Preliminary Feasibility Study for South San Francisco Bay Shoreline

Economic Impact Areas 1 to 10

Appendix II: Statistic Analysis of Water Surface Elevation Via Monte Carlo Simulation

Final Report

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1.0 INTRODUCTION

1.1 Background

The entire South San Francisco Bay Shoreline Study (SSFBSS) project site is located south of the Dumbarton Bridge at the far southern end of San Francisco Bay. The study encompasses 18 miles of the bay shoreline in Santa Clara County, which is divided into 11 sections, called Economic Impact Areas (EIAs) that include a number of salt ponds that were previously used for salt production by Cargill, Inc. The specific area for the present study between EIA 1 and EIA 10 is bounded on the west by San Francisquito Creek in Palo Alto and on the east by Guadalupe River in San Jose, as shown in Figure 1. It is noted that the feasibility study of EIA 11 within the City of San Jose was performed by the Corps of Engineers, San Francisco District (USACE-SFD, 2014a & 2014b). Table 1 lists the included EIAs for the jurisdiction of individual local agencies.

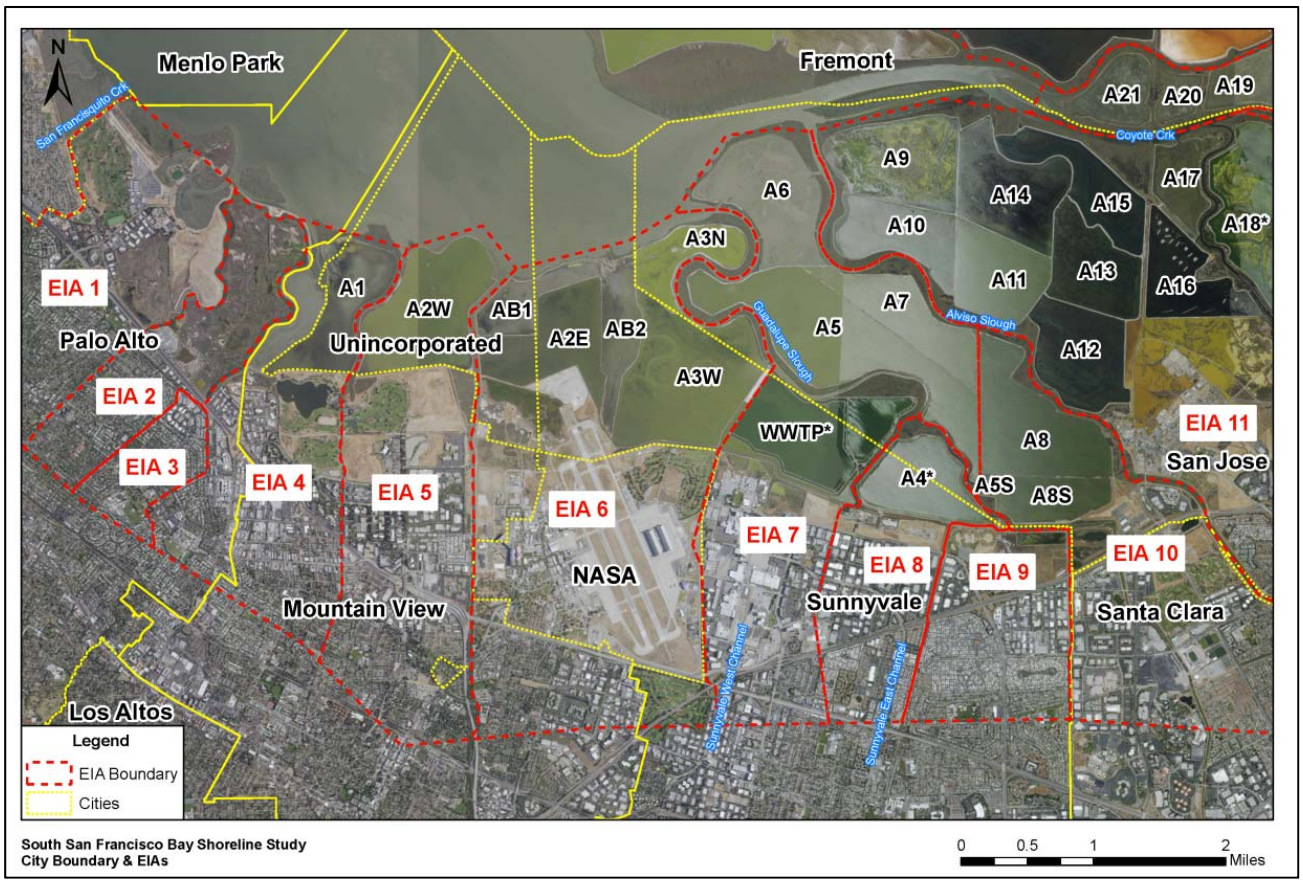


Figure 1. Project Site Location

This statistic analysis report is to document the development of the Monte Carlo simulation technique that provides results via the uncertainty analysis for the without- and with- project

conditions to perform a preliminary economic analysis for possible project decisions, based on the processes within the economic evaluation and environmental consideration.

Table 1. Included EIA within Individual Agency

Agency	Included EIA
City of Palo Alto	EIA 1, EIA 2 & EIA 3
City of Mountain View	EIA 4, EIA 5 & EIA 6
Federal Agency (NASA)	EIA 6
City of Sunnyvale	EIA 7, EIA 8 & EIA 9
City of San Jose	EIA 10
City of Santa Clara	EIA 10

1.2 Analysis Purpose

The project area has considerable risk for storm-induced flooding within the low-lying terrain that is currently protected by non- engineered levees. The flood risk will substantially increase due to potential future sea level rise (SLR) from global warming. In addition to flood risk, the past creation of commercial salt harvesting ponds along the south bay shoreline has resulted in a loss of most of the tidal marsh habitat within the project area. This preliminary statistic analysis deduces the water surface elevations (WSEs) under various return storm frequency at the present day and in the future under different SLR projections in order to estimate the potential damage to properties and infrastructures. Furthermore, the crest elevation of the proposed protective levee along the study shoreline can also be determined for an economic analysis to assess the project cost and associated storm-damage reduction.

2.0 PROJECT CONCEPTUAL PLANS

The proposed preliminary coastal levee alignment extends for approximately 14.33 miles as shown in Figure 2. The protective levees alignment was formulated after consultations with local and federal agencies in the area including City of Palo Alto, City of Mountain View, City of Sunnyvale, City of San Jose, County, NASA, U.S. Fish and Wildlife Service, California State Coastal Conservancy. Table 2 presents the breakdown of the levee length in each EIA.

3.0 PRESENT AND FUTURE SEA LEVEL RISE CONDITIONS

The ocean level has never remained constant over geologic time, but has risen and fallen relative to the land surface. A trendline analysis of yearly Mean Sea Level (MSL) data recorded at the San Francisco Golden Gate tide gage from 1987 to 2015 indicates that the MSL upward trend is approximately 0.0064 ft/yr (NOAA, 2016). Also, positive departure from the MSL typically occurs during strong El Nino episodes and consequently increases the likelihood of coincident storm waves and higher storm surge.

A report issued by National Research Council in 1987 (NRC, 1987) presented the estimated eustatic sea level rise rates for three different projected scenarios. These curves were modified

by the Corps of Engineers in 2009 (USACE, 2009) and updated in 2013 (USACE, 2013). The following projected formula was used to deduce the values of future sea level rise for the South San Francisco Bay.

$$SLR(t) = E_{local}\, t + bt^2$$

Where *SLR(t)* is the amount of sea level rise from the base year of 1992,

E_{local} is the historic trend at a local gage station per year,
b = 0.0000271 is a constant for Curve I,
b = 0.00007 is a constant for Curve II,
b = 0.000113 is a constant for Curve III, and
t is the year difference between 1992 and the subject year

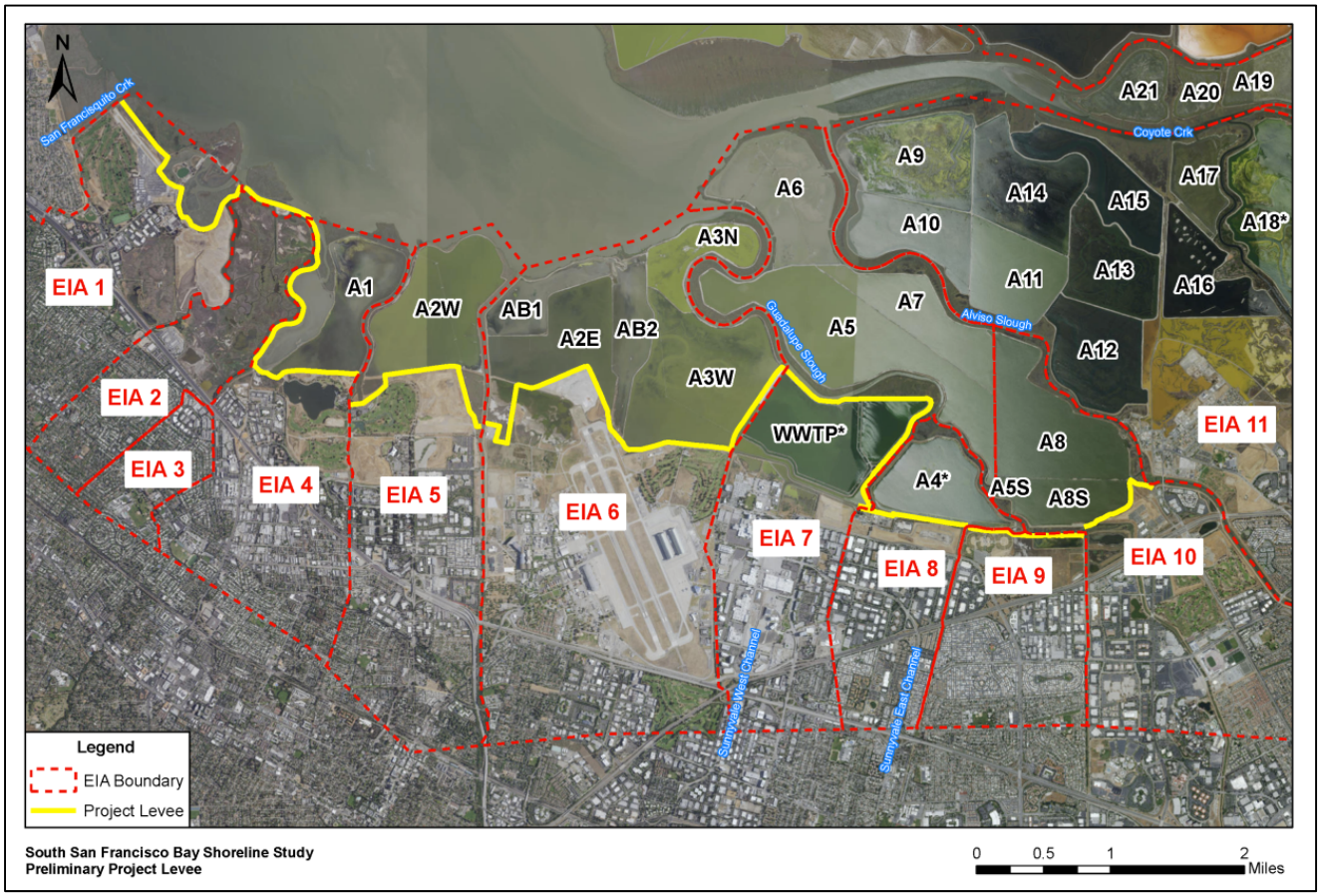


Figure 2. Proposed Protective Levee

Table 3 presents the deduced values of future SLR under three projected scenarios, which is identical to the values used in the Corps study for EIA 11 (USACE-SFD, 2014b). It is noted that additional recent studies to project SLR in the future were prepared (NRC, 2012 & COCAT,

2013) to update the SLR projections. The estimated SLR in the future is slightly higher than the guidelines issued by the Corps of Engineers.

Table 2. Breakdown of Levee Length

EIA	Preliminary Levee Length	
	(feet)	(Miles)
1	9,408	1.78
2/3	10,595	2.01
4	4,355	0.82
5	7,638	1.45
6	14,776	2.80
7	15,968	3.02
8	4,359	0.83
9	4,613	0.87
10	3,957	0.75
Total	75,669	14.33

Table 3. Projected Sea Level Rise 50 Years from Base Year

SLR Projection	Sea Level Rise (ft)		
	Low	Intermediate	High
	0.51	1.01	2.59

Note: Based on the Tide Gage (No. 9414290) and the base year of 2017
Source: USACE-SFD, 2014

4.0 MONTE CARLO SIMULATIONS

The applied Monte Carlo simulation technique is a statistical approach to predict an uncertain system by recreating a random process to solve a problem which cannot be easily evaluated by a standard numerical analysis. This technique allows for the random sampling of a pre-defined (known) occurrence distribution of each individual element to statistically characterize the behavior of the uncertain system. A brief description of various components required to execute the Monte Carlo simulations is provided in the following sections.

4.1 Treatment of Levee Failure

4.1.1 Levee Failure Condition

The protective outer levee within the project area is susceptible to breaching failure, which is a combined effect of seepage-induced erosion (a static process) and water overtopping (a dynamic process). A method was formulated by the Engineering Research and Development Center (ERDC) during the initial South San Francisco Bay Shoreline Feasibility Study (Lee, 2009a & Lee, 2009b). Additional analysis of the levee failure criterion based on the available geotechnical information was later performed and a set of failure probability in relation to the

bay water level was established to reevaluate the Federal interest and economic justification for a future project (USACE-SFD, 2014b). The new criterion assumes that the outer levee is the only line of protection and a breach failure at the outer levee will result in a subsequent breach at the inner levee above a specific threshold loading. Table 4 shows the estimated probability of the two failure mechanisms and the combined probabilities for respective water surface elevations.

Table 4. Probability of Levee Failure Due to Erosion and Overtopping

Static WSE	Probability of Failure		
(NAVD88, ft)	Erosion	Overtopping	Combined
12	0.30	1.00	*1.00*
11	0.30	0.85	*0.90*
10	0.25	0.20	*0.40*
9	0.20	0.05	*0.25*
8	0.10	0.0	*0.10*
7	0.0	0.0	*0.0*

Source: USACD-SFD, 2014

4.1.2 Levee Breached Zones

To limit the total cases of long wave model simulation, various EIAs are lumped into one levee breached zone within which all levees are breached at the same time if levee failure occurs. In total, five levee-breach zones are designated as described in the long wave modeling report (Anchor, 2017). Table 5 lists the included EIAs for each zone, while Figure 3 illustrates the zone boundary associated with individual EIAs.

Table 5. Defined Levee Beached Zone

Levee-Breach Zone	EIA
Zone 1	EIA 1, EIA 2 & EIA 3
Zone 2	EIA 4 & EIA 5
Zone 3	EIA 6 & EIA 7
Zone 4	EIA 8 & EIA 9
Zone 5	EIA 10

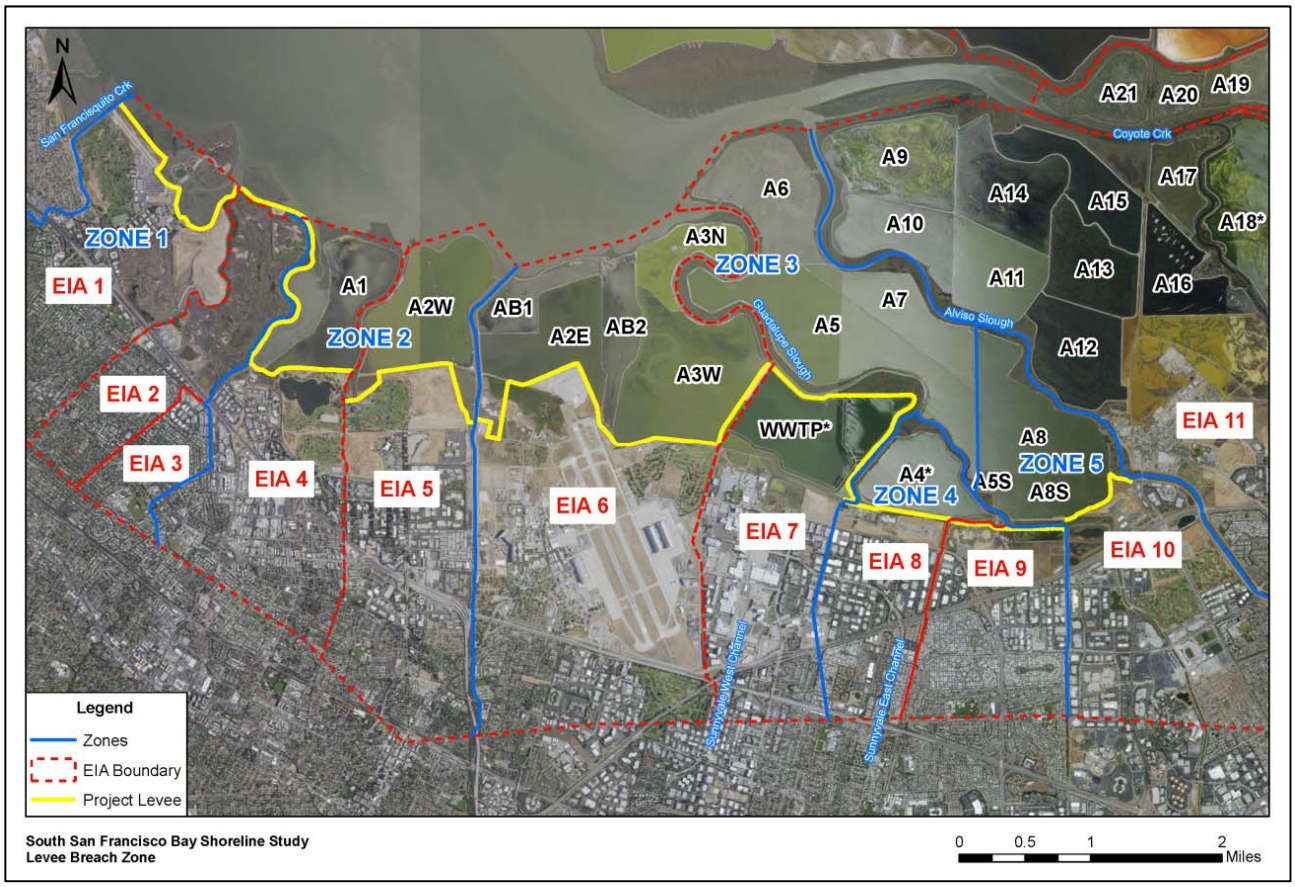


Figure 3. Levee Breach Zones

4.2 Long Wave Look-Up Tables

Long wave simulations consist of various forcing parameters such as astronomical tide, residual surge, wind speed, and wind direction under the without- and with- project conditions.

The year 0 simulations were performed for a set of synthesized events that cover the ranges of all the controlling parameters including the currently updated salt pond restoration. Table 6 presents the four (4) selected astronomical tides and three (3) residual surges for a combined total of 12 cases. A sea level rise ranging from 0.51 feet for the Curve I projection to 2.59 feet for the Curve III estimation (see Table 3) was added to the existing astronomical tide for the simulations in Year 50. The Year 50 simulations also incorporate the anticipated accretion within the project ponds, as well as estimated channel evolution in the vicinity of the project area. The simulations also include both the without-breach and with-breach conditions at the various levee locations (Anchor, 2017).

Simulated water levels are tabulated in the lookup tables that allow the interpolation of the responses of all the synthesized events randomly selected by the Monte Carlo Simulation (MCS) process in the statistical analysis. Table 6 lists the values and conditions of forcing

parameters used in the synthesized events for the long wave simulations in 2017 and 2067 under various SLR projections.

Table 6. Parameters Used for Long Wave Model Simulations

Year	*SLR (ft)*	*Outer Levee Breached*	*Astronomical Tide (ft, NAVD)*	*Residual Surge (ft)*	*Wind Direction (deg)*	*Wind Speed (mph)*
Year 0	0	Yes No	5.15 5.85 6.55 7.25	0.5 1.5 2.5	292.5° 315°	20 30 40
Year 50	0.51 (Low)	Yes No	5.66 6.36 7.06 7.76	0.5 1.5 2.5	292.5° 315°	20 30 40
	1.01 (Intermediate)	Yes No	6.16 6.96 7.56 8.26	0.5 1.5 2.5	292.5° 315°	20 30 40
	2.59 (High)	Yes No	7.74 8.44 9.14 9.84	0.5 1.5 2.5	292.5° 315°	20 30 40

4.2.1 Impacts of Winds

To assure adequate lookup events to be used for interpolation in the statistic analysis, four events (among the 12 basic cases) with different combinations of two (2) astronomical tides and two (2) residual surges are chosen. The four doublets of astronomical tide and residual surge are (5.15, 0.5), (5.15, 2.5), (7.25, 0.5) and (7.25, 2.5). Six wind scenarios combining two different wind directions and three speeds, as seen in Table 6, were simulated for each event resulting in a total of twenty-four simulations for the 4 events. The wind setup for each wind simulation event was calculated as the difference between the peak water surface elevation from the simulations with- and without- wind. As a result, the calculated wind setup at locations within the ponds includes both wind induced setup as well as any additional wind induced overtopping of the outer pond levees that results from the wind setup.

4.2.2 Simulation Scenarios

Long wave simulations to formulate the required look-up tables consist of various forcing parameters such as astronomical tide, residual surge, wind speed, and wind direction under the Year 0 and Year 50 conditions.

4.2.2.1 Without Project Conditions

The hydrodynamic simulations in Year 0 (2017) under the without project conditions incorporates the current salt pond operations in the winter months, which connects all salt ponds (A1 through A 18, as seen in Figure 1) to various creeks, sloughs, channels, and flood basins via culverts, pipes and siphons (Anchor, 2017). The Year 50 (2067) simulations are based on the resulting accretion in the project area and erosion in the south bay as a consequence of future sea level rise (MacWilliams et. al., 2013). Since salt ponds in the project area will not be restored to tidal ponds unless a protective levee is in place to protect the landward development, it is assumed that no additional salt ponds are restored under the future without-project conditions.

Table 7 lists the total scenarios modeled under the without project conditions, including 180 individual events for Year 0 and the same 180 events for each projected sea level rise rate in Year 50. 720 events in total were simulated to form the basis for the Monte Carlo Simulation that was used to predict the return storm-induced water surface elevation throughout the project area. The ground elevation near the project levee between Calabazas Creek and San Tomas Aquino Creek in EIA 10 is very high (> +14 ft, NAVD), and as a result, no levee breach scenarios were modeled for EIA 10.

4.2.2.2 With Project Conditions

The model setup for the long wave (hydrodynamic) simulations under the with-project conditions is similar to the without-project conditions in Year 0, except the installation of the proposed protective levee as illustrated in Figure 2. The Year 50 simulations under the with-project conditions take into account the marsh accretion within individually restored ponds as well as the projected sea level rise. Table 8 lists the total scenarios simulated to generate the look-up tables of storm-induced water surface. It is noted that no outer levee-breached conditions in EIA 1 through EIA 3 were modeled as the alignment of the protective levee is situated at the most bayward location. In total, 252 simulation scenarios are required under the with-projection conditions. Similar to the without-project conditions, no levee-breached scenarios were modeled in EIA 10.

