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Coastal and Riverine Flood Assessment for Alameda County Flood Control District

Delft3D FM and SWAN model development and application for derivation of extremes across the San Francisco Bay

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Authors:
Kees Nederhoff

Project Manager:
Rohin Saleh

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San Francisco Bay and Delta –Still Water Level: Delft3D FM and SWAN model development and application for the derivation of extremes across the San Francisco Bay

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1 Executive Summary

The San Francisco Bay and Delta (SFBD) is the largest estuary on the U.S. West Coast. Over the last few decades, a range of numerical models using different software platforms have been developed to study complex hydrodynamic and sediment-transport-related issues in the SFBD. Recent successful modeling applications include UnTrim (Casulli and Zanolli, 2002), SUNTANS (Fringer et al., 2006), MIKE 21 (DHI, 2014), SCHISM (Zhang et al., 2016), RMA2, Delft3D curvilinear (Erikson et al., 2013; O'Neill et al., 2017), and Flexible Mesh Suite (Kernkamp et al., 2011). However, most of these models have limitations related to proprietary software, access to the research community for further development, limited support/maintenance, model extent, extreme value analysis methodology, and model schematizations. The models were not designed for ease of use or calibrated for high water level computations. Moreover, the model simulation times with previous models were too long, computationally extensive, and not cost-effective to utilize for the long-term hindcast applications critical to this effort.

The objective of this study was to set up, calibrate, and validate a model of the San Francisco Bay and Delta that can be used as a base model to (1) simulate still water levels (SWL; tide and surge) in the Bay, local tributaries and Delta channels and 2) to hindcast SWL accurately for a long period to perform reliable extreme value analysis for the area of interest of the San Francisco Bay. SWL includes tide, sea level anomalies at the Pacific Ocean, and local surges due to wind setup and fluvial water levels but does not include wave-driven setup and swash. In addition, this effort uses an open access policy that enables others to utilize, free of costly software licensing, the base model. Delft3D and SWAN grant users the right to study, change, and distribute the software to anyone and for any purpose without licensing cost and were therefore chosen for this study. All model schematization, results, and analysis are made publicly available on www.d3d-baydelta.org under the Creative Commons License. This allows third parties to run, amend, copy, and distribute. Therefore, this work is the first step towards a consistent approach to modeling, planning, and design efforts to mitigate the impacts of existing flooding and future flooding and Sea Level Rise (SLR) for flood plain managers across the SFBD.

This report presents the model set-up, calibration, validation, and application of the San Francisco Bay and Delta –Still Water Levels (SFBD-SWL). Overall, even with default model parameters, the model performs well in terms of computed water levels. However, after minor calibration of the tidal constituents and bottom friction, water levels within the Bay were well reproduced with errors smaller than 5 inches (average 3.1 inches). Errors are the smallest near San Francisco and increase in the direction of South Bay and the Delta.

It is important to note that no single storm is responsible for past extreme water levels across the entire San Francisco Bay region. The combination of events that produce, for example, a one-in-100-year (1-percent-annual-chance) flood at one location in the Bay may be quite different than the events that have produced a one-in-100-year flood elsewhere. Several statistical techniques can be used to compute the probability of extreme events, but all techniques benefit from long historical records. Within this project, High-Performance Computing (HPC) on Linux was leveraged to allow for a continuous computation of a 70-year record (1950-2019) and therefore a reliable determination of extremes. The model allows it to be run on multiple cores at the same time and in practice this means only 2-3 days to simulate the 70-years of hindcast record.

The 70-year hindcast simulation was used to estimate extreme values of water levels and their corresponding return periods. In this study, the peak-over-threshold (POT) Generalized Pareto distribution (GPD) was used for the analysis. The POT/GPD makes better use of the available modeled data but requires a high temporal resolution and was only used on the observation points of the model. With this method, it was possible to accurately estimate the return period for extremes across the Bay for rare events (100-year) as well as more frequent events (e.g. yearly extremes). Estimated 100-year SWL varies between ~9 and 10.7 ft+NAVD88 with higher values in South Bay and towards the Delta. Moreover, model results matched well when compared to previous studies (e.g. DHI, 2013).

The effect of future sea levels on the extremes shows that with increasing mean sea levels, SWL will increase as well. This increase is slightly less than linear because tidal amplification decreases with increasing water depths. Moreover, the initial effect of three adaptation strategies was evaluated with this model: 1) protection of developed areas with seawalls in the Bay, 2) salt pond recovery by introducing more than 400 breaches into the man-made levees around the Bay and 3) a combination of strategy 1 and 2. The construction of a seawall increases tidal amplification and thus increases the extreme SWL by up to 6 inches. Salt pond recovery might mitigate part of these adverse effects but cannot completely offset the increase in water levels due to a Bay-wide seawall. The analysis is based on the initial hydrodynamic effect since morphological development was not taken into account.

It is important to note that by focusing only on still water levels, which is a limitation of any hydrodynamic model, processes such as wave set-up and wave swash (together runup) are neglected. To quantify the contribution of waves to the water level, a SWAN model with the empirical equation of Stockdon et al. (2016) was used to compute wave runup. While waves in the Pacific Ocean can exceed 30 feet, waves in large portions of the Bay are generally less than 3 feet. An exception is Central Bay which is affected by Pacific Ocean-generated swell. The contribution of the wave-driven process in the Bay is generally limited. For example, in 75% of the analyzed points around the Bay, waves contribute less than 10% to the extremes compared to mean higher high water (MHHW). This means that the Total Water Level (TWL) relative to MHHW is 10% higher compared to extremes only based on the hydrodynamic model computed SWL. The wave contribution increases to less than 20% for 95% of the points.

Ultimately, the results of this effort are intended to be utilized to provide downstream boundary conditions for the District outfall channels and creeks into the Bay for steady and unsteady hydraulic modeling. For some test cases, HEC-RAS modeling was performed at District outfalls into the Bay to evaluate existing flooding and future flooding, including the effects of SLR, and to evaluate proposed flood mitigation alternatives. Future work might focus on improving the 1D network in the tributaries of the Bay and Delta to have one integrated modeling system for SWL across the estuary and urban areas.

2 Introduction

2.1 Background

The San Francisco Bay and Delta (SFBD) is the largest estuary on the U.S. West Coast and one of the most developed regions of the United States, with a population of over eight million people. Like other low-lying coastal communities, the San Francisco Bay population is vulnerable to present-day, and future coastal flooding events (Knowles, 2010; Barnard et al., 2019) and sea level rise (SLR). The drivers of coastal flooding must be adequately understood to facilitate the planning and implementation of coastal flooding mitigation and adaptation measures.

Over the last few decades, a range of numerical models using different software platforms have been developed to study complex hydrodynamic and sediment-transport-related issues in the SFBD. Recent successful modeling applications include UnTrim (Casulli and Zanolli, 2002), SUNTANS (Fringer et al., 2006), MIKE 21 (DHI, 2014), SCHISM (Zhang et al., 2016), RMA2[1]), Delft3D curvilinear (Erikson et al., 2013; O'Neill et al., 2017), and Flexible Mesh Suite (Kernkamp et al., 2011). A regional San Francisco Bay hydrodynamic modeling study was completed as part of FEMA's San Francisco Bay Area Coastal Study, analyzing extreme water levels (DHI, 2013). A hindcast[2] based on the DHI results from 1956-2009 was conducted to perform an extreme value analysis (EVA) based on the Annual Maxima (AM) and Generalized Extreme Value (GEV). The purpose of the EVA was to derive extreme water level statistics across SF Bay that inform design decisions on a local flood control district level.

Yet, these models aren't without drawbacks. Issues include proprietary software limitations, restricted access to research development, limited ongoing support, challenges in model scale and design, and complex schematizations. These models weren't particularly user-friendly nor were they optimized for high water level calculations. Furthermore, their long and computationally demanding simulation times made them less cost-effective for prolonged studies. The existing SFBD Community Model (http://www.d3d-baydelta.org/; Achete et al. 2015, Vroom et al., 2017, Martyr-Koller et al., 2017) has been beneficial for holistic ecosystem modeling. However, this platform was less geared towards flood protection and forecasting purposes, limiting its use for such purposes.

Delft3D and SWAN grant users the right to study, change, and distribute the software to anyone and for any purpose without additional licensing cost and were therefore chosen for this study. All model schematization, results, and analysis are made publicly available on www.d3d-baydelta.org under the Creative Commons License. This allows third parties to run, amend, copy, and distribute. Therefore, this work is the first step towards a consistent approach to modeling, planning, and design efforts to mitigate the impacts of existing flooding and future flooding for flood plain managers across the SFBD.

2.2 Objectives

This study set up, calibrated, and validated a community base model of the San Francisco Bay and Delta area (SFBD, Figure 1) that can:

1. Simulate still water levels (SWL; tide and NTR) in the Bay, Delta channels, and local tributaries, and;

[1] https://www.xmswiki.com/wiki/SMS:RMA2

[2] https://www.adaptingtorisingtides.org/

2. To hindcast SWL with sufficient high accuracy and for a sufficient long-term period to perform reliable extreme value analysis (EVA) that can be used to identify coastal flood hazards in the San Francisco Bay (i.e. Bay; Suisun Bay, San Pablo Bay, Central Bay, and South Bay).

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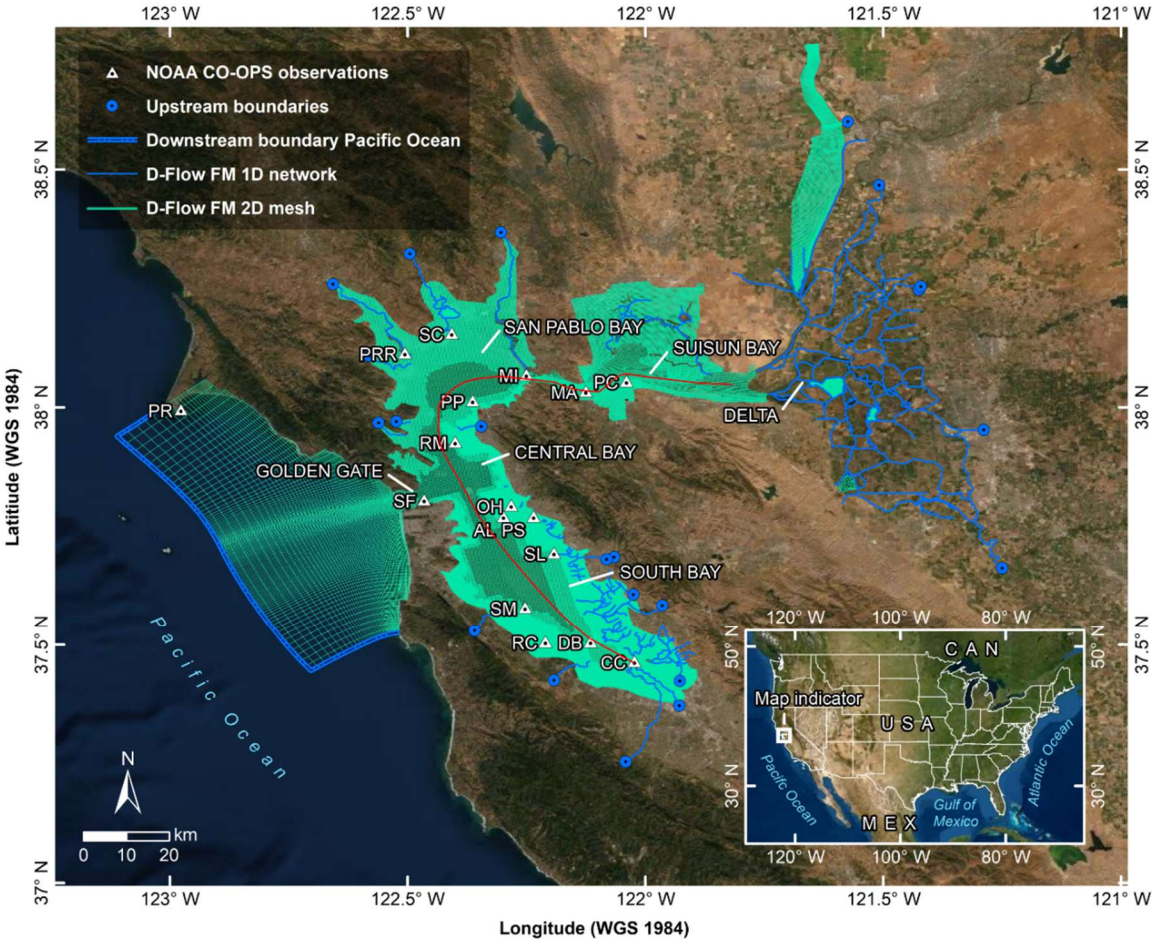

