 0 ft
Total loss = 0 ft

SC #2 Effluent Box   **107.69**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 4 ft
Flow = 2.01 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 70.76 ft^2
Hydraulic radius = 1.797
Normal depth = infinite
Critical depth = 0.27 ft
Depth downstream = 17.69 ft
Bend loss = 0 ft
Depth upstream = 17.69 ft
Velocity = 0.04 ft/s
Flow profile = Horizontal

SC #2 Effluent Launder   **107.87**

Launder invert = 107
Launder length = 100 ft
Launder width = 1 ft
Launder slope = 0.004 ft/ft
Flow through launder = 0.912 mgd

Section Description	Water Surface Elevation

Critical depth = 0.4 ft
Downstream depth = 0.69 ft
Upstream depth = 0.47 ft

SC #2 Effluent Weir　　　　　　　　　　　**109.38**

Invert of V notch = 109.3
Angle of V notch = 90 degrees
Number of notches = 594
Total flow over weir = 2.01 mgd
Weir submergence = unsubmerged
Head over weir = 0.08 ft

SC #2　　　　　　　　　　　**109.39**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 75 ft
Channel width/diameter = 75 ft
Flow = 3.278 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 1453.9 ft^2
Hydraulic radius = 12.779
Normal depth = infinite
Critical depth = 0.05 ft
Depth downstream = 19.38 ft
Bend loss = 0 ft
Depth upstream = 19.39 ft
Velocity = 0 ft/s
Flow profile = Horizontal

SC #2 Inlet Ports　　　　　　　　　　　**109.41**

Opening type = rectangular orifice
Opening diameter/width = 6 in
Opening height = 30 in
Invert = 106
Number of openings = 6
Flow through opening(s) = 3.332 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through opening(s) = 0.69 ft/s
Flow behavior = orifice, downstream control
Orifice loss = 0.02 ft
Downstream water level = 109.39
Upstream water level = 109.41

SC #2 - 36-IN Influent　　　　　　　　　　　**109.43**

Pipe shape = Circular
Diameter = 36 in

Section Description	Water Surface Elevation

Length = 200 ft
Flow = 3.278 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 2
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 0.72 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.02 ft
Total loss = 0.03 ft

SC #2 Influent Box   **109.43**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3 ft
Channel width/diameter = 7 ft
Flow = 3.278 mgd
Downstream channel invert = 100
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 66.01 ft^2
Hydraulic radius = 2.553
Normal depth = infinite
Critical depth = 0.25 ft
Depth downstream = 9.43 ft
Bend loss = 0 ft
Depth upstream = 9.43 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

SC Dist Box Weir #5   **110.38**
Weir invert (top of weir) = 110
Weir length = 7 ft
Weir 'C' coefficient = 3.33
Flow over weir = 3.47 mgd
Weir submergence = unsubmerged
Head over weir = 0.38 ft

SC Distribution Box   **110.38**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 9 ft
Channel width/diameter = 35 ft
Flow = 10.93 mgd

Section Description	**Water Surface Elevation**

Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 170.66 ft^2
Hydraulic radius = 3.813
Normal depth = infinite
Critical depth = 0.19 ft
Depth downstream = 4.88 ft
Bend loss = 0 ft
Depth upstream = 4.88 ft
Velocity = 0.1 ft/s
Flow profile = Horizontal

AB 36-IN Effluent   110.42

Pipe shape = Circular
Diameter = 36 in
Length = 5 ft
Flow = 5.465 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.76
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 1.2 ft/s
Friction loss = 0 ft
Fitting loss = 0.04 ft
Total loss = 0.04 ft

Effluent Gate   110.48

Opening type = circular gate
Opening diameter/width = 36 in
Gate height = 36 in
Invert = 106
Number of gates = 1
Flow through gate(s) = 5.47 mgd
Total area of opening(s) = 7.07 ft^2
Velocity through gate(s) = 1.2 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.06 ft
Downstream water level = 110.42
Upstream water level = 110.48

AB 3 ML Drop Box   110.48

Channel shape = Rectangular
Manning's 'n' = 0.012

Section Description	Water Surface Elevation

Channel length = 3 ft
Channel width/diameter = 3 ft
Flow = 5.47 mgd
Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 14.95 ft^2
Hydraulic radius = 1.153
Normal depth = infinite
Critical depth = 0.63 ft
Depth downstream = 4.98 ft
Bend loss = 0 ft
Depth upstream = 4.98 ft
Velocity = 0.57 ft/s
Flow profile = Horizontal

AB 3 ML Effluent Channel   **110.49**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 5.5 ft
Channel width/diameter = 3 ft
Flow = 5.47 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 3.71 ft^2
Hydraulic radius = 0.678
Normal depth = infinite
Critical depth = 0.63 ft
Depth downstream = 1.23 ft
Bend loss = 0 ft
Depth upstream = 1.24 ft
Velocity = 2.29 ft/s
Flow profile = Horizontal