4.3 Short Wave Generations

Due to the sheltering effect provided by the neighboring salt ponds and levees, wind-generated short waves within the project site are minimal. Therefore, simplified wave growth formulas that predict wave growth based on restricted fetches and duration-limited criteria (ACES, 1991) were applied to estimate the magnitude of short waves approaching the outer and inner levees in accordance with respective restricted fetches and duration. The forcing wind conditions, including wind speed and direction, to estimate wave heights are identical to those used in the long wave simulations. The generated wave height lookup tables were interpolated in the Monte Carlo simulations, based on randomly selected wind direction and speed.

Table 7. Simulation Scenario Matrix under Without Project Conditions

Without Project Scenario	*Year*	*SLR Rate*	*Inner Breaches*	*Outer Breaches*	*Number of Simulations*
Existing Levee	0	None	None	None	36
			EIA 1 to EIA 3	EIA 1 to EIA 3	36
			EIA 4 & EIA 5	EIA 4 & EIA 5	36
			EIA 6 & EIA 7	EIA 6 & EIA 7	36
			EIA 8 & EIA 9	EIA 8 & EIA 9	36
			EIA 10	EIA 10	0
Existing Levee with Pond Restoration	50	Curve I (Low)	None	None	36
			EIA 1 to EIA 3	EIA 1 to EIA 3	36
			EIA 4 & EIA 5	EIA 4 & EIA 5	36
			EIA 6 & EIA 7	EIA 6 & EIA 7	36
			EIA 8 & EIA 9	EIA 8 & EIA 9	36
			EIA 10	EIA 10	0
	50	Curve II (intermediate)	None	None	36
			EIA 1 to EIA 3	EIA 1 to EIA 3	36
			EIA 4 & EIA 5	EIA 4 & EIA 5	36
			EIA 6 & EIA 7	EIA 6 & EIA 7	36
			EIA 8 & EIA 9	EIA 8 & EIA 9	36
			EIA 10	EIA 10	0
	50	Curve III (High)	None	None	36
			EIA 1 to EIA 3	EIA 1 to EIA 3	36
			EIA 4 & EIA 5	EIA 4 & EIA 5	36
			EIA 6 & EIA 7	EIA 6 & EIA 7	36
			EIA 8 & EIA 9	EIA 8 & EIA 9	36
			EIA 10	EIA 10	0
Total Number of Simulations					*720*

Source: Anchor, 2017

Table 8. Simulation Scenario Matrix under With Project Conditions

With Project Scenario	*Year*	*SLR Rate*	*Inner Breaches*	*Outer Breaches*	*Number of Simulations*
Preliminarily Propose Levee Alignment with Pond Restoration	0	None	None	None	36
				EIA 1 to EIA	0
				EIA 4 & EIA 5	36
				EIA 6 & EIA 7	36
				EIA 8 & EIA 9	36
				EIA 10	0
	50	Curve I (Low)	None	None	36
				EIA 6 & EIA 8	36
		Curve II (Intermediate)	None	None	36
				EIA 6 & EIA 8	36
		Curve III (High)	None	None	36
				EIA 6 & EIA 8	36
Total Number of Simulations					*360*

Source: Anchor, 2017

4.4 Overall Structure of Monte Carlo Simulations

Various physical processes are required to create the lookup database so that the Monte Carlo analysis can be executed. Each physical parameter was simulated for a range of forcing conditions to generate the necessary lookup tables used in the Monte Carlo simulations.

4.4.1 Control Parameters

The ultimate goal of the Monte Carlo simulation is to statistically determine the recurrence of water surface elevation (WSE) at the protective levee so that an optimal engineering design of the levee (i.e., the crest elevation) can be determined. Various control parameters that dictate the WSE at the protective levee during a storm event include astronomical tide, residual surge, and wind direction and speed (Andes & Wu, 2012). Table 9 briefly describes each parameter and the derivation of the associated probability of occurrence. In total, five control parameters are employed in this Monte Carlo simulation.

Using tide measurements at Fort Point in San Francisco Bay for more than 100 years, the cumulative distribution functions (CDFs) for the number of storms per year, astronomical tide, and residual surge were deduced according to the following criteria:

- The measured water surface elevation is ≥ 6.9 feet, Mean Lower Low Water (MLLW)
- The residual surge is ≥ 0.5 feet

Table 9. Control Parameters for Monte Carlo Simulation

Control Parameter	*Derivation of Probability of Occurrence*
Number of Storms Per Year	Based on historical storm events per year that satisfies the sampling criteria of astronomical and residual surge
Astronomical Tide	Astronomical tides obtained from selected historical storm events
Residual Surge	Residual surge obtained from selected historical storm events
Wind Direction	Based on the historical wind data recorded at San Francisco Airport for wind-setup estimate
	Based on the historical wind data recorded at Moffat Field to be used for estimation of locally-generated waves
Wind Speed	Based on wind data recorded at San Francisco Airport for selected wind directions (wind setup estimate)
	Based on wind data recorded at Moffat Field for selected wind directions (estimate of locally-generated waves)

Figure 4 to Figure 6 show the deduced CDF curves for these three parameters (number of storms annually, astronomical tide and residual surge). It is noted that the MLLW datum is only lower than NAVD88 by 0.06 feet at the Golden Gate gage (USACE-SFD, 2014b). Historically

recorded data of wind direction and speed at San Francisco Airport (SFO) that is located in the central bay and at Moffat Field located in the south bay were respectively analyzed to derive the CDF curves for assessment of wind-induced setup and locally-generated fetch-limited waves.

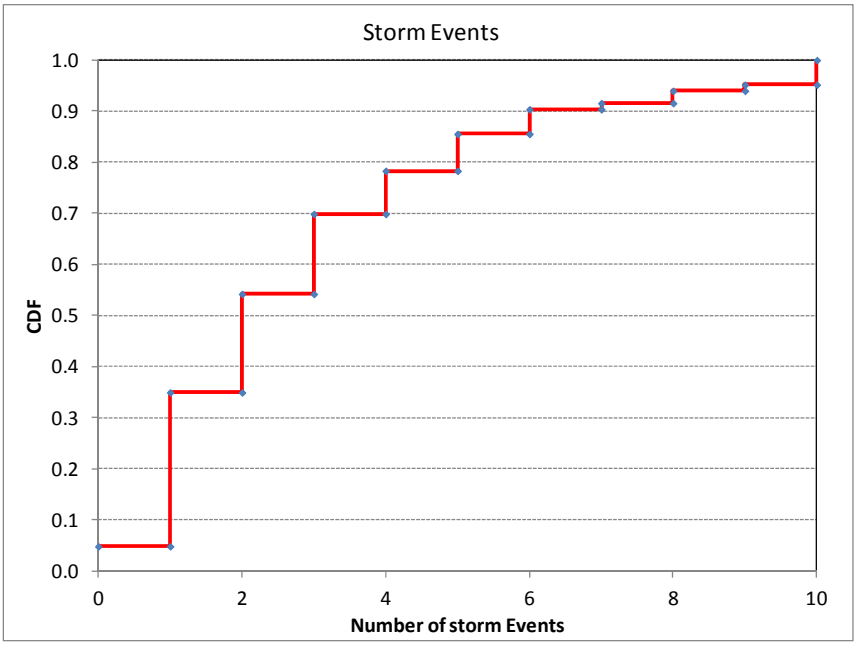


Figure 4. Cumulative Distribution Function for Number of Storm Events Annually

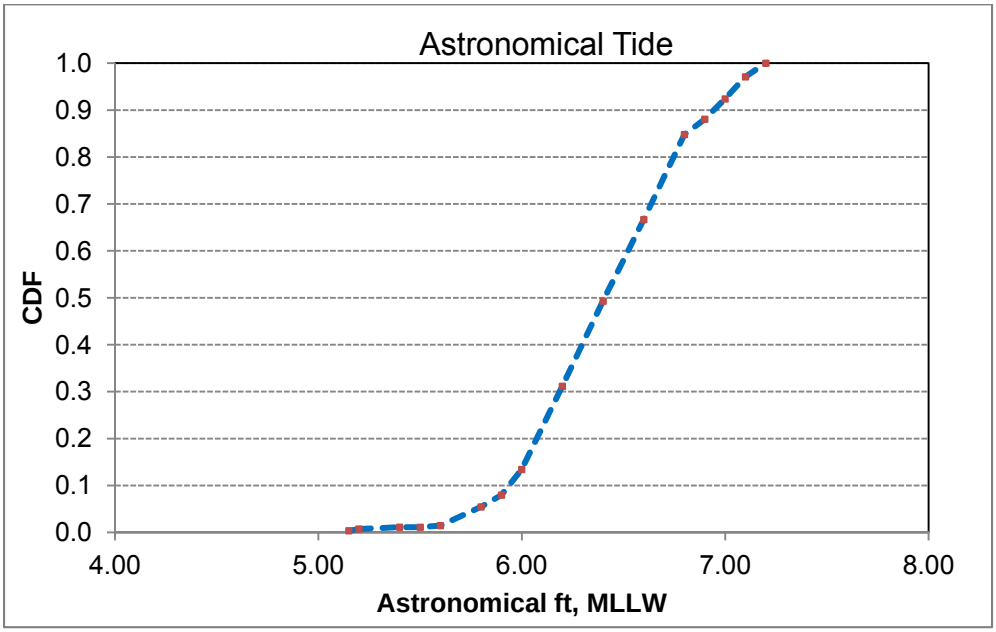


Figure 5. Cumulative Distribution Function for Astronomical Tide

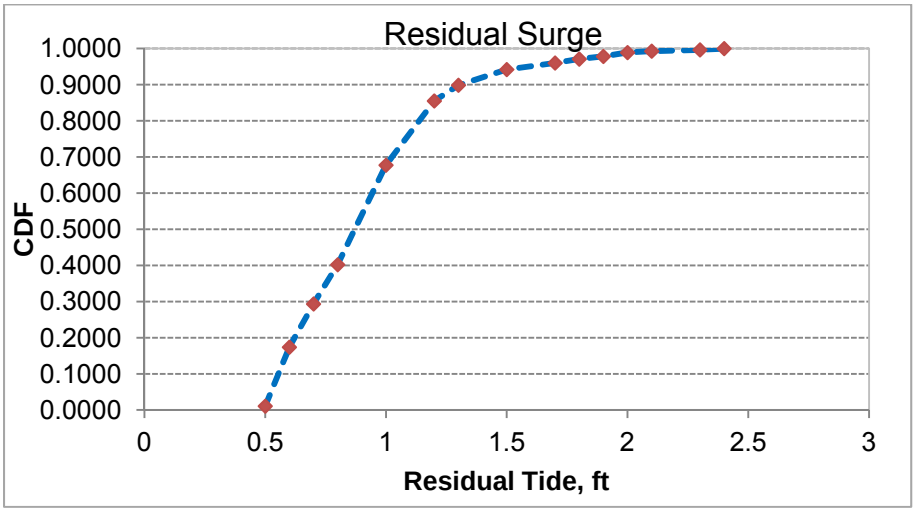
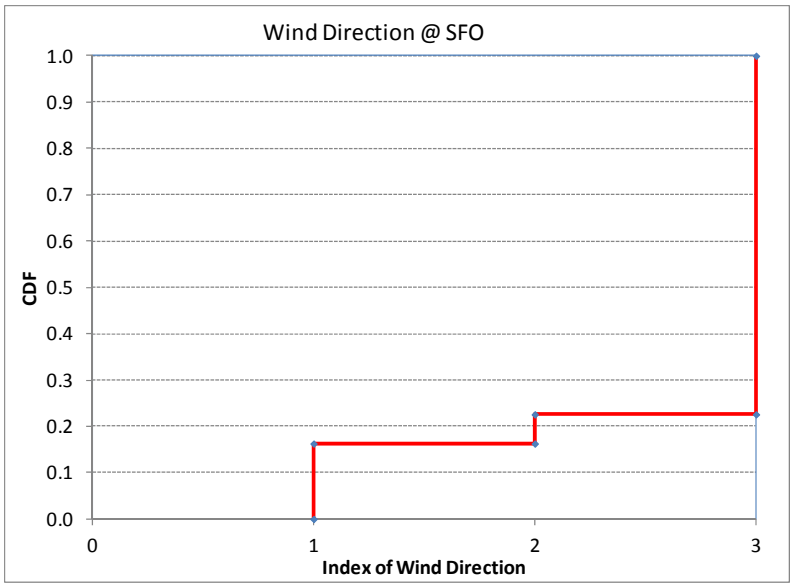


Figure 6. Cumulative Distribution Function for Residual Surge

A preliminary analysis indicates that two primary wind directions of 292.5^{o} and 315^{o} can induce a measurable setup and also produce locally-generated waves due to the major alignment of the south bay and the geographic location of the study area. Wind data at San Francisco Airport was applied, via the UnTRIM long wave model, to estimate the wind-induced setup, while the data at Moffat Field was used for the estimation of short wave conditions (i.e., wave height, Hs and wave period, Ts). Figure 7 to Figure 10 illustrate the derived CDF curves for wind direction and speed at the two respective meteorological stations (NCI, 2012).



Note: 292.5^{o} =Index 1, 315^{o} =Index 2 & all other directions =Index 3

Figure 7. Cumulative Distribution Function for Wind Direction at San Francisco Airport

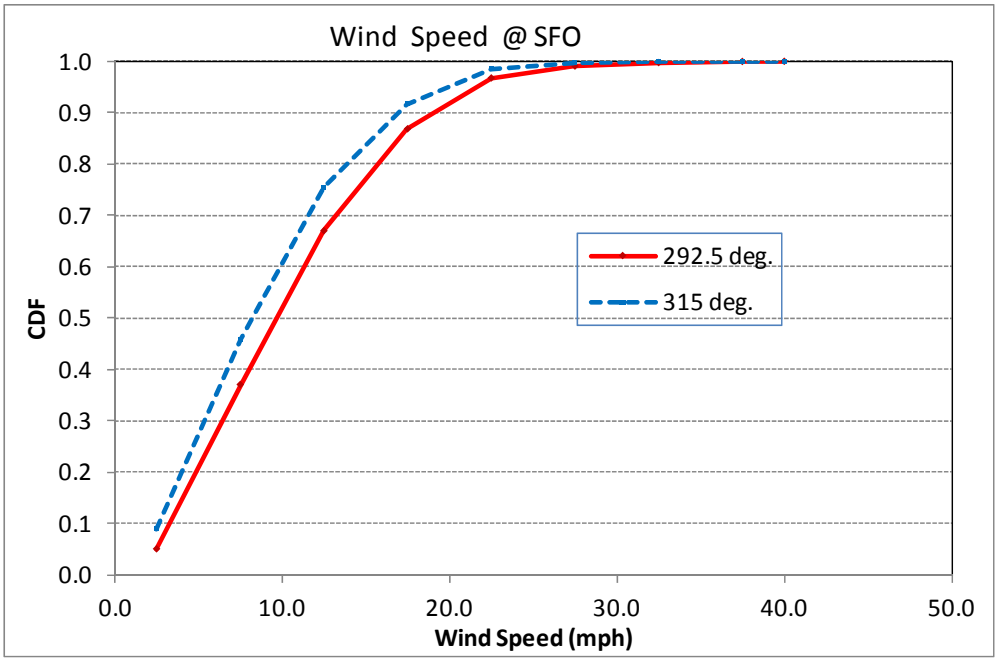
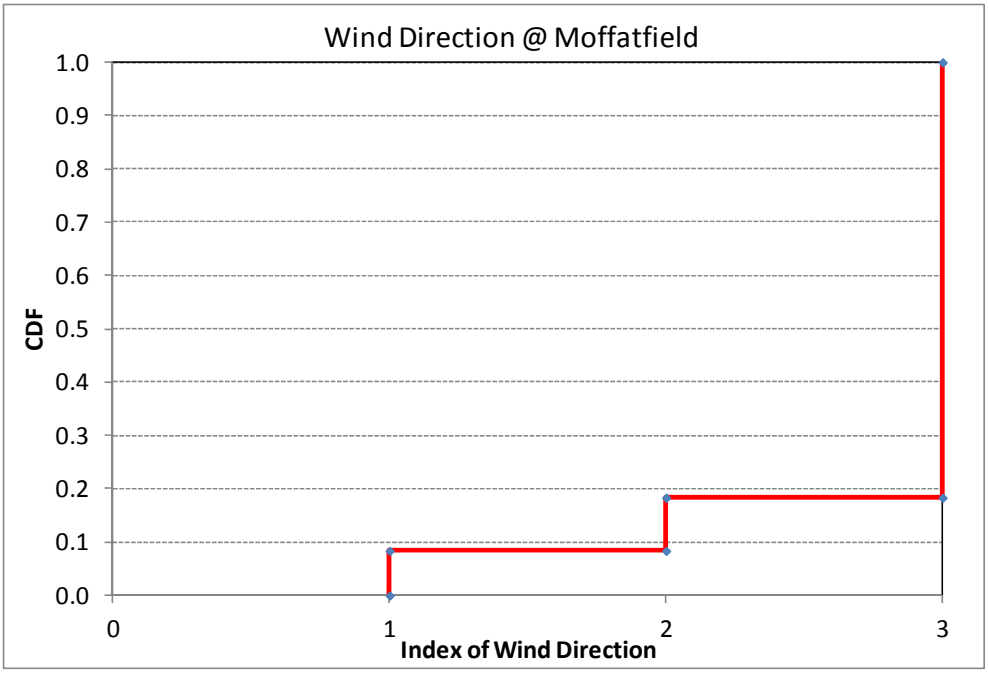


Figure 8. Cumulative Distribution Function for Wind Speed at San Francisco Airport



Note: 292.5^{o} =Index 1, 315^{o} =Index 2 & all other directions =Index 3

Figure 9. Cumulative Distribution Function for Wind Direction at Moffat Field

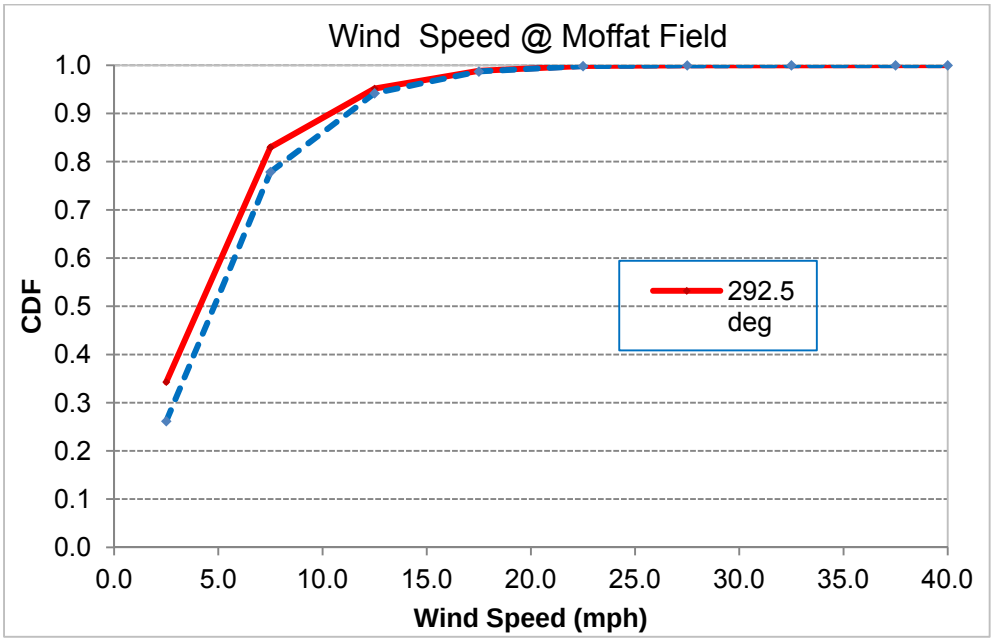


Figure 10. Cumulative Distribution Function for Wind Speed at Moffat Field

4.4.2 Algorithm of Monte Carlo Simulations

The procedure to execute the Monte Carlo Simulation in determining the water surface elevation at inner levee and the potential inundation within the project basins is delineated in the following:

- Randomly select the number of storms for each simulation year, based on the derived CDF.
- Randomly select an astronomical tide and a residual surge at the Presidio gage, based on the derived CDFs for each storm event.
- Determine the water surface elevation (WSE) at outer levee from the generated long wave lookup table via the UnTRIM modeling.
- Randomly select a wind direction and the associated speed, based on the derived CDFs at San Francisco Airport, and determine the wind setup via a wind-setup lookup table.
- Determine whether levee failure occurs from the combined water surface elevation at outer levee.
- Select the water surface elevation at inner levee under the outer levee breached conditions for subsequent analysis, if a failure occurs.
- Otherwise, select the water surface elevation at inner levee under the intact outer levee conditions for subsequent analysis, if a failure does not occur.
- Compute short wave conditions (Hs & Ts) within salt ponds located bayward of the protective inner levee.
- Estimate water volume that enters the project basins due to wave overtopping and surge overflow, if it occurs.

- Determine the river discharge rate during the selected storm event via an empirical formula as a function of the residual surge.
- Interpolate the lookout tables to obtain the breakout water volume from the associated creek in each EIA, if applied.
- Estimate the correlated inundation depth within the basins from the rating curve between the water volume and flooding depth for one storm event.
- Repeat the same procedure for all storm events in a year.
- Repeat the same procedure for all simulation years to complete one simulation.

5.0 SIMULATION RESULTS

Each Monte Carlo simulation was executed for a 500-year duration. A comparison was made between 100, 200 and 500 simulations for determining the statistics of the 1000-year return period. It was found that the difference of the results from the three numbers of simulations is minimal. Nevertheless, 500 simulations, each with a duration of 500 years, were still selected for all simulation scenarios to derive the statistical representation. The results from multiple Monte Carlo Simulations including both without- and with- project conditions in Year 0 and Year 50 are respectively presented herein. Table 10 lists the representative WSE locations selected in each EIA as well as the indication of whether they are situated bay-ward of the proposed protective levee or not. Figure 11 shows the location map of these simulated stations and the corresponding ground elevations in ft, NAVD.

