Poseidon Resources Corporation

ATTACHMENT 4

FLOW MINIMIZATION ALTERNATIVES

THROUGH-SCREEN VELOCITIES

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LONG-TERM WEST BASIN WATER LEVEL ANALYSIS FOR ASSESSING TRESHOLD IMPINGEMENT EFFECTS OF REDUCED INTAKE FLOWS AT AGUA HEDIONDA LAGOON

FLOW MINIMIZATION ALTERNATIVES - THROUGH-SCREEN VELOCITY ASSESSMENT

EXISTING INTAKE PUMPS, SCREENS AND SCREEN VELOCITIES

Power Plant Unit Number	P	ump Size		Maximum Ve Upstream o			Velocity (fps) the Screens	Size	Screens Number		Ratio
	gpm	MGD	cfs	High Tíde 4.83	Low Tide -5.07	High Tide 4.83	Low Tide -5.07	of Openings (in)			Total Area/ Openings
Unit 1			-	4.00	-0.07	4.05	-0.07				
Pump 1 S	24,000	34.56	53.52								
Pump 1 N	24,000	34.56	53.52								
Total Pump Capacity Unit 1 =	48,000	69.12	107.04	0.7	1.2	2 1.2	2.1	3/8-inches		2	1.75
							A. 1	Johnenea	Shared w/	-	1.75
Unit 2									Units 1 & 2		
Pump 2 S	24,000	34.56	53.52						01110 1 0 2		
Pump 2 N	24,000	34.56	53.52								
Total Pump Capacity Unit 2 =	48,000	69.12	107.04	0.7	. 1.2	2 1.2	2.1	3/8-inches		2	1.75
									Shared w/		
Unit 3									Units 1 & 3		
Pump 3 S	24,000	34.56	53.52								
Pump 3 N	24,000	34.56	53.52								
Total Pump Capacity Unit 3 =	48,000	69.12	107.04	0.7	1.2	2 1.2	, 2.1	3/8-inches		2	1.75
									Shared w/		
Unit 4									Units 1 & 3		
Pump 4 E	100,000	144.01	223								
Pump 4 W	100,000	144.01	223								
Total Pump Capacity Unit 4 =	200,000	288.02	446	1.0	1.6	5 1.8	2.8	3/8-inches		2	1.75
Unit 5											
Pump 5 E	104,000	149.76	231.92								
Pump 5 W	104,000	149.77	231.92								
Total Pump Capacity Unit 5 =	208,000	299.54	463.84	0.7	·· 14	1.0	1.6	5/8-inches		3	1.46
Note: Pump and Screen Parameters Liste					1.	1.0	1.0	5/o-menes		J	1.40

Note: Pump and Screen Parameters Listed Above Are Provided by the Encina Power Plant Staff.

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CHANNEL AND SCREEN VELOCITIES WITH ALL PUMPS IN OPERATION - TOTAL INTAKE FLOW OF 794.92 MGD

Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow =	322.2	cfs	322.2 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide	Malaaiku a	4.00		Low Tide	
Channel Width =	12.5		In-Channel	Velocity =	1.20	fps	Through-Screen Velocity =	2.10
Channel Depth =	25			R =	5.7737839			
Water Depth in Channels (Low Tide)	10.73							
Water Depth in Channels (High Tide)	19.93							
			High Tide In-Channel	Velocity =	0.65	fps	High Tide Through-Screen Velocity =	1.13
Channel for Unit 4 Number of Screen Channels =	2	Total	Unit 4 Flow =	2	446.0	cfs	446 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.88	fps	Through-Screen Velocity =	3.29
	11.23			R ≠	5.43904958	7		
	05 75							

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Channel Depth =

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Water Depth in Channels (Low Tide)	10.53						
Water Depth in Channels (High Tide)	19,43						
			High Tide			Link Tide	
			In-Channel Velocity =	= 1.02	fps	High Tide Through-Screen Velocity =	1.79
			<u> </u>				
Channel for Unit 5		Total	Unit 5 Flow =	463.84	cfs	463.84 cfs (check)	
Number of Screen Channels =	3						
Channel Bottom Elevation =	-20		Low Tide In-Channel Velocity =	= 1.33	fps	Low Tide	
Channel Width =	11.25		In ondrinoi velocity -	1.00		Through-Screen Velocity =	1.94
Channel Depth =	27.75		R =	6.4075993	706		
Water Depth in Channels (Low Tide)	10.33						
Water Depth in Channels (High Tide)	19.23						
			High Tide			High Tide	
			In-Channel Velocity =	0.71	fps	Through-Screen Velocity =	1.04
OPERATIONAL CONDITION 1 - 1	TOTAL INTAKE FLO	OW = 316.96	MGD				
Unit 1 (Both Pumps) =	69.12 MGD	107.0	14 060				
Unit 2 (One Pump) =	34.56 MGD		04 cfs 52 cfs				
Unit 3 (Both Pumps) =	69.12 MGD)4 cfs		•		
Unit 4 (One Pump) =	144.01 MGD	22	23 cfs				
Total Pump Flow =	316.82 MGD	490	.6 cfs				
Channels for Units 1,2 & 3		Total	Unit 1, 2 & 3 Flow =	267.6	cfs	267.6 cfs (check)	
Number of Screen Channels =	2		•				
Channel Bottom Elevation =	-20		Low Tide	· · · · ·		Low Tide	
			In-Channel Velocity =	1.14	fps	Through-Screen Velocity =	2.00
Channel Width =	12.5		R =	EREFOR	204		
Channel Depth =	25		к-	5.3555098	551		
Water Depth in Channels // ow Tide)	0.27 #						
Water Depth in Channels (Low Tide)	9.37 ft						
Water Depth in Channels (High Tide)	18.27 ft						
			High Tide			High Tide	
			In-Channel Velocity =	0.59	fps	Through-Screen Velocity =	1.03
Channel for Unit 4	•	Total	Unit 4 Flow =	223.0	cfs	223 cfs (check)	
Number of Screen Channels =	2						
Channel Bottom Elevation =	-20		Low Tide			Low Tide	
Channel Width =	11.25		In-Channel Velocity =	1.55	fps	Through-Screen Velocity =	2.72
			R ⇒	4.0732208	368		
Channel Depth =	25.75						
Water Depth in Channels (Low Tide)	6,39						
Water Depth in Channels (High Tide)	15.29						
			High Tide		••••	High Tide	1
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In-Channel Velocity = 0.65 fps Through-Screen Velocity = 1.13