AB 3 Effluent Sluice Gate   **110.54**
Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 109.25
Number of gates = 1
Flow through gate(s) = 5.47 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through gate(s) = 1.13 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.05 ft
Downstream water level = 110.49

Section Description	Water Surface Elevation

Upstream water level = 110.54

AB 3 Zone E   **110.54**
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 95 ft
    Channel width/diameter = 20 ft
    Flow = 11.56 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 280.81 ft^2
    Hydraulic radius = 5.84
    Normal depth = infinite
    Critical depth = 0.29 ft
    Depth downstream = 14.04 ft
    Bend loss = 0 ft
    Depth upstream = 14.04 ft
    Velocity = 0.06 ft/s
    Flow profile = Horizontal

Baffle Wall E to D   **110.56**
    Weir invert (top of weir) = 109
    Weir length = 20 ft
    Weir 'C' coefficient = 3.33
    Flow over weir = 11.56 mgd
    Weir submergence = fully submerged
    Head over weir = 1.56 ft

Contact Stabilization Influent Pipe   **110.69**
    Pipe shape = Circular
    Diameter = 24 in
    Length = 100 ft
    Flow = 6.06 mgd
    Friction method = Hazen Williams
    Friction factor = 120
    Total fitting K value = 0
    Pipe area = 3.14 ft²
    Pipe hydraulic radius = 0.5
    Age factor = 1
    Solids factor = 1
    Velocity = 2.98 ft/s
    Friction loss = 0.14 ft
    Fitting loss = 0 ft
    Total loss = 0.14 ft

AB 3 Zone D   **110.56**

    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 95 ft
    Channel width/diameter = 20 ft
    Flow = 11.56 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 281.25 ft^2
    Hydraulic radius = 5.844
    Normal depth = infinite
    Critical depth = 0.29 ft
    Depth downstream = 14.06 ft
    Bend loss = 0 ft
    Depth upstream = 14.06 ft
    Velocity = 0.06 ft/s
    Flow profile = Horizontal

Baffle Wall D to C   110.58
    Weir invert (top of weir) = 109
    Weir length = 20 ft
    Weir 'C' coefficient = 3.33
    Flow over weir = 11.56 mgd
    Weir submergence = fully submerged
    Head over weir = 1.58 ft

AB 4 Zone C   110.59
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 130 ft
    Channel width/diameter = 20 ft
    Flow = 11.56 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 281.69 ft^2
    Hydraulic radius = 5.848
    Normal depth = infinite
    Critical depth = 0.29 ft
    Depth downstream = 14.08 ft
    Bend loss = 0 ft
    Depth upstream = 14.09 ft
    Velocity = 0.06 ft/s
    Flow profile = Horizontal

Baffle Wall C to B   110.61
    Weir invert (top of weir) = 109

Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 11.56 mgd
Weir submergence = fully submerged
Head over weir = 1.61 ft

AB Zone B   110.61

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 11.56 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 282.13 ft^2
Hydraulic radius = 5.852
Normal depth = infinite
Critical depth = 0.29 ft
Depth downstream = 14.11 ft
Bend loss = 0 ft
Depth upstream = 14.11 ft
Velocity = 0.06 ft/s
Flow profile = Horizontal

Baffle Wall B to A   110.63

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 11.56 mgd
Weir submergence = fully submerged
Head over weir = 1.63 ft

AB Zone A   110.63

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 30 ft
Channel width/diameter = 20 ft
Flow = 11.56 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 282.57 ft^2
Hydraulic radius = 5.856
Normal depth = infinite
Critical depth = 0.29 ft
Depth downstream = 14.13 ft
Bend loss = 0 ft

Section Description	Water Surface Elevation

Depth upstream = 14.13 ft
Velocity = 0.06 ft/s
Flow profile = Horizontal

AB 4 Influent Sluice Gate   **110.64**
Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 110
Number of gates = 2
Flow through gate(s) = 5.47 mgd
Total area of opening(s) = 15 ft^2
Velocity through gate(s) = 0.56 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.01 ft
Downstream water level = 110.63
Upstream water level = 110.64

AB 4 Influent Channel   **110.65**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 3 ft
Flow = 5.47 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 4.18 ft^2
Hydraulic radius = 0.723
Normal depth = infinite
Critical depth = 0.63 ft
Depth downstream = 1.39 ft
Bend loss = 0 ft
Depth upstream = 1.4 ft
Velocity = 2.02 ft/s
Flow profile = Horizontal

AB 4 Influent Sloped Channel   **110.64**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 5.3 ft
Channel width/diameter = 3 ft
Flow = 5.47 mgd
Downstream channel invert = 109.25
Channel slope = 0.0141 ft/ft
Channel side slope = not applicable
Area of flow = 4.07 ft^2
Hydraulic radius = 0.712