Table 10. Representative WSE Stations within Each EIA

EIA 1	Bayward	EIA1_1 through EIA1_4	EIA 6	Bayward	EIA6_1 through EIA6_5
	Landward	EIA1_5 through EIA1_8		Landward	EIA6_6 and EIA6_7
EIA 2	Bayward	EIA2_1	EIA 7	Bayward	EIA7_1 through EIA7_4
EIA 3	Landward	EIA2_2 through EIA2_4		Landward	EIA7_5 and EIA7_6
	Landward	EIA3_1 and EIA3_2	EIA 8	Bayward	EIA8_1 through EIA8_3
EIA 4	Bayward	EIA4_1 through EIA1_5		Landward	EIA8_4 through EIA8_7
	Landward	EIA4_6 through EIA1_10	EIA 9	Bayward	EIA9_1 and EIA9_2
EIA 5	Bayward	EIA5_1 through EIA5_3		Landward	EIA9_3 through EIA9_6
	Landward	EIA5_4 through EIA5_5	EIA 10	Bayward	EIA10_1
				Landward	EIA10_2 through EIA10_4

5.1 Without Project Conditions

MCS was used to estimate the water surface elevation in terms of flood stage frequency at various locations in each EIA for both Yr-0 and Yr-50 conditions. In general, the modeled water level at WSE stations for the Year 0 simulations is higher under the non-breach levee conditions than under the levee-breached conditions if the WSE stations are significantly influenced by the tidal exchange. These WSE stations are predominantly along the outer levee or in the channels

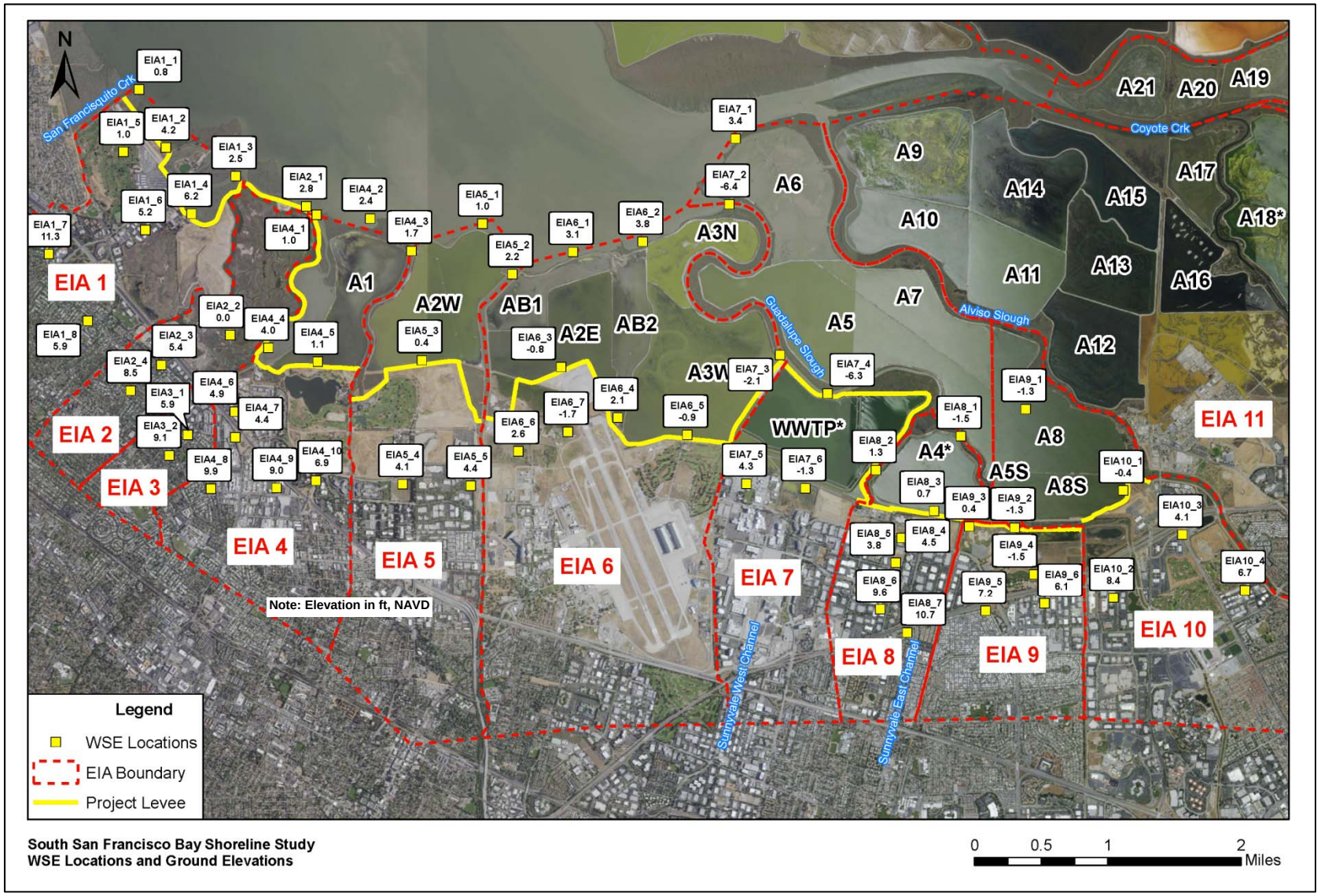


Figure 11. Locations of Modeled Water Surface Elevation

between the salt ponds. When the outer levees are breached, tidal water rushes into various salt ponds (i.e., the flooding zone is expanded), which reduces the water level at WSE stations that are prone to flooding under the non-breach conditions.

On the contrary, the water levels at those WSE stations that are relatively dry under the non-breach conditions are higher under the levee-breached conditions because the flooded area is expanded to include these stations. Under various future SLR scenarios (i.e., Year 50), the computed return water levels are proportionally increased in correspondence with the projected SLR rates. Elevated water levels due to the effect of high-projected sea level rise can overtop the inner levee, which results in the slightly lower WSE at some stations than would be predicted by adding the projected value of sea level rise to the computed WSEs in Year 0.

5.1.1 Existing Without Project Conditions (Year 0)

Figure 12 illustrates the deduced 100-year WSEs at the modeled stations in individual EIAs, while Table 11 through Table 14 present the WSEs at the computed stations on a breach zone by zone basis (Zone 1, 2, 3 and 4 & 5). The 100-year WSEs along the bay edge of the shoreline in Year 0 is about +10.8 feet, NAVD. The highest WSE is at Station EIA9_2, which has a water level of +12.3 feet, NAVD. A more complete statistical representation for several particularly selected locations including the 5%, 50% (mean) and 95% confidence limits are presented in Appendix A-1.

Table 11. 100-Year WSEs in Zone 1 Under Without Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA1_1	0.8	10.7	10.8	11.5	13.0
EIA1_2	4.2	10.7	10.9	11.5	13.0
EIA1_3	2.5	10.8	11.0	11.5	13.0
EIA1_4	6.2	10.8	11.0	11.5	13.0
EiA1_5	1.0	10.7	10.9	11.5	13.0
EIA1_6	5.2	10.7	10.9	11.5	13.0
EIA1_7	11.3	11.3	11.6	11.6	13.0
EIA1_8	5.9	10.7	11.0	11.5	13.0
EIA2_1	2.8	10.8	11.0	11.5	13.0
EIA2_2	0.0	10.7	11.0	11.5	13.0
EIA2_3	5.4	10.8	11.0	11.5	13.0
EIA2_4	8.5	10.7	11.0	11.5	13.0
EIA3_1	6.0	8.1	8.8	10.0	13.0
EIA3_2	9.1	9.4	9.5	10.3	13.0

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

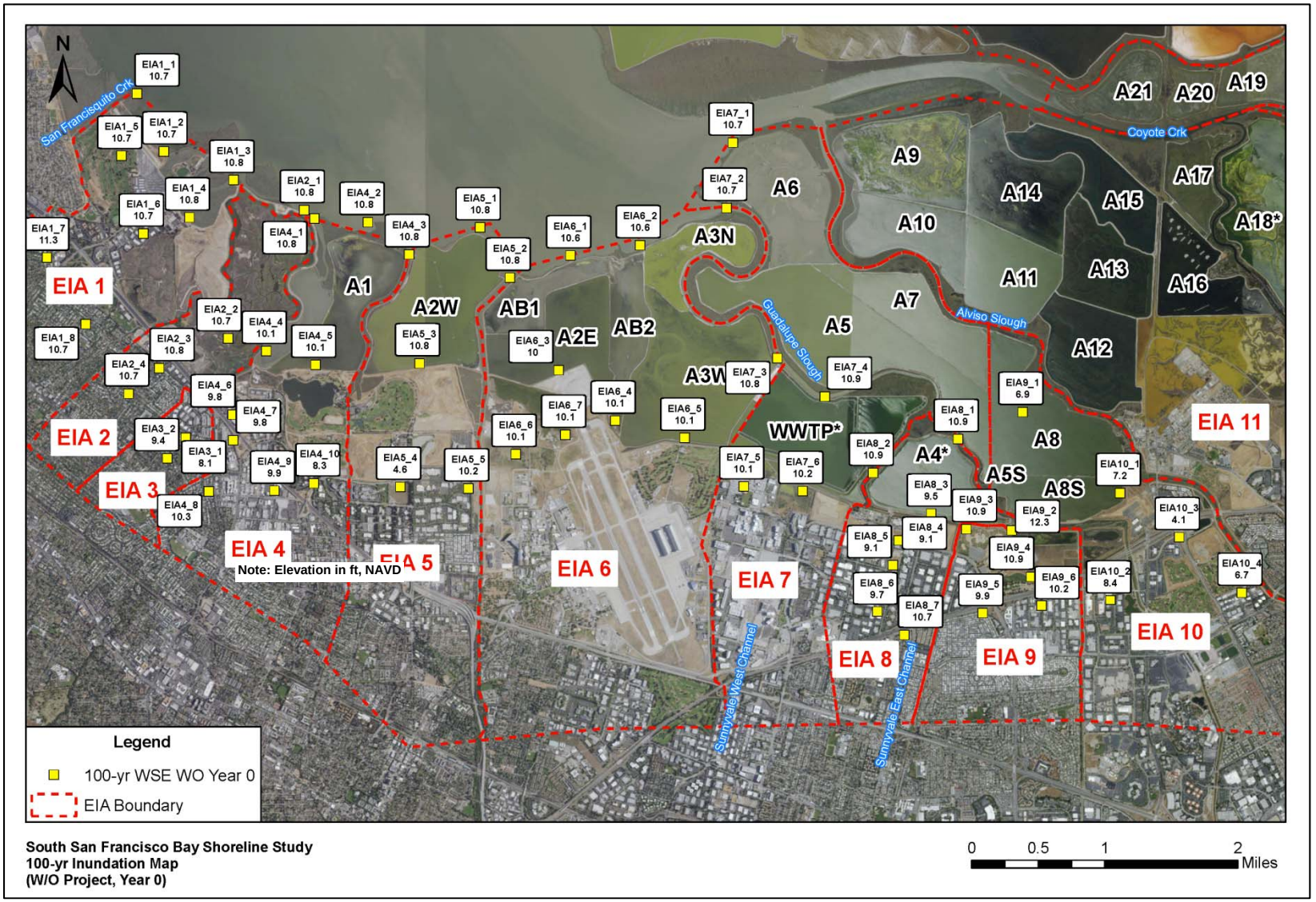


Figure 12. 100-year WSE under Without Project Condition in Year 0

Table 12. 100-Year WSEs in Zone 2 Under Without Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA4_1	1.0	10.8	11.0	11.5	12.8
EIA4_2	2.4	10.8	11.0	11.5	12.9
EIA4_3	1.7	10.8	11.0	11.4	12.8
EIA4_4	4.0	10.1	10.5	11.1	12.7
EiA4_5	1.1	10.1	10.5	11.1	12.7
EIA4_6	4.9	9.8	10.3	11.1	12.7
EIA4_7	4.4	9.8	10.3	11.1	12.8
EIA4_8	9.9	10.3	10.6	11.1	12.8
EIA4_9	9.0	9.9	10.4	11.1	12.8
EIA4_10	6.9	8.3	9.3	10.6	12.8
EIA5_1	1.0	10.8	11.0	11.5	12.8
EIA5_2	2.2	10.8	11.0	11.5	12.8
EIA5_3	0.4	10.8	11.0	11.5	12.8
EIA5_4	4.1	4.6	5.0	6.4	11.7
EIA5_5	4.4	10.2	10.5	11.1	12.1

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Table 13. 100-Year WSEs in Zone 3 Under Without Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA6_1	3.1	10.6	10.8	11.3	12.8
EIA6_2	3.8	10.6	10.7	11.2	12.8
EIA6_3	-0.8	10.0	10.3	11.0	12.7
EIA6_4	2.1	10.1	10.3	11.0	12.7
EiA6_5	-0.9	10.1	10.3	11.0	12.7
EIA6_6	2.6	10.1	10.3	10.9	12.7
EIA6_7	-1.7	10.1	10.3	11.0	12.7
EIA7_1	3.4	10.7	10.9	11.3	12.7
EIA7_2	-6.4	10.7	10.9	11.3	12.8
EIA7_3	-2.1	10.8	10.9	11.3	12.8
EIA7_4	-6.3	10.9	11.0	11.4	12.8
EIA7_5	4.3	10.1	10.4	11.0	12.8
EIA7_6	-1.3	10.2	10.4	11.0	12.8

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Table 14. 100-Year WSEs in Zones 4 & 5 Under Without Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA8_1	-1.5	10.9	11.0	11.2	11.9
EIA8_2	1.3	10.9	10.9	11.2	11.8
EIA8_3	0.7	9.5	9.8	10.2	11.6
EIA8_4	4.5	9.1	9.5	10.1	11.6
EiA8_5	3.8	9.1	9.5	10.1	11.6
EIA8_6	9.6	9.7	9.9	10.0	11.5
EIA8_7	10.7	10.7	10.7	10.7	10.8
EIA9_1	-1.3	6.9	7.6	8.2	10.9
EIA9_2	-1.3	12.3	12.3	12.3	12.1
EIA9_3	0.4	10.9	11.0	11.1	11.6
EIA9_4	-1.5	10.9	11.0	11.1	11.6
EIA9_5	7.2	9.9	10.1	10.4	11.2
EIA9_6	6.1	10.2	10.4	10.8	11.6
EIA10_1	-0.4	7.2	8.0	8.7	11.4
EIA10_2	8.4	8.4	8.4	8.4	8.4
EIA10_3	4.1	4.1	4.1	4.1	4.1
EIA10_4	6.7	6.7	6.7	6.7	6.7

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

There exist 10 creeks within the study area and these creeks play a role in directing bay water into various landward WSE locations, particularly under the scenarios when the exiting outer levee is breached. The computation of return WSEs via the Monte Carlo Simulation combines the occurrence of non-breached and breached levee conditions. It is noted that without any outer levee failure, there is no flooding predicted at points EIA3_1 for any Year 0 scenarios. If levee failure at one designated levee in the Palo Alto Flood Basin (PAFB) occurs, the water levels in the PAFB can extend up into Adobe and Barron Creeks (e.g., at EIA3_1). Once the water level of the influencing creeks reaches above the elevation of the protective floodwall or the bank top, creek water overtops the creeks and flows into EIA 3. However, the duration that the water level above the floodwall or the bank top is relatively short so the basin (bowl) in EIA 3 does not fill up. As a result, EIA3_1 (the same for the other location EIA3-2) can be flooded, but the water levels are not as high as it is computed at EIA2_1 (see Table 11).

In other breach zones, the computed results follow a similar trend that the deduced 100-year WSEs are slightly lower at the landward stations, except at Station EIA9_2 in EIA 9. Creek flows can overtop the existing levee near the confluence of Sunnyvale East Channel, Calabazas Creek, and San Tomas Aquino Creek in EIA 9 under the without-project conditions in Year 0. The confluence of the three creeks and the combined creek flows adjacent to EIA 9 is a significant factor on the overtopping of the levee into EIA 9. The deduced WSE at Station EIA9-

2 shows a large increase in the 100-year water levels under the existing conditions in Year 0 because the predicted water levels at this location are strongly influenced by the creek inflows. It is noted that the modeled creek inflow that is proportional to the residual surge is less than the 100-year creek flow. In EIA 10, the ground elevations located landward of Salt Pond A8S are high enough that the landward area (e.g. EIA10_2 to EIA10_4) is dry without being inundated under the existing condition.

5.1.2 Future Without Project Conditions (Year 50)

The 100-year WSEs at various stations under three future SLR scenarios are also respectively presented in Table 11 to Table 14. A more complete statistical representation for several particularly selected locations including the 5%, 50% (mean) and 95% confidence limits are presented in Appendix A-2 through A-4 for all three projected SLRs. The maximum WSE is at +13.0 feet, NAVD along the south bay shoreline. The deduced WSEs have a similar trend as described for the WSEs in Year 0, except under the SLR Curve III scenario. Under this highest SLR projection, the high bay water can overtop the outer levee even without levee breached and, as a result, flooding occurs within the entire zone. As a consequence, the deduced 100-yr WSEs at the landward stations can be the same as the stations along the shoreline (e.g., Zone 1 as shown in Table 11). WSEs can also be slightly reduced (e.g., EIA9_2 in Zone 4) at locations that are strongly influenced by creek inflows. Figure 13 to Figure 15 show the 100-year WSEs at all selected stations (see Table 10) under the three projected SLR scenarios.

5.2 With Project Conditions

Compared to the WSEs under the existing without-project conditions, the storm-induced WSE tends to be in-differentiable along the outer levees when the protective levee is built in Year 0. However, the WSE stations landward of the proposed projective levee can be impacted by the creek's drainage capability and upstream inflows. Under various future SLR scenarios (i.e., Year 50), the computed return water levels are proportionally increased in correspondence with the projected SLR rates.

5.2.1 Existing With Project Conditions (Year 0)

Table 15 to Table 18 present the deduced 100-year WSEs at various stations located baywards of the protective levee including one inner station (EIA2_2) in the Palo Alto Flood Basin (PAFB). A more complete statistical representation for several particularly selected locations including the 5%, 50% (mean) and 95% confidence limits are presented in Appendix A-5.

Figure 16 shows the 100-year WSEs at all selected stations excluding the landward stations where the locations are dry due to the protection provided by the proposed levee. All deduced 100-year WSEs along the south bay shoreline are equal to or slightly higher than the WSEs obtained under the without-project conditions in Year 0. This is due to the fact that the bay water can overtop the existing levee under the without-project conditions, but is not allowed to overtop the proposed protective levee, particularly at the locations (e.g., EIA 8_1) where the existing levee is overtopped under without project conditions.