Figure 1. Model extent in the San Francisco Bay and Delta. The focus of this study is on SWL in the Bay (i.e. Suisun Bay, San Pablo Bay, Central Bay, and South Bay). Acronyms: San Francisco (SF); Alameda (AL); Port Chicago (PC); Redwood City (RC); Richmond (RM); Mare Island (MI); Coyote Creek (CC); Martinez-Amorco Pier (MA); Dumbarton Bridge (DB); Sonoma Creek Entrance (SC); Pinole Point, San Pablo Bay (PP); Park Street Bridge (PS); Oakland Inner Harbor (OH); San Mateo Bridge (SM); San Leandro Marina (SL). Centerline is used in specific analysis throughout this report.

Modeling for this study required the following:

1 A hydrodynamic model with relatively high resolution in SFBD (~300 feet or ~100 m) and sufficient resolution in the rest of the model domain);
2 Feasible computational times (1 water year, WY, in less than 3 days on a local laptop);
3 Similar or better representation of water levels in the area of interest of the Bay than previous modeling efforts (e.g., DHI, 2013).
4 Long-term simulations (e.g. 70 years of record) to perform robust extreme value analysis

As stated previously, the hydrodynamic does not include wave-driven set-up and swash directly. Note that wave-driven set-up and swash together are commonly referred to as wave runup. Moreover, wave runup is the maximum vertical extent of wave uprush on a beach or structure above the SWL. For this

study, a secondary evaluation was performed with a wave model (SWAN) to map extreme wave conditions around the Bay.

2.3 Modeling Overview

The existing SFBD community model on www.d3d-baydelta.org in Delft3D Flexible Mesh (Delft3D FM; Kernkamp et al., 2011) model was updated for this study. The previous model (SFBD-3D) has a relatively coarse resolution of ~1500 feet (500 meters) in the Bay, does not include 1D tributaries in the SF Bay or Delta nor include subgrid features constraining the flow extent. Moreover, the model's boundary conditions were only available for 2 water years and the model was not calibrated to reproduce SWL in the area of interest of the Bay as accurately as possible since the focus was on 3D hydrodynamics. For more information on the SFBD-3D one is referred to Martyr-Koller et al. (2017) or Vroom (2017).

The updated model has a relatively high grid resolution in the Bay (~300 feet, 100 meters) and covers the local Bay tributaries and Delta channels to account for fluvial inflow. The seaward boundary of the model domain starts at ~80 feet (25 meters) water depth in the Pacific and has a maximum coarse resolution of 6500 feet (~1 mile; 2000 meters). We refer to this new model schematization as the San Francisco Bay and Delta – Still Water Level model or SFBD-SWL. To hindcast SWL for a sufficient long-term period to perform reliable extreme value analysis, a one-dimensional (1D) – two-dimensional horizontal (2DH) depth-averaged model was created instead of a 3D model to achieve reasonable computational times since a 3D model is not necessary for reliable computation of water levels. If the focus of this study were on flow velocities or sediment transport, a 3D model may be needed because a limitation of the 1D-2DH depth-averaged model is that it assumes a logarithmic vertical velocity profile and therefore neglects the vertical distribution of the offshore directed undertow and density-driven currents.

Location and sources for boundary conditions were selected based on the temporal length to allow for a sufficient long-term period hindcast to perform reliable extreme value analysis. The model was calibrated on tidal constituents and bottom friction to represent water levels in the Bay with a high level of accuracy. Hindcasting results from 1950-2019 were used for the extreme value analysis.

To quantify the difference between TWL and SWL, a standalone spectral wave model SWAN (Booij et al., 1999) was created and used in conjunction with an empirical runup formula by Stockdon et al. (2006).

Modeling for this study included the following efforts:

- **Data collection**, analysis, and quality review;
- **Delft3D Flexible Mesh**
    - **Model set-up** by creating a numerical model grid and matching bathymetry for a Delft3D FM model. The second step was to derive boundary conditions for the period from 1950-2019.
    - **Model calibration and validation** by adjusting various relevant model parameters and comparison against observed water levels.
    - **Model simulations** using 1950-2019 data to compute SWLs and perform extreme value analysis on different model simulations with/without sea-level rise and with/without adaption strategies.
- **SWAN**. Create a three-level nested SWAN model and apply it to compute TWLs for comparison to SWLs.

3 Applied data

3.1 Introduction

Chapter 3 documents data used in model set-up and calibration/validation. Data sources will be presented 'as-is'. Data manipulation as needed to provide boundary conditions for Delft3D FM as described in Chapter 4.

3.2 Bathymetry and friction

The SFBD-SWL uses the following data sources for bathymetry and selection of friction coefficients based on land cover:

1. The LEAN-Corrected San Francisco Bay Digital Elevation Model by Buffington and Thorne (2019). LEAN stands for Lidar Elevation Adjustment with NDVI (LEAN).
2. The Seamless, High-Resolution Digital Elevation Model of the San Francisco Bay-Delta Estuary (Fregoso et al., 2017).
3. The National Land Cover Database Land Cover (CONUS; Homer et al., 2020).

LEAN-corrected bathymetry is only available for land. The Digital Elevation Model (DEM) data from Fregoso et al. (2017) and land cover data from CONUS are available across the model domain.

3.3 Water levels and fluvial inflows

3.3.1 TPXO tidal constituents

Water levels at the offshore model boundary for the Delft3D FM model were derived from the TPXO 8.0 (Egbert and Erofeeva, 2002). TPXO is a series of fully-global models of ocean tides, which best-fits, in a least-squares sense, the Laplace Tidal Equations and altimetry data. TPXO 8.0 includes 13 tidal constituents.

3.3.2 NOAA water levels in Bay

Time-series of measured water levels were downloaded from the NOAA database for a total of 18 stations in the Bay (Table 1; Figure 1). Tidal constituents[3] for all stations were determined with the Matlab u_tide toolbox (Codiga, 2011) to compare the model results in the frequency domain. These data are applied for model calibration and validation. The column 'years with interruptions' summarizes the years with less than 180 days of observations. The more years of interpretations a station has, the less robust the validation can be performed at this location.

[3] Tides are created by the gravitational forces of the Moon, Sun and Earth. There are hundreds of periodic motions that are identified and each of these motions or "constituents" can be represented as a cosine curve. Each harmonic constituent provides the mathematical values which describe a specific cosine curve. A tidal analysis such as u_tide determines the amplitude and phases of the tidal constituents based on a time series of observed water level data.

Table 1. Overview of water level station in the Bay.

Name	IDcode	start date	end date	Years with interruptions
'San Francisco'	'9414290'	1949-01-01	active	'1970, 1971'
'Redwood City'	'9414523'	1974-10-10	active	'1976, 1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997'
'Alameda'	'9414750'	1976-03-01	active	'1976, 1977, 1978, 1979'
'Richmond'	'9414863'	1996-01-01	active	'2006'
'Point Reyes'	'9415020'	1975-01-12	active	-
'Martinez-Amorco Pier'	'9415102'	2013-05-06	active	-
'Port Chicago'	'9415144'	1979-11-01	active	-
'Mare Island'	'9415218'	1996-06-26	2012-10-28	'1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005'
'Arena Cove'	'9416841'	1979-08-01	active	'1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990'
'Coyote Creek'	9414575'	1983-11-03	2018-10-30	'1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2012, 2013'
'Dumbarton Bridge'	'9414509'	1996-03-16	2011-07-14	'1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010'
'San Mateo Bridge'	'9414458'	2005-01-01	2005-03-30	-
'San Leandro Marina'	'9414688'	2005-01-04	2005-02-16	-
'Park Street Bridge'	'9414746'	2010-11-18	2011-03-03	-
'Oakland Inner Harbor'	'9414764'	1976-12-01	2011-05-01	'1977, 1978, 1979, 1980, 1981, 1982, 1983, 1984, 1985, 1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010'
'Pinole Point, San Pablo Bay'	'9415056'	2010-11-19	2011-03-20	-
'Sonoma Creek Entrance'	'9415338'	2012-10-27	2013-03-02	-
'Petaluma River Entrance'	'9415252'	1985-06-21	2014-06-30	'1986, 1987, 1988, 1989, 1990, 1991, 1992, 1993, 1994, 1995, 1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013'

3.3.3 USGS fluvial inflow and water levels in tributaries in Delta

Daily fluvial inflows to the Bay were based on observed USGS gage data. In total 16 local tributaries were incorporated into the Delft3D FM model as boundary conditions. Table 2 presents an overview of gauged tributaries incorporated into the Delft3D FM model based on USGS data. Maximum riverine flow are presented based on the applied data within this study. The data are a daily-average value as published by USGS and included to provide the reader with a reference of contribution per tributary. Table 2 presents the locations where USGS gauge data was available for either establishing model boundary conditions (yellow circles) or performing model calibration and validation. Moreover, 28 gauges in the Delta were included for validation (see green circles in Figure 2).

For fluvial inflows of the Delta, estimates of Dayflow (California Department of Water Resources, 2019) were used. Dayflow is the estimate of the daily average outflow from the Delta. It is computed once per year following the start of the new water year (October 1) and provides estimates for 14 different locations in the Delta. The maximum daily average outflow from the Delta was estimated to be 629,494 cfs (17,825 m^3/s) of which the majority comes from the Sacramento River (18%) and Yolo Bypass (79%). Other tributaries (i.e. Cosumnes, Mokelumne, eastDelta[4] , and San Joaquin) have smaller contributions.