Normal depth = 0.41 ft
Critical depth = 0.63 ft
Depth downstream = 1.4 ft
Bend loss = 0 ft
Depth upstream = 1.31 ft
Velocity = 2.02 ft/s
Flow profile = Steep

AB 4 Influent Split Box-Channel 110.72

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 12 ft
Channel width/diameter = 4.5 ft
Flow = 5.47 mgd
Downstream channel invert = 110
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 2.94 ft^2
Hydraulic radius = 0.506
Normal depth = infinite
Critical depth = 0.48 ft
Depth downstream = 0.64 ft
Bend loss = 0.05 ft
Depth upstream = 0.72 ft
Velocity = 2.94 ft/s
Flow profile = Horizontal

AB 3/4 42-IN Influent Pipe 110.74

Pipe shape = Circular
Diameter = 42 in
Length = 58 ft
Flow = 5.47 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.5
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 0.88 ft/s
Friction loss = 0 ft
Fitting loss = 0.02 ft
Total loss = 0.02 ft

42-IN Tee to AB 3/4 110.75

Tee type = run of tee
Diameter of pipe run past tee = 42 in

Section Description	Water Surface Elevation

Flow through tee = 5.47 mgd
Velocity through tee = 0.88 ft/s
Total tee K value = 0.6
Overall head loss = 0.01 ft

42-IN PC Effluent to PC Junction Box   **111.02**

    Pipe shape = Circular
    Diameter = 42 in
    Length = 244 ft
    Flow = 10.93 mgd
    Friction method = Hazen Williams
    Friction factor = 100
    Total fitting K value = 1
    Pipe area = 9.62 ft²
    Pipe hydraulic radius = 0.875
    Age factor = 2.348
    Solids factor = 1
    Velocity = 1.76 ft/s
    Friction loss = 0.23 ft
    Fitting loss = 0.05 ft
    Total loss = 0.28 ft

Prim. Eff. Junction Box   **111.02**

    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 16.5 ft
    Channel width/diameter = 7 ft
    Flow = 10.93 mgd
    Downstream channel invert = 104.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 45.64 ft^2
    Hydraulic radius = 2.278
    Normal depth = infinite
    Critical depth = 0.57 ft
    Depth downstream = 6.52 ft
    Bend loss = 0 ft
    Depth upstream = 6.52 ft
    Velocity = 0.37 ft/s
    Flow profile = Horizontal

PC 2 24-IN Effluent   **111.07**

    Pipe shape = Circular
    Diameter = 24 in
    Length = 15 ft
    Flow = 2.02 mgd
    Friction method = Hazen Williams

<u>Section Description</u>	<u>Water Surface Elevation</u>

Friction factor = 100
Total fitting K value = 2.2
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 0.99 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.03 ft
Total loss = 0.04 ft

PC 2 Effluent Box   111.07
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 1.5 ft
Channel width/diameter = 4 ft
Flow = 2.02 mgd
Downstream channel invert = 106
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 20.28 ft^2
Hydraulic radius = 1.434
Normal depth = infinite
Critical depth = 0.27 ft
Depth downstream = 5.07 ft
Bend loss = 0 ft
Depth upstream = 5.07 ft
Velocity = 0.15 ft/s
Flow profile = Horizontal

PC 2 Effluent Launder   112.78
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 71 ft
Channel width/diameter = 1 ft
Flow = 1.01 mgd
Downstream channel invert = 112
Channel slope = 0.0015 ft/ft
Channel side slope = not applicable
Area of flow = 0.55 ft^2
Hydraulic radius = 0.261
Normal depth = 0.74 ft
Critical depth = 0.42 ft
Depth downstream = 0.42 ft
Bend loss = 0 ft
Depth upstream = 0.67 ft
Velocity = 3.69 ft/s

Section Description	**Water Surface Elevation**

      Flow profile = Mild

PC 2 Effluent Weir   **114.38**

      Invert of V notch = 114.25
      Angle of V notch = 90 degrees
      Number of notches = 212
      Total flow over weir = 2.02 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.13 ft

PC 2 Basin   **114.38**

      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 45 ft
      Channel width/diameter = 45 ft
      Flow = 2.02 mgd
      Downstream channel invert = 106
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 377.05 ft^2
      Hydraulic radius = 6.105
      Normal depth = infinite
      Critical depth = 0.05 ft
      Depth downstream = 8.38 ft
      Bend loss = 0 ft
      Depth upstream = 8.38 ft
      Velocity = 0.01 ft/s
      Flow profile = Horizontal

PC 2 Influent Well   **114.46**

      Pipe shape = Circular
      Diameter = 18 in
      Length = 7 ft
      Flow = 2.02 mgd
      Friction method = Hazen Williams
      Friction factor = 100
      Total fitting K value = 1.25
      Pipe area = 1.77 ft²
      Pipe hydraulic radius = 0.375
      Age factor = 2.348
      Solids factor = 1
      Velocity = 1.77 ft/s
      Friction loss = 0.02 ft
      Fitting loss = 0.06 ft
      Total loss = 0.08 ft