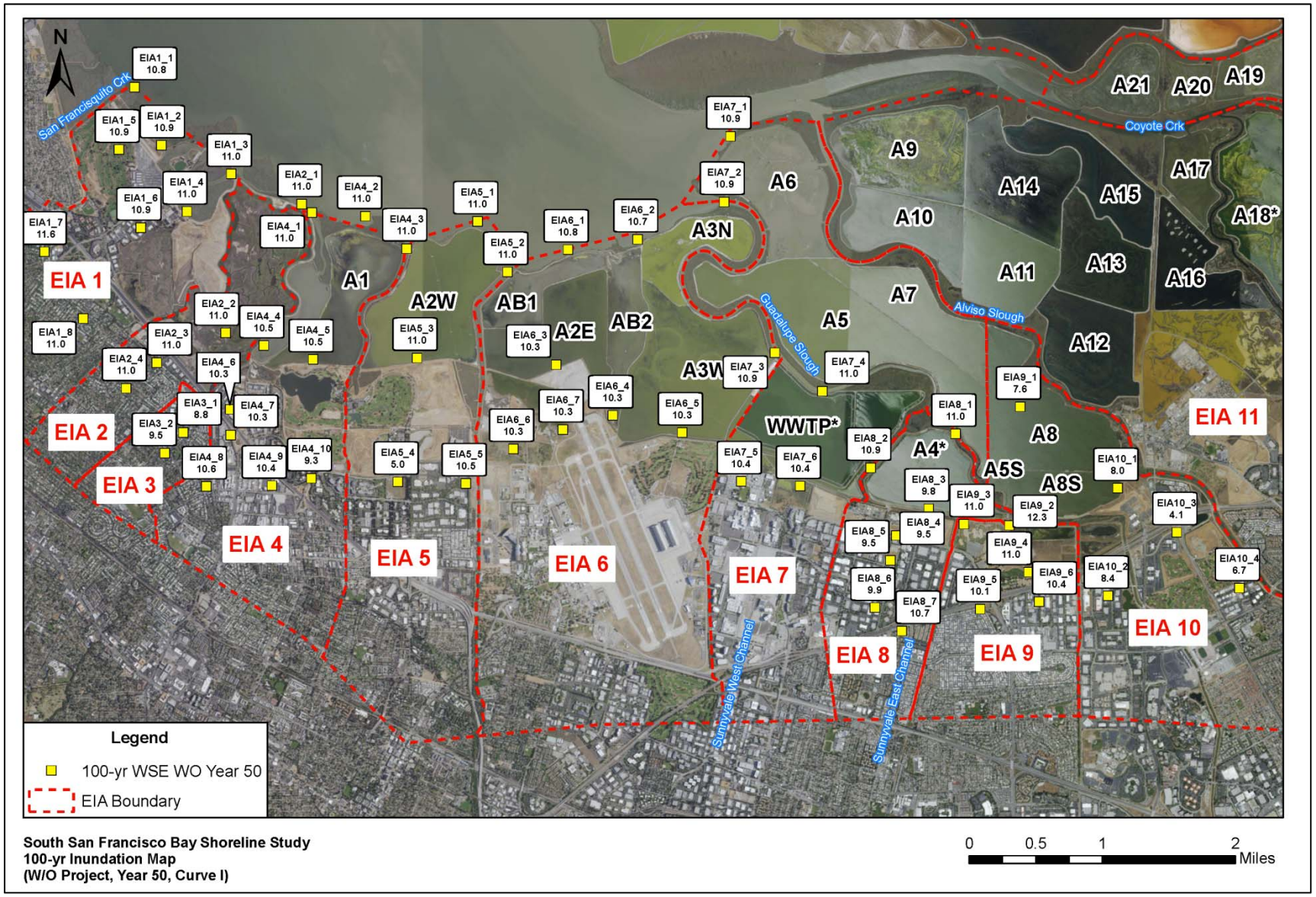


Figure 13. 100-year WSE under Without Project Condition in Year 50 SLR Curve I

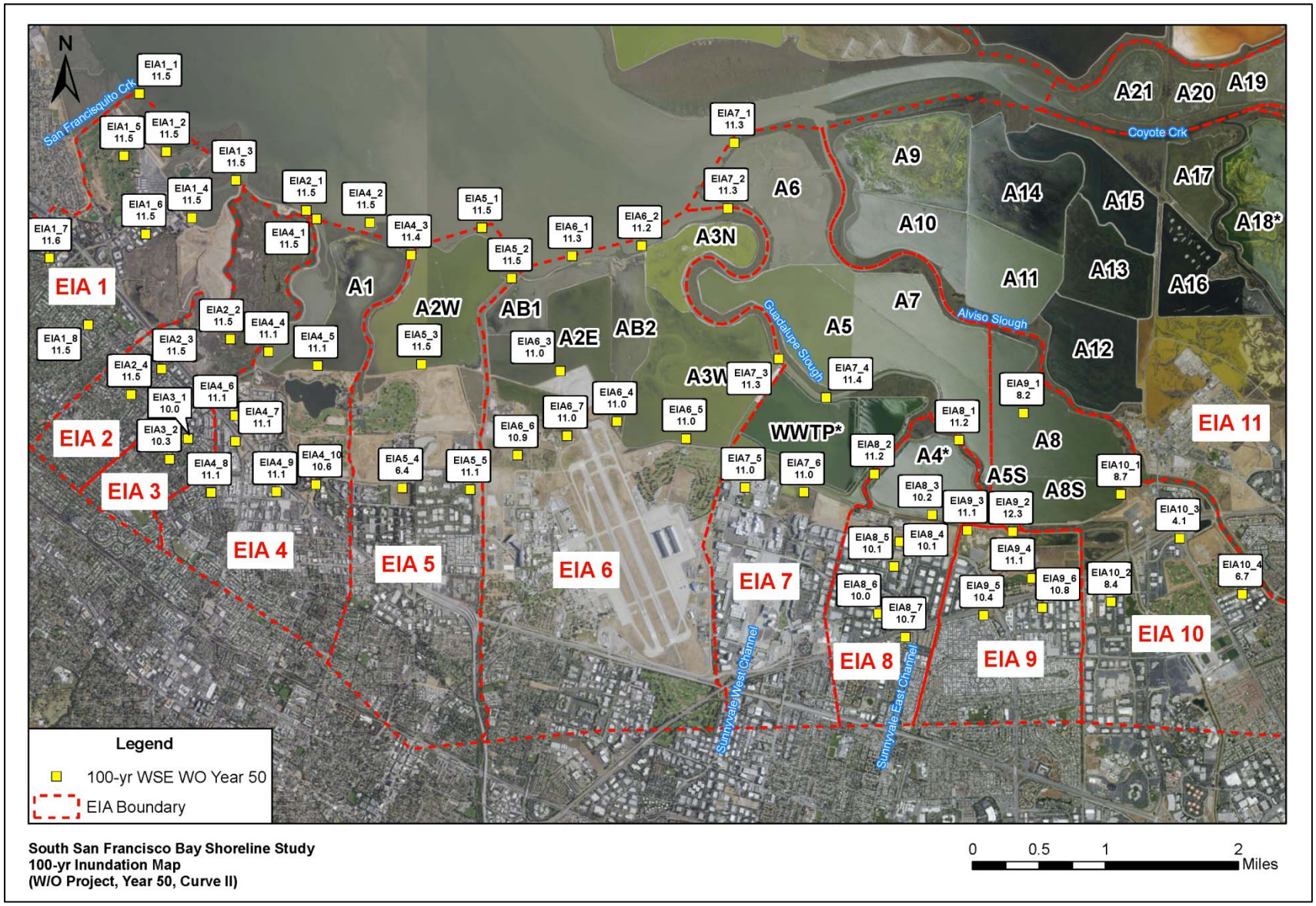


Figure 14. 100-year WSE under Without Project Condition in Year 50 SLR Curve II

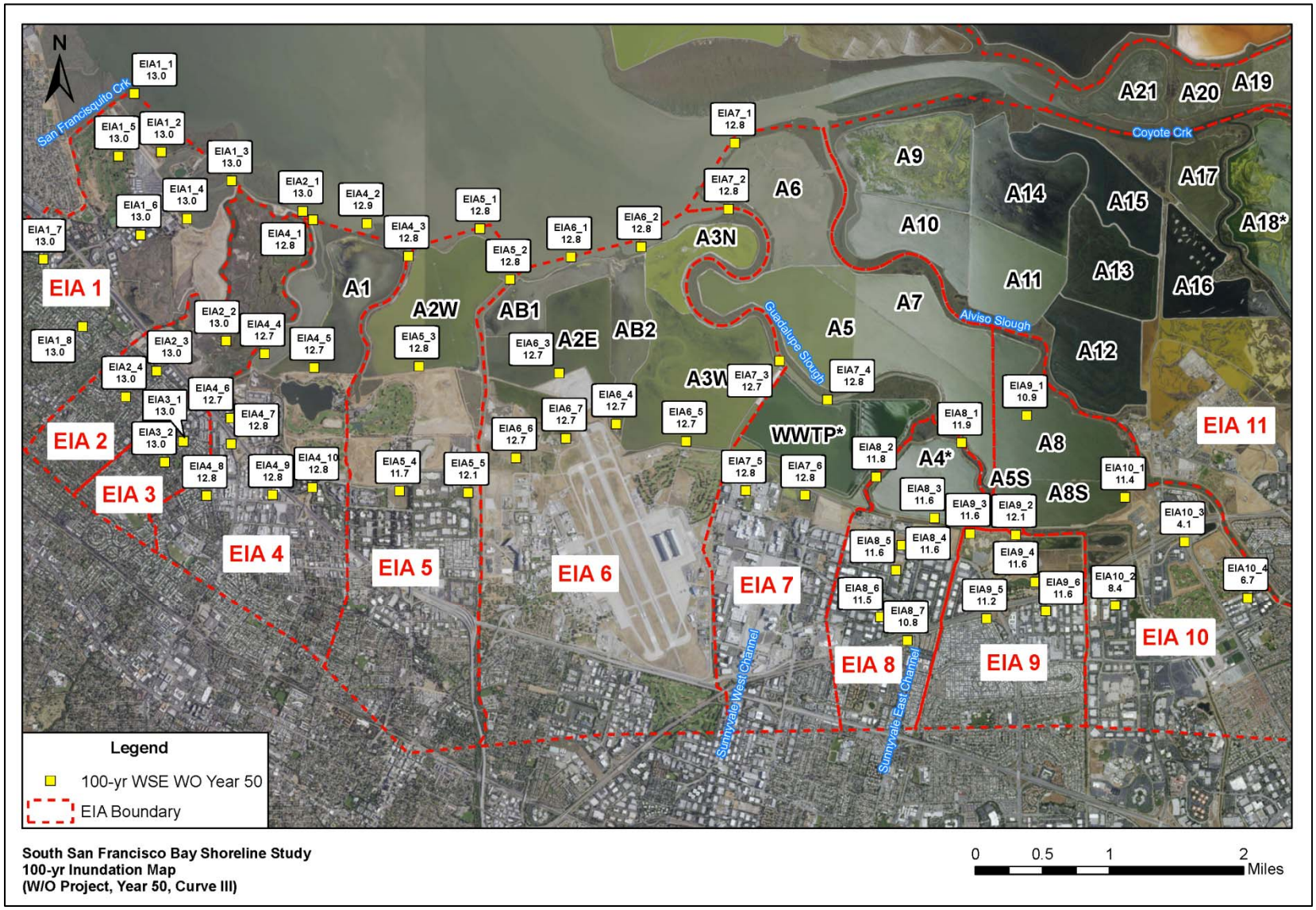


Figure 15. 100-year WSE under Without Project Condition in Year 50 SLR Curve III

Table 15. 100-Year WSEs in Zone 1 Under With Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA1_1	0.8	10.8	11.0	11.4	13.0
EIA1_2	4.2	10.8	10.9	11.4	13.0
EIA1_3	2.5	10.8	11.0	11.5	13.0
EIA1_4	6.2	10.8	11.0	11.5	13.0
EiA1_5	1.0	1.0	1.0	1.0	1.0
EIA1_6	5.2	5.2	5.2	5.2	5.2
EIA1_7	11.3	11.3	11.3	11.3	11.3
EIA1_8	5.9	6.0	5.9	5.9	5.9
EIA2_1	2.8	10.8	11.0	11.5	13.0
EIA2_2	0.0	5.5	5.7	5.7	6.1
EIA2_3	5.4	5.5	5.5	5.5	5.5
EIA2_4	8.5	8.5	8.5	8.5	8.5
EIA3_1	6.0	6.0	6.0	6.0	6.0
EIA3_2	9.1	9.1	9.1	9.1	9.1

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Table 16. 100-Year WSEs in Zone 2 Under With Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA4_1	1.0	10.9	11.0	11.5	13.0
EIA4_2	2.4	10.8	11.0	11.5	13.0
EIA4_3	1.7	10.8	11.0	11.5	13.0
EIA4_4	4.0	10.6	11.1	11.5	13.0
EiA4_5	1.1	10.6	11.1	11.5	13.0
EIA4_6	4.9	4.9	4.9	4.9	4.9
EIA4_7	4.4	4.4	4.4	4.4	4.4
EIA4_8	9.9	9.9	9.9	9.9	9.9
EIA4_9	9.0	9.0	9.0	9.0	9.0
EIA4_10	6.9	6.9	6.9	6.9	6.9
EIA5_1	1.0	10.8	11.0	11.5	13.0
EIA5_2	2.2	10.8	11.0	11.5	13.0
EIA5_3	0.4	10.6	11.1	11.5	13.0
EIA5_4	4.1	4.1	4.1	4.1	4.1
EIA5_5	4.4	4.4	4.4	4.4	4.4

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Table 17. 100-Year WSEs in Zone 3 Under With Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA6_1	3.1	10.8	10.9	11.4	13.1
EIA6_2	3.8	10.8	10.9	11.4	13.1
EIA6_3	-0.8	10.8	10.8	11.3	13.1
EIA6_4	2.1	10.8	10.8	11.3	13.1
EiA6_5	-0.9	10.8	10.8	11.3	13.1
EIA6_6	2.6	2.6	2.6	2.6	2.6
EIA6_7	-1.7	-1.7	-1.7	-1.7	-1.7
EIA7_1	3.4	10.8	10.9	11.4	13.0
EIA7_2	-6.4	10.8	10.9	11.4	13.0
EIA7_3	-2.1	11.0	10.9	11.4	13.1
EIA7_4	-6.3	11.1	10.9	11.5	13.1
EIA7_5	4.3	4.3	4.3	4.3	4.3
EIA7_6	-1.3	-1.3	-1.3	-1.3	-1.3

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Table 18. 100-Year WSEs in Zones 4 & 5 Under With Project Conditions

Station ID	Ground Elv. ft, NAVD	Without Project Conditions			
		WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA8_1	-1.5	11.2	10.8	11.4	13.3
EIA8_2	1.3	11.1	10.9	11.4	13.3
EIA8_3	0.7	11.0	10.6	11.2	13.3
EIA8_4	4.5	4.5	4.5	4.5	4.5
EiA8_5	3.8	3.8	3.8	3.8	3.8
EIA8_6	9.6	9.6	9.6	9.6	9.6
EIA8_7	10.7	10.7	10.7	10.7	10.7
EIA9_1	-1.3	7.3	11.0	11.5	13.2
EIA9_2	-1.3	12.7	11.4	11.9	13.2
EIA9_3	0.4	0.4	0.4	0.4	0.4
EIA9_4	-1.5	-1.5	-1.5	-1.5	-1.5
EIA9_5	7.2	7.2	7.2	7.2	7.2
EIA9_6	6.1	6.1	6.1	6.1	6.1
EIA10_1	-0.4	7.4	11.1	11.6	13.2
EIA10_2	8.4	8.4	8.4	8.4	8.4
EIA10_3	4.1	4.1	4.1	4.1	4.1
EIA10_4	6.7	6.7	6.7	6.7	6.7

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I, etc.

Figure 16. 100-year WSE under With Project Condition in Year 0

As expected, WSE stations located landward of the protective levee are dry, except at Station EIA2_2. Station EIA2_2 located landward of the project levee and in the PAFB is flooded under the with-project conditions. Water level in the basin is controlled by the inflows from Matadero Creek, Adobe Creek, Barron Creek, and the capacity of the outlet structure to release flow during the low tide cycle. Thus, the predicted water levels in the PAFB under with project conditions are not related to coastal flooding or protective levee overtopping, but instead are reflected to the tributary inflows from these three creeks. The WSEs in the PAFB that are predicted should not be considered 100-year water level within the PAFB. The inflows from the three creeks used in the simulations are based on an empirical relation to the residual surge and are considerably lower than the 100-year creek flows.

5.2.2 Future With-Project Conditions (Year 50)

The deduced 100-year WSEs at stations bayward of the proposed protective levee are also presented in Table 15 to Table 18, including EIA2_2. A more complete statistical representation for the particularly selected locations including the 5%, 50% (mean) and 95% confidence limits are presented in Appendix A-6 to A-8. Figure 17 to Figure 19 illustrate the predicted 100-year WSEs with the protective levee in place under the three future SLR scenarios. All WSE stations landward of the protective levee are not flooded, except at EIA2_2.

Under the pond restoration plan, Ponds A2E, portions of Ponds AB2 and A3W remain as managed ponds in Year 50 with project conditions, as illustrated in Figure 20. The levee between Pond A2E and Pond AB1 and a portion of Pond AB2 is raised and a new levee is constructed across Ponds AB2 and A3W (see Figure 20) in Year 50. The crest elevation of the constructed levee is planned to be +13 feet NAVD88, which provides an equivalent level of protection to the outer levee bayward of Ponds AB1 and AB2.

It is also noted that in EIA 8 (e.g., EIA8_1), the WSEs in Year 50 under the Curve I SLR projection, is slightly lower than the deduced WSEs in Year 0. The main reason is that the existing conditions (Year 0) conditions assume that no pond restoration occurs. In contrast, extensive pond restoration will be implemented in Year 50. Under the Curve I SLR projection, the sea level increase is small but the resulting effect on WSE due to the pond restoration is greater at some locations. The reduction on water level in EIA 8 under the Curve I SLR projection in Year 50 relative to Year 0 is due primarily to the more connected ponds to the east of Guadalupe Slough (A5, A7, A8 & A8s), which decreases the amount of water moving up Guadalupe Slough from the bay side. As the SLR curve increases, the benefit of the pond restoration on water level becomes smaller than the sea level rise effect (see Table 18).

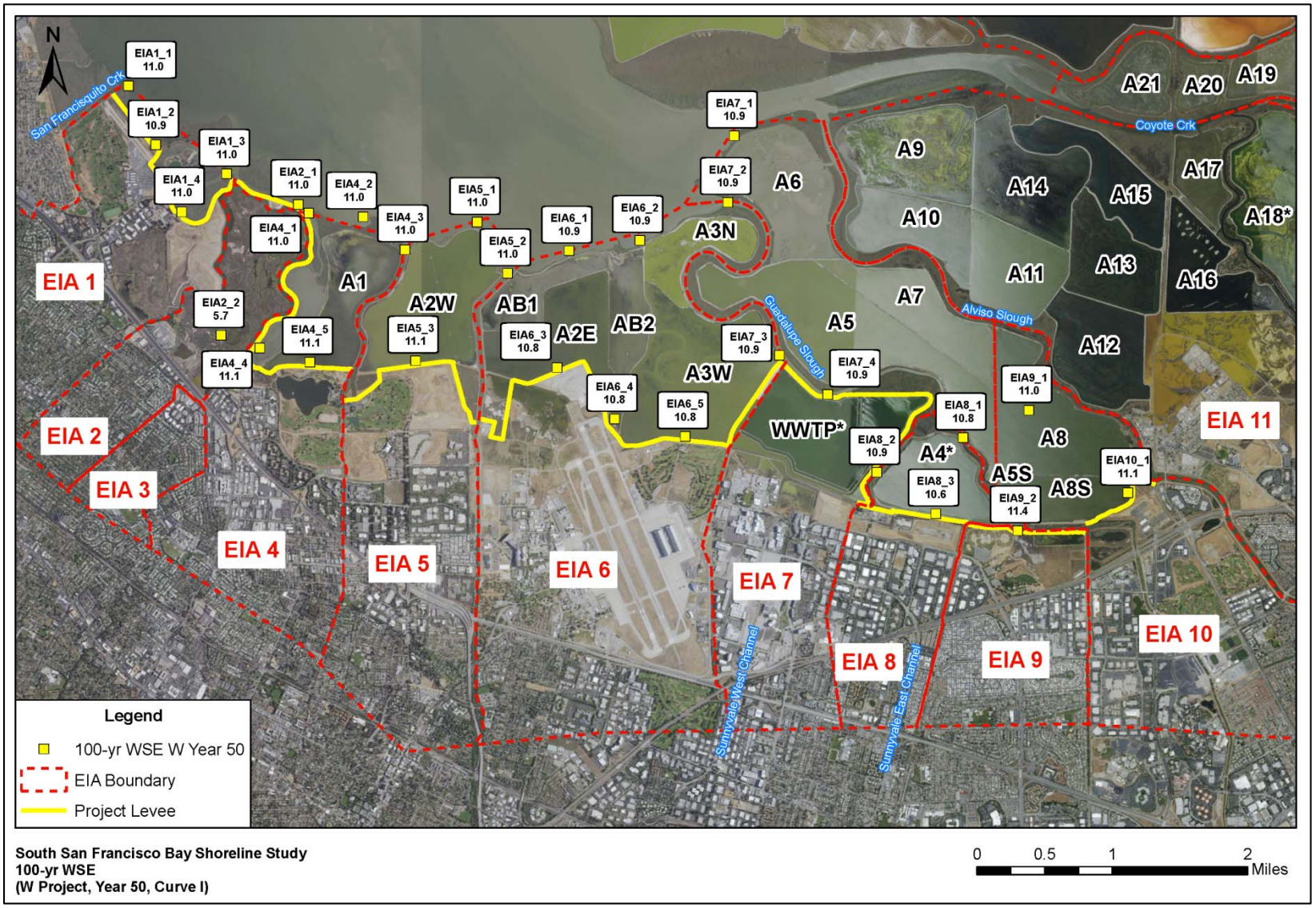


Figure 17. 100-year WSE under With Project Condition in Year 50 SLR Curve I

Figure 18. 100-year WSE under With Project Condition in Year 50 SLR Curve II

Figure 19. 100-year WSE under With Project Condition in Year 50 SLR Curve III

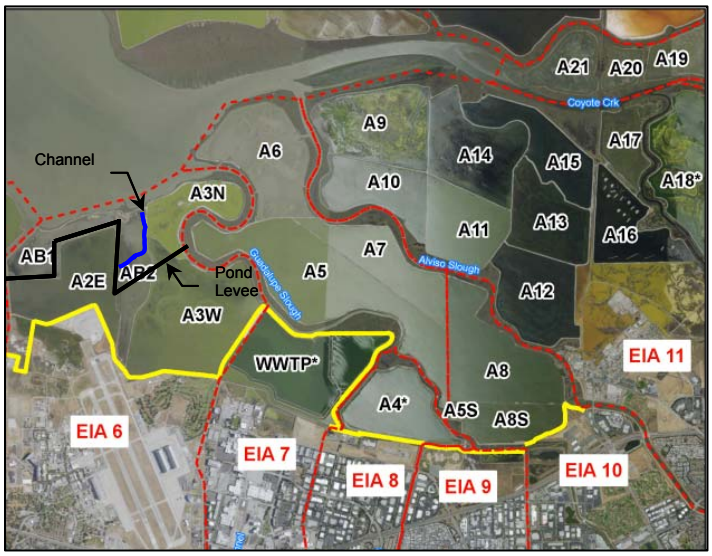


Figure 20. Proposed New Pond Levee

5.3 Comparison of 100-year WSE between Without and With Project

A comparison of the deduced WSEs indicates that the deduced 100-year WSEs for the project conditions, in general, are equal to or slightly higher than the without project conditions. This is due to the fact that the bay water can overtop or breach the existing outer levee under the without project conditions, but is not allowed to overtop or breach the proposed protective levee. However, several locations in EIA 8 and EIA 9 exhibit some different trends between without- and with project conditions, as presented in Table 19.

Table 19. Comparison of 100-Year WSEs in EIA 8 & EIA 9

Station ID	Ground Elv. ft, NAVD	Without Project Conditions				With Project Conditions			
		WSE in ft, NAVD				WSE in ft, NAVD			
		Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III	Yr 0	Yr 50 & I	Yr 50 & II	Yr 50 & III
EIA8_1	-1.5	10.9	11.0	11.2	11.9	11.2	10.8	11.4	13.3
EIA8_2	1.3	10.9	10.9	11.2	11.8	11.1	10.9	11.4	13.3
EIA8_3	0.7	9.5	9.8	10.2	11.6	11.0	10.6	11.2	13.3
EIA9_1	-1.3	6.9	7.6	8.2	10.9	7.3	11.0	11.5	13.2
EIA9_2	-1.3	12.3	12.3	12.3	12.1	12.7	11.4	11.9	13.2

Note: Yr 50 & I indicates in Year 50 under the SLR Curve I

These trends and reasons are delineated below:

- WSES at EIA9_2 are much higher than adjacent stations under the without-project conditions in both Year 0 and Year 50. EIA8_1, EIA8_2 and EIA8_3 are respectively located in Guadalupe Slough, Moffett Channel (connected to Sunnyvale West Channel) and Pond A4. EIA9_2 is located at the confluence of Sunnyvale East Channel, Calabazas Creek, and San Tomas Aquino Creek. Water surface elevations at EIA8_1 to

EIA8_3 are not as strongly influenced by the flow from these three tributaries as the channel capacity increases downstream, while EIA9_2 is more strongly influenced by the inflows from the three tributaries. As a consequence, water levels at EIA9_2 are strongly dominated by fluvial rather than coastal water surging effects and consequently higher than adjacent locations. It is noted that 100-year creek inflows were not used in the long wave modeling (i.e., coincident flows with peak surge are smaller than 100-year flows). This may mean that 100-year water level at EIA9_2 is potentially higher than the WSEs derived from the MCS analysis.

- Under the project conditions, the 100-year WSEs for a low SLR projection in Year 50 are lower than in Year 0. The WSEs in EIA 8 & EIA 9 are strongly influenced by adjacent creek inflows, pond restoration and the protective levees. No pond restoration is implemented in Year 0, only the installation of the project levee. However, both the extensive pond restoration and protective levees are implemented in Year 50.

  The effect of the inflows from Sunnyvale East Channel, Calabazas Creek, and San Tomas Aquino Creek are responsible for elevating water levels during the higher surge events, particularly at EIA 9_2. After the completion of pond restoration in Year 50, the additional breach in Pond A8S (see Figure 20) significantly reduces the increase of water level from the creek inflows, as the inflows can be transported to the bay through the ponds rather than through a narrow creek channel. Thus, the pond restoration and levee breach in Pond A8S significantly reduce water levels at EIA9_2 and to a lesser extent at EIA 8_1 and EIA8_2 in Year 50, particularly for the Low SLR. Under the Low SLR projection, the effect of pond restoration tends to be greater at these locations than the effect of sea level rise. Consequently, water levels with a low SLR projection in Year 50 can be lower than the WSEs in Year 0. As the SLR rate increases (i.e., intermediate or high projection), the SLR effect gradually becomes more dominant than that of the pond breaches at these locations (see EIA8_1 to EIA8_3), which results in higher water levels under the intermediate and high SLR projections.

6.0 FLOOD MAPPING

6.1 100-Year Flood Map Under Existing Conditions (Year 0)

Based on the computed 100-Year WSEs and ground elevations at all selected stations in all EIAs, an inundation map was prepared for the without project conditions in Year 0. Figure 21 illustrates the generated inundation map. Between EIA 1 and EIA 4, the footprint of the 100-year inundation extends landwards beyond Highway 101, although the inundation depth is relatively shallow. The Palo Alto Airport and PAWQCP, a waste water treatment plant located in EIA 1, are flooded as well. The ground elevations within EIA 5 are relatively high, except at a few low-lying areas where the inundation occurs due to storm water flowing into the subject locations from creeks. In EIA 6, the bayward area of the Moffett Airfield is flooded. The SWPCP (the second waste water treatment plant in the region) located in EIA 7 is also inundated. The footprint of coastal flooding in EIA 8 and EIA 9 extends to Highway 237.

