San Francisco Bay Tidal Datums and Extreme Tides Study

Final Report • February 2016

AECOM

Acknowledgments

CONSULTANT TEAM: Michael Mak, Erica Harris, Mark Lightner, Justin Vandever, Kris May

THE PROJECT TEAM WOULD LIKE TO THANK THE FOLLOWING AGENCIES:

San Francisco Bay Conservation and Development Commission's Adapting to Rising Tides Program, the Alameda County Flood Control and Water Conservation District, the San Francisco Public Utilities Commission, the Metropolitan Transportation Commission, the San Francisco Bay Area Rapid Transit District, and the California Department of Transportation, District Number 4 for their valuable input, and their continued use and support of the products developed from the Federal Emergency Management Agency San Francisco Bay Area Coastal Study.

San Francisco Bay Tidal Datums and Extreme Tides Study

Final Report • February 2016

The preparation of this report has been financed in part by the Federal Emergency Management Agency and the San Francisco Bay Conservation and Development Commission.

CONTENTS

1.0

INTRODUCTION

1. INTRODUCTION

This study is the first comprehensive publication of tidal datums and extreme tides for San Francisco Bay (Bay) since the United States Army Corps of Engineers (USACE) published its *San Francisco Bay Tidal Stage vs. Frequency Study* in 1984 (USACE 1984). The USACE study was groundbreaking at the time of publication, presenting tidal datums and the "100-year tide" elevation for 53 locations around the Bay. The purpose of this study is to update and expand on the USACE study and to present daily and extreme tidal information for more than 900 locations along the Bay shoreline.

Tidal datums, described further in Section 2, are standard elevations defined by a certain phase of the tide (e.g., mean high tide, mean low tide). A tidal datum is used as a reference to measure and define local water levels, and as such is specific to local hydrodynamic processes and is not easily extended from one area to another without substantiating measurements or analysis. Many industries and activities rely on tidal datums, including shipping and navigation, coastal flood management, coastal development, and wetland restoration. Extreme tidal elevations are estimated for less-frequent extreme tides (e.g., 2-year tides to 500-year tides [tides with a 50.0 percent to 0.2 percent annual chance of occurrence]). Knowledge of the 100-year tide, or the water elevation with a 1 percent annual chance of occurrence, is critical for shoreline planning, floodplain management, and sea level rise (SLR) adaptation efforts.

This study presents detailed daily and extreme tide information for the entirety of the Bay shoreline. This data set will support floodplain management efforts; shoreline vulnerability and risk analyses; shoreline engineering, design, and permitting; ecological studies; and appropriate sea level rise adaptation planning. The goal of this study is to provide data that support a wide-range of planning efforts around the Bay, particularly as communities seek to understand—and begin to adapt to—rising sea levels.

1.1 WHY UPDATE SAN FRANCISCO BAY TIDAL DATUMS?

An updated publication of Bay tidal datums is timely for several reasons.

1. Bay conditions have changed over the past century and will continue to change.
2. Data collection and modeling capabilities have improved, allowing a level of detail not possible in 1984.
3. Detailed model output is available that captures the Bay's complex hydrodynamics at a scale and a resolution that exceed available tide gage data.

These concepts are discussed in more detail below.

1.1.1 IMPROVED TIDE DATA COLLECTION AND MODELS

Significant technological advances in measuring and modeling hydrodynamic data have occurred since 1984. Computer resources and tide observation instruments have improved dramatically, increasing the availability of water-level data. We now have more Bay data for a longer period from tide stations and from hydrodynamic models. Two characteristics of the current tide data available in the Bay are worth noting:

- Confidence is higher in the Presidio tide station data taken after 1970, when new instruments replaced older, less-accurate recorders. These instruments continue to be updated.
- Our ability to model complex Bay hydrodynamic processes and produce detailed, accurate information has advanced substantially. A Bay-wide hydrodynamic model (see Section 2) that

captures a sufficient and appropriate period of record necessary for calculating daily and extreme tide elevations across the entire Bay shoreline is now available.

1.1.2 CHANGING BAY CONDITIONS

Bay conditions, including tide levels and related climate variables, have not been stable over the past century and will continue to change. The National Oceanic and Atmospheric Administration (NOAA) San Francisco Presidio tide station (Presidio station, #9414290) record shows that mean sea level (MSL) has risen continuously, extreme tides have become more frequent and larger in recent decades, and annual maximum tide levels are rising even faster than average sea level is rising (Figure 1-1 and Figure 1-2). The annual maximum water levels, as measured at the Presidio tide station, are increasing, even with the mean sea level rise trend removed to 2013 (Figure 1-1). In addition, the number of daily peak water levels that exceed 7.0 feet (ft) North American Vertical Datum of 1988 (NAVD88) has increased over the past 50+ years (sea level rise was not removed from the peak water levels), as shown on Figure 1-2. Since 1980, on average more than 12 daily high tides per year have exceeded 7.0 ft NAVD88, which is the approximate local nuisance flood elevation at the Presidio tide station. Between 1950 and 1979, daily high tides exceeded 7.0 ft NAVD88 only 5 days per year on average. Figure 1-1 and Figure 1-2 highlight that extreme and peak daily water levels at the Presidio tide station have increased in frequency and magnitude over the past century.

As seas continue to rise and shoreline assets are increasingly exposed to flood hazards, an updated, more detailed understanding of daily and extreme tidal elevations within the Bay is needed.

Given the continuous rise in MSL and annual maximum tides since 1855, extreme tide statistics calculated using tide data from the past 50 years better represent *current* water level conditions than using the full historical period of record.

The tidal datums presented in the USACE 1984 report are based on a previous National Tidal Datum Epoch (NTDE). The updated tidal datums presented in this report reflect the current NTDE (1983 to 2001).

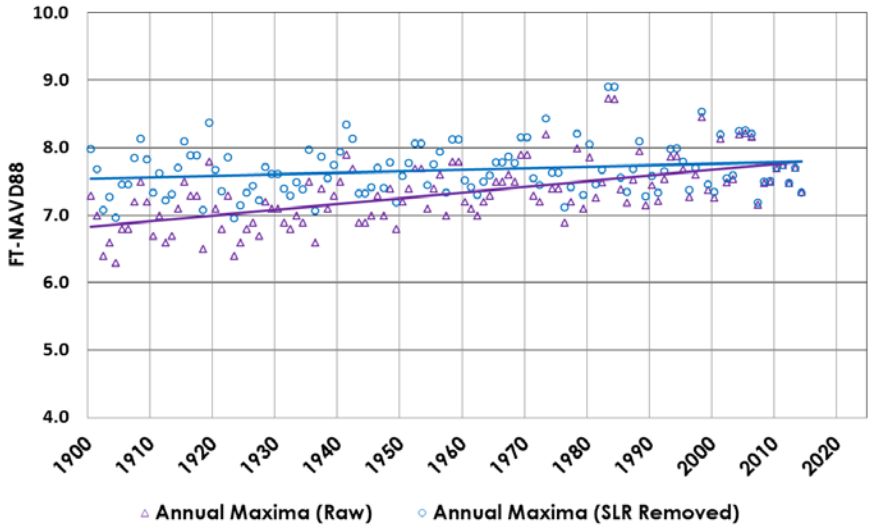


Figure 1-1. Annual Maximum Water Levels at the Presidio Tide Station

Note: Linear trend in annual maxima (shown in blue) after water levels detrended for SLR to 2013.

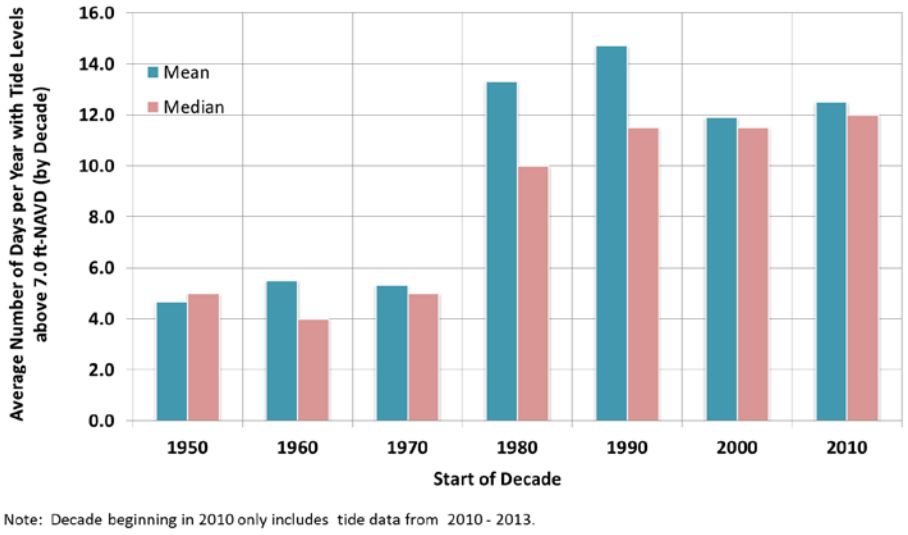


Figure 1-2. Average Number of Days per Year with Tide Levels above 7.0 ft NAVD88 at Presidio Tide Station (by Decade)

Note: Decade starting in 2010 only includes tide data from 2010–2013. Water levels not detrended for SLR.

1.1.3 DETAILED MODELING TO REPRESENT A COMPLEX BAY

Ideally, daily tidal datums and extreme tide elevations would be calculated from measured data over a long observation period of record. This method would require that (1) a sufficiently long period of record is available; (2) climate variables, such as average water elevations or storm frequency and intensity, are relatively stable; and (3) data have been recorded at enough gages to adequately represent tidal variability throughout the Bay. Those criteria are not met within the Bay.

The Bay is complex and water levels are far from flat: the Bay shoreline stretches roughly 300 miles, and tide elevations vary along its length. NOAA has recorded tidal data at 60 tide stations within the Bay (NOAA 2015). However, only seven stations are currently active, and only three stations have more than a 30-year period of record. These few long-term tide gages do not adequately capture the variability of the water surface along the entirety of the Bay's complex shoreline. This variability is best captured using a hydrodynamic model that is calibrated and validated with observed data. The graphical and statistical approach used by USACE in 1984 allowed extreme tide statistics to be calculated at 53 locations, an average of one data point per 20 miles of shoreline. Although the USACE approach is still valid, the hydrodynamic model used for this update allowed for calculations of both daily and extreme tide statistics at more than 900 locations, providing resolution of tidal complexity at a level of detail not possible 30 years ago.

1.1.4 1984 METHODOLOGY

The USACE San Francisco District used a graphical and statistical procedure developed in 1975 to define tidal stage versus frequency relationships at various tide stations in the Bay. These curves were updated in 1980 to include the extreme tides of January 1973 and again in 1984 to include the extreme tides of January and December 1983. The methods used in the tidal stage versus frequency study (USACE 1984) are summarized below.

To calculate the tide stage versus frequency curves, the USACE used 129 years of observed annual maxima water levels from the San Francisco Presidio tide station. Statistical analysis of initial results and identification of an upward trend in annual maximum high tides were used to refine the frequency relationships.

To better represent the upward trend in annual maximum high tides and represent the 1983 water levels with a more realistic frequency of occurrence, the mean of the tide stage versus frequency curve was adjusted upwards by 0.53 ft. This adjustment resulted in the January 1983 water levels showing a frequency of occurrence of less than 100 years (i.e., the January 1983 extreme tide water levels were lower than the estimated 100-year tides).

Tide stage versus frequency curves were created for 47 additional tide stations using the assumption that the frequencies of the published (National Ocean Survey) highest estimated tide (HET) and mean higher high water (MHHW) datums at these stations were similar to those of the Presidio. The 100-year water elevations for the 48 stations (including the Presidio tide station) were plotted and smoothed to create a Bay profile and used to fill in the values for five additional locations, resulting in 53 stations with 100-year return period values (USACE 1984, Plates 8 and 9).

The results of the tidal stage versus frequency analysis (USACE 1984) were key contributions to previous coastal studies in the Bay. Tide information was used to supplement the USACE shoreline studies for Alameda, San Mateo, and Santa Clara Counties (USACE 1988, 1989) and were used to define the coastal flood hazard areas for United States Department of Homeland Security's Federal Emergency Management Agency (FEMA) Flood Insurance Studies (FISs) published in the 1990s and early 2000s.

1.1.5 COMPARISON OF FEMA AND USACE METHODS

This updated study uses an improved approach to calculate the extreme tides for the Bay that includes several key differences (presented in Table 1-1 and discussed below).

Table 1-1. Summary of USACE and FEMA Methods

Variable	USACE	FEMA
General method	Statistical/graphical analysis based on relationships to Presidio station	Individually modeled locations; statistical analysis
Source of water levels	Observations from tide stations; additional tide estimates from NOAA	Hydrodynamic model simulations; calibrated and validated with tide station data and supplemental water levels
Water levels	Stillwater elevation (SWEL)	SWEL
Length of record	129 years	Most recent available 31–54 years
Number of data locations	53	900+
Tidal epoch	Prior epoch (unspecified)	1983–2001
Consideration of sea level trends	Frequency curve adjusted upward by 0.53 ft to account for increasing annual maximum tides over period of record	Recent period of record used; data detrended for SLR relative to 2009/2011

* Water levels calculated using the FEMA method in the Central/North Bay were detrended to 2009 and in the South Bay were detrended to 2011.

Method: The USACE used statistical analyses to plot tidal stage versus frequency. Additional curve fitting was performed to achieve reasonable results. Because only estimates of the HET at each tide station were available and not actual observed values, a second curve smoothing was used to remove remaining

inconsistencies. Although widely used in older applications, a statistical/graphical method is no longer recommended by FEMA (FEMA 2005).

This study employs an entirely statistical method to estimate extreme tide elevations based on modeled water levels from a regional hydrodynamic model of the Bay (DHI 2011, 2013). The approach follows FEMA recommendations in *Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States* (FEMA 2005). See Section 1 for further detail on the statistical methods used in this analysis.

Tide Elevation Data and Locations: The USACE's tide stage versus frequency curve developed for the Presidio tide station relied on long-term observed tide data and served as a benchmark for computing the extreme tide estimates at 52 additional tide stations within the Bay.

In this study, a regional hydrodynamic model of the entire San Francisco Bay was developed to support FEMA's San Francisco Bay Area Coastal Study[1]. This model provided simulated tide data at over 8,000 points along the shoreline and eliminated the need to rely on a single tide station, observed tides, estimated tides, or adjustment factors to calculate extreme tides at many locations. Extreme tide estimates were calculated at over 900 locations, capturing the variation in tides that are used for a wide range of applications. Figure 1-3 presents the 53 locations where the USACE analyzed tide information compared to the 900 locations used in this study.

Length of Record and Current Conditions: The USACE study used 129 years of data recorded at the Presidio tide gage. The tidal stage versus frequency curve was increased by 0.53 ft to better represent the observed increasing trends in annual maximum high tides. In this study, modeling results for recent time periods (e.g., 1973–2003 results for the North and Central Bay and the 1956–2009 results for the South Bay) were used to estimate daily and extreme tide conditions.[2]

1.2 OVERVIEW OF REPORT

The organization of this report is summarized below:

1. **Section 2, Tidal Dynamics in San Francisco Bay,** provides background information relevant to interpreting and utilizing tidal datums around the Bay, provides an overview of the bathymetry and hydrodynamics of the Bay, discusses tidal processes that influence Bay water elevations, and reviews the commonly used orthometric and tidal datums.
2. **Section 3, Tidal Datum and Extreme Tide Estimates,** presents the methods and results for estimating tidal datums and extreme tides.
3. **Section 4, Implications for Sea Level Rise Planning and Response**, presents a brief overview of the latest sea level rise estimates for San Francisco Bay and discusses how sea level rise estimates may be used in tandem with tidal datums for future planning purposes.
4. **Section 5, References.**

Complete tidal datum information and maps are presented in the appendices. **Appendix A** presents a map series that illustrates the 900+ locations along the shoreline where the tidal datums were calculated. **Appendix B** presents tables of the daily and extreme tidal elevations for each location.

[1] http://www.r9map.org/Pages/San-Francisco-Coastal-Bay-Study.aspx

[2] The period of record used coincides with the availability of input conditions at the time of model development, which occurred in two stages.

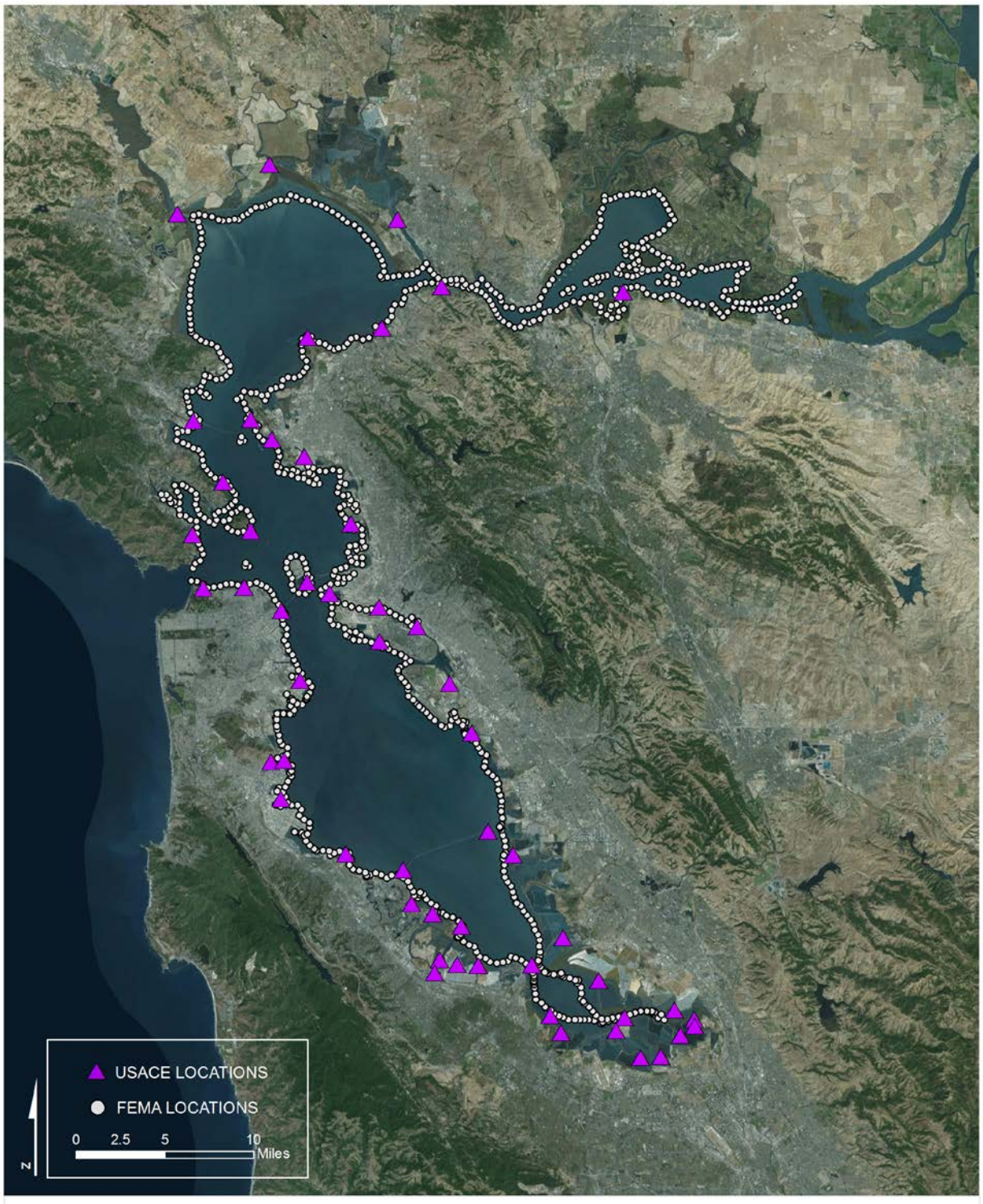


Figure 1-3. Locations of Tide Stations used in USACE 1984 and Present Studies.

1.3 ACRONYMS/ABBREVIATIONS

Bay	San Francisco Bay
CASCADE	Computational Assessment of Scenarios for the Delta Ecosystem
cm	centimeter(s)
ENSO	El Niño–Southern Oscillation
FEMA	United States Department of Homeland Security's Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
ft	foot or feet
GEV	Generalized Extreme Value
GHG	greenhouse gas
HET	highest estimated tide
HOT	highest observed tide
MHHW	mean higher high water
MHW	mean high water
MLLW	mean lower low water
MLW	mean low water
mm/yr	millimeter(s) per year
MSL	mean sea level
MTL	mean tide level
NAVD88	North American Vertical Datum of 1988
NGVD29	National Geodetic Vertical Datum of 1929
NOAA	National Oceanic and Atmospheric Administration
NTDE	National Tidal Datum Epoch
PDO	Pacific Decadal Oscillation
RMS	root mean square
SLR	sea level rise
SWEL	stillwater elevation
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey

1.4 GLOSSARY

The following definitions describe each term as it is used in this report:

Annual maximum: The maximum observed or predicted water level for a specified year.

Astronomical tide: Tidal water levels that fluctuate only due to gravitational influences (due to the moon/sun and the earth's rotation), not atmospheric influences. Astronomical tide levels do not include any increases in water level due to storm surge (from wind or changes in atmospheric pressure) or influences from riverine discharges.

Bathymetry: Depth of water relative to sea level.

Benchmark: A fixed object or physical feature from which horizontal or vertical datums are referenced.

Daily tide: See tidal datum. For example, daily high tide can be represented by the mean higher high water tidal datum.

Diurnal tides: One high and one low tide each lunar day.

Datum: A set of points of reference from which measurements can be made.

Ebb tide: An outgoing or falling tide.

El Niño–Southern Oscillation (ENSO): El Niño conditions are defined by prolonged warming in the Pacific Ocean sea surface temperatures. Typically, an El Niño happens at irregular intervals of 2 to 7 years, and can last anywhere from 9 months to 2 years.

Extreme tide: Temporary, short- to medium-term increases in sea level above the predicted astronomical tide levels as a result of changes in atmospheric pressure, wind, or freshwater inflows.

Fetch: An area of water over which waves are generated by the wind.

Flood tide: An incoming or rising tide.

Generalized Extreme Value (GEV): A family of statistical probability distributions in a single form that is used to model block maxima that are part of a set of independent, identically distributed random values representing observations or measurements to calculate quantiles or extreme values with a specified return period.

Greenhouse gases: Gases that trap heat in the atmosphere, including carbon dioxide, methane, nitrous oxide, and fluorinated gases.

Lunar day: The period of time it takes for a specific site on the earth to rotate from an exact point under the moon to the same point under the moon.

Mean high water (MHW): Average of all high water elevations over the NTDE.

Mean higher high water: Average of all higher high water elevations over the NTDE.

Mean low water (MLW): Average of all low water elevations.

Mean lower low water (MLLW): Average of the lower of the two daily low water elevations over the NTDE.

Mean sea level: The arithmetic mean of hourly water levels over the NTDE.

Mean tide level (MTL): A datum midway between MHW and MLW calculated as the arithmetic mean of MHW and MLW over the NTDE.

Mixed semidiurnal tides: Two high tides and two low tides of differing amplitudes every lunar day.

National Tidal Datum Epoch: The NTDE is a specific 19-year period identified as the official time segment over which tide observations are taken and used to obtain mean values for tidal datums. The present NTDE is 1983 through 2001. This time frame is deemed a full cycle because most significant tidal variations complete their cycles within 19 years.

Neap tide: A tide occurring twice per month when the sun and moon are at right angles to the earth. The gravitational force, exerted in two directions, causes a lower difference between observed high and low water levels.

Orthometric datum: A surface of zero elevation that historically has attempted to approximate the average elevation of the surface of global oceans or "sea level." For engineering and topographic purposes, NAVD88 is the current national standard reference elevation. NAVD88 relies on one control point (Father Point tide station in Quebec, Canada) and satellite technology to set an elevation of zero across all of North America.

Pacific Decadal Oscillation (PDO): A pattern of climate variability similar to ENSO (El Niño) that occurs over a much longer period (20 to 30 years). PDO is classified as being either in a warm or cool phase, based on sea surface temperatures in the Pacific Ocean. The current phase of the PDO influences winds in the upper atmosphere and correlates with wetter or drier periods in western North America.

Progressive wave: A long period wave where the high and low waters of the wave move progressively forward along the surface of the sea or at an intermediate depth.

Semidiurnal tides: Two high tides and two low tides of equal amplitude every lunar day.

Slack water: Period during daily cycle between the ebb and flood tides, where water movement due to tides is temporarily paused.

Spring tide: A tide occurring twice per month when the sun and moon are aligned. The gravitational force becomes amplified, causing a large difference between observed high and low water levels.

Standing wave: A wave that oscillates without progression in any direction due to interference, for example from a reflected wave.

Station datum: An arbitrary elevation unique to each tide station from which water levels are measured. The station datum is established at a lower elevation than water levels can be expected to fall.

Storm surge: See extreme tide.

Storm year: The July through June storm year was defined for evaluating coastal hazards in San Francisco Bay because it is closely tied to the physical processes controlling these hazards (i.e., winter storms, large Pacific ocean swells, and the highest astronomical tides). The July–June storm year is consistent with the methods that FEMA uses for the San Francisco Bay Area Coastal Study.

Stillwater elevation: A base tide level that includes the additional storm surge due to short-term meteorological processes (such as low atmospheric pressure due to storms) and large-scale

oceanographic conditions (such as ENSO, which can elevate tides above typical levels for months at a time). The SWEL does not include any wave effects.

Tidal datum: A datum defined by a certain phase of the tide. A tidal datum is calculated from water levels over a defined period of observation (the National Tidal Datum Epoch).

Tide: A term used to define the alternating rise and fall of the oceans with respect to the land.

2.0

TIDAL DYNAMICS IN SAN FRANCISCO BAY

2. TIDAL DYNAMICS IN SAN FRANCISCO BAY

This section provides a brief overview of the tidal dynamics in the Bay, including the processes and forces that drive tidal water level fluctuations.

San Francisco Bay is the largest estuary in the western United States, draining a watershed that includes nearly 40 percent of California. The Bay consists of a complex network of embayments, creeks, rivers, and sloughs that are all tidally influenced. The relatively shallow waters of the Bay cover approximately 460 square miles and include four smaller embayments: Suisun Bay, San Pablo Bay (Suisun Bay and San Pablo Bay are collectively referred to as the North Bay), the Central Bay, and the South Bay (Figure 2-1). Upstream of the North Bay is the vast Sacramento–San Joaquin River Delta, which drains both the Sacramento River and the San Joaquin River. The waters of these historically mighty, but now heavily dammed and diverted, rivers provide the largest component of freshwater input to the Bay.

2.1 BATHYMETRY

The bathymetry of the Bay is one of several important factors that influence the variation in tide elevations along the shoreline. The bathymetry is typical of a sheltered tidal estuary system with broad shallow waters bisected by deep tidal and navigation channels. The Central Bay, which includes the connection between the Bay and the Pacific Ocean through the Golden Gate Strait, includes the deepest portions of the Bay, with an average depth of 43 ft (Figure 2-2). A mix of highly developed and armored shorelines characterize the Central Bay coastline, with wetlands and less-developed shorelines through Marin County. The Golden Gate Strait is more than 300 ft deep. In the North Bay and South Bay, average depth is 15 to 17 ft, with broad expanses of mudflats that are exposed at low tide. Tidal salt marsh and former and current salt ponds are found along the shoreline. Navigation channels are maintained through periodic dredging (Barnard et al. 2013) to allow the passage of large ships to major ports, including the Ports of San Francisco, Oakland, and West Sacramento.

From the mid-19th century through 1965, more than one-third of the original Bay was filled and developed, and much of this land is currently within 3 ft of MHW. As agriculture flourished and use of well water depleted groundwater aquifers, land adjacent to the Bay subsided. Now swaths of land in both the North Bay and the South Bay are below mean sea level, protected from inundation by wetlands, salt ponds, levees, berms, and embankments (many of which were not originally designed for flood protection). These flatlands are increasingly at risk of floods from rising seas and extreme tides.

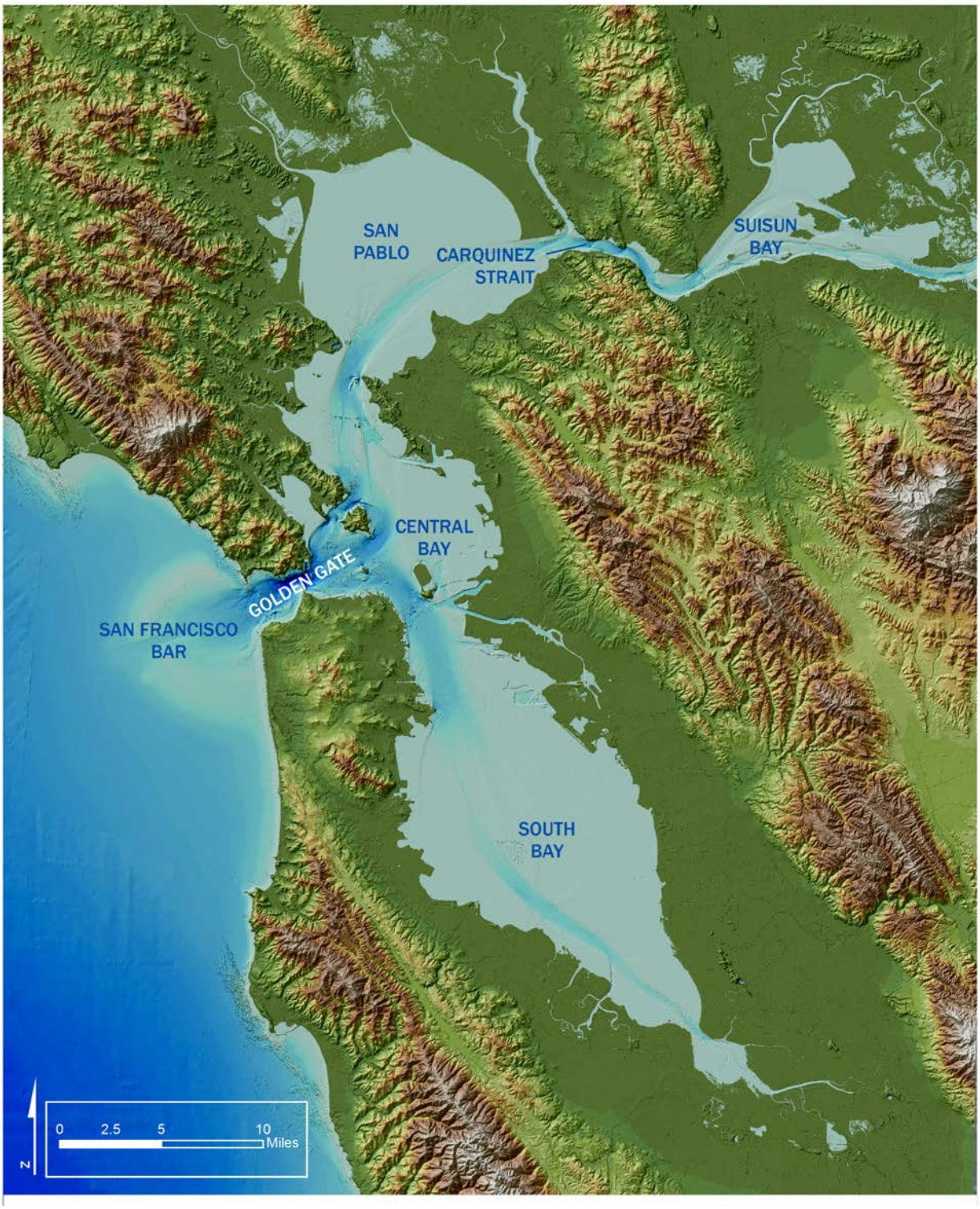


Figure 2-1. The San Francisco Bay Coastal and Estuarine System

Topographic base map adapted from USGS (USGS 2013).

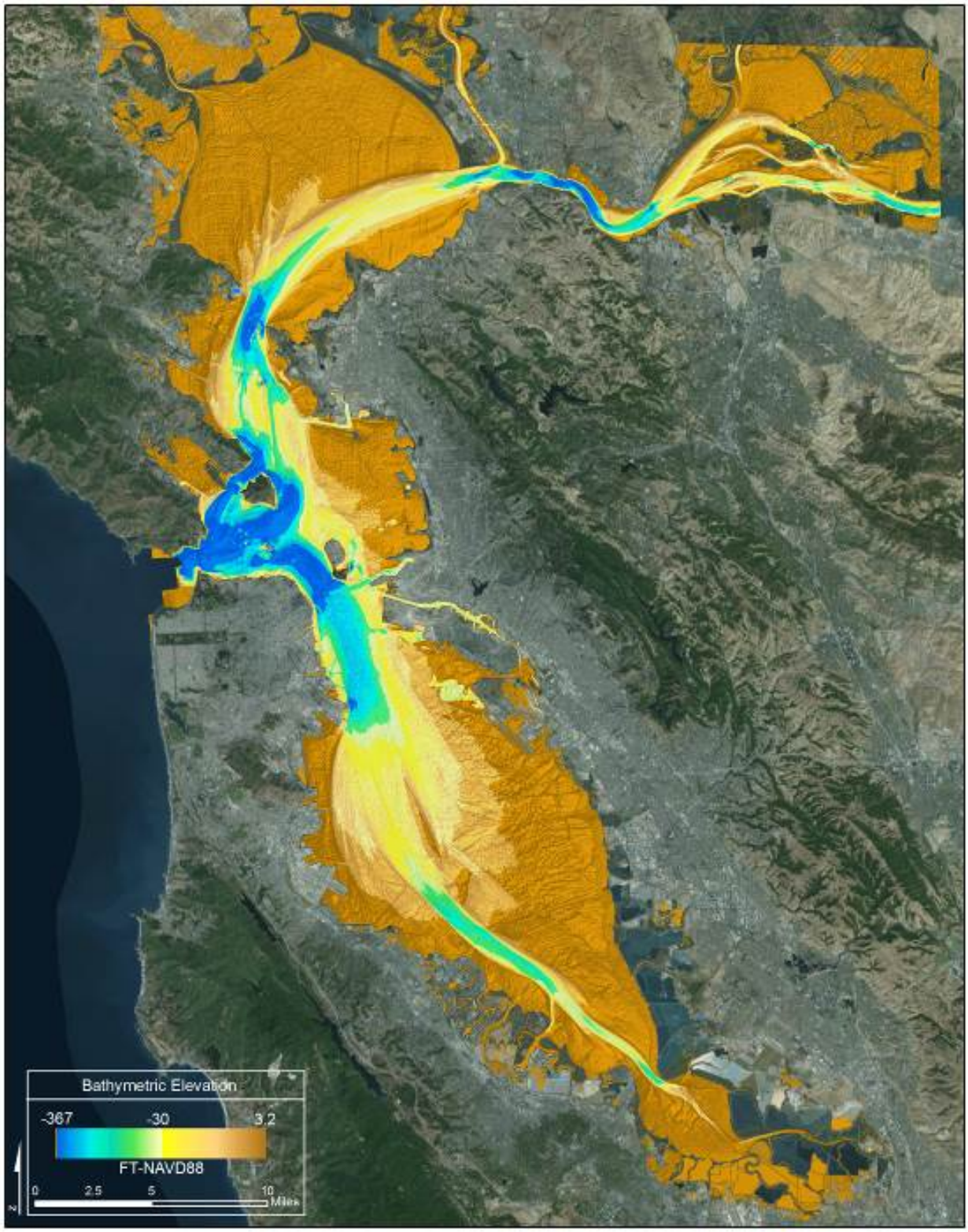


Figure 2-2. San Francisco Bay Bathymetry

2.2 HYDRODYNAMICS

The movement of water in the Bay is complex and influenced by many different factors, both natural and anthropogenic, that vary in time scale from hours to millions of years. The most significant contributors to the movement of Bay waters are tides, freshwater inflows, winds, and bathymetry.

The Bay is a partially mixed estuary where gravitational circulation has been observed in deeper areas, particularly during neap tides and periods of strong stratification (Monismith et al. 2002). Gravitational circulation in the Bay occurs when cold, saline, dense seawater flows landward along the bottom of a deep channel, while less dense fresher water flows seaward above. As most freshwater flows into the Bay from the Sacramento–San Joaquin River Delta, these density-driven flows are most common in the North Bay (Conomos 1979). In the South Bay, the water column is generally well-mixed and freshwater inflow is muted compared to the flows from the north. However, during extreme freshwater inflows from the Delta, the freshwater can extend into the South Bay from the north. Local freshwater inflows occur through several smaller tributaries in the South Bay, and treated wastewater is also a significant freshwater source in the South Bay, especially in the drier summer months, when riverine inflows are small (PWA 2005).

Wind waves, which develop in areas with sufficient fetch (or length of water over which wind blows), can be important drivers of water circulation and are contributors to flooding and shoreline erosion during high tide conditions. However, tides are the dominant force in Bay hydrodynamics and are discussed in further detail in Section 2.3.

2.3 TIDES

Astronomical tides are the daily rise and fall of the sea surface caused by the gravitational attraction between the rotating earth, moon, and sun. In contrast to astronomical tides, extreme tides are temporary, short- to medium-term increases in sea level above the predicted astronomical tide levels. They are generally caused by atmospheric conditions (the weather), as opposed to the relationships of the planets. The waters of the Bay are influenced by oceanic astronomical tides, atmospheric conditions, and freshwater input. The sections that follow provide an overview of astronomical tides, extreme tides, and San Francisco Bay hydrodynamics.

2.3.1 ASTRONOMICAL TIDES

Although astronomical tides are observed along the shoreline as the regular rise and fall of the water levels, they are in fact very long-period waves that move across the oceans in response to the gravitational pull of the moon and sun. This wave movement includes a horizontal motion of the water into and out of bays and estuaries. These are tidal currents. As tides rise, the tidal current flowing from the oceans into bays and estuaries is called a "flood tide." As tides fall, the “ebb tide” flows back toward the oceans. For short periods, as tides reverse, a slack tide occurs with little or no current.

Because the earth is closer to the moon than the sun, the moon’s gravitational pull has a larger influence on tides. Therefore, tidal cycles follow the lunar orbit, which takes 24 hours and 50 minutes (one lunar day). High tides occur approximately every 12 hours and 25 minutes, or one-half of a lunar day. Figure 2-3 demonstrates the high and low tides at the Presidio tide station over a typical 2-day period. At this location, there is approximately a 2 ft difference between the two high tide water elevations.

Three types of astronomical tides occur globally, depending on the bathymetry, or the shape of the seafloor, and the shape and size of the coastlines at a given location:

1. Semidiurnal tides: These occur along the east coast of North America. Two high tides and two low tides occur each day, with both highs reaching similar elevations and both lows reaching similar elevations.
2. Mixed semidiurnal tides: These occur along the entirety of the California coastline, including within the Bay. Two high tides and two low tides occur each day, with each of the four tides reaching different elevations.
3. Diurnal tides: These occur along the Gulf Coast of North America. One high and one low tide occur each day.

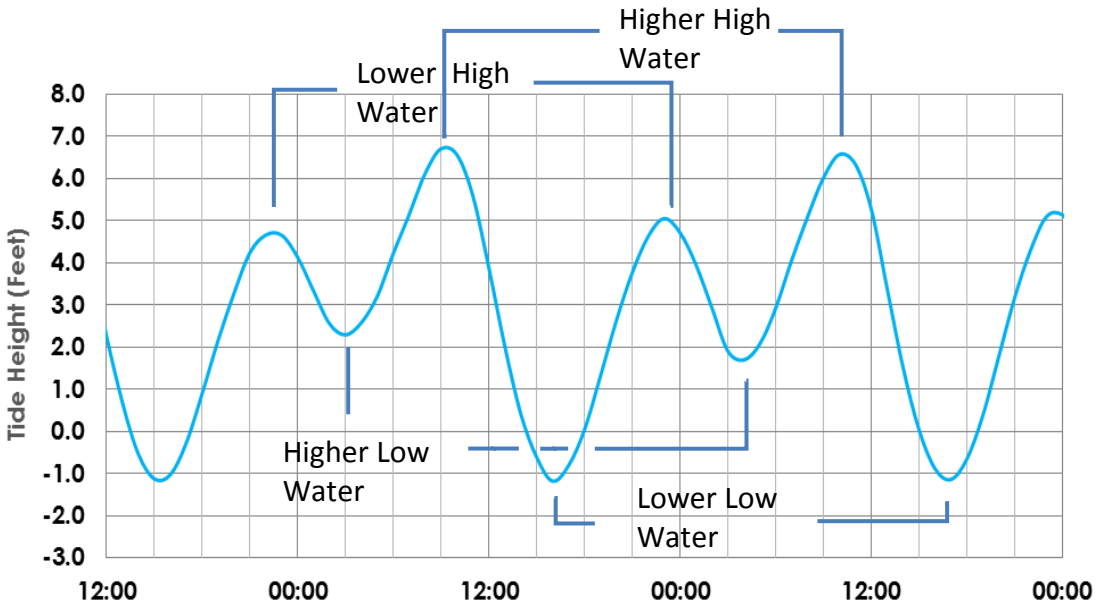


Figure 2-3. Daily High and Low Tide Patterns in a Mixed Semidiurnal Tide
Source: Retrieved from NOAA 2015.