24-IN Influent Pipe   **114.47**

      Pipe shape = Circular

Section Description	Water Surface Elevation

Diameter = 24 in
Length = 10 ft
Flow = 2.02 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 0.42
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 0.99 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.01 ft
Total loss = 0.01 ft

36-IN PC Influent Pipe   **114.5**

Pipe shape = Circular
Diameter = 24 in
Length = 10 ft
Flow = 2.02 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 1.67
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 0.99 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.03 ft
Total loss = 0.03 ft

Drop Box to Primary Clarifier No 2   **114.5**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3.5 ft
Channel width/diameter = 3.5 ft
Flow = 2.02 mgd
Downstream channel invert = 108
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 22.75 ft^2
Hydraulic radius = 1.379
Normal depth = infinite
Critical depth = 0.29 ft
Depth downstream = 6.5 ft
Bend loss = 0 ft

Section Description	**Water Surface Elevation**

      Depth upstream = 6.5 ft
      Velocity = 0.14 ft/s
      Flow profile = Horizontal

Primary Clarifier Distribution Box Weir   **117.41**
      Weir invert (top of weir) = 117
      Weir length = 3.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 2.01 mgd
      Weir submergence = unsubmerged
      Head over weir = 0.41 ft

Pinole PWWF Flow.vhf

Hydraulic Profile

Current flow conditions

Forward Flow	Return I Flow	Return II Flow	Return III Flow
20 mgd	10 mgd	-----	-----

Section Description	**Water Surface Elevation**
Starting water surface elevation	**107**

Effluent Weir   **108.17**
      Weir invert (top of weir) = 107.15
      Weir length = 4.5 ft
      Weir 'C' coefficient = 3.33
      Flow over weir = 10 mgd
      Weir submergence = unsubmerged
      Head over weir = 1.02 ft

Chlorine Contact Basin   **108.18**
      Channel shape = Rectangular
      Manning's 'n' = 0.012
      Channel length = 140 ft
      Channel width/diameter = 4 ft
      Flow = 10 mgd
      Downstream channel invert = 103.25
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 19.69 ft^2
      Hydraulic radius = 1.422
      Normal depth = infinite
      Critical depth = 0.77 ft
      Depth downstream = 4.92 ft
      Bend loss = 0 ft
      Depth upstream = 4.93 ft
      Velocity = 0.79 ft/s
      Flow profile = Horizontal

Slide Gate   **108.45**
      Opening type = rectangular gate
      Opening diameter/width = 36 in
      Gate height = 24 in
      Invert = 103.25
      Number of gates = 1
      Flow through gate(s) = 10 mgd

Section Description	Water Surface Elevation

Total area of opening(s) = 6 ft^2
Velocity through gate(s) = 2.58 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.27 ft
Downstream water level = 108.18
Upstream water level = 108.45

CC Basin Influent Box   **108.45**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 8 ft
Channel width/diameter = 4 ft
Flow = 20 mgd
Downstream channel invert = 103.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 20.8 ft^2
Hydraulic radius = 1.444
Normal depth = infinite
Critical depth = 1.23 ft
Depth downstream = 5.2 ft
Bend loss = 0 ft
Depth upstream = 5.2 ft
Velocity = 1.49 ft/s
Flow profile = Horizontal

42-IN SC Effluent   **108.83**

Pipe shape = Circular
Diameter = 42 in
Length = 116 ft
Flow = 20 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.75
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 3.22 ft/s
Friction loss = 0.1 ft
Fitting loss = 0.28 ft
Total loss = 0.38 ft

SC #1 Effluent Connection   **108.85**

Tee type = branch to line
Diameter of pipe line = 42 in
Diameter of pipe branch = 42 in

Section Description	Water Surface Elevation

Flow through tee = 6 mgd
Velocity through tee = 0.96 ft/s
Total tee K value = 1.5
Overall head loss = 0.02 ft

SC #1 - 30-IN Effluent   **108.87**

Pipe shape = Circular
Diameter = 42 in
Length = 70 ft
Flow = 6 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 1
Solids factor = 1
Velocity = 0.96 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.01 ft
Total loss = 0.02 ft

SC #1 Effluent Box   **108.87**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 4 ft
Channel width/diameter = 4 ft
Flow = 6 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 75.48 ft^2
Hydraulic radius = 1.808
Normal depth = infinite
Critical depth = 0.55 ft
Depth downstream = 18.87 ft
Bend loss = 0 ft
Depth upstream = 18.87 ft
Velocity = 0.12 ft/s
Flow profile = Horizontal