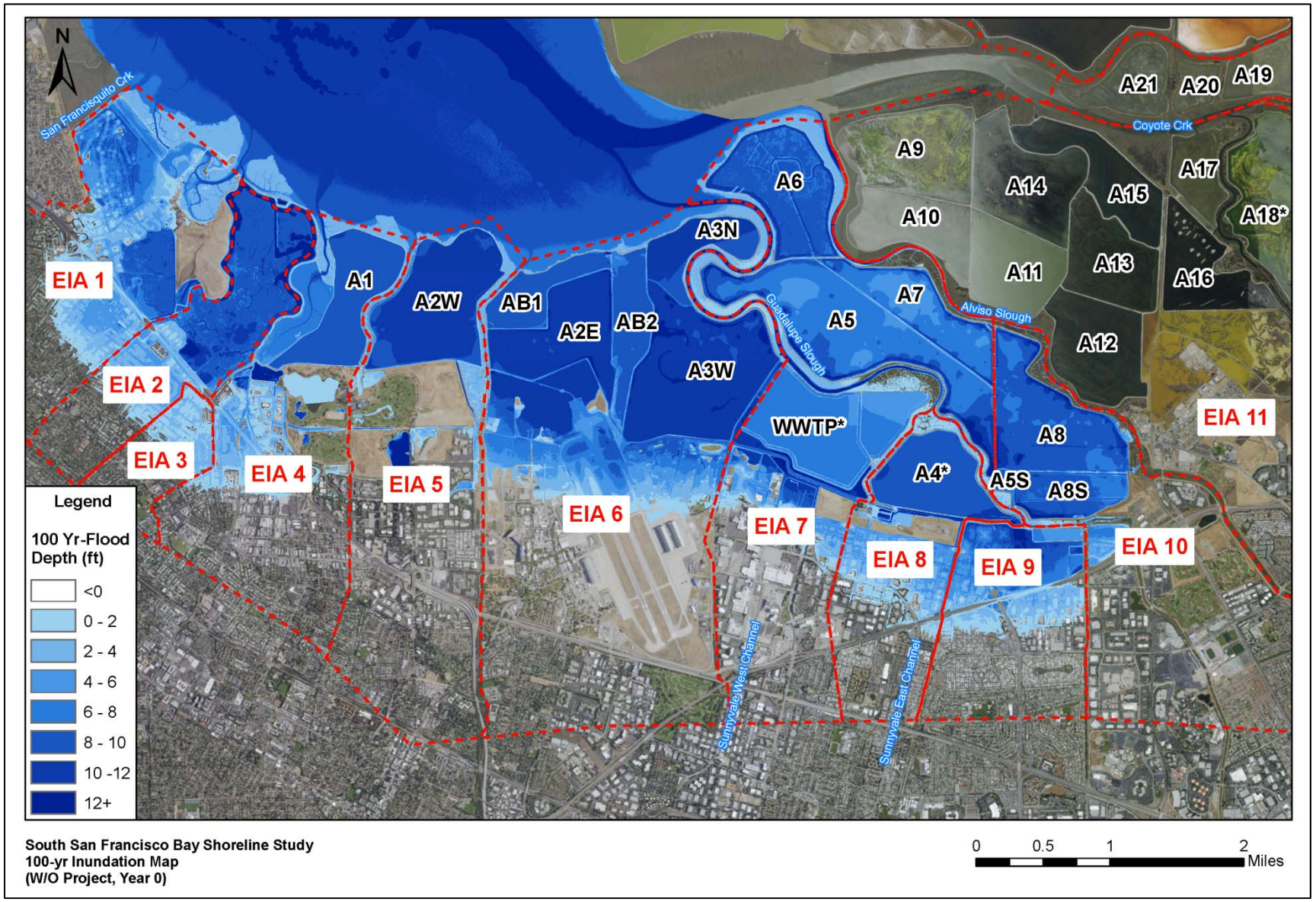


Figure 21. 100-year Inundation Map Without Project in Year 0

6.2 100-Year Flood Map Without Project in Year 50

Figure 22 to Figure 24 show the predicted 100-year inundation maps that take into account the three future SLR projections in Year 50 under the without-project conditions. Intuitively, a higher SLR projection (e.g., Curve III) yields a slightly bigger footprint as well as a larger inundation depth.

7.0 SUMMARY AND CONCLUSIONS

The coastal flood stage frequency including the range of confident limit was deduced by using the Monte Carlo Simulation (MCS) technique. The modeled peak water levels that were derived from combining four astronomical tides, three residual surges, two wind directions and three corresponding wind speeds form the basis for the MCS interpolation (Anchor, 2017). The above-mentioned four parameters and the number of storm occurrences in each simulated year were randomly selected to interpolate the pre-computed water surface elevations and subsequently obtain the flood stage frequency at various selected locations throughout the project area.

7.1 Without Project Conditions (Year 0 and Year 50)

Under the Year 0 existing conditions, the 100-year WSEs are about +10.8 feet, NAVD along the bay edge of the shoreline (e. g., EIA2_1 & EIA4_1) and can be higher along the creeks due to the hydraulic inflows. The highest WSE is at Station EIA9_2, which has a water level of +12.3 feet, NAVD (see Figure 12). EIA9_2, which is situated near the confluence of Sunnyvale East Channel, Calabazas Creek, and San Tomas Aquino Creek in EIA 9, is significantly impacted by the combined creek flows that can overtop the creek levee and spread into EIA 9. As a consequence, the deduced 100-year WSE at EIA9_2 in Year 0 is the highest within the entire project area. A similar impact area can also be observed in EIA 3, which is situated landward of Highway 101. When the levee failure occurs in the Palo Alto Flood Basin (PAFB) occurs, water levels in the PAFB can extend up into Adobe and Barron Creeks and flow into EIA 3 (e.g., at EIA3_1). It is noted that the modeled creek inflow that is proportional to the residual surge is less than the 100-year creek flow (Anchor, 2017).

The 100-year WSEs in the project area under three future SLR scenarios are respectively illustrated in Figure 13 to Figure 15. The maximum WSE is at +13.0 feet, NAVD along the south bay shoreline in EIAs 1 and 2. The computed WSEs are slightly lower along the eastern shoreline of the south bay (i. e., EIAs 4 to 7). The deduced WSEs have a similar trend as described for the WSEs in Year 0, except under the SLR Curve III scenario. Under this highest SLR projection, the high bay water can overtop the outer levee even without the levee being breached and, as a result, flooding occurs within the entire zone. As a consequence, the deduced 100-yr WSEs at the landward stations can be the same as the stations along the shoreline (e.g., Zone 1 as shown in Table 11). The WSEs can also be slightly reduced (e.g., EIA9_2 in Zone 4) at locations that are strongly influenced by creek inflows.

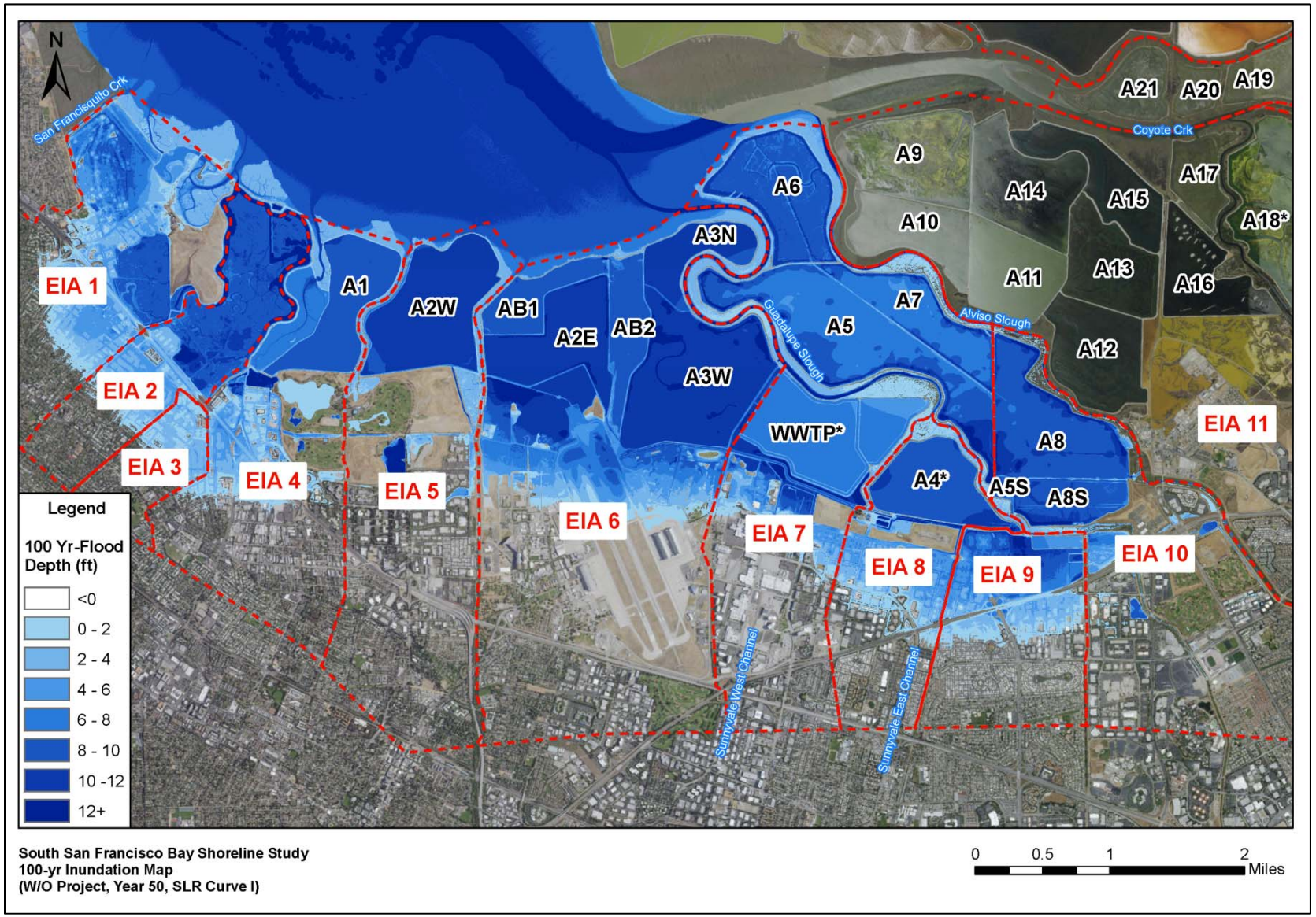


Figure 22. 100-year Inundation Map Without Project in Year 50 SLR Curve I

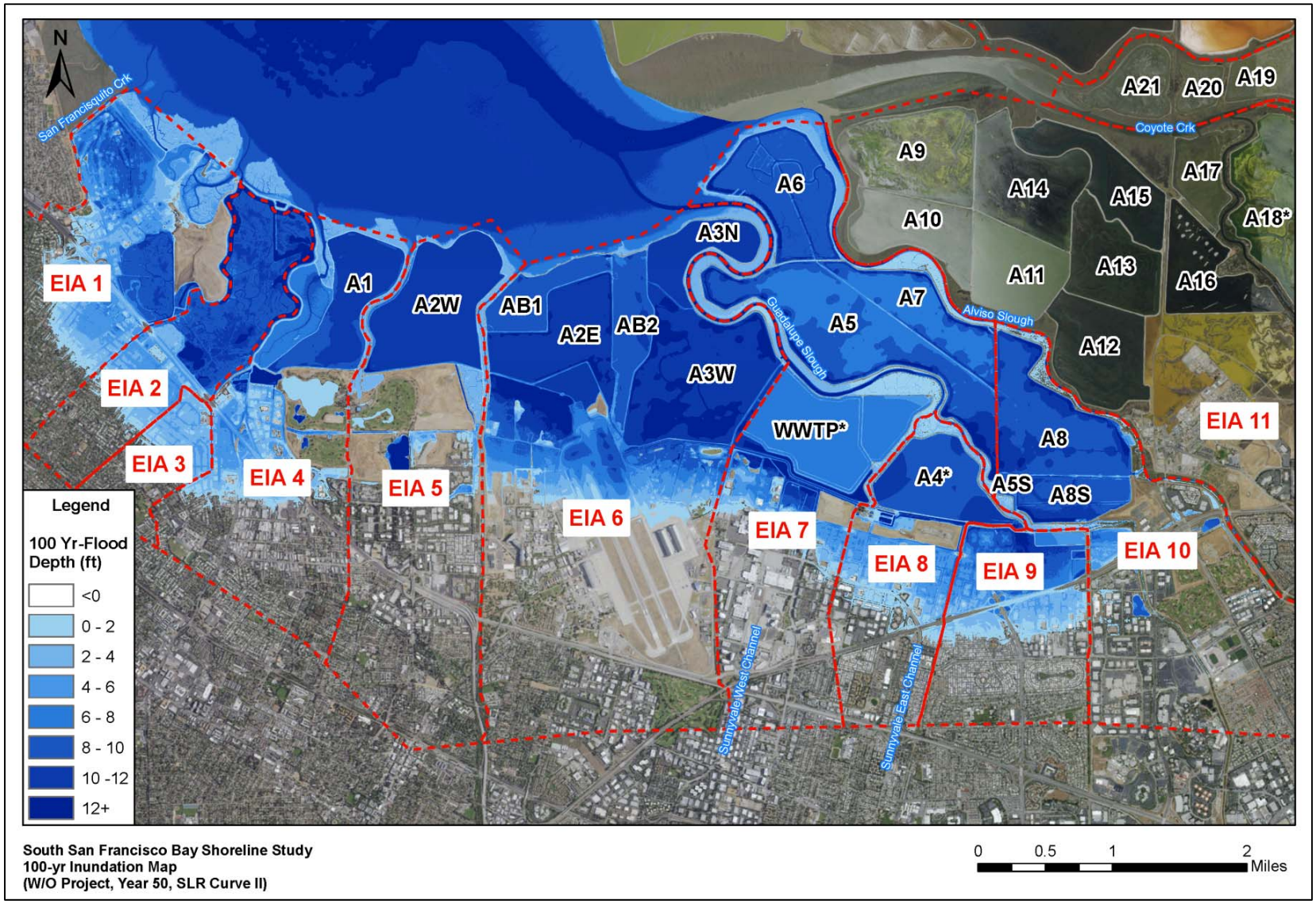


Figure 23. 100-year Inundation Map Without Project in Year 50 SLR Curve II

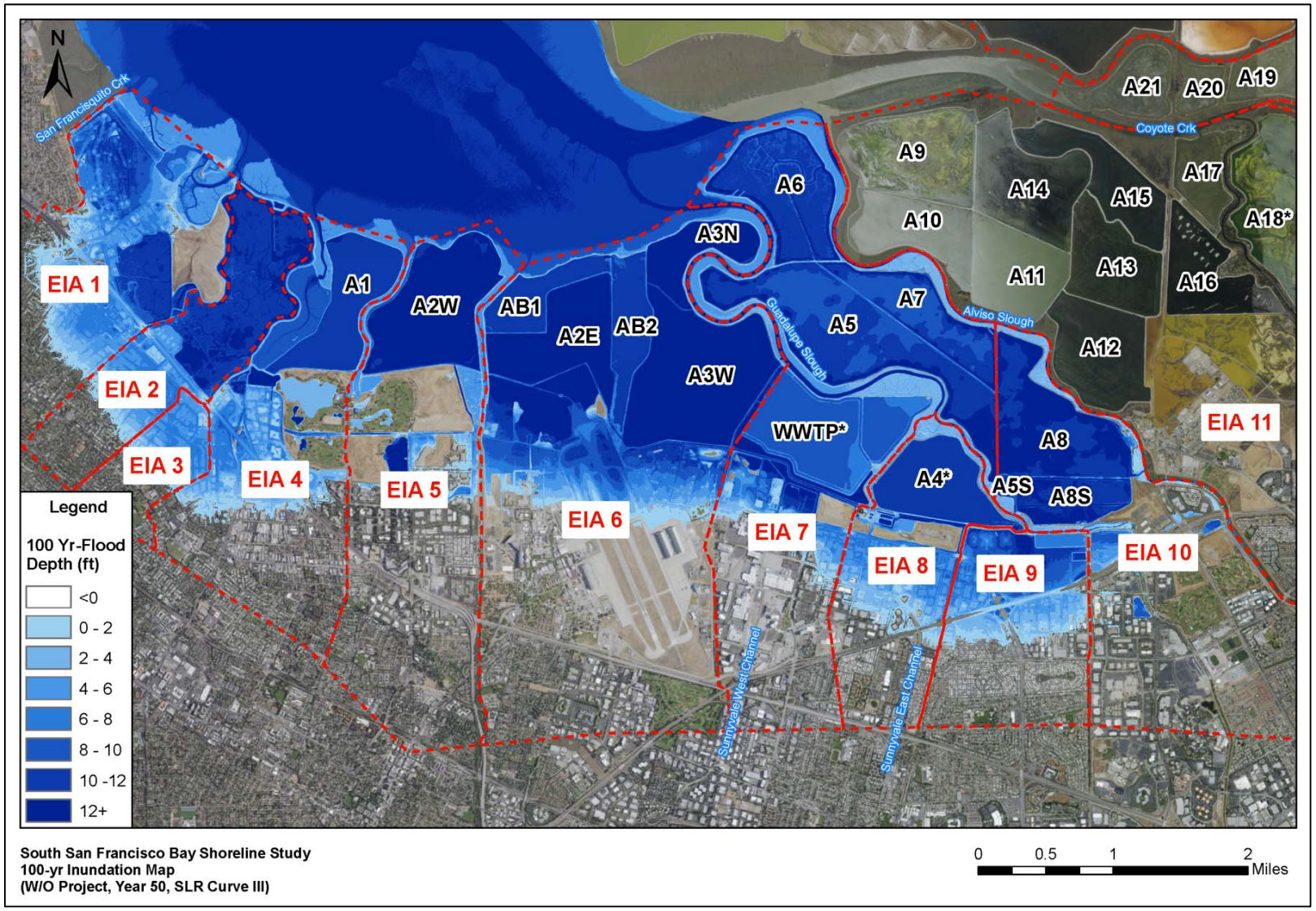


Figure 24. 100-year Inundation Map Without Project in Year 50 SLR Curve III

In EIA 10, the ground elevations located landward of Salt Pond A8S are high enough that the landward area (e.g. EIA10_2 to EIA10_4) is dry without being inundated even under all future SLR scenarios. The derived 100-year inundation maps in Year 0 and in Year 50 with three SLR projections are respectively shown in Figure 21 and from Figure 22 to Figure 24 under the without-project conditions. As expected, the footprint of the inundation area is larger as the projected SLR is higher.

7.2 With Project Conditions (Year 0 and Year 50)

Flood stage frequency with confident limits was also obtained for the proposed preliminary levee alignment that extends for approximately 14.3 miles, as presented in Figure 2. All reduced 100-year WSEs bayward of the protective levee are slightly higher than the WSEs obtained under the without-project conditions in Year 0. This is due to the fact that the bay water can overtop the existing levee under the without-project conditions, but is not allowed to overtop the proposed protective levee. The deduced 100-year WSEs at all selected stations, excluding the landward stations where the locations are dry due to the proposed levee protection, are illustrated in Figure 16 to Figure 19 for all analyzed existing and future conditions. The maximum WSEs in Year 50 under the high projected SLR (Curve III) range from +13.0 feet, NAVD in EIAs 1 to 4 to +13.3 feet, NAVD in EIA 8. Table 20 summarizes the highest deduced WSEs in each EIA, which will form the basis for establishing the crest elevation of the proposed protective levee.

Table 20. Deduced Highest WSE in Individual EIAs

EIA	Highest WSE (ft, NAVD)
EIAs 1 to 5	+13.0
EIS 6 & EIA 7	+13.1
EIA 8	+13.3
EIA 9 & EIA 10	+13.2

Station EIA2-2, located landward of the project levee and in the PAFB, is flooded for all sea level scenarios (existing and future) under the with-project conditions. Water level in the basin is controlled by the inflows from Matadero Creek, Adobe Creek, Barron Creek, and the capacity of the outlet structure to release flow during the low tide cycle. Thus, the predicted water levels in the PAFB (i.e., EIA2_2) under the with-project conditions are not related to coastal flooding or protective levee overtopping, but instead is reflected to the tributary inflows from these three creeks. The WSEs in the PAFB that is predicted should not be considered 100-year water level within the PAFB. The inflows from the three creeks used in the simulations are based on an empirical correlation to the residual surge and are considerably lower than the 100-year creek flows.

8.0 REFERENCES

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9.0 APPENDIX A: Deduced Flood Stage Frequency at Representative Locations

A.1 Without Project Conditions (Year 0)

EIA-1

Table A-1. Flood Stage Frequency at Representative Locations in EIA 1 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA1_1 (+0.8 ft, NAVD)			*EIA1_5 (+1.0 ft, NAVD)*		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	1.0	1.0	1.1
2	9.6	9.7	9.7	8.7	8.8	8.9
5	9.9	10.0	10.0	9.4	9.4	9.5
10	10.1	10.2	10.2	9.7	9.8	9.9
25	10.3	10.4	10.5	10.0	10.2	10.4
50	10.5	10.6	10.7	10.3	10.5	10.6
100	10.6	10.8	10.9	10.5	10.7	10.8
250	10.8	10.9	11.1	10.7	10.9	11.1
500	10.8	11.0	11.2	10.7	11.0	11.2
1000	10.9	11.1	11.3	10.8	11.1	11.3
Return Period (yr)	*EIA1_6 (+5.2 ft, NAVD)*			*EIA1_8 (+5.9 ft, NAVD)*		
	5%	50%	95%	5%	50%	95%
1	5.2	5.2	5.2	6.0	6.0	6.0
2	8.9	9.0	9.0	6.8	7.0	7.2
5	9.4	9.5	9.6	8.1	8.3	8.5
10	9.7	9.8	9.9	8.9	9.1	9.4
25	10.0	10.2	10.4	9.8	10.1	10.3
50	10.3	10.5	10.6	10.2	10.5	10.7
100	10.5	10.7	10.8	10.5	10.7	10.9
250	10.7	10.9	11.1	10.7	10.9	11.2
500	10.8	11.0	11.2	10.8	11.1	11.3
1000	10.8	11.1	11.3	10.9	11.2	11.5

Note: (+0.8 ft, NAVD) denotes bottom elevation,etc.

EIA-2

Table A-2. Flood Stage Frequency at Representative Locations in EIA 2 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)			EIA2_4 (+8.5 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	3.4	3.6	4.1	8.6	8.6	8.6
2	9.6	9.6	9.7	9.0	9.1	9.2	8.8	8.9	8.9
5	9.9	9.9	10.0	9.5	9.6	9.6	9.3	9.3	9.4
10	10.1	10.1	10.2	9.8	9.8	9.9	9.6	9.7	9.8
25	10.3	10.4	10.5	10.1	10.2	10.4	10.0	10.2	10.4
50	10.5	10.6	10.7	10.3	10.5	10.6	10.3	10.5	10.7
100	10.6	10.8	10.9	10.5	10.7	10.8	10.5	10.7	10.9
250	10.7	10.9	11.1	10.6	10.9	11.1	10.7	10.9	11.1
500	10.8	11.0	11.2	10.7	11.0	11.2	10.7	11.0	11.3
1000	10.8	11.1	11.3	10.8	11.1	11.3	10.8	11.1	11.3

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

Table A-3. Flood Stage Frequency at Representative Locations in EIA 3
(Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA3_1 (+6.0 ft, NAVD)			EIA3_2 (+9.1 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	6.0	6.0	6.0	9.1	9.1	9.1
2	6.0	6.0	6.0	9.1	9.1	9.1
5	6.2	6.2	6.3	9.1	9.1	9.1
10	6.5	6.6	6.7	9.1	9.1	9.1
25	6.9	7.1	7.4	9.2	9.2	9.2
50	7.2	7.6	8.0	9.2	9.3	9.3
100	7.7	8.1	8.5	9.3	9.4	9.5
250	8.0	8.5	9.2	9.4	9.5	9.8
500	8.2	8.9	9.6	9.4	9.7	9.9
1000	8.4	9.2	9.7	9.5	9.8	10.1

Note: (+6.0 ft, NAVD) denotes bottom elevation, etc.