During full and new moons, spring tides occur because the sun and the moon are aligned with respect to the earth (Figure 2-4). Their combined gravity causes a larger than average tidal range: high tides are particularly high, and low tides are particularly low (Figure 2-5). During quarter moons, when the gravity of the sun and the moon are opposed (Figure 2-4), a smaller than average tidal range occurs (Figure 2-5). These are known as neap tides.

King tides are unusually large but predictable astronomical tides. They occur each year when the earth, in its annual orbit, is particularly close to the moon and sun. This proximity increases gravitational attraction and, when combined with a spring tide, causes the most extreme annual astronomical tidal range. King tides generally occur in the winter months between December and February. King tides produce both the highest high tides and the lowest low tides of the year, and as seas have risen, have caused annual flooding of low-lying areas along the Bay shoreline.

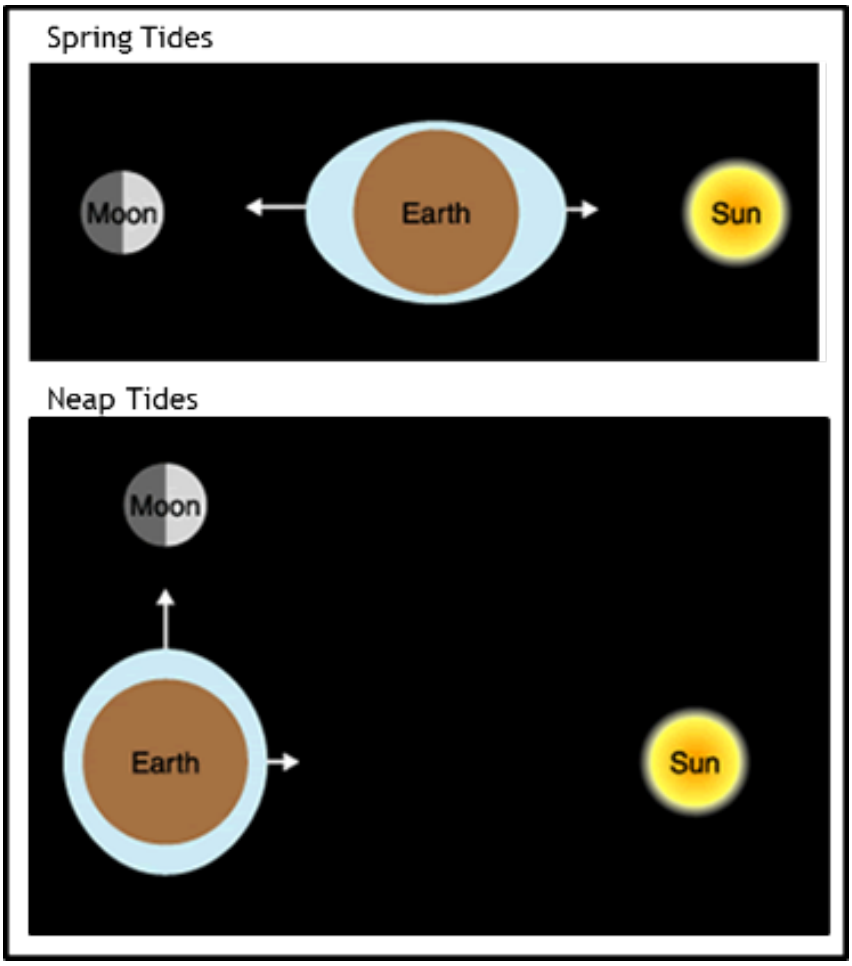


Figure 2-4. Gravitational Forcing of Spring and Neap Tidal Cycles
Source: Adapted from NASA. n.d.

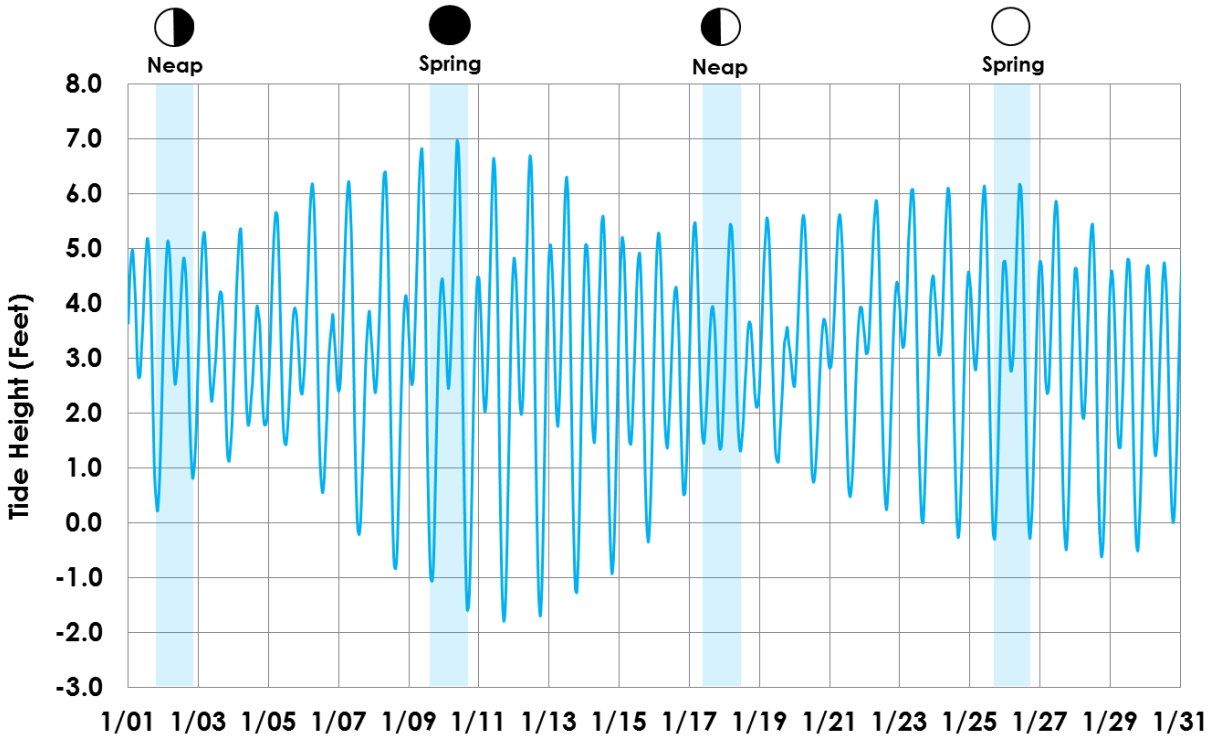


Figure 2-5. Monthly Spring and Neap Tide Patterns
Source: Retrieved from NOAA 2015.

2.3.2 EXTREME TIDES

Extreme tides are temporary, short (hours to days) increases in sea level above the predicted astronomical tide levels. This difference in water elevation between the predicted and observed tides may constitute storm surge, El Niño, or other oceanic cycles, local wind setup, freshwater inflows, or a combination of these factors. Observations of extreme tides at tide stations typically do not include wave effects, although wave effects can influence water levels at the shoreline. The extreme tide elevation is also referred to as the stillwater elevation (or SWEL). An extreme tide that occurs on average once per century is commonly referred to as the 100-year extreme tide elevation, the 100-year SWEL, or the 1 percent annual chance SWEL (or 1 percent SWEL). The frequency of extreme tides is correlated to their magnitude, as shown in Table 2-1. For simplification, the 1 percent annual chance event will be referred to as a 100-year extreme tide for the remainder of this report, and similarly for the other tide frequencies presented in Table 2-1.

Table 2-1. Extreme Tide Frequency of Recurrence

Annual Chance of Exceedance	100%	50%	10%	2%	1%	0.2%
Event	King tide	2-year	10-year	50-year	100-year	500-year

The following events may contribute to extreme tides and the flooding caused by extreme tides. Higher Bay surface elevations may occur over shorter or longer time frames as a result of these conditions, either individually or in combination.

1. **Storm surge:** Storm surge is an increase in ocean surface elevation caused by low atmospheric pressure and wind effects. Even on clear days, storm surge may raise Bay water levels. When storms coincide with high tides, storm surge can produce extreme high tides, resulting in temporary flooding. Examples of historical storm surge events within the Bay include January 27, 1983; December 3, 1983; February 6, 1998; January 8, 2005; December 31, 2006; December 24, 2012; and December 11, 2014. Figure 2-6 shows the predicted tide on December 11, 2014, compared to the observed tide. The difference between the two corresponds to storm surge.
2. **El Niño:** During El Niño, atmospheric and oceanographic conditions in the Pacific Ocean bring warm, higher waters to the Bay Area. Water levels are often 0.5 to 1.0 ft above normal for months at a time. Severe winter storms bring intense rainfall and storm conditions to the Bay Area, and wave setup during storm events can raise water levels even further. El Niño conditions prevailed in 1977–1978, 1982–1983, 1997–1998, 2009–2010, and 2015–2016.
3. **The Pacific Decadal Oscillation:** This atmospheric shift is similar to El Niño, but varies over a time scale of decades, rather than years. The PDO can remain in the same phase for 20 to 30 years, in contrast to El Niño phases of 9 months to 2 years.
4. **Freshwater inflows:** Precipitation across 40 percent of California drains into the Bay through the Sacramento–San Joaquin River Delta and out through the Golden Gate Strait. During precipitation events of high intensity and/or duration, tremendous volumes of water drain through the Bay. As a result, water levels throughout the Bay may be higher than predicted, particularly in proximity to the Delta and other freshwater sources.

High coastal waters, by themselves or in combination with rain, may overtop seawalls, back up into storm drains, and delay drainage of stormwater into the Bay. These occurrences can lead to surface flooding (Figure 2-7A in Berkeley, CA, and Figure 2-7B in Oakland, CA) and can pressurize storm drains, causing damage to underground pipes, leading to subsurface issues such as sinkholes (Figure 2-7C in San Francisco, CA) and sending manhole covers flying (Figure 2-7D in Oakland, CA).

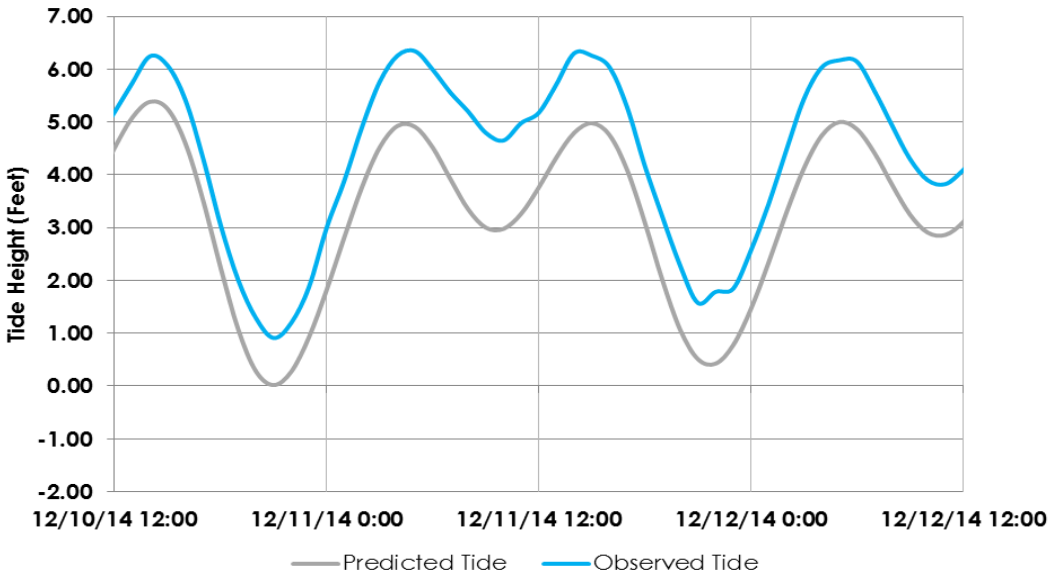


Figure 2-6. Predicted Tide versus Observed Tide with Storm Surge, December 11, 2014

Figure 2-7. San Francisco Bay Region Extreme Tide Impacts, December 11, 2014

Photo credit: *San Francisco Chronicle*.

2.3.3 SAN FRANCISCO BAY TIDAL PATTERNS

San Francisco Bay tides are mixed semidiurnal with strong spring-neap variability. Within the Bay, the tidal range for a typical spring tide is 5 to 8 ft, depending on location. During a king tide, the tidal range can increase to 7 to 10 ft, and storm conditions may increase the tidal range even further.

Due to the Bay's complex bathymetry and geographic configuration, tidal range and elevation vary spatially. Interactions between tidal processes (e.g., reflection of tidal waves), bathymetric variations, and shoreline orientation can amplify the tides with increasing distance from the Golden Gate Strait. Tidal amplification is greatest in the South Bay, causing an average tide range greater than 7.5 ft south of the San Mateo Bridge, compared to only 5.8 ft at the Golden Gate Bridge (Table 2-2). Because most of the South Bay consists of shallow mudflats, current and former salt ponds, and tidal wetlands, great expanses of the South Bay are exposed during low tides.

Tide range also increases from the Golden Gate Strait into the North Bay, though the tide range is not as amplified to the north as it is to the south (Table 2-2). East of the Carquinez Strait in Suisun Bay, the tide range is highly dissipated (Walters et al. 1985).

Table 2-2. Observed Tide Ranges in San Francisco Bay

Location	NOAA Tide Station (station number)	Tide Range (feet)
North Bay (Suisun Bay)	Port Chicago (9415144)	4.9
North Bay (San Pablo)	Richmond (9414863)	6.1
Central Bay (Golden Gate)	Presidio (9414290)	5.8
Central Bay	Alameda (9414750)	6.6
South Bay	Redwood City (9414523)	8.2
South Bay	Coyote Creek (9414575)	9.0

Note: "Tide range" is the mean daily tide range at each location based on the difference between the mean higher high water and mean lower low water (typically referred to as the "diurnal range").

Within the Bay, the tide manifests in two general patterns: progressive and standing waves. The tide in the North Bay is primarily progressive. Progressive waves eventually dissipate as they move upstream due to friction in shallower areas, interactions with the shoreline, and attenuation from riverine discharges. As a result, Suisun Bay experiences the smallest tidal range in the Bay (Table 2-2).

In contrast, the South Bay exhibits a mix of standing wave and progressive wave behavior. The standing wave behavior in the South Bay is caused by interference between the incoming progressive tidal wave and wave reflection back from the shoreline. This standing wave propagates tides faster than the progressive wave in the North Bay, shifting the timing of the tidal cycle where high tides occur earlier in the South Bay, depending on distance from the Golden Gate Strait (Conomos 1979).

Due to these wave differences, the tidal phases of the North and South Bay are not concurrent: the South Bay begins to ebb while the North Bay is still flooding, and the South Bay begins to flood while the North Bay is still ebbing. This phase difference drives circulation between the two regions, allowing lower-salinity water from the North Bay to intrude and mix with South Bay waters (Barnard et al. 2013; Conomos 1979). This mixing contributes to additional local variations in tidal water elevations (Walters et al. 1985).

2.4 VERTICAL DATUMS

A datum is a reference used to define coordinates. A datum provides a baseline or a starting position against which other positions may be measured. There are two main types of datums: horizontal and vertical. Horizontal datums (e.g., the equator and Greenwich, England) are used to reference geographic position (e.g., latitude and longitude), and vertical datums are used to establish heights and elevations. Vertical datums can be categorized as either orthometric or tidal datums, defined below. Coastal activities, including navigation, shipping, shoreline development, coastal and wetland restoration, and determination of jurisdictional boundaries, rely on accurate orthometric and tidal datums. Many cities within the Bay region have also established independent, city-specific vertical datums.

2.4.1 ORTHOMETRIC DATUMS

An orthometric (or topographic) datum is a reference plane of zero elevation that historically has attempted to approximate the average elevation of the surface of global oceans or "sea level." For engineering and topographic purposes, NAVD88 is the current national standard vertical datum. NAVD88 relies on one control point (Father Point tide station in Quebec, Canada) to set an elevation of zero across all of North America. It replaced the National Geodetic Vertical Datum of 1929 (NGVD29), which

was the previous national standard for 60 years. This document utilizes NAVD88 throughout, converting historical data from NGVD29 to NAVD88 as necessary.

2.4.2 TIDAL DATUMS

Tidal datums are elevations defined by a certain phase of the tide, which can also be reported relative to an orthometric datum. Thus, the tidal datum MHHW may be reported at a point along the Bay as 6 ft NAVD88, meaning MHHW at this location is 6 ft above the zero elevation of NAVD88.

The most commonly used tidal datums are MHHW, MHW, and MLLW. MLLW is a frequent reference for water depths on nautical charts. In contrast, MHW or MHHW is used for establishing jurisdictional shorelines[3] or for coastal engineering purposes.

The most commonly referenced tidal datums are:

1. MHW: Average of all high water elevations.
2. MLW: Average of all low water elevations.
3. MTL: A datum located midway between MHW and MLW, calculated as the arithmetic mean of MHW and MLW.
4. MSL: the arithmetic mean of hourly water levels.

In areas with mixed semidiurnal tides, such as the San Francisco Bay, two additional datums are defined:

1. MHHW: Average of the higher of the two daily high water elevations.
2. MLLW: Average of the lower of the two daily low water elevations.

Each tidal datum is calculated over the period corresponding to the NTDE. The NTDE is a specific 19-year period identified as the official time segment over which tide observations are taken and used to obtain mean values for tidal datums. The present NTDE is 1983 through 2001. Recalculations of local tidal datums are performed every 20 to 25 years due to periodic or secular trends in sea level.

2.4.3 RELATIONSHIPS BETWEEN DATUMS

The relationship between tidal datums and an orthometric datum can vary from one section of shoreline to another. As described above, the tidal range magnitude varies throughout the Bay from a low of 4.9 ft in the North Bay to a high of 9.0 ft in the South Bay (NOAA 2015). Similarly, the Bay's tidal datums are not flat, but vary between Bay locations. For example, MHHW observed in San Francisco is lower than MHHW observed across the Bay in Alameda. To make regional or historical comparisons, data must be converted to a standard reference. NAVD is used in this report as the standard datum.

Two visual examples are provided below to show how tidal datums relate to NAVD88 and vary across the Bay. Figure 2-8 compares the relationships between several tidal datum elevations and NAVD88 at NOAA's San Francisco and Alameda tide stations. The MHHW elevations between the two locations vary by almost half a foot. Referencing both elevations to a single orthometric datum (i.e., NAVD88) allows for a direct comparison of water surface elevation between locations.

[3] The regulatory jurisdiction of the San Francisco Bay Conservation and Development Commission is 100 ft inland of the MHW shoreline.

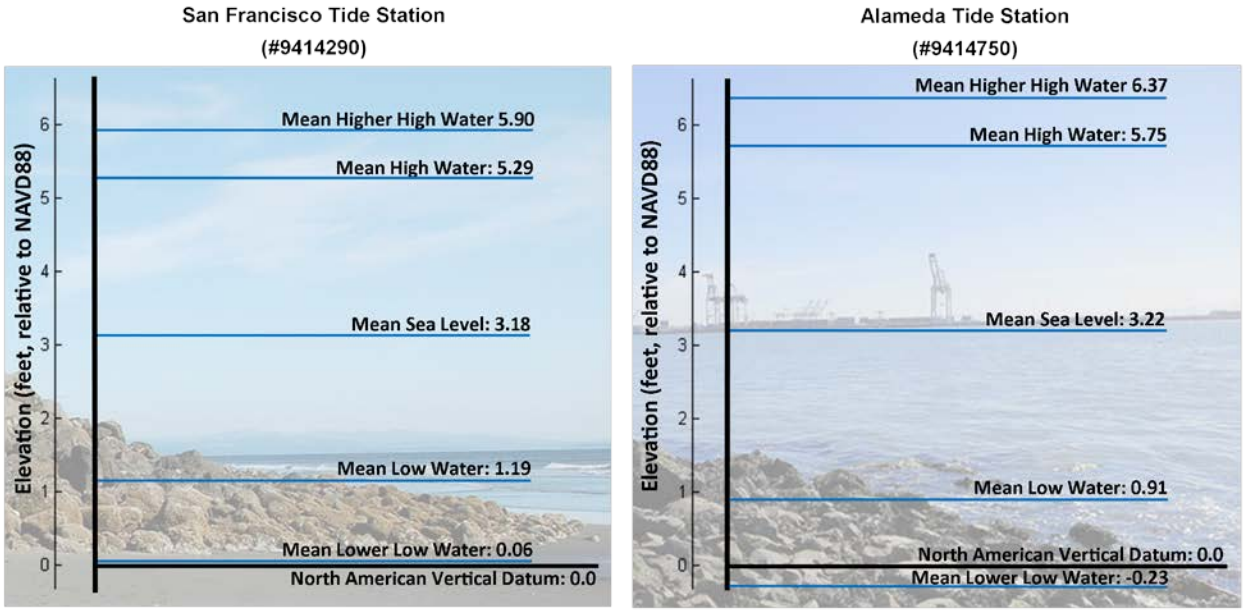


Figure 2-8. Comparison between Tidal Datum Elevations at Two NOAA Tide Stations in the Bay

Historically, many factors have made such conversions necessary:

1. **Historical national datums:** Water levels recorded before the establishment of NAVD88 in 1991 may be referenced to NGVD29, if referenced to an orthometric datum at all.
2. **City-specific datums:** Many Bay cities have defined city-specific vertical datums. For example, the City and County of San Francisco uses a citywide datum that has elevation values more than 5 feet higher than the City of Oakland's datum for the same level and neither matches a standard national datum. Other city-specific datums, such as Foster City's, use relationships relative to NGVD29, such as NGVD29 + 100 feet.
3. **Tide-station-specific datums:** Of the approximately 60 historical NOAA tide stations in the Bay, only five active stations and 15 inactive stations are referenced to NAVD88 (Figure 2-9), with the remainder referenced to station-specific reference points or NGVD29.

This abundance of historical, city-specific, and/or local station datums can introduce complexity into regional planning and potential error into local planning or engineering analyses. To simplify these conversions and provide consistency and ease of use, all tidal datum elevations presented in this study are referenced in feet relative to NAVD88.

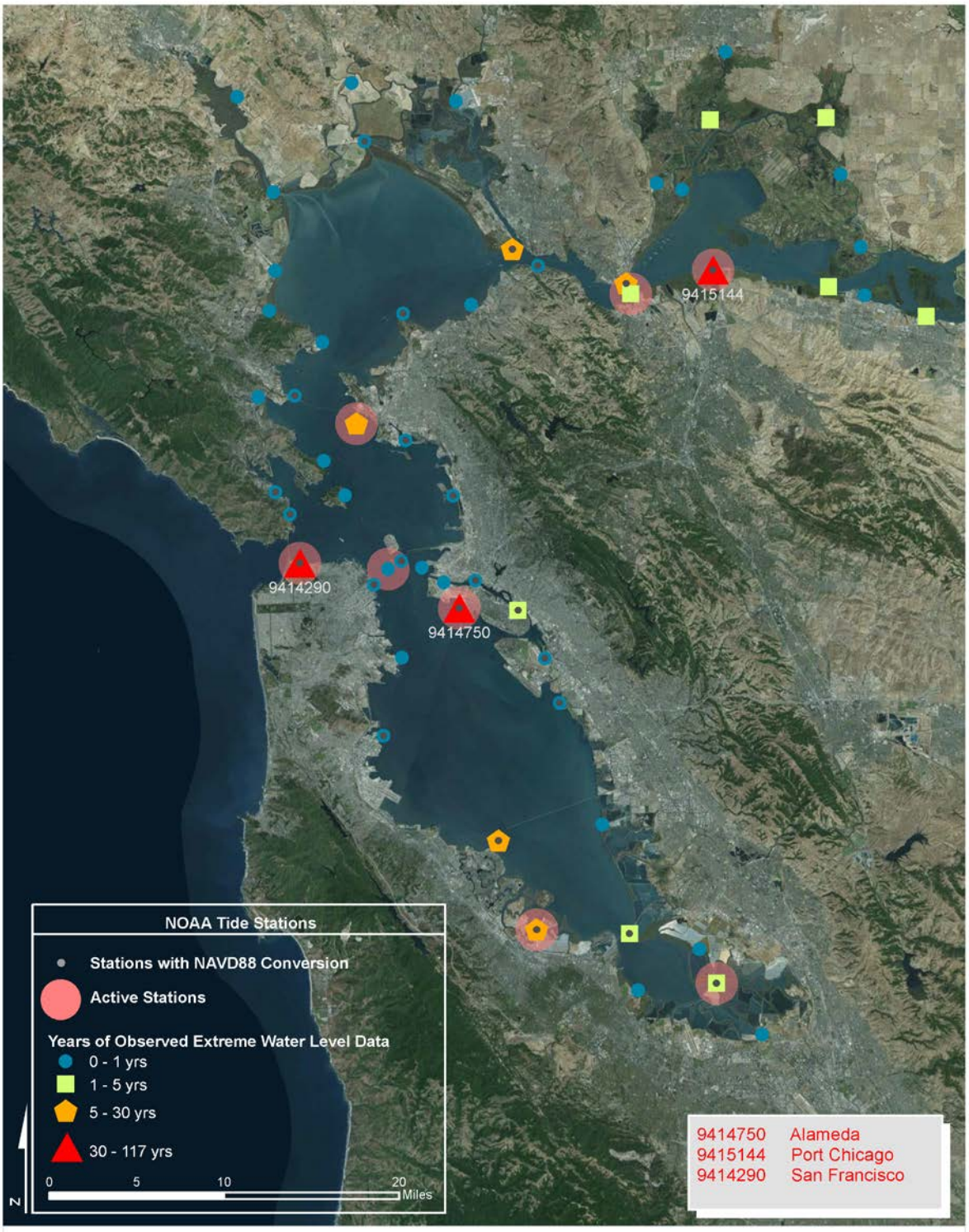


Figure 2-9. Locations of NOAA Tide Stations

Note: In addition to published NOAA MLLW-NAVD88 conversions, the following stations have conversions available from USGS: San Leandro Marina, Oyster Point Marina, San Mateo Bridge, Redwood City Wharf 5, Dumbarton Bridge, and Coyote Creek.

3.0

INUNDATION MAPPING

3. TIDAL DATUM AND EXTREME TIDE ESTIMATES

The USACE (1984) study presented the first comprehensive study of tidal datums and extreme tides within the Bay. It published MHHW, 10-year (10-percent-annual-chance), 100-year (1-percent-annual-chance), and 500-year (0.2-percent-annual-chance) tide elevations for 53 locations along the Bay shorelines (Figure 1-1) and into major Bay tributaries. The elevations were referenced to MLLW and NGVD29. To update the USACE (1984) tidal datum information and provide more tidal datum information along the complex Bay shoreline, 900+ points were selected to adequately capture local variations along the shoreline. These variations, including changes in shoreline orientation, bathymetry, or riverine influences, affect both tidal range and absolute tide elevations. The tidal datum information relies on "as-is" shoreline conditions and bathymetry from the time the regional hydrodynamic modeling was performed (DHI 2011, 2013). As shorelines change through natural geomorphic processes or through development, restoration, levee breaches, or similar alterations, Bay hydrodynamics may change, but this potential change is not considered.

The sections that follow present the methodologies and results for tidal datum and extreme tide calculations throughout the Bay. Section 3.1 presents the methodology and results of the Bay-wide tidal datums analysis, including comparison with published NOAA elevations. Section 3.1.4 presents the methodology and results of the Baywide extreme tide analysis, including comparison with the USACE (1984) extreme tide elevations and more recent NOAA estimates.

3.1 DAILY TIDAL DATUMS

This study presents calculated tidal datums and extreme tide elevations referenced to NAVD88 for more than 900 locations along the Bay shoreline (Figure 3-1), allowing a level of resolution and precision previously unobtainable for the region.

3.1.1 TIDAL DATUM METHODS

This study leveraged a regional San Francisco Bay hydrodynamic modeling study completed as part of FEMA's San Francisco Bay Area Coastal Study (DHI 2011, 2013). The FEMA model output provided water level data in 15-minute time intervals for each location, which consisted of water surface elevations relative to NAVD88. The tidal datums analysis used simulated water levels from 1983 through 2001, corresponding to the most recent NTDE as defined by NOAA.

Tidal datums were calculated by selecting the relevant data (for example, the higher of the two high tides that occur each day for MHHW) from the 15-minute water level data, then averaging those data over the entire NTDE from January 1, 1983, to December 31, 2001. These methods were used to calculate the MLLW, MLW, MTL, MSL, MHW, and MHHW tidal datum elevations.

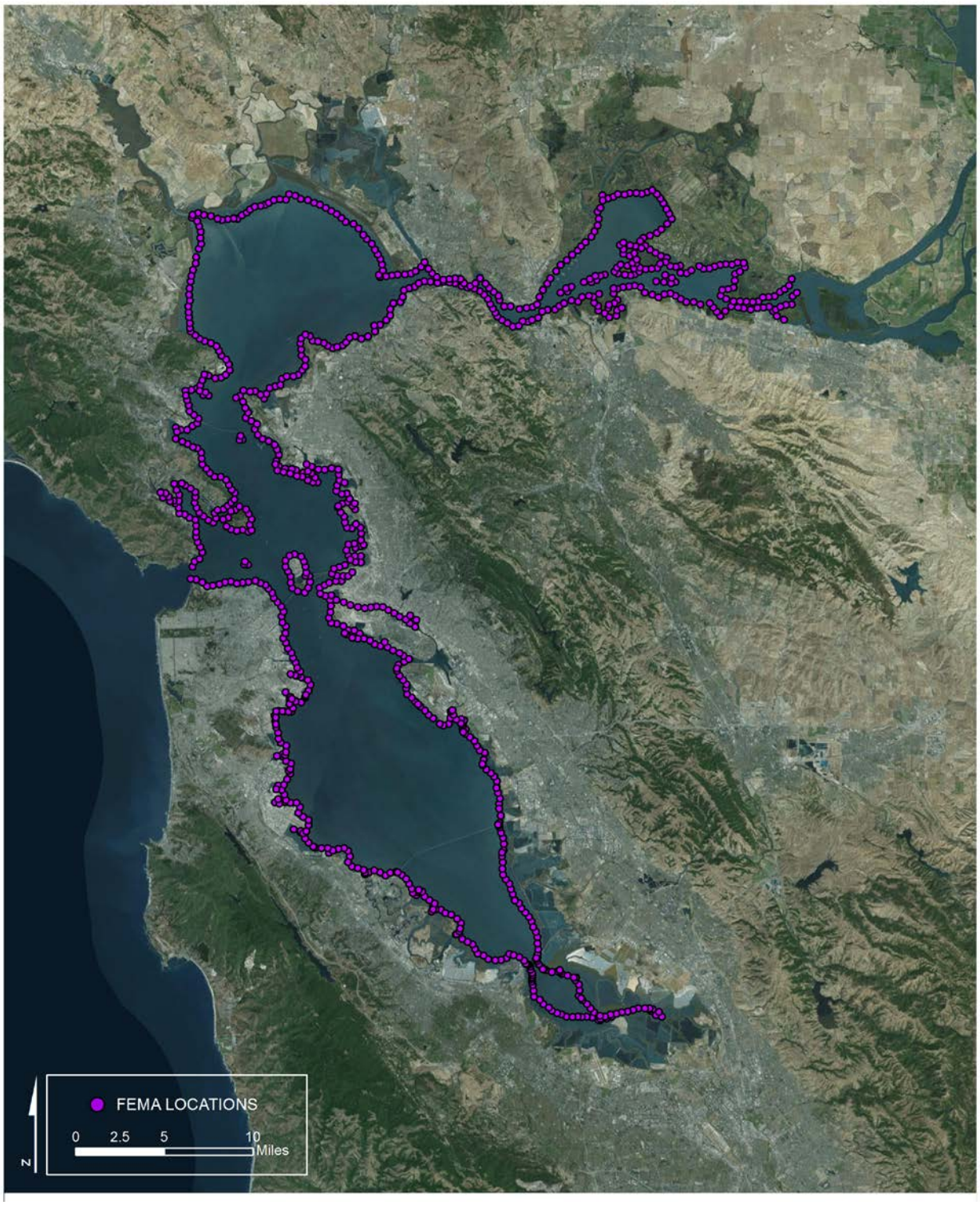


Figure 3-1. Locations with Calculated Tidal Datums and Extreme Tide Elevations

3.1.2 RESULTS VALIDATION

The tidal datum elevations calculated for this study are based on modeled water surface elevations, whereas the tidal datums published for the NOAA tide stations are primarily based on observations recorded at each tide station.[4] The accuracy of tidal datum estimates based on observations depends on the duration and age of measurement, the equipment used, and the accuracy of the vertical control. These vary widely within the Bay. For instance, the length of time any particular Bay NOAA tide station recorded tidal data ranges from 1 month to over 100 years. As a result, tidal datum estimates based on these observations have varying degrees of accuracy.

The accuracy of the tidal datum elevations presented in this study relies on the quality and accuracy of the calibration and validation of the FEMA regional hydrodynamic model. The FEMA model was calibrated to daily water levels at nine tide stations within the Bay and was calibrated to two large storm events. The model was validated against 11 other time periods with observed high water levels (DHI 2011, 2013).

In general, the model calibration and validation results agreed well with observations. The absolute errors in tidal harmonic amplitude were within 0.02 ft (0.6 centimeter [cm]) and within 1 to 2 degrees in phase (DHI 2011, 2013). Cheng et al. (1993) describes a well-calibrated hydrodynamic model to be within 2 degrees of phase and 1 cm of amplitude; therefore, the FEMA model is considered to be well-calibrated. Model validation results were also reasonable and root mean square (RMS) errors at long-term NOAA tide stations were 0.1 to 0.4 ft; however, water level differences were more variable for individual storm events. Differences in peak water levels ranged from -0.4 to +0.5 ft.

The tidal datum elevations calculated from the regional modeling output were compared to the published values at several NOAA tide stations (see Figure 3-2). The comparison is shown in Table 3-1 (all tidal datums) and on Figure 3-3 (MLLW), Figure 3-4 (MSL), and Figure 3-5 (MHHW). Table 3-1 shows good agreement, on average, for the mean tide (MSL and MTL) and high water (MHW and MHHW) tidal datums at all stations, with an average difference between the modeled and the NOAA values of less than 0.1 ft. The comparison shows larger differences (e.g., greater than 0.5 ft) for the low tide datums (MLW and MLLW), particularly at two tide stations (Sonoma Creek and Coyote Creek) where NOAA's tidal datum elevations are not based on full NTDE measurements. Both these stations are also influenced by frictional effects on nearby intertidal mudflats, freshwater discharge, and model boundary effects, which may contribute to discrepancies in the model. The low water tidal datums at other stations (e.g., Richmond, Presidio, and Alameda) show better agreement with the NOAA published datums, with an average difference of less than 0.1 ft.

Although freshwater discharges were included within the FEMA regional hydrodynamic model, the freshwater discharges were approximated at several creeks and were not based on actual streamflow measurements for the entire model simulation period (except for the Sacramento River). Sensitivity testing was conducted to support this approach; this testing found only relatively small changes in local water levels would occur by using mean annual discharges at major tributaries (DHI 2013). The only exception may be at Coyote Creek, which has the most pronounced influence on local tide elevations in the South Bay, and additional analysis in this area is recommended for future work.

[4] Some NOAA tide stations were inactive for some or all of the current NTDE. Two examples of such tide stations are the Coyote Creek station, which was active for only 15 months during the current NTDE, and the Sonoma Creek station, which was not active at all during the current NTDE. The NOAA tidal datums at stations such as these are partially or entirely derived from calculations based on other long-term reference stations.

The overall results provide confidence that the tidal datum results presented in this study can be used to accurately represent tidal elevations throughout the majority of the Bay. They are appropriate for planning-level purposes, with the caveat that the low tide datums (MLW and MLLW) in some areas have greater uncertainty.

Table 3-1. Comparison of FEMA 2015 and NOAA Published Tidal Datum Elevations

Location	Source	MLLW	MLW	MSL	MTL	MHW	MHHW	Diurnal Range [1]
		(ft NAVD88)						
Port Chicago	FEMA	0.94	1.74	3.69	3.67	5.59	6.13	5.19
	NOAA	1.10	1.84	3.66	3.67	5.50	6.01	4.91
Difference (ft)		**-0.16**	**-0.10**	**0.03**	**0.00**	**0.09**	**0.12**	**0.28**
Sonoma Creek	FEMA	-	-	-	-	5.72	6.29	-
	NOAA	-0.01	1.11	3.25	3.27	5.44	6.05	6.06
Difference (ft)		-	-	-	-	**0.28**	**0.24**	**-**
Richmond	FEMA	0.02	1.06	3.30	3.31	5.55	6.11	6.09
	NOAA	-0.01	1.11	3.25	3.27	5.44	6.05	6.06
Difference (ft)		**0.03**	**-0.05**	**0.05**	**0.04**	**0.11**	**0.06**	**0.03**
Presidio	FEMA	0.05	1.04	3.21	3.23	5.41	5.95	5.90
	NOAA	0.06	1.19	3.18	3.24	5.29	5.90	5.84
Difference (ft)		**-0.01**	**-0.15**	**0.03**	**-0.01**	**0.12**	**0.05**	**0.06**
Alameda	FEMA	-0.30	0.81	3.25	3.32	5.83	6.42	6.72
	NOAA	-0.23	0.91	3.22	3.33	5.75	6.37	6.60
Difference (ft)		**-0.07**	**-0.10**	**0.03**	**-0.01**	**0.08**	**0.05**	**0.12**
Redwood City	FEMA	-1.18	0.05	3.35	3.28	6.51	7.12	8.30
	NOAA	-1.10	0.10	3.30	3.28	6.47	7.10	8.20
Difference (ft)		**-0.08**	**-0.05**	**0.05**	**0.00**	**0.04**	**0.02**	**0.10**
Coyote Creek	FEMA	-	-	-	-	6.85	7.46	-
	NOAA	-1.50	-0.26	3.42	3.33	6.92	7.51	9.01
Difference (ft)		**-**	**-**	**-**	**-**	**-0.07**	**-0.05**	**-**

Note: Published tidal datums retrieved from NOAA 2015 and converted to NAVD88.

[1] Diurnal range is the tide range defined as the difference between MHHW and MLLW.