Table 2. Overview of gauged tributaries in the Bay

Name	Site number	Start date	End date	Max flow [cfs]
Coyote Creek	'11172175'	'02-Jan-1999'	active	5,440
Guadalupe	'11169025'	'24-May-2002'	active	4,280
Saratoga	'11169500'	'01-Jan-1949'	active	755
San Francisquito	'11164500'	'02-Oct-1950'	active	2,650
San Mateo	'11162753'	'13-Sep-2008'	active	298
Corte Madera	'11460000'	'23-Feb-1951'	active	3,840
San Rafael	'11459800'	'07-Nov-1971'	'11-Apr-1976'	63
Novato	'11459500'	'01-Jan-1949'	active	2,850
Petaluma	'11459150'	'30-Nov-1998'	active	4,560
Sonoma	'11458500'	'10-Feb-1955'	active	8,180
Napa	'11458000'	'02-Oct-1959'	active	26,200
WildCat	'11181400'	'02-Aug-1964'	'29-Sep-1975'	475
San Lorenzo #1	'11181000'	'01-Jan-1949'	active	2,600
San Lorenzo #2	'11181008'	'02-Oct-1971'	active	322
Alameda #1	'11180500'	'02-Apr-1959'	active	453
Alameda #2	'11179000'	'01-Jan-1949'	active	23,900

[4] eastDelta is a combination of all remaining inflow conditions from Dayflow

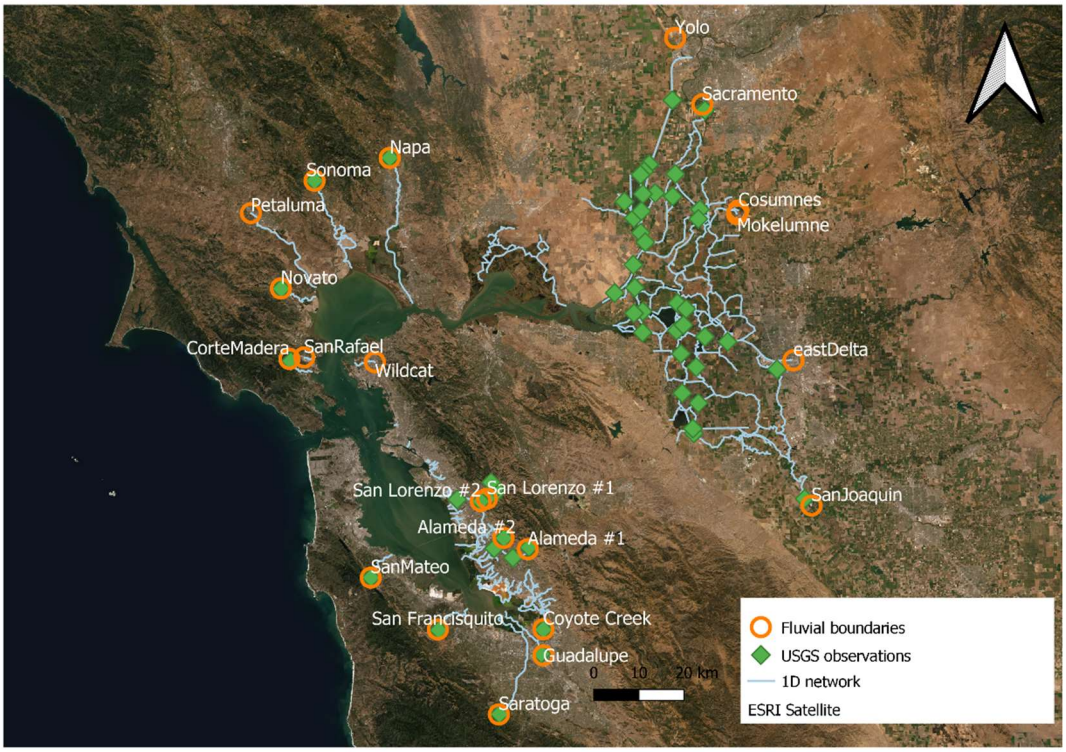

Figure 2. Observations by USGS (green; outside tidal reach in Bay and Delta), and fluvial boundaries (orange open circles)

3.4 Wind, pressure, and waves

Besides observations, several weather models exist that hindcast the status of the atmosphere. The advantage of using weather models over measurements is that the spatial variability in wind and pressure conditions can be used to provide boundary conditions to the hydrodynamic models. A meteorological reanalysis is a meteorological data assimilation project that aims to assimilate historical observational data spanning an extended period. One well-known global atmospheric reanalysis model is ERA5 (Hersbach et al., 2020). For the period 1950-2019, the hourly model output of winds and pressure computed by ERA5 was collected. The ERA5 has a resolution of 18.6 miles (30 km). Besides atmospheric conditions, ERA5 also provides a reanalysis of wave parameters (e.g., wave height, period, and direction)

4 Delft3D FM (hydrodynamics)

4.1 Introduction

This Chapter describes the Delft3D FM model set-up, model calibration, and validation, and presents the long-term hindcast of SWL, including EVA. In particular, the model has been calibrated via correction of the offshore tidal constituents and bottom friction and validated by comparing modeled SWL with observed water levels at NOAA stations across the Bay. The model has been re-run several times for the 1950-2019 hindcasting period to assess the effect of current and future sea levels and the effect of several adaptation strategies on the extremes SWL across the Bay.

4.2 Model set-up

4.2.1 Mesh and bathymetry generation

4.2.1.1 Numerical grid

The computational domain of the numerical grid covers San Francisco Bay and Delta up to an elevation of +30 ft+NAVD88 (+10m+NAVD88; Figure 3). The resolution of the Delft3D FM grid varies between 300 and 6500 feet (100 m and 2000 m), with the highest resolution in the shallow parts of the Bay. The model schematization includes 1D profiles of riverine tributaries to the Bay for which historic fluvial inflow observations were available. In the Delta, the schematizations (both location of the network and profiles) of the Delta Simulation Model II (DSM2) were imported (California Department of Water Resources, 2013). The unstructured grid consists of 185,690 net nodes and is projected in WGS 84 / UTM 10N (EPSG 32610) in meters. Delft3D uses the metric system (centimeters, meters, kilometers, etc.) but for this report, values were converted to the imperial system (inch, feet, miles, etc.).

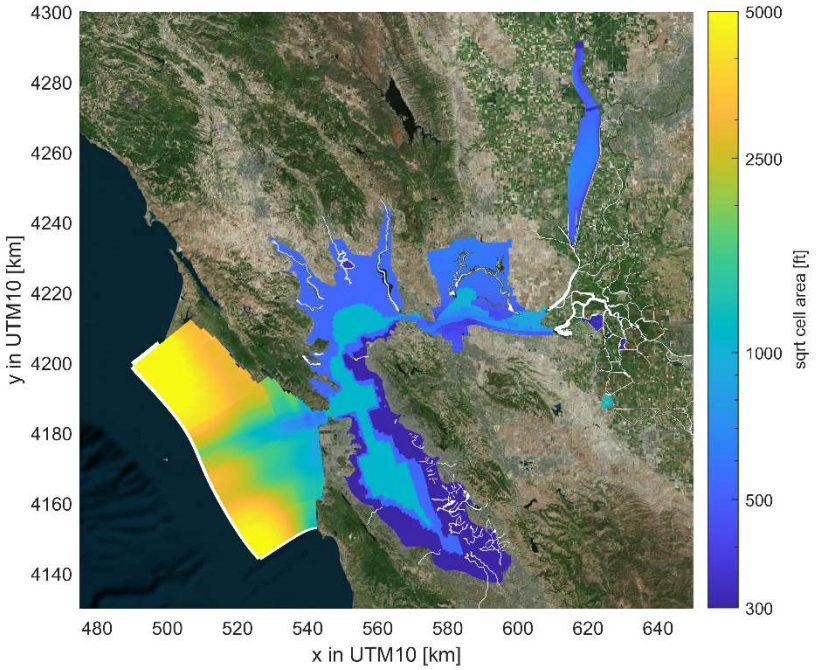

Figure 3. Network size and extent of SFBD-SWL: 2D domain (space) and extent of the 1D domain (white). The cell area is presented on a log scale and as the square root of the surface area in feet.

4.2.1.2 Bathymetry and friction

Bathymetry sources were applied in the order presented in Section 3.2.1. Data from the National Land Cover Database Land Cover (CONUS; Homer et al., 2020) were converted to roughness values using Manning's coefficients suggested in DHI (2013). Friction in open-water was calibrated to optimize tidal propagation in the Bay and Delta with Manning's n coefficients varying from 0.023 $s.m^{-1/3}$ for most of the domain, at 0.020 $s.m^{-1/3}$ in South Bay and 0.030 $s.m^{-1/3}$ in the Delta.

For both the bathymetry (Figure 4) and friction values (Figure 5) a grid cell averaging method was applied to convert input data into processed data for the model. This method was chosen because the 2D network has a coarser resolution compared to the input data. For the 1D elements, a linear interpolation method was applied because of the higher resolution of these elements compared to the 2D mesh. The vertical reference level of the model is NAVD88 in meters (but presented here in feet).

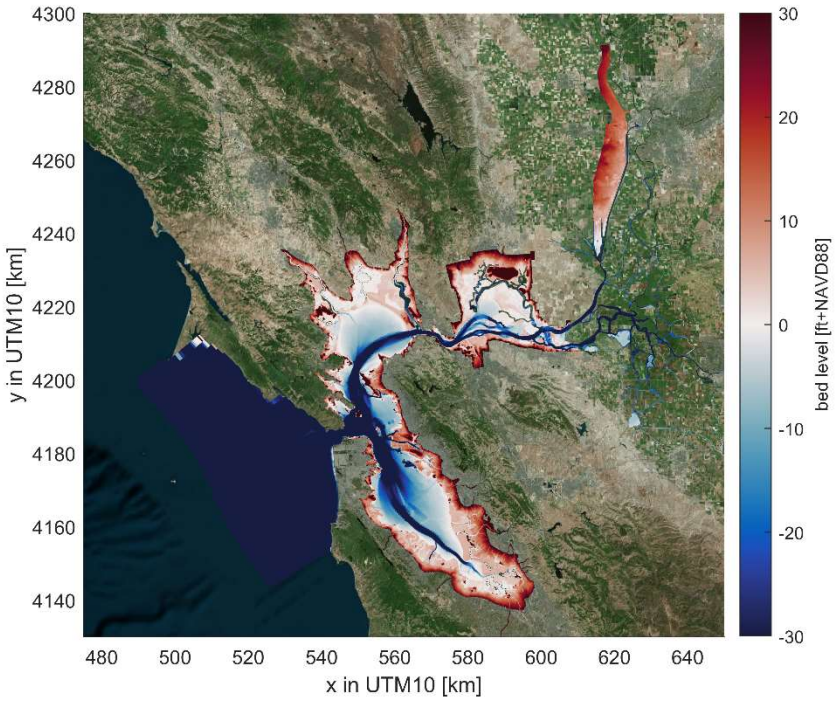

Figure 4. Applied topo-bathymetry in SFBD-SWL. Bed level is presented in feet+NAVD88.