EIA-4

Table A-4. Flood Stage Frequency at Representative Locations in EIA 4
(Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	4.9	4.9	5.0
2	9.6	9.7	9.7	7.7	7.8	7.9
5	9.9	9.9	10.0	8.4	8.5	8.6
10	10.1	10.1	10.2	8.8	8.9	9.0
25	10.3	10.4	10.5	9.2	9.5	9.7
50	10.5	10.6	10.8	9.6	9.8	10.1
100	10.6	10.8	10.9	9.8	10.1	10.4
250	10.8	10.9	11.1	10.1	10.4	10.7
500	10.8	11.0	11.3	10.2	10.5	10.9
1000	10.9	11.1	11.4	10.3	10.7	11.0
Return Period (yr)	EIA4_7 (+4.4 ft, NAVD)			EIA4_9 (+9.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	4.5	4.5	4.5	9.1	9.1	9.1
2	6.6	6.7	6.9	9.1	9.1	9.1
5	7.6	7.7	7.9	9.1	9.1	9.1
10	8.1	8.3	8.5	9.1	9.1	9.1
25	8.7	9.0	9.3	9.2	9.4	9.6
50	9.2	9.5	9.8	9.5	9.7	9.9
100	9.5	9.8	10.2	9.7	9.9	10.2
250	9.8	10.2	10.6	9.9	10.2	10.6
500	10.0	10.4	10.8	10.0	10.4	10.8
1000	10.1	10.6	10.9	10.1	10.6	10.9

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-5. Flood Stage Frequency at Representative Locations in EIA 5 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)			EIA5_5 (+4.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.4	9.4	9.4	2.5	2.6	2.9	4.5	4.5	4.5
2	9.6	9.7	9.7	9.1	9.2	9.3	5.3	5.5	5.7
5	9.9	10.0	10.0	9.7	9.7	9.8	6.8	7.0	7.3
10	10.1	10.2	10.2	9.9	10.0	10.1	7.7	8.0	8.3
25	10.3	10.5	10.6	10.2	10.4	10.5	8.8	9.2	9.6
50	10.5	10.6	10.8	10.4	10.6	10.8	9.4	9.8	10.1
100	10.7	10.8	10.9	10.6	10.8	10.9	9.8	10.2	10.5
250	10.8	11.0	11.1	10.8	11.0	11.2	10.1	10.5	10.8
500	10.9	11.1	11.3	10.9	11.1	11.3	10.2	10.7	11.1
1000	10.9	11.2	11.4	10.9	11.2	11.4	10.4	10.8	11.3

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-6. Flood Stage Frequency at Representative Locations in EIA 6 (Year0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	0.9	0.9	0.9
2	9.6	9.6	9.7	8.3	8.4	8.4
5	9.9	9.9	9.9	8.8	8.9	8.9
10	10.0	10.1	10.2	9.1	9.2	9.3
25	10.2	10.3	10.4	9.4	9.6	9.7
50	10.4	10.5	10.6	9.7	9.8	10.0
100	10.5	10.6	10.8	9.9	10.0	10.2
250	10.6	10.8	11.0	10.0	10.3	10.6
500	10.7	10.9	11.1	10.1	10.4	10.7
1000	10.8	11.0	11.3	10.2	10.6	10.9
Return Period (yr)	EIA6_5 (-0.9 ft, NAVD)			EIA6_7 (-1.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	1.0	1.0	1.0	2.6	2.6	2.6
2	8.3	8.4	8.4	8.3	8.4	8.4
5	8.8	8.9	8.9	8.8	8.9	8.9
10	9.1	9.2	9.3	9.1	9.2	9.3
25	9.5	9.6	9.7	9.4	9.6	9.7
50	9.7	9.8	10.0	9.7	9.8	10.0
100	9.9	10.1	10.3	9.9	10.1	10.2
250	10.1	10.3	10.6	10.1	10.3	10.6
500	10.2	10.5	10.7	10.1	10.4	10.7
1000	10.3	10.6	10.9	10.2	10.6	10.9

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-7. Flood Stage Frequency at Representative Locations in EIA 7 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)			EIA7_6 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	9.5	9.6	9.6	-1.2	7.5	7.9
2	9.6	9.7	9.7	9.8	9.9	9.9	8.4	8.5	8.6
5	9.9	9.9	10.0	10.1	10.2	10.2	8.9	9.0	9.1
10	10.1	10.1	10.2	10.3	10.4	10.4	9.2	9.3	9.4
25	10.3	10.4	10.5	10.5	10.6	10.7	9.6	9.7	9.8
50	10.4	10.5	10.7	10.7	10.7	10.8	9.8	9.9	10.1
100	10.6	10.7	10.8	10.8	10.9	11.0	10.0	10.2	10.3
250	10.7	10.9	11.1	10.9	11.0	11.2	10.1	10.4	10.6
500	10.8	11.0	11.2	10.9	11.1	11.3	10.2	10.5	10.8
1000	10.8	11.1	11.3	11.0	11.2	11.4	10.3	10.6	11.0

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-8. Flood Stage Frequency at Representative Locations in EIA 8 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA8_1 (-1.5 ft, NAVD)			EIA8_4 (+4.5 ft, NAVD)			EIA8_6 (+9.6 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.5	9.6	9.6	6.1	6.3	6.4	9.7	9.7	9.7
2	9.9	9.9	10.0	7.0	7.0	7.1	9.7	9.7	9.7
5	10.2	10.2	10.3	7.6	7.7	7.8	9.7	9.7	9.7
10	10.3	10.4	10.5	8.0	8.2	8.3	9.7	9.7	9.7
25	10.5	10.6	10.7	8.5	8.7	8.8	9.7	9.7	9.7
50	10.7	10.8	10.9	8.8	8.9	9.1	9.7	9.7	9.7
100	10.8	10.9	11.1	9.0	9.1	9.3	9.7	9.7	9.7
250	10.9	11.1	11.3	9.1	9.3	9.6	9.7	9.7	9.9
500	11.0	11.2	11.4	9.2	9.5	9.8	9.7	9.8	10.0
1000	11.1	11.3	11.5	9.3	9.6	9.9	9.7	9.9	10.2

Note: (-1.5 ft, NAVD) denotes bottom elevation, etc.

EIA-9

Table A-9. Flood Stage Frequency at Representative Locations in EIA 9 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)			EIA9_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	5.6	5.6	5.6	10.1	10.2	10.2	6.8	7.1	7.3
2	5.7	5.8	5.8	10.6	10.7	10.7	8.2	8.4	8.5
5	6.0	6.0	6.1	11.1	11.1	11.2	9.2	9.5	9.7
10	6.2	6.3	6.4	11.3	11.4	11.5	10.0	10.1	10.2
25	6.5	6.6	6.7	11.7	11.9	12.1	10.4	10.5	10.6
50	6.6	6.8	6.9	12.1	12.2	12.3	10.5	10.7	10.8
100	6.8	6.9	7.0	12.2	12.3	12.4	10.7	10.9	11.0
250	6.9	7.1	7.2	12.3	12.5	12.6	10.9	11.0	11.0
500	7.0	7.2	7.4	12.4	12.5	12.7	10.9	11.0	11.1
1000	7.0	7.3	7.7	12.5	12.6	12.8	11.0	11.1	11.2

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-10. Flood Stage Frequency at Representative Locations in EIA 10 (Year 0, W/O Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA10_1 (-0.4 ft, NAVD)			EIA10_4 (+6.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	5.6	5.6	5.6	6.7	6.7	6.7
2	5.7	5.8	5.8	6.7	6.7	6.7
5	6.0	6.0	6.1	6.7	6.7	6.7
10	6.3	6.4	6.5	6.7	6.7	6.7
25	6.7	6.8	6.9	6.7	6.7	6.7
50	6.9	7.0	7.2	6.7	6.7	6.7
100	7.1	7.2	7.4	6.7	6.7	6.7
250	7.2	7.4	7.7	6.7	6.7	6.7
500	7.3	7.5	7.8	6.7	6.7	6.7
1000	7.4	7.7	8.0	6.7	6.7	6.7

Note: (-0.4 ft, NAVD) denotes bottom elevation, etc.

A.2 Without Project Conditions (Year 50, SLR Curve I)

EIA-1

Table A-11. Flood Stage Frequency at Representative Locations in EIA 1 (Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA1_1 (+0.8 ft, NAVD)			EIA1_5 (+1.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.6	9.6	9.6	1.1	1.2	7.9
2	9.8	9.9	9.9	9.2	9.3	9.4
5	10.1	10.2	10.2	9.7	9.8	9.9
10	10.3	10.4	10.4	10.0	10.1	10.2
25	10.5	10.6	10.7	10.3	10.5	10.6
50	10.7	10.8	10.9	10.6	10.7	10.9
100	10.8	11.0	11.1	10.7	10.9	11.1
250	11.0	11.1	11.3	10.9	11.1	11.3
500	11.0	11.2	11.4	11.0	11.2	11.4
1000	11.1	11.3	11.5	11.1	11.3	11.5
Return Period (yr)	EIA1_6 (+5.2 ft, NAVD)			EIA1_8 (+5.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	5.2	5.2	8.6	6.0	6.0	6.1
2	9.2	9.3	9.4	7.3	7.6	7.8
5	9.7	9.8	9.9	8.9	9.1	9.3
10	10.0	10.1	10.2	9.6	9.8	10.1
25	10.4	10.5	10.7	10.3	10.5	10.7
50	10.6	10.7	10.9	10.6	10.8	11.0
100	10.8	10.9	11.1	10.8	11.0	11.1
250	10.9	11.1	11.3	11.0	11.2	11.4
500	11.0	11.2	11.4	11.1	11.3	11.5
1000	11.1	11.3	11.5	11.1	11.4	11.7

Note: (+0.8 ft, NAVD) denotes bottom elevation, etc.

EIA-2

Table A-12. Flood Stage Frequency at Representative Locations in EIA 2
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)			EIA2_4 (+8.5 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.6	9.6	9.7	3.9	4.7	8.7	8.6	8.6	8.6
2	9.8	9.9	9.9	9.4	9.5	9.5	9.0	9.1	9.2
5	10.1	10.2	10.2	9.8	9.9	10.0	9.6	9.7	9.8
10	10.3	10.4	10.5	10.1	10.2	10.3	10.0	10.1	10.3
25	10.5	10.6	10.8	10.4	10.5	10.7	10.4	10.6	10.8
50	10.7	10.8	11.0	10.6	10.8	10.9	10.7	10.9	11.0
100	10.9	11.0	11.1	10.8	11.0	11.1	10.9	11.0	11.2
250	11.0	11.1	11.3	11.0	11.1	11.3	11.0	11.2	11.4
500	11.1	11.3	11.5	11.0	11.2	11.5	11.1	11.3	11.5
1000	11.1	11.4	11.6	11.1	11.3	11.6	11.2	11.4	11.7

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

Table A-13. Flood Stage Frequency at Representative Locations in EIA 3
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA3_1 (+6.0 ft, NAVD)			EIA3_2 (+9.1 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	6.0	6.0	6.0	9.1	9.1	9.1
2	6.2	6.3	6.3	9.1	9.1	9.1
5	6.6	6.7	6.8	9.1	9.1	9.1
10	7.0	7.1	7.3	9.1	9.1	9.2
25	7.6	7.8	8.1	9.2	9.2	9.3
50	8.0	8.3	8.6	9.3	9.3	9.5
100	8.4	8.8	9.1	9.4	9.5	9.7
250	8.7	9.2	9.8	9.5	9.7	10.1
500	8.9	9.5	10.2	9.6	9.9	10.3
1000	9.1	9.7	10.3	9.7	10.1	10.5

Note: (+6.0 ft, NAVD) denotes bottom elevation, etc.

EIA-4

Table A-14. Flood Stage Frequency at Representative Locations in EIA 4 (Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.6	9.6	9.7	4.8	4.9	7.5
2	9.8	9.9	9.9	8.3	8.4	8.4
5	10.1	10.2	10.2	8.9	9.0	9.1
10	10.3	10.4	10.5	9.3	9.4	9.6
25	10.6	10.7	10.8	9.7	9.9	10.1
50	10.7	10.8	11.0	10.0	10.2	10.4
100	10.9	11.0	11.1	10.2	10.5	10.7
250	11.0	11.2	11.4	10.5	10.7	11.0
500	11.1	11.3	11.5	10.6	10.9	11.2
1000	11.1	11.4	11.6	10.7	11.0	11.3
Return Period	EIA4_7 (+4.4 ft, NAVD)			EIA4_9 (+9.0 ft, NAVD)		
(yr)	5%	50%	95%	5%	50%	95%
1	4.5	4.5	5.7	9.1	9.1	9.1
2	7.5	7.6	7.8	9.1	9.1	9.2
5	8.4	8.5	8.6	9.3	9.3	9.4
10	8.9	9.0	9.2	9.5	9.5	9.6
25	9.4	9.6	9.9	9.7	9.9	10.0
50	9.7	10.0	10.3	10.0	10.2	10.4
100	10.0	10.3	10.6	10.2	10.4	10.7
250	10.3	10.6	11.0	10.4	10.7	11.1
500	10.4	10.8	11.2	10.5	10.9	11.3
1000	10.5	11.0	11.3	10.6	11.1	11.5

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-15. Flood Stage Frequency at Representative Locations in EIA 5 (Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)			EIA5_5 (+4.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.6	9.6	9.7	3.0	3.6	8.7	4.5	4.5	4.5
2	9.9	9.9	9.9	9.5	9.6	9.6	5.8	6.1	6.4
5	10.1	10.2	10.2	9.9	10.0	10.1	7.6	7.9	8.1
10	10.3	10.4	10.5	10.2	10.3	10.4	8.5	8.8	9.2
25	10.6	10.7	10.8	10.5	10.6	10.8	9.5	9.8	10.1
50	10.7	10.9	11.0	10.7	10.8	11.0	10.0	10.2	10.5
100	10.9	11.0	11.2	10.9	11.0	11.2	10.3	10.5	10.7
250	11.0	11.2	11.4	11.0	11.2	11.4	10.5	10.7	10.9
500	11.1	11.3	11.5	11.1	11.3	11.5	10.6	10.8	11.0
1000	11.2	11.4	11.6	11.1	11.4	11.6	10.7	10.9	11.1

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-16. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.5	9.6	9.6	1.0	1.0	7.9
2	9.8	9.8	9.9	8.5	8.6	8.7
5	10.1	10.1	10.1	9.1	9.1	9.2
10	10.2	10.3	10.4	9.4	9.5	9.6
25	10.4	10.5	10.6	9.7	9.8	10.0
50	10.6	10.7	10.8	9.9	10.1	10.3
100	10.7	10.8	10.9	10.1	10.3	10.5
250	10.8	11.0	11.2	10.3	10.5	10.8
500	10.9	11.1	11.3	10.4	10.7	11.0
1000	10.9	11.2	11.4	10.5	10.8	11.1
Return Period (yr)	EIA6_5 (-0.9 ft, NAVD)			EIA6_7 (-1.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	1.0	1.0	7.9	-1.6	-1.6	7.9
2	8.6	8.6	8.7	8.5	8.6	8.7
5	9.1	9.2	9.2	9.1	9.1	9.2
10	9.4	9.5	9.6	9.4	9.5	9.6
25	9.7	9.9	10.0	9.7	9.8	10.0
50	10.0	10.1	10.3	10.0	10.1	10.3
100	10.1	10.3	10.5	10.1	10.3	10.5
250	10.3	10.5	10.8	10.3	10.5	10.8
500	10.4	10.7	11.0	10.4	10.7	11.0
1000	10.5	10.8	11.1	10.5	10.8	11.1

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-17. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)			EIA7_6 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.5	9.5	9.6	9.7	9.7	9.8	7.8	8.0	8.2
2	9.7	9.8	9.8	10.0	10.0	10.1	8.7	8.8	8.8
5	10.0	10.1	10.1	10.3	10.3	10.4	9.2	9.3	9.3
10	10.2	10.3	10.3	10.5	10.5	10.6	9.5	9.6	9.7
25	10.4	10.5	10.6	10.7	10.7	10.8	9.8	9.9	10.1
50	10.6	10.7	10.8	10.8	10.9	11.0	10.0	10.2	10.3
100	10.7	10.9	11.0	10.9	11.0	11.1	10.2	10.4	10.6
250	10.8	11.0	11.2	11.0	11.2	11.3	10.4	10.6	10.8
500	10.9	11.1	11.3	11.1	11.3	11.5	10.5	10.7	11.0
1000	11.0	11.2	11.5	11.1	11.4	11.6	10.5	10.9	11.2

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-18. Flood Stage Frequency at Representative Locations in EIA 8
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA8_1 (-1.5 ft, NAVD)			EIA8_4 (+4.5 ft, NAVD)			EIA8_6 (+9.6 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.6	9.7	9.7	6.7	6.8	6.9	9.7	9.7	9.7
2	10.0	10.0	10.1	7.4	7.5	7.6	9.7	9.7	9.7
5	10.3	10.3	10.4	8.1	8.2	8.3	9.7	9.7	9.7
10	10.5	10.5	10.6	8.5	8.6	8.8	9.7	9.7	9.7
25	10.6	10.7	10.8	8.9	9.1	9.2	9.7	9.7	9.7
50	10.8	10.8	10.9	9.2	9.3	9.5	9.7	9.8	9.8
100	10.9	11.0	11.1	9.3	9.5	9.7	9.8	9.9	9.9
250	11.0	11.2	11.4	9.5	9.7	10.0	9.8	10.0	10.1
500	11.1	11.3	11.5	9.6	9.9	10.2	9.9	10.0	10.2
1000	11.2	11.4	11.6	9.7	10.0	10.3	9.9	10.1	10.3

Note: (-1.5 ft, NAVD) denotes bottom elevation, etc.

EIA-9

Table A-19. Flood Stage Frequency at Representative Locations in EIA 9
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)			EIA9_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	6.3	6.4	6.4	10.2	10.2	10.3	7.4	7.6	7.8
2	6.5	6.5	6.6	10.7	10.7	10.8	8.5	8.7	8.8
5	6.7	6.8	6.8	11.1	11.2	11.2	9.5	9.7	9.9
10	6.9	7.0	7.1	11.3	11.4	11.5	10.2	10.3	10.4
25	7.2	7.3	7.4	11.7	11.9	12.1	10.5	10.6	10.7
50	7.3	7.5	7.6	12.0	12.2	12.3	10.7	10.8	10.9
100	7.5	7.6	7.8	12.2	12.3	12.5	10.8	11.0	11.0
250	7.6	7.8	8.1	12.3	12.5	12.6	11.0	11.1	11.1
500	7.7	8.0	8.3	12.4	12.5	12.7	11.0	11.1	11.2
1000	7.8	8.1	8.5	12.5	12.6	12.8	11.1	11.2	11.2

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-20. Flood Stage Frequency at Representative Locations in EIA 10
(Year 50, W/O Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA10_1 (-0.4 ft, NAVD)			EIA10_4 (+6.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	6.4	6.4	6.4	6.7	6.7	6.7
2	6.6	6.6	6.6	6.7	6.7	6.7
5	6.8	6.9	6.9	6.7	6.7	6.7
10	7.1	7.2	7.3	6.7	6.7	6.7
25	7.4	7.6	7.7	6.7	6.7	6.7
50	7.7	7.8	8.0	6.7	6.7	6.7
100	7.9	8.0	8.3	6.7	6.7	6.7
250	8.0	8.3	8.6	6.7	6.7	6.7
500	8.1	8.4	8.8	6.7	6.7	6.7
1000	8.2	8.6	8.9	6.7	6.7	6.7

Note: (-0.4 ft, NAVD) denotes bottom elevation, etc.

A.3 Without Project Conditions (Year 50, SLR Curve II)

EIA-1

Table A-21. Flood Stage Frequency at Representative Locations in EIA 1
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA1_1 (+0.8 ft, NAVD)			EIA1_5 (+1.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.1	10.1	9.3	9.5	9.6
2	10.3	10.3	10.4	10.1	10.1	10.2
5	10.6	10.6	10.7	10.5	10.5	10.6
10	10.8	10.8	10.9	10.7	10.8	10.9
25	11.0	11.1	11.2	11.0	11.1	11.2
50	11.2	11.3	11.4	11.2	11.3	11.4
100	11.3	11.5	11.6	11.3	11.5	11.6
250	11.5	11.6	11.8	11.5	11.6	11.8
500	11.5	11.7	11.9	11.5	11.7	11.9
1000	11.6	11.8	12.0	11.6	11.9	12.1
Return Period (yr)	EIA1_6 (+5.2 ft, NAVD)			EIA1_8 (+5.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.5	9.6	7.9	8.2	8.5
2	10.1	10.1	10.2	9.5	9.7	9.8
5	10.5	10.6	10.6	10.3	10.4	10.5
10	10.7	10.8	10.9	10.7	10.8	10.9
25	11.0	11.1	11.2	11.0	11.1	11.2
50	11.2	11.3	11.4	11.2	11.3	11.5
100	11.3	11.5	11.6	11.4	11.5	11.7
250	11.5	11.6	11.8	11.5	11.7	11.9
500	11.5	11.8	12.0	11.6	11.8	12.0
1000	11.6	11.9	12.1	11.7	11.9	12.1

Note: (+0.8 ft, NAVD) denotes bottom elevation, etc.

EIA-2

Table A-22. Flood Stage Frequency at Representative Locations in EIA 2
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)			EIA2_4 (+8.5 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	10.0	10.1	10.1	9.4	9.6	9.7	8.9	9.1	9.2
2	10.3	10.4	10.4	10.1	10.1	10.2	9.7	9.8	9.9
5	10.6	10.6	10.7	10.5	10.5	10.6	10.3	10.4	10.5
10	10.8	10.8	10.9	10.7	10.8	10.9	10.7	10.8	10.9
25	11.0	11.1	11.2	11.0	11.1	11.2	11.0	11.1	11.2
50	11.2	11.3	11.4	11.2	11.3	11.4	11.2	11.3	11.4
100	11.3	11.5	11.6	11.3	11.5	11.6	11.3	11.5	11.6
250	11.5	11.6	11.8	11.5	11.6	11.8	11.5	11.6	11.8
500	11.5	11.6	11.8	11.5	11.8	12.0	11.6	11.8	12.0
1000	11.6	11.9	12.1	11.6	11.9	12.1	11.6	11.9	12.1

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

Table A-23. Flood Stage Frequency at Representative Locations in EIA 3
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA3_1 (+6.0 ft, NAVD)			EIA3_2 (+9.1 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	6.2	6.3	6.4	9.1	9.1	9.1
2	6.9	7.0	7.1	9.1	9.1	9.1
5	7.7	7.8	7.9	9.2	9.2	9.2
10	8.2	8.3	8.5	9.2	9.3	9.4
25	8.8	9.1	9.4	9.5	9.7	9.9
50	9.3	9.6	10.0	9.8	10.0	10.2
100	9.7	10.0	10.5	10.0	10.3	10.6
250	10.0	10.5	11.1	10.3	10.6	11.2
500	10.2	10.7	11.4	10.4	10.9	11.4
1000	10.4	11.0	11.5	10.5	11.1	11.5

Note: (+6.0 ft, NAVD) denotes bottom elevation, etc.