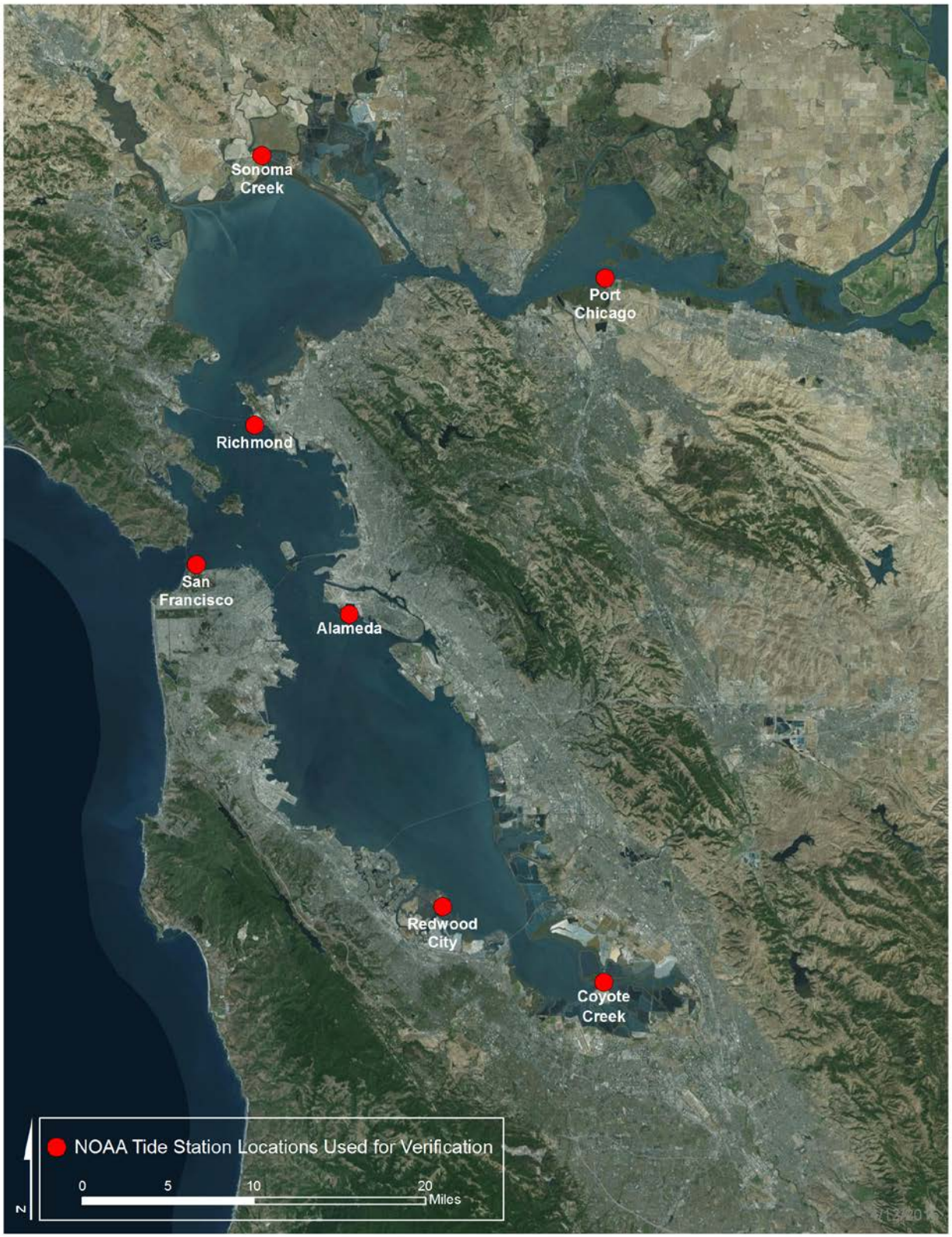


Figure 3-2. Locations of Published NOAA Tidal Datums Used to Verify the Tidal Datum Calculations

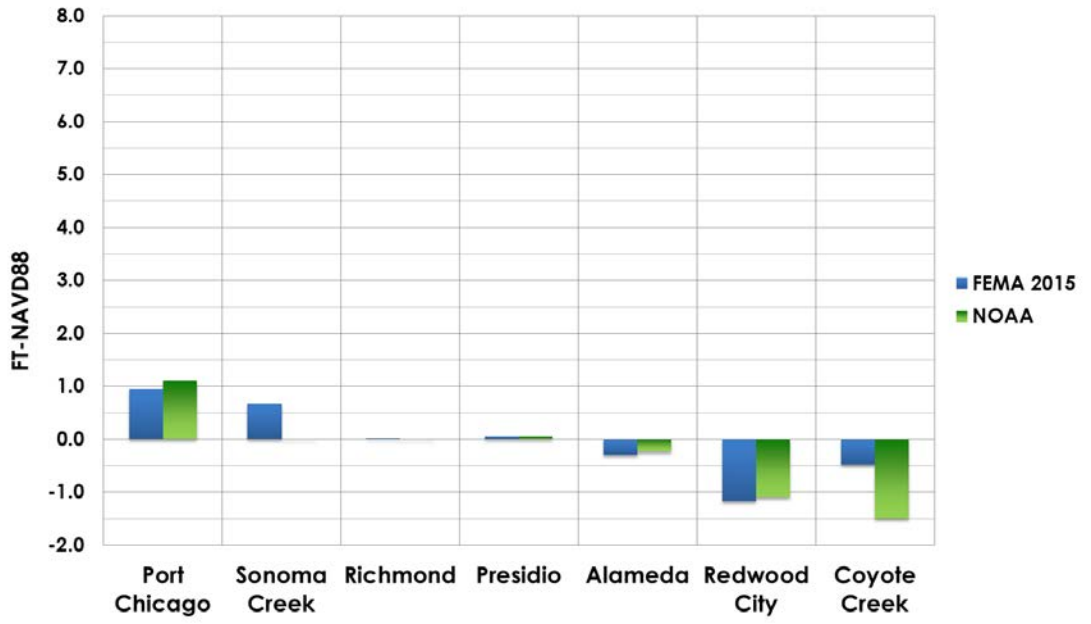


Figure 3-3. Comparison of MLLW Tidal Datum Elevations (FEMA and NOAA)

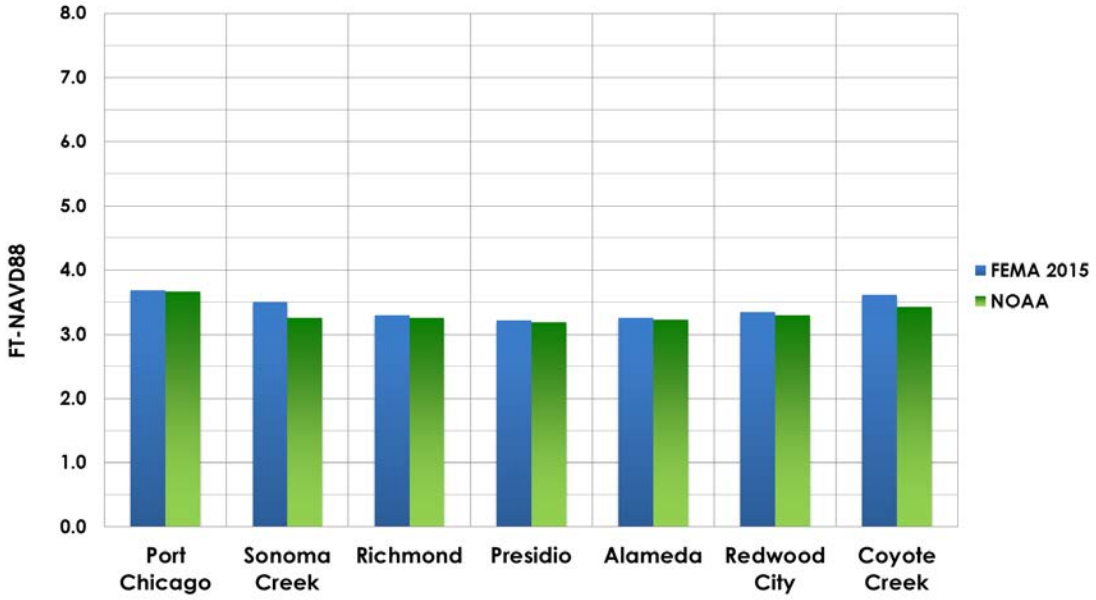


Figure 3-4. Comparison of MSL Tidal Datum Elevations (FEMA and NOAA)

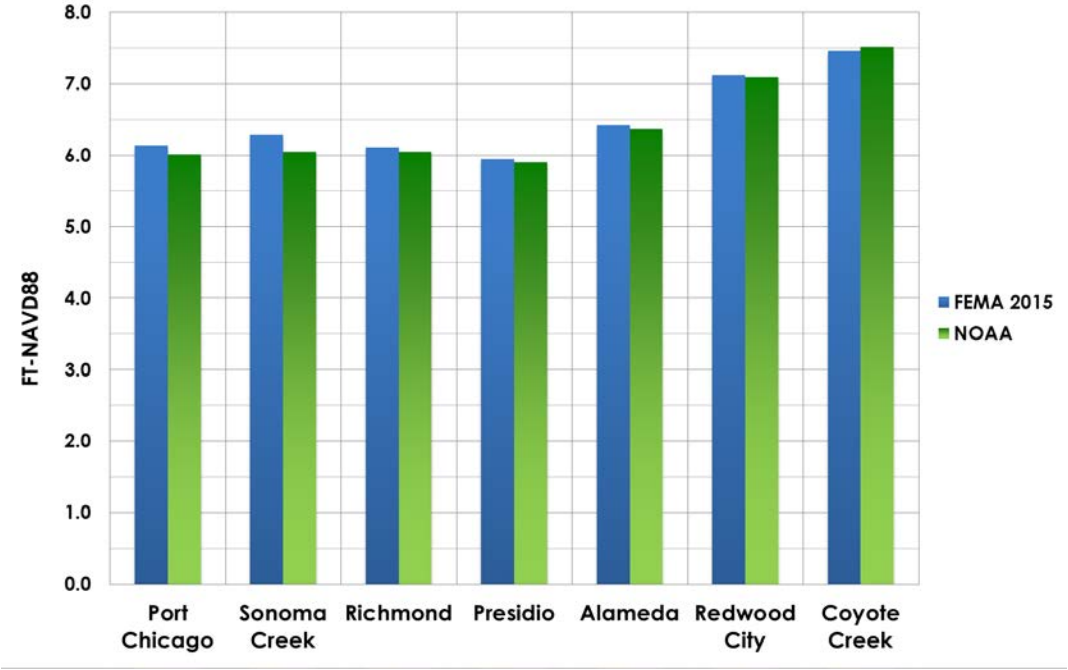


Figure 3-5. Comparison of MHHW Tidal Datum Elevations (FEMA and NOAA)

3.1.3 TIDAL DATUM RESULTS

Appendix A presents a series of maps that depict the locations and unique identifications (IDs) for the 900+ tidal datum calculation locations. Appendix B presents a table with the full set of tidal datum elevations for the same locations.

The results of the tidal datum calculations confirm the general understanding of tidal ranges previously derived from observations alone. In addition, these calculated tidal datums highlight the variability of tide elevations in the Bay and allow for more detailed understanding of local variations. For example, in the 25 miles between the Presidio and Redwood City tide stations (over 50 miles of winding shoreline), only four historical NOAA tide stations have produced observation-based tidal datums—none of which are currently active. Only two of these stations (Pier 22½ and San Mateo Bridge) have tidal datum information with a conversion to NAVD88 (from either NOAA or the United States Geological Survey [USGS]). In general, the observations date to the late 1970s and were collected before the current NTDE. This study presents tidal datum information at 150 locations between the Presidio and Redwood City, increasing the understanding of local tide variations. This information is important because the daily high tide elevation between these two locations differs by more than 1 ft and the tidal range differs by more than 2 ft.

Table 3-2 presents a sample of the results at 10 locations (out of the 150 calculated) between the Presidio and Redwood City to illustrate the detail in tide information now available.

Table 3-2. Sample of Modeled Tidal Datums between Presidio and Redwood City

Location	MLLW	MLW	MSL	MTL	MHW	MHHW	Diurnal Range
	(ft NAVD88)						
Presidio	0.03	1.04	3.22	3.23	5.43	5.97	5.94
SF Pier 39	-0.06	0.97	3.19	3.27	5.56	6.11	6.17
Pier 22½ (Bay Bridge)	-0.17	0.91	3.23	3.30	5.69	6.26	6.43
Hunters Point	-0.43	0.70	3.25	3.31	5.93	6.53	6.96
Oyster Point Marina	-0.64	0.54	3.31	3.33	6.11	6.73	7.37
SFO Airport	-0.74	0.45	3.32	3.31	6.18	6.80	7.54
Coyote Point	-0.81	0.39	3.32	3.31	6.24	6.86	7.67
San Mateo Bridge	—	—	—	—	6.32	6.94	—
Redwood Shores	—	—	—	—	6.41	7.02	—
Redwood City	-1.18	0.05	3.35	3.28	6.51	7.12	8.30

Figure 3-6 illustrates calculated MLLW and MHHW elevations within the Bay. Figure 3-7 presents a profile of the variation of the MLLW and MHHW calculated for the Bay along a longitudinal central axis. The amplification of the daily tide range with increasing distance from the Golden Gate Strait to the south is clearly visible. To the north, tidal range attenuates toward the Carquinez Strait. The smallest diurnal tide range is approximately 5 ft near the Delta. The largest diurnal tidal range occurs in the South Bay, particularly near the mouth of Coyote Creek.

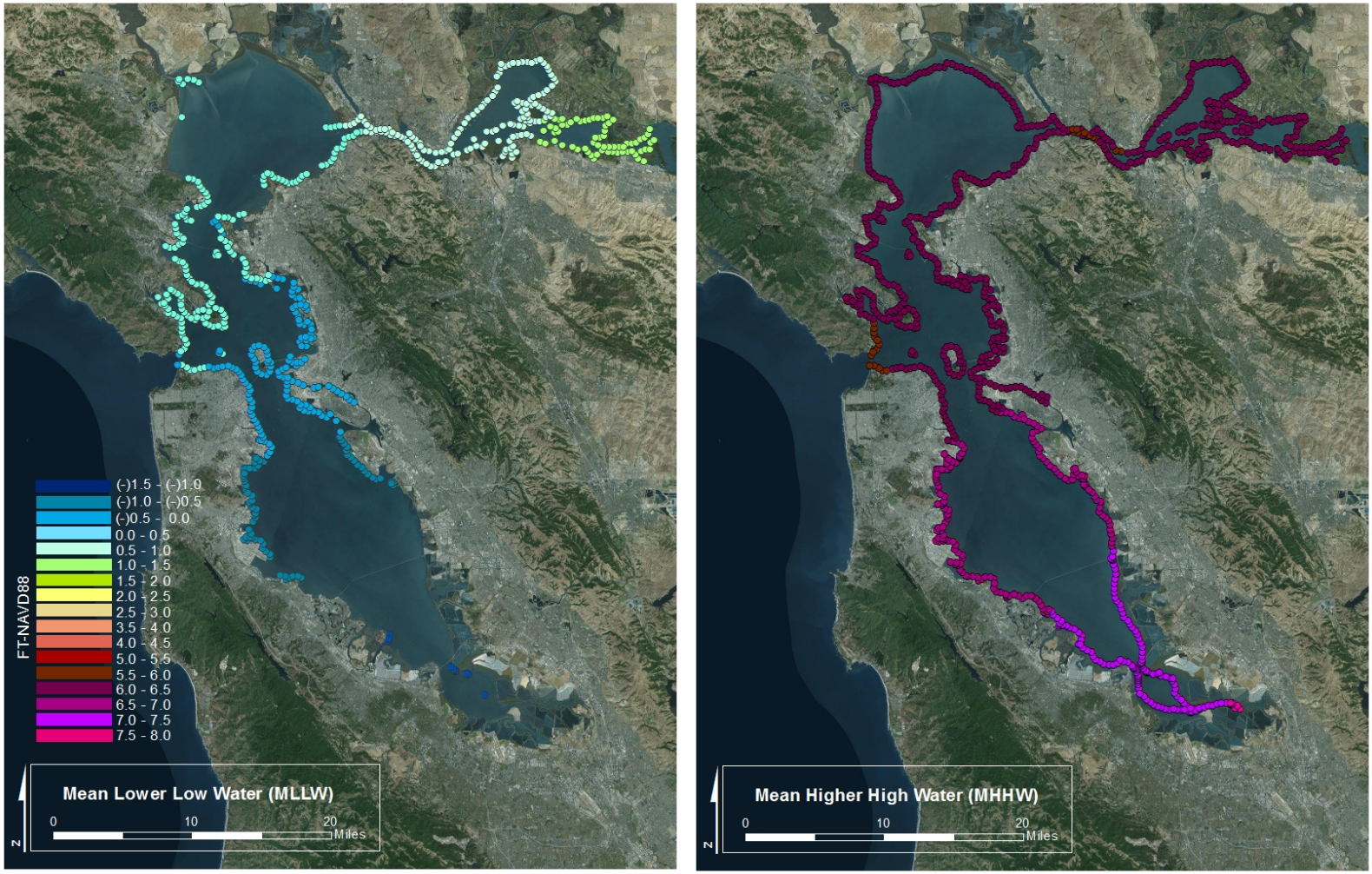


Figure 3-6. MLLW and MHHW Elevations in San Francisco Bay

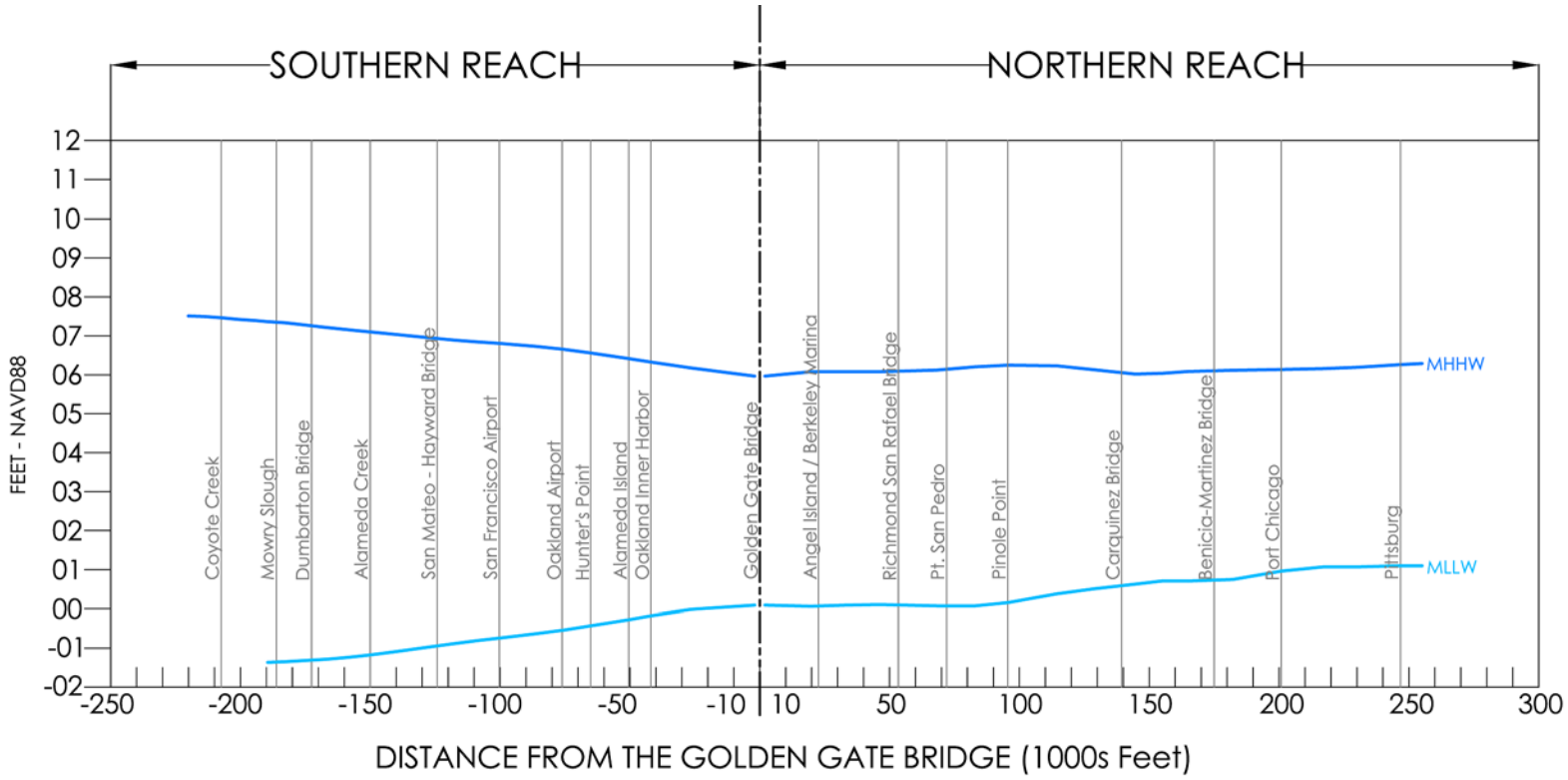


Figure 3-7. Daily Tide Elevation Profile in San Francisco Bay

3.1.4 CAVEATS ON THE USE OF LOW WATER TIDAL DATUMS

The FEMA hydrodynamic modeling results are influenced by frictional effects on nearby intertidal mudflats, freshwater discharge, and model boundary effects in some areas. In addition, some model output points are on intertidal mudflats and may "dry out" during unusually low tides (i.e., the intertidal mudflats are exposed during low tides). Accurate calculation of the MSL, MTL, MLW, and MLLW tidal datums requires that the full range of water level fluctuations, from high tide to low tide, be captured for the duration of the analysis period. At model output points where low tides were not captured, a reliable assessment of these datums could not be made. Therefore, the MSL, MTL, MLW, and MLLW tidal datums were excluded from the Appendix B results at these locations, and only the MHW and MHHW tidal datums and extreme tide estimates are provided.

3.2 EXTREME TIDES

As described in Section 2.3, an extreme tide refers to a temporary, short- to medium-term (hours to days) increase in sea level above the predicted astronomical tide levels (excluding local wave effects). Extreme tides can result in inundation of low-lying roads, neighborhoods, and critical assets; exacerbate riverine flooding and cause upstream flooding; and result in property damage, limit mobility, and put lives at risk. Extreme tide elevation data are important for evaluating floodplain extents, assessing the level of flood protection provided by shoreline features, mapping the extent of flooding during a given extreme event, and minimizing and adapting to future flood hazards through for land use and coastal planning.

No single storm is responsible for past extreme tide levels across the entire Bay. The combination of events that produce a 100-year (1-percent-annual-chance) coastal flood at one location in the Bay may be quite different than the events that have produced a 100-year coastal flood elsewhere. The highest recorded Bay levels have all occurred since January 1983. This is no coincidence: mean sea level has increased in the last century, so base water levels (regular tides) are higher, and extreme tides are occurring more frequently. Figure 3-8 illustrates the dates at which maximum water surfaces have been experienced along portions of the Bay shoreline, illustrating how different events were responsible for the highest water levels experienced in different regions of the Bay.

Extreme tide elevations were calculated for 1-, 2-, 5-, 10-, 25-, 50-, 100-, and 500-year events at the same 900+ locations used to calculate tidal datums. Ideally, extreme tide calculations would rely on water level data with a sufficiently long period of record, and Bay water levels and storm characteristics (such as frequency and intensity) would have been relatively stable over the period of observation. These requirements are most important for calculating extreme tides that occur less frequently, such as the 100-year extreme tide.

These requirements are not met with the observed data available from existing NOAA tide stations, as only a single tide station (the Presidio tide station) has recorded over 100 years of observed water levels. Also, climate variables over the past century have not been stable. Climate trends have resulted in uncertainty around the frequency and intensity of future storms, and the Presidio record shows that MSL has risen continuously and extreme tides have become more frequent and larger in recent years.

Other tide stations throughout the Bay have shorter records, which may be sufficient for calculating some of the more frequent extreme tide levels (e.g., 2-year through 50-year extreme tides). However, having consistency in the period of record analysis and the density of locations is important when the objective is to calculate extreme tide statistics along the entire Bay shoreline. Given these circumstances, the FEMA regional hydrodynamic model provides the water levels best suited to this analysis. The FEMA model

output provides better consistency during the recent period of record than using observed data recorded at a limited number of tide stations.

3.2.1 EXTREME TIDE METHODS

Because both MSL and the annual maximum tide levels recorded at the Presidio tide station have risen continuously since tide station measurements began in 1855, each of these trends was taken into account to appropriately reflect current flooding. The local MSL trend was removed from the model to adjust the simulated water levels to existing conditions (DHI 2011, 2013). This removal accounts for the sea level rise trends that have occurred at the Presidio tide station over the last century and creates a stationary data set, which is a requirement of the extreme tide statistical analysis. The full available water level record from the FEMA hydrodynamic modeling was used to calculate extreme tide elevations. For the Central and North Bay, a 31-year record (January 1, 1973, to December 31, 2003) was used. For the South Bay, a 54-year record (January 1, 1956, to December 31, 2009) was used. The difference in period of record is due to the time period when the modeling effort was completed for FEMA and the availability of appropriate boundary condition data to drive the regional model.[5]

The statistical analyses of simulated water levels followed the procedures suggested in the FEMA Pacific guidelines (FEMA 2005), which recommend developing the 100-year extreme tide using a minimum of 30 years of observed data. The 31-year and 54-year periods evaluated using the model output captured both periods of quiescence and periods with large storm events.

Within the Bay, there is no single event (such as a hurricane) that is expected to result in a simultaneous 100-year water level along the entire complex shoreline. Therefore, calculating extreme tide elevations at multiple locations along the shoreline provides the best approach to calculating a location-specific 100-year extreme water level.

The following steps were performed to calculate the extreme tide elevations at each location:

1. The highest annual water level (annual maximum) for each year was calculated from simulated water levels, using a July–June storm year, which is consistent with the FEMA coastal hazard analysis for San Francisco Bay.
2. The 2-year through 100-year elevations were calculated by fitting a GEV probability distribution to the annual maxima data set. This provided estimates of the extreme tide levels that would occur at a given interval (i.e., every 2 years, 5 years, or 100 years).
3. A 1-year, or annual, event was calculated by extrapolating from the 2- through 100-year estimates.
4. Figure 3-9 shows the annual maximum water elevations (red boxes) for the years 1956 to 2009 for one example location in the South Bay. Figure 3-9 also distinguishes between the 31-year period available for the Central and North Bay analysis and the 54-year period available for the South Bay analysis.

[5] DHI (2011) began the initial regional hydrodynamic modeling in 2005, and the period of record was limited to post-1973 due to the availability of wave data in the open Pacific coast. The wave data were critical for capturing the long-period ocean swell propagating from the open ocean through the Golden Gate. The regional hydrodynamic model was updated in 2012 to better approximate hydrodynamic conditions in the South Bay. Limiting the focus to the South Bay extended the model hindcast to 1956, as ocean swell conditions have a negligible effect on South Bay hydrodynamics (DHI 2013). The hindcast was also extended to 2009 due to the availability of more recent data.

The estimates of the 500-year tide levels have greater uncertainty than those for more common events, given the relatively short duration of the hydrodynamic model simulation period. These estimates are presented for reference and to show that events with greater than 100-year severity may occur. Both the 100-year and 500-year extreme tide elevations are consistent with the values FEMA is using for the current updates to the FEMA Flood Insurance Rate Maps (FIRMs) and FISs for the Bay counties.

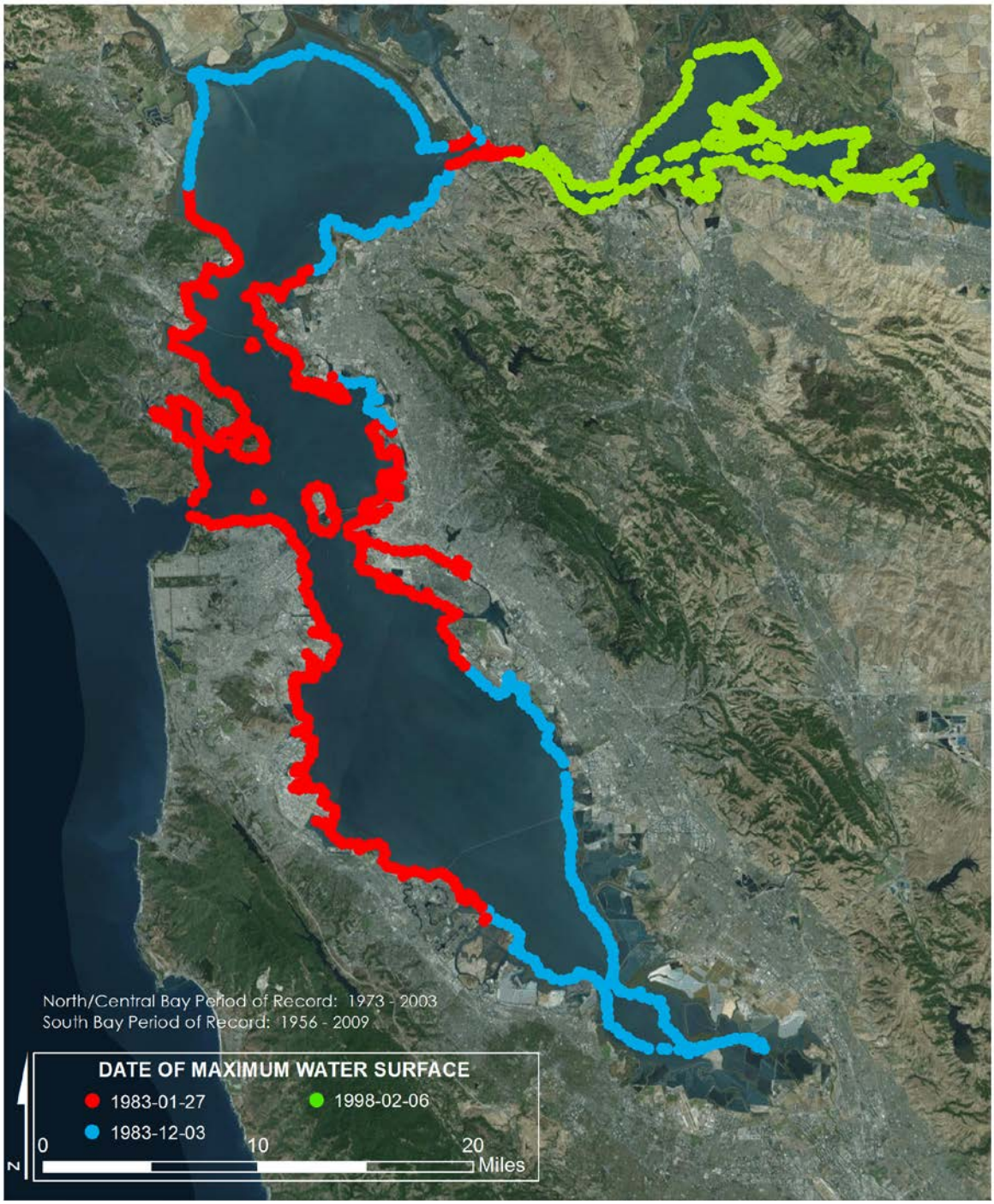


Figure 3-8. Date of Maximum Observed Tide Based on Simulated Water Levels (since 1956)

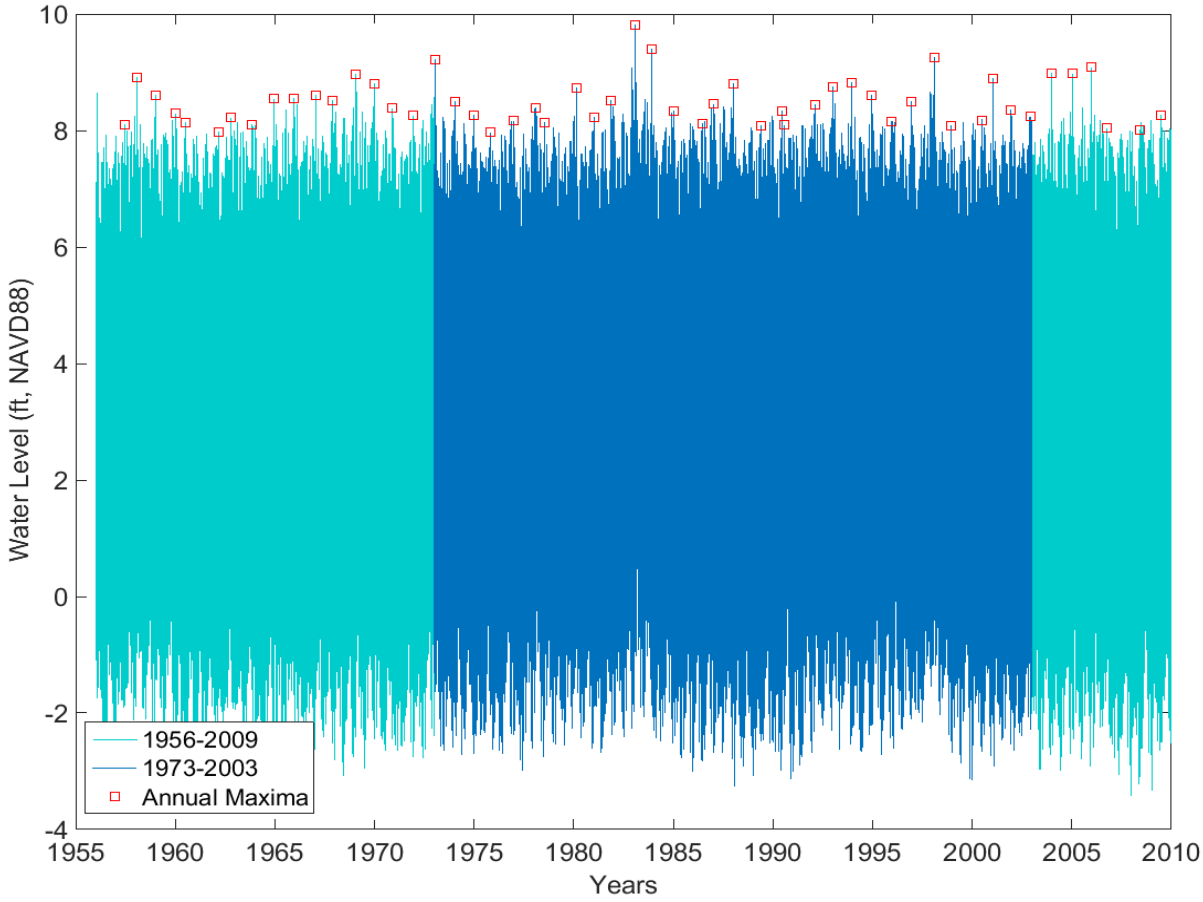


Figure 3-9. Extreme Value Analysis of Annual Maxima for Sample Location (Showing 31- and 54-Year Simulation Periods Used)

3.2.2 RESULTS VALIDATION

The 10-, 100-, and 500-year extreme tide estimates calculated in this study were compared to previously published estimates and observations of extreme tides (Figure 3-10) at the same locations compared for the tidal datums. This comparison includes the extreme tide estimates published by the USACE in 1984 (Table 3-3). The 100-year extreme tide estimates are also compared to the highest observed tide (HOT) levels recorded at the nearest NOAA tide station (Table 3-4). The extreme tide estimates are also compared graphically in Figure 3-10 (10-year), Figure 3-11 (100-year), and Figure 3-12 (500-year). The HOT levels recorded at each tide station are shown on Figure 3-11.

To develop the extreme tide estimates, the USACE (1984) evaluated a 129-year period of record from the Presidio Station, from 1855 to 1984. The FEMA regional hydrodynamic model output extends from 1973 to 2003 (for the Central and North Bay) and from 1956 to 2009 (for the South Bay); therefore, a maximum of 11 comparable years of record are contained within both studies (i.e., 1973 to 1984). The maximum observed water levels at the NOAA tide stations were not adjusted for sea level rise. The USACE (1984) results were also not adjusted for the sea level rise that has occurred from 1984 to present. For extreme tides observed during the 1983 El Niño winter, sea level rise trends over the past 30 years would add approximately 0.2 feet (based on the Presidio tide station) to the reported values if the same storm events occurred today. The FEMA 2015 results are based on water levels that were detrended for sea level rise through 2008 (for the Central and North Bay) and through 2011 (for the South Bay).

Table 3-3. Difference between FEMA Extreme Tide Estimates and Previous Estimates of Extreme Tides (feet)

Location	Source	10-Year	100-Year	500-Year
		FT-NAVD		
Port Chicago	FEMA 2015	8.33	9.58	10.69
	USACE 1984	8.57	9.07	9.37
	Difference (feet)	-0.24	0.51	1.32
Sonoma Creek	FEMA 2015	8.64	9.91	11.05
	USACE 1984	8.67	9.17	9.37
	Difference (feet)	-0.03	0.74	1.68
Richmond	FEMA 2015	8.34	9.53	10.59
	USACE 1984	8.55	8.95	9.25
	Difference (feet)	-0.21	0.58	1.34
Presidio	FEMA 2015	8.15	9.41	10.63
	USACE 1984	8.22	8.72	9.02
	Difference (feet)	-0.07	0.69	1.61
Alameda	FEMA 2015	8.65	9.82	10.9
	USACE 1984	8.91	9.41	9.71
	Difference (feet)	-0.26	0.41	1.19
Redwood City	FEMA 2015	9.38	10.68	12.1
	USACE 1984	9.29	9.69	9.99
	Difference (feet)	0.09	0.99	2.11
Coyote Creek	FEMA 2015	9.8	11.32	13.15
	USACE 1984	10.46	10.96	11.26
	Difference (feet)	-0.66	0.36	1.89

Note: The FEMA 2015 locations are approximate to the tide stations presented in the USACE 1984 analysis.

Table 3-4. Comparison of 100-Year Extreme Tide Estimates to Highest Observed Tide

Location	Source	Date / Return Period	Tide Elevation	Difference from NOAA Highest Observed Tide
			FT-NAVD88	FT
Port Chicago	NOAA obs.	Dec. 3,1983	9.02	—
	USACE 1984	100-yr	9.07	0.05
	FEMA 2015	100-yr	9.58	0.56
Richmond	NOAA obs.	Feb. 6, 1998	8.64	—
	USACE 1984	100-yr	8.95	0.31
	FEMA 2015	100-yr	9.53	0.89
Presidio	NOAA obs.	Jan. 27, 1983	8.72	—
	USACE 1984	100-yr	8.72	0.00
	FEMA 2015	100-yr	9.41	0.69
Alameda	NOAA obs.	Dec. 3,1983	9.42	—
	USACE 1984	100-yr	9.41	-0.01
	FEMA 2015	100-yr	9.82	0.40
Redwood City	NOAA obs.	Dec. 3,1983	9.70	—
	USACE 1984	100-yr	9.69	-0.01
	FEMA 2015	100-yr	10.68	0.98

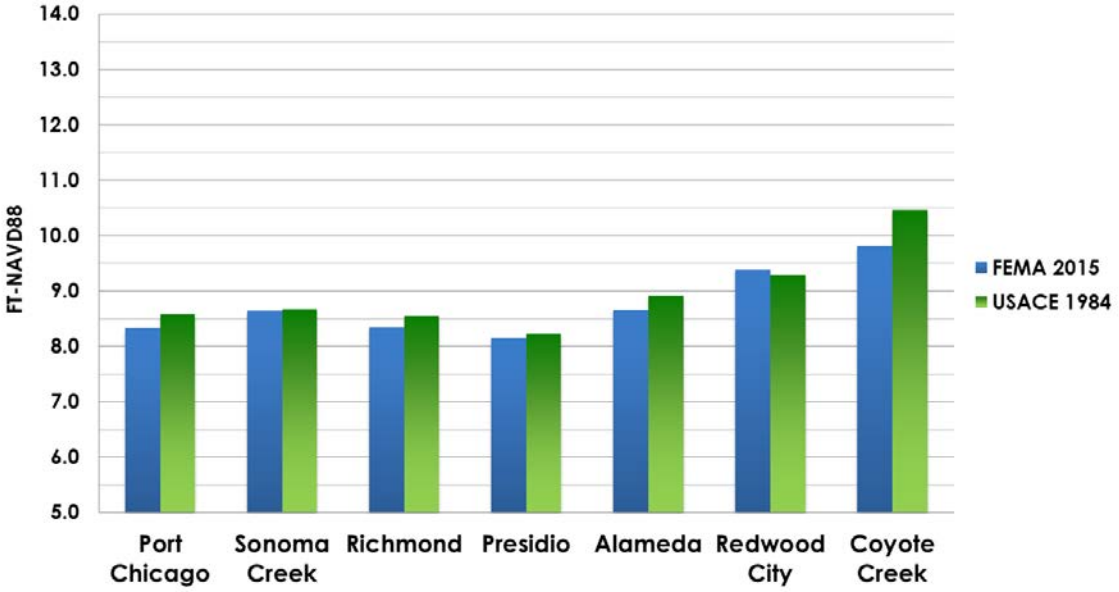


Figure 3-10. Comparison of 10-year Tide Estimates (FEMA and USACE)

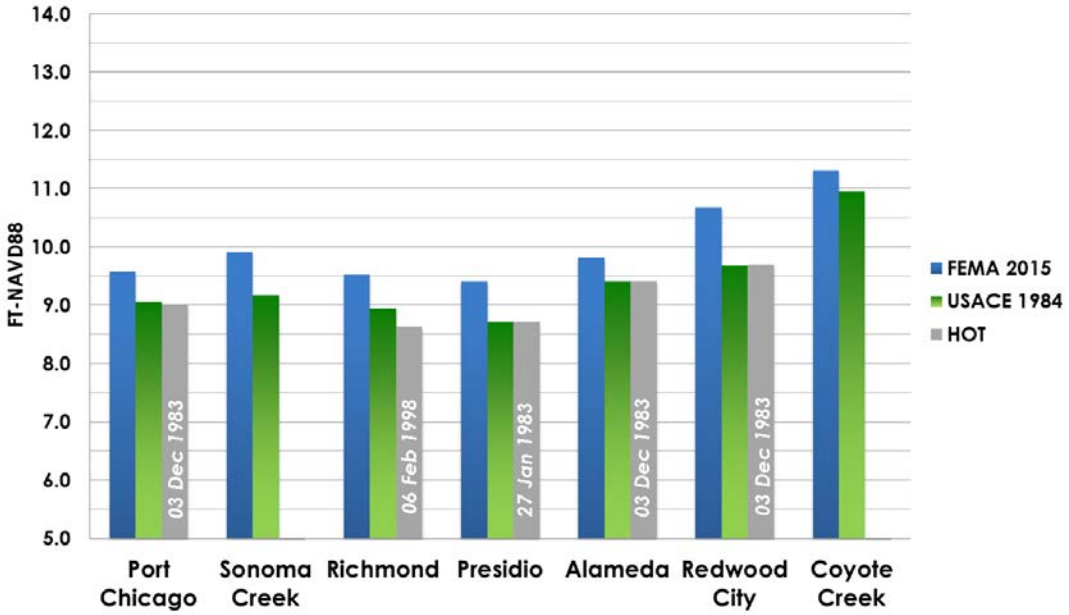


Figure 3-11. Comparison of 100-year Tide Estimates (FEMA and USACE) vs. Highest Observed Tide (NOAA)

Note: Sufficient long-term observed tide levels were not available at the Sonoma Creek and Coyote Creek stations to capture a meaningful highest observed tide elevation.