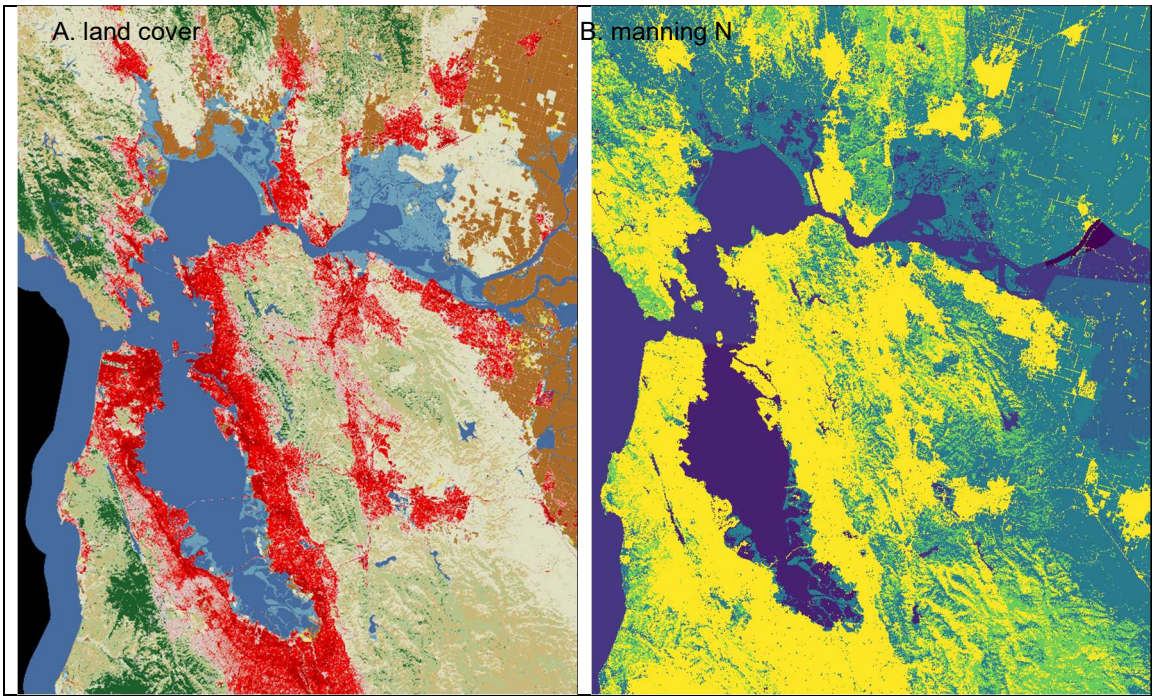

Figure 5. Land cover (panel A) is translated into friction coefficient (panel B) via relationships of DHI (2013) for the SFBD-SWL. Color in the land cover presents different land classes following Homer al. (2010). Color in the friction presents the friction coefficient. Colors (blue) are lower friction and warmer colors (yellow) higher.

4.2.1.3 Subgrid features

The 300-feet resolution of the model network is not fine enough to resolve some more minor features such as local levees and dams. In particular, in South Bay salt ponds have a significant effect on the local hydrodynamics (e.g. Holleman & Stacy, 2014). Therefore, an additional file has been included in the Delft3D FM model to simulate the constraining effect of these local levees and dams. This so-called weir file (Figure 6) describes the location (x and y coordinates) and height (z elevation) of each subgrid feature. Mapped locations of these features were provided by District staff. Feature height is based on the maximum elevation established from the merged topo-bathymetry within a buffer of 300 feet. In Delft3D FM, the result is twofold: 1) constraining the flow extent and 2) accounting for energy losses due to constriction of the flow on the subgrid-scale.

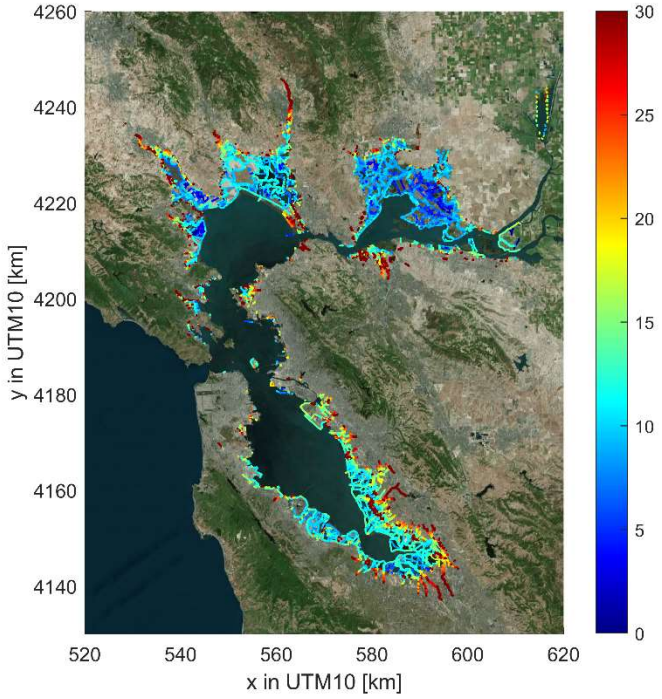

Figure 6. Applied subgrid features in the SFBD-SWL. Color presents the height of the weir in feet + NAVD88.

4.2.2 Boundary conditions

4.2.2.1 Marine boundaries

Tidal boundary constituents were based on San Francisco (NOAA station #9414290) and TPXO 8.0 (for minor spatial variability). Moreover, constituents were calibrated based on the observed tidal constituents at San Francisco (NOAA station #9414290). Figure 7 presents the M2 amplitude (left panel) and phase (right panel) based on TPXO (field) and applied within the Delft3D FM model (circles). The San Francisco station was also used to determine the non-tidal residual (NTR). The NTR was applied uniformly across the offshore boundary.

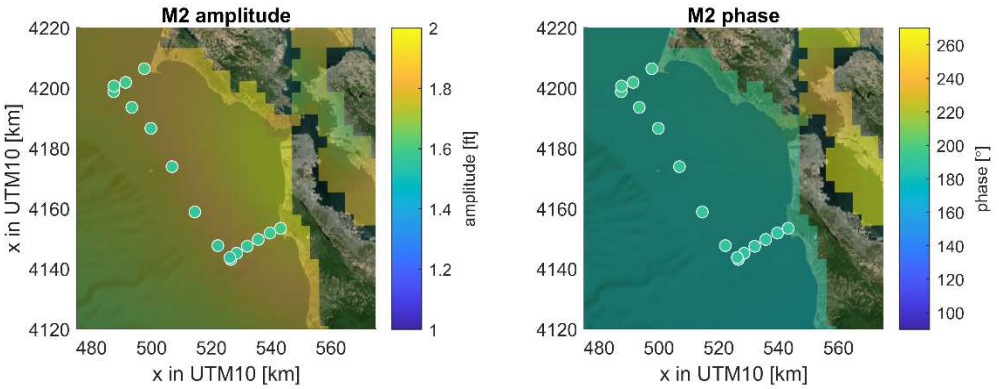

Figure 7. TPXO database (space) compared to applied boundaries in SFBD-SWL (circles). Panel A: M2 amplitude in feet. Panel B. M2 phase in degrees.

4.2.2.2 Fluvial boundaries

USGS gauges in the Bay contained data gaps and could not provide continuous inflow boundaries for the entire simulation period (1950-2019). Therefore, a simple correlation for the most suitable station in terms of the highest R-value was applied to fill in the data gaps. The determined correlation factors and R-values are presented in Table 4. Correlation with other USGS gauges was used (in the order of best fit in terms of R) until a fully continuous record was created for each station. No further corrections on the daily discharge were applied to improve the temporal variability of the peak. Daily-averaged flows from Dayflow were directly applied in the Delta. Consumptive usage of water across the Delta was included as a lateral discharge sink across all 1D elements in the Delta.

Table 3. Correlation results of the USGS gauges in the Bay.

River	1st fit	R	factor	2nd fit	R	factor	3rd fit	R	factor
CoyoteCreek	Alameda #1	0.81	0.35	Guadalupe	0.81	0.61	Saratoga	0.74	4.60
Guadalupe	Alameda #1	0.90	0.53	Saratoga	0.87	7.39	CoyoteCreek	0.81	1.12
Saratoga	SanFrancisquito	0.87	0.29	Guadalupe	0.87	0.10	Napa	0.84	0.03
San Francisquito	Alameda #1	0.90	7.45	Saratoga	0.87	2.69	WildCat	0.84	4.11
San Mateo	Alameda #1	0.67	0.04	Guadalupe	0.63	0.06	CoyoteCreek	0.58	0.08
Corte Madera	WildCat	0.87	4.84	Napa	0.85	0.12	Novato	0.84	1.64
SanRafael	CorteMadera	0.90	0.05	Sonoma	0.78	0.02	WildCat	0.71	0.19
Novato	WildCat	0.86	2.39	Napa	0.85	0.06	Saratoga	0.83	1.48
Petaluma	Novato	0.84	3.49	Napa	0.81	0.19	Sonoma	0.80	0.53
Sonoma	Napa	0.92	0.34	WildCat	0.87	12.89	Novato	0.84	4.87
Napa	WildCat	0.86	33.34	Novato	0.85	12.16	Saratoga	0.84	21.59
WildCat	San Lorenzo #2	0.88	0.29	CorteMadera	0.87	0.16	Sonoma	0.87	0.06
San Lorenzo #1	Alameda #2	0.91	5.16	SanFrancisquito	0.90	0.67	WildCat	0.88	2.71
San Lorenzo #2	WildCat	0.78	0.58	SanFrancisquito	0.76	0.10	Alameda #2	0.74	0.81
Alameda #1	SanFrancisquito	0.90	0.11	Saratoga	0.80	0.30	Novato	0.79	0.16
Alameda #2	Guadalupe	0.89	1.54	CoyoteCreek	0.81	1.92	Alameda #2	0.80	29.63

4.2.2.3 Meteorological forcing

Hourly ERA5 wind and pressure fields were interpolated linearly to an equidistant grid in the local UTM zone with a resolution of 3x3 miles (5 x 5 km). No further modifications to the meteorological forcing were performed.

4.2.3 Model settings

The San Francisco Bay and Delta –Still Water Level model (SFBD-SWL) was run with the Deltares hydrodynamic modeling program Delft3D Flexible Mesh (Delft3D FM; www.deltares.nl/en/software/delft3d-flexible-mesh-suite/, 2020.04 release, SVN revision 66357; April 11, 2020) in depth-averaged mode. The following model settings were applied:

- Time zone: The model was run in GMT. This made it possible to directly use the water levels from the large-scale hydrodynamic model as boundary conditions.
- Viscosity and diffusivity: The model was run with a uniform horizontal eddy viscosity of 1 m^2/s and a uniform horizontal eddy diffusivity of 1 m^2/s.
- The density of water was set to 1025 kg/m^3. This is a typical value for saltwater.
- Drying and flooding: The minimum drying/flooding procedure was applied with the criteria for drying and flooding of individual cells set to 0.001 m.
- Wind stress formulation: The wind stress formulation of Vatvani et al. (2012) was used. According to this formulation, the drag coefficient increases until a wind speed of about 28 m/s and decreases with further increase of the wind speed since the stress above the air-sea interface starts to saturate.
- Non-linear 1D volumes have been excluded to save computational time.

4.2.4 Community model

The SFBD-SWL model was developed by Deltares USA and the U.S. Geological Survey and is available via https://doi.org/10.5066/P9WWB9V4. The download includes the entire model schematization and encompasses the model grid and input conditions for the water year 2019 (WY2019; 1 October 2018 to 1 October 2019) and validation data. The input conditions and results for 1950-2019 can be viewed at www.d3d-baydelta.org. On the same webpage, the outcomes of the extreme analysis performed in this study are available.

4.3 Delft3D FM calibration and validation

4.3.1 Tidal propagation

4.3.1.1 Offshore calibration of tidal constituents

The offshore boundary conditions strongly influence water levels in the Bay. In this study, the astronomical boundary conditions are based on the NOAA station at San Francisco (#9414290) and TPXO 8.0. Tidal calibration was performed by comparing tidal constituents simulated by Delft3D FM and observed in San Francisco (NOAA #9414290). Table 4 presents the tidal constituents at the offshore boundary before calibration and post-calibration. Primary constituents[5] M2, K1, O1, S2, N2, P1, and K2 were calibrated. The other constituents (SA, Q1, SSA, NU2, J1) were unchanged.

[5] Each tidal constituent is designated by a name and a symbol. A0 is the vertical offset between MSL and NAVD88, M2 is the principal lunar semidiurnal constituent, K1 is the lunar diurnal constituent and O1 is the lunar diurnal constituent. For more information on tides please visit www.tidesandcurrents.noaa.gov.