EIA-4

Table A-24. Flood Stage Frequency at Representative Locations in EIA 4
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.1	10.1	8.4	8.6	8.7
2	10.3	10.4	10.4	9.2	9.3	9.4
5	10.6	10.6	10.7	9.8	9.9	10.0
10	10.8	10.9	10.9	10.2	10.3	10.4
25	11.0	11.1	11.2	10.6	10.7	10.8
50	11.2	11.3	11.4	10.8	10.9	11.1
100	11.3	11.5	11.6	11.0	11.1	11.3
250	11.5	11.6	11.8	11.1	11.3	11.5
500	11.5	11.7	11.9	11.2	11.4	11.6
1000	11.6	11.8	12.0	11.3	11.5	11.7
Return Period	EIA4_7 (+4.4 ft, NAVD)			EIA4_9 (+9.0 ft, NAVD)		
(yr)	5%	50%	95%	5%	50%	95%
1	7.9	8.1	8.2	9.1	9.1	9.2
2	8.9	9.0	9.1	9.4	9.4	9.4
5	9.6	9.7	9.8	9.7	9.8	9.9
10	10.0	10.1	10.3	10.0	10.1	10.2
25	10.5	10.6	10.8	10.4	10.6	10.7
50	10.7	10.9	11.1	10.7	10.9	11.0
100	10.9	11.1	11.3	10.9	11.1	11.3
250	11.1	11.3	11.5	11.1	11.3	11.5
500	11.2	11.4	11.7	11.2	11.4	11.7
1000	11.3	11.5	11.8	11.2	11.5	11.8

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-25. Flood Stage Frequency at Representative Locations in EIA 5
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)			EIA5_5 (+4.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	10.1	10.1	10.1	9.5	9.7	9.8	6.4	6.8	7.1
2	10.3	10.4	10.4	10.2	10.2	10.3	8.6	8.8	9.0
5	10.6	10.7	10.7	10.6	10.6	10.7	9.7	9.9	10.0
10	10.8	10.9	11.0	10.8	10.9	10.9	10.2	10.4	10.5
25	11.1	11.2	11.3	11.0	11.2	11.3	10.7	10.8	10.9
``50	11.2	11.3	11.4	11.2	11.3	11.4	10.9	11.0	11.0
100	11.4	11.5	11.6	11.4	11.5	11.6	11.0	11.1	11.2
250	11.5	11.6	11.8	11.5	11.6	11.8	11.1	11.2	11.3
500	11.6	11.7	11.9	11.6	11.7	11.9	11.1	11.3	11.4
1000	11.6	11.8	12.0	11.6	11.8	12.0	11.2	11.3	11.5

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-26. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.0	10.0	8.7	8.8	8.9
2	10.2	10.3	10.3	9.4	9.5	9.5
5	10.5	10.5	10.6	9.8	9.9	10.0
10	10.7	10.7	10.8	10.1	10.2	10.3
25	10.9	10.9	11.1	10.4	10.5	10.7
50	11.0	11.1	11.2	10.6	10.8	10.9
100	11.2	11.3	11.4	10.8	11.0	11.1
250	11.3	11.4	11.6	11.0	11.1	11.4
500	11.4	11.5	11.7	11.0	11.3	11.5
1000	11.4	11.6	11.8	11.1	11.4	11.6
Return Period	EIA6_5 (-0.9 ft, NAVD)			EIA6_7 (-1.7 ft, NAVD)		
(yr)	5%	50%	95%	5%	50%	95%
1	8.7	8.9	9.0	8.7	8.9	9.0
2	9.4	9.5	9.5	9.4	9.5	9.5
5	9.9	9.9	10.0	9.9	9.9	10.0
10	10.1	10.2	10.3	10.1	10.2	10.3
25	10.5	10.6	10.7	10.4	10.6	10.7
50	10.7	10.8	11.0	10.7	10.8	10.9
100	10.8	11.0	11.2	10.8	11.0	11.1
250	11.0	11.2	11.4	11.0	11.2	11.4
500	11.1	11.3	11.6	11.1	11.3	11.5
1000	11.1	11.4	11.7	11.1	11.4	11.7

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-27. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)			EIA7_6 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.9	10.0	10.0	10.0	10.1	10.1	8.9	9.1	9.1
2	10.2	10.2	10.3	10.3	10.4	10.4	9.5	9.6	9.6
5	10.5	10.5	10.6	10.6	10.7	10.7	9.9	10.0	10.1
10	10.7	10.7	10.8	10.8	10.9	10.9	10.2	10.3	10.4
25	10.9	11.0	11.1	11.0	11.1	11.2	10.5	10.6	10.7
50	11.1	11.2	11.3	11.2	11.3	11.4	10.7	10.8	11.0
100	11.2	11.3	11.4	11.3	11.4	11.5	10.9	11.0	11.2
250	11.3	11.5	11.7	11.4	11.5	11.7	11.0	11.2	11.4
500	11.4	11.6	11.8	11.5	11.6	11.8	11.1	11.3	11.6
1000	11.5	11.7	11.9	11.5	11.7	11.9	11.2	11.5	11.7

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-28. Flood Stage Frequency at Representative Locations in EIA 8
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA8_1 (-1.5 ft, NAVD)			EIA8_4 (+4.5 ft, NAVD)			EIA8_6 (+9.6 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.8	9.9	10.0	7.6	7.7	7.8	9.7	9.7	9.7
2	10.2	10.3	10.3	8.2	8.2	8.3	9.7	9.7	9.7
5	10.5	10.6	10.6	8.7	8.8	8.9	9.7	9.7	9.7
10	10.7	10.7	10.8	9.1	9.2	9.3	9.7	9.7	9.7
25	10.8	10.9	11.0	9.5	9.6	9.8	9.7	9.7	9.8
50	11.0	11.0	11.1	9.7	9.9	10.0	9.7	9.8	9.9
100	11.1	11.2	11.3	9.9	10.1	10.2	9.8	10.0	10.1
250	11.2	11.3	11.5	10.0	10.3	10.5	9.9	10.1	10.4
500	11.2	11.4	11.7	10.1	10.4	10.7	10.0	10.2	10.6
1000	11.3	11.5	11.8	10.2	10.5	10.8	10.1	10.4	10.7

Note: (-1.5 ft, NAVD) denotes bottom elevation, etc.

EIA-9

Table A-29. Flood Stage Frequency at Representative Locations in EIA 9
(Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)			EIA9_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	6.8	6.8	6.8	10.2	10.3	10.4	8.3	8.4	8.5
2	6.9	7.0	7.0	10.7	10.8	10.8	9.0	9.1	9.2
5	7.2	7.2	7.3	11.1	11.2	11.2	9.8	10.0	10.2
10	7.4	7.5	7.6	11.3	11.4	11.5	10.4	10.5	10.6
25	7.7	7.8	7.9	11.6	11.7	11.9	10.7	10.7	10.8
50	7.9	8.0	8.2	11.8	12.0	12.2	10.8	10.9	11.1
100	8.0	8.2	8.4	12.0	12.3	12.4	10.9	11.1	11.2
250	8.2	8.4	8.7	12.2	12.4	12.6	11.1	11.2	11.2
500	8.3	8.6	8.9	12.4	12.5	12.7	11.2	11.2	11.3
1000	8.3	8.7	9.1	12.4	12.6	12.8	11.2	11.3	11.3

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-30. Flood Stage Frequency at Representative Locations in EIA 10 (Year 50, W/O Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA10_1 (-0.4 ft, NAVD)			EIA10_4 (+6.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	6.8	6.8	6.9	6.7	6.7	6.7
2	7.0	7.1	7.1	6.7	6.7	6.7
5	7.3	7.4	7.4	6.7	6.7	6.7
10	7.6	7.7	7.8	6.7	6.7	6.7
25	8.0	8.2	8.3	6.7	6.7	6.7
50	8.3	8.4	8.6	6.7	6.7	6.7
100	8.5	8.7	8.9	6.7	6.7	6.7
250	8.6	8.9	9.2	6.7	6.7	6.7
500	8.7	9.1	9.5	6.7	6.7	6.7
1000	8.8	9.2	9.6	6.7	6.7	6.7

Note: (-0.4 ft, NAVD) denotes bottom elevation, etc.

A.4 Without Project Conditions (Year 50, SLR Curve III)

EIA-1

Table A-31. Flood Stage Frequency at Representative Locations in EIA 1 (Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA1_1 (+0.8 ft, NAVD)			EIA1_5 (+1.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.5	11.6	11.6	11.6	11.6	11.6
2	11.8	11.9	11.9	11.8	11.9	11.9
5	12.1	12.1	12.2	12.1	12.2	12.2
10	12.3	12.4	12.4	12.3	12.4	12.4
25	12.5	12.6	12.7	12.6	12.7	12.8
50	12.7	12.8	12.9	12.7	12.8	13.0
100	12.8	13.0	13.1	12.8	13.0	13.1
250	13.0	13.1	13.3	13.0	13.1	13.3
500	13.0	13.2	13.4	13.1	13.2	13.4
1000	13.1	13.3	13.5	13.1	13.4	13.5
Return Period (yr)	EIA1_6 (+5.2 ft, NAVD)			EIA1_8 (+5.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.7	11.6	11.7	11.7
2	11.9	11.9	11.9	11.9	11.9	12.0
5	12.1	12.2	12.2	12.2	12.2	12.3
10	12.3	12.4	12.5	12.4	12.4	12.5
25	12.6	12.7	12.8	12.6	12.7	12.8
50	12.7	12.9	13.0	12.8	12.9	13.0
100	12.9	13.0	13.1	12.9	13.0	13.2
250	13.0	13.2	13.4	13.0	13.2	13.4
500	13.1	13.3	13.5	13.1	13.3	13.5
1000	13.2	13.4	13.6	13.2	13.4	13.6

Note: (+0.8 ft, NAVD) denotes bottom elevation, etc.

EIA-2

Table A-32. Flood Stage Frequency at Representative Locations in EIA 2
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)			EIA2_4 (+8.5 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.7	11.6	11.6	11.6	11.6	11.7	11.7
2	11.9	11.9	11.9	11.9	11.9	11.9	11.9	11.9	12.0
5	12.1	12.2	12.2	12.1	12.2	12.2	12.2	12.2	12.3
10	12.3	12.4	12.5	12.3	12.4	12.5	12.4	12.4	12.5
25	12.6	12.7	12.8	12.6	12.7	12.8	12.6	12.7	12.8
50	12.7	12.8	13.0	12.7	12.9	13.0	12.8	12.9	13.0
100	12.9	13.0	13.1	12.9	13.0	13.1	12.9	13.0	13.2
250	13.0	13.1	13.3	13.0	13.2	13.3	13.0	13.2	13.4
500	13.1	13.2	13.4	13.1	13.3	13.5	13.1	13.3	13.5
1000	13.1	13.3	13.5	13.1	13.4	13.6	13.2	13.4	13.6

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

Table A-33. Flood Stage Frequency at Representative Locations in EIA 3
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA3_1 (+6.0 ft, NAVD)			EIA3_2 (+9.1 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.6	10.7	10.8	10.6	10.7	10.8
2	11.2	11.3	11.4	11.2	11.3	11.4
5	11.8	11.9	12.0	11.8	11.9	12.0
10	12.1	12.2	12.3	12.1	12.2	12.3
25	12.4	12.6	12.7	12.4	12.6	12.7
50	12.6	12.8	12.9	12.6	12.8	12.9
100	12.8	13.0	13.1	12.8	13.0	13.1
250	13.0	13.2	13.4	13.0	13.2	13.4
500	13.0	13.3	13.5	13.0	13.3	13.5
1000	13.1	13.4	13.6	13.1	13.4	13.6

Note: (+6.0 ft, NAVD) denotes bottom elevation, etc.

EIA-4

Table A-34. Flood Stage Frequency at Representative Locations in EIA 4
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.6	11.2	11.3	11.3
2	11.8	11.8	11.9	11.5	11.6	11.6
5	12.1	12.1	12.1	11.8	11.8	11.9
10	12.2	12.3	12.3	12.0	12.0	12.1
25	12.4	12.5	12.6	12.2	12.3	12.5
50	12.6	12.7	12.8	12.4	12.5	12.7
100	12.7	12.8	13.0	12.5	12.7	12.9
250	12.8	13.0	13.2	12.7	12.9	13.2
500	12.9	13.1	13.3	12.8	13.1	13.3
1000	13.0	13.2	13.5	12.9	13.2	13.5
Return Period	EIA4_7 (+4.4 ft, NAVD)			EIA4_9 (+9.0 ft, NAVD)		
(yr)	5%	50%	95%	5%	50%	95%
1	11.2	11.3	11.3	11.2	11.3	11.3
2	11.6	11.6	11.6	11.6	11.6	11.6
5	11.8	11.9	11.9	11.8	11.9	11.9
10	12.0	12.1	12.1	12.0	12.1	12.1
25	12.3	12.4	12.5	12.3	12.4	12.5
50	12.4	12.6	12.7	12.5	12.6	12.7
100	12.6	12.8	12.9	12.6	12.8	12.9
250	12.7	13.0	13.2	12.8	13.0	13.2
500	12.8	13.1	13.4	12.9	13.1	13.4
1000	12.9	13.2	13.5	12.9	13.3	13.5

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-35. Flood Stage Frequency at Representative Locations in EIA 5
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)			EIA5_5 (+4.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.6	11.6	11.6	11.6	11.2	11.2	11.2
2	11.8	11.9	11.9	11.8	11.8	11.9	11.4	11.4	11.4
5	12.1	12.1	12.1	12.0	12.1	12.1	11.5	11.6	11.6
10	12.2	12.3	12.3	12.2	12.2	12.3	11.6	11.7	11.7
25	12.4	12.5	12.6	12.4	12.5	12.5	11.8	11.8	11.9
50	12.6	12.7	12.8	12.5	12.6	12.7	11.9	12.0	12.1
100	12.7	12.8	13.0	12.6	12.8	12.9	12.0	12.1	12.3
250	12.8	13.0	13.2	12.7	12.9	13.1	12.1	12.3	12.5
500	12.9	13.1	13.3	12.8	13.0	13.2	12.2	12.4	12.6
1000	13.0	13.2	13.4	12.9	13.1	13.3	12.2	12.5	12.8

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-36. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.4	11.4	11.4	11.1	11.1	11.1
2	11.6	11.7	11.7	11.4	11.4	11.5
5	11.9	11.9	12.0	11.7	11.8	11.8
10	12.1	12.1	12.2	11.9	12.0	12.1
25	12.3	12.4	12.5	12.2	12.3	12.4
50	12.5	12.6	12.7	12.4	12.5	12.7
100	12.6	12.8	12.9	12.6	12.7	12.9
250	12.8	12.9	13.1	12.7	12.9	13.1
500	12.8	13.1	13.3	12.8	13.0	13.2
1000	12.9	13.2	13.4	12.9	13.1	13.4
Return Period (yr)	EIA6_5 (-0.9 ft, NAVD)			EIA6_7 (-1.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.1	11.1	11.2	11.1	11.1	11.2
2	11.4	11.4	11.5	11.4	11.4	11.5
5	11.7	11.8	11.9	11.7	11.8	11.8
10	12.0	12.0	12.1	11.9	12.0	12.1
25	12.2	12.4	12.5	12.2	12.3	12.4
50	12.4	12.6	12.7	12.4	12.5	12.7
100	12.6	12.7	12.9	12.6	12.7	12.9
250	12.7	12.9	13.1	12.7	12.9	13.1
500	12.8	13.0	13.3	12.8	13.0	13.2
1000	12.9	13.1	13.4	12.9	13.1	13.4

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-37. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)			EIA7_6 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	11.4	11.5	11.5	11.3	11.3	11.4	11.1	11.1	11.2
2	11.7	11.7	11.8	11.6	11.6	11.6	11.4	11.5	11.5
5	11.9	12.0	12.0	11.9	11.9	12.0	11.8	11.8	11.9
10	12.1	12.2	12.3	12.1	12.1	12.2	12.0	12.1	12.2
25	12.4	12.5	12.6	12.3	12.4	12.5	12.3	12.4	12.5
50	12.5	12.6	12.8	12.5	12.6	12.7	12.4	12.6	12.7
100	12.7	12.8	12.9	12.6	12.8	12.9	12.6	12.8	12.9
250	12.8	13.0	13.2	12.8	12.9	13.1	12.7	12.9	13.1
500	12.9	13.1	13.3	12.8	13.0	13.3	12.8	13.0	13.3
1000	12.9	13.2	13.4	12.9	13.1	13.5	12.9	13.2	13.5

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-38. Flood Stage Frequency at Representative Locations in EIA 8
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA8_1 (-1.5 ft, NAVD)			EIA8_4 (+4.5 ft, NAVD)			EIA8_6 (+9.6 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	10.3	10.4	10.4	9.7	9.7	9.8	10.0	10.0	10.0
2	10.7	10.8	10.9	10.1	10.1	10.2	10.2	10.3	10.3
5	11.2	11.3	11.3	10.5	10.6	10.7	10.5	10.6	10.6
10	11.4	11.5	11.5	10.8	10.9	11.0	10.8	10.9	11.0
25	11.6	11.7	11.7	11.1	11.2	11.3	11.1	11.2	11.3
50	11.7	11.8	11.9	11.3	11.4	11.5	11.3	11.4	11.5
100	11.8	11.9	12.0	11.4	11.6	11.7	11.4	11.5	11.7
250	11.9	12.0	12.3	11.6	11.7	11.9	11.5	11.7	11.9
500	11.9	12.1	12.4	11.6	11.8	12.1	11.6	11.8	12.1
1000	12.0	12.3	12.6	11. .	11.9	12.2	11.7	11.9	12.2

Note: (-1.5 ft, NAVD) denotes bottom elevation, etc.

EIA-9

Table A-39. Flood Stage Frequency at Representative Locations in EIA 9
(Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)			EIA9_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	8.3	8.4	8.4	10.0	10.0	10.1	9.6	9.6	9.7
2	8.6	8.7	8.7	10.5	10.6	10.8	10.0	10.0	10.1
5	9.0	9.1	9.1	11.3	11.4	11.5	10.5	10.6	10.7
10	9.3	9.5	9.6	11.6	11.6	11.7	10.9	11.0	11.1
25	9.8	10.1	10.3	11.8	11.8	11.9	11.2	11.3	11.4
50	10.2	10.5	10.8	11.9	12.0	12.0	11.3	11.5	11.6
100	10.5	10.9	11.3	12.0	12.1	12.2	11.5	11.6	11.7
250	10.9	11.3	12.1	12.1	12.2	12.4	11.6	11.8	12.0
500	11.0	11.7	12.5	12.1	12.3	12.5	11.7	11.9	12.1
1000	11.2	12.0	12.6	12.2	12.4	12.6	11.7	12.0	12.2

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-40. Flood Stage Frequency at Representative Locations in EIA 10 (Year 50, W/O Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA10_1 (-0.4 ft, NAVD)			EIA10_4 (+6.7 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	8.6	8.6	8.7	6.7	6.7	6.7
2	8.9	9.0	9.0	6.7	6.7	6.7
5	9.4	9.5	9.6	6.7	6.7	6.7
10	9.8	9.9	10.1	6.7	6.7	6.7
25	10.4	10.6	10.8	6.7	6.7	6.7
50	10.7	11.0	11.3	6.7	6.7	6.7
100	11.0	11.4	11.8	6.7	6.7	6.7
250	11.3	11.8	12.4	6.7	6.7	6.7
500	11.5	12.1	12.7	6.7	6.7	6.7
1000	11.7	12.3	12.9	6.7	6.7	6.7

Note: (-0.4 ft, NAVD) denotes bottom elevation, etc.

A.5 With Project Condition (Year 0)

EIA-1

Table A-41. Flood Stage Frequency at Representative Locations in EIA 1 (Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88		
	EIA1_1 (+0.8 ft, NAVD)		
	5%	50%	95%
1	9.3	9.4	9.4
2	9.6	9.6	9.7
5	9.9	9.9	10.0
10	10.1	10.1	10.2
25	10.3	10.4	10.5
50	10.5	10.6	10.7
100	10.6	10.8	10.9
250	10.8	10.9	11.1
500	10.8	11.0	11.2
1000	10.9	11.1	11.3

Note: (-0.4 ft, NAVD) denotes bottom elevation, etc.

EIA-2

Table A-42. Flood Stage Frequency at Representative Locations in EIA 2
(Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	2.9	3.0	3.0
2	9.6	9.7	9.7	3.3	3.4	3.4
5	9.9	9.9	10.0	3.9	4.0	4.1
10	10.1	10.2	10.2	4.4	4.5	4.7
25	10.3	10.4	10.5	4.9	5.0	5.1
50	10.5	10.6	10.8	5.0	5.2	5.5
100	10.6	10.8	10.9	5.3	5.5	5.6
250	10.8	10.9	11.1	5.6	5.7	5.7
500	10.9	11.0	11.2	5.6	5.7	5.8
1000	10.9	11.1	11.4	5.7	5.8	5.8

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

No storm-induced inundation water is computed at EIA3_1 and EIA3_2 as these two stations are located landward of the protective levee.

EIA-4

Table A-43. Flood Stage Frequency at Representative Locations in EIA 4
(Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	4.9	4.9	5.0
2	9.6	9.7	9.7	7.9	8.1	8.2
5	9.9	9.9	10.0	8.7	8.8	8.9
10	10.1	10.1	10.2	9.1	9.3	9.4
25	10.3	10.4	10.5	9.6	9.9	10.1
50	10.5	10.6	10.8	10.0	10.3	10.5
100	10.6	10.8	10.9	10.3	10.6	10.8
250	10.8	10.9	11.2	10.6	10.8	11.1
500	10.8	11.0	11.3	10.7	11.0	11.3
1000	10.9	11.2	11.4	10.8	11.1	11.4

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-44. Flood Stage Frequency at Representative Locations in EIA 5
(Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.4	9.4	9.4	2.3	2.4	2.4
2	9.6	9.7	9.7	2.9	3.1	4.0
5	9.9	10.0	10.0	9.3	9.4	9.5
10	10.1	10.2	10.2	9.6	9.7	9.8
25	10.4	10.5	10.6	9.9	10.1	10.3
50	10.5	10.6	10.8	10.2	10.4	10.5
100	10.7	10.8	10.9	10.4	10.6	10.8
250	10.8	11.0	11.2	10.6	10.8	11.1
500	10.9	11.1	11.3	10.7	11.0	11.3
1000	10.9	11.2	11.4	10.8	11.1	11.4

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-45. Flood Stage Frequency at Representative Locations in EIA 6
(Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88								
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)			EIA6_5 (-0.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	0.9	0.9	1.0	1.0	1.0	1.0
2	9.6	9.7	9.7	9.0	9.1	9.2	9.0	9.1	9.2
5	9.9	10.0	10.0	9.6	9.7	9.7	9.6	9.7	9.7
10	10.1	10.2	10.2	9.9	10.0	10.1	9.9	10.0	10.1
25	10.4	10.5	10.6	10.3	10.4	10.5	10.3	10.4	10.6
50	10.5	10.6	10.8	10.5	10.6	10.8	10.5	10.6	10.8
100	10.7	10.8	11.0	10.6	10.8	11.0	10.7	10.8	11.0
250	10.8	11.0	11.2	10.8	11.0	11.2	10.8	11.0	11.2
500	10.9	11.1	11.3	10.9	11.1	11.3	10.9	11.1	11.3
1000	11.0	11.2	11.4	11.0	11.2	11.4	11.0	11.2	11.5

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-46. Flood Stage Frequency at Representative Locations in EIA 7 (Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.4	9.4	9.4	9.6	9.7	9.7
2	9.6	9.7	9.7	9.9	10.0	10.0
5	9.9	10.0	10.0	10.3	10.3	10.4
10	10.1	10.2	10.2	10.5	10.6	10.6
25	10.4	10.4	10.6	10.8	10.8	10.9
50	10.5	10.6	10.8	10.9	11.0	11.1
100	10.7	10.8	10.9	11.0	11.1	11.3
250	10.8	10.9	11.1	11.2	11.3	11.4
500	10.9	11.1	11.3	11.2	11.4	11.6
1000	10.9	11.2	11.4	11.3	11.5	11.7

Note: (-1.5 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-47. Flood Stage Frequency at Representative Locations in EIA 8 (Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88		
	EIA8_1 (-1.5 ft, NAVD)		
	5%	50%	95%
1	9.6	9.7	9.08
2	10.0	10.1	10.1
5	10.3	10.4	10.4
10	10.5	10.6	10.7
25	10.8	10.9	11.0
50	10.9	11.0	11.1
100	11.1	11.2	11.3
250	11.2	11.3	11.5
500	11.2	11.4	11.6
1000	11.3	11.5	11.7

Note: (-1.5 ft, NAVD) denotes bottom elevation.