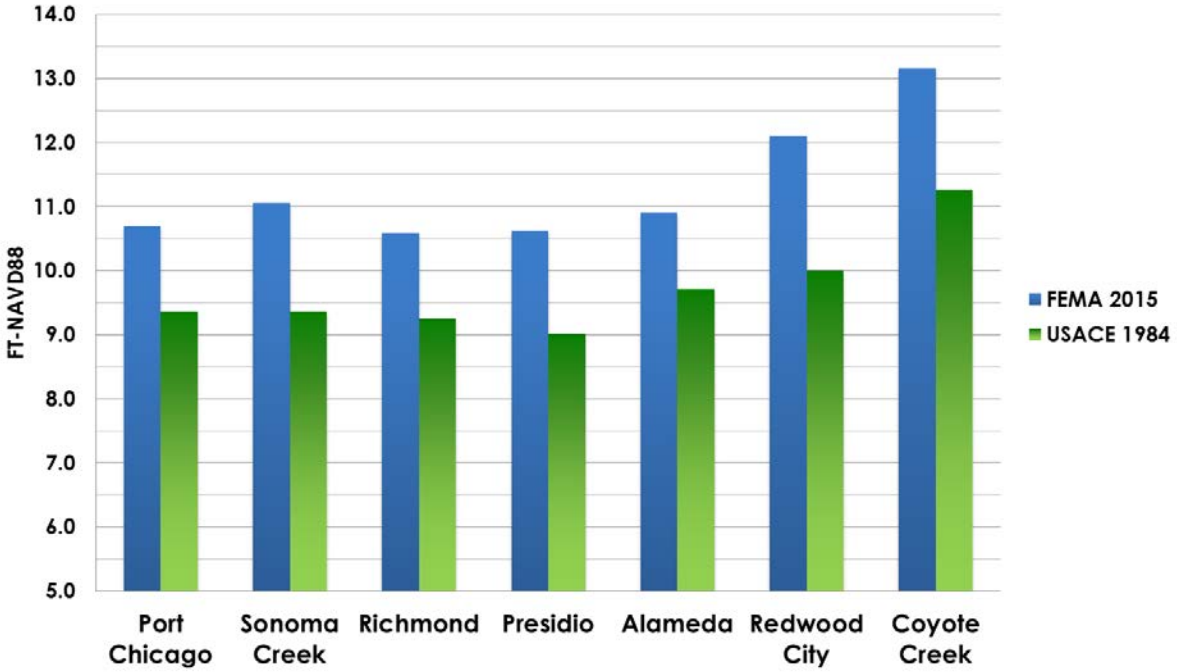


Figure 3-12. Comparison of 500-year Tide Estimates (FEMA and USACE)

The 10-year extreme tide estimates compare well with both the USACE (1984) and the NOAA results, as shown in Table 3-3 and on Figure 3-10. The 10-year extreme tides are generally within 0.2 to 0.3 ft of the USACE (1984) results, and in some cases within 0.1 ft. Of the locations compared, the greatest difference occurs at the Coyote Creek station (+0.7 ft). The reasons for the differences in this region are not fully understood, but are believed to be related to model assumptions due to freshwater discharge, model boundary conditions effects, and bathymetry grid resolution in the upper reaches of South Bay tributaries. Therefore, a full comparison between the two studies in this area is limited.

For the locations presented in Table 3-3, the 100-year extreme tide elevations based on the FEMA model simulations are higher than the USACE estimates. All of the 100-year extreme tides are within 1.0 ft of the USACE results, and the majority of the 500-year extreme tides are within 2.0 ft. Higher extreme tide estimates for this study compared to previous USACE (1984) estimates are expected, as discussed in Section 1.1.

Figure 3-11 also provides a comparison between the FEMA and USACE (1984) 100-year extreme tide estimates and NOAA's HOT levels. The USACE (1984) study used the January 1983 recorded tide level at the Presidio (i.e., the highest tide on record at the Presidio) as the baseline for the 100-year extreme tide in the tidal stage versus frequency analysis. The USACE (1984) results therefore trend well when compared to the HOT levels; however, it should be noted that the January 1983 water levels are not the highest water levels recorded at all San Francisco Bay tide gages. The December 1983 water levels in the South Bay exceeded the January 1983 water levels. In February 1998, the combination of high freshwater inflows from the Delta and extreme high tides resulted in the highest recorded water levels in Suisun Bay (see Figure 3-8 and Figure 3-11). These three events (January 1983, December 1983, and February 1998) all produced similar extreme high tides throughout the Bay. Additional extreme tide events occurred in January 2005 and December 2006, and both of these events approached the 1983 extreme water levels. Therefore, when all of these events are considered together statistically, along with

the annual maximum water levels that occurred in other years, the resulting 100-year extreme tide is higher than any of the individual extreme events. The statistical analyses show the January and December 1983 high water levels having return frequencies of less than 100 years. This result is reasonable given the number of large storm events that occurred in the Bay after 1984 and the increasing frequency at which these high water events are occurring (e.g., February 2, 1998; January 8, 2005; and December 31, 2006).

The largest differences between this and previous studies are found when comparing the 500-year water levels. Similar to the 100-year results, the number of years available and the methods used can lead to differences in estimated extreme tide elevations. A comparison between the 500-year results should be taken with some caution; even 129 years of observed data are likely to produce an estimate of the 500-year water level with relatively high uncertainty. These results should be used solely for understanding that the increase in water levels between a 100- and 500-year event in the Bay is typically within 1.5 ft or less.

3.2.3 EXTREME TIDE RESULTS

Sample results of the 1-year through 500-year extreme tide analysis for representative Bay locations are presented in Table 3-5. The full set of extreme tide elevations, corresponding to the 900+ locations, is included in Appendix B.

As with daily high tides (i.e., MHHW), extreme tide elevations generally increase with increasing distance north and south from the Golden Gate Bridge (Table 3-5, Figure 3-13, and Figure 3-14), primarily due to the influence of astronomical tides, as increases in water levels associated with storm surge tend to be relatively constant across the Bay.

Figure 3-13 illustrates the elevation of 100-year extreme tides within the Bay. Figure 3-14 presents a longitudinal profile of the Bay from Pittsburg in the north to Coyote Creek in the south. The elevation of daily high and low tides, the 100-year extreme tide, and two historical extreme tides are compared. This figure illustrates the 100-year elevations above MHHW. The elevation increase near Pittsburg is caused by freshwater inflows from the Delta. The full time series of Sacramento–San Joaquin River Delta River inflows is included within the FEMA regional hydrodynamic model. As shown on Figure 3-8, the highest recorded levels in Suisun Bay were not associated with the 1983 events, but were instead associated with high riverine inflows that occurred coincident an extreme tide event in February 1998.

Table 3-5. Sample of Bay-Wide Extreme Tide Elevations (ft NAVD88)

Location	1-yr	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr*
	(ft NAVD88)							
Port Chicago	7.26	7.57	8.00	8.33	8.79	9.17	9.58	10.69
Richmond	7.33	7.63	8.03	8.34	8.78	9.13	9.53	10.59
Sonoma Creek	7.56	7.88	8.31	8.64	9.10	9.49	9.91	11.05
Alameda	7.68	7.98	8.36	8.65	9.07	9.43	9.82	10.90
San Francisco (Presidio)	7.12	7.44	7.84	8.15	8.60	8.98	9.41	10.63
Redwood City	8.39	8.75	9.09	9.38	9.82	10.22	10.68	12.10
Coyote Creek	8.72	9.14	9.49	9.80	10.29	10.75	11.32	13.15

*Note: There is considerable uncertainty in estimates of the 500-year extreme tide elevation, especially in the far South Bay.

Figure 3-13. 100-yr Extreme Tide Estimates in San Francisco Bay

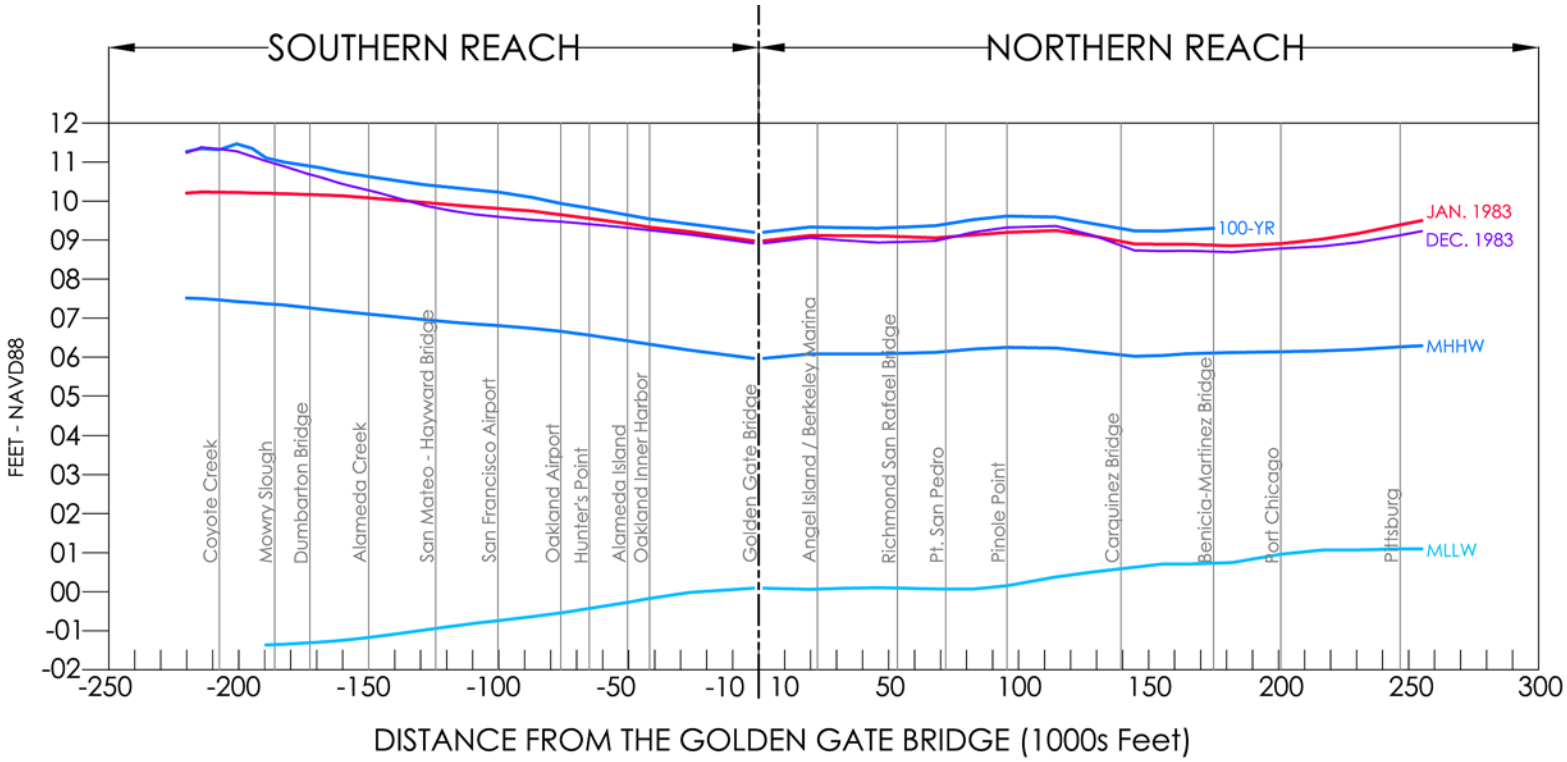


Figure 3-14. Daily and Extreme Tide Elevation Profile in San Francisco Bay

3.2.4 CAVEATS ON THE USE OF EXTREME TIDE ESTIMATES

Freshwater discharge from the Delta affects simulated water levels in the North Bay, particularly the area upstream of Carquinez Strait. The statistical estimates of extreme tide elevations derived from the FEMA hydrodynamic model in this region are therefore dominated by freshwater discharge events, not extreme tide events. Accurate determination of extreme water levels due to tidal and storm surge processes alone is therefore not possible in this region given the present model configuration. As a result, extreme tide estimates for portions of the North Bay upstream of Carquinez Strait have been excluded from Appendix B. Only the tidal datum estimates are provided at these locations.

4.0

IMPLICATIONS FOR SEA LEVEL RISE PLANNING AND RESPONSE

4. IMPLICATIONS FOR SEA LEVEL RISE PLANNING AND RESPONSE

The tidal datums presented in this study account for the sea level rise that has occurred to date within the Bay, but they do not include future sea level rise. This section provides an overview of sea level rise in the Bay as it is understood at the time of publication and discusses how sea level rise estimates may be used in tandem with the tidal datums and extreme tide elevations for future planning purposes.

4.1 INTRODUCTION TO SEA LEVEL RISE

There is no doubt that sea levels have risen and will continue to rise at an accelerated rate over the coming century (NRC 2012). Climate change is already affecting California and the Bay. Globally, sea level began rising at the end of the last glacial period, more than 10,000 years ago (USGS 2000). Data collected by a worldwide network of tide stations, including satellite-based measurements, indicate that global mean sea level rose at an average rate of approximately +1.8 millimeters per year (mm/yr) (0.59 ft/century) from 1961 to 2003 and increased to approximately +3.1 mm/yr (1.0 ft/century) from 1993 to 2003 (IPCC 2007).

Local relative (or eustatic) rates of mean sea level change can deviate from global rates due to tectonic land motions (uplift, subsidence, etc.) and local atmospheric and oceanic circulation processes, among other factors. In fact, there is considerable variability in relative mean sea level trends within San Francisco Bay itself. At the Presidio tide station, measurements by NOAA indicate a long-term relative mean sea level trend of +1.92 mm/yr (0.63 ft/century) over the 20th century. Long-term estimates by NOAA at Alameda and Redwood City indicate rates of +0.60 mm/yr (0.20 ft/century) and +1.25 mm/yr (0.41 ft/century), respectively. PWA (2005) estimated short-term relative rates of sea level change at several South Bay tide stations (Dumbarton Bridge, Palo Alto Yacht Club, and Coyote Creek) and found late 20th century rates (approximately 25 years) of approximately +1.52 mm/yr (0.50 ft/century) for MSL and +2.44 mm/yr (0.80 ft/century) for MHHW. These results suggest that the elevation of high tides may be increasing at a faster rate than overall mean sea level (due to complex hydrodynamic processes in the Bay that are not fully understood; see Section 4.2) (Flick et al. 2003).

It is difficult to predict with certainty the amount of sea level rise that will occur by any given date in the future. The uncertainty increases with time (e.g., the uncertainties associated with 2100 projections are greater than those associated with 2050 projections) because of uncertainties in future greenhouse gas (GHG) emissions trends, the evolving understanding of the sensitivity of climate conditions to GHG concentrations, and the overall reliability of climate models. The science associated with sea level rise is continually being updated, revised, and strengthened. The sea level rise projections presented in this document draw on the best available science on the potential effects of sea level rise in California as of September 2015.

Table 4-1 presents the National Research Council sea level rise projections for San Francisco relative to the year 2000 (NRC 2012). These projections (for example, 6 inches in 2030) represent the likely sea level rise values based on a moderate level of GHG emissions, extrapolation of continued accelerating

land ice melt patterns, plus or minus one standard deviation.[6] The extreme limits of the upper ranges (for example, 12 inches for 2030) represent unlikely but possible levels of sea level rise using very high emissions scenarios and including potential significant land ice melt.

Table 4-1. Sea Level Rise Estimates for San Francisco Relative to the Year 2000

Year	Most Likely Rise (inches)	Upper Range (inches)
2030	6 ± 2	12
2050	11 ± 4	24
2100	36 ±10	66

Source: NRC 2012.

At this time, the use of NRC (2012) projections and ranges is appropriate for planning purposes because they encompass the best available science, have been derived considering local and regional processes and conditions, and their use is consistent with current state guidance.

4.2 APPLICATION OF SEA LEVEL RISE TO ESTIMATE FUTURE DAILY AND EXTREME TIDE LEVELS

Sea level rise vulnerability and risk assessments require an adequate understanding of existing hydrodynamics, Bay water levels, and coastal flood risks. The tidal datum and extreme tide elevations presented in Appendix B provide fundamental data needed for these assessments. A complete coastal flood hazard assessment should also consider wave-induced flooding (FEMA 2005). In addition, these data can inform adaptation planning, both locally and regionally, to support resilient shoreline restoration, conservation, and development.

The daily and extreme tide elevations can be projected into the future simply by adding specific amounts of sea level rise (e.g., 12 inches or 36 inches). For example, to calculate the new daily high tide elevation in the year 2100 based on the NRC (2012) most likely sea level rise scenario, 36 inches of sea level rise can be added directly to the existing MHHW elevation for a particular location. This approach is referred to as the "linear superposition method," and it relies on the assumption that water level increases (to either a daily or extreme tide) are equal to the increase in mean sea level (e.g., a 1 ft rise in MSL translates into a 1 ft increase in MHHW). This assumption does not account for factors that may modify the tidal hydrodynamics over time. For example, as sea level rises, the mean water depth of the Bay will increase, which could affect the way in which tides propagate through the Bay, thereby changing the tide range at a given location. Holleman and Stacey (2014) used a hydrodynamic model to simulate the effects of sea level rise on Bay water levels. The model showed that in the absence of implementing large-scale adaptation measures, the linear superposition approach is appropriate within the Bay. Although small changes in the tidal range were observed, these changes were small compared to the amount of sea level rise examined (Holleman and Stacey 2014). Similarly, as part of the Adapting to Rising Tides Project (AECOM et al. 2011), AECOM evaluated hydrodynamic modeling completed by the USGS for the Computational Assessment of Scenarios for the Delta Ecosystem (CASCADE) Project (Knowles 2010) to evaluate tidal amplification due to sea level rise. That assessment found that along the Alameda County shoreline, the MHHW tidal datum may increase by an additional 0.3 ft in response to a 55-inch (4.6 ft) increase in MSL and that the diurnal tide range (MLLW to MHHW) may increase by 0.5 ft.

[6] One standard deviation roughly corresponds to a 15%/85% confidence interval, meaning that there is approximately 15% chance the value will exceed the high end of the projection (8 inches for the 2030 example given) and a 15% chance the value will be lower than the low end of the range (4 inches in the 2030 example).

The change in tide range modeled by Knowles (2010) is also considered small relative to the amount of sea level rise examined; therefore, the linear superposition approach in San Francisco Bay is reasonable.

The linear superposition approach expands the utility of the tidal datum and extreme tide water levels, as a wide range of future sea level rise scenarios can easily be evaluated. As the science of sea level rise progresses, this approach can also accommodate changes to future sea level projections. This approach is appropriate for high-level planning purposes and is not intended to take the place of more detailed, site-specific hydrodynamics modeling or engineering analyses.

5.0

REFERENCES

Photo used under Creative Commons. Provided by Flickr user Caleb Gomer.

5. REFERENCES

AECOM, Arcadis, Geografika, and 3D Visions. 2011. *Adapting to Rising Tides: Transportation Vulnerability and Risk Assessment Pilot Project*. Prepared for the Metropolitan Transportation Commission, Bay Conservation and Development Commission, Caltrans District 4, and the Federal Highway Administration. November 2011.

Barnard, P.L., D.H. Schoellhamer, B.E. Jaffe, and L.J. McKee. 2013. "Sediment Transport in the San Francisco Bay Coastal System: An Overview." *Marine Geology* 345: 3–17.

Cheng, R.T., V. Casulli, and J.W. Gartner. 1993. "Tidal, Residual, Intertidal Mudflat (TRIM) Model and its Applications to San Francisco Bay, California." *Estuarine, Coastal and Shelf Science* 36(3): 235–280.

Conomos, T.J. 1979. "Properties and Circulation of San Francisco Bay Waters." In: T.J. Conomos, ed., *San Francisco Bay: The Urbanized Estuary*, 47–84. San Francisco, CA: Pacific Division, American Association for the Advancement of Science.

DHI (DHI Water and Environment). 2011. *Regional Coastal Hazard Modeling Study for North and Central San Francisco Bay*. Final Draft Report. Prepared for Federal Emergency Management Agency as part of the FEMA Services Group (DHI, Nolte Associates and Fugro). October 2011.

———. 2013. *Regional Coastal Hazard Modeling Study for South San Francisco Bay*. Final Draft Report. Prepared for FEMA, January 2013.

FEMA (Federal Emergency Management Agency). 2005. *Final Draft Guidelines for Coastal Flood Hazard Analysis and Mapping for the Pacific Coast of the United States*. February 2005.

Flick R., J. Murray, and L. Ewing. 2003. "Trends in United States Tidal Datum Statistics and Tide Range." *Journal of Waterway, Port, Coastal and Ocean Engineering* 129(4): 155–164.

Holleman, R.C. and M.T. Stacey. 2014. "Coupling of Sea Level Rise, Tidal Amplification, and Inundation." *J. Phys. Oceanography* 44: 1439–1455.

IPCC (Intergovernmental Panel on Climate Change). 2007. *Climate Change 2007: The Physical Science Basis*, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Edited by S. Solomon, D. Qin, M. Manning, Z. Chen, M. Marquis, K. B. Averyt, M. Tignor, and H. L. Miller. Cambridge, England, and New York, NY: Cambridge University Press.

Knowles, N. 2010. "Potential Inundation due to Rising Sea Levels in the San Francisco Bay Region. California Climate Change Center. San Francisco Estuary and Watershed Science, 8:1.

Monismith, S.G., W. Kimmerer, J.R. Burau, and M.T Stacey. 2002. "Structure and Flow-Induced Variability of the Subtidal Salinity Field in Northern San Francisco Bay." *J. Phys. Oceanography* 32(11): 3003–3019.

NASA (National Aeronautics and Space Administration). n.d. Ocean Motion and surface currents. Accessed 2015. http://oceanmotion.org/html/background/tides-types.htm.

NOAA (National Oceanic and Atmospheric Administration). 2015. Tides & Currents webpage. NOAA/NOS Center for Operational Oceanographic Products and Services. Accessed 2015. http://tidesandcurrents.noaa.gov.

NRC (National Research Council). 2012. *Sea-Level Rise for the Coasts of California, Oregon, and Washington: Past, Present, and Future*. Prepared by the Committee on Sea Level Rise in California, Oregon, and Washington and the National Research Council Board on Earth Sciences and Resources and Ocean Studies Board Division on Earth and Life Studies.

PWA (Philip Williams and Associates). 2005. *Hydrodynamics and Sediment Dynamics: Existing Conditions Report*. Prepared for California State Coastal Conservancy, U.S. Fish and Wildlife Service, California Department of Fish and Game. San Francisco, CA.

USACE (United States Army Corps of Engineers). 1984. *San Francisco Bay Tidal Stage vs. Frequency Study*. USACE, San Francisco District. 24 pp.

———. 1988. San Francisco Bay Shoreline Study: Southern Alameda and Santa Clara Counties (interim).

———. 1989. Office Report San Mateo and Northern Alameda Counties Interim San Francisco Bay Shoreline Study.

USGS (United States Geological Survey). 2000. “Sea Level and Climate.” USGS Fact Sheet 002-00. January 2000.

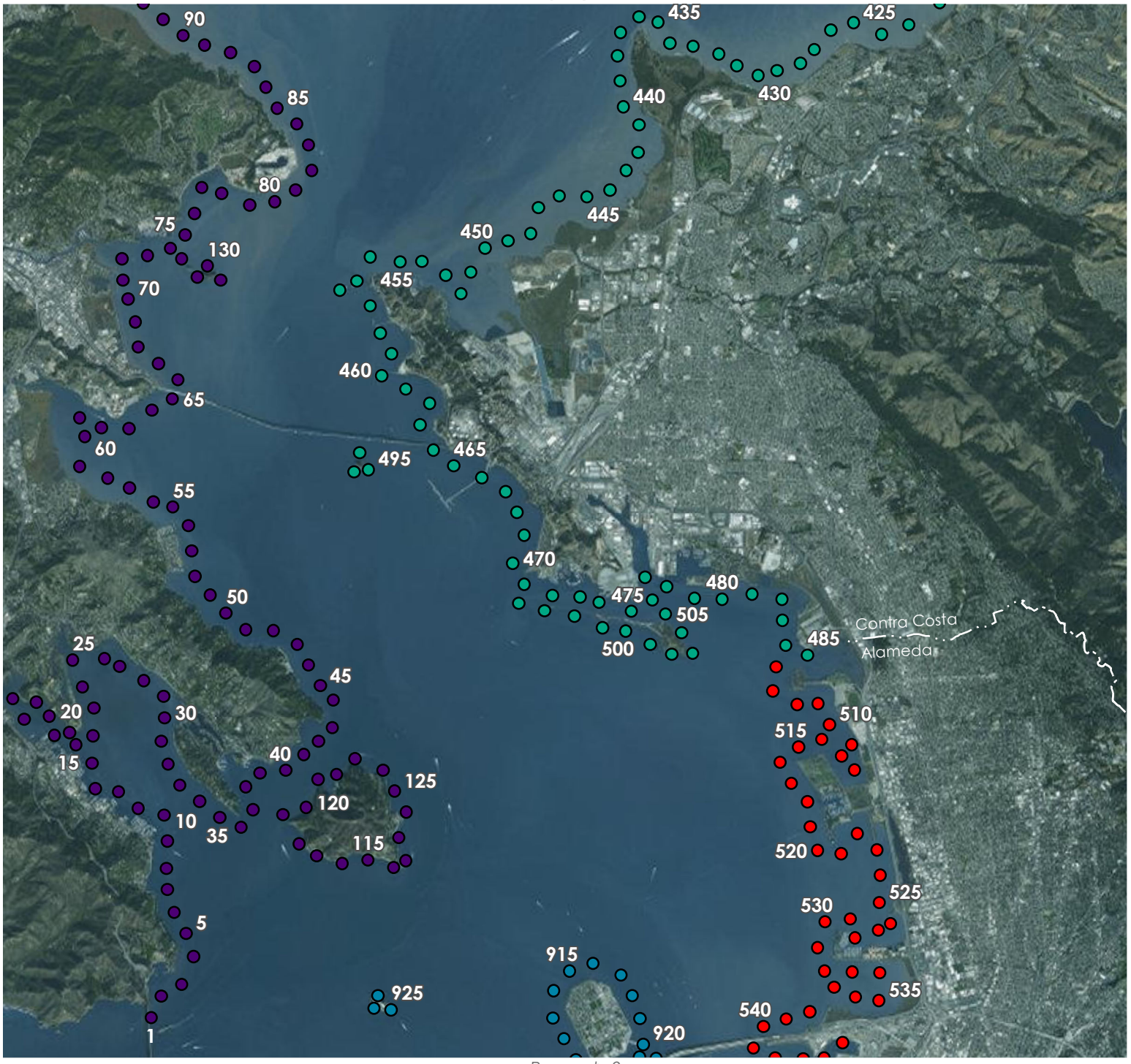
———. 2013. A. Foxgrover, personal communication, July 29, 2013.

Walters, R.A., R.T. Cheng, and T.J. Conomos. 1985. “Time Scales of Circulation and Mixing Processes of San Francisco Bay Waters.” In: *Temporal Dynamics of an Estuary: San Francisco Bay,* 13–36. Springer Netherlands.

A

LOCATIONS OF CALCULATED TIDAL DATUMS AND EXTREME TIDES IN SAN FRANCISCO BAY

Panel 2



Panel 8

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 1

Panel 1

Panel 3

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

0 1 2 Miles

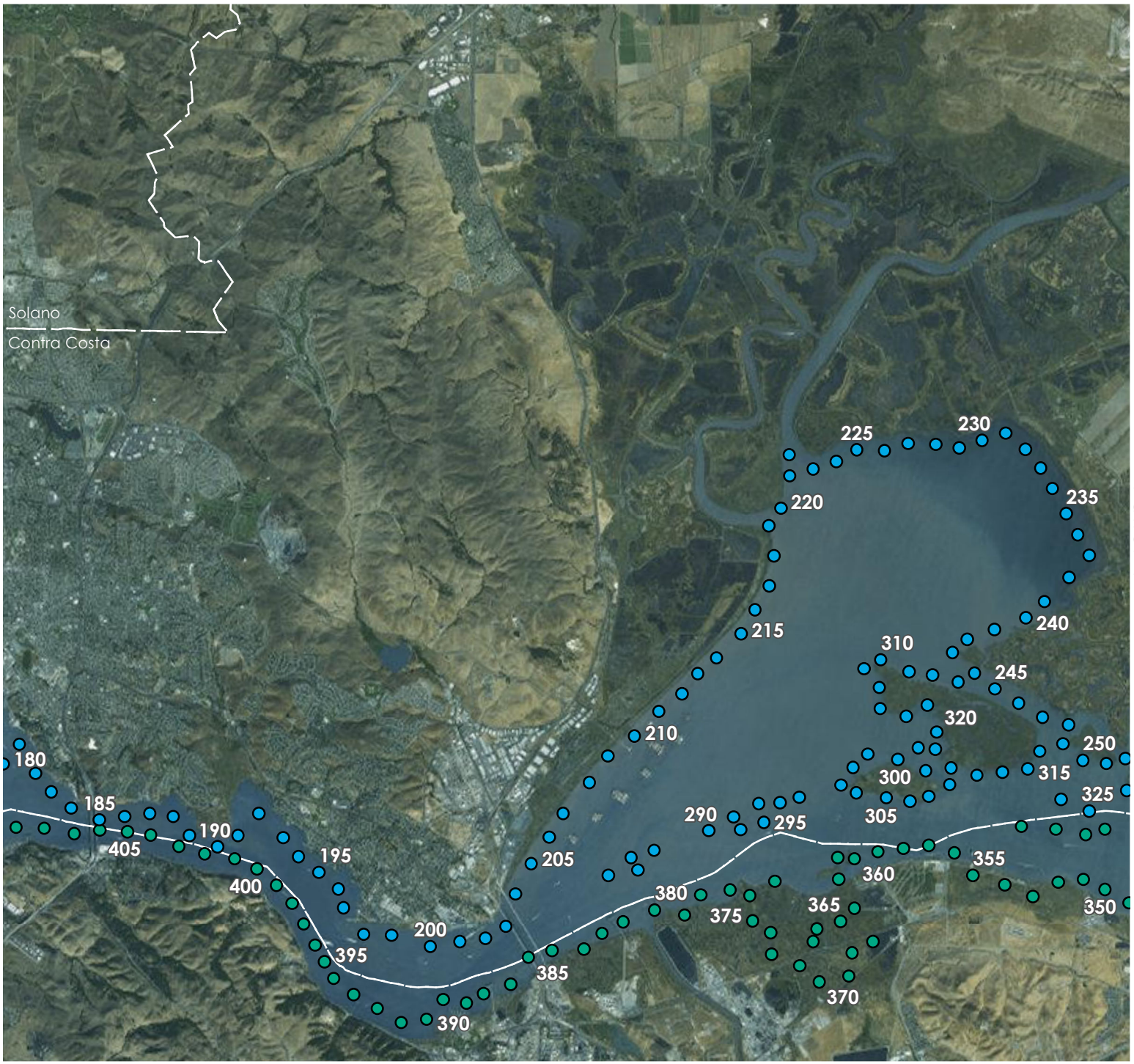
N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 2

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS



- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

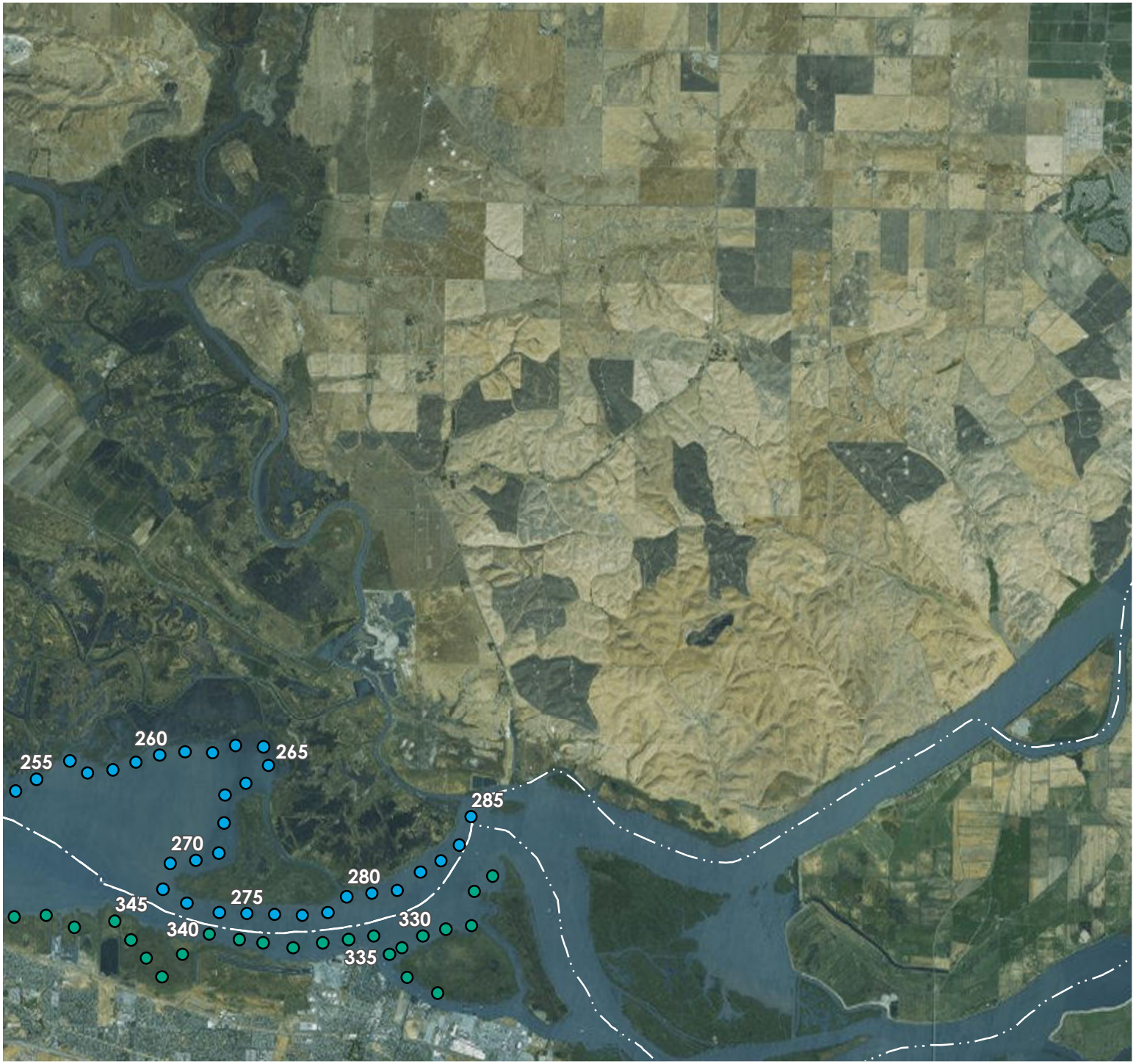
0 5,000 10,000 15,000 Feet

0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 3



Panel 3

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 4

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

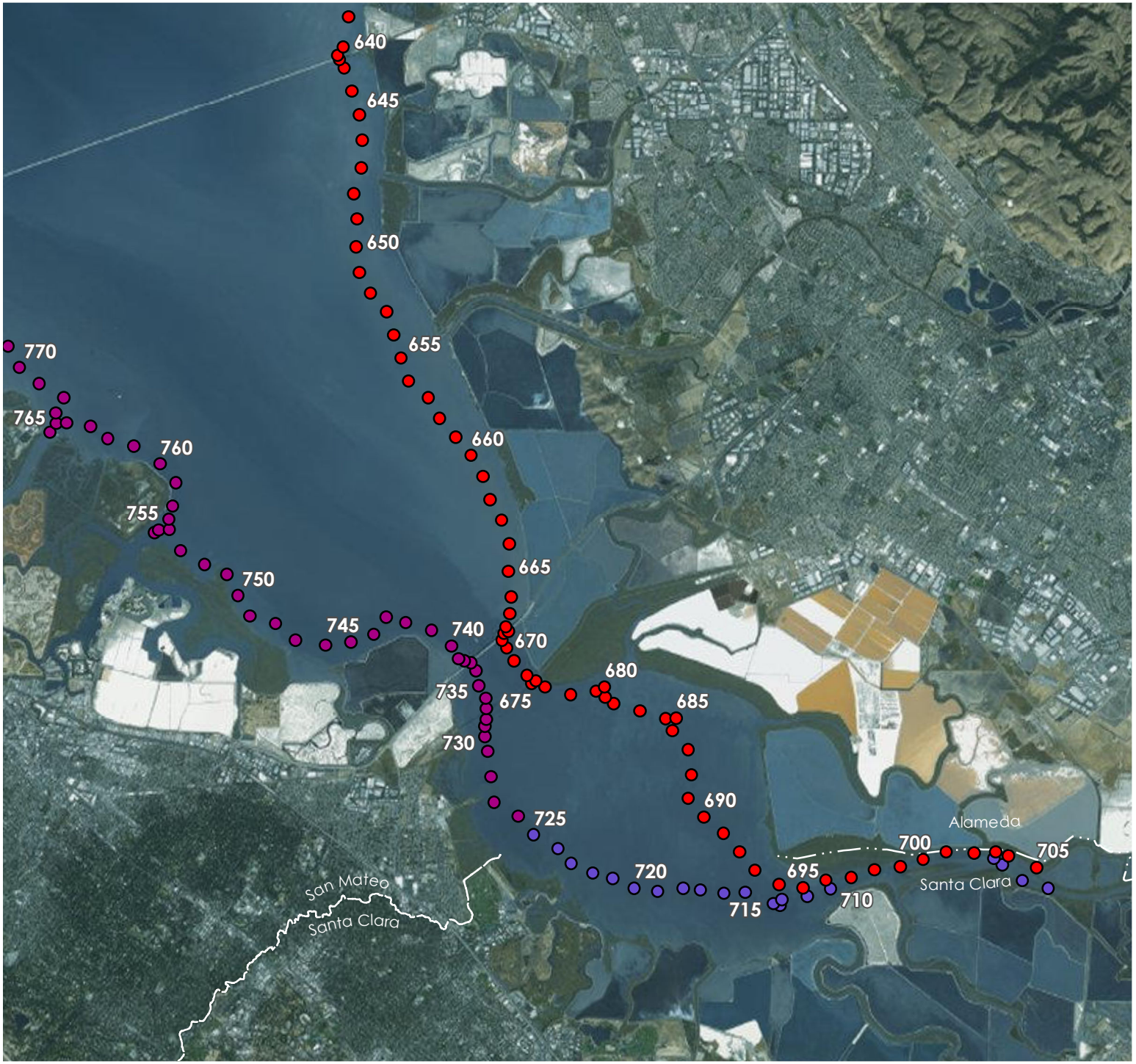
0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 5