OPERATIONAL CONDITION 2 - TOTAL INTAKE FLOW = 322.58 MGD

Unit 1, 2 or 3 (One Pump) = Unit 4 (Both Pumps) = Total Pump Flow =	34.56 MGD 288.02 MGD 322.58 MGD	4	52 cfs 46 cfs 52 cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow =	53.5	cfs	53.52 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channe! Width =	12.5		In-Channel	Velocity =	0.69	fps	Through-Screen Velocity =	1.20
Channel Depth =	25			R =	2.494877377	7		
Water Depth in Channels (Low Tide)	3.117 ft							
Water Depth in Channels (High Tide)	12.017 ft							
			High Tide in-Channel	Velocity =	0.18	fps	High Tide Through-Screen Velocity <i>=</i>	0.31
			Channel Elev	vation @ Scree	n Velocity of 0.	5 fps =	0.49925989 7.5 ft	
			Tide Level @	Screen Veloc	ity of 0.5 fps =		-0.687 ft	
Channel for Unit 4 Number of Screen Channels =	2	Total	Unit 4 Flow	=	446.0	cfs	446 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.88	fps	Through-Screen Velocity =	3.29
Channel Depth =	25.75			R≃	5.439049587	7		
Water Depth in Channels (Low Tide)	10.53							
Water Depth In Channels (High Tide)	19.43							
			High Tide In-Channel	Velocity =	1.02	fps	High Tide Through-Screen Velocity =	1.79
OPERATIONAL CONDITION 3 - 1	TOTAL INTAKE FLC)W = 328.33	MGD					
Unit 1, 2 or 3 (One Pump) = Unit 4 (One Pump) = Unit 5 (One Pump) = Total Pump Flow ≕	34.56 MGD 144.01 MGD 149.76 MGD 328.33 MGD	2 231.	52 cfs 23 cfs 92 cfs 44 cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1,2 or 3	Flow =	53,5	cfs	53.52 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide In-Channel	Velocity =	0.69	fps	Low Tide Through-Screen Velocity =	1.20
Channel Width =	12.5			R =	2.49487737		THEOREM VEIGHTY -	
Channel Depth =	25			N -	z.4340//3/	,		

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Water Depth in Channels (Low Tide)	3.12 ft							
Water Depth in Channels (High Tide)	12.02 ft							
			High Tide In-Channel	Velocity =	0.18	fps	High Tide Through-Screen Velocity =	0.3
Channel for Unit 4 Number of Screen Channels =	2	Total	Unit 4 Flow =	• .	223.0	cfs	223 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.55	fps	Through-Screen Velocity =	2.7
Channel Depth =	25.75			R =	4.0732208	868		
Water Depth in Channels (Low Tide)	6.39							
Water Depth in Channels (High Tide)	15.29							
			High Tide				High Tide	
			In-Channel	Velocity =	0.65	fps	Through-Screen Velocity =	1.1
Channel for Unit 5 Number of Screen Channels =	3	Total	Unit 5 Flow =	1	231.74	cfs	231.92 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide			<u></u>	Low Tide	· · · · · · ·
Channel Width =	11.25	·	In-Channel	Velocity =	1.07	fps	Through-Screen Velocity =	1.5
				R =	4.6401718	58		
Channel Depth =	27.75							
Water Depth in Channels (Low Tide)	6.40							
Water Depth in Channels (High Tide)	15.3							
			High Tide In-Channei		0.45		High Tide	

OPERATIONAL CONDITION 5 - TOTAL INTAKE FLOW = 184.32 MGD

Unit 1, 2 or 3 (One Pump) = Unit 5 (One Pump) = Total Pump Flow =	34.56 MGD 149.76 MGD 184.32 MGD	53.52 231.92 285.44	cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow =	53.5	cfs	53.52 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	12.5		In-Channel	Velocity =	0.69	fps	Through-Screen Velocity =	1.20
Channel Depth =	25			R =	2.494877377	7		
Water Depth in Channels (Low Tide)	3.117 ft							
Water Depth in Channels (High Tide)	12.017 ft							
			High Tide In-Channel	Velocity =	0.18	fps	High Tide Through-Screen Velocity =	0.31

Channel Elevation @ Screen Velocity of 0.5 fps = 0.77509611 7.5 ft

			Tide Level @	Screen Veloc	ity of 0.5 fps	=	-0.687 ft	
Channel for Unit 5 Number of Screen Channels =	3	Total	Unit 5 Flow :	=	231.74	cfs	231.92 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide	·			Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.07	fps	Through-Screen Velocity =	1.5
Channel Depth =	27.75			R =	4.6401718	58		
Water Depth in Channels (Low Tide)	6.40							
Water Depth in Channels (High Tide)	15.3							
			High Tide In-Channel	Velocity =	0.45	fps	High Tide Through-Screen Velocity =	0.6
OPERATIONAL CONDITION 4 - T	OTAL INTAKE FLO	W = 218.88	MGD					
Unit 1, 2 or 3 (Two Pumps) = Unit 5 (One Pump) = Total Pump Flow =	69.12 MGD 149.76 MGD 218.88 MGD	231.9	04 cfs 92 cfs 96 cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow =	107.0	cfs	107.04 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	12.5		In-Channel	Velocity =	0.87	fps	Through-Screen Velocity =	1.5
Channel Depth =	25			R =	3.5391695	82		
Water Depth in Channels (Low Tide)	4,937 ft							
Water Depth in Channels (High Tide)	13.837 ft							
			High Tide In-Channel	Velocity =	0.31	fps	High Tide Through-Screen Velocity ≕	0.6
Channel for Unit 5 Number of Screen Channels =	3	Totai	Unit 5 Flow =	:	231.74	cfs	231.92 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
			in-Channel	Velocity =	1.07	fps	LOW TIGE Through-Screen Velocity =	1.5
Channel Width =	11.25			R =	4.6401718	58		
Channel Depth =	27.75							
	6.40					•		
Water Depth in Channels (Low Tide)								

FLOW MINIMIZATION ALTERNATIVES - THROUGH-SCREEN VELOCITY ASSESSMENT

EXISTING INTAKE PUMPS, SCREENS AND SCREEN VELOCITIES

Power Plant Unit Number	P	ump Size		Maximum Ve Upstream o			Velocity (fps) the Screens	Size of Openings	Screens Number		Ratio Total Area/
	gpm	MGD	cfs	High Tide 4,83	Low Tide -5.07	High Tide 4.83	Low Tide -5.07	(in)			Openings
Unit 1				4.00	-0.07	4.00	-5.07				
Pump 1 S	24,000	34.56	53,52								
Pump 1 N	24,000	34.56	53.52								
Total Pump Capacity Unit 1 =	48,000	69.12	107.04	0.7	1.2	2 1.2	2.1	3/8-inches		2	1.75
								0.0 1101100	Shared w/	-	1.75
Unit 2									Units 1 & 2		
Pump 2 S	24,000	34.56	53.52								
Pump 2 N	24,000	34.56	53.52								
Total Pump Capacity Unit 2 =	48,000	69.12	107.04	0.7	1.2	2 1.2	2.1	3/8-inches		2	1.75
									Shared w/		
Unit 3									Units 1 & 3		
Pump 3 S	24,000	34.56	53.52								
Pump 3 N	24,000	34.56	53.52								
Total Pump Capacity Unit 3 =	48,000	69.12	107.04	0.7	1.2	2 1.2	2.1	3/8-inches		2	1.75
11-14									Shared w/		
Unit 4									Units 1 & 3		
Pump 4 E	100,000	144.01	223								
Pump 4 W	100,000	144.01	223								
Total Pump Capacity Unit 4 =	200,000	288.02	446	1.0	1.6	5 1.8	2.8	3/8-inches		2	1.75
Unit 5											
Pump 5 E	104,000	149,76	231.92								
Pump 5 W	104,000	149.70	231.92								
Total Pump Capacity Unit 5 =	208,000	299.54	463.84	0.7		1.0	4.0	F (D 1-+			4.40
Note: Pump and Screen Parameters Listed					1.1	1.0	1.6	5/8-inches		3	1.46
		noco by me L	noma i ovici r	ant otan.							