SC #1 Effluent Launder   **109.26**

Launder invert = 107
Launder length = 100 ft
Launder width = 1 ft
Launder slope = 0.004 ft/ft
Flow through launder = 3 mgd

Section Description	Water Surface Elevation

Critical depth = 0.87 ft
Downstream depth = 1.87 ft
Upstream depth = 1.86 ft

SC #1 Effluent Weir   **109.43**
Invert of V notch = 109.3
Angle of V notch = 90 degrees
Number of notches = 594
Total flow over weir = 6 mgd
Weir submergence = unsubmerged
Head over weir = 0.13 ft

SC #1   **109.43**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 75 ft
Channel width/diameter = 75 ft
Flow = 9 mgd
Downstream channel invert = 90
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 1457.39 ft^2
Hydraulic radius = 12.799
Normal depth = infinite
Critical depth = 0.1 ft
Depth downstream = 19.43 ft
Bend loss = 0 ft
Depth upstream = 19.43 ft
Velocity = 0.01 ft/s
Flow profile = Horizontal

SC #2 Influent Ports   **109.57**
Opening type = rectangular orifice
Opening diameter/width = 6 in
Opening height = 30 in
Invert = 106
Number of openings = 6
Flow through opening(s) = 9 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through opening(s) = 1.86 ft/s
Flow behavior = orifice, downstream control
Orifice loss = 0.14 ft
Downstream water level = 109.43
Upstream water level = 109.57

SC #2 - 36-IN Influent   **109.78**
Pipe shape = Circular
Diameter = 36 in

Section Description	Water Surface Elevation

Length = 200 ft
Flow = 9 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 2
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 1.97 ft/s
Friction loss = 0.08 ft
Fitting loss = 0.12 ft
Total loss = 0.2 ft

SC #1 Drop box   **109.78**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3 ft
Channel width/diameter = 8 ft
Flow = 9 mgd
Downstream channel invert = 100
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 78.24 ft^2
Hydraulic radius = 2.839
Normal depth = infinite
Critical depth = 0.46 ft
Depth downstream = 9.78 ft
Bend loss = 0 ft
Depth upstream = 9.78 ft
Velocity = 0.18 ft/s
Flow profile = Horizontal

SC Dist Box Weir #5   **110.71**

Weir invert (top of weir) = 110
Weir length = 7 ft
Weir 'C' coefficient = 3.33
Flow over weir = 9 mgd
Weir submergence = unsubmerged
Head over weir = 0.71 ft

SC Distribution Box   **110.71**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 9 ft
Channel width/diameter = 30 ft
Flow = 30 mgd

Section Description	Water Surface Elevation

Downstream channel invert = 100
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 321.29 ft^2
Hydraulic radius = 6.248
Normal depth = infinite
Critical depth = 0.42 ft
Depth downstream = 10.71 ft
Bend loss = 0 ft
Depth upstream = 10.71 ft
Velocity = 0.14 ft/s
Flow profile = Horizontal

AB 36-IN Effluent   **111.01**

Pipe shape = Circular
Diameter = 36 in
Length = 5 ft
Flow = 15 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.76
Pipe area = 7.07 ft²
Pipe hydraulic radius = 0.75
Age factor = 1
Solids factor = 1
Velocity = 3.28 ft/s
Friction loss = 0.01 ft
Fitting loss = 0.29 ft
Total loss = 0.3 ft

AB Exit Gate   **111.48**

Opening type = circular gate
Opening diameter/width = 36 in
Gate height = 36 in
Invert = 106
Number of gates = 1
Flow through gate(s) = 15.01 mgd
Total area of opening(s) = 7.07 ft^2
Velocity through gate(s) = 3.29 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.47 ft
Downstream water level = 111.01
Upstream water level = 111.48

AB 3 ML Drop Box   **111.48**

Channel shape = Rectangular
Manning's 'n' = 0.012

Section Description	Water Surface Elevation

Channel length = 3 ft
Channel width/diameter = 3 ft
Flow = 15.01 mgd
Downstream channel invert = 105.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 17.93 ft^2
Hydraulic radius = 1.199
Normal depth = infinite
Critical depth = 1.23 ft
Depth downstream = 5.98 ft
Bend loss = 0 ft
Depth upstream = 5.98 ft
Velocity = 1.3 ft/s
Flow profile = Horizontal

AB 3 ML Effluent Channel   **111.49**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 5.5 ft
Channel width/diameter = 3 ft
Flow = 15.01 mgd
Downstream channel invert = 109.25
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 6.69 ft^2
Hydraulic radius = 0.897
Normal depth = infinite
Critical depth = 1.23 ft
Depth downstream = 2.23 ft
Bend loss = 0 ft
Depth upstream = 2.24 ft
Velocity = 3.47 ft/s
Flow profile = Horizontal