Panel 7



SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

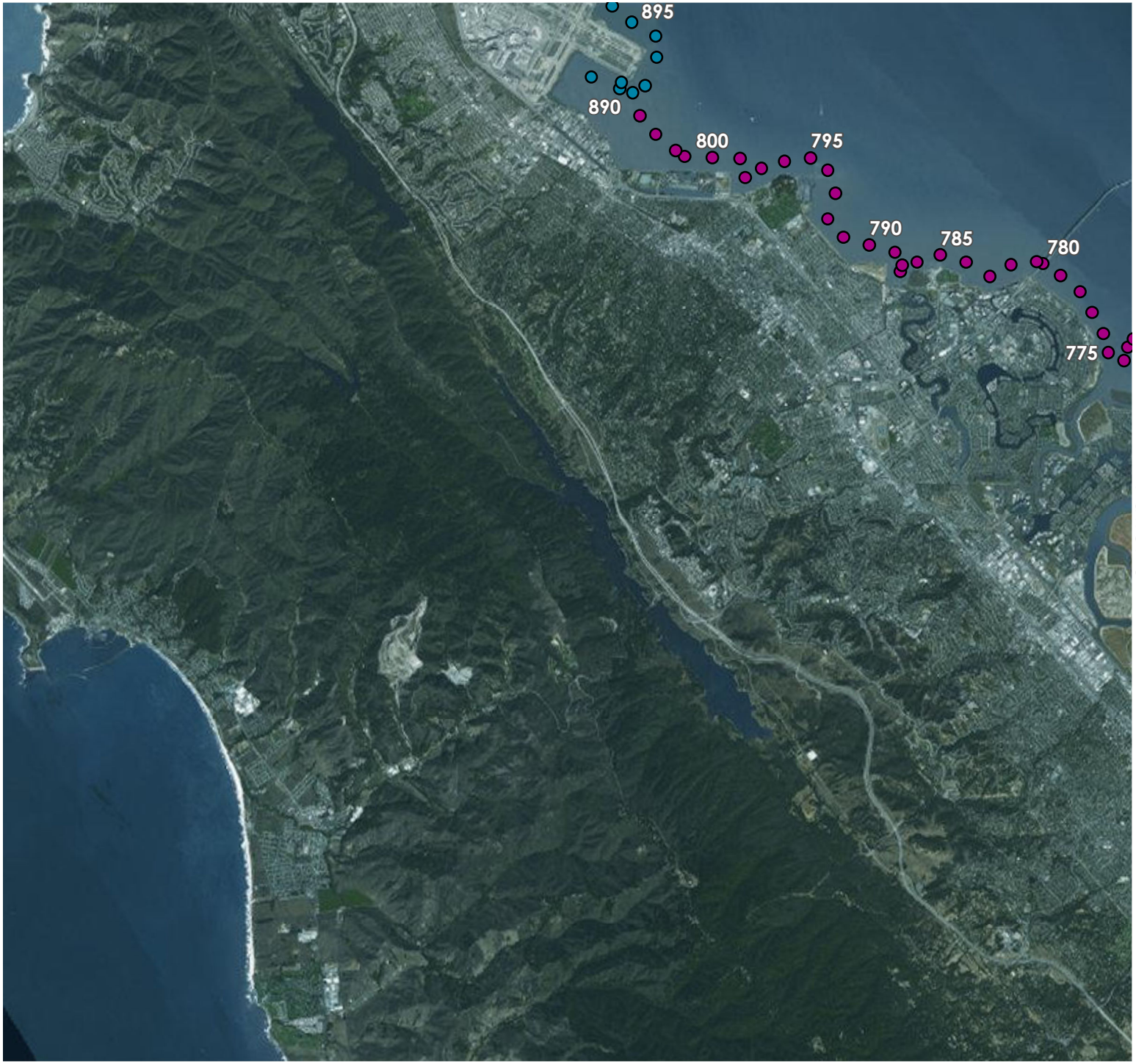
0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 6

Panel 8



Panel 6

SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

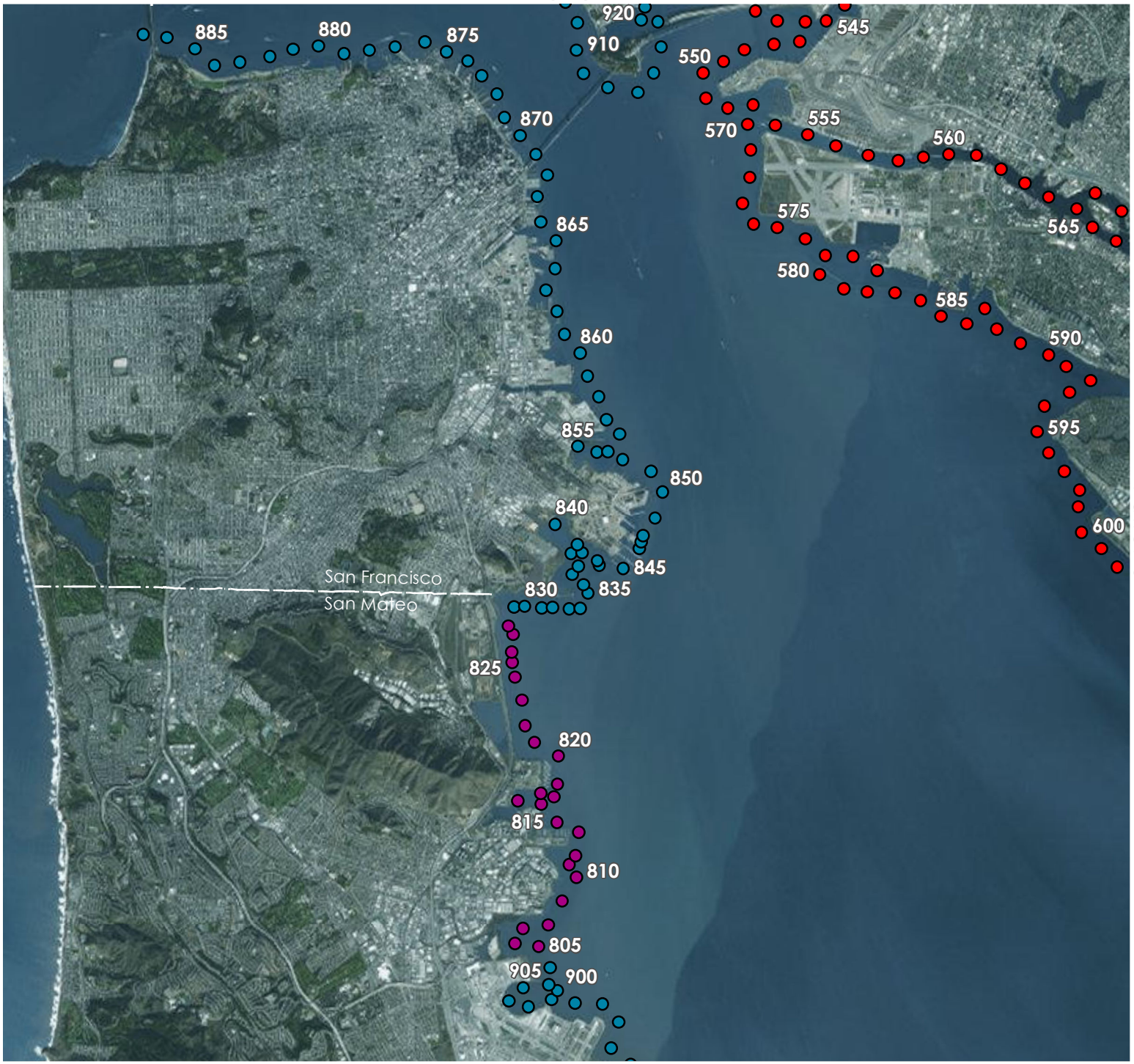
0 5,000 10,000 15,000 Feet

0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 7



SAN FRANCISCO BAY

LOCATIONS OF TIDAL DATUM AND EXTREME TIDE STATISTICS

- Alameda
- Contra Costa
- Marin
- San Francisco
- San Mateo
- Santa Clara
- Solano
- Sonoma

AECOM

0 5,000 10,000 15,000 Feet

0 1 2 Miles

N

Coordinate System: North American Datum 1983
Projection: State Plane California III Feet

Panel 8

B

TIDAL DATUM AND EXTREME TIDE ELEVATIONS IN SAN FRANCISCO BAY


Matson

APPENDIX B. TIDAL DATUM AND EXTREME TIDE ELEVATIONS IN SAN FRANCISCO BAY

Appendix B presents the tidal datum and extreme tide elevations for the locations along the San Francisco Bay shoreline shown in Appendix A. The tidal datums presented for each location include MLLW, MLW, MSL, MTL, MHW, and MHHW. Extreme tide elevations are also presented for each location for the 1-, 2-, 5-, 10-, 25-, 50-, 100-, and 500-year events.

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	1	5990421.943	2128209.589	-0.06	0.91	3.10	3.14	5.36	5.88	7.04	7.35	7.75	8.06	8.50	8.88	9.29	10.45
Marin	2	5991094.547	2129705.747	0.07	1.05	3.19	3.22	5.38	5.91	7.08	7.39	7.79	8.10	8.55	8.93	9.35	10.53
Marin	3	5992530.338	2130499.118	0.06	1.04	3.19	3.22	5.40	5.93	7.10	7.42	7.82	8.12	8.57	8.96	9.38	10.57
Marin	4	5993331.452	2132441.142	0.08	1.07	3.22	3.24	5.42	5.96	7.13	7.45	7.85	8.16	8.61	9.00	9.43	10.63
Marin	5	5992825.252	2134035.627	0.12	1.11	3.26	3.27	5.43	5.97	7.15	7.47	7.87	8.18	8.63	9.02	9.45	10.66
Marin	6	5992031.881	2135471.418	0.13	1.12	3.27	3.28	5.43	5.98	7.16	7.48	7.88	8.19	8.64	9.03	9.46	10.68
Marin	7	5991525.648	2137065.903	0.12	1.12	3.27	3.28	5.44	5.98	7.16	7.49	7.89	8.20	8.65	9.04	9.47	10.69
Marin	8	5991465.281	2138531.878	0.12	1.12	3.27	3.28	5.44	5.99	7.17	7.50	7.90	8.21	8.66	9.05	9.48	10.70
Marin	9	5991533.391	2140443.718	0.11	1.11	3.27	3.28	5.45	6.00	7.18	7.51	7.91	8.22	8.67	9.06	9.49	10.72
Marin	10	5991314.330	2142196.864	0.10	1.11	3.28	3.28	5.46	6.01	7.19	7.52	7.92	8.23	8.69	9.08	9.52	10.75
Marin	11	5989531.000	2142710.806	0.09	1.10	3.28	3.28	5.46	6.01	7.20	7.53	7.93	8.24	8.70	9.09	9.53	10.76
Marin	12	5988163.319	2143829.275	0.08	1.10	3.28	3.28	5.46	6.01	7.20	7.53	7.94	8.25	8.72	9.11	9.56	10.81
Marin	13	5986538.650	2144056.047	0.08	1.10	3.28	3.28	5.47	6.02	7.20	7.53	7.94	8.26	8.73	9.13	9.57	10.84
Marin	14	5986319.589	2145809.193	0.08	1.09	3.28	3.28	5.47	6.02	7.20	7.54	7.95	8.27	8.74	9.14	9.59	10.87
Marin	15	5985239.079	2147086.323	0.07	1.09	3.28	3.28	5.47	6.02	7.20	7.55	7.96	8.28	8.76	9.17	9.63	10.94
Marin	16	5983742.888	2147758.959	0.08	1.10	3.28	3.28	5.47	6.03	7.21	7.55	7.97	8.29	8.78	9.19	9.66	11.01

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	17	5981642.203	2148847.211	-	-	-	-	5.47	6.03	7.21	7.57	7.98	8.31	8.80	9.23	9.71	11.10
Marin	18	5980848.832	2150283.003	-	-	-	-	5.48	6.04	7.22	7.58	8.00	8.33	8.82	9.25	9.73	11.13
Marin	19	5982473.501	2150056.231	0.09	1.10	3.29	3.29	5.48	6.03	7.21	7.57	7.99	8.32	8.81	9.23	9.71	11.10
Marin	20	5983395.349	2149066.273	-	-	-	-	5.47	6.03	7.21	7.56	7.98	8.30	8.79	9.21	9.69	11.07
Marin	21	5984763.030	2147947.804	0.07	1.09	3.28	3.28	5.47	6.03	7.20	7.55	7.96	8.29	8.77	9.18	9.65	10.98
Marin	22	5986387.699	2147721.033	-	-	-	-	5.47	6.02	7.21	7.54	7.96	8.28	8.75	9.16	9.62	10.91
Marin	23	5986455.809	2149632.840	0.07	1.09	3.28	3.28	5.47	6.03	7.21	7.55	7.96	8.29	8.76	9.17	9.62	10.92
Marin	24	5985662.438	2151068.664	0.05	1.08	3.28	3.28	5.47	6.02	7.21	7.55	7.97	8.29	8.77	9.18	9.64	10.94
Marin	25	5984997.544	2152950.287	-	-	-	-	5.47	6.03	7.22	7.56	7.98	8.30	8.78	9.19	9.65	10.96
Marin	26	5987196.556	2153040.871	0.07	1.09	3.28	3.28	5.47	6.03	7.22	7.56	7.97	8.30	8.78	9.18	9.64	10.94
Marin	27	5988246.882	2152496.712	0.07	1.09	3.28	3.28	5.47	6.03	7.22	7.55	7.97	8.30	8.77	9.18	9.63	10.92
Marin	28	5989901.734	2151536.937	0.07	1.09	3.28	3.28	5.47	6.02	7.21	7.55	7.97	8.29	8.76	9.17	9.62	10.90
Marin	29	5991269.448	2150418.501	0.09	1.10	3.29	3.29	5.47	6.02	7.21	7.55	7.96	8.28	8.75	9.16	9.61	10.88
Marin	30	5991329.815	2148952.493	0.08	1.10	3.28	3.28	5.47	6.02	7.21	7.54	7.96	8.28	8.75	9.15	9.60	10.87
Marin	31	5991103.011	2147327.825	0.08	1.10	3.28	3.28	5.47	6.02	7.20	7.54	7.95	8.27	8.73	9.13	9.58	10.84
Marin	32	5991609.244	2145733.373	0.09	1.10	3.28	3.28	5.47	6.02	7.20	7.53	7.94	8.26	8.72	9.11	9.55	10.79
Marin	33	5992402.615	2144297.549	0.09	1.11	3.28	3.28	5.46	6.01	7.20	7.52	7.93	8.24	8.70	9.09	9.53	10.76

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	34	5993770.296	2143179.113	0.09	1.11	3.28	3.28	5.46	6.01	7.19	7.52	7.92	8.23	8.69	9.08	9.51	10.74
Marin	35	5995138.010	2142060.644	0.09	1.10	3.28	3.28	5.46	6.01	7.20	7.52	7.92	8.23	8.69	9.07	9.51	10.73
Marin	36	5996634.168	2141388.040	0.07	1.09	3.26	3.27	5.46	6.01	7.20	7.52	7.92	8.23	8.68	9.07	9.50	10.71
Marin	37	5997465.466	2142597.060	0.08	1.10	3.27	3.29	5.47	6.02	7.21	7.53	7.93	8.24	8.70	9.08	9.52	10.74
Marin	38	5996959.266	2144191.512	0.10	1.11	3.28	3.29	5.47	6.02	7.21	7.53	7.93	8.24	8.70	9.08	9.52	10.73
Marin	39	5997949.225	2145113.393	0.10	1.11	3.28	3.29	5.47	6.02	7.21	7.53	7.93	8.25	8.70	9.09	9.52	10.73
Marin	40	5999702.371	2145332.422	0.08	1.09	3.26	3.28	5.47	6.01	7.21	7.52	7.93	8.24	8.68	9.06	9.49	10.66
Marin	41	6000979.501	2146412.964	-	-	-	-	5.48	6.02	7.22	7.53	7.93	8.24	8.69	9.07	9.48	10.64
Marin	42	6001969.459	2147334.813	0.07	1.09	3.26	3.28	5.48	6.03	7.23	7.54	7.94	8.25	8.69	9.07	9.48	10.63
Marin	43	6002959.451	2148256.694	0.05	1.07	3.25	3.27	5.48	6.02	7.23	7.53	7.94	8.24	8.68	9.05	9.45	10.56
Marin	44	6003027.561	2150168.501	0.04	1.07	3.26	3.27	5.47	6.02	7.22	7.53	7.93	8.24	8.67	9.04	9.43	10.52
Marin	45	6002105.679	2151158.460	0.06	1.08	3.27	3.28	5.47	6.02	7.22	7.52	7.93	8.23	8.67	9.03	9.43	10.51
Marin	46	6001312.308	2152594.284	0.08	1.10	3.28	3.29	5.48	6.03	7.23	7.53	7.94	8.24	8.68	9.04	9.44	10.52
Marin	47	6000518.937	2154030.075	0.09	1.11	3.29	3.30	5.49	6.03	7.24	7.54	7.95	8.25	8.69	9.05	9.45	10.52
Marin	48	5998864.085	2154989.850	0.11	1.12	3.30	3.31	5.49	6.04	7.25	7.55	7.95	8.25	8.69	9.05	9.44	10.50
Marin	49	5996952.278	2155057.960	0.12	1.14	3.31	3.31	5.49	6.04	7.25	7.55	7.96	8.26	8.69	9.05	9.45	10.51
Marin	50	5995584.564	2156176.429	0.13	1.14	3.31	3.32	5.49	6.05	7.26	7.56	7.96	8.27	8.70	9.06	9.45	10.52

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	51	5994504.054	2157453.559	0.12	1.14	3.31	3.32	5.50	6.05	7.26	7.56	7.97	8.27	8.71	9.07	9.46	10.52
Marin	52	5993423.512	2158730.689	0.13	1.14	3.31	3.32	5.50	6.05	7.27	7.57	7.97	8.28	8.71	9.07	9.46	10.53
Marin	53	5993204.451	2160483.835	0.13	1.14	3.31	3.32	5.50	6.05	7.27	7.57	7.97	8.28	8.71	9.07	9.46	10.52
Marin	54	5992985.422	2162236.981	0.12	1.14	3.31	3.32	5.50	6.06	7.28	7.57	7.98	8.28	8.71	9.07	9.46	10.50
Marin	55	5991904.880	2163514.111	0.13	1.14	3.32	3.32	5.51	6.06	7.28	7.57	7.98	8.29	8.72	9.07	9.46	10.49
Marin	56	5990567.382	2163899.576	0.13	1.14	3.32	3.32	5.51	6.06	7.28	7.57	7.98	8.29	8.72	9.08	9.46	10.50
Marin	57	5988912.530	2164859.351	0.13	1.14	3.32	3.33	5.51	6.07	7.29	7.58	7.99	8.30	8.73	9.09	9.47	10.51
Marin	58	5987416.339	2165531.955	-	-	-	-	5.51	6.07	7.29	7.59	8.00	8.30	8.74	9.09	9.48	10.52
Marin	59	5985474.315	2166333.069	-	-	-	-	5.51	6.07	7.30	7.59	8.00	8.31	8.75	9.10	9.49	10.54
Marin	60	5985829.597	2168403.570	-	-	-	-	5.51	6.07	7.30	7.60	8.01	8.32	8.76	9.11	9.50	10.54
Marin	61	5985482.058	2169710.884	0.12	1.13	3.32	3.32	5.51	6.07	7.31	7.60	8.02	8.33	8.76	9.12	9.51	10.55
Marin	62	5986978.249	2169038.280	0.12	1.13	3.32	3.32	5.51	6.07	7.30	7.60	8.01	8.32	8.76	9.11	9.50	10.55
Marin	63	5988890.056	2168970.170	0.11	1.13	3.32	3.32	5.51	6.07	7.30	7.59	8.01	8.31	8.75	9.11	9.50	10.54
Marin	64	5990454.358	2170209.373	0.12	1.14	3.32	3.33	5.52	6.07	7.30	7.59	8.00	8.31	8.74	9.10	9.49	10.52
Marin	65	5991890.149	2171002.745	0.12	1.13	3.32	3.33	5.52	6.08	7.30	7.59	8.00	8.31	8.74	9.09	9.48	10.51
Marin	66	5992275.614	2172340.242	0.11	1.13	3.31	3.32	5.51	6.06	7.28	7.57	7.98	8.28	8.71	9.06	9.44	10.46
Marin	67	5990907.933	2173458.678	0.10	1.12	3.31	3.32	5.52	6.07	7.29	7.58	7.99	8.29	8.72	9.07	9.46	10.48

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	68	5989540.219	2174577.147	0.09	1.11	3.31	3.32	5.52	6.07	7.29	7.58	7.99	8.30	8.73	9.08	9.47	10.49
Marin	69	5989321.158	2176330.293	0.08	1.11	3.31	3.32	5.52	6.07	7.30	7.59	8.00	8.31	8.74	9.09	9.48	10.50
Marin	70	5988814.958	2177924.778	0.09	1.11	3.31	3.32	5.52	6.08	7.30	7.60	8.01	8.32	8.75	9.10	9.49	10.51
Marin	71	5988467.419	2179232.092	-	-	-	-	5.52	6.08	7.31	7.60	8.01	8.32	8.75	9.11	9.49	10.51
Marin	72	5988407.052	2180698.066	-	-	-	-	5.53	6.08	7.31	7.60	8.02	8.33	8.76	9.11	9.50	10.52
Marin	73	5990160.198	2180917.128	0.09	1.11	3.32	3.32	5.53	6.08	7.31	7.60	8.02	8.33	8.76	9.11	9.49	10.51
Marin	74	5991754.683	2181423.327	0.08	1.10	3.31	3.31	5.53	6.08	7.31	7.59	8.01	8.31	8.74	9.10	9.48	10.49
Marin	75	5992744.642	2182345.209	0.07	1.10	3.31	3.31	5.52	6.07	7.30	7.59	8.00	8.30	8.73	9.08	9.46	10.46
Marin	76	5993417.278	2183841.367	0.09	1.10	3.31	3.31	5.53	6.08	7.30	7.59	8.00	8.31	8.74	9.09	9.47	10.47
Marin	77	5993931.221	2185624.730	-	-	-	-	5.53	6.08	7.31	7.60	8.01	8.32	8.75	9.10	9.48	10.48
Marin	78	5995268.718	2185239.265	-	-	-	-	5.53	6.08	7.31	7.60	8.01	8.31	8.74	9.09	9.47	10.48
Marin	79	5997210.709	2184438.151	0.08	1.10	3.31	3.32	5.53	6.08	7.30	7.59	8.00	8.30	8.73	9.08	9.46	10.47
Marin	80	5998963.888	2184657.212	0.08	1.10	3.30	3.32	5.53	6.08	7.29	7.58	7.99	8.29	8.71	9.06	9.44	10.45
Marin	81	6000399.679	2185450.583	0.08	1.09	3.29	3.31	5.54	6.09	7.29	7.58	7.98	8.28	8.71	9.06	9.43	10.44
Marin	82	6001518.115	2186818.264	0.06	1.08	3.28	3.31	5.54	6.09	7.29	7.58	7.98	8.29	8.71	9.06	9.44	10.45
Marin	83	6001299.087	2188571.410	0.06	1.09	3.30	3.33	5.56	6.12	7.32	7.61	8.02	8.32	8.75	9.10	9.49	10.52
Marin	84	6000505.716	2190007.234	0.07	1.09	3.30	3.33	5.56	6.11	7.32	7.61	8.02	8.32	8.75	9.11	9.49	10.53

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	85	5999138.002	2191125.670	0.08	1.09	3.30	3.33	5.57	6.12	7.33	7.62	8.03	8.33	8.77	9.13	9.52	10.57
Marin	86	5998344.631	2192561.494	0.08	1.10	3.31	3.34	5.58	6.13	7.34	7.63	8.04	8.35	8.78	9.14	9.53	10.58
Marin	87	5997551.259	2193997.285	0.08	1.10	3.31	3.34	5.58	6.14	7.35	7.65	8.06	8.36	8.80	9.16	9.55	10.61
Marin	88	5995896.407	2194957.060	0.09	1.11	3.32	3.35	5.59	6.15	7.36	7.66	8.07	8.38	8.82	9.18	9.57	10.64
Marin	89	5994113.077	2195471.003	0.08	1.10	3.33	3.35	5.60	6.15	7.36	7.67	8.08	8.39	8.83	9.20	9.59	10.67
Marin	90	5992616.886	2196143.639	-	-	-	-	5.60	6.16	7.37	7.67	8.09	8.40	8.84	9.21	9.61	10.69
Marin	91	5991249.205	2197262.075	-	-	-	-	5.60	6.16	7.38	7.68	8.10	8.41	8.85	9.22	9.62	10.69
Marin	92	5989881.524	2198380.544	-	-	-	-	5.60	6.16	7.39	7.69	8.11	8.42	8.87	9.23	9.63	10.70
Marin	93	5989692.647	2199400.686	-	-	-	-	5.60	6.16	7.39	7.69	8.11	8.43	8.87	9.24	9.64	10.71
Marin	94	5989632.279	2200866.661	-	-	-	-	5.61	6.17	7.40	7.70	8.12	8.44	8.88	9.25	9.65	10.73
Marin	95	5989413.218	2202619.840	-	-	-	-	5.61	6.17	7.40	7.71	8.13	8.45	8.90	9.26	9.67	10.75
Marin	96	5989352.851	2204085.815	-	-	-	-	5.62	6.18	7.41	7.71	8.14	8.46	8.91	9.28	9.68	10.77
Marin	97	5989133.789	2205838.961	-	-	-	-	5.62	6.18	7.41	7.72	8.15	8.47	8.92	9.29	9.69	10.78
Marin	98	5989647.732	2207622.324	-	-	-	-	5.62	6.19	7.42	7.73	8.15	8.47	8.92	9.30	9.70	10.79
Marin	99	5989428.704	2209375.470	-	-	-	-	5.63	6.19	7.43	7.73	8.16	8.48	8.93	9.31	9.72	10.81
Marin	100	5989496.814	2211287.277	-	-	-	-	5.63	6.19	7.43	7.74	8.17	8.49	8.95	9.32	9.73	10.84
Marin	101	5989852.062	2213357.778	-	-	-	-	5.64	6.20	7.44	7.75	8.18	8.50	8.96	9.34	9.75	10.86

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	102	5990078.866	2214982.447	-	-	-	-	5.64	6.20	7.44	7.75	8.19	8.51	8.97	9.35	9.76	10.88
Marin	103	5990592.809	2216765.776	-	-	-	-	5.64	6.21	7.45	7.76	8.20	8.52	8.98	9.36	9.78	10.90
Marin	104	5991393.890	2218707.800	0.11	1.12	3.37	3.38	5.65	6.21	7.46	7.77	8.20	8.53	8.99	9.38	9.79	10.93
Marin	105	5991462.000	2220619.640	-	-	-	-	5.66	6.22	7.46	7.78	8.21	8.54	9.01	9.39	9.81	10.96
Marin	106	5992391.591	2223007.463	-	-	-	-	5.66	6.23	7.48	7.79	8.23	8.56	9.02	9.41	9.83	10.97
Marin	107	5993064.228	2224503.655	-	-	-	-	5.67	6.23	7.49	7.80	8.24	8.57	9.03	9.42	9.84	10.98
Marin	108	5992845.167	2226256.801	-	-	-	-	5.67	6.24	7.50	7.81	8.25	8.58	9.04	9.43	9.84	10.97
Marin	109	5992913.277	2228168.641	-	-	-	-	5.68	6.24	7.52	7.83	8.26	8.59	9.05	9.43	9.84	10.95
Marin	110	5992407.077	2229763.093	-	-	-	-	5.68	6.25	7.53	7.84	8.28	8.60	9.06	9.44	9.84	10.93
Marin	111	5991900.844	2231357.578	0.12	1.11	3.39	3.40	5.68	6.25	7.55	7.85	8.29	8.62	9.07	9.45	9.85	10.91
Marin	112	6007530.800	2140662.024	0.01	1.05	3.28	3.27	5.50	6.05	7.24	7.56	7.96	8.27	8.72	9.10	9.53	10.71
Marin	113	6008037.000	2139067.539	0.01	1.05	3.26	3.27	5.48	6.03	7.22	7.54	7.94	8.25	8.70	9.08	9.49	10.66
Marin	114	6007175.518	2138591.523	0.01	1.04	3.25	3.27	5.50	6.05	7.25	7.57	7.97	8.28	8.73	9.11	9.54	10.74
Marin	115	6005392.189	2139105.466	0.04	1.07	3.27	3.28	5.50	6.05	7.25	7.57	7.97	8.28	8.73	9.11	9.54	10.74
Marin	116	6003639.043	2138886.405	0.05	1.08	3.27	3.28	5.49	6.04	7.24	7.56	7.96	8.27	8.72	9.10	9.53	10.73
Marin	117	6001855.713	2139400.347	0.07	1.09	3.28	3.29	5.50	6.05	7.25	7.58	7.98	8.29	8.74	9.13	9.57	10.80
Marin	118	6000646.693	2140231.645	0.07	1.09	3.27	3.28	5.48	6.03	7.21	7.54	7.94	8.25	8.71	9.10	9.53	10.77

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Marin	119	5999535.967	2142241.779	0.06	1.07	3.24	3.27	5.46	6.00	7.18	7.51	7.91	8.22	8.67	9.06	9.49	10.69
Marin	120	6001130.452	2142747.978	0.06	1.08	3.25	3.27	5.47	6.01	7.20	7.52	7.92	8.23	8.68	9.06	9.48	10.66
Marin	121	6001931.533	2144690.002	0.07	1.08	3.25	3.28	5.48	6.03	7.22	7.54	7.94	8.25	8.69	9.07	9.49	10.65
Marin	122	6003238.879	2145037.541	-	-	-	-	5.49	6.04	7.23	7.55	7.95	8.26	8.71	9.09	9.52	10.70
Marin	123	6004515.977	2146118.083	0.14	1.15	3.31	3.32	5.49	6.05	7.24	7.56	7.96	8.27	8.72	9.10	9.53	10.71
Marin	124	6006458.000	2145316.969	0.06	1.09	3.30	3.30	5.50	6.05	7.25	7.57	7.97	8.28	8.73	9.11	9.54	10.72
Marin	125	6007251.371	2143881.178	0.05	1.08	3.29	3.29	5.49	6.05	7.24	7.56	7.96	8.27	8.72	9.11	9.53	10.72
Marin	126	6008044.742	2142445.354	0.02	1.06	3.28	3.28	5.49	6.04	7.24	7.56	7.96	8.27	8.72	9.10	9.52	10.71
Marin	127	5995223.049	2179216.639	0.09	1.11	3.31	3.32	5.53	6.08	7.30	7.59	8.00	8.30	8.73	9.08	9.47	10.49
Marin	128	5993598.380	2179443.410	0.09	1.12	3.32	3.32	5.53	6.09	7.31	7.60	8.02	8.33	8.76	9.11	9.50	10.53
Marin	129	5992517.871	2180720.540	0.08	1.10	3.30	3.31	5.52	6.07	7.30	7.58	8.00	8.30	8.73	9.08	9.45	10.45
Marin	130	5994301.200	2180206.598	-	-	-	-	5.52	6.07	7.29	7.58	7.99	8.30	8.72	9.07	9.45	10.46
Sonoma	131	5990245.992	2232317.353	0.12	1.11	3.39	3.40	5.68	6.25	7.57	7.86	8.31	8.63	9.08	9.45	9.85	10.88
Sonoma	132	5990502.980	2233209.018	0.13	1.11	3.39	3.40	5.68	6.25	7.57	7.87	8.31	8.64	9.09	9.45	9.85	10.88
Sonoma	133	5992097.465	2233715.250	-	-	-	-	5.68	6.25	7.57	7.87	8.31	8.63	9.08	9.45	9.85	10.88
Sonoma	134	5993880.794	2233201.308	0.14	1.12	3.40	3.40	5.69	6.25	7.56	7.86	8.30	8.62	9.08	9.45	9.85	10.91
Sonoma	135	5995951.295	2232846.026	0.14	1.13	3.40	3.41	5.69	6.25	7.54	7.85	8.29	8.61	9.07	9.44	9.85	10.94

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Sonoma	136	5997893.319	2232044.913	0.14	1.13	3.40	3.41	5.69	6.25	7.53	7.84	8.28	8.60	9.06	9.44	9.86	10.97
Sonoma	137	5999230.816	2231659.480	-	-	-	-	5.69	6.26	7.52	7.84	8.27	8.60	9.06	9.44	9.86	10.99
Sonoma	138	6000983.963	2231878.509	-	-	-	-	5.69	6.26	7.52	7.84	8.27	8.60	9.06	9.45	9.87	11.01
Sonoma	139	6002737.109	2232097.570	-	-	-	-	5.69	6.26	7.52	7.84	8.27	8.60	9.06	9.45	9.87	11.02
Sonoma	140	6003915.945	2231999.276	-	-	-	-	5.69	6.26	7.52	7.83	8.27	8.60	9.06	9.45	9.87	11.03
Sonoma	141	6005193.075	2233079.819	-	-	-	-	5.69	6.26	7.52	7.84	8.27	8.60	9.07	9.45	9.88	11.03
Sonoma	142	6006628.866	2233873.190	-	-	-	-	5.69	6.26	7.52	7.84	8.28	8.60	9.07	9.46	9.88	11.03
Sonoma	143	6007618.857	2234795.038	-	-	-	-	5.70	6.27	7.53	7.85	8.28	8.61	9.07	9.46	9.89	11.04
Sonoma	144	6009054.649	2235588.409	-	-	-	-	5.70	6.27	7.53	7.85	8.29	8.61	9.08	9.47	9.89	11.04
Sonoma	145	6010807.795	2235807.471	-	-	-	-	5.70	6.27	7.53	7.85	8.29	8.61	9.08	9.47	9.89	11.04
Sonoma	146	6012115.108	2236154.977	-	-	-	-	5.70	6.27	7.54	7.85	8.29	8.62	9.08	9.47	9.89	11.05
Sonoma	147	6013263.761	2236789.687	-	-	-	-	5.71	6.28	7.54	7.86	8.29	8.62	9.08	9.47	9.90	11.05
Sonoma	148	6014699.552	2237583.058	-	-	-	-	5.71	6.28	7.54	7.86	8.30	8.62	9.09	9.48	9.90	11.05
Sonoma	149	6016452.698	2237802.119	-	-	-	-	5.71	6.28	7.55	7.87	8.30	8.63	9.09	9.48	9.90	11.05
Sonoma	150	6018364.538	2237734.009	-	-	-	-	5.71	6.28	7.55	7.87	8.30	8.62	9.09	9.48	9.90	11.05
Solano	151	6019324.313	2239388.861	-	-	-	-	5.72	6.29	7.56	7.88	8.31	8.64	9.10	9.49	9.91	11.05
Solano	152	6021107.643	2238874.919	-	-	-	-	5.72	6.29	7.56	7.88	8.31	8.63	9.09	9.48	9.90	11.04

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	153	6022762.495	2237915.144	-	-	-	-	5.72	6.29	7.56	7.87	8.30	8.62	9.08	9.47	9.88	11.02
Solano	154	6024832.996	2237559.862	-	-	-	-	5.72	6.29	7.56	7.87	8.30	8.62	9.08	9.46	9.87	11.00
Solano	155	6026775.020	2236758.748	-	-	-	-	5.72	6.29	7.56	7.87	8.29	8.62	9.07	9.45	9.86	10.98
Solano	156	6028558.350	2236244.806	-	-	-	-	5.72	6.29	7.56	7.87	8.29	8.61	9.07	9.44	9.85	10.96
Solano	157	6030213.202	2235285.031	-	-	-	-	5.72	6.29	7.55	7.86	8.29	8.61	9.06	9.43	9.84	10.93
Solano	158	6031868.054	2234325.256	-	-	-	-	5.72	6.28	7.55	7.86	8.28	8.60	9.05	9.42	9.82	10.91
Solano	159	6033522.907	2233365.481	-	-	-	-	5.71	6.29	7.55	7.86	8.28	8.59	9.04	9.41	9.81	10.88
Solano	160	6034890.620	2232247.012	-	-	-	-	5.71	6.28	7.55	7.85	8.27	8.59	9.03	9.40	9.79	10.86
Solano	161	6036258.301	2231128.576	-	-	-	-	5.71	6.28	7.55	7.85	8.27	8.58	9.02	9.38	9.78	10.83
Solano	162	6038487.464	2230486.123	-	-	-	-	5.71	6.28	7.55	7.84	8.26	8.58	9.01	9.37	9.76	10.80
Solano	163	6040013.839	2229080.516	-	-	-	-	5.70	6.27	7.54	7.84	8.26	8.57	9.00	9.36	9.75	10.78
Solano	164	6041411.736	2227229.076	-	-	-	-	5.69	6.26	7.53	7.83	8.24	8.55	8.99	9.35	9.73	10.76
Solano	165	6042492.246	2225951.946	-	-	-	-	5.69	6.26	7.52	7.82	8.23	8.54	8.98	9.33	9.72	10.75
Solano	166	6044018.621	2224546.338	-	-	-	-	5.68	6.25	7.51	7.81	8.22	8.53	8.97	9.32	9.71	10.73
Solano	167	6044970.653	2222823.376	-	-	-	-	5.68	6.24	7.51	7.80	8.21	8.52	8.95	9.31	9.69	10.71
Solano	168	6045764.024	2221387.585	-	-	-	-	5.67	6.24	7.50	7.79	8.20	8.51	8.94	9.29	9.68	10.69
Solano	169	6046557.395	2219951.761	-	-	-	-	5.67	6.23	7.49	7.78	8.19	8.50	8.93	9.28	9.66	10.68

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	170	6047063.628	2218357.276	-	-	-	-	5.66	6.23	7.48	7.77	8.19	8.49	8.92	9.27	9.65	10.66
Solano	171	6047282.689	2216604.130	-	-	-	-	5.66	6.22	7.48	7.77	8.18	8.48	8.91	9.26	9.64	10.64
Solano	172	6046164.220	2215236.449	-	-	-	-	5.64	6.21	7.46	7.75	8.16	8.47	8.90	9.25	9.63	10.65
Solano	173	6046481.575	2214662.139	0.42	1.34	3.46	3.46	5.58	6.13	7.37	7.65	8.07	8.38	8.81	9.16	9.53	10.53
Solano	174	6048234.721	2214881.167	0.44	1.36	3.47	3.47	5.58	6.13	7.37	7.66	8.07	8.38	8.81	9.15	9.53	10.51
Solano	175	6049987.867	2215100.229	0.47	1.39	3.48	3.48	5.57	6.13	7.37	7.65	8.06	8.37	8.79	9.13	9.50	10.46
Solano	176	6051741.013	2215319.290	0.47	1.38	3.48	3.47	5.56	6.12	7.36	7.63	8.05	8.35	8.77	9.12	9.48	10.43
Solano	177	6053939.992	2215409.841	0.50	1.41	3.48	3.47	5.54	6.09	7.32	7.60	8.01	8.32	8.73	9.07	9.43	10.36
Solano	178	6055693.171	2215628.902	0.53	1.43	3.49	3.49	5.55	6.09	7.34	7.61	8.03	8.33	8.75	9.08	9.44	10.37
Solano	179	6057128.962	2216422.273	0.55	1.44	3.50	3.50	5.55	6.10	7.34	7.61	8.03	8.33	8.75	9.08	9.43	10.35
Solano	180	6058693.263	2217661.477	0.56	1.45	3.51	3.51	5.57	6.12	7.36	7.63	8.04	8.34	8.76	9.09	9.44	10.36
Solano	181	6059811.699	2219029.158	0.55	1.45	3.52	3.51	5.58	6.13	7.37	7.64	8.06	8.36	8.77	9.11	9.46	10.38
Solano	182	6060922.425	2217019.057	0.56	1.46	3.52	3.51	5.57	6.12	7.36	7.63	8.05	8.35	8.77	9.11	9.47	10.40
Solano	183	6062002.968	2215741.927	0.55	1.45	3.49	3.49	5.53	6.07	7.31	7.57	7.99	8.29	8.71	9.04	9.39	10.29
Solano	184	6063370.649	2214623.458	0.54	1.44	3.50	3.49	5.54	6.09	7.32	7.59	8.01	8.31	8.72	9.05	9.40	10.31
Solano	185	6065312.673	2213822.344	0.53	1.43	3.47	3.45	5.48	6.02	7.24	7.50	7.92	8.22	8.63	8.95	9.30	10.17
Solano	186	6067065.819	2214041.405	0.54	1.43	3.46	3.45	5.46	5.99	7.20	7.46	7.88	8.18	8.59	8.91	9.25	10.12