CHANNEL AND SCREEN VELOCITIES WITH ALL PUMPS IN OPERATION - TOTAL INTAKE FLOW OF 794.92 MGD

Channels for Units 1,2 & 3		Total	Unit 1, 2 & 3	Flow =	322.2	cfs	322.2 cfs (check)	
Number of Screen Channels =	2							
Channel Bottom Elevation =	-20		Low Tide		4.02		Low Tide	
Channel Width ≂	12.5		In-Channel	Velocity =	1.20	fps	Through-Screen Velocity =	2.10
Channel Depth =	25			R =	5.7737839			
Water Depth in Channels (Low Tide)	10.73							
Water Depth in Channels (High Tide)	19.93							
			High Tide In-Channel	Velocity =	0.65	fps	High Tide Through-Screen Velocity ≆	1.13
Channel for Unit 4 Number of Screen Channels =	2	Total	Unit 4 Flow	=	446.0	cfs	446 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.88	fps	Through-Screen Velocity =	3.29
Channel Depth =	25.75			R =	5.43904958	7		

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Water Depth in Channels (Low Tide)								
	10.53							
Water Depth in Channels (High Tide)	19.43							
			High Tide			•	High Tide	···
			in-Channel	Velocity =	1.02	fps	Through-Screen Velocity =	1.79
Channel for Unit 5 Number of Screen Channels =	3	Total	Unit 5 Flow =		463.84	cfs	463.84 cfs (check)	
	5							
Channel Bottom Elevation =	-20		Low Tide In-Channel	Velocity =	1.33	fps	Low Tide Through-Screen Velocity =	1.94
Channel Width =	11.25			R=	6.407599706		Through Screen Velocity -	1.54}
Channel Depth ≍	27.75			N -	6.407599700	0		
Water Depth in Channels (Low Tide)	10.33							
Water Depth in Channels (High Tide)	19.23							
			High Tide			<u> </u>	High Tide	
			In-Channel	Velocity =	0.71	fps	Through-Screen Velocity =	1.04
OPERATIONAL CONDITION 1 -	TOTAL INTAKE FLO)W = 316.96 M	IGD					
Unit 1 (Both Pumps) = Unit 2 (One Pump) = Unit 3 (Both Pumps) = Unit 4 (One Pump) = Total Pump Flow =	69.12 MGD 34.56 MGD 69.12 MGD 144.01 MGD 316.82 MGD	107.04 53.52 107.04 223 490.6	2 cfs 4 cfs 3 cfs					
	2	Total	Unit 1, 2 & 3 i	Flow =	267.6	cfs	267.6 cfs (check)	
Number of Screen Channels =	2 -20	Total	Low Tide				Low Tide	
Number of Screen Channels = Channel Bottorn Elevation =		Total		Velocity =	1.14	fps		2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width =	-20	Total	Low Tide			fps	Low Tide	2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth =	-20 12.5	Total	Low Tide	Velocity =	1.14	fps	Low Tide	2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Water Depth in Channels (Low Tide)	-20 12.5 25	Total	Low Tide	Velocity =	1.14	fps	Low Tide	2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Water Depth in Channels (Low Tide)	-20 12.5 25 9.37 ft	Total	Low Tide In-Channel	Velocity =	1.14	fps	Low Tide Through-Screen Velocity =	2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Vater Depth in Channels (Low Tide)	-20 12.5 25 9.37 ft	Total	Low Tide	Velocity =	1.14	fps	Low Tide	2.00
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Vater Depth in Channels (Low Tide) Vater Depth in Channels (High Tide)	-20 12.5 25 9.37 ft	Total	Low Tide In-Channel	Velocity = R = Velocity =	1.14 5.355509833	fps I	Low Tide Through-Screen Velocity = High Tide]
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Vater Depth in Channels (Low Tide) Vater Depth in Channels (High Tide) Channel for Unit 4 Number of Screen Channels =	-20 12.5 25 9.37 ft 18.27 ft		Low Tide In-Channel High Tide In-Channel	Velocity = R = Velocity =	1.14 5.355509831 0.59	fps fps	Low Tide Through-Screen Velocity = High Tide Through-Screen Velocity =]
Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Vater Depth in Channels (Low Tide) Vater Depth in Channels (High Tide) Channel for Unit 4 Number of Screen Channels = Channel Bottom Elevation =	-20 12.5 25 9.37 ft 18.27 ft		Low Tide In-Channel High Tide In-Channel Unit 4 Fiow =	Velocity = R = Velocity =	1.14 5.355509831 0.59	fps fps	Low Tide Through-Screen Velocity = High Tide Through-Screen Velocity = 223 cfs (check)]
Rumber of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Vater Depth in Channels (Low Tide) Vater Depth in Channels (High Tide) Vater Depth in Channels (High Tide) Channel for Unit 4 Rumber of Screen Channels = Channel Bottom Elevation =	-20 12.5 25 9.37 ft 18.27 ft 2 2		Low Tide In-Channel High Tide In-Channel Unit 4 Flow = Low Tide	Velocity = R = Velocity =	1.14 5.355509837 0.59 223.0	fps fps cfs fps	Low Tide Through-Screen Velocity = High Tide Through-Screen Velocity = 223 cfs (check) Low Tide	1.03
Number of Screen Channels = Channel Bottorn Elevation = Channel Width = Channel Depth = Water Depth in Channels (Low Tide) Water Depth in Channels (High Tide) Channel for Unit 4 Number of Screen Channels = Channel Bottorn Elevation = Channel Width = Channel Depth =	-20 12.5 25 9.37 ft 18.27 ft 2 -20 11.25		Low Tide In-Channel High Tide In-Channel Unit 4 Flow = Low Tide	Velocity = R = Velocity = Velocity =	1.14 5.355509831 0.59 223.0 1.55	fps fps cfs fps	Low Tide Through-Screen Velocity = High Tide Through-Screen Velocity = 223 cfs (check) Low Tide	1.03
Channels for Units 1,2 & 3 Number of Screen Channels = Channel Bottom Elevation = Channel Width = Channel Depth = Water Depth in Channels (Low Tide) Water Depth in Channels (High Tide) Channel for Unit 4 Number of Screen Channels = Channel Bottom Elevation = Channel Bottom Elevation = Channel Depth = Water Depth in Channels (Low Tide) Water Depth in Channels (Low Tide)	-20 12.5 25 9.37 ft 18.27 ft 2 -20 11.25 25.75		Low Tide In-Channel High Tide In-Channel Unit 4 Flow = Low Tide	Velocity = R = Velocity = Velocity =	1.14 5.355509831 0.59 223.0 1.55	fps fps cfs fps	Low Tide Through-Screen Velocity = High Tide Through-Screen Velocity = 223 cfs (check) Low Tide	1.03