AB 3 Effluent Sluice Gate   **111.87**

Opening type = rectangular gate
Opening diameter/width = 36 in
Gate height = 30 in
Invert = 109.25
Number of gates = 1
Flow through gate(s) = 15.01 mgd
Total area of opening(s) = 7.5 ft^2
Velocity through gate(s) = 3.1 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.39 ft
Downstream water level = 111.49

Section Description	**Water Surface Elevation**

Upstream water level = 111.87

AB 3 Zone E   **111.87**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 95 ft
Channel width/diameter = 20 ft
Flow = 15.01 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 307.46 ft^2
Hydraulic radius = 6.059
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 15.37 ft
Bend loss = 0 ft
Depth upstream = 15.37 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall E to D   **111.89**

Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 15 mgd
Weir submergence = fully submerged
Head over weir = 2.89 ft

Step Feed Gates AB No 3   **111.9**

Opening type = rectangular gate
Opening diameter/width = 24 in
Gate height = 36 in
Invert = 110.5
Number of gates = 3
Flow through gate(s) = 10 mgd
Total area of opening(s) = 18 ft^2
Velocity through gate(s) = 0.86 ft/s
Flow behavior = orifice, downstream control
Gate loss = 0.03 ft
Downstream water level = 111.87
Upstream water level = 111.9

Step Feed Channel AB No 3   **112.03**

Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 108 ft

    Channel width/diameter = 3 ft
    Flow = 10 mgd
    Downstream channel invert = 110
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 5.84 ft^2
    Hydraulic radius = 0.847
    Normal depth = infinite
    Critical depth = 0.94 ft
    Depth downstream = 1.9 ft
    Bend loss = 0.05 ft
    Depth upstream = 2.03 ft
    Velocity = 2.71 ft/s
    Flow profile = Horizontal

Step Feed Channel Bend   112.08
    Channel shape = Rectangular
    Manning's 'n' = 0.013
    Channel length = 8 ft
    Channel width/diameter = 3 ft
    Flow = 10 mgd
    Downstream channel invert = 110
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 6.11 ft^2
    Hydraulic radius = 0.864
    Normal depth = infinite
    Critical depth = 0.94 ft
    Depth downstream = 2.03 ft
    Bend loss = 0.04 ft
    Depth upstream = 2.08 ft
    Velocity = 2.54 ft/s
    Flow profile = Horizontal

AB 3/4 Influent Pipe   112.19
    Pipe shape = Circular
    Diameter = 42 in
    Length = 54 ft
    Flow = 10 mgd
    Friction method = Hazen Williams
    Friction factor = 100
    Total fitting K value = 1.7
    Pipe area = 9.62 ft²
    Pipe hydraulic radius = 0.875
    Age factor = 2.348
    Solids factor = 1
    Velocity = 1.61 ft/s

Section Description	Water Surface Elevation

Friction loss = 0.04 ft
Fitting loss = 0.07 ft
Total loss = 0.11 ft

42-IN Tee to AB 3/4   **112.29**
Tee type = run of tee
Diameter of pipe run past tee = 42 in
Flow through tee = 20 mgd
Velocity through tee = 3.22 ft/s
Total tee K value = 0.6
Overall head loss = 0.1 ft

42-IN PC Effluent to PC Junction Box CS Mode   **113.14**
Pipe shape = Circular
Diameter = 42 in
Length = 244 ft
Flow = 20 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 1
Pipe area = 9.62 ft²
Pipe hydraulic radius = 0.875
Age factor = 2.348
Solids factor = 1
Velocity = 3.22 ft/s
Friction loss = 0.7 ft
Fitting loss = 0.16 ft
Total loss = 0.86 ft

Prim. Eff. Junction Box (CS Mode)   **113.14**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 15.5 ft
Channel width/diameter = 7 ft
Flow = 20 mgd
Downstream channel invert = 104.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 60.48 ft^2
Hydraulic radius = 2.491
Normal depth = infinite
Critical depth = 0.85 ft
Depth downstream = 8.64 ft
Bend loss = 0 ft
Depth upstream = 8.64 ft
Velocity = 0.51 ft/s
Flow profile = Horizontal

Section Description	**Water Surface Elevation**

PC 2 24-IN Effluent CS Mode 113.28
    Pipe shape = Circular
    Diameter = 24 in
    Length = 15 ft
    Flow = 4 mgd
    Friction method = Hazen Williams
    Friction factor = 100
    Total fitting K value = 1.7
    Pipe area = 3.14 ft²
    Pipe hydraulic radius = 0.5
    Age factor = 2.348
    Solids factor = 1
    Velocity = 1.97 ft/s
    Friction loss = 0.03 ft
    Fitting loss = 0.1 ft
    Total loss = 0.14 ft