EIA-9

Table A-48. Flood Stage Frequency at Representative Locations in EIA 9 (Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88					
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	5.6	5.6	5.6	10.6	10.7	10.7
2	5.8	5.8	5.8	11.1	11.2	11.3
5	6.0	6.0	6.1	11.9	12.1	12.2
10	6.3	6.4	6.6	12.3	12.4	12.4
25	6.7	6.8	7.0	12.5	12.5	12.6
50	6.9	7.1	7.3	12.6	12.7	12.7
100	7.1	7.3	7.5	12.7	12.7	12.8
250	7.3	7.5	7.8	12.8	12.8	12.9
500	7.4	7.7	8.0	12.8	12.9	12.9
1000	7.5	7.8	8.1	12.8	12.9	12.9

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-49. Flood Stage Frequency at Representative Locations in EIA 10 (Year 0, W/ Project)

Return Period (yr)	WSE in ft, NAVD88		
	EIA10_1 (-0.4 ft, NAVD)		
	5%	50%	95%
1	5.6	5.6	5.6
2	5.8	5.8	5.8
5	6.0	6.1	6.1
10	6.3	6.5	6.6
25	6.7	6.9	7.0
50	6.9	7.2	7.3
100	7.2	7.4	7.5
250	7.3	7.6	7.9
500	7.4	7.7	8.0
1000	7.5	7.9	8.2

Note: (-0.4 ft, NAVD) denotes bottom elevation

A.6 With Project Conditions (Year 50, SLR Curve I)

EIA-1

Table A-50. Flood Stage Frequency at Representative Locations in EIA 1 (Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88		
	EIA1_1 (+0.8 ft, NAVD)		
	5%	50%	95%
1	9.5	9.6	9.6
2	9.8	9.8	9.9
5	10.1	10.1	10.1
10	10.2	10.3	10.4
25	10.5	10.6	10.7
50	10.7	10.8	10.9
100	10.8	11.0	11.1
250	10.9	11.1	11.3
500	11.0	11.2	11.5
1000	11.1	11.3	11.5

Note: (+0.8 ft, NAVD) denotes bottom elevation

EIA-2

Table A-51. Flood Stage Frequency at Representative Locations in EIA 2 (Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.5	9.6	9.6	3.0	3.0	3.1
2	9.8	9.8	9.9	3.4	3.4	3.5
5	10.1	10.1	10.2	3.9	4.1	4.2
10	10.3	10.3	10.4	4.5	4.6	4.8
25	10.5	10.6	10.7	4.9	5.1	5.2
50	10.7	10.8	10.9	5.1	5.3	5.6
100	10.8	11.0	11.1	5.4	5.7	5.8
250	11.0	11.1	11.3	5.7	5.8	5.8
500	11.0	11.2	11.5	5.7	5.8	5.9
1000	11.1	11.4	11.6	5.8	5.9	5.9

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

No storm-induced inundation water is computed at EIA3_1 and EIA3_2 as these two stations are located landward of the protective levee.

EIA-4

Table A-52. Flood Stage Frequency at Representative Locations in EIA 4
(Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.5	9.6	9.6	9.2	9.3	9.3
2	9.8	9.8	9.9	9.6	9.7	9.8
5	10.1	10.1	10.2	10.0	10.1	10.2
10	10.3	10.3	10.4	10.3	10.4	10.5
25	10.5	10.6	10.7	10.6	10.7	10.8
50	10.7	10.8	10.9	10.8	10.9	11.0
100	10.8	11.0	11.1	10.9	11.1	11.2
250	11.0	11.1	11.3	11.0	11.2	11.4
500	11.0	11.3	11.5	11.1	11.3	11.5
1000	11.1	11.4	11.6	11.2	11.4	11.6

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-53. Flood Stage Frequency at Representative Locations in EIA 5
(Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.5	9.6	9.6	9.4	9.5	9.5
2	9.8	9.8	9.9	9.8	9.8	9.9
5	10.1	10.1	10.2	10.1	10.2	10.2
10	10.3	10.3	10.4	10.3	10.4	10.5
25	10.5	10.6	10.7	10.6	10.7	10.8
50	10.7	10.8	10.9	10.8	10.9	11.0
100	10.8	11.0	11.1	10.9	11.1	11.2
250	11.0	11.1	11.3	11.1	11.2	11.4
500	11.0	11.2	11.5	11.1	11.3	11.5
1000	11.1	11.4	11.6	11.2	11.4	11.7

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-54. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88								
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)			EIA6_5 (-0.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	9.5	9.5	9.6	5.8	5.8	7.7	1.2	1.3	7.7
2	9.8	9.8	9.8	8.8	8.9	9.0	8.8	8.9	9.0
5	10.0	10.1	10.1	9.4	9.5	9.6	9.4	9.5	9.6
10	10.2	10.3	10.4	9.8	9.9	10.0	9.8	9.9	10.0
25	10.5	10.6	10.7	10.2	10.3	10.4	10.2	10.3	10.5
50	10.6	10.8	10.9	10.4	10.6	10.7	10.4	10.6	10.7
100	10.8	10.9	11.0	10.6	10.8	10.9	10.6	10.8	10.9
250	10.9	11.1	11.3	10.7	10.9	11.2	10.7	11.0	11.2
500	11.0	11.2	11.4	10.8	11.1	11.4	10.8	11.1	11.4
1000	11.0	11.3	11.5	10.9	11.2	11.5	10.9	11.2	11.5

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-55. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.4	9.4	9.5	9.2	9.3	9.3
2	9.7	9.7	9.7	9.6	9.6	9.6
5	9.9	10.0	10.0	9.9	9.9	10.0
10	10.1	10.2	10.3	10.1	10.2	10.3
25	10.4	10.5	10.6	10.4	10.5	10.7
50	10.6	10.7	10.9	10.6	10.7	10.9
100	10.7	10.9	11.0	10.8	10.9	11.1
250	10.9	11.1	11.3	10.9	11.1	11.4
500	11.0	11.2	11.4	11.0	11.2	11.6
1000	11.0	11.3	11.6	11.1	11.4	11.7

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-56. Flood Stage Frequency at Representative Locations in EIA 8 (Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88		
	EIA8_1 (-1.5 ft, NAVD)		
	5%	50%	95%
1	9.2	9.3	9.3
2	9.6	9.6	9.6
5	9.9	9.9	10.0
10	10.1	10.2	10.3
25	10.4	10.5	10.6
50	10.6	10.7	10.8
100	10.7	10.8	11.0
250	10.8	11.0	11.3
500	10.9	11.2	11.5
1000	11.0	11.3	11.6

Note: (-1.5 ft, NAVD) denotes bottom elevation , etc.

EIA-9

Table A-57. Flood Stage Frequency at Representative Locations in EIA 9 (Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88					
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.3	9.4	9.4	9.5	9.6	9.6
2	9.7	9.7	9.7	9.9	9.9	10.0
5	10.0	10.0	10.1	10.2	10.3	10.4
10	10.2	10.3	10.4	10.5	10.6	10.7
25	10.5	10.6	10.7	10.9	11.0	11.1
50	10.7	10.8	11.0	11.1	11.2	11.4
100	10.9	11.0	11.2	11.3	11.4	11.6
250	11.0	11.2	11.5	11.4	11.6	11.9
500	11.1	11.3	11.6	11.5	11.7	12.0
1000	11.2	11.5	11.8	11.6	11.9	12.2

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-58. Flood Stage Frequency at Representative Locations in EIA 10 (Year 50, W/ Project, SLR Curve I)

Return Period (yr)	WSE in ft, NAVD88		
	EIA10_1 (-0.4 ft, NAVD)		
	5%	50%	95%
1	9.4	9.4	9.5
2	9.7	9.7	9.8
5	10.0	10.1	10.2
10	10.3	10.3	10.4
25	10.6	10.7	10.8
50	10.7	10.9	11.0
100	10.9	11.1	11.2
250	11.1	11.3	11.5
500	11.1	11.4	11.8
1000	11.2	11.5	12.0

Note: (-0.4 ft, NAVD) denotes bottom elevation

A.7 With Project Conditions (Year 50, SLR Curve II)

EIA-1

Table A-59. Flood Stage Frequency at Representative Locations in EIA 1 (Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88		
	EIA1_1 (+0.8 ft, NAVD)		
	5%	50%	95%
1	10.0	10.0	10.1
2	10.3	10.3	10.3
5	10.5	10.6	10.6
10	10.7	10.8	10.9
25	11.0	11.1	11.2
50	11.2	11.3	11.4
100	11.3	11.4	11.6
250	11.4	11.6	11.8
500	11.5	11.7	11.9
1000	11.6	11.8	12.0

Note: (+0.8 ft, NAVD) denotes bottom elevation

EIA-2

Table A-60. Flood Stage Frequency at Representative Locations in EIA 2
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.0	10.1	3.0	3.1	3.1
2	10.3	10.3	10.3	3.4	3.5	3.5
5	10.6	10.6	10.7	4.0	4.1	4.3
10	10.7	10.8	10.9	4.6	4.7	4.9
25	11.0	11.1	11.2	5.0	5.1	5.3
50	11.2	11.3	11.4	5.2	5.4	5.7
100	11.3	11.5	11.6	5.5	5.7	5.9
250	11.5	11.6	11.8	5.7	5.9	5.9
500	11.5	11.7	11.9	5.8	5.9	6.0
1000	11.6	11.8	12.1	5.9	6.0	6.0

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

No storm-induced inundation water is computed at EIA3_1 and EIA3_2 as these two stations are located landward of the protective levee.

EIA-4

Table A-61. Flood Stage Frequency at Representative Locations in EIA 4
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA4_1 (+1.0 ft, NAVD)			EIA4_4 (+4.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.0	10.1	9.9	10.0	10.0
2	10.3	10.3	10.3	10.3	10.3	10.4
5	10.6	10.6	10.7	10.6	10.6	10.7
10	10.8	10.8	10.9	10.8	10.9	11.0
25	11.0	11.1	11.2	11.1	11.2	11.3
50	11.2	11.3	11.4	11.2	11.4	11.5
100	11.3	11.5	11.6	11.4	11.5	11.6
250	11.5	11.6	11.8	11.5	11.7	11.9
500	11.5	11.7	12.0	11.6	11.8	12.0
1000	11.6	11.8	12.1	11.6	11.9	12.1

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-5

Table A-62. Flood Stage Frequency at Representative Locations in EIA 5
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	10.0	10.0	10.1	10.0	10.0	10.0
2	10.3	10.3	10.3	10.3	10.3	10.4
5	10.5	10.6	10.6	10.6	10.7	10.7
10	10.7	10.8	10.9	10.8	10.9	11.0
25	11.0	11.1	11.2	11.1	11.2	11.3
50	11.2	11.3	11.4	11.3	11.4	11.5
100	11.3	11.5	11.6	11.4	11.5	11.7
250	11.5	11.6	11.8	11.5	11.7	11.9
500	11.5	11.7	12.0	11.6	11.8	12.0
1000	11.6	11.9	12.1	11.7	11.9	12.1

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-63. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88								
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)			EIA6_5 (-0.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	10.0	10.0	10.0	8.9	9.1	9.2	8.9	9.0	9.2
2	10.2	10.3	10.3	9.7	9.7	9.8	9.7	9.7	9.8
5	10.5	10.6	10.6	10.2	10.2	10.3	10.2	10.2	10.3
10	10.7	10.8	10.8	10.4	10.5	10.6	10.4	10.5	10.6
25	11.0	11.0	11.2	10.8	10.9	11.0	10.8	10.9	11.0
50	11.1	11.2	11.4	11.0	11.1	11.3	11.0	11.1	11.3
100	11.3	11.4	11.6	11.1	11.3	11.5	11.1	11.3	11.5
250	11.4	11.6	11.8	11.3	11.5	11.7	11.3	11.5	11.8
500	11.5	11.7	11.9	11.4	11.6	11.9	11.4	11.7	12.0
1000	11.6	11.8	12.0	11.5	11.8	12.0	11.5	11.8	12.1

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-64. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.9	9.9	9.9	9.8	9.8	9.8
2	10.1	10.2	10.2	10.1	10.1	10.2
5	10.4	10.5	10.5	10.4	10.5	10.5
10	10.6	10.7	10.8	10.6	10.7	10.8
25	10.9	11.0	11.1	10.9	11.0	11.2
50	11.1	11.2	11.4	11.1	11.3	11.4
100	11.2	11.4	11.6	11.3	11.5	11.6
250	11.4	11.6	11.8	11.4	11.7	11.9
500	11.5	11.7	11.9	11.5	11.8	12.0
1000	11.5	11.8	12.1	11.6	11.9	12.2

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-65. Flood Stage Frequency at
Representative Locations in EIA 8
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88		
	EIA8_1 (-1.5 ft, NAVD)		
	5%	50%	95%
1	9.7	9.8	9.8
2	10.0	10.1	10.1
5	10.4	10.4	10.5
10	10.6	10.6	10.7
25	10.8	11.0	11.1
50	11.0	11.2	11.4
100	11.2	11.4	11.6
250	11.4	11.6	11.9
500	11.5	11.7	12.1
1000	11.5	11.9	12.2

Note: (-1.5 ft, NAVD) denotes bottom

EIA-9

Table A-66. Flood Stage Frequency at Representative Locations in EIA 9
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88					
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	9.8	9.9	9.9	10.0	10.1	10.1
2	10.2	10.2	10.2	10.3	10.4	10.4
5	10.5	10.5	10.6	10.7	10.8	10.8
10	10.7	10.8	10.9	11.0	11.1	11.2
25	11.0	11.1	11.3	11.3	11.4	11.6
50	11.2	11.4	11.5	11.5	11.7	11.8
100	11.4	11.5	11.7	11.7	11.9	12.1
250	11.5	11.7	12.0	11.9	12.1	12.3
500	11.6	11.9	12.2	12.0	12.2	12.4
1000	11.7	12.0	12.3	12.0	12.3	12.5

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-67. Flood Stage Frequency at
Representative Locations in EIA 10
(Year 50, W/ Project, SLR Curve II)

Return Period (yr)	WSE in ft, NAVD88		
	EIA10_1 (-0.4 ft, NAVD)		
	5%	50%	95%
1	9.9	9.9	10.0
2	10.2	10.3	10.3
5	10.5	10.6	10.7
10	10.8	10.8	10.9
25	11.1	11.2	11.3
50	11.3	11.4	11.6
100	11.4	11.6	11.8
250	11.6	11.8	12.0
500	11.7	11.9	12.2
1000	11.7	12.0	12.3

Note: (-0.4 ft, NAVD) denotes bottom elevation

A.8 With Project Conditions (Year 50, SLR Curve III)

EIA-1

Table A-68. Flood Stage Frequency at Representative Locations in EIA 1 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88		
	EIA1_1 (+0.8 ft, NAVD)		
	5%	50%	95%
1	11.5	11.6	11.6
2	11.8	11.8	11.9
5	12.1	12.1	12.2
10	12.3	12.4	12.4
25	12.5	12.6	12.8
50	12.7	12.8	13.0
100	12.8	13.0	13.1
250	13.0	13.1	13.3
500	13.1	13.2	13.5
1000	13.1	13.4	13.6

Note: (+0.8 ft, NAVD) denotes bottom

EIA-2

Table A-69. Flood Stage Frequency at Representative Locations in EIA 2 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA2_1 (+2.8 ft, NAVD)			EIA2_2 (+0.0 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.6	3.3	3.4	3.4
2	11.8	11.9	11.9	3.7	3.8	3.8
5	12.1	12.2	12.2	4.3	4.4	4.5
10	12.3	12.4	12.5	4.8	5.0	5.2
25	12.6	12.7	12.8	5.3	5.4	5.6
50	12.7	12.8	13.0	5.5	5.7	6.0
100	12.9	13.0	13.1	5.7	6.1	6.2
250	13.0	13.2	13.4	6.1	6.2	6.3
500	13.1	13.3	13.5	6.2	6.3	6.3
1000	13.1	13.4	13.6	6.2	6.3	6.4

Note: (+2.8 ft, NAVD) denotes bottom elevation, etc.

EIA-3

No storm-induced inundation water is computed at EIA3_1 and EIA3_2 as these two stations located landward of the protective levee.

EIA-4

Table 70. Flood Stage Frequency at Representative Locations in EIA 4 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88		
	EIA4_1 (+1.0 ft, NAVD)		
	5%	50%	95%
1	11.5	11.6	11.6
2	11.8	11.9	11.9
5	12.1	12.2	12.2
10	12.3	12.4	12.5
25	12.6	12.7	12.8
50	12.7	12.9	13.0
100	12.9	13.0	13.1
250	13.0	13.2	13.4
500	13.1	13.3	13.5
1000	13.1	13.4	13.6

Note: (+1.0 ft, NAVD) denotes bottom

EIA-5

Table A-71. Flood Stage Frequency at Representative Locations in EIA 5

Return Period (yr)	WSE in ft, NAVD88					
	EIA5_1 (+1.0 ft, NAVD)			EIA5_3 (+0.4 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.5	11.6	11.6	11.6	11.6	11.7
2	11.8	11.9	11.9	11.9	11.9	11.9
5	12.1	12.2	12.2	12.1	12.2	12.2
10	12.3	12.4	12.5	12.3	12.4	12.5
25	12.6	12.7	12.8	12.6	12.7	12.8
50	12.7	12.9	13.0	12.8	12.9	13.0
100	12.9	13.0	13.2	12.9	13.0	13.2
250	13.0	13.2	13.4	13.0	13.2	13.4
500	13.1	13.3	13.5	13.1	13.3	13.5
1000	13.2	13.4	13.6	13.2	13.4	13.7

Note: (+1.0 ft, NAVD) denotes bottom elevation, etc.

EIA-6

Table A-72. Flood Stage Frequency at Representative Locations in EIA 6
(Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88								
	EIA6_1 (+3.1 ft, NAVD)			EIA6_3 (-0.8 ft, NAVD)			EIA6_5 (-0.9 ft, NAVD)		
	5%	50%	95%	5%	50%	95%	5%	50%	95%
1	11.5	11.5	11.6	11.4	11.4	11.5	11.4	11.4	11.5
2	11.8	11.8	11.9	11.7	11.7	11.8	11.7	11.8	11.8
5	12.1	12.1	12.2	12.0	12.1	12.2	12.1	12.1	12.2
10	12.3	12.4	12.5	12.3	12.4	12.5	12.3	12.4	12.5
25	12.6	12.7	12.8	12.6	12.7	12.8	12.6	12.7	12.9
50	12.8	12.9	13.0	12.8	12.9	13.1	12.8	13.0	13.1
100	12.9	13.1	13.2	12.9	13.1	13.3	13.0	13.1	13.3
250	13.1	13.3	13.5	13.1	13.3	13.5	13.1	13.3	13.6
500	13.1	13.4	13.7	13.2	13.4	13.7	13.2	13.4	13.8
1000	13.2	13.5	13.8	13.3	13.5	13.9	13.3	13.6	13.9

Note: (+3.1 ft, NAVD) denotes bottom elevation, etc.

EIA-7

Table A-73. Flood Stage Frequency at Representative Locations in EIA 7
(Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA7_1 (+3.4 ft, NAVD)			EIA7_4 (-6.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.5	11.5	11.6	11.5	11.6	11.6
2	11.8	11.8	11.9	11.8	11.9	11.9
5	12.1	12.1	12.2	12.2	12.2	12.3
10	12.3	12.4	12.5	12.4	12.5	12.5
25	12.6	12.7	12.8	12.6	12.8	12.9
50	12.7	12.9	13.0	12.8	13.0	13.1
100	12.9	13.0	13.2	13.0	13.1	13.3
250	13.0	13.2	13.4	13.1	13.3	13.5
500	13.1	13.3	13.6	13.2	13.4	13.7
1000	13.2	13.4	13.7	13.3	13.5	13.8

Note: (+3.4 ft, NAVD) denotes bottom elevation, etc.

EIA-8

Table A-74. Flood Stage Frequency at Representative Locations in EIA 8 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88		
	EIA8_1 (-1.5 ft, NAVD)		
	5%	50%	95%
1	11.4	11.5	11.5
2	11.8	11.8	11.9
5	12.2	12.2	12.3
10	12.4	12.5	12.6
25	12.7	12.8	13.0
50	12.9	13.1	13.2
100	13.1	13.3	13.5
250	13.3	13.5	13.8
500	13.4	13.6	13.9
1000	13.5	13.8	14.1

Note: (-1.5 ft, NAVD) denotes bottom

EIA-9

Table A-75. Flood Stage Frequency at Representative Locations in EIA 9 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88					
	EIA9_1 (-1.3 ft, NAVD)			EIA9_2 (-1.3 ft, NAVD)		
	5%	50%	95%	5%	50%	95%
1	11.6	11.6	11.7	11.7	11.7	11.8
2	11.9	12.0	12.0	12.0	12.1	12.1
5	12.2	12.3	12.4	12.4	12.4	12.5
10	12.5	12.5	12.6	12.6	12.7	12.7
25	12.7	12.8	13.0	12.8	12.9	13.0
50	12.9	13.0	13.2	13.0	13.1	13.2
100	13.1	13.2	13.4	13.1	13.2	13.4
250	13.2	13.4	13.6	13.3	13.4	13.7
500	13.3	13.5	13.9	13.3	13.6	14.0
1000	13.3	13.6	14.1	13.4	13.7	14.2

Note: (-1.3 ft, NAVD) denotes bottom elevation, etc.

EIA-10

Table A-76. Flood Stage Frequency at Representative Locations in EIA 10 (Year 50, W/ Project, SLR Curve III)

Return Period (yr)	WSE in ft, NAVD88		
	EIA10_1 (-0.4 ft, NAVD)		
	5%	50%	95%
1	11.6	11.7	11.7
2	12.0	12.0	12.0
5	12.3	12.3	12.4
10	12.5	12.6	12.7
25	12.8	12.9	13.0
50	13.0	13.1	13.2
100	13.1	13.2	13.4
250	13.2	13.4	13.7
500	13.3	13.6	14.0
1000	13.4	13.7	14.2

Note: (-0.4 ft, NAVD) denotes bottom