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	187	6068818.965	2214260.466	0.62	1.50	3.50	3.48	5.46	5.99	7.20	7.46	7.88	8.18	8.59	8.91	9.26	10.14
Solano	188	6070443.633	2214033.662	0.64	1.51	3.52	3.50	5.48	6.02	7.23	7.49	7.91	8.21	8.61	8.94	9.28	10.17
Solano	189	6071524.176	2212756.532	0.63	1.50	3.50	3.48	5.47	6.00	7.20	7.46	7.88	8.18	8.59	8.91	9.26	10.14
Solano	190	6073466.167	2211955.451	0.67	1.54	3.53	3.50	5.47	6.00	7.20	7.46	7.88	8.18	8.58	8.91	9.25	10.13
Solano	191	6074901.991	2212748.823	-	-	-	-	5.48	6.01	7.22	7.48	7.89	8.19	8.60	8.92	9.27	10.15
Solano	192	6076307.598	2214275.165	-	-	-	-	5.49	6.02	7.23	7.49	7.90	8.20	8.61	8.93	9.28	10.15
Solano	193	6077992.634	2212582.419	0.73	1.59	3.56	3.54	5.49	6.02	7.23	7.49	7.91	8.20	8.61	8.93	9.28	10.16
Solano	194	6079073.176	2211305.289	0.71	1.57	3.56	3.53	5.50	6.02	7.23	7.49	7.90	8.20	8.61	8.93	9.27	10.15
Solano	195	6080440.857	2210186.820	0.70	1.56	3.55	3.53	5.49	6.02	7.23	7.49	7.90	8.20	8.60	8.93	9.27	10.14
Solano	196	6081808.538	2209068.384	0.68	1.55	3.54	3.52	5.50	6.03	7.23	7.49	7.90	8.20	8.60	8.92	9.26	10.13
Solano	197	6082156.077	2207761.070	0.67	1.54	3.54	3.52	5.50	6.03	7.23	7.49	7.90	8.20	8.60	8.92	9.26	10.13
Solano	198	6083553.975	2205909.597	0.62	1.49	3.48	3.47	5.44	5.97	7.15	7.41	7.83	8.12	8.53	8.85	9.19	10.06
Solano	199	6085465.782	2205841.487	0.64	1.51	3.51	3.49	5.47	6.00	7.17	7.43	7.85	8.15	8.56	8.89	9.23	10.13
Solano	200	6088140.809	2205070.590	0.63	1.50	3.51	3.49	5.49	6.02	7.18	7.45	7.86	8.16	8.57	8.89	9.24	10.13
Solano	201	6090181.127	2205448.312	0.67	1.54	3.54	3.52	5.51	6.04	7.21	7.47	7.88	8.18	8.59	8.91	9.26	10.15
Solano	202	6091934.273	2205667.341	0.66	1.53	3.54	3.52	5.52	6.05	7.21	7.48	7.89	8.18	8.59	8.92	9.27	10.18
Solano	203	6093370.064	2206460.712	0.71	1.57	3.58	3.56	5.55	6.08	7.25	7.52	7.93	8.22	8.63	8.95	9.30	10.20

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	204	6094012.484	2208689.907	0.71	1.57	3.57	3.55	5.52	6.05	-	-	-	-	-	-	-	-
Solano	205	6095100.769	2210790.592	0.72	1.58	3.58	3.56	5.53	6.06	-	-	-	-	-	-	-	-
Solano	206	6096347.715	2212604.105	0.74	1.59	3.59	3.57	5.54	6.07	-	-	-	-	-	-	-	-
Solano	207	6097307.490	2214258.957	0.75	1.60	3.60	3.58	5.56	6.09	-	-	-	-	-	-	-	-
Solano	208	6099128.747	2216389.859	0.75	1.60	3.61	3.59	5.57	6.10	-	-	-	-	-	-	-	-
Solano	209	6100375.693	2218203.372	0.77	1.62	3.63	3.60	5.58	6.11	-	-	-	-	-	-	-	-
Solano	210	6102227.133	2219601.269	0.75	1.61	3.63	3.60	5.59	6.12	-	-	-	-	-	-	-	-
Solano	211	6103919.912	2221286.305	0.75	1.61	3.64	3.60	5.60	6.13	-	-	-	-	-	-	-	-
Solano	212	6105484.180	2222525.509	0.75	1.61	3.64	3.61	5.61	6.14	-	-	-	-	-	-	-	-
Solano	213	6106602.649	2223893.190	0.75	1.61	3.65	3.61	5.61	6.14	-	-	-	-	-	-	-	-
Solano	214	6107879.779	2224973.732	0.75	1.61	3.65	3.61	5.62	6.15	-	-	-	-	-	-	-	-
Solano	215	6109572.558	2226658.768	0.75	1.61	3.66	3.62	5.63	6.16	-	-	-	-	-	-	-	-
Solano	216	6110532.333	2228313.621	0.76	1.62	3.67	3.63	5.64	6.17	-	-	-	-	-	-	-	-
Solano	217	6111492.108	2229968.473	0.76	1.62	3.67	3.63	5.65	6.18	-	-	-	-	-	-	-	-
Solano	218	6111847.389	2232038.974	-	-	-	-	5.66	6.20	-	-	-	-	-	-	-	-
Solano	219	6111469.634	2234079.292	0.74	1.60	3.69	3.63	5.66	6.20	-	-	-	-	-	-	-	-
Solano	220	6112300.932	2235288.312	0.74	1.60	3.69	3.63	5.67	6.21	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	221	6112943.384	2237517.474	0.74	1.60	3.69	3.64	5.67	6.21	-	-	-	-	-	-	-	-
Solano	222	6112882.984	2238983.481	0.73	1.60	3.69	3.64	5.67	6.21	-	-	-	-	-	-	-	-
Solano	223	6114537.837	2238023.706	0.74	1.60	3.69	3.64	5.67	6.21	-	-	-	-	-	-	-	-
Solano	224	6116132.322	2238529.906	0.74	1.60	3.70	3.64	5.68	6.22	-	-	-	-	-	-	-	-
Solano	225	6117568.113	2239323.277	0.74	1.60	3.70	3.64	5.68	6.22	-	-	-	-	-	-	-	-
Solano	226	6119479.953	2239255.167	0.74	1.60	3.70	3.64	5.69	6.23	-	-	-	-	-	-	-	-
Solano	227	6121074.438	2239761.367	0.74	1.60	3.71	3.65	5.69	6.23	-	-	-	-	-	-	-	-
Solano	228	6122986.245	2239693.257	0.74	1.60	3.71	3.65	5.69	6.23	-	-	-	-	-	-	-	-
Solano	229	6124610.913	2239466.486	0.73	1.60	3.71	3.65	5.70	6.24	-	-	-	-	-	-	-	-
Solano	230	6126205.398	2239972.685	0.73	1.60	3.71	3.65	5.70	6.24	-	-	-	-	-	-	-	-
Solano	231	6127799.883	2240478.918	0.75	1.61	3.72	3.66	5.70	6.24	-	-	-	-	-	-	-	-
Solano	232	6129167.564	2239360.449	0.75	1.61	3.72	3.66	5.71	6.24	-	-	-	-	-	-	-	-
Solano	233	6130248.107	2238083.319	0.75	1.61	3.72	3.66	5.71	6.25	-	-	-	-	-	-	-	-
Solano	234	6131041.478	2236647.528	0.74	1.61	3.72	3.66	5.71	6.25	-	-	-	-	-	-	-	-
Solano	235	6131993.510	2234924.566	0.74	1.61	3.72	3.66	5.71	6.25	-	-	-	-	-	-	-	-
Solano	236	6132786.881	2233488.742	0.75	1.61	3.72	3.66	5.71	6.25	-	-	-	-	-	-	-	-
Solano	237	6133580.253	2232052.951	0.76	1.62	3.72	3.66	5.71	6.25	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	238	6132174.645	2230526.576	0.74	1.61	3.72	3.66	5.70	6.24	-	-	-	-	-	-	-	-
Solano	239	6130481.866	2228841.540	0.74	1.61	3.71	3.65	5.70	6.24	-	-	-	-	-	-	-	-
Solano	240	6129204.736	2227760.997	0.74	1.61	3.71	3.65	5.70	6.24	-	-	-	-	-	-	-	-
Solano	241	6127035.941	2226937.442	0.74	1.61	3.71	3.65	5.69	6.23	-	-	-	-	-	-	-	-
Solano	242	6125154.318	2226272.582	0.75	1.61	3.70	3.65	5.68	6.22	-	-	-	-	-	-	-	-
Solano	243	6124164.326	2225350.700	0.75	1.61	3.69	3.64	5.67	6.20	-	-	-	-	-	-	-	-
Solano	244	6125690.701	2223945.093	0.78	1.63	3.69	3.64	5.65	6.18	-	-	-	-	-	-	-	-
Solano	245	6127058.415	2222826.657	0.81	1.66	3.70	3.65	5.64	6.17	-	-	-	-	-	-	-	-
Solano	246	6128713.267	2221866.849	0.87	1.70	3.72	3.66	5.62	6.16	-	-	-	-	-	-	-	-
Solano	247	6130368.120	2220907.074	0.90	1.73	3.73	3.67	5.61	6.14	-	-	-	-	-	-	-	-
Solano	248	6132151.450	2220393.131	0.91	1.73	3.74	3.67	5.62	6.15	-	-	-	-	-	-	-	-
Solano	249	6131765.984	2219055.634	0.92	1.74	3.72	3.66	5.58	6.11	-	-	-	-	-	-	-	-
Solano	250	6133133.665	2217937.198	1.01	1.80	3.74	3.69	5.58	6.12	-	-	-	-	-	-	-	-
Solano	251	6134758.334	2217710.394	1.03	1.82	3.76	3.71	5.59	6.13	-	-	-	-	-	-	-	-
Solano	252	6136065.648	2218057.933	1.03	1.82	3.76	3.70	5.59	6.11	-	-	-	-	-	-	-	-
Solano	253	6136156.232	2215858.954	1.03	1.81	3.75	3.71	5.60	6.14	-	-	-	-	-	-	-	-
Solano	254	6138068.039	2215790.844	1.07	1.85	3.78	3.72	5.60	6.14	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	255	6139503.863	2216584.215	1.07	1.85	3.78	3.73	5.61	6.14	-	-	-	-	-	-	-	-
Solano	256	6141801.135	2217853.602	1.07	1.84	3.79	3.73	5.62	6.15	-	-	-	-	-	-	-	-
Solano	257	6143010.155	2217022.305	1.06	1.84	3.79	3.73	5.62	6.16	-	-	-	-	-	-	-	-
Solano	258	6144763.301	2217241.366	1.06	1.84	3.79	3.73	5.63	6.17	-	-	-	-	-	-	-	-
Solano	259	6146357.786	2217747.566	1.05	1.84	3.80	3.74	5.64	6.17	-	-	-	-	-	-	-	-
Solano	260	6147952.271	2218253.798	1.05	1.84	3.80	3.74	5.64	6.18	-	-	-	-	-	-	-	-
Solano	261	6149705.417	2218472.827	1.05	1.84	3.80	3.74	5.65	6.19	-	-	-	-	-	-	-	-
Solano	262	6151617.224	2218404.717	1.05	1.84	3.81	3.74	5.65	6.19	-	-	-	-	-	-	-	-
Solano	263	6153211.709	2218910.949	1.05	1.84	3.81	3.75	5.66	6.19	-	-	-	-	-	-	-	-
Solano	264	6155123.549	2218842.839	-	-	-	-	5.66	6.19	-	-	-	-	-	-	-	-
Solano	265	6155471.088	2217535.526	1.05	1.84	3.81	3.75	5.66	6.20	-	-	-	-	-	-	-	-
Solano	266	6153906.787	2216296.322	1.05	1.84	3.81	3.75	5.65	6.19	-	-	-	-	-	-	-	-
Solano	267	6152470.996	2215502.951	1.05	1.84	3.81	3.74	5.65	6.19	-	-	-	-	-	-	-	-
Solano	268	6152402.885	2213591.111	1.05	1.84	3.80	3.74	5.65	6.19	-	-	-	-	-	-	-	-
Solano	269	6152047.604	2211520.610	1.05	1.84	3.80	3.74	5.65	6.19	-	-	-	-	-	-	-	-
Solano	270	6150453.119	2211014.410	1.05	1.83	3.80	3.74	5.65	6.18	-	-	-	-	-	-	-	-
Solano	271	6148699.973	2210795.349	1.05	1.83	3.79	3.74	5.64	6.18	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	272	6148186.030	2209012.019	1.06	1.84	3.79	3.73	5.63	6.17	-	-	-	-	-	-	-	-
Solano	273	6149840.883	2208052.244	1.05	1.83	3.77	3.73	5.63	6.16	-	-	-	-	-	-	-	-
Solano	274	6152070.078	2207409.791	1.07	1.84	3.79	3.74	5.64	6.17	-	-	-	-	-	-	-	-
Solano	275	6153981.885	2207341.681	1.07	1.85	3.80	3.75	5.65	6.18	-	-	-	-	-	-	-	-
Solano	276	6155893.725	2207273.571	1.08	1.85	3.80	3.75	5.65	6.19	-	-	-	-	-	-	-	-
Solano	277	6157805.532	2207205.461	1.08	1.85	3.81	3.76	5.66	6.20	-	-	-	-	-	-	-	-
Solano	278	6159558.678	2207424.522	1.08	1.85	3.82	3.76	5.67	6.21	-	-	-	-	-	-	-	-
Solano	279	6160835.808	2208505.065	1.08	1.86	3.83	3.77	5.68	6.22	-	-	-	-	-	-	-	-
Solano	280	6162588.954	2208724.093	1.09	1.86	3.83	3.77	5.69	6.23	-	-	-	-	-	-	-	-
Solano	281	6164342.133	2208943.154	1.08	1.85	3.83	3.78	5.70	6.24	-	-	-	-	-	-	-	-
Solano	282	6165906.402	2210182.358	1.08	1.85	3.84	3.78	5.71	6.25	-	-	-	-	-	-	-	-
Solano	283	6167342.193	2210975.729	1.07	1.85	3.84	3.78	5.71	6.25	-	-	-	-	-	-	-	-
Solano	284	6168619.323	2212056.271	1.07	1.85	3.84	3.78	5.72	6.26	-	-	-	-	-	-	-	-
Solano	285	6169420.437	2213998.295	1.09	1.86	3.86	3.79	5.72	6.27	-	-	-	-	-	-	-	-
Solano	286	6100420.575	2209981.768	-	-	-	-	5.57	6.10	-	-	-	-	-	-	-	-
Solano	287	6101984.876	2211220.971	-	-	-	-	5.57	6.10	-	-	-	-	-	-	-	-
Solano	288	6103579.361	2211727.171	-	-	-	-	5.58	6.11	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	289	6102460.892	2210359.490	0.75	1.60	3.61	3.59	5.57	6.11	-	-	-	-	-	-	-	-
Solano	290	6107342.641	2213056.926	0.82	1.65	3.64	3.62	5.59	6.12	-	-	-	-	-	-	-	-
Solano	291	6109065.603	2214008.991	-	-	-	-	5.60	6.13	-	-	-	-	-	-	-	-
Solano	292	6110788.566	2214961.023	-	-	-	-	5.61	6.14	-	-	-	-	-	-	-	-
Solano	293	6112254.541	2215021.423	-	-	-	-	5.60	6.14	-	-	-	-	-	-	-	-
Solano	294	6113561.854	2215368.962	0.92	1.72	3.69	3.66	5.60	6.14	-	-	-	-	-	-	-	-
Solano	295	6111136.104	2213653.709	0.90	1.71	3.67	3.65	5.59	6.12	-	-	-	-	-	-	-	-
Solano	296	6109541.619	2213147.509	0.83	1.66	3.64	3.62	5.59	6.12	-	-	-	-	-	-	-	-
Solano	297	6116463.653	2216222.700	0.84	1.67	3.68	3.64	5.61	6.14	-	-	-	-	-	-	-	-
Solano	299	6118284.909	2218353.569	-	-	-	-	5.64	6.18	-	-	-	-	-	-	-	-
Solano	300	6120355.410	2217998.287	0.81	1.65	3.68	3.64	5.63	6.17	-	-	-	-	-	-	-	-
Solano	301	6122297.434	2217197.206	0.92	1.73	3.70	3.67	5.60	6.13	-	-	-	-	-	-	-	-
Solano	302	6123952.286	2216237.431	0.97	1.77	3.73	3.68	5.59	6.12	-	-	-	-	-	-	-	-
Solano	303	6122516.462	2215444.060	-	-	-	-	5.58	6.11	-	-	-	-	-	-	-	-
Solano	304	6121209.149	2215096.521	0.97	1.76	3.70	3.67	5.58	6.12	-	-	-	-	-	-	-	-
Solano	305	6119584.513	2215323.292	0.97	1.77	3.71	3.68	5.59	6.12	-	-	-	-	-	-	-	-
Solano	306	6117514.012	2215678.574	0.95	1.74	3.69	3.66	5.58	6.11	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	307	6119184.317	2221474.428	-	-	-	-	5.63	6.17	-	-	-	-	-	-	-	-
Solano	308	6119123.949	2222940.403	0.76	1.62	3.68	3.64	5.65	6.19	-	-	-	-	-	-	-	-
Solano	309	6118043.407	2224217.533	0.76	1.61	3.68	3.64	5.66	6.20	-	-	-	-	-	-	-	-
Solano	310	6119192.059	2224852.243	0.76	1.61	3.68	3.64	5.67	6.21	-	-	-	-	-	-	-	-
Solano	311	6121134.050	2224051.129	0.77	1.62	3.70	3.65	5.67	6.21	-	-	-	-	-	-	-	-
Solano	312	6122758.719	2223824.358	0.76	1.62	3.70	3.65	5.67	6.22	-	-	-	-	-	-	-	-
Solano	313	6124542.082	2223310.383	0.75	1.61	3.69	3.64	5.67	6.21	-	-	-	-	-	-	-	-
Solano	314	6130171.499	2218549.434	0.95	1.76	3.74	3.68	5.60	6.13	-	-	-	-	-	-	-	-
Solano	315	6129340.235	2217340.414	1.01	1.80	3.75	3.70	5.59	6.13	-	-	-	-	-	-	-	-
Solano	316	6127587.056	2217121.353	0.99	1.78	3.73	3.69	5.59	6.12	-	-	-	-	-	-	-	-
Solano	317	6125833.910	2216902.292	0.97	1.77	3.72	3.68	5.59	6.12	-	-	-	-	-	-	-	-
Solano	318	6124050.580	2217416.234	0.94	1.75	3.71	3.67	5.58	6.11	-	-	-	-	-	-	-	-
Solano	319	6122970.038	2218693.364	0.89	1.70	3.70	3.66	5.62	6.16	-	-	-	-	-	-	-	-
Solano	320	6123068.331	2219872.201	0.84	1.67	3.70	3.65	5.64	6.17	-	-	-	-	-	-	-	-
Solano	321	6122403.470	2221753.857	0.83	1.67	3.70	3.65	5.64	6.17	-	-	-	-	-	-	-	-
Solano	322	6120967.646	2220960.486	0.82	1.66	3.69	3.65	5.63	6.17	-	-	-	-	-	-	-	-
Solano	323	6121791.201	2218791.658	0.86	1.69	3.70	3.65	5.62	6.16	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Solano	324	6131629.764	2215231.987	1.00	1.80	3.74	3.70	5.60	6.13	-	-	-	-	-	-	-	-
Solano	325	6133571.788	2214430.873	1.01	1.80	3.74	3.70	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	326	6170908.885	2209947.844	1.07	1.84	3.83	3.78	5.73	6.27	-	-	-	-	-	-	-	-
Contra Costa	327	6169631.755	2208867.301	1.07	1.84	3.83	3.78	5.72	6.26	-	-	-	-	-	-	-	-
Contra Costa	328	6169435.168	2206509.662	1.07	1.85	3.84	3.78	5.72	6.26	-	-	-	-	-	-	-	-
Contra Costa	329	6167682.022	2206290.601	1.07	1.85	3.84	3.78	5.72	6.26	-	-	-	-	-	-	-	-
Contra Costa	330	6166087.537	2205784.401	1.08	1.85	3.84	3.78	5.71	6.25	-	-	-	-	-	-	-	-
Contra Costa	331	6164651.745	2204991.030	-	-	-	-	5.71	6.25	-	-	-	-	-	-	-	-
Contra Costa	332	6167130.153	2201862.427	1.12	1.88	3.85	3.79	5.70	6.25	-	-	-	-	-	-	-	-
Contra Costa	333	6165029.468	2202950.712	1.10	1.87	3.84	3.79	5.70	6.24	-	-	-	-	-	-	-	-
Contra Costa	333	6163790.264	2204514.981	1.08	1.86	3.84	3.78	5.70	6.24	-	-	-	-	-	-	-	-
Contra Costa	334	6162709.722	2205792.111	1.08	1.86	3.84	3.78	5.70	6.24	-	-	-	-	-	-	-	-
Contra Costa	335	6160956.576	2205573.082	1.06	1.84	3.81	3.76	5.68	6.22	-	-	-	-	-	-	-	-
Contra Costa	336	6159203.430	2205354.021	1.08	1.85	3.82	3.76	5.67	6.21	-	-	-	-	-	-	-	-
Contra Costa	337	6157163.112	2204976.299	1.08	1.85	3.82	3.76	5.67	6.20	-	-	-	-	-	-	-	-
Contra Costa	338	6155092.611	2205331.580	1.08	1.85	3.81	3.76	5.66	6.19	-	-	-	-	-	-	-	-
Contra Costa	339	6153467.942	2205558.351	1.07	1.85	3.80	3.75	5.65	6.19	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	340	6151397.441	2205913.633	1.06	1.84	3.79	3.74	5.64	6.18	-	-	-	-	-	-	-	-
Contra Costa	341	6149546.001	2204515.735	1.06	1.84	3.80	3.75	5.66	6.20	-	-	-	-	-	-	-	-
Contra Costa	342	6148140.394	2202989.360	1.06	1.84	3.80	3.75	5.65	6.19	-	-	-	-	-	-	-	-
Contra Costa	343	6147059.852	2204266.490	1.06	1.84	3.80	3.75	5.65	6.19	-	-	-	-	-	-	-	-
Contra Costa	344	6145979.309	2205543.620	1.07	1.84	3.80	3.74	5.65	6.18	-	-	-	-	-	-	-	-
Contra Costa	345	6144898.799	2206820.750	1.07	1.84	3.79	3.74	5.64	6.17	-	-	-	-	-	-	-	-
Contra Costa	346	6142125.478	2206412.844	1.04	1.82	3.78	3.73	5.63	6.17	-	-	-	-	-	-	-	-
Contra Costa	347	6140183.455	2207213.958	1.04	1.82	3.77	3.72	5.63	6.16	-	-	-	-	-	-	-	-
Contra Costa	348	6137984.476	2207123.374	-	-	-	-	5.62	6.16	-	-	-	-	-	-	-	-
Contra Costa	349	6136329.624	2208083.149	1.04	1.82	3.77	3.72	5.62	6.15	-	-	-	-	-	-	-	-
Contra Costa	350	6134674.771	2209042.957	-	-	-	-	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	351	6133178.580	2209715.561	1.03	1.82	3.75	3.71	5.60	6.14	-	-	-	-	-	-	-	-
Contra Costa	352	6131425.434	2209496.500	-	-	-	-	5.61	6.14	-	-	-	-	-	-	-	-
Contra Costa	353	6129702.472	2208544.467	1.02	1.80	3.75	3.71	5.61	6.14	-	-	-	-	-	-	-	-
Contra Costa	354	6127760.481	2209345.581	1.02	1.81	3.75	3.70	5.60	6.14	-	-	-	-	-	-	-	-
Contra Costa	355	6125531.286	2209988.001	-	-	-	-	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	356	6124292.082	2211552.270	0.93	1.73	3.68	3.66	5.59	6.12	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	357	6122508.752	2212066.245	0.94	1.74	3.69	3.66	5.58	6.12	-	-	-	-	-	-	-	-
Contra Costa	358	6120755.606	2211847.184	0.94	1.74	3.69	3.66	5.59	6.12	-	-	-	-	-	-	-	-
Contra Costa	359	6119002.427	2211628.123	0.94	1.74	3.69	3.67	5.59	6.13	-	-	-	-	-	-	-	-
Contra Costa	360	6117407.975	2211121.923	0.96	1.76	3.70	3.67	5.58	6.12	-	-	-	-	-	-	-	-
Contra Costa	361	6116229.139	2211220.217	-	-	-	-	5.61	6.14	-	-	-	-	-	-	-	-
Contra Costa	362	6116289.506	2209754.209	0.92	1.73	3.69	3.67	5.60	6.14	-	-	-	-	-	-	-	-
Contra Costa	363	6117400.232	2207744.108	0.91	1.72	3.69	3.66	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	364	6118669.620	2205446.803	0.89	1.70	3.69	3.66	5.62	6.15	-	-	-	-	-	-	-	-
Contra Costa	365	6116410.274	2206822.260	0.90	1.72	3.69	3.66	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	366	6117233.829	2204653.432	0.88	1.70	3.69	3.66	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	367	6117007.057	2203028.796	0.89	1.70	3.69	3.66	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	368	6114815.789	2206316.027	0.90	1.71	3.69	3.66	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	369	6114558.834	2205424.362	0.88	1.70	3.68	3.65	5.61	6.14	-	-	-	-	-	-	-	-
Contra Costa	370	6114966.740	2202651.041	-	-	-	-	5.61	6.15	-	-	-	-	-	-	-	-
Contra Costa	371	6113599.026	2203769.510	0.88	1.70	3.68	3.65	5.61	6.14	-	-	-	-	-	-	-	-
Contra Costa	372	6111657.035	2204570.624	-	-	-	-	5.60	6.14	-	-	-	-	-	-	-	-
Contra Costa	373	6111596.635	2206036.598	-	-	-	-	5.60	6.14	-	-	-	-	-	-	-	-

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	374	6111891.549	2209573.107	0.85	1.67	3.65	3.63	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	375	6110387.615	2206867.896	-	-	-	-	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	376	6110168.587	2208621.042	-	-	-	-	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	377	6108831.089	2209006.507	-	-	-	-	5.59	6.12	-	-	-	-	-	-	-	-
Contra Costa	378	6106790.772	2208628.785	0.77	1.61	3.61	3.60	5.58	6.12	-	-	-	-	-	-	-	-
Contra Costa	379	6105672.303	2207261.104	0.75	1.60	3.61	3.59	5.59	6.12	-	-	-	-	-	-	-	-
Contra Costa	380	6103601.802	2207616.352	0.78	1.63	3.62	3.60	5.58	6.11	-	-	-	-	-	-	-	-
Contra Costa	381	6101433.007	2206792.798	0.71	1.57	3.59	3.57	5.57	6.10	-	-	-	-	-	-	-	-
Contra Costa	382	6099997.216	2205999.427	0.71	1.57	3.58	3.56	5.56	6.09	-	-	-	-	-	-	-	-
Contra Costa	383	6098720.086	2204918.884	-	-	-	-	5.56	6.09	-	-	-	-	-	-	-	-
Contra Costa	384	6096521.107	2204828.333	0.69	1.56	3.57	3.55	5.55	6.08	-	-	-	-	-	-	-	-
Contra Costa	385	6094926.622	2204322.133	0.67	1.54	3.57	3.55	5.56	6.09	7.27	7.53	7.93	8.23	8.63	8.96	9.30	10.20
Contra Costa	386	6093679.676	2202508.587	-	-	-	-	5.55	6.08	7.26	7.52	7.93	8.22	8.63	8.95	9.29	10.18
Contra Costa	387	6091798.053	2201843.693	0.67	1.54	3.57	3.55	5.55	6.08	7.26	7.53	7.93	8.23	8.63	8.95	9.29	10.18
Contra Costa	388	6090649.400	2201209.016	0.68	1.55	3.57	3.55	5.56	6.09	7.28	7.54	7.94	8.24	8.64	8.96	9.31	10.20
Contra Costa	389	6089024.731	2201435.787	0.68	1.54	3.56	3.54	5.53	6.06	7.25	7.51	7.92	8.21	8.62	8.94	9.28	10.17
Contra Costa	390	6087906.295	2200068.106	0.67	1.55	3.58	3.56	5.57	6.11	7.30	7.56	7.97	8.26	8.66	8.98	9.33	10.21

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	391	6086153.116	2199849.045	0.71	1.57	3.58	3.56	5.55	6.09	7.28	7.55	7.95	8.24	8.65	8.97	9.31	10.20
Contra Costa	392	6084498.264	2200808.820	0.69	1.56	3.57	3.55	5.54	6.07	7.27	7.53	7.93	8.23	8.63	8.95	9.30	10.18
Contra Costa	393	6082843.412	2201768.595	0.69	1.56	3.56	3.54	5.52	6.06	7.25	7.51	7.92	8.22	8.62	8.94	9.28	10.17
Contra Costa	394	6081475.731	2202887.064	0.69	1.56	3.56	3.54	5.52	6.05	7.25	7.51	7.92	8.21	8.61	8.94	9.28	10.15
Contra Costa	395	6080841.021	2204035.717	0.68	1.55	3.55	3.53	5.51	6.04	7.24	7.50	7.91	8.21	8.61	8.93	9.27	10.14
Contra Costa	396	6080206.344	2205184.336	0.67	1.54	3.54	3.52	5.51	6.04	7.24	7.49	7.90	8.20	8.60	8.92	9.26	10.13
Contra Costa	397	6079412.972	2206620.160	0.67	1.54	3.54	3.52	5.50	6.03	7.24	7.49	7.90	8.20	8.60	8.92	9.26	10.13
Contra Costa	398	6078619.601	2208055.951	0.67	1.54	3.54	3.51	5.49	6.02	7.22	7.48	7.89	8.19	8.59	8.91	9.25	10.12
Contra Costa	399	6077539.059	2209333.081	0.66	1.53	3.52	3.50	5.48	6.00	7.20	7.46	7.88	8.17	8.58	8.90	9.24	10.11
Contra Costa	400	6076171.378	2210451.517	0.64	1.51	3.50	3.48	5.45	5.98	7.18	7.44	7.85	8.15	8.56	8.88	9.22	10.09
Contra Costa	401	6074675.187	2211124.154	0.66	1.52	3.52	3.50	5.47	6.00	7.20	7.46	7.87	8.17	8.58	8.90	9.24	10.12
Contra Costa	402	6072604.685	2211479.402	0.66	1.53	3.52	3.50	5.47	6.01	7.21	7.47	7.89	8.19	8.59	8.92	9.26	10.14
Contra Costa	403	6070821.356	2211993.378	0.63	1.51	3.51	3.49	5.47	6.00	7.21	7.47	7.89	8.19	8.59	8.92	9.26	10.14
Contra Costa	404	6068879.332	2212794.459	0.57	1.46	3.47	3.45	5.45	5.98	7.18	7.44	7.86	8.16	8.57	8.90	9.24	10.13
Contra Costa	405	6067254.663	2213021.263	0.53	1.42	3.45	3.43	5.45	5.98	7.17	7.44	7.85	8.15	8.57	8.89	9.24	10.13
Contra Costa	406	6065342.856	2213089.373	0.51	1.41	3.47	3.45	5.49	6.03	7.25	7.51	7.93	8.23	8.64	8.96	9.30	10.18
Contra Costa	407	6063589.710	2212870.312	0.55	1.44	3.50	3.49	5.53	6.07	7.31	7.57	7.99	8.29	8.70	9.03	9.38	10.28

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	408	6061519.209	2213225.593	0.51	1.41	3.48	3.47	5.53	6.07	7.30	7.57	7.99	8.29	8.70	9.04	9.39	10.29
Contra Costa	409	6059607.369	2213293.703	0.47	1.38	3.46	3.46	5.53	6.08	7.31	7.58	7.99	8.30	8.71	9.04	9.39	10.30
Contra Costa	410	6058012.884	2212787.471	0.48	1.39	3.47	3.47	5.54	6.09	7.33	7.60	8.01	8.31	8.73	9.06	9.42	10.33
Contra Costa	411	6056735.754	2211706.961	0.47	1.38	3.47	3.47	5.55	6.10	7.34	7.61	8.03	8.33	8.75	9.08	9.44	10.37
Contra Costa	412	6055141.302	2211200.729	0.47	1.38	3.47	3.47	5.56	6.11	7.35	7.62	8.04	8.34	8.76	9.10	9.46	10.40
Contra Costa	413	6053546.817	2210694.529	0.43	1.35	3.46	3.46	5.56	6.12	7.35	7.63	8.04	8.35	8.77	9.11	9.47	10.43
Contra Costa	414	6053191.535	2208624.028	0.42	1.34	3.47	3.48	5.61	6.17	7.41	7.69	8.11	8.41	8.84	9.19	9.56	10.55
Contra Costa	415	6052518.932	2207127.836	0.41	1.34	3.47	3.48	5.62	6.18	7.42	7.70	8.12	8.42	8.85	9.20	9.58	10.57
Contra Costa	416	6050478.614	2206750.114	0.40	1.33	3.47	3.48	5.62	6.18	7.42	7.71	8.12	8.43	8.85	9.20	9.58	10.58
Contra Costa	417	6049518.839	2205095.262	0.38	1.32	3.47	3.48	5.65	6.21	7.45	7.74	8.15	8.46	8.89	9.25	9.63	10.66
Contra Costa	418	6049450.729	2203183.455	0.37	1.31	3.48	3.49	5.67	6.23	7.47	7.76	8.17	8.48	8.91	9.27	9.66	10.70
Contra Costa	419	6048332.260	2201815.741	0.35	1.30	3.47	3.49	5.67	6.24	7.47	7.77	8.18	8.48	8.92	9.28	9.67	10.72
Contra Costa	420	6046480.820	2200417.876	0.34	1.28	3.47	3.48	5.68	6.24	7.47	7.77	8.17	8.48	8.92	9.28	9.67	10.74
Contra Costa	421	6044727.674	2200198.815	0.32	1.27	3.46	3.48	5.68	6.25	7.47	7.77	8.18	8.49	8.92	9.29	9.69	10.77
Contra Costa	422	6044946.736	2198445.669	-	-	-	-	5.69	6.26	7.48	7.78	8.19	8.50	8.93	9.30	9.70	10.78
Contra Costa	423	6042808.124	2196889.110	-	-	-	-	5.70	6.26	7.48	7.78	8.19	8.49	8.93	9.30	9.70	10.79
Contra Costa	424	6040926.468	2196224.216	-	-	-	-	5.69	6.26	7.47	7.78	8.18	8.49	8.93	9.30	9.70	10.80

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	425	6038984.477	2197025.330	0.25	1.22	3.44	3.46	5.69	6.26	7.47	7.78	8.18	8.49	8.93	9.30	9.70	10.81
Contra Costa	426	6037389.992	2196519.131	0.24	1.21	3.44	3.45	5.69	6.26	7.47	7.78	8.18	8.49	8.93	9.30	9.70	10.81
Contra Costa	427	6036271.523	2195151.417	0.22	1.20	3.43	3.45	5.69	6.26	7.47	7.78	8.18	8.49	8.93	9.30	9.70	10.82
Contra Costa	428	6035281.565	2194229.568	0.21	1.20	3.43	3.44	5.69	6.26	7.47	7.77	8.18	8.49	8.93	9.30	9.70	10.82
Contra Costa	429	6033687.080	2193723.368	0.20	1.18	3.42	3.44	5.69	6.26	7.46	7.77	8.18	8.48	8.93	9.30	9.70	10.82
Contra Costa	430	6032379.766	2193375.830	0.20	1.18	3.42	3.43	5.69	6.25	7.46	7.77	8.17	8.48	8.92	9.29	9.70	10.82
Contra Costa	431	6030883.608	2194048.433	0.17	1.16	3.41	3.43	5.69	6.25	7.46	7.77	8.17	8.48	8.92	9.29	9.70	10.81
Contra Costa	432	6029674.588	2194879.731	0.16	1.16	3.40	3.42	5.68	6.25	7.46	7.76	8.17	8.48	8.92	9.29	9.70	10.81
Contra Costa	433	6027891.225	2195393.674	0.14	1.14	3.39	3.41	5.68	6.24	7.45	7.76	8.17	8.47	8.92	9.29	9.69	10.80
Contra Costa	434	6026266.589	2195620.445	0.13	1.14	3.38	3.41	5.67	6.24	7.44	7.75	8.16	8.47	8.91	9.28	9.68	10.79
Contra Costa	435	6025473.185	2197056.269	0.10	1.11	3.36	3.39	5.67	6.23	7.44	7.75	8.16	8.46	8.91	9.27	9.68	10.78
Contra Costa	436	6024135.688	2197441.734	0.09	1.10	3.35	3.38	5.67	6.23	7.44	7.74	8.15	8.46	8.90	9.27	9.67	10.77
Contra Costa	437	6022858.558	2196361.191	0.07	1.09	3.35	3.38	5.66	6.22	7.43	7.73	8.14	8.45	8.89	9.25	9.65	10.74
Contra Costa	438	6022631.787	2194736.523	0.06	1.08	3.35	3.37	5.66	6.22	7.43	7.73	8.14	8.44	8.88	9.25	9.65	10.74
Contra Costa	439	6022850.848	2192983.376	0.05	1.08	3.35	3.37	5.66	6.22	7.42	7.73	8.13	8.44	8.87	9.23	9.63	10.71
Contra Costa	440	6023069.876	2191230.230	-	-	-	-	5.66	6.22	7.42	7.72	8.12	8.43	8.86	9.22	9.61	10.67
Contra Costa	441	6024150.419	2189953.100	-	-	-	-	5.66	6.22	7.42	7.72	8.12	8.42	8.85	9.20	9.59	10.64

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	442	6024082.309	2188041.260	-	-	-	-	5.65	6.21	7.42	7.71	8.11	8.41	8.84	9.19	9.58	10.62
Contra Costa	443	6023251.011	2186832.241	-	-	-	-	5.65	6.21	7.41	7.71	8.10	8.40	8.83	9.19	9.57	10.63
Contra Costa	444	6022132.575	2185464.560	-	-	-	-	5.64	6.21	7.40	7.70	8.10	8.40	8.82	9.18	9.57	10.63
Contra Costa	445	6020538.090	2184958.360	-	-	-	-	5.64	6.20	7.39	7.69	8.09	8.39	8.82	9.18	9.57	10.64
Contra Costa	446	6018626.250	2185026.470	-	-	-	-	5.63	6.19	7.38	7.68	8.08	8.39	8.82	9.18	9.57	10.64
Contra Costa	447	6017190.459	2184233.066	-	-	-	-	5.62	6.18	7.37	7.67	8.07	8.38	8.81	9.17	9.56	10.63
Contra Costa	448	6016676.516	2182449.736	-	-	-	-	5.61	6.17	7.36	7.66	8.06	8.36	8.79	9.15	9.55	10.61
Contra Costa	449	6015082.031	2181943.536	0.01	1.05	3.31	3.33	5.61	6.16	7.35	7.65	8.05	8.36	8.79	9.15	9.54	10.60
Contra Costa	450	6013487.546	2181437.337	0.01	1.05	3.30	3.32	5.60	6.15	7.35	7.64	8.04	8.35	8.78	9.14	9.53	10.59
Contra Costa	451	6012527.772	2179782.451	-	-	-	-	5.59	6.14	7.34	7.63	8.03	8.34	8.77	9.12	9.51	10.56
Contra Costa	452	6011855.168	2178286.293	-	-	-	-	5.59	6.14	7.33	7.63	8.03	8.33	8.76	9.12	9.51	10.56
Contra Costa	453	6010774.625	2179563.423	0.01	1.05	3.29	3.31	5.58	6.14	7.33	7.63	8.03	8.33	8.76	9.12	9.51	10.56
Contra Costa	454	6009119.773	2180523.198	0.01	1.04	3.28	3.31	5.57	6.12	7.32	7.61	8.02	8.32	8.75	9.11	9.49	10.54
Contra Costa	455	6007653.798	2180462.831	0.01	1.04	3.27	3.30	5.56	6.11	7.31	7.60	8.01	8.31	8.74	9.09	9.47	10.50
Contra Costa	456	6005583.297	2180818.079	0.01	1.04	3.27	3.29	5.55	6.10	7.30	7.59	7.99	8.29	8.72	9.07	9.45	10.46
Contra Costa	457	6005575.554	2177440.265	-0.01	1.03	3.28	3.30	5.56	6.12	7.33	7.62	8.03	8.34	8.77	9.12	9.51	10.55
Contra Costa	458	6006240.448	2175558.641	0.01	1.04	3.28	3.30	5.55	6.10	7.31	7.60	8.01	8.31	8.74	9.10	9.48	10.51