PC 2 Effluent Box CS Mode 113.28
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 1.5 ft
    Channel width/diameter = 4 ft
    Flow = 4 mgd
    Downstream channel invert = 104.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 35.12 ft^2
    Hydraulic radius = 1.629
    Normal depth = infinite
    Critical depth = 0.42 ft
    Depth downstream = 8.78 ft
    Bend loss = 0 ft
    Depth upstream = 8.78 ft
    Velocity = 0.18 ft/s
    Flow profile = Horizontal

PC 2 Effluent Launder CS Mode 113.39
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 71 ft
    Channel width/diameter = 1 ft
    Flow = 2 mgd
    Downstream channel invert = 112
    Channel slope = 0.0015 ft/ft
    Channel side slope = not applicable
    Area of flow = 1.28 ft^2
    Hydraulic radius = 0.36

Section Description	**Water Surface Elevation**

Normal depth = 1.28 ft
Critical depth = 0.67 ft
Depth downstream = 1.28 ft
Bend loss = 0 ft
Depth upstream = 1.28 ft
Velocity = 2.41 ft/s
Flow profile = Mild

PC 2 Effluent Weir CS Mode   **114.42**
Invert of V notch = 114.25
Angle of V notch = 90 degrees
Number of notches = 212
Total flow over weir = 4 mgd
Weir submergence = unsubmerged
Head over weir = 0.17 ft

PC 2   **114.42**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 45 ft
Channel width/diameter = 45 ft
Flow = 3.96 mgd
Downstream channel invert = 106
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 378.86 ft^2
Hydraulic radius = 6.127
Normal depth = infinite
Critical depth = 0.08 ft
Depth downstream = 8.42 ft
Bend loss = 0 ft
Depth upstream = 8.42 ft
Velocity = 0.02 ft/s
Flow profile = Horizontal

PC Influent Well   **114.72**
Pipe shape = Circular
Diameter = 18 in
Length = 7 ft
Flow = 4 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 1.25
Pipe area = 1.77 ft²
Pipe hydraulic radius = 0.375
Age factor = 2.348
Solids factor = 1
Velocity = 3.5 ft/s

Section Description	**Water Surface Elevation**

Friction loss = 0.06 ft
Fitting loss = 0.24 ft
Total loss = 0.3 ft

24-IN PC Influent   **114.79**

Pipe shape = Circular
Diameter = 24 in
Length = 15 ft
Flow = 4 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 0.67
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 1.97 ft/s
Friction loss = 0.03 ft
Fitting loss = 0.04 ft
Total loss = 0.07 ft

36-IN PC Influent   **114.87**

Pipe shape = Circular
Diameter = 24 in
Length = 15 ft
Flow = 4 mgd
Friction method = Hazen Williams
Friction factor = 100
Total fitting K value = 0.75
Pipe area = 3.14 ft²
Pipe hydraulic radius = 0.5
Age factor = 2.348
Solids factor = 1
Velocity = 1.97 ft/s
Friction loss = 0.03 ft
Fitting loss = 0.05 ft
Total loss = 0.08 ft

Drop Box to PC 2   **114.87**

Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 3.5 ft
Channel width/diameter = 3.5 ft
Flow = 4 mgd
Downstream channel invert = 108
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 24.05 ft^2

Hydraulic radius = 1.395
Normal depth = infinite
Critical depth = 0.46 ft
Depth downstream = 6.87 ft
Bend loss = 0 ft
Depth upstream = 6.87 ft
Velocity = 0.26 ft/s
Flow profile = Horizontal

PC Distribution Box Weir to PC 2   **117.66**
Weir invert (top of weir) = 117
Weir length = 3.5 ft
Weir 'C' coefficient = 3.33
Flow over weir = 4 mgd
Weir submergence = unsubmerged
Head over weir = 0.66 ft

AB 3 Zone D   **111.9**
Channel shape = Rectangular
Manning's 'n' = 0.012
Channel length = 95 ft
Channel width/diameter = 20 ft
Flow = 15.01 mgd
Downstream channel invert = 96.5
Channel slope = 0 ft/ft
Channel side slope = not applicable
Area of flow = 307.9 ft^2
Hydraulic radius = 6.062
Normal depth = infinite
Critical depth = 0.35 ft
Depth downstream = 15.39 ft
Bend loss = 0 ft
Depth upstream = 15.4 ft
Velocity = 0.08 ft/s
Flow profile = Horizontal

Baffle Wall D to C   **111.92**
Weir invert (top of weir) = 109
Weir length = 20 ft
Weir 'C' coefficient = 3.33
Flow over weir = 5 mgd
Weir submergence = fully submerged
Head over weir = 2.92 ft

AB 3 Zone C   **111.92**
Channel shape = Rectangular
Manning's 'n' = 0.013
Channel length = 130 ft

Section Description	Water Surface Elevation

    Channel width/diameter = 20 ft
    Flow = 5.01 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 308.34 ft^2
    Hydraulic radius = 6.066
    Normal depth = infinite
    Critical depth = 0.17 ft
    Depth downstream = 15.42 ft
    Bend loss = 0 ft
    Depth upstream = 15.42 ft
    Velocity = 0.03 ft/s
    Flow profile = Horizontal