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In-Channel Velocity = 0.65 fps Through-Screen Velocity = 1.13

OPERATIONAL CONDITION 2 - TOTAL INTAKE FLOW = 322.58 MGD

Unit 4 (Both Pumps) = Total Pump Flow =	34.56 MGD 288.02 MGD 322.58 MGD	44	2 cfs 6 cfs 2 cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow =	53.5	cfs	53.52 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide In-Channel	Velocity =	0.69	fps	Low Tide	4.00
Channel Width =	12.5			R =		•	Through-Screen Velocity =	1.20
Channel Depth ≠	25			к -	2.494877377			
Water Depth in Channels (Low Tide)	3.117 ft							
Water Depth in Channels (High Tide)	12.017 ft							
			High Tide In-Channel	Velocity =	0.18	fps	High Tide Through-Screen Velocity =	0.31
			Channel Eleva	ation @ Scree	en Velocity of 0.	5 fps =	0.49925989 7.5 ft	
			Tide Level @	Screen Veloc	ity of 0.5 fps =		-0.687 ft	
Channel for Unit 4 Number of Screen Channels =	2	Total	Unit 4 Flow =	:	446.0	cfs	446 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	11.25		In-Channel	Velocity =	1.88	fps	Through-Screen Velocity =	3.29
Channel Depth =	25.75			R =	5.439049587			
Water Depth in Channels (Low Tide)	10.53							
Water Depth in Channels (High Tide)	19.43							
			High Tide In-Channel	Velocity =	1.02	fps	High Tide Through-Screen Velocity =	1.79
OPERATIONAL CONDITION 3 -	TOTAL INTAKE FLC)W = 328.33 I	MGD					
OPERATIONAL CONDITION 3 - Unit 1, 2 or 3 (One Pump) = Unit 4 (One Pump) = Unit 5 (One Pump) = Total Pump Flow =	TOTAL INTAKE FLO 34.56 MGD 144.01 MGD 149.76 MGD 328.33 MGD	53.5	2 cfs 3 cfs 2 cfs					
Unit 1, 2 or 3 (One Pump) = · Unit 4 (One Pump) = Unit 5 (One Pump) =	34.56 MGD 144.01 MGD 149.76 MGD	53.5 22 231.9	2 cfs 3 cfs 2 cfs	Flow =	53.5	cfs	53.52 cfs (check)	
Unit 1, 2 or 3 (One Pump) = Unit 4 (One Pump) = Unit 5 (One Pump) = Total Pump Flow = Channels for Units 1,2 & 3	34.56 MGD 144.01 MGD 149.76 MGD 328.33 MGD	53.5 22 231.9 508.4	2 cfs 3 cfs 2 cfs 4 cfs Unit 1,2 or 3				Low Tide	
Unit 1, 2 or 3 (One Pump) = Unit 4 (One Pump) = Unit 5 (One Pump) = Total Pump Flow = Channels for Units 1,2 & 3 Number of Screen Channels =	34.56 MGD 144.01 MGD 149.76 MGD 328.33 MGD	53.5 22 231.9 508.4	2 cfs 3 cfs 2 cfs 4 cfs Unit 1,2 or 3	Flow = Velocity = R =	53.5 0.69 2.494877377	fps	· ·	1.20

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Water Depth in Channels (Low Tide) 3.12 ft Water Depth in Channels (High Tide) 12.02 ft

Channel for Unit 5 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check) Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =	0.31	High Tide Through-Screen Velocity =	fps	0.18	Velocity =	High Tide In-Channel			
Number of Screen Channels = 2 Item of Number of Screen Channels = 2 Channel Bottom Elevation = -20 Low Tide Low Tide Channel Width = 11.25 R = 4.073220868 Channel Depth = 25.75 R = 4.073220868 Water Depth in Channels (Low Tide) 6.39 Item of Screen Velocity = Item of Screen Velocity = Water Depth in Channels (High Tide) 15.29 Item of Screen Channels = Item of Screen Channels = 3 Channel Bottom Elevation = -20 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check In-Channel Velocity = Channel Bottom Elevation = -20 Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =			_				Total		Channel for Unit A
Channel Width =11.25Cov TideChannel Depth =25.75 $R = 4.073220868$ Water Depth in Channels (Low Tide)6.39Water Depth in Channels (High Tide)15.29High Tide In-Channel Velocity =0.65fpsThrough-Screen Velocity =Channel for Unit 5 Number of Screen Channels =TotalUnit 5 Flow =231.74Channel Bottom Elevation =-20Low Tide In-ChannelLow Tide In-ChannelLow Tide In-ChannelLow Tide In-ChannelLow Tide 	()	223 cfs (check)	cts	223.0	-	Unit 4 Flow =	TOTAL	2	
Channel Width = 11.25 Channel Depth = 25.75 Water Depth in Channels (Low Tide) 6.39 Water Depth in Channels (High Tide) 15.29 High Tide In-Channel Velocity = 0.65 fps Through-Screen Velocity = Channel for Unit 5 Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide In-Channel Velocity = 10.07 fps) (-) II			-20	Channel Bottom Elevation =
Channel Depth = 25.75 Water Depth in Channels (Low Tide) 6.39 Water Depth in Channels (Ligh Tide) 15.29 High Tide In-Channel High Tide In-Channel Velocity = 0.65 fps Through-Screen Velocity = Channel for Unit 5 Total Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide In-Channel Velocity = 10.7 fps	2.72	Through-Screen Velocity =	tps	1.55	velocity =	In-Channei		11.25	Channel Width =
Water Depth in Channels (High Tide) 15.29 High Tide In-Channel Velocity = 0.65 fps Through-Screen Velocity = Channel for Unit 5 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check Number of Screen Channels = 3 3 Low Tide Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =			68	4.0732208	R =			25.75	Channel Depth =
High Tide High Tide High Tide In-Channel for Unit 5 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check Number of Screen Channels = 3 3 Low Tide Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =								6,39	Water Depth in Channels (Low Tide)
In-Channel Velocity = 0.65 fps Through-Screen Velocity = Channel for Unit 5 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =								15.29	Water Depth in Channels (High Tide)
Channel for Unit 5 Total Unit 5 Flow = 231.74 cfs 231.92 cfs (check Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =		High Tide							
Number of Screen Channels = 3 Channel Bottom Elevation = -20 Low Tide Low Tide In-Channel Velocity = 1.07 fps Through-Screen Velocity =	1.13	Through-Screen Velocity =	fps	0.65	Velocity =	in-Channel			
In-Channel Velocity = 1.07 fps Through-Screen Velocity =)	231.92 cfs (check)	cfs	231.74		Unit 5 Flow =	Total	3	
				1.07	Velocity =			-20	Channel Bottom Elevation =
	1.57	Inrougn-Screen Velocity =	ips	1.07	······			11.25	Channel Width =
Channel Depth = 27.75 R = 4.640171858			58	4.6401718	R =			27.75	Channel Depth =
Water Depth in Channels (Low Tide) 6.40								6.40	Water Depth in Channels (Low Tide)
Water Depth in Channels (High Tide) 15.3								15.3	Water Depth in Channels (High Tide)
High Tide High Tide High Tide In-Channel Velocity = 0.45 fps Through-Screen Velocity =	0.66	High Tide Through-Screen Velocity =	600	0.45	Velocity -				