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	459	6007033.819	2174122.850	0.00	1.04	3.28	3.29	5.54	6.10	7.31	7.60	8.00	8.31	8.73	9.08	9.47	10.49
Contra Costa	460	6006361.183	2172626.659	0.00	1.04	3.28	3.29	5.54	6.09	7.30	7.59	8.00	8.30	8.73	9.08	9.46	10.48
Contra Costa	461	6008016.035	2171666.884	0.01	1.05	3.28	3.29	5.54	6.10	7.32	7.61	8.02	8.32	8.75	9.10	9.48	10.51
Contra Costa	462	6009670.887	2170707.109	0.01	1.05	3.29	3.30	5.54	6.10	7.32	7.61	8.02	8.32	8.75	9.11	9.49	10.51
Contra Costa	463	6008998.284	2169210.917	0.01	1.05	3.29	3.30	5.55	6.10	7.33	7.62	8.03	8.33	8.76	9.11	9.50	10.53
Contra Costa	464	6009950.316	2167487.955	0.02	1.06	3.29	3.30	5.54	6.09	7.32	7.61	8.02	8.32	8.75	9.11	9.50	10.54
Contra Costa	465	6011318.030	2166369.486	0.02	1.06	3.30	3.31	5.55	6.11	7.33	7.63	8.03	8.34	8.77	9.13	9.53	10.59
Contra Costa	466	6013260.021	2165568.405	-	-	-	-	5.55	6.11	7.33	7.63	8.04	8.35	8.79	9.15	9.54	10.62
Contra Costa	467	6014914.873	2164608.630	0.02	1.07	3.31	3.31	5.55	6.11	7.33	7.63	8.04	8.35	8.78	9.14	9.54	10.61
Contra Costa	468	6015708.244	2163172.806	0.02	1.07	3.31	3.31	5.55	6.10	7.33	7.63	8.03	8.34	8.78	9.14	9.53	10.61
Contra Costa	469	6016214.477	2161578.354	0.02	1.07	3.31	3.31	5.55	6.10	7.32	7.62	8.03	8.33	8.77	9.13	9.52	10.60
Contra Costa	470	6015413.363	2159636.330	0.02	1.06	3.30	3.30	5.54	6.10	7.32	7.62	8.02	8.32	8.76	9.12	9.51	10.58
Contra Costa	471	6016206.734	2158200.539	0.02	1.07	3.30	3.31	5.55	6.10	7.32	7.63	8.03	8.34	8.77	9.14	9.54	10.64
Contra Costa	472	6018148.758	2157399.425	0.02	1.06	3.30	3.31	5.55	6.11	7.33	7.64	8.05	8.36	8.80	9.17	9.58	10.70
Contra Costa	473	6020060.565	2157331.315	0.02	1.06	3.31	3.31	5.56	6.12	7.35	7.66	8.07	8.38	8.83	9.21	9.63	10.77
Contra Costa	474	6021398.095	2156945.850	0.01	1.06	3.31	3.31	5.56	6.12	7.35	7.67	8.08	8.39	8.85	9.23	9.65	10.82
Contra Costa	475	6023627.257	2156303.430	0.00	1.06	3.31	3.32	5.58	6.15	7.38	7.70	8.12	8.44	8.90	9.30	9.73	10.94

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	476	6025063.048	2157096.801	0.00	1.06	3.31	3.32	5.59	6.16	7.38	7.71	8.13	8.45	8.92	9.31	9.75	10.98
Contra Costa	477	6024556.849	2158691.253	0.00	1.05	3.31	3.32	5.59	6.16	7.38	7.72	8.13	8.46	8.93	9.32	9.77	11.01
Contra Costa	478	6026053.040	2158018.650	-0.03	1.04	3.31	3.32	5.60	6.17	7.40	7.73	8.15	8.47	8.94	9.34	9.78	11.03
Contra Costa	479	6027995.031	2157217.536	-0.07	1.01	3.31	3.31	5.61	6.18	7.41	7.74	8.16	8.48	8.95	9.35	9.80	11.04
Contra Costa	480	6029906.871	2157149.426	-0.08	1.01	3.31	3.31	5.62	6.19	7.42	7.75	8.17	8.49	8.96	9.36	9.81	11.05
Contra Costa	481	6031947.188	2157527.148	-	-	-	-	5.62	6.19	7.42	7.76	8.17	8.50	8.97	9.36	9.81	11.06
Contra Costa	482	6034017.689	2157171.900	-	-	-	-	5.63	6.20	7.43	7.76	8.17	8.49	8.96	9.36	9.80	11.04
Contra Costa	483	6034078.056	2155705.892	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.17	8.49	8.96	9.36	9.80	11.04
Contra Costa	484	6034297.118	2153952.746	-0.07	1.01	3.31	3.32	5.63	6.19	7.42	7.75	8.17	8.49	8.95	9.35	9.79	11.03
Contra Costa	485	6035793.276	2153280.142	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.76	8.17	8.49	8.96	9.35	9.80	11.03
Contra Costa	486	6134652.330	2213153.743	1.09	1.86	3.78	3.73	5.60	6.13	-	-	-	-	-	-	-	-
Contra Costa	487	6133344.984	2212806.204	1.05	1.82	3.75	3.71	5.59	6.12	-	-	-	-	-	-	-	-
Contra Costa	488	6131274.516	2213161.486	-	-	-	-	5.59	6.12	-	-	-	-	-	-	-	-
Contra Costa	489	6128916.843	2213358.073	1.03	1.81	3.74	3.70	5.59	6.13	-	-	-	-	-	-	-	-
Contra Costa	491	6004623.522	2179163.227	-0.01	1.02	3.24	3.27	5.53	6.07	7.28	7.56	7.97	8.27	8.69	9.03	9.41	10.40
Contra Costa	492	6003474.870	2178528.550	-0.05	0.98	3.21	3.24	5.49	6.03	7.23	7.51	7.92	8.22	8.63	8.97	9.34	10.31
Contra Costa	493	6004819.355	2167276.637	0.10	1.12	3.30	3.31	5.51	6.06	7.28	7.57	7.98	8.28	8.71	9.06	9.44	10.46

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Contra Costa	494	6004433.890	2165939.139	0.07	1.09	3.30	3.30	5.51	6.07	7.29	7.58	7.98	8.29	8.71	9.06	9.44	10.46
Contra Costa	495	6005454.065	2166127.984	0.02	1.05	3.28	3.29	5.52	6.07	7.28	7.58	7.98	8.29	8.72	9.07	9.46	10.49
Contra Costa	496	6015821.269	2156863.009	0.00	1.05	3.29	3.29	5.54	6.09	7.31	7.61	8.02	8.33	8.76	9.13	9.53	10.63
Contra Costa	497	6017604.631	2156349.067	-0.02	1.04	3.30	3.30	5.57	6.13	7.34	7.66	8.07	8.38	8.84	9.22	9.65	10.83
Contra Costa	498	6019675.133	2155993.818	-0.02	1.04	3.31	3.31	5.58	6.14	7.37	7.69	8.10	8.42	8.88	9.27	9.70	10.91
Contra Costa	499	6021617.123	2155192.704	-0.03	1.04	3.31	3.32	5.59	6.16	7.38	7.71	8.12	8.44	8.90	9.29	9.73	10.95
Contra Costa	500	6023241.792	2154965.900	-	-	-	-	5.60	6.16	7.38	7.71	8.13	8.45	8.91	9.30	9.74	10.96
Contra Costa	501	6024896.644	2154006.125	-	-	-	-	5.60	6.17	7.39	7.72	8.13	8.45	8.91	9.31	9.75	10.99
Contra Costa	502	6026392.836	2153333.521	-	-	-	-	5.61	6.18	7.40	7.73	8.14	8.46	8.93	9.33	9.77	11.02
Contra Costa	503	6027858.810	2153393.889	-0.06	1.01	3.30	3.31	5.61	6.18	7.40	7.74	8.15	8.47	8.94	9.34	9.78	11.02
Contra Costa	504	6027065.439	2154829.713	-	-	-	-	5.61	6.18	7.40	7.74	8.15	8.47	8.94	9.34	9.78	11.02
Contra Costa	505	6025984.930	2156106.810	-	-	-	-	5.59	6.16	7.39	7.72	8.13	8.46	8.92	9.32	9.76	10.99
Alameda	506	6033624.481	2152456.555	-0.07	1.01	3.31	3.32	5.63	6.19	7.42	7.75	8.16	8.48	8.95	9.34	9.79	11.02
Alameda	507	6033397.710	2150831.919	-0.07	1.01	3.31	3.32	5.62	6.20	7.42	7.75	8.16	8.48	8.94	9.34	9.78	11.01
Alameda	508	6035052.562	2149872.111	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.48	8.94	9.34	9.77	11.00
Alameda	509	6036518.537	2149932.511	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.48	8.94	9.34	9.77	11.00
Alameda	510	6037311.908	2148496.687	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.48	8.94	9.33	9.76	10.98

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	511	6038838.283	2147091.080	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.47	8.93	9.32	9.75	10.96
Alameda	512	6039057.344	2145337.934	-0.08	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.47	8.93	9.32	9.75	10.96
Alameda	513	6038135.463	2146327.892	-0.08	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.47	8.93	9.32	9.75	10.96
Alameda	514	6036767.782	2147446.361	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.48	8.93	9.32	9.76	10.97
Alameda	515	6035173.297	2146940.161	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.16	8.47	8.93	9.32	9.76	10.97
Alameda	516	6033896.167	2145859.619	-0.07	1.01	3.31	3.32	5.63	6.19	7.42	7.75	8.15	8.47	8.93	9.31	9.75	10.95
Alameda	517	6034689.538	2144423.795	-0.07	1.01	3.31	3.32	5.63	6.20	7.42	7.75	8.15	8.47	8.92	9.31	9.74	10.93
Alameda	518	6035770.081	2143146.698	-0.07	1.01	3.31	3.32	5.63	6.20	7.43	7.75	8.16	8.47	8.92	9.30	9.73	10.91
Alameda	519	6035989.142	2141393.519	-0.07	1.01	3.31	3.32	5.63	6.20	7.43	7.75	8.16	8.47	8.92	9.30	9.72	10.90
Alameda	520	6036495.342	2139799.067	-0.08	1.00	3.30	3.32	5.64	6.21	7.44	7.75	8.16	8.47	8.92	9.30	9.72	10.88
Alameda	521	6038120.010	2139572.263	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.92	9.30	9.72	10.88
Alameda	522	6039238.446	2140939.977	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.17	8.48	8.93	9.31	9.73	10.90
Alameda	523	6040606.160	2139821.508	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.17	8.48	8.93	9.30	9.72	10.89
Alameda	524	6040825.221	2138068.362	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.92	9.30	9.71	10.87
Alameda	525	6040757.111	2136156.522	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.91	9.29	9.70	10.86
Alameda	526	6041550.482	2134720.731	-0.08	1.00	3.31	3.32	5.65	6.22	7.45	7.76	8.16	8.47	8.91	9.29	9.70	10.85
Alameda	527	6040689.001	2134244.714	-0.08	1.00	3.31	3.32	5.64	6.22	7.44	7.76	8.16	8.47	8.91	9.28	9.70	10.85

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	528	6039094.516	2133738.515	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.91	9.28	9.70	10.84
Alameda	529	6038746.978	2135045.828	-0.08	1.00	3.31	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.91	9.29	9.70	10.85
Alameda	530	6036993.832	2134826.767	-0.08	1.00	3.30	3.32	5.64	6.21	7.44	7.76	8.16	8.47	8.91	9.28	9.70	10.84
Alameda	531	6036479.889	2133043.437	-0.08	1.00	3.30	3.32	5.64	6.21	7.45	7.76	8.16	8.47	8.91	9.28	9.68	10.80
Alameda	532	6036986.089	2131448.952	-0.09	0.99	3.30	3.32	5.65	6.22	7.46	7.76	8.16	8.47	8.90	9.27	9.67	10.78
Alameda	533	6038897.929	2131380.842	-0.09	0.99	3.30	3.32	5.65	6.22	7.46	7.77	8.17	8.47	8.91	9.27	9.67	10.78
Alameda	534	6040809.736	2131312.732	-	-	-	-	5.65	6.23	7.46	7.77	8.17	8.47	8.91	9.27	9.67	10.78
Alameda	535	6040741.626	2129400.892	-	-	-	-	5.65	6.23	7.46	7.77	8.16	8.47	8.90	9.26	9.66	10.76
Alameda	536	6039116.957	2129627.696	-	-	-	-	5.65	6.22	7.46	7.77	8.16	8.47	8.90	9.26	9.66	10.76
Alameda	537	6037620.799	2130300.300	-	-	-	-	5.65	6.22	7.46	7.76	8.16	8.47	8.90	9.27	9.67	10.77
Alameda	538	6035928.020	2128615.264	-	-	-	-	5.65	6.22	7.46	7.76	8.16	8.46	8.90	9.26	9.66	10.75
Alameda	539	6034333.535	2128109.064	-	-	-	-	5.65	6.22	7.46	7.76	8.16	8.46	8.90	9.26	9.65	10.73
Alameda	540	6032739.050	2127602.831	-0.11	0.97	3.28	3.31	5.65	6.22	7.47	7.77	8.17	8.47	8.89	9.24	9.63	10.66
Alameda	541	6032066.446	2126106.673	-0.11	0.97	3.28	3.31	5.66	6.23	7.48	7.77	8.17	8.47	8.89	9.24	9.63	10.65
Alameda	542	6033562.605	2125434.037	-0.13	0.96	3.28	3.31	5.67	6.24	7.49	7.78	8.18	8.48	8.90	9.25	9.62	10.64
Alameda	543	6035474.445	2125365.926	-0.13	0.96	3.28	3.31	5.67	6.24	7.50	7.78	8.18	8.48	8.90	9.25	9.62	10.64
Alameda	544	6038217.550	2126506.836	-0.13	0.96	3.28	3.31	5.67	6.24	7.50	7.79	8.18	8.48	8.90	9.24	9.62	10.64

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	545	6036940.420	2125426.327	-0.13	0.96	3.28	3.31	5.67	6.24	7.50	7.79	8.18	8.48	8.90	9.24	9.62	10.64
Alameda	546	6035088.980	2124028.429	-0.13	0.96	3.28	3.31	5.67	6.24	7.49	7.78	8.18	8.48	8.90	9.24	9.62	10.64
Alameda	547	6033335.834	2123809.368	-	-	-	-	5.67	6.24	7.49	7.78	8.18	8.48	8.90	9.25	9.62	10.64
Alameda	548	6031295.516	2123431.646	-0.13	0.96	3.28	3.31	5.67	6.24	7.50	7.79	8.18	8.48	8.90	9.25	9.63	10.65
Alameda	549	6029859.725	2122638.274	-0.14	0.95	3.27	3.31	5.68	6.25	7.51	7.79	8.19	8.49	8.91	9.25	9.63	10.64
Alameda	550	6028423.934	2121844.903	-0.14	0.94	3.27	3.31	5.68	6.26	7.52	7.80	8.20	8.49	8.91	9.26	9.63	10.64
Alameda	551	6028642.962	2120091.757	-0.16	0.92	3.25	3.31	5.70	6.27	7.54	7.82	8.22	8.51	8.92	9.26	9.63	10.62
Alameda	552	6030139.154	2119419.154	-0.18	0.91	3.26	3.31	5.71	6.29	7.55	7.83	8.23	8.52	8.94	9.28	9.65	10.65
Alameda	553	6031892.300	2119638.182	-0.18	0.91	3.26	3.31	5.72	6.30	7.55	7.84	8.24	8.53	8.95	9.29	9.66	10.67
Alameda	554	6033418.675	2118232.575	-0.18	0.91	3.26	3.31	5.72	6.30	7.56	7.84	8.23	8.53	8.94	9.28	9.66	10.66
Alameda	555	6035647.837	2117590.155	-0.15	0.93	3.26	3.32	5.70	6.27	7.54	7.83	8.22	8.51	8.93	9.27	9.64	10.65
Alameda	556	6037589.860	2116789.041	-0.12	0.95	3.27	3.32	5.69	6.27	7.54	7.82	8.21	8.50	8.90	9.24	9.60	10.57
Alameda	557	6039819.023	2116146.621	-	-	-	-	5.69	6.27	7.53	7.81	8.20	8.48	8.89	9.22	9.58	10.56
Alameda	558	6041889.524	2115791.339	-0.10	0.97	3.27	3.33	5.70	6.27	7.54	7.82	8.20	8.49	8.89	9.23	9.59	10.57
Alameda	559	6043642.670	2116010.401	-0.10	0.97	3.27	3.34	5.70	6.27	7.54	7.82	8.20	8.49	8.90	9.23	9.60	10.59
Alameda	560	6045395.816	2116229.429	-	-	-	-	5.70	6.28	7.54	7.82	8.21	8.49	8.90	9.24	9.60	10.58
Alameda	561	6047307.656	2116161.319	-0.10	0.97	3.28	3.34	5.70	6.28	7.54	7.83	8.21	8.50	8.90	9.24	9.61	10.59

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	562	6048962.508	2115201.544	-0.11	0.97	3.28	3.34	5.71	6.28	7.55	7.83	8.22	8.50	8.91	9.24	9.60	10.57
Alameda	563	6050617.361	2114241.769	-0.11	0.97	3.28	3.34	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.24	9.60	10.57
Alameda	564	6052272.213	2113281.994	-0.11	0.97	3.28	3.34	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.24	9.61	10.58
Alameda	565	6054214.237	2112480.880	-0.11	0.97	3.28	3.34	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.25	9.61	10.57
Alameda	566	6055491.367	2113561.422	-	-	-	-	5.70	6.29	7.56	7.84	8.23	8.51	8.92	9.25	9.61	10.58
Alameda	567	6057304.880	2112314.476	-	-	-	-	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.25	9.61	10.58
Alameda	568	6056949.599	2110243.975	-0.11	0.97	3.28	3.34	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.24	9.60	10.57
Alameda	569	6055294.746	2111203.750	-0.11	0.97	3.28	3.34	5.71	6.29	7.56	7.84	8.22	8.51	8.91	9.24	9.60	10.57
Alameda	570	6031506.835	2118300.685	-0.18	0.91	3.26	3.31	5.72	6.30	7.56	7.84	8.24	8.53	8.95	9.29	9.66	10.67
Alameda	571	6031725.896	2116547.539	-0.20	0.89	3.26	3.31	5.73	6.31	7.58	7.86	8.25	8.55	8.96	9.31	9.68	10.69
Alameda	572	6031657.786	2114635.699	-0.23	0.87	3.25	3.31	5.75	6.33	7.59	7.88	8.27	8.57	8.98	9.33	9.71	10.73
Alameda	573	6031143.843	2112852.369	-0.26	0.85	3.24	3.31	5.77	6.35	7.62	7.91	8.30	8.59	9.01	9.35	9.74	10.77
Alameda	574	6031937.214	2111416.578	-0.28	0.83	3.24	3.31	5.79	6.38	7.64	7.93	8.32	8.61	9.03	9.38	9.76	10.82
Alameda	575	6033561.883	2111189.774	-0.29	0.82	3.25	3.32	5.81	6.40	7.66	7.96	8.34	8.64	9.06	9.41	9.80	10.86
Alameda	576	6035503.874	2110388.693	-0.30	0.81	3.25	3.32	5.83	6.41	7.68	7.98	8.36	8.65	9.07	9.43	9.82	10.89
Alameda	577	6036871.588	2109270.224	-0.30	0.81	3.25	3.32	5.83	6.41	7.68	7.98	8.36	8.65	9.07	9.43	9.82	10.89
Alameda	578	6038783.395	2109202.114	-0.30	0.81	3.25	3.32	5.82	6.42	7.68	7.98	8.36	8.65	9.07	9.43	9.82	10.89

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	579	6040438.247	2108242.339	-0.30	0.81	3.25	3.32	5.83	6.42	7.68	7.98	8.36	8.65	9.07	9.43	9.82	10.90
Alameda	580	6036486.123	2107932.726	-0.35	0.77	3.23	3.31	5.85	6.44	7.70	8.01	8.39	8.68	9.10	9.45	9.84	10.93
Alameda	581	6038140.975	2106972.951	-0.38	0.75	3.24	3.31	5.88	6.47	7.73	8.04	8.42	8.71	9.13	9.48	9.88	10.98
Alameda	582	6039765.644	2106746.147	-0.41	0.73	3.26	3.32	5.92	6.52	7.79	8.09	8.47	8.76	9.18	9.53	9.93	11.03
Alameda	583	6041677.451	2106678.037	-0.42	0.72	3.27	3.33	5.94	6.54	7.81	8.12	8.49	8.78	9.20	9.56	9.95	11.05
Alameda	584	6043460.813	2106164.095	-0.43	0.71	3.27	3.33	5.95	6.55	7.83	8.14	8.51	8.80	9.22	9.57	9.97	11.07
Alameda	585	6044828.494	2105045.659	-0.44	0.70	3.27	3.33	5.96	6.56	7.84	8.14	8.52	8.81	9.23	9.58	9.97	11.08
Alameda	586	6046611.824	2104531.716	-0.46	0.69	3.28	3.33	5.98	6.58	7.87	8.17	8.54	8.83	9.25	9.60	10.00	11.10
Alameda	587	6047888.954	2105612.226	-0.46	0.69	3.28	3.34	5.99	6.59	7.87	8.18	8.55	8.84	9.26	9.61	10.01	11.11
Alameda	588	6048682.325	2104176.435	-	-	-	-	5.99	6.60	7.87	8.18	8.55	8.84	9.26	9.61	10.01	11.12
Alameda	589	6050337.178	2103216.660	-0.48	0.67	3.28	3.34	6.00	6.60	7.88	8.19	8.56	8.85	9.27	9.62	10.02	11.14
Alameda	590	6052279.201	2102415.546	-	-	-	-	6.00	6.61	7.89	8.19	8.56	8.85	9.27	9.63	10.02	11.15
Alameda	591	6053488.221	2101584.248	-	-	-	-	6.01	6.61	7.89	8.20	8.56	8.85	9.27	9.62	10.02	11.14
Alameda	592	6055143.073	2100624.473	-	-	-	-	6.00	6.61	7.88	8.19	8.56	8.84	9.26	9.61	10.01	11.13
Alameda	593	6053707.282	2099831.102	-	-	-	-	6.01	6.61	7.88	8.19	8.56	8.85	9.26	9.62	10.01	11.14
Alameda	594	6051984.320	2098879.070	-0.49	0.66	3.29	3.33	6.01	6.61	7.88	8.19	8.56	8.84	9.26	9.62	10.02	11.15
Alameda	595	6051470.377	2097095.740	-0.51	0.65	3.28	3.33	6.02	6.63	7.89	8.21	8.57	8.86	9.28	9.64	10.04	11.19

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	596	6052263.748	2095659.916	-0.51	0.65	3.29	3.33	6.02	6.63	7.90	8.21	8.58	8.87	9.29	9.65	10.05	11.21
Alameda	597	6053344.258	2094382.786	-0.51	0.64	3.28	3.33	6.03	6.64	7.90	8.22	8.58	8.87	9.29	9.65	10.06	11.22
Alameda	598	6054424.801	2093105.656	-0.52	0.63	3.29	3.34	6.04	6.65	7.92	8.24	8.60	8.89	9.31	9.67	10.08	11.24
Alameda	599	6054326.507	2091926.853	-0.58	0.59	3.28	3.32	6.05	6.67	7.93	8.25	8.61	8.89	9.31	9.68	10.08	11.25
Alameda	600	6054545.568	2090173.674	-0.61	0.56	3.28	3.32	6.08	6.69	7.96	8.28	8.64	8.92	9.34	9.71	10.11	11.29
Alameda	601	6055913.249	2089055.238	-0.63	0.55	3.29	3.33	6.10	6.72	7.99	8.31	8.67	8.95	9.37	9.74	10.15	11.33
Alameda	602	6056993.792	2087778.108	-0.64	0.54	3.29	3.33	6.12	6.73	8.01	8.33	8.69	8.97	9.40	9.76	10.18	11.38
Alameda	603	6058520.134	2086372.500	-0.66	0.52	3.30	3.33	6.14	6.75	8.03	8.35	8.71	9.00	9.42	9.79	10.21	11.42
Alameda	604	6059887.847	2085254.032	-0.67	0.51	3.30	3.33	6.15	6.77	8.04	8.37	8.73	9.01	9.44	9.81	10.23	11.45
Alameda	605	6060968.357	2083976.902	-0.69	0.50	3.30	3.33	6.17	6.79	8.06	8.39	8.74	9.03	9.45	9.82	10.25	11.47
Alameda	606	6062336.071	2082858.466	-0.70	0.48	3.30	3.33	6.18	6.80	8.08	8.40	8.76	9.04	9.47	9.84	10.26	11.48
Alameda	607	6064308.278	2081324.348	-0.70	0.48	3.33	3.35	6.22	6.83	8.18	8.46	8.81	9.08	9.47	9.79	10.15	11.14
Alameda	608	6065358.604	2080780.222	-0.72	0.45	3.33	3.34	6.24	6.85	8.20	8.48	8.84	9.10	9.49	9.81	10.17	11.15
Alameda	609	6066953.089	2081286.421	-0.73	0.45	3.34	3.35	6.25	6.87	8.23	8.51	8.86	9.13	9.51	9.82	10.17	11.12
Alameda	610	6067467.032	2083069.784	-	-	-	-	6.26	6.87	8.27	8.53	8.88	9.14	9.51	9.81	10.14	11.01
Alameda	611	6067535.142	2084981.591	-	-	-	-	6.26	6.88	8.29	8.54	8.89	9.15	9.51	9.80	10.11	10.93
Alameda	612	6068109.452	2085298.946	-	-	-	-	6.26	6.88	8.30	8.55	8.90	9.15	9.51	9.80	10.11	10.91

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	613	6068456.990	2083991.633	-	-	-	-	6.26	6.87	8.28	8.54	8.89	9.15	9.51	9.80	10.12	10.96
Alameda	614	6069250.361	2082555.841	-	-	-	-	6.26	6.88	8.27	8.53	8.88	9.14	9.51	9.81	10.14	11.01
Alameda	615	6070716.369	2082616.209	-	-	-	-	6.26	6.88	8.28	8.54	8.89	9.15	9.51	9.81	10.13	10.99
Alameda	616	6071608.034	2082359.221	-	-	-	-	6.26	6.88	8.28	8.54	8.89	9.15	9.52	9.81	10.14	11.00
Alameda	617	6071351.046	2081467.556	-	-	-	-	6.26	6.88	8.27	8.53	8.88	9.15	9.51	9.82	10.15	11.03
Alameda	618	6070618.075	2081437.373	-	-	-	-	6.26	6.88	8.27	8.53	8.88	9.14	9.51	9.82	10.15	11.04
Alameda	619	6071124.275	2079842.888	-0.73	0.45	3.35	3.36	6.26	6.88	8.26	8.53	8.88	9.14	9.52	9.83	10.17	11.09
Alameda	620	6072015.940	2079585.933	-0.73	0.45	3.36	3.36	6.27	6.88	8.26	8.53	8.88	9.14	9.52	9.83	10.16	11.07
Alameda	621	6071154.459	2079109.917	-0.74	0.44	3.35	3.35	6.27	6.89	8.26	8.53	8.88	9.14	9.52	9.83	10.17	11.10
Alameda	622	6071917.646	2078407.096	-0.74	0.44	3.35	3.36	6.27	6.89	8.27	8.54	8.89	9.15	9.52	9.83	10.17	11.09
Alameda	623	6073285.327	2077288.628	-	-	-	-	6.28	6.91	8.28	8.55	8.90	9.16	9.53	9.84	10.18	11.08
Alameda	624	6074653.041	2076170.191	-	-	-	-	6.29	6.91	8.29	8.56	8.91	9.17	9.54	9.85	10.18	11.07
Alameda	625	6075446.412	2074734.400	-	-	-	-	6.30	6.91	8.30	8.56	8.91	9.17	9.54	9.85	10.19	11.09
Alameda	626	6076239.783	2073298.576	-	-	-	-	6.31	6.93	8.30	8.57	8.92	9.18	9.55	9.86	10.20	11.10
Alameda	627	6077735.942	2072625.973	-	-	-	-	6.31	6.93	8.32	8.58	8.93	9.19	9.56	9.86	10.19	11.08
Alameda	628	6077380.693	2070555.472	-	-	-	-	6.31	6.93	8.30	8.57	8.92	9.19	9.56	9.88	10.22	11.15
Alameda	629	6077153.889	2068930.803	-	-	-	-	6.32	6.94	8.30	8.57	8.92	9.19	9.57	9.89	10.24	11.21

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	630	6078234.431	2067653.673	-	-	-	-	6.33	6.95	8.31	8.58	8.93	9.20	9.58	9.90	10.25	11.23
Alameda	631	6079602.112	2066535.237	-	-	-	-	6.34	6.96	8.32	8.59	8.94	9.21	9.59	9.91	10.26	11.22
Alameda	632	6080523.994	2065545.246	-	-	-	-	6.34	6.96	8.32	8.60	8.95	9.21	9.59	9.91	10.26	11.23
Alameda	633	6081317.365	2064109.454	-	-	-	-	6.35	6.97	8.32	8.60	8.95	9.22	9.60	9.92	10.28	11.26
Alameda	634	6081249.255	2062197.614	-	-	-	-	6.35	6.97	8.31	8.60	8.95	9.22	9.61	9.94	10.31	11.33
Alameda	635	6081755.455	2060603.162	-	-	-	-	6.36	6.98	8.32	8.61	8.96	9.23	9.62	9.95	10.32	11.36
Alameda	636	6082261.654	2059008.677	-	-	-	-	6.37	6.99	8.32	8.62	8.96	9.23	9.63	9.97	10.34	11.40
Alameda	637	6082034.883	2057384.009	-	-	-	-	6.37	6.99	8.32	8.62	8.97	9.24	9.64	9.98	10.36	11.44
Alameda	638	6082095.250	2055918.034	-	-	-	-	6.38	7.00	8.32	8.62	8.97	9.24	9.64	9.99	10.38	11.48
Alameda	639	6082472.973	2053877.716	-	-	-	-	6.39	7.01	8.32	8.63	8.98	9.25	9.66	10.00	10.40	11.52
Alameda	640	6082117.724	2051807.215	-	-	-	-	6.39	7.00	8.31	8.62	8.97	9.25	9.66	10.02	10.42	11.58
Alameda	641	6081702.075	2051202.689	-	-	-	-	6.40	7.02	8.32	8.64	8.99	9.26	9.68	10.03	10.43	11.59
Alameda	642	6081860.737	2050915.550	-	-	-	-	6.40	7.02	8.33	8.64	8.99	9.27	9.68	10.03	10.44	11.59
Alameda	643	6082178.092	2050341.208	-	-	-	-	6.41	7.03	8.34	8.65	9.00	9.28	9.69	10.04	10.44	11.59
Alameda	644	6082684.291	2048746.756	-	-	-	-	6.42	7.03	8.35	8.66	9.01	9.29	9.70	10.06	10.46	11.62
Alameda	645	6083190.524	2047152.271	-	-	-	-	6.43	7.04	8.35	8.67	9.02	9.30	9.71	10.07	10.48	11.65
Alameda	646	6083409.552	2045399.124	-	-	-	-	6.43	7.05	8.36	8.68	9.03	9.31	9.72	10.09	10.50	11.68

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	647	6083341.442	2043487.284	-	-	-	-	6.44	7.06	8.36	8.68	9.04	9.32	9.73	10.10	10.51	11.72
Alameda	648	6082827.500	2041703.955	-	-	-	-	6.45	7.07	8.37	8.69	9.05	9.33	9.75	10.11	10.53	11.75
Alameda	649	6083046.561	2039950.809	-	-	-	-	6.46	7.08	8.38	8.71	9.06	9.34	9.76	10.13	10.55	11.78
Alameda	650	6082978.451	2038038.969	-	-	-	-	6.48	7.09	8.39	8.72	9.07	9.35	9.78	10.15	10.58	11.83
Alameda	651	6083197.512	2036285.822	-	-	-	-	6.49	7.10	8.40	8.73	9.08	9.37	9.79	10.17	10.60	11.88
Alameda	652	6083990.883	2034850.031	-	-	-	-	6.50	7.12	8.41	8.75	9.10	9.38	9.81	10.19	10.63	11.92
Alameda	653	6085071.426	2033572.901	-	-	-	-	6.51	7.13	8.42	8.76	9.11	9.40	9.83	10.21	10.65	11.96
Alameda	654	6085577.625	2031978.416	-	-	-	-	6.52	7.14	8.43	8.77	9.12	9.41	9.84	10.22	10.67	11.99
Alameda	655	6086083.825	2030383.931	-	-	-	-	6.53	7.15	8.44	8.78	9.13	9.42	9.85	10.24	10.68	12.01
Alameda	656	6086590.058	2028789.446	-	-	-	-	6.54	7.16	8.44	8.79	9.14	9.43	9.86	10.25	10.70	12.05
Alameda	657	6087957.739	2027671.010	-	-	-	-	6.55	7.17	8.45	8.80	9.15	9.44	9.88	10.27	10.72	12.08
Alameda	658	6088751.110	2026235.219	-	-	-	-	6.56	7.18	8.46	8.81	9.17	9.45	9.89	10.29	10.74	12.12
Alameda	659	6089831.652	2024958.089	-	-	-	-	6.57	7.19	8.47	8.82	9.18	9.47	9.91	10.30	10.77	12.16
Alameda	660	6090912.162	2023680.959	-	-	-	-	6.58	7.20	8.48	8.83	9.19	9.48	9.92	10.32	10.79	12.20
Alameda	661	6091705.533	2022245.135	-	-	-	-	6.59	7.20	8.48	8.84	9.20	9.49	9.94	10.34	10.81	12.24
Alameda	662	6092211.766	2020650.683	-	-	-	-	6.60	7.21	8.49	8.85	9.21	9.50	9.95	10.35	10.83	12.28
Alameda	663	6093005.137	2019214.859	-	-	-	-	6.61	7.22	8.49	8.86	9.22	9.51	9.96	10.37	10.85	12.32

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	664	6093511.337	2017620.407	-	-	-	-	6.62	7.23	8.50	8.87	9.22	9.52	9.97	10.38	10.87	12.35
Alameda	665	6093443.226	2015708.567	-	-	-	-	6.63	7.24	8.51	8.88	9.23	9.53	9.98	10.40	10.88	12.38
Alameda	666	6093662.288	2013955.421	-	-	-	-	6.64	7.25	8.52	8.89	9.25	9.54	10.00	10.41	10.90	12.39
Alameda	667	6093563.994	2012776.585	-	-	-	-	6.64	7.26	8.53	8.90	9.26	9.55	10.00	10.41	10.90	12.39
Alameda	668	6093307.006	2011884.920	-	-	-	-	6.65	7.26	8.54	8.91	9.26	9.56	10.01	10.42	10.90	12.39
Alameda	669	6093465.700	2011597.748	-	-	-	-	6.65	7.27	8.55	8.92	9.27	9.56	10.01	10.42	10.90	12.39
Alameda	670	6093178.529	2011439.087	-	-	-	-	6.65	7.27	8.55	8.92	9.27	9.56	10.01	10.42	10.90	12.39
Alameda	671	6093050.051	2010993.255	-	-	-	-	6.66	7.27	8.55	8.92	9.27	9.56	10.02	10.43	10.91	12.38
Alameda	672	6093367.374	2010418.912	-	-	-	-	6.66	7.28	8.56	8.93	9.28	9.57	10.02	10.43	10.90	12.37
Alameda	673	6093843.423	2009557.431	-1.33	-0.10	3.37	3.28	6.67	7.29	8.58	8.94	9.29	9.58	10.03	10.43	10.91	12.36
Alameda	674	6094765.271	2008567.472	-1.33	-0.11	3.37	3.29	6.68	7.30	8.59	8.96	9.30	9.59	10.04	10.45	10.92	12.37
Alameda	675	6095082.626	2007993.162	-1.33	-0.12	3.38	3.29	6.69	7.31	8.60	8.96	9.31	9.60	10.05	10.46	10.93	12.39
Alameda	676	6095369.765	2008151.824	-1.34	-0.12	3.37	3.29	6.69	7.30	8.60	8.96	9.31	9.60	10.05	10.46	10.93	12.39
Alameda	677	6095974.291	2007736.175	-1.34	-0.12	3.37	3.29	6.70	7.31	8.60	8.97	9.32	9.61	10.06	10.47	10.94	12.41
Alameda	678	6097757.621	2007222.232	-	-	-	-	6.71	7.32	8.62	8.99	9.34	9.63	10.08	10.49	10.97	12.46
Alameda	679	6099510.767	2007441.294	-	-	-	-	6.72	7.34	8.63	9.00	9.35	9.64	10.10	10.51	10.99	12.48
Alameda	680	6100085.110	2007758.649	-	-	-	-	6.72	7.34	8.64	9.01	9.36	9.65	10.10	10.51	11.00	12.49

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	681	6100115.293	2007025.645	-1.34	-0.13	3.40	3.30	6.72	7.34	8.63	9.01	9.36	9.65	10.10	10.52	11.00	12.51
Alameda	682	6100719.787	2006609.996	-1.35	-0.13	3.40	3.30	6.73	7.34	8.63	9.01	9.36	9.65	10.11	10.52	11.02	12.54
Alameda	682	6100719.787	2006609.996	-	-	-	-	6.73	7.34	8.63	9.01	9.36	9.65	10.11	10.52	11.02	12.54
Alameda	683	6102503.149	2006096.053	-	-	-	-	6.74	7.35	8.65	9.02	9.37	9.67	10.12	10.54	11.03	12.56
Alameda	684	6104286.479	2005582.111	-	-	-	-	6.75	7.36	8.66	9.04	9.39	9.68	10.14	10.56	11.05	12.59
Alameda	685	6105019.483	2005612.295	-	-	-	-	6.75	7.37	8.66	9.04	9.39	9.69	10.15	10.56	11.06	12.60
Alameda	686	6104762.495	2004720.630	-	-	-	-	6.75	7.36	8.65	9.04	9.39	9.68	10.15	10.57	11.07	12.64
Alameda	687	6105843.038	2003443.500	-	-	-	-	6.76	7.37	8.65	9.04	9.40	9.69	10.16	10.59	11.10	12.71
Alameda	688	6106062.066	2001690.354	-	-	-	-	6.76	7.38	8.64	9.05	9.40	9.70	10.18	10.62	11.15	12.84
Alameda	689	6105835.295	2000065.685	-	-	-	-	6.77	7.38	8.64	9.05	9.40	9.70	10.18	10.63	11.17	12.88
Alameda	690	6106915.837	1998788.555	-1.33	-0.13	3.44	3.32	6.78	7.38	8.61	9.05	9.41	9.72	10.22	10.70	11.29	13.24
Alameda	691	6108283.518	1997670.086	-	-	-	-	6.78	7.39	8.59	9.06	9.41	9.73	10.25	10.76	11.40	13.54
Alameda	692	6109364.061	1996392.989	-	-	-	-	6.79	7.40	8.59	9.06	9.42	9.74	10.27	10.80	11.45	13.70
Alameda	693	6110444.570	1995115.859	-	-	-	-	6.80	7.41	8.59	9.07	9.43	9.75	10.29	10.81	11.48	13.76
Alameda	694	6112099.423	1994156.051	-	-	-	-	6.81	7.42	8.61	9.09	9.44	9.76	10.29	10.81	11.46	13.70
Alameda	695	6113724.091	1993929.280	-	-	-	-	6.82	7.43	8.63	9.10	9.45	9.77	10.29	10.80	11.43	13.58
Alameda	696	6115318.576	1994435.480	-	-	-	-	6.83	7.44	8.66	9.11	9.46	9.77	10.29	10.78	11.39	13.42