Table 4. Calibrated tidal constituents at the offshore boundary. A is the amplitude in feet, and P is the phase in degrees. In total, the Delft3D FM model was forced with 68 tidal constituents. This table shows the 13 largest ones with an amplitude of 1 inch or larger. Smaller constituents than J1 were not calibrated.

Constituent	A Pre [ft]	P Pre [°]	A Post [ft]	P Post [°]	Comment
A0	3.081	0.0	3.179	0.0	calibrated
M2	1.772	190.5	1.581	194.7	calibrated
K1	1.260	220.5	1.155	221.7	calibrated
O1	0.768	204.4	0.705	205.4	calibrated
S2	0.453	196.3	0.394	199.5	calibrated
N2	0.397	164.1	0.361	167.5	calibrated
P1	0.390	216.8	0.371	218.9	calibrated
SA	0.190	290.1	0.190	290.1	same
Q1	0.138	196.4	0.138	196.4	same
K2	0.125	186.7	0.118	189.2	calibrated
SSA	0.105	265.3	0.105	265.3	same
NU2	0.079	170.0	0.079	170.0	same
J1	0.075	232.1	0.075	232.1	same

4.3.1.2 Tidal propagation in the Bay

Tidal water levels in SF Bay are mainly driven by a semi-diurnal tide primarily composed of M2 and K1. Figure 8 presents the M2 and K1 amplitude computed by the model compared to observations (circles). Errors in tidal amplitudes and phases are generally small (less than 1%). Errors in tide are the lowest at San Francisco (NOAA station #9414290) and increase further into the Bay. As described by Holleman and Stacy (2014), tidal amplification for M2 in South Bay and San Pablo Bay is evident in both the observed and modeled amplitudes (Figure 8A). K1 shows a more gradual decreasing pattern due to bottom friction going from the Pacific into the Delta.

Friction values were slightly varied within the Bay (not explicitly shown in this report). In particular, friction in open-water was adjusted in the Bay with Manning's coefficients varying from 0.023 s.m-1/3 for the majority of the domain to 0.020 s.m-1/3 in South Bay to improve tidal reproduction by the model.

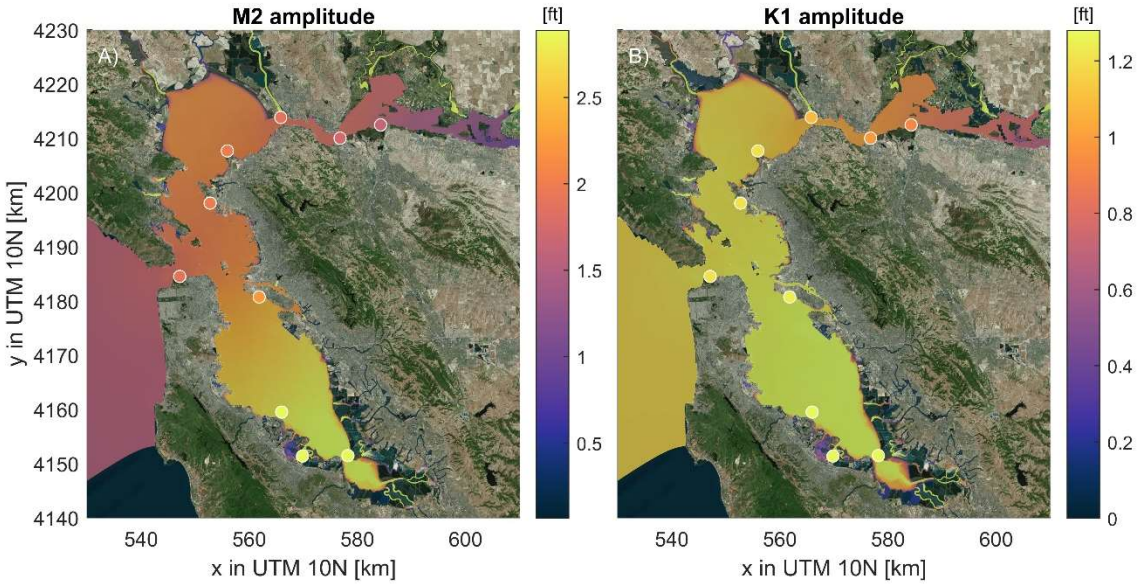

Figure 8. The tidal amplitude of M2 (left; panel A) and K1 (right; panel B) in feet was computed with the observed water levels in circles for the year 2018 for San Francisco Bay.

4.3.1.3 Tidal propagation in the Delta

Similar to the Bay, tidal water levels in the Delta are also mainly driven by a semi-diurnal tide primarily composed of M2 and K1. Figure 9 presents the M2 amplitude as computed by the model compared to observations (circles).

Friction values were slightly varied within the Delta (not explicitly shown in this report). In particular, friction in open-water was increased to improve tidal propagation in the Delta with Manning's coefficients varying from 0.023 s.m-1/3 for the majority of the domain to 0.030 s.m-1/3 in the Delta to improve tidal reproduction by the model.

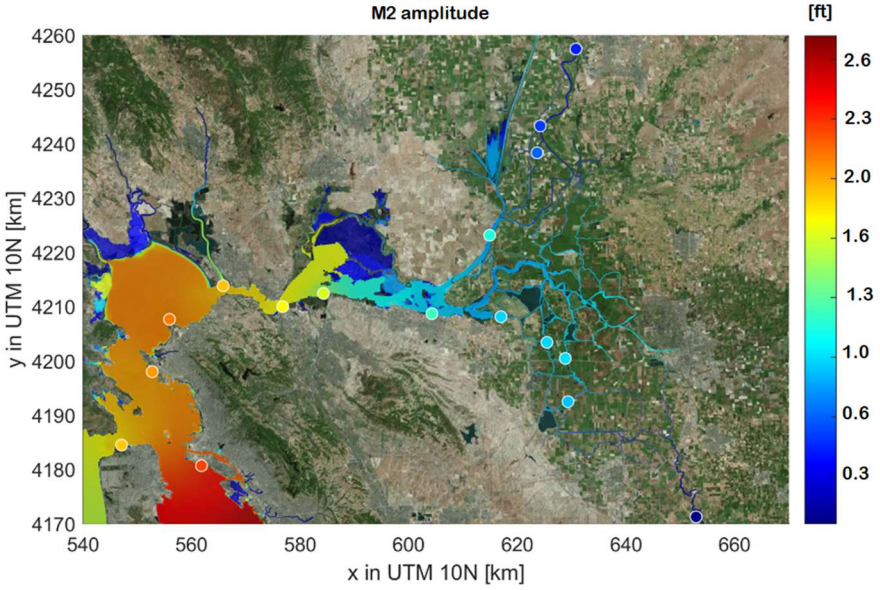

Figure 9. The tidal amplitude of M2 in feet as computed with the observed water levels in circles for the year 2018 for the entire San Francisco Delta.

4.3.2 Validation Still Water Level (SWL)

4.3.2.1 San Francisco Bay

Table 5 contains a summary of skill scores for SWL, tide, and non-tidal-residual (NTR) of the 15 gauges across the Bay for 70 years of modeled water years from 1950 until 2019. A skill score provides a quantitative measure of model skill in hindcasting historical observations. Different skill metrics exist but model bias, mean-absolute-error (MAE), root-mean-square-error (RMSE), and scatter index (SCI) have been applied in this study. The latter gives a relative measure of the RMSE compared to the observed variability. Higher MAE, RMSE, or SCI are associated with a lower skill.

NTR is influenced by, for example, high river flow, wind, and sea level anomalies that propagate from the open ocean through the Golden Gate to the Bay. Figure 10 shows the RMSE for all historical NOAA stations per year. Skill scores vary from year to year but are relatively constant in time and vary spatially from station to station. Model skill is the best at the San Francisco NOAA station (#9414290, RMSE: 2.2 cm) and skill decreases when going deeper into the Bay (RMSE of 4.7 cm and 4.2 cm respectively at NOAA station Coyote Creek #9414575 and Martinez #9415102). Errors are driven by a combination of errors both in modeled tide (~60% contribution) and NTR (~40% contribution). SCI is the lowest at San Francisco (#9414290) with 5.1% and the highest at Coyote Creek (#9414575) with 11.7%. It should be noted that the errors in Coyote Creek may be in part due to shifts in the coordinate system affecting both the digital elevation model used and perceived water levels (Foxgrover et al., 2014).

Table 5. Model skill (RMSE, SCI, MAE, and bias) of the SFBD-SWL for SWL, tide, NTR, and high water (HW) for all observation stations sorted to the longest record in San Francisco Bay. See Figure 1 for the location of these stations. N indicates the number of hours with observed data.

Name	NOAA station #	RMSE SWL [inch]	MAE SWL [inch]	bias SWL [inch]	SCI SWL [%]	RMSE tide inch]	RMSE NTR [inch]	RMSE HW [inch]	N [hours]
San Francisco	9414290	2.2	1.8	-0.6	5.1	1.4	1.5	2.2	579688
Alameda	9414750	2.7	2.2	-0.5	6.0	2.4	1.6	2.0	346347
Port Chicago	9415144	3.6	3.0	-2.1	7.5	2.8	2.8	2.8	338432
Redwood City	9414523	3.0	2.3	-0.7	6.0	3.9	1.7	2.4	209379
Richmond	9414863	2.6	2.0	-0.9	5.7	1.8	1.4	1.9	197300
Mare Island	9415218	3.3	2.7	-1.4	7.1	2.3	2.9	2.8	62504
Coyote Creek	9414575	4.7	3.3	1.4	9.0	4.6	1.6	2.7	60880
Martinez-Amorco Pier	9415102	4.2	3.5	-3.3	8.3	2.9	1.4	2.4	52447
Dumbarton Bridge	9414509	3.0	2.3	-0.8	5.9	3.9	1.8	3.9	17968
Sonoma Creek Entrance	9415338	5.4	3.9	1.3	11.2	3.7	1.7	1.7	3021
Pinole Point, San Pablo Bay	9415056	1.9	1.5	1.1	4.1	1.3	1.3	1.5	2891
Park Street Bridge	9414746	3.2	2.5	1.9	7.0	2.2	2.0	2.2	2514

Name	NOAA station #	RMSE SWL [inch]	MAE SWL [inch]	bias SWL [inch]	SCI SWL [%]	RMSE tide inch]	RMSE NTR [inch]	RMSE HW [inch]	N [hours]
Oakland Inner Harbor	9414764	2.6	2.1	1.5	6.0	1.8	1.7	3.1	2161
San Mateo Bridge	9414458	2.0	1.5	0.1	3.8	1.6	0.3	1.3	2135
San Leandro Marina	9414688	2.7	2.1	1.4	5.4	2.2	1.7	2.2	1034
Average		**3.1**	**2.5**	**-0.1**	**6.5**	**2.6**	**1.7**	**2.4**	

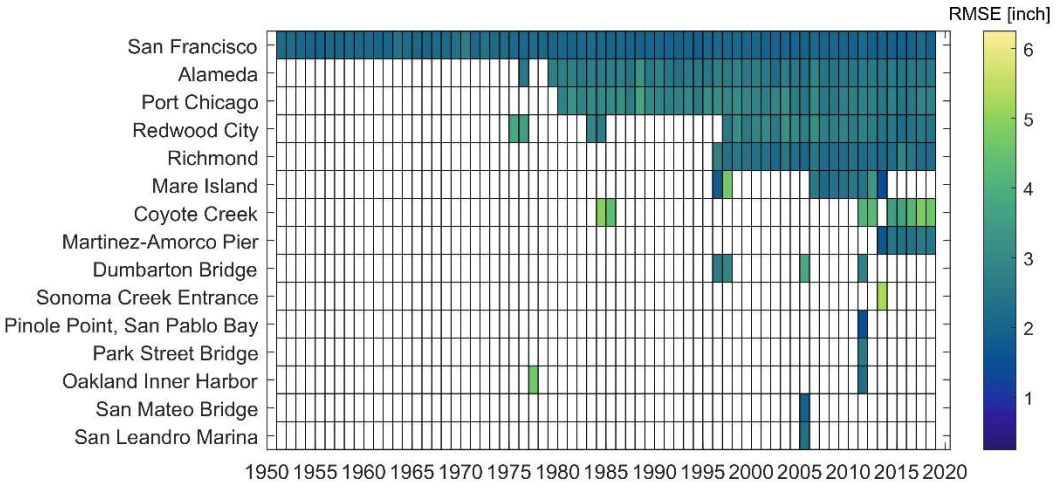

Figure 10. Overview skill score over time (1950-2019) for the 15 NOAA tide gauges with observed SWL within the San Francisco Bay. White squares indicate times/locations when no data was available. The skill score is presented as RMSE in inches.