OPERATIONAL CONDITION 5 - TOTAL INTAKE FLOW = 184.32 MGD

Unit 1, 2 or 3 (One Pump) = Unit 5 (One Pump) = Total Pump Flow =	34.56 MGD 149.76 MGD 184.32 MGD	53.52 231.92 285.44	cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3 Flow =		53.5	cfs	53.52 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	12.5		In-Channel	Velocity =	0.69	fps	Through-Screen Velocity =	1,20
Channel Depth =	25			R =	2.494877377	,		
Water Depth in Channels (Low Tide)	3.117 ft							
Water Depth in Channels (High Tide)	12.017 ft							
			High Tide				High Tide	
			In-Channel	Velocity =	0.18	fps	Through-Screen Velocity =	0.31

Channel Elevation @ Screen Velocity of 0.5 fps = 0.77509611 7.5 ft

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				Screen Veloo	ary or 0.0 ips	-0.687 ft		
Channel for Unit 5 Number of Screen Channels =	3	Total	Unit 5 Flow	=	231.74	cfs	231.92 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width ≍	11.25		In-Channel	Velocity =	1.07	fps	Through-Screen Velocity =	1.57
Channel Depth =	27.75			R =	4.6401718	58		
Water Depth in Channels (Low Tide)	6.40							
Water Depth in Channels (High Tide)	15.3							
			High Tide In-Channel	Velocity =	0.45	fps	High Tide Through-Screen Velocity =	0.66
DPERATIONAL CONDITION 4 - T Unit 1, 2 or 3 (Two Pumps) = Unit 5 (One Pump) = Total Pump Flow =	OTAL INTAKE FLC 69.12 MGD 149.76 MGD 218.88 MGD	107.0 231.9	MGD 04 cfs 92 cfs 96 cfs					
Channels for Units 1,2 & 3 Number of Screen Channels =	2	Total	Unit 1, 2 & 3	Flow ≖	107.0	cfs	107.04 cfs (check)	
Channel Bottom Elevation =	-20		Low Tide				Low Tide	
Channel Width =	12.5		In-Channel	Velocity =	0.87	fps	Through-Screen Velocity =	1.52
Channel Depth =	25			R =	3.5391695	82		
Nater Depth in Channels (Low Tide)	4.937 ft							
Nater Depth in Channels (High Tide)	13.837 ft							
			High Tide	·····-,	•	·	High Tide	
			In-Channel	Velocity =	0.31	fps	Through-Screen Velocity =	0.54
Channel for Unit 5		Total	Unit 5 Flow :	-	231.74	cfs	231.92 cfs (check)	
Number of Screen Channels =	3					010	To light old (placek)	
Channel Bottom Elevation ≕	-20		Low Tide In-Channel		1.07	fa -	Low Tide	
Channel Width =	11.25			Velocity =	1.07	fps	Through-Screen Velocity =	1.57
Channel Depth =	27.75			R =	4.6401718	58		
Vater Depth in Channels (Low Tide)	6.40							
	15.3							
Vater Depth in Channels (High Tide)			High Tide				High Tide	

Long-Term West Basin Water Level Analysis for Assessing Threshold Impingement Effects of Reduced Intake Flows at Agua Hedionda Lagoon

Submitted by: Scott A. Jenkins, Ph. D. and Joseph Wasyl Dr. Scott A. Jenkins Consulting 14765 Kalapana Street, Poway, CA 92064

Submitted to:

Poseidon Resources, Suite 840 501 West Broadway San Diego, CA 92101

21 January 2007

1) Introduction:

This study evaluates the long term water level variation in the West Basin of Agua Hedionda Lagoon. The objective of this analysis is to determine the persistence of water levels occurring higher than the threshold elevation for impingement losses during reduced flow rate operations of a stand alone desalination plant co-located at Encina Generating Station. There are two threshold water levels of interest for reduced flow operations ranging from 149.8 mgd to 304 mgd. These thresholds are -0.687 ft MSL and + 4.83 ft MSL. The persistence analysis of these thresholds is performed by hydrodynamic model simulation of the water elevation history in the West Basin due to tidal forcing at the ocean inlet by historic ocean water levels measured at the nearby Scripps Pier tide gage (NOAA # 931-0230) during the period of record 1980-2000. This time period was chosen because it coincides with the period of record used in the hydrodynamic studies in Appendix E of the certified EIR (Jenkins and Wasyl, 2005). The verified ocean water level data on which this analysis is based was obtained from NOAA (2006).

Because of tidal muting by frictional losses through the ocean inlet of Agua Hedionda, it is not possible to use the Scripps Pier tide gage measurements directly to determine persistence analysis of. Such a simple approach would err on the side of over-estimating the percentage of time the water elevation in the West Basin of the lagoon met or exceeded the two threshold elevations of interest. Instead the tidal muting of the measured ocean water levels was determined through computer simulation of the lagoon tidal hydraulics. The TIDE FEM tidal hydraulics model presented in Jenkins and Inman (1999) was gridded for a computational mesh of Agua Hedionda Lagoon as shown in Figure 1, using pre- and post dredging bathymetry from the 2002 dredge event from Jenkins and Wasyl (2003). The pre-dredging bathymetry featured the inlet bar in the west basin that was mapped during the October 2002 sounding shown in Figure 2. The postdredging survey performed in April 2003 indicated uniform deep water throughout the west basin with depths ranging from -20 ft NGVD to -30 ft NGVD, similar to that found in Figure 2-2 of Elwany, et al (2005). The lagoon model was excited at the ocean inlet by the ocean water level elevation time series measured by the Scripps Pier tide gage for the period 1980-2000. The simulated lagoon water levels in the west basin of Agua Hedionda were then sampled at 1 hour intervals, resulting in 183,432 separate outcomes of water elevation that could be subject to statistical analysis of persistence at or above the threshold elevations of interest.