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Alameda	697	6117071.723	1994654.541	-	-	-	-	6.84	7.45	8.69	9.13	9.48	9.78	10.28	10.76	11.33	13.23
Alameda	698	6118666.208	1995160.741	-	-	-	-	6.85	7.46	8.72	9.14	9.49	9.80	10.29	10.75	11.32	13.14
Alameda	699	6120419.354	1995379.802	-	-	-	-	6.85	7.47	8.74	9.16	9.51	9.82	10.31	10.76	11.32	13.12
Alameda	700	6122013.839	1995886.034	-	-	-	-	6.86	7.48	8.76	9.17	9.53	9.83	10.32	10.77	11.32	13.08
Alameda	701	6123608.324	1996392.234	-	-	-	-	6.86	7.49	8.77	9.19	9.54	9.84	10.33	10.78	11.32	13.05
Alameda	702	6125520.131	1996324.124	-	-	-	-	6.87	7.50	8.79	9.20	9.55	9.86	10.35	10.80	11.34	13.08
Alameda	703	6126986.138	1996384.491	-	-	-	-	6.87	7.51	8.79	9.21	9.57	9.87	10.36	10.82	11.36	13.09
Alameda	704	6127877.803	1996127.537	-	-	-	-	6.87	7.51	8.80	9.21	9.57	9.88	10.37	10.82	11.36	13.08
Alameda	705	6129819.827	1995326.423	-	-	-	-	6.88	7.52	8.81	9.22	9.59	9.90	10.40	10.86	11.41	13.16
Santa Clara	706	6130613.198	1993890.632	-	-	-	-	6.87	7.51	8.82	9.21	9.57	9.87	10.34	10.77	11.27	12.84
Santa Clara	707	6128829.835	1994404.574	-	-	-	-	6.88	7.52	8.80	9.22	9.58	9.89	10.39	10.85	11.40	13.16
Santa Clara	708	6127462.155	1995523.010	-	-	-	-	6.87	7.51	8.80	9.21	9.57	9.88	10.37	10.83	11.37	13.12
Santa Clara	709	6126857.628	1995938.659	-	-	-	-	6.87	7.51	8.79	9.21	9.57	9.87	10.36	10.82	11.36	13.10
Santa Clara	710	6115635.931	1993861.170	-	-	-	-	6.83	7.44	8.66	9.11	9.46	9.78	10.29	10.78	11.39	13.44
Santa Clara	711	6114041.446	1993354.970	-	-	-	-	6.82	7.43	8.64	9.10	9.45	9.77	10.29	10.80	11.43	13.58
Santa Clara	712	6112288.300	1993135.909	-	-	-	-	6.81	7.42	8.61	9.09	9.44	9.76	10.30	10.82	11.48	13.74
Santa Clara	713	6112159.823	1992690.076	-	-	-	-	6.81	7.42	8.61	9.09	9.44	9.76	10.30	10.83	11.49	13.78

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
Santa Clara	714	6111713.990	1992818.554	-	-	-	-	6.81	7.42	8.60	9.09	9.44	9.76	10.30	10.83	11.49	13.79
Santa Clara	715	6109771.967	1993619.668	-	-	-	-	6.80	7.41	8.58	9.07	9.43	9.75	10.29	10.83	11.50	13.84
Santa Clara	716	6108305.992	1993559.300	-	-	-	-	6.80	7.41	8.27	9.07	9.42	9.74	10.29	10.83	11.50	13.85
Santa Clara	717	6106681.323	1993786.071	-	-	-	-	6.79	7.40	8.58	9.06	9.41	9.73	10.27	10.79	11.45	13.70
Santa Clara	718	6105502.487	1993884.365	-	-	-	-	6.78	7.40	8.59	9.06	9.41	9.73	10.25	10.75	11.38	13.50
Santa Clara	719	6103749.341	1993665.337	-	-	-	-	6.78	7.39	8.21	9.05	9.40	9.71	10.21	10.68	11.25	13.11
Santa Clara	720	6102124.672	1993892.108	-	-	-	-	6.77	7.38	8.63	9.05	9.40	9.70	10.19	10.65	11.20	12.98
Santa Clara	721	6100628.481	1994564.712	-	-	-	-	6.76	7.38	8.63	9.04	9.39	9.69	10.17	10.62	11.17	12.91
Santa Clara	722	6099290.984	1994950.177	-	-	-	-	6.76	7.37	8.63	9.03	9.38	9.68	10.16	10.61	11.14	12.85
Santa Clara	723	6097794.793	1995622.813	-	-	-	-	6.75	7.36	8.63	9.03	9.38	9.67	10.15	10.58	11.11	12.78
Santa Clara	724	6096872.944	1996612.772	-	-	-	-	6.75	7.36	8.63	9.02	9.37	9.66	10.13	10.57	11.08	12.72
Santa Clara	725	6095218.092	1997572.547	-	-	-	-	6.74	7.35	8.63	9.01	9.36	9.65	10.11	10.54	11.04	12.63
San Mateo	726	6094137.549	1998849.677	-	-	-	-	6.73	7.34	8.63	9.01	9.35	9.64	10.10	10.52	11.01	12.57
San Mateo	727	6092482.697	1999809.452	-	-	-	-	6.72	7.34	8.62	9.00	9.34	9.63	10.09	10.50	10.99	12.53
San Mateo	728	6092263.668	2001562.598	-	-	-	-	6.71	7.33	8.62	8.99	9.34	9.63	10.08	10.49	10.98	12.49
San Mateo	729	6092044.607	2003315.744	-	-	-	-	6.71	7.32	8.61	8.98	9.33	9.62	10.07	10.48	10.96	12.46
San Mateo	730	6091855.730	2004335.919	-	-	-	-	6.70	7.31	8.60	8.97	9.32	9.61	10.06	10.47	10.95	12.44

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	731	6091825.546	2005068.923	-	-	-	-	6.69	7.31	8.60	8.97	9.32	9.60	10.05	10.46	10.94	12.42
San Mateo	732	6091954.056	2005514.755	-	-	-	-	6.69	7.30	8.60	8.96	9.31	9.60	10.05	10.46	10.94	12.41
San Mateo	733	6091923.840	2006247.726	-	-	-	-	6.69	7.30	8.59	8.96	9.31	9.60	10.04	10.45	10.93	12.39
San Mateo	734	6091893.656	2006980.730	-	-	-	-	6.68	7.29	8.59	8.95	9.30	9.59	10.04	10.44	10.92	12.37
San Mateo	735	6091417.640	2007842.211	-	-	-	-	6.67	7.28	8.58	8.94	9.29	9.58	10.03	10.43	10.91	12.36
San Mateo	736	6091228.762	2008862.354	-	-	-	-	6.66	7.28	8.56	8.93	9.28	9.57	10.02	10.43	10.91	12.37
San Mateo	737	6090911.440	2009436.696	-	-	-	-	6.66	7.27	8.55	8.92	9.27	9.56	10.02	10.42	10.90	12.38
San Mateo	738	6090465.608	2009565.174	-	-	-	-	6.66	7.27	8.55	8.92	9.27	9.56	10.01	10.42	10.90	12.38
San Mateo	739	6090019.775	2009693.651	-	-	-	-	6.65	7.27	8.55	8.92	9.27	9.56	10.01	10.42	10.90	12.38
San Mateo	740	6089543.726	2010555.132	-	-	-	-	6.64	7.26	8.53	8.90	9.25	9.55	10.00	10.41	10.90	12.39
San Mateo	741	6088176.045	2011673.601	-	-	-	-	6.63	7.24	8.51	8.88	9.23	9.52	9.98	10.39	10.88	12.39
San Mateo	742	6086392.716	2012187.544	-	-	-	-	6.60	7.22	8.49	8.85	9.20	9.49	9.94	10.35	10.83	12.29
San Mateo	743	6085055.186	2012573.009	-	-	-	-	6.59	7.20	8.48	8.84	9.19	9.48	9.93	10.33	10.81	12.25
San Mateo	744	6084223.921	2011363.989	-	-	-	-	6.58	7.20	8.47	8.83	9.18	9.47	9.92	10.32	10.80	12.24
San Mateo	745	6082629.436	2010857.756	-	-	-	-	6.58	7.19	8.46	8.83	9.18	9.47	9.91	10.32	10.79	12.23
San Mateo	746	6080876.290	2010638.728	-	-	-	-	6.57	7.19	8.46	8.82	9.17	9.46	9.90	10.31	10.78	12.22
San Mateo	747	6078805.789	2010993.977	-	-	-	-	6.56	7.18	8.45	8.81	9.16	9.45	9.90	10.30	10.77	12.21

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	748	6077438.075	2012112.446	-	-	-	-	6.56	7.18	8.45	8.81	9.16	9.44	9.89	10.29	10.76	12.20
San Mateo	749	6075654.745	2012626.388	-	-	-	-	6.55	7.17	8.44	8.80	9.15	9.44	9.88	10.29	10.76	12.20
San Mateo	750	6074861.374	2014062.179	-	-	-	-	6.54	7.16	8.43	8.79	9.14	9.43	9.88	10.28	10.75	12.19
San Mateo	751	6074068.003	2015498.003	-	-	-	-	6.54	7.15	8.42	8.78	9.13	9.42	9.87	10.27	10.74	12.17
San Mateo	752	6072571.812	2016170.607	-	-	-	-	6.52	7.14	8.41	8.77	9.12	9.40	9.85	10.25	10.72	12.16
San Mateo	753	6070916.959	2017130.382	-	-	-	-	6.52	7.13	8.40	8.76	9.11	9.40	9.84	10.24	10.71	12.13
San Mateo	754	6070123.588	2018566.206	-	-	-	-	6.51	7.13	8.40	8.76	9.10	9.39	9.83	10.23	10.69	12.10
San Mateo	755	6069390.617	2018535.989	-	-	-	-	6.51	7.12	8.39	8.75	9.10	9.38	9.82	10.22	10.68	12.09
San Mateo	757	6070093.404	2019299.177	-1.18	0.05	3.35	3.28	6.51	7.12	8.40	8.75	9.10	9.39	9.83	10.23	10.69	12.10
San Mateo	758	6070350.392	2020190.842	-1.18	0.06	3.35	3.28	6.50	7.12	8.40	8.75	9.10	9.39	9.83	10.22	10.68	12.07
San Mateo	759	6070577.163	2021815.510	-1.17	0.06	3.35	3.28	6.50	7.11	8.39	8.74	9.09	9.38	9.82	10.21	10.67	12.04
San Mateo	760	6069496.621	2023092.640	-	-	-	-	6.48	7.09	8.37	8.72	9.07	9.35	9.78	10.17	10.62	11.97
San Mateo	761	6067683.107	2024339.586	-	-	-	-	6.46	7.07	8.35	8.69	9.04	9.32	9.75	10.13	10.57	11.89
San Mateo	762	6065899.778	2024853.529	-	-	-	-	6.44	7.06	8.21	8.68	9.02	9.30	9.73	10.11	10.55	11.86
San Mateo	763	6064690.758	2025684.827	-	-	-	-	6.43	7.05	8.33	8.67	9.01	9.29	9.72	10.10	10.55	11.87
San Mateo	764	6063066.089	2025911.598	-	-	-	-	6.43	7.05	8.19	8.66	9.00	9.28	9.71	10.10	10.54	11.87
San Mateo	765	6062333.085	2025881.414	-	-	-	-	6.42	7.04	8.31	8.66	9.00	9.28	9.71	10.09	10.54	11.87

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	766	6061917.437	2025276.921	-	-	-	-	6.42	7.04	8.32	8.66	9.00	9.28	9.71	10.09	10.53	11.85
San Mateo	767	6062302.902	2026614.418	-	-	-	-	6.42	7.04	8.31	8.65	9.00	9.28	9.71	10.09	10.54	11.87
San Mateo	768	6062847.028	2027664.777	-	-	-	-	6.42	7.04	8.31	8.65	9.00	9.28	9.71	10.09	10.53	11.86
San Mateo	769	6061192.175	2028624.552	-	-	-	-	6.41	7.02	8.30	8.64	8.98	9.26	9.69	10.07	10.51	11.82
San Mateo	770	6059824.495	2029742.988	-	-	-	-	6.39	7.01	8.28	8.62	8.97	9.25	9.67	10.05	10.48	11.78
San Mateo	771	6059031.123	2031178.812	-	-	-	-	6.38	7.00	8.27	8.61	8.96	9.24	9.66	10.04	10.48	11.78
San Mateo	772	6057980.765	2031722.938	-	-	-	-	6.37	6.99	8.27	8.60	8.95	9.23	9.65	10.03	10.47	11.76
San Mateo	773	6057565.116	2031118.412	-	-	-	-	6.37	7.00	8.26	8.60	8.95	9.23	9.65	10.03	10.46	11.75
San Mateo	774	6057308.161	2030226.747	-	-	-	-	6.37	6.99	8.26	8.60	8.94	9.22	9.64	10.02	10.45	11.73
San Mateo	775	6056257.802	2030770.873	-	-	-	-	6.37	6.99	8.26	8.60	8.94	9.22	9.65	10.02	10.46	11.76
San Mateo	776	6055910.263	2032078.186	-	-	-	-	6.37	6.99	8.25	8.59	8.94	9.22	9.65	10.02	10.46	11.76
San Mateo	777	6055116.892	2033514.010	-	-	-	-	6.36	6.98	8.24	8.58	8.93	9.21	9.64	10.02	10.46	11.76
San Mateo	778	6054323.521	2034949.801	-	-	-	-	6.35	6.97	8.23	8.57	8.92	9.20	9.63	10.01	10.45	11.76
San Mateo	779	6052955.840	2036068.270	-	-	-	-	6.34	6.96	8.22	8.56	8.91	9.19	9.62	10.00	10.44	11.75
San Mateo	780	6051746.820	2036899.535	-	-	-	-	6.32	6.94	8.21	8.55	8.90	9.18	9.61	9.99	10.42	11.72
San Mateo	781	6051300.988	2037028.045	-	-	-	-	6.32	6.94	8.21	8.54	8.89	9.17	9.60	9.98	10.41	11.69
San Mateo	782	6049547.842	2036808.984	-	-	-	-	6.30	6.92	8.19	8.53	8.88	9.16	9.58	9.96	10.39	11.65

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	783	6048112.018	2036015.613	-	-	-	-	6.30	6.92	8.19	8.52	8.87	9.15	9.58	9.95	10.38	11.66
San Mateo	784	6046457.166	2036975.388	-	-	-	-	6.29	6.91	8.18	8.51	8.86	9.14	9.57	9.95	10.38	11.65
San Mateo	785	6044673.836	2037489.331	-	-	-	-	6.28	6.90	8.17	8.50	8.85	9.14	9.56	9.94	10.37	11.64
San Mateo	786	6043079.351	2036983.131	-	-	-	-	6.27	6.90	8.16	8.50	8.85	9.13	9.56	9.93	10.37	11.65
San Mateo	787	6042059.209	2036794.253	-	-	-	-	6.27	6.89	8.16	8.49	8.84	9.13	9.55	9.93	10.36	11.64
San Mateo	788	6041930.731	2036348.421	-	-	-	-	6.27	6.89	8.16	8.49	8.84	9.13	9.55	9.93	10.36	11.63
San Mateo	789	6041583.192	2037655.734	-	-	-	-	6.27	6.89	8.16	8.49	8.84	9.13	9.55	9.93	10.36	11.64
San Mateo	790	6039799.830	2038169.677	-	-	-	-	6.26	6.88	8.15	8.49	8.84	9.12	9.55	9.93	10.36	11.63
San Mateo	791	6038016.500	2038683.619	-	-	-	-	6.26	6.88	8.15	8.48	8.83	9.12	9.55	9.93	10.36	11.64
San Mateo	792	6036935.958	2039960.749	-	-	-	-	6.25	6.88	8.14	8.48	8.83	9.12	9.54	9.92	10.35	11.63
San Mateo	793	6037449.933	2041744.112	-	-	-	-	6.25	6.87	8.14	8.47	8.83	9.11	9.54	9.92	10.36	11.63
San Mateo	794	6036943.700	2043338.564	-0.82	0.38	3.32	3.31	6.24	6.86	8.13	8.47	8.82	9.11	9.54	9.92	10.35	11.63
San Mateo	795	6035734.680	2044169.862	-0.81	0.39	3.32	3.31	6.24	6.86	8.12	8.46	8.81	9.10	9.53	9.91	10.35	11.63
San Mateo	796	6033981.534	2043950.833	-0.80	0.39	3.33	3.31	6.23	6.85	8.11	8.45	8.81	9.10	9.53	9.91	10.35	11.63
San Mateo	797	6032387.049	2043444.601	-0.80	0.40	3.33	3.31	6.23	6.85	8.11	8.45	8.80	9.09	9.52	9.90	10.34	11.62
San Mateo	798	6031238.430	2042809.924	-0.80	0.40	3.33	3.31	6.23	6.85	8.11	8.45	8.80	9.09	9.52	9.90	10.33	11.61
San Mateo	799	6030890.891	2044117.237	-0.80	0.40	3.33	3.31	6.22	6.84	8.11	8.44	8.80	9.09	9.52	9.90	10.33	11.61

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	800	6028979.051	2044185.347	-0.79	0.40	3.33	3.31	6.22	6.84	8.11	8.44	8.80	9.08	9.51	9.89	10.32	11.58
San Mateo	801	6027067.244	2044253.457	-	-	-	-	6.22	6.84	8.11	8.44	8.80	9.08	9.51	9.88	10.31	11.55
San Mateo	802	6026462.717	2044669.106	-	-	-	-	6.22	6.83	8.11	8.44	8.80	9.08	9.51	9.88	10.31	11.54
San Mateo	803	6025095.036	2045787.542	-	-	-	-	6.21	6.83	8.11	8.44	8.80	9.08	9.51	9.88	10.30	11.52
San Mateo	804	6024014.494	2047064.672	-	-	-	-	6.21	6.83	8.11	8.44	8.80	9.08	9.50	9.87	10.29	11.50
San Mateo	805	6017100.925	2061611.559	-0.71	0.47	3.32	3.31	6.16	6.77	8.07	8.39	8.75	9.03	9.44	9.80	10.20	11.34
San Mateo	806	6015476.256	2061838.330	-	-	-	-	6.15	6.77	8.08	8.39	8.75	9.03	9.44	9.79	10.19	11.32
San Mateo	807	6016020.415	2062888.689	-	-	-	-	6.15	6.77	8.09	8.39	8.75	9.03	9.44	9.78	10.17	11.27
San Mateo	808	6017773.562	2063107.750	-	-	-	-	6.15	6.77	8.08	8.38	8.74	9.03	9.44	9.79	10.19	11.31
San Mateo	809	6018733.337	2064762.603	-0.69	0.49	3.32	3.32	6.15	6.76	8.07	8.38	8.74	9.02	9.43	9.78	10.17	11.29
San Mateo	810	6019693.112	2066417.455	-0.67	0.51	3.32	3.32	6.14	6.75	8.07	8.37	8.73	9.01	9.41	9.76	10.15	11.24
San Mateo	811	6019217.095	2067278.936	-0.67	0.51	3.32	3.32	6.13	6.75	8.06	8.36	8.72	9.00	9.41	9.76	10.15	11.25
San Mateo	812	6019632.744	2067883.430	-0.66	0.52	3.31	3.32	6.13	6.75	8.06	8.36	8.72	9.00	9.40	9.75	10.13	11.21
San Mateo	813	6019859.515	2069508.099	-0.65	0.53	3.31	3.33	6.12	6.73	8.05	8.35	8.71	8.98	9.39	9.73	10.10	11.16
San Mateo	814	6018363.324	2070180.702	-0.64	0.54	3.31	3.33	6.11	6.73	8.05	8.34	8.70	8.98	9.38	9.71	10.09	11.12
San Mateo	815	6017282.814	2071457.832	-0.63	0.55	3.31	3.33	6.11	6.72	8.05	8.34	8.70	8.97	9.37	9.70	10.06	11.08
San Mateo	816	6015658.146	2071684.636	-	-	-	-	6.11	6.73	8.06	8.34	8.70	8.97	9.36	9.69	10.05	11.04

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Mateo	817	6017252.631	2072190.836	-0.63	0.54	3.31	3.33	6.11	6.72	8.06	8.34	8.70	8.97	9.37	9.70	10.06	11.06
San Mateo	818	6018144.296	2071933.881	-0.63	0.55	3.31	3.33	6.11	6.72	8.05	8.34	8.70	8.97	9.36	9.69	10.06	11.07
San Mateo	819	6018401.251	2072825.546	-0.62	0.55	3.31	3.33	6.10	6.72	8.05	8.33	8.69	8.96	9.36	9.69	10.05	11.05
San Mateo	820	6018469.361	2074737.353	-0.60	0.56	3.31	3.33	6.09	6.70	8.03	8.32	8.67	8.95	9.34	9.66	10.02	11.00
San Mateo	821	6016814.508	2075697.128	-0.59	0.57	3.31	3.33	6.08	6.69	8.03	8.30	8.66	8.94	9.32	9.64	9.99	10.95
San Mateo	822	6016179.831	2076845.781	-0.59	0.58	3.31	3.33	6.08	6.69	8.03	8.30	8.66	8.94	9.32	9.64	9.99	10.93
San Mateo	823	6015960.770	2078598.927	-0.58	0.59	3.31	3.33	6.07	6.68	8.03	8.30	8.66	8.93	9.31	9.63	9.97	10.90
San Mateo	824	6015454.570	2080193.412	-0.57	0.59	3.31	3.33	6.06	6.68	8.03	8.30	8.66	8.93	9.31	9.62	9.96	10.87
San Mateo	825	6015265.693	2081213.554	-0.60	0.57	3.28	3.31	6.05	6.66	7.92	8.26	8.63	8.92	9.36	9.74	10.18	11.46
San Mateo	826	6015235.509	2081946.558	-0.57	0.60	3.31	3.33	6.06	6.67	8.03	8.29	8.66	8.93	9.31	9.62	9.96	10.86
San Mateo	827	6015333.803	2083125.394	-0.59	0.57	3.28	3.31	6.05	6.66	7.92	8.26	8.62	8.92	9.36	9.74	10.17	11.44
San Mateo	828	6015016.448	2083699.704	-0.56	0.60	3.31	3.33	6.06	6.67	8.03	8.29	8.66	8.93	9.31	9.62	9.96	10.86
San Francisco	829	6015401.913	2085037.201	-0.58	0.58	3.28	3.31	6.05	6.66	7.92	8.26	8.63	8.92	9.36	9.74	10.17	11.43
San Francisco	830	6016134.917	2085067.418	-0.56	0.60	3.31	3.33	6.06	6.67	8.03	8.29	8.66	8.93	9.31	9.62	9.96	10.87
San Francisco	831	6017313.753	2084969.124	-0.58	0.58	3.28	3.31	6.04	6.66	7.92	8.25	8.62	8.91	9.35	9.73	10.16	11.40
San Francisco	832	6018046.724	2084999.308	-0.55	0.61	3.30	3.33	6.05	6.66	8.02	8.28	8.65	8.92	9.30	9.61	9.95	10.86
San Francisco	833	6019225.560	2084901.014	-0.57	0.59	3.28	3.31	6.03	6.64	7.90	8.23	8.60	8.89	9.32	9.70	10.13	11.35

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	834	6019958.564	2084931.198	-0.53	0.62	3.30	3.33	6.04	6.65	8.00	8.26	8.62	8.89	9.27	9.58	9.92	10.82
San Francisco	835	6020502.690	2085981.524	-0.55	0.61	3.27	3.31	6.01	6.63	7.89	8.21	8.58	8.87	9.30	9.67	10.09	11.30
San Francisco	836	6020185.335	2086555.866	-0.52	0.64	3.29	3.33	6.02	6.63	7.98	8.24	8.61	8.88	9.26	9.57	9.90	10.80
San Francisco	837	6019422.147	2087258.654	-0.54	0.61	3.27	3.31	6.01	6.62	7.88	8.21	8.58	8.87	9.30	9.67	10.09	11.29
San Francisco	838	6019837.796	2087863.180	-0.51	0.64	3.29	3.33	6.02	6.63	7.98	8.25	8.61	8.88	9.26	9.57	9.91	10.80
San Francisco	839	6019361.780	2088724.661	-0.52	0.64	3.29	3.33	6.02	6.63	7.98	8.25	8.61	8.88	9.26	9.57	9.91	10.80
San Francisco	840	6018251.054	2090734.762	-	-	-	-	6.03	6.64	7.99	8.25	8.62	8.89	9.27	9.58	9.92	10.81
San Francisco	841	6019777.429	2089329.155	-0.51	0.64	3.29	3.33	6.02	6.63	7.98	8.25	8.61	8.88	9.26	9.57	9.91	10.80
San Francisco	842	6020094.784	2088754.845	-0.54	0.61	3.27	3.31	6.01	6.62	7.89	8.21	8.58	8.87	9.30	9.67	10.09	11.29
San Francisco	843	6021145.110	2088210.719	-0.51	0.64	3.29	3.33	6.02	6.63	7.98	8.24	8.61	8.88	9.26	9.57	9.91	10.81
San Francisco	844	6021303.804	2087923.547	-0.54	0.62	3.27	3.31	6.01	6.62	7.88	8.20	8.57	8.86	9.29	9.66	10.08	11.27
San Francisco	845	6022928.472	2087696.776	-0.53	0.63	3.27	3.31	6.00	6.60	7.87	8.19	8.56	8.85	9.28	9.64	10.06	11.25
San Francisco	846	6024046.909	2089064.457	-0.51	0.64	3.25	3.31	5.98	6.59	7.85	8.17	8.54	8.83	9.25	9.62	10.03	11.21
San Francisco	847	6024175.386	2089510.289	-0.50	0.65	3.25	3.31	5.98	6.58	7.85	8.17	8.54	8.83	9.25	9.62	10.03	11.20
San Francisco	848	6024303.896	2089956.122	-0.49	0.65	3.24	3.31	5.96	6.57	7.84	8.16	8.53	8.82	9.24	9.60	10.01	11.17
San Francisco	849	6025135.194	2091165.142	-0.48	0.67	3.24	3.31	5.96	6.57	7.83	8.15	8.52	8.81	9.23	9.60	10.01	11.17
San Francisco	850	6025649.136	2092948.472	-0.45	0.69	3.25	3.31	5.94	6.54	7.81	8.12	8.50	8.79	9.21	9.57	9.98	11.13

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	851	6024855.765	2094384.295	-0.43	0.70	3.25	3.31	5.93	6.53	7.79	8.10	8.48	8.77	9.19	9.55	9.96	11.09
San Francisco	852	6022913.742	2095185.377	-0.42	0.72	3.26	3.31	5.91	6.51	7.78	8.08	8.46	8.75	9.17	9.53	9.93	11.05
San Francisco	853	6021863.383	2095729.536	-0.41	0.72	3.26	3.31	5.90	6.50	7.77	8.08	8.46	8.75	9.17	9.53	9.93	11.05
San Francisco	854	6021130.412	2095699.319	-0.41	0.73	3.26	3.31	5.90	6.50	7.77	8.08	8.46	8.75	9.17	9.53	9.93	11.06
San Francisco	855	6019792.882	2096084.784	-	-	-	-	5.90	6.50	7.77	8.08	8.46	8.75	9.18	9.54	9.94	11.07
San Francisco	856	6022694.680	2096938.523	-0.40	0.73	3.26	3.31	5.89	6.49	7.76	8.06	8.44	8.73	9.16	9.51	9.91	11.02
San Francisco	857	6021772.832	2097928.514	-0.38	0.74	3.25	3.31	5.88	6.47	7.74	8.05	8.43	8.72	9.14	9.50	9.89	10.99
San Francisco	858	6021266.632	2099522.966	-0.36	0.76	3.25	3.31	5.86	6.45	7.72	8.02	8.40	8.70	9.12	9.47	9.87	10.96
San Francisco	859	6020473.261	2100958.790	-0.35	0.77	3.26	3.31	5.85	6.44	7.71	8.01	8.39	8.68	9.11	9.46	9.86	10.95
San Francisco	860	6019967.028	2102553.275	-0.33	0.79	3.25	3.31	5.83	6.42	7.68	7.98	8.37	8.66	9.08	9.43	9.82	10.89
San Francisco	861	6018886.519	2103830.372	-0.31	0.80	3.25	3.31	5.81	6.40	7.67	7.97	8.35	8.64	9.06	9.41	9.80	10.86
San Francisco	862	6018380.286	2105424.857	-0.30	0.81	3.26	3.31	5.80	6.39	7.66	7.95	8.34	8.63	9.05	9.40	9.79	10.84
San Francisco	863	6017586.915	2106860.681	-0.28	0.82	3.26	3.31	5.80	6.38	7.65	7.94	8.33	8.62	9.04	9.39	9.78	10.83
San Francisco	864	6018259.551	2108356.840	-0.27	0.83	3.25	3.31	5.78	6.37	7.64	7.93	8.32	8.61	9.03	9.37	9.75	10.78
San Francisco	865	6018327.661	2110268.680	-0.24	0.85	3.23	3.30	5.75	6.34	7.60	7.89	8.28	8.58	8.99	9.34	9.71	10.73
San Francisco	866	6017247.119	2111545.810	-0.22	0.87	3.24	3.30	5.74	6.32	7.59	7.88	8.27	8.56	8.98	9.32	9.70	10.71
San Francisco	867	6017028.058	2113298.956	-0.21	0.88	3.23	3.31	5.73	6.31	7.58	7.86	8.25	8.55	8.96	9.31	9.68	10.70

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	868	6017700.694	2114795.114	-0.19	0.89	3.22	3.30	5.71	6.29	7.55	7.84	8.23	8.52	8.94	9.29	9.67	10.71
San Francisco	869	6016907.323	2116230.938	-0.17	0.91	3.23	3.30	5.69	6.26	7.52	7.81	8.21	8.50	8.93	9.28	9.66	10.71
San Francisco	870	6015826.781	2117508.068	-0.15	0.93	3.23	3.30	5.68	6.25	7.50	7.79	8.19	8.48	8.91	9.26	9.65	10.71
San Francisco	871	6014746.238	2118785.198	-0.13	0.94	3.23	3.30	5.66	6.23	7.47	7.77	8.17	8.46	8.89	9.25	9.63	10.70
San Francisco	872	6014240.038	2120379.650	-0.12	0.94	3.20	3.29	5.64	6.20	7.44	7.74	8.14	8.44	8.87	9.23	9.62	10.70
San Francisco	873	6013159.496	2121656.780	-0.09	0.95	3.21	3.29	5.62	6.18	7.42	7.72	8.12	8.42	8.85	9.21	9.60	10.68
San Francisco	874	6012237.647	2122646.772	-0.08	0.96	3.20	3.28	5.60	6.16	7.39	7.69	8.09	8.39	8.83	9.19	9.59	10.69
San Francisco	875	6010741.456	2123319.375	-0.07	0.97	3.20	3.28	5.58	6.14	7.36	7.67	8.07	8.37	8.81	9.17	9.58	10.69
San Francisco	876	6009245.298	2123992.012	-0.06	0.97	3.19	3.27	5.56	6.11	7.32	7.64	8.04	8.34	8.78	9.16	9.58	10.73
San Francisco	877	6007204.980	2123614.257	-0.04	0.99	3.22	3.27	5.54	6.09	7.30	7.61	8.01	8.32	8.76	9.14	9.56	10.75
San Francisco	878	6005451.834	2123395.228	-0.03	1.01	3.22	3.26	5.52	6.08	7.28	7.59	7.99	8.30	8.74	9.12	9.55	10.74
San Francisco	879	6003698.688	2123176.167	-0.01	1.02	3.23	3.26	5.51	6.06	7.25	7.58	7.97	8.28	8.73	9.11	9.54	10.74
San Francisco	880	6001915.326	2123690.110	-0.01	1.02	3.22	3.26	5.50	6.05	7.23	7.56	7.95	8.26	8.71	9.10	9.52	10.74
San Francisco	881	6000162.179	2123471.048	0.00	1.02	3.22	3.25	5.48	6.03	7.21	7.54	7.93	8.24	8.69	9.08	9.51	10.72
San Francisco	882	5998567.694	2122964.849	0.01	1.03	3.22	3.25	5.46	6.01	7.19	7.52	7.91	8.22	8.67	9.06	9.49	10.70
San Francisco	883	5996527.410	2122587.126	0.02	1.03	3.22	3.24	5.45	5.99	7.17	7.49	7.89	8.20	8.65	9.03	9.46	10.68
San Francisco	884	5994774.264	2122368.065	0.03	1.04	3.22	3.23	5.43	5.97	7.15	7.47	7.87	8.18	8.63	9.02	9.45	10.66

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	885	5993406.550	2123486.534	0.05	1.04	3.21	3.22	5.41	5.95	7.12	7.44	7.84	8.15	8.60	8.98	9.41	10.63
San Francisco	886	5991464.526	2124287.648	0.07	1.05	3.20	3.22	5.39	5.93	7.09	7.41	7.81	8.12	8.57	8.95	9.38	10.58
San Francisco	887	5989839.890	2124514.419	-0.06	0.90	3.06	3.13	5.37	5.89	7.05	7.36	7.76	8.07	8.51	8.89	9.30	10.47
San Francisco	888	6020674.606	2049717.226	-	-	-	-	6.21	6.83	8.14	8.44	8.80	9.08	9.49	9.84	10.23	11.33
San Francisco	889	6022745.107	2049361.945	-	-	-	-	6.21	6.83	8.12	8.44	8.80	9.08	9.50	9.86	10.27	11.44
San Francisco	890	6022616.629	2048916.112	-	-	-	-	6.21	6.83	8.12	8.44	8.80	9.08	9.50	9.86	10.27	11.45
San Francisco	891	6023508.294	2048659.157	-	-	-	-	6.21	6.83	8.11	8.44	8.80	9.08	9.51	9.87	10.29	11.50
San Francisco	892	6024369.775	2049135.173	-	-	-	-	6.21	6.83	8.11	8.43	8.79	9.08	9.51	9.88	10.30	11.52
San Francisco	893	6025170.856	2051077.197	-0.76	0.43	3.32	3.31	6.20	6.82	8.10	8.43	8.78	9.07	9.50	9.87	10.29	11.52
San Francisco	894	6025110.489	2052543.172	-0.76	0.44	3.32	3.31	6.19	6.81	8.09	8.42	8.78	9.06	9.49	9.86	10.28	11.50
San Francisco	895	6023455.637	2053502.947	-0.74	0.45	3.32	3.32	6.19	6.80	8.08	8.41	8.77	9.06	9.48	9.85	10.27	11.49
San Francisco	896	6022087.956	2054621.416	-0.74	0.45	3.32	3.31	6.18	6.80	8.09	8.41	8.77	9.05	9.47	9.84	10.25	11.44
San Francisco	897	6022601.898	2056404.745	-0.73	0.46	3.32	3.32	6.18	6.79	8.08	8.40	8.76	9.05	9.47	9.83	10.24	11.43
San Francisco	898	6021521.356	2057681.875	-0.72	0.47	3.32	3.32	6.17	6.79	8.07	8.39	8.75	9.04	9.46	9.82	10.23	11.41
San Francisco	899	6019609.549	2057749.986	-0.71	0.47	3.32	3.32	6.16	6.78	8.07	8.39	8.75	9.03	9.46	9.82	10.23	11.40
San Francisco	900	6018400.529	2058581.283	-0.72	0.47	3.32	3.32	6.16	6.78	8.07	8.39	8.75	9.03	9.45	9.81	10.22	11.37
San Francisco	901	6017984.880	2057976.757	-	-	-	-	6.16	6.78	8.07	8.39	8.75	9.03	9.45	9.81	10.22	11.38

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	902	6016390.395	2057470.557	-0.73	0.46	3.32	3.31	6.16	6.78	8.08	8.39	8.75	9.04	9.46	9.81	10.22	11.37
San Francisco	903	6015052.898	2057856.022	-0.73	0.46	3.32	3.31	6.16	6.78	8.09	8.40	8.76	9.04	9.46	9.81	10.21	11.34
San Francisco	904	6016042.856	2058777.871	-0.73	0.46	3.32	3.31	6.16	6.78	8.09	8.39	8.76	9.04	9.45	9.80	10.20	11.32
San Francisco	905	6017796.002	2058996.932	-0.72	0.47	3.32	3.31	6.16	6.77	8.08	8.39	8.75	9.03	9.45	9.81	10.21	11.35
San Francisco	906	6017894.296	2060175.768	-0.71	0.47	3.32	3.32	6.16	6.78	8.08	8.39	8.75	9.03	9.44	9.80	10.19	11.32
San Francisco	907	6023927.650	2120484.965	-0.13	0.95	3.28	3.32	5.69	6.26	7.52	7.81	8.20	8.50	8.92	9.26	9.64	10.67
San Francisco	908	6021857.149	2120840.214	-0.12	0.96	3.26	3.31	5.67	6.24	7.49	7.79	8.18	8.48	8.90	9.25	9.63	10.67
San Francisco	909	6020202.297	2121799.989	-0.11	0.95	3.23	3.30	5.66	6.22	7.47	7.76	8.16	8.46	8.88	9.23	9.61	10.66
San Francisco	910	6019696.097	2123394.474	-0.09	0.97	3.24	3.30	5.64	6.20	7.44	7.74	8.14	8.44	8.86	9.22	9.61	10.67
San Francisco	911	6019764.207	2125306.314	-0.07	0.99	3.26	3.31	5.62	6.19	7.43	7.73	8.12	8.42	8.85	9.21	9.61	10.68
San Francisco	912	6018970.836	2126742.105	-0.06	1.00	3.27	3.30	5.61	6.17	7.41	7.71	8.11	8.41	8.84	9.20	9.60	10.68
San Francisco	913	6018177.465	2128177.896	-0.04	1.01	3.27	3.30	5.60	6.16	7.39	7.69	8.09	8.40	8.83	9.19	9.59	10.69
San Francisco	914	6018245.575	2130089.736	-0.03	1.03	3.28	3.31	5.59	6.15	7.38	7.69	8.09	8.40	8.84	9.21	9.63	10.77
San Francisco	915	6019364.011	2131457.417	-0.03	1.02	3.29	3.31	5.60	6.17	7.38	7.70	8.10	8.41	8.85	9.23	9.65	10.83
San Francisco	916	6020958.496	2131963.649	-0.04	1.01	3.27	3.31	5.61	6.17	7.40	7.71	8.11	8.42	8.86	9.24	9.65	10.80
San Francisco	917	6022900.520	2131162.536	-0.06	1.00	3.27	3.31	5.63	6.19	7.43	7.73	8.13	8.44	8.87	9.24	9.64	10.73
San Francisco	918	6023693.891	2129726.744	-0.07	0.99	3.27	3.31	5.64	6.21	7.45	7.75	8.15	8.45	8.88	9.24	9.64	10.71

Location		Coordinates (UTM Zone 10N - Meters)		Tidal Datum						Extreme Tide Elevation							
				FEET-NAVD88						FEET-NAVD88							
County	Point ID	Easting	Northing	MLLW	MLW	MSL	MTL	MHW	MHHW	1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR	500-YR
San Francisco	919	6024200.091	2128132.259	-0.09	0.98	3.27	3.31	5.65	6.22	7.47	7.76	8.16	8.47	8.89	9.25	9.64	10.70
San Francisco	920	6024419.152	2126379.113	-0.10	0.97	3.28	3.32	5.66	6.23	7.48	7.78	8.18	8.48	8.90	9.26	9.64	10.69
San Francisco	921	6024162.164	2125487.416	-0.11	0.97	3.28	3.32	5.66	6.24	7.49	7.79	8.18	8.48	8.91	9.26	9.65	10.70
San Francisco	922	6025341.000	2125389.122	-0.12	0.97	3.28	3.32	5.67	6.23	7.49	7.79	8.18	8.48	8.91	9.26	9.64	10.69
San Francisco	923	6025560.062	2123635.976	-0.12	0.95	3.27	3.31	5.67	6.25	7.50	7.79	8.19	8.49	8.91	9.26	9.64	10.68
San Francisco	924	6025046.119	2121852.646	-0.14	0.94	3.27	3.31	5.68	6.25	7.51	7.80	8.20	8.49	8.91	9.26	9.64	10.65
San Francisco	925	6006993.662	2128745.250	0.04	1.07	3.27	3.30	5.53	6.08	7.28	7.60	8.00	8.31	8.75	9.13	9.55	10.71
San Francisco	926	6005814.826	2128843.544	-0.02	1.01	3.23	3.27	5.53	6.09	7.28	7.61	8.00	8.31	8.76	9.14	9.57	10.77
San Francisco	927	6006071.813	2129735.209	-0.02	1.00	3.19	3.25	5.51	6.06	7.25	7.56	7.96	8.27	8.72	9.09	9.50	10.65