4.3.2.2 San Francisco Delta

Table 6 contains a summary of skill scores for SWL, tide, and NTR of the 28 gauges across the Delta for WY2017 in terms of RMSE. The average RMSE for the total SWL is 6.3 inches of which 4.0 inches is driven by errors in tide (~43%) and 5.2 inches due to NTR (~57%). Assuming that the error in tide and NTR are independent and unbiased variables, the variances can be added. This implies $RMSE_{total}^2 = RMSE_{tide}^2 + RMSE_{NTR}^2$. Observations within the Delta do not have a consistent vertical datum in NAVD88, therefore, observations were compared to the SFBD-SWL in local mean sea level (MSL). In practice, this means that error statistics are all bias-corrected (i.e. unbiased RMSE or uRMSE).

Table 6. Model skill (RMSE) of the SFBD-SWL for total SWL, tide, and NTR for all observation stations in the San Francisco Delta in inches.

Station	RMSE [inch]	RMSE tide [inch]	RMSE NTR [inch]
Threemile Slough Rio Vista	4.2	3.1	2.2
Sacramento A Freeport	10.6	6.7	10.3
Sutter A Courtland	7.9	5.1	7.6
Steamboat Slough Walnut Grove	6.7	4.1	6.3
Sacramento R Ab Cross Channel	8.1	5.0	7.6
Sacramento R Georgiana Slough	7.5	4.6	6.9
Miner A Hwy	7.8	3.8	7.4
Cache Slough A S Liberty Island Rio Vista	10.1	5.7	9.1
Sacramento R Deep Water Ship Nr Rio	12.0	6.1	11.5
Cache A Ryer	10.5	6.7	10.0
Sacramento R Rio Vista	6.8	3.7	6.1
Sacramento R A Decker Nr Rio	5.1	2.8	3.9
San Joaquin R Garwood Bridge	9.3	8.2	8.0
Turner Nr Holt	4.0	2.2	2.8
Victoria Nr Byron	5.4	3.7	3.9
Middle R Middle River	4.2	2.6	3.0
Middle Nr Holt	3.9	2.2	2.8
Old R Nr Mendota Canal	7.4	5.6	4.6
Grant Line Nr Tracy	7.6	5.9	4.5
Old Near Byron	5.0	3.4	3.3
Old R Bacon Island	3.9	2.3	2.9
Holland Cut Bethel Island	3.7	2.0	2.7
Dutch Slough Bl Jersey Rd A	4.6	3.3	2.4
Old R A Quimby Island Bethel Island	3.7	2.1	2.7
False Nr Oakley	3.9	2.4	2.4
Old R A Franks Nr Terminous	3.5	1.9	2.6
San Joaquin R A Pt Nr	6.3	3.3	5.7
San Joaquin R Jersey Point	4.0	2.8	2.2
Average	**6.3**	**4.0**	**5.2**

4.4 Extreme value analysis for current and future sea level

4.4.1 Extreme Value Analysis (EVA)

No single storm is responsible for past extreme tide levels across the entire San Francisco Bay region. The combination of events that produce a one-in-100-year (1-percent-annual-chance) flood at one location in the Bay may be quite different than the events that have produced a one-in-100-year flood

elsewhere (O'Neill et al. 2017). Several statistical techniques can be used to compute the probability of extreme values. The two most important for SWL are:

1. Annual Maxima with a Generalized Extreme Value (AM/GEV).
2. Peak-over-Threshold (POT) with a Generalized Pareto Distribution (POT/GPD).

The steps in an extreme value analysis are as follows:

1. **Definition of the extreme values in the dataset**
    a. Initial Distribution (ID)
    b. Peak over threshold (POT)
    c. Annual Maxima (AM)
2. **Fitting a trend line (distribution) to these extreme values**
    a. The POT approach is asymptotically Pareto distributed (Generalized Pareto Distribution or GPD)
    b. AM are distributed according to the Generalized Extreme Value distribution (GEV)
3. **Determining the return values (e.g. 100 year Hs) using an appropriate distribution**

AM/GEV is a relatively straightforward method. For each WY, the maximum water level computed is stored and used to fit the GEV. Delft3D FM allows for the AM to be automatically stored for the entire computational grid. POT/GPD is a slightly more complicated and data-intense method. POT/GPD requires continuous modeled time series. The advantage is that individual storm peaks are identified and used to fit the extreme value distribution. This allows for more reliable estimates of more frequent events (Caires, 2016) and is therefore preferred. Regardless of the statistical method, simulated (historical) water levels were detrended to the existing mean sea level (the year 2020) using a least-squares linear fit to remove the historical sea-level rise signal. For more details on extreme value theory, one can refer to for example Coles (2001).

4.4.2 High water levels across the SF Bay

Figure 11 presents the results of an extreme value analysis based on AM/GEV and POT/GPD at Alameda station (NOAA #9414750). The estimated 100-year SWL varies between 9.2 and 10.5 m+NAVD88. Also, the analysis established that extreme water levels similarly match previous studies such as DHI (2013). For example, a 100-year SWL based on MIKE21 (green line) of 9.80 ft compares well to the Deflt3D FM computed median of 9.74 ft (blue line). The DHI study applied an AM/GEV method while this study used a POT/GPD. Differences between extremes determined via AM/GEV (red) and POT/GPD (blue) are limited for higher return periods but increase for more frequent storms. For example, the 2-year SWL is almost 8 inches lower based on the AM/GEV versus the POT/GPD. Arguably this is due to the incorrect representation of storm peaks in the AM method. For example, the year 1983 contains 2 of the highest peaks on record which cannot be taken into account in the AM method.

Figure 12 presents the spatial patterns of the 2-year and 100-year SWL based on the AM/GEV. Higher SWL can occur in South Bay due to tidal amplification. Hence, the Mean Higher High Water (MHHW) in most of the Bay is around 6 ft but exceeds 7 ft in the South Bay (e.g., at Coyote Creek). Figure 13, showing the extreme water levels for various return periods but based on POT/GPD, reveals similar trends. SWL with a return period of 1 year is the lowest at the San Francisco NOAA station (#9414290) and the Delta (e.g., Port Chicago NOAA station #9415144). The annual SWL is ~2 ft higher compared to the MHHW. Extreme water levels towards the Delta increase more for higher return periods than in South Bay (see Figure 13B). The 100-year SWL is around 3.5 ft higher than MHHW in South Bay while near the Delta the 100-year SWL is more than 4 ft higher than MHHW.

Moreover, uncertainty in the extreme SWL increases strongly with higher return periods, as shown by the increasing size of the 95% confidence interval (CI) in Figure 13. The CI for a yearly event is around 1 inch. For a 100-year event, this interval increases to more than 13 inches (~1 ft).

For more details and analysis on high water levels across the SF Bay, see Nederhoff et al. (2021). This report also comes with a shapefile presenting the results of extreme value analysis across the Bay for 1049 points within the Bay. This shapefile is accessible on www.d3d-baydelta.org. Extreme values for several stations across the Bay based on POT/GPD for the current sea level are presented in Table 8.

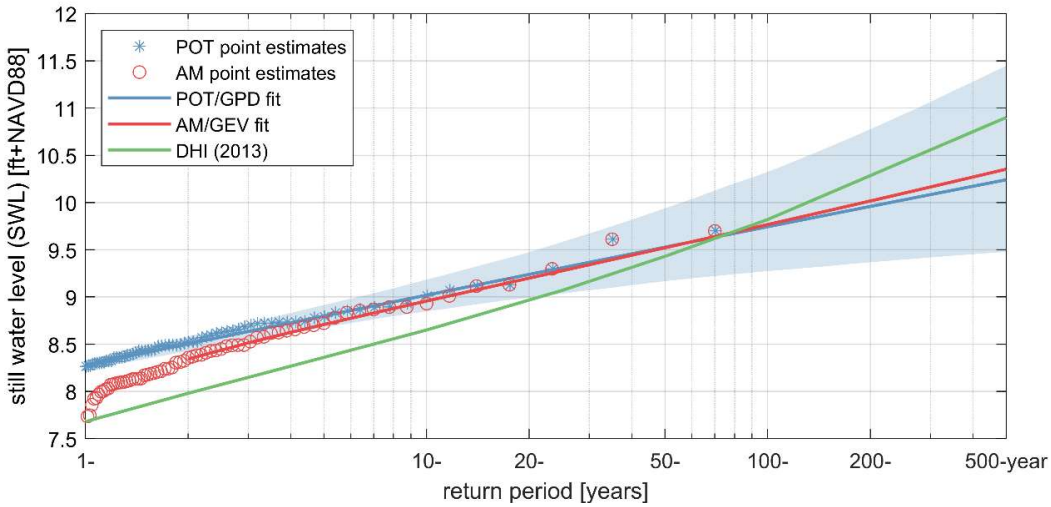

Figure 11. Extreme Value Analysis for Alameda (NOAA station #9414750) based on the POT/GPD (blue) and AM/GEV method (red) on the computed water levels of SFBD-SWL. The solid line represents the mean fit and the shading of the 95% CI. Circles and stars are point estimates used to fit the representative distribution. Results from DHI (2013) are presented in green.

Table 7. Extreme Value Analysis for Alameda (NOAA station #9414750) based on the Annual Maxima (AM) method, Peak-Over-Threshold Generalised Pareto (POT/GPD) on the computed water levels from Delft3D compared to DHI (2013) results.