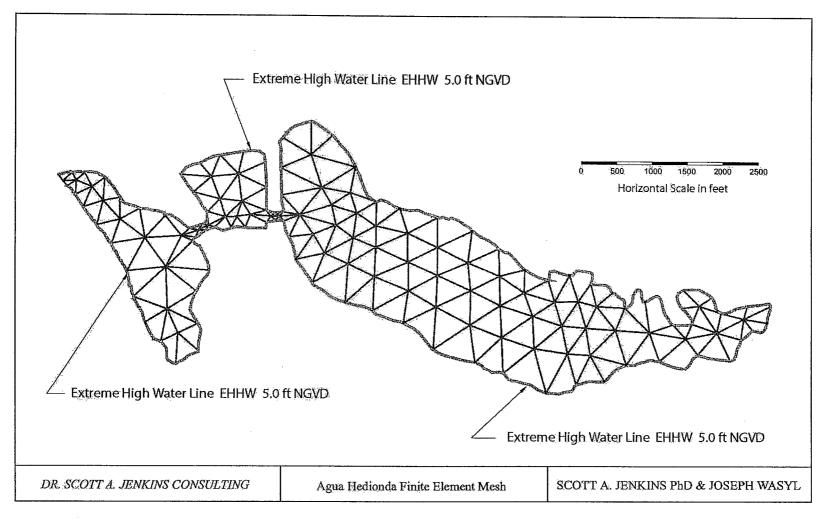


Figure 1. Computational mesh for TIDE_FEM tidal hydraulics model of Agua Hedionda Lagoon.

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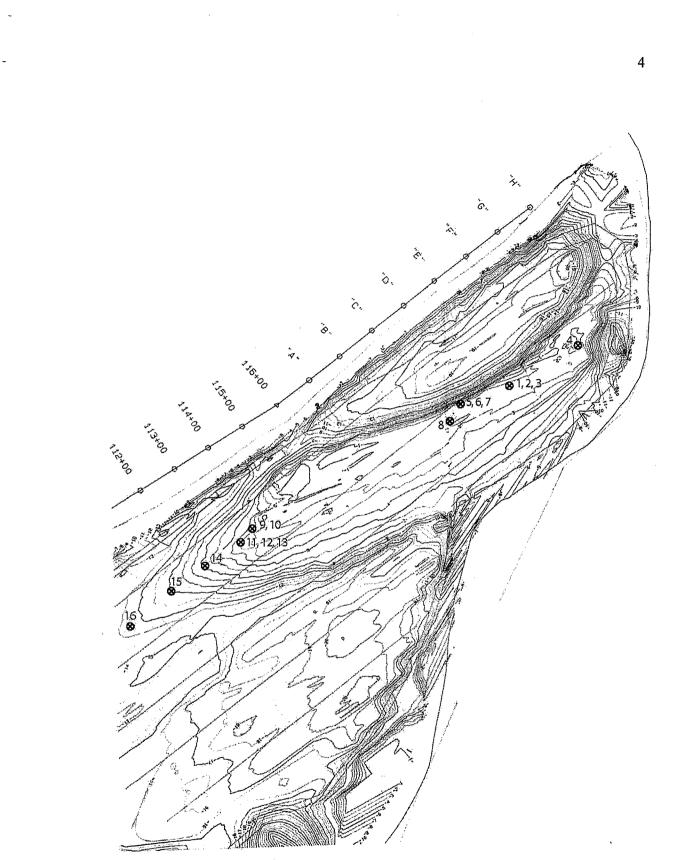
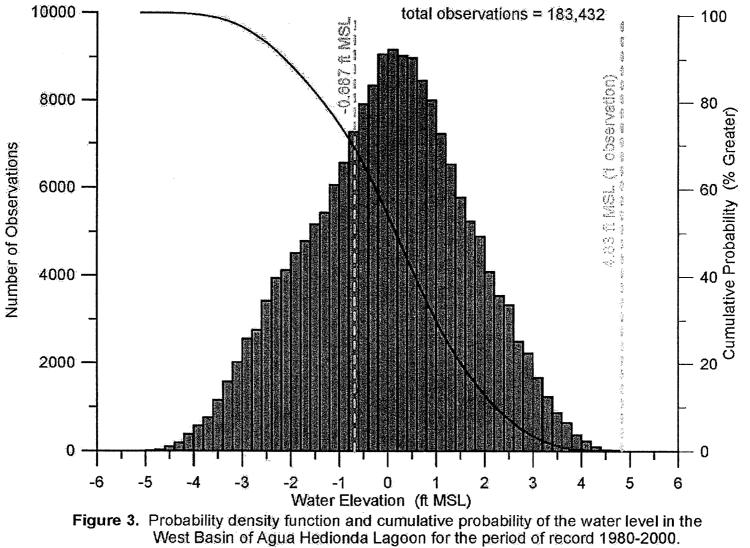


Figure 2. Location key for 12 October 2002 bottom sediment sampling.

2) Results:

Time series of the simulated West Basin water levels for each from 1980 through 2000 are given in the upper panel of Figures A-1 through A-21 in Appendix-A. The lower panel of these Figures gives the west basin water level variation for the month containing the highest water level occurring that particular year. Figure 3 presents the probability density function (defined by red histogram bars) resulting from the 183,432 hourly realizations of West Basin water level. The blue curve in Figure 3 is the cumulative probability that the water level will be greater than or equal to a particular water level. The vertical dashed green line in Figure 3 defines the water elevation at -0.687 ft MSL, above which intake flow velocities at the Unit 1 intakes are below the impingement threshold. From the cumulative probability curve, we find that water elevations equal or exceed the -0.687 ft MSL threshold 67% of the time during this 21 year period of record. Thus it is more probable that impingement would not occur at the Unit 1 intakes. On the other hand, there was only one hourly outcome in the 21 year period of record when water elevations exceeded the Unit 5 threshold elevation at +4.83 (light blue dashed vertical line); and hence impingement would remain a definite possibility for nearly any tidal regime around the Unit 5 intake.