Baffle Wall C to B   **111.94**

    Weir invert (top of weir) = 109
    Weir length = 20 ft
    Weir 'C' coefficient = 3.33
    Flow over weir = 5 mgd
    Weir submergence = fully submerged
    Head over weir = 2.94 ft

AB Zone B   **111.94**

    Channel shape = Rectangular
    Manning's 'n' = 0.013
    Channel length = 30 ft
    Channel width/diameter = 20 ft
    Flow = 5.01 mgd
    Downstream channel invert = 96.5
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 308.78 ft^2
    Hydraulic radius = 6.069
    Normal depth = infinite
    Critical depth = 0.17 ft
    Depth downstream = 15.44 ft
    Bend loss = 0 ft
    Depth upstream = 15.44 ft
    Velocity = 0.03 ft/s
    Flow profile = Horizontal

Baffle Wall A to B   **111.96**

    Weir invert (top of weir) = 109
    Weir length = 20 ft
    Weir 'C' coefficient = 3.33
    Flow over weir = 5 mgd

Section Description	**Water Surface Elevation**

      Weir submergence = fully submerged
      Head over weir = 2.96 ft

AB Zone A   **111.96**

      Channel shape = Rectangular
      Manning's 'n' = 0.013
      Channel length = 30 ft
      Channel width/diameter = 20 ft
      Flow = 5.01 mgd
      Downstream channel invert = 96.5
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 309.22 ft^2
      Hydraulic radius = 6.072
      Normal depth = infinite
      Critical depth = 0.17 ft
      Depth downstream = 15.46 ft
      Bend loss = 0 ft
      Depth upstream = 15.46 ft
      Velocity = 0.03 ft/s
      Flow profile = Horizontal

AB 4 Influent Sluice Gate   **111.97**

      Opening type = rectangular gate
      Opening diameter/width = 36 in
      Gate height = 30 in
      Invert = 110
      Number of gates = 2
      Flow through gate(s) = 5.01 mgd
      Total area of opening(s) = 15 ft^2
      Velocity through gate(s) = 0.52 ft/s
      Flow behavior = orifice, downstream control
      Gate loss = 0.01 ft
      Downstream water level = 111.96
      Upstream water level = 111.97

AB 4 Influent Channel   **111.98**

      Channel shape = Rectangular
      Manning's 'n' = 0.013
      Channel length = 3 ft
      Channel width/diameter = 3 ft
      Flow = 5.01 mgd
      Downstream channel invert = 109.25
      Channel slope = 0 ft/ft
      Channel side slope = not applicable
      Area of flow = 8.17 ft^2
      Hydraulic radius = 0.967
      Normal depth = infinite

    Critical depth = 0.59 ft
    Depth downstream = 2.72 ft
    Bend loss = 0 ft
    Depth upstream = 2.73 ft
    Velocity = 0.95 ft/s
    Flow profile = Horizontal

AB 4 Influent Slopped Channel   **111.97**
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 5.3 ft
    Channel width/diameter = 3 ft
    Flow = 15.01 mgd
    Downstream channel invert = 109.25
    Channel slope = 0.0141 ft/ft
    Channel side slope = not applicable
    Area of flow = 8.06 ft^2
    Hydraulic radius = 0.962
    Normal depth = 0.81 ft
    Critical depth = 1.23 ft
    Depth downstream = 2.73 ft
    Bend loss = 0 ft
    Depth upstream = 2.64 ft
    Velocity = 2.84 ft/s
    Flow profile = Steep

AB 4 Influent Split Box-Channel   **112.02**
    Channel shape = Rectangular
    Manning's 'n' = 0.012
    Channel length = 12 ft
    Channel width/diameter = 4.5 ft
    Flow = 15.01 mgd
    Downstream channel invert = 110
    Channel slope = 0 ft/ft
    Channel side slope = not applicable
    Area of flow = 8.87 ft^2
    Hydraulic radius = 1.051
    Normal depth = infinite
    Critical depth = 0.94 ft
    Depth downstream = 1.97 ft
    Bend loss = 0.04 ft
    Depth upstream = 2.02 ft
    Velocity = 2.62 ft/s
    Flow profile = Horizontal

10-IN RAS Influent Pipe   **122.12**
    Pipe shape = Circular

Section Description   ## Water Surface Elevation

Diameter = 10 in
Length = 58 ft
Flow = 5 mgd
Friction method = Hazen Williams
Friction factor = 120
Total fitting K value = 1.9
Pipe area = 0.55 ft²
Pipe hydraulic radius = 0.208
Age factor = 1
Solids factor = 1
Velocity = 14.18 ft/s
Friction loss = 4.17 ft
Fitting loss = 5.93 ft
Total loss = 10.1 ft