Return period	AM	DHI (2013)	POT/GPD
1	7.73	7.68	8.28
2	8.36	7.98	8.50
5	8.72	8.36	8.80
10	8.93	8.65	9.02
20	9.13	8.93	9.24
50	9.61	9.43	9.53
100		9.82	9.74
200		10.09	9.96
500		10.90	10.24

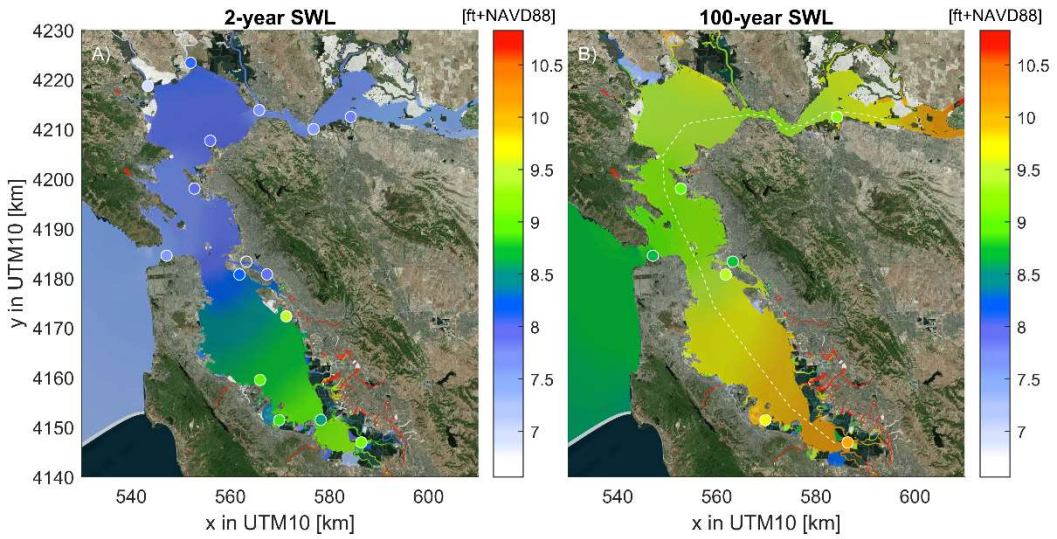

Figure 12. Extreme SWL with a 2-year return period (left; panel A) and 100-year return period (right; panel B) based on the AM/GEV. Circles are parametric estimates based on observed water levels. Only observations with 1/5 of the return period are presented (panel A: ~5 months; panel B: 20 years). The white dashed line is used to present extremes in Figure 13.

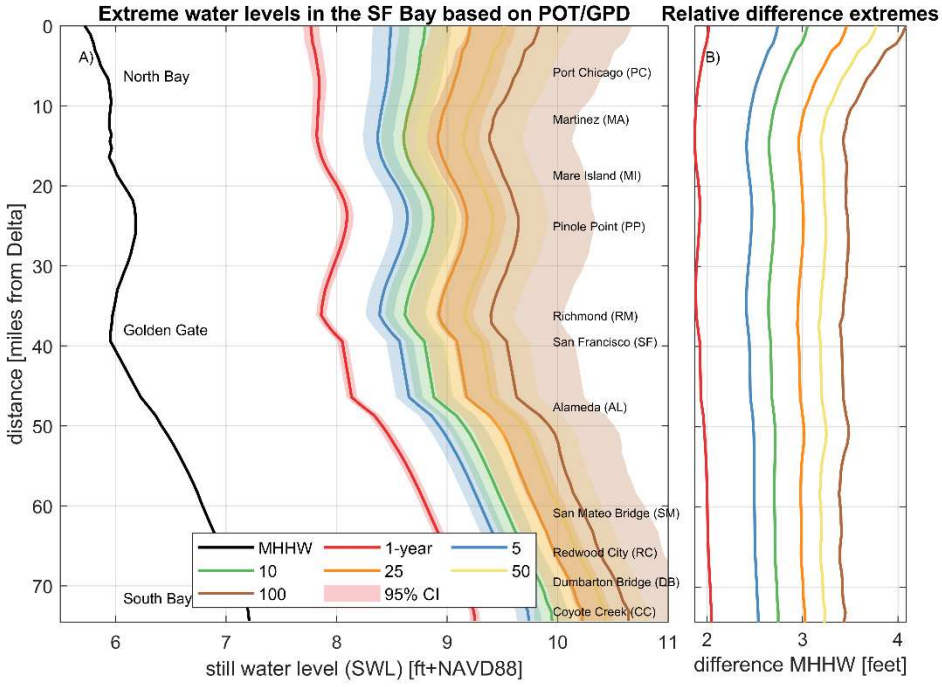

Figure 13. Panel A) Extreme water level as computed based on the model results in combination with POT/GPD, as a function of the distance from the Delta mouth (see Figure 1 for locations). Different colors represent different return periods. The solid lines represent the mean fits and the shadings of the 95% CI. Panel B) Relative difference in cm compared to MHHW for different return periods.

Table 8. Return values for SWL for different return periods in ft + NAVD88 based on POT/GPD for current sea level (the year 2020)

Name	#NOAA	RP: 1	RP: 2	RP: 5	RP: 10	RP: 25	RP: 50	RP: 100	RP: 500
San Francisco	9414290	7.61	7.84	8.14	8.37	8.69	8.92	9.15	9.71
San Mateo Bridge	9414458	8.79	9.02	9.28	9.51	9.78	9.97	10.17	10.66
Dumbarton Bridge	9414509	9.12	9.32	9.61	9.81	10.07	10.27	10.47	10.89
Redwood City	9414523	9.02	9.22	9.51	9.71	9.97	10.17	10.37	10.79
Coyote Creek	9414575	9.25	9.48	9.74	9.97	10.27	10.47	10.70	11.22
San Leandro Marina	9414688	8.73	8.92	9.22	9.45	9.71	9.91	10.10	10.56
Park Street Bridge	9414746	8.27	8.46	8.76	8.99	9.28	9.51	9.74	10.27
Alameda	9414750	8.27	8.50	8.79	9.02	9.32	9.51	9.74	10.24
Oakland Inner Harbor	9414764	8.17	8.40	8.69	8.92	9.19	9.42	9.61	10.07
Richmond	9414863	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
Point Reyes	9415020	7.45	7.68	7.94	8.17	8.46	8.66	8.89	9.38
San Pablo Bay	9415056	8.07	8.30	8.60	8.86	9.19	9.42	9.68	10.27
Martinez-Amorco Pier	9415102	7.84	8.10	8.40	8.66	8.99	9.22	9.48	10.07
Port Chicago	9415144	7.81	8.10	8.46	8.73	9.12	9.38	9.68	10.33
Mare Island	9415218	7.94	8.17	8.46	8.69	9.02	9.25	9.51	10.07
Petaluma River Entrance	9415252	8.17	8.40	8.73	8.99	9.28	9.51	9.78	10.30
Sonoma Creek Entrance	9415338	8.20	8.43	8.73	8.99	9.28	9.51	9.74	10.27

4.4.3 The effect of sea-level rise on extremes in the Bay

Sea-level rise (SLR) is caused primarily by two factors related to global warming: the added water from melting ice sheets and glaciers and the expansion of seawater as it warms. One of the longest continuous tidal records on the Pacific Ocean, 160 years of records at the San Francisco NOAA station #9414290 (Talke and Jay 2013), shows a historical sea level trend of 0.72 ft rise per century (Flick et al. 2003). The 70-year hydrodynamic simulation was re-run with the same historical boundary conditions such as wind, remote NTR, and fluvial discharges, and several sea-level rise scenarios to assess the influence of SLR on extreme water levels. The analysis considered 1.6 feet, 2.5 feet, 4.8 feet, and 10 feet of sea-level rise. The latter is the most extreme scenario (H++) for the year 2100 time horizon, according to the California Coastal Commission (2018). The sea-level rise of 4.8 feet is a low risk for the year 2130 time horizon and a medium-high risk for the year 2080 time horizon.

Table 9 presents the 100-year SWL for various sea-level rise scenarios based on model simulations and a POT/GPD analysis for several locations within the Bay. With increasing mean sea levels, extreme SWL starts to increase as well. This increase is less than linear because, with increasing water depths,

tidal amplification decreases. For example, 10 feet mean sea-level rise increases the 100-year return value on average with 9.74 feet (i.e. the difference SWL between 0 and 10 ft scenario in Table 8).

Table 9. Return values for SWL with a return period for 100 years in ft + NAVD88 based on POT/GPD for several sea- level rise scenarios (current sea level, 1.6 feet, 2.5 feet, 4.8 feet, and 10 feet which equates to 0, 0.49, 0.76, 1.46, 3.0 meter).

Name	#NOAA	0	1.6	2.5	4.8	10 feet
San Francisco	9414290	9.15	10.83	11.61	13.88	18.96
San Mateo Bridge	9414458	10.17	11.84	12.73	14.76	20.08
Dumbarton Bridge	9414509	10.47	12.01	12.70	14.96	20.41
Redwood City	9414523	10.37	12.27	12.73	14.90	20.21
Coyote Creek	9414575	10.70	12.24	12.89	14.93	20.67
San Leandro Marina	9414688	10.10	11.68	12.57	14.73	20.01
Park Street Bridge	9414746	9.74	11.45	12.24	14.44	19.59
Alameda	9414750	9.74	11.38	12.20	14.40	19.65
Oakland Inner Harbor	9414764	9.61	11.12	11.98	14.14	19.39
Richmond	9414863	9.42	12.30	11.81	14.14	19.26
Point Reyes	9415020	8.89	10.56	11.35	13.62	18.70
San Pablo Bay	9415056	9.68	11.32	12.14	14.11	19.46
Martinez-Amorco Pier	9415102	9.48	10.93	11.55	13.42	18.70
Port Chicago	9415144	9.68	10.96	11.58	13.58	18.80
Mare Island	9415218	9.51	11.06	11.78	13.71	19.06
Petaluma River Entrance	9415252	9.78	11.25	12.11	14.11	19.39
Sonoma Creek Entrance	9415338	9.74	11.38	12.11	14.14	19.59

4.4.4 Strategies

4.4.4.1 Scenarios evaluated

Human and natural systems can mitigate the impacts of global warming and SLR. However, mitigation requires adaptation strategies. This study included an initial exploration of three potential adaption options to demonstrate the model's application:

1. **Edge of development seawall:** One of the possible adaption strategies to mitigate the increase in flood hazard due to sea-level rise is developing a seawall across developed areas of the Bay. Figure 14 presents the extent of the seawall which is taken into account as an infinitely high weir in the simulation. The measure was implemented in the model based on the edge of development in 2020 based on aerial imagery (and not an actual plan) to determine the impact on extreme water levels and used for study purposes only.

2. **Salt pond recovery**: Another possibility is the recovery of salt ponds across the Bay by breaching existing levees, allowing for water storage (during extreme tidal or storm events). The idea of projects such as the South Bay Salt Pond Restoration Project is that more room is given to the Bay, reducing (extreme) water levels, improving flood protection, and providing numerous ecological benefits. Alameda Flood Control District mapped hundreds of possible restoration locations across the Bay. These locations were included in the model as ~1000 feet breaches with a depth of mean lower low water (MLLW). Figure 15 presents an example of possible levee breaches within South Bay. This chosen breach size ensured the connection of the salt pond with the Bay as water could flow in-and-out given the resolution of the model of ~300 feet. Once again, assumptions were made for the evaluation which could differ from the actual plans.
3. **Seawall + recovery**: The third option is to combine the seawall with the salt pond recovery.