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APPENDIX-A: Time Series of West Basin Water Levels

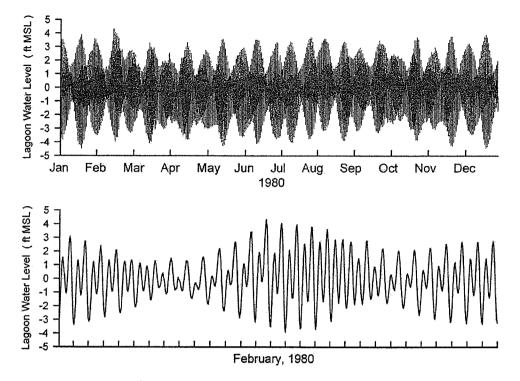
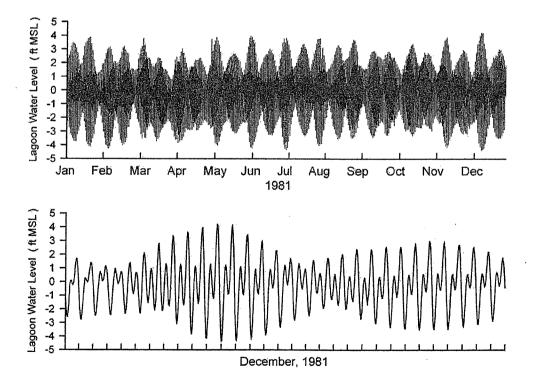
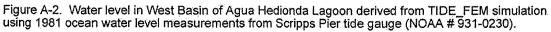


Figure A-1. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1980 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).





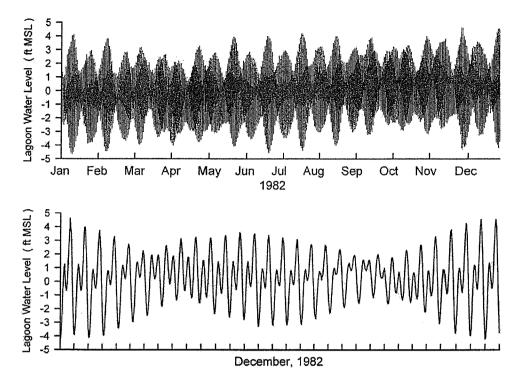
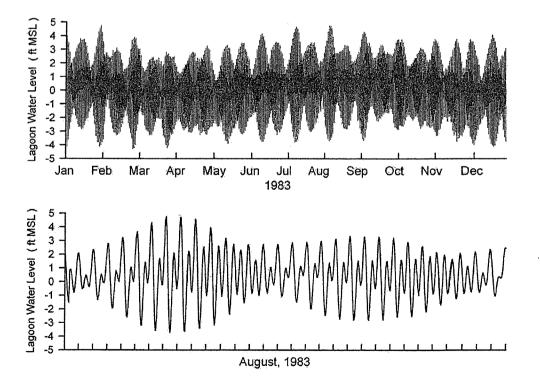
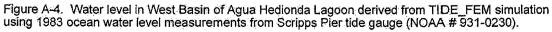


Figure A-3. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1982 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).





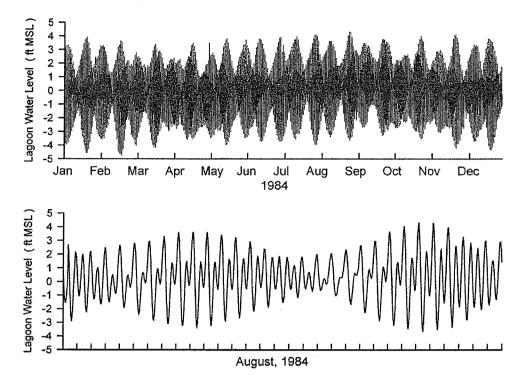


Figure A-5. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1984 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

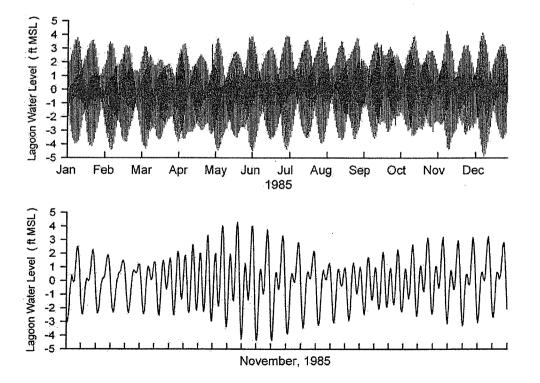


Figure A-6. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1985 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

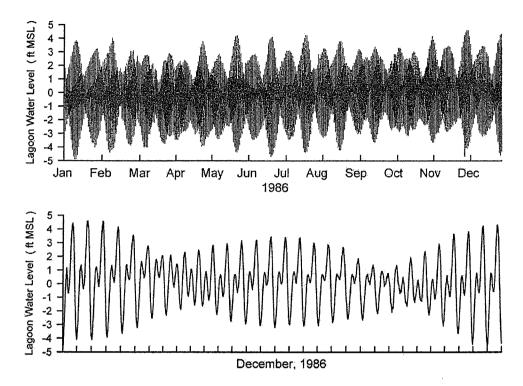
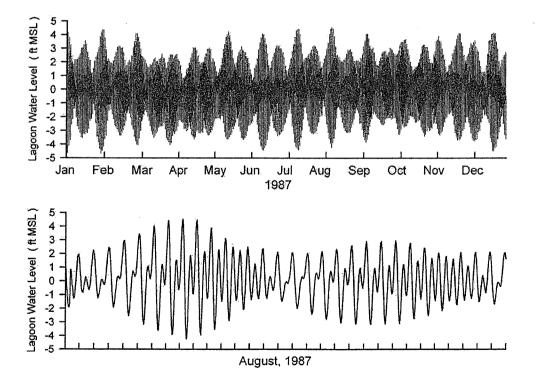
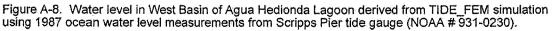


Figure A-7. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1986 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).





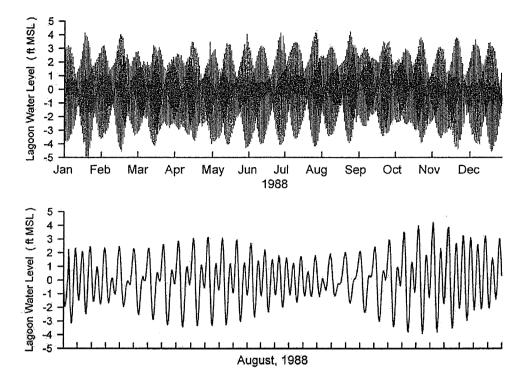
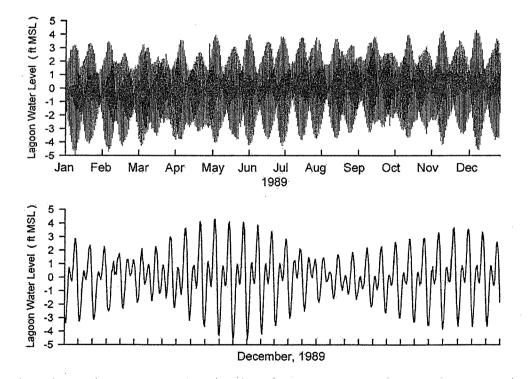
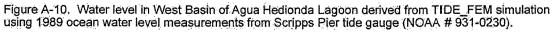


Figure A-9. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1988 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).