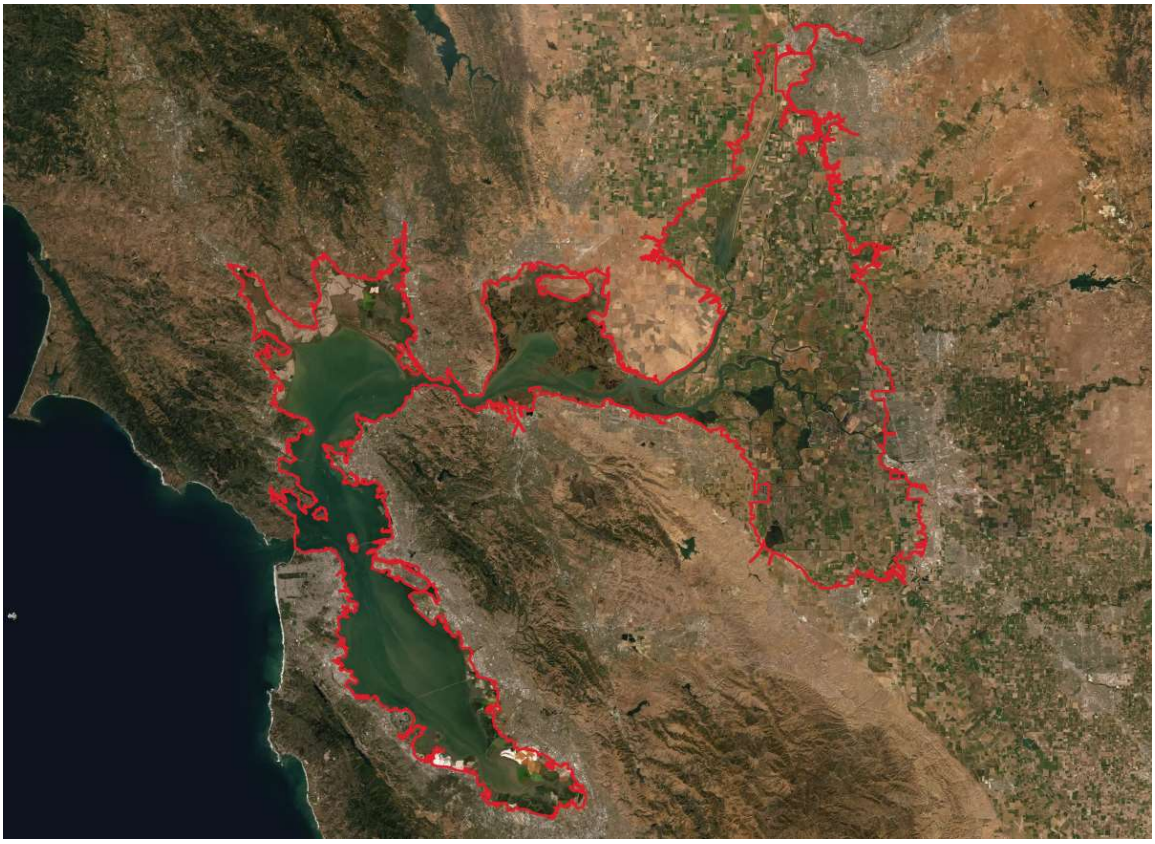

Figure 14. Bay-wide Seawall that protects the edge of the development of areas in 2020.

These three different options were evaluated against the reference (do nothing) for two sets of conditions:

1. **Deterministic run** for WY1983: this run quantifies changes to the annual maximum water level and changes in tidal propagation. The analysis considered eleven different sea-level rise scenarios ranging from 0 to 10 feet, the reference situation, and the three adaptation options (11x4). This results in 44 individual WY simulations.
2. **Probabilistic run** for 1950-2019 considering the reference situation, the three adaptation options, and one sea-level rise scenario of 4.8 feet (70x4=280).

This results in a total number of year simulations of 324 (44 + 280). This analysis allows for the quantification of the initial hydrodynamic impacts. However, long-term impacts are not known since the morphodynamic change has not been considered. For example, the salt pond recovery might get filled in again by deposition for Bay suspended sediment or nearby fluvial systems.

Figure 15. Example of identified possible levee breaches in South Bay. The pink boxes represent the breaching locations. The middle of each breach was used in combination with a 1000-foot wide circle to adjust the model bathymetry and weir. The depth is based on mean lower low water (MLLW).

4.4.4.2 Deterministic results

Figure 16 presents the maximum computed water level for WY1983 with 4 ft of SLR. Model simulations indicate that this seawall would *increase* the water levels across the Bay up to 0.5 feet (6 inches). Salt pond recovery both with and without the seawall *decreases* the water level across the Bay compared to the current situation up to 0.5 feet. Changes in tidal propagation drive these differences in extremes. For example, Figure 17 presents M2 amplitude with 4.8 feet of sea-level rise. Tidal amplitudes are largest with the seawall scenario (red) but relatively similar to the reference scenario (blue), albeit slightly higher. On the other hand, large-scale salt pond recovery (with or without seawall) decreases the tidal amplitudes by up to 0.3 feet (~4 inches) when compared to the current scenario. The magnitude of the water level decrease varies from location to location.

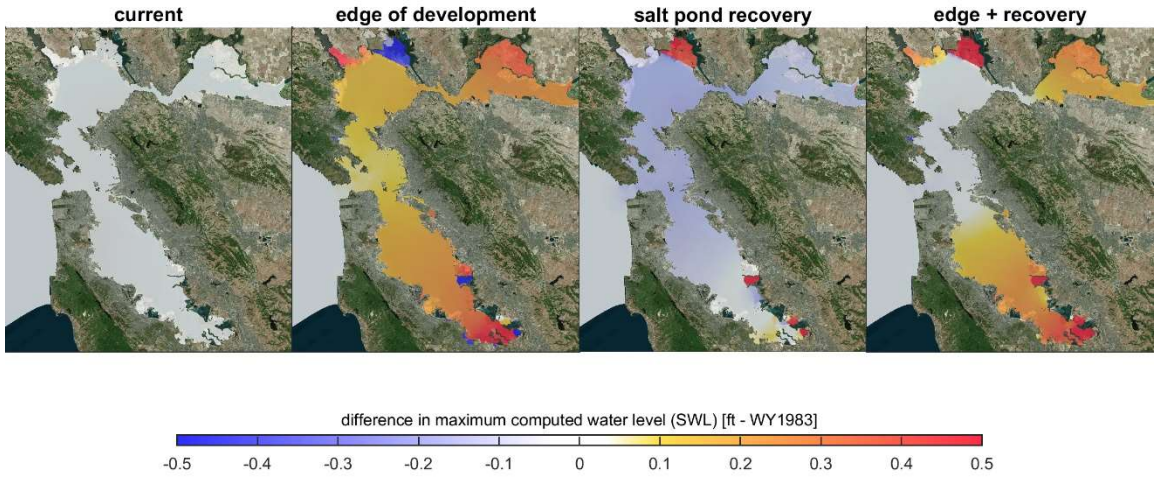

Figure 16. Effect of different adaption measures on the maximum computed water level for WY1983 with 4 feet of SLR.

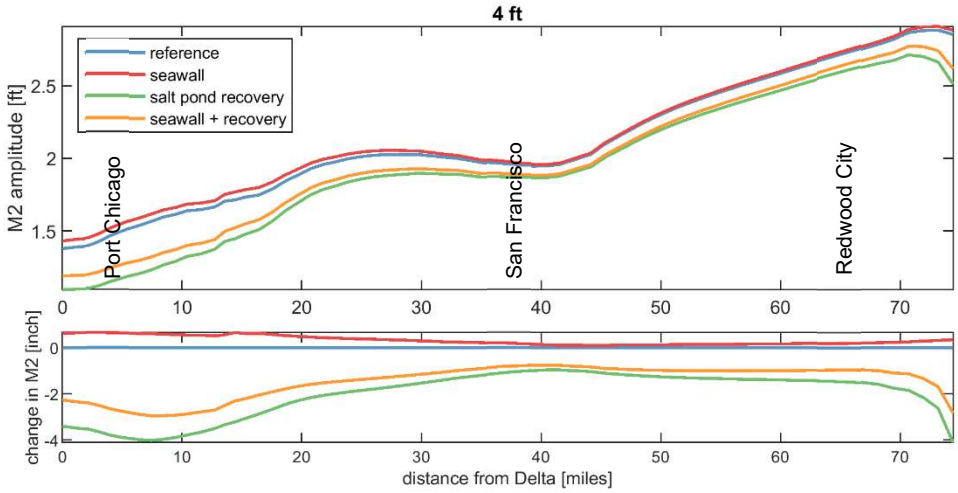

Figure 17. M2 tidal amplitude in feet at the centerline of the SF Bay. Top panel M2 amplitude. Bottom panel: difference of M2 amplitude compared to the reference case without SLR in inches.

Figure 18 presents how the tidal amplitudes vary spatially due to sea-level rise. For M2 there is a trend of decreasing amplitudes with an increasing amount of sea-level rise. This is due to the reduction of tidal amplification since the Bay gets deeper and deeper. Model results indicate that for sea-level rise values up to 5 and 8 feet, the seawall option with salt pond recovery (orange) and recovery-only scenario (green) results in a reduction in tidal amplitude compared to the reference scenario. On the other hand, seawalls to protect developed areas cause increased M2 amplitudes with rising sea levels. For an SLR of 10 feet, the increase amounts to ~2 inches.

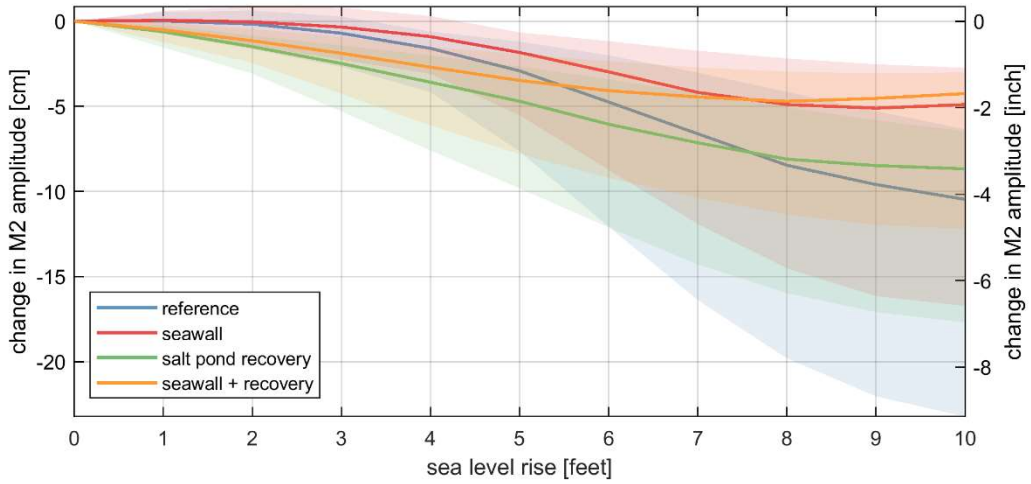

Figure 18. Change in M2 amplitude compared to the reference situation without SLR. The solid line is the median value, and the shading is 95% CI which represents the spatial variability.

4.4.4.3 Probabilistic results

Figure 19 presents the POT/GPD results for the four different scenarios evaluated in the probabilistic analysis. Based on this analysis, salt pond recovery seems to mitigate some flood hazards during extreme events. The recovery of salt ponds reduces water levels by on average (based on all stations and return periods) 0.8 inch. However, large variability exists from station to station. On the other hand, the seawall increases water levels. Again, averaged over all return periods and stations, the seawall increases water levels by +2.5 inches. The seawall combined with salt pond recovery can mitigate some of the increased extremes, but on average, an increase of water levels of +1.8 inch would still occur.

Figures 20 to 22 show the extreme water levels as a function of the return period for various locations, using the AM/GEV approach. Model results indicate that the seawall increases extremes for large parts of the Bay but mainly for lower South Bay and North Bay. This difference compared to the reference simulations also seems to increase with higher return periods. Salt pond recovery, on the other hand, reduces water levels across the Bay. This reduction in SWL does decrease for high return periods. Again, the seawall combined with salt pond recovery may mitigate some increased extremes. However, water levels still increase in lower South Bay and North Bay.

This analysis demonstrates that the model can be used to assess different adaptation strategies. By adjusting bed level and including man-made structures the impacts on water levels can be evaluated. Long-term different effects will occur as a result of feedback between the hydrodynamic and morphology (e.g. eroding bed due to increased flow) but are not included in this analysis.