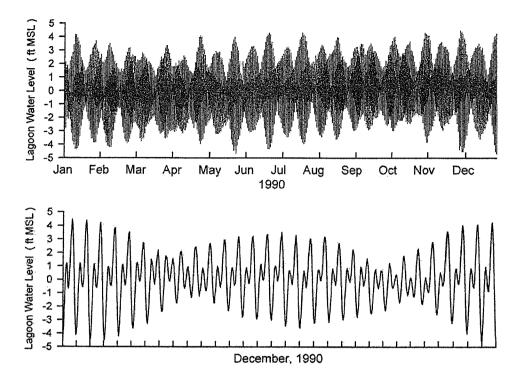


Figure A-11. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1990 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

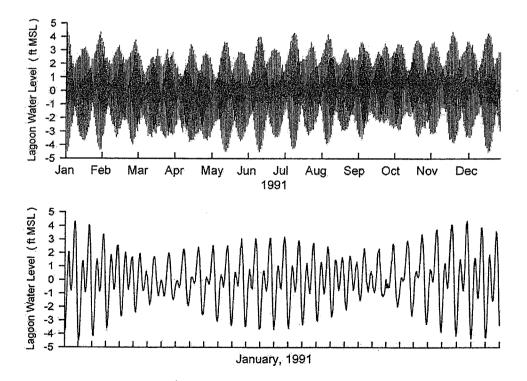


Figure A-12. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1991 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

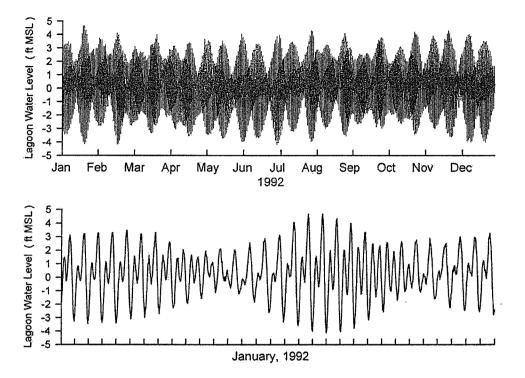
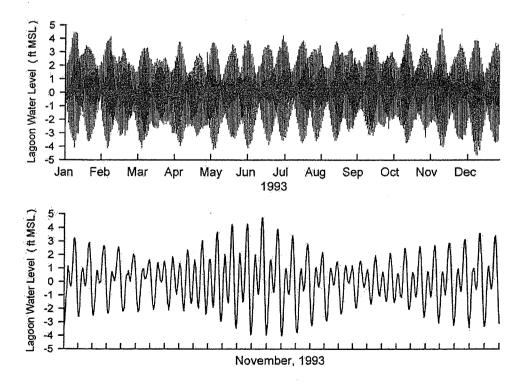
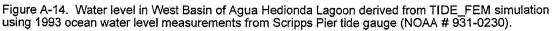


Figure A-13. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1992 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).





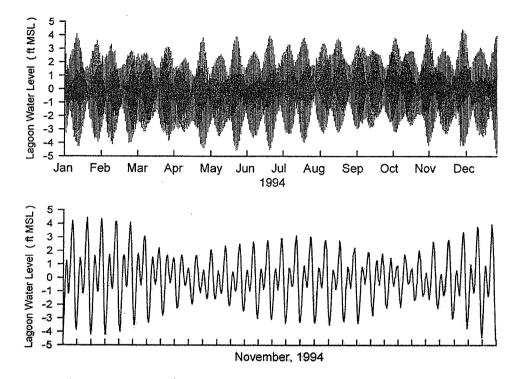
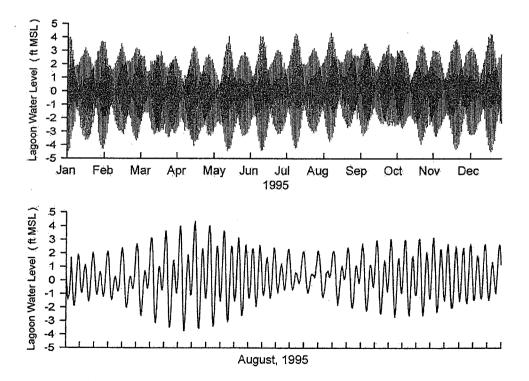
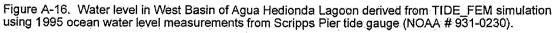
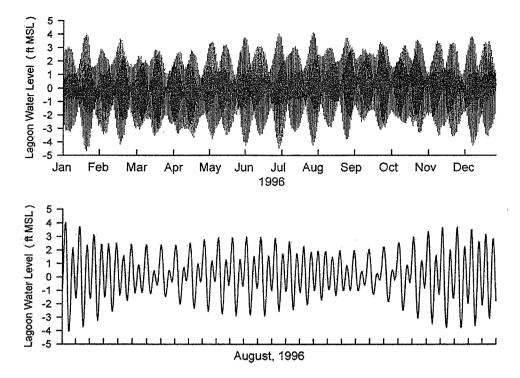


Figure A-15. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1994 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).







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Figure A-17. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1996 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

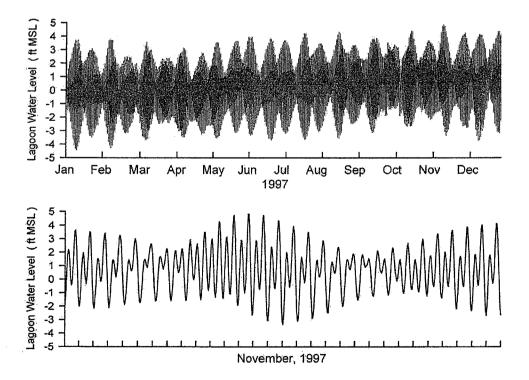
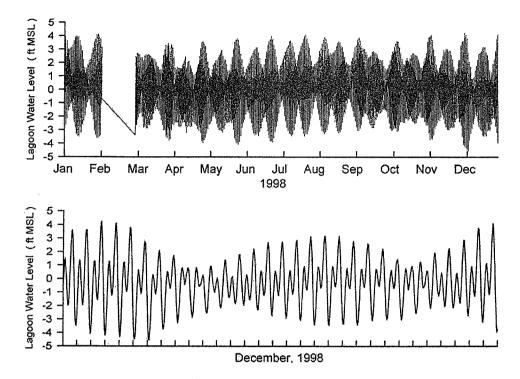


Figure A-18. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1997 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).



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Figure A-19. Water level in West Basin of Agua Hedionda Lagoon derived from TIDE_FEM simulation using 1998 ocean water level measurements from Scripps Pier tide gauge (NOAA # 931-0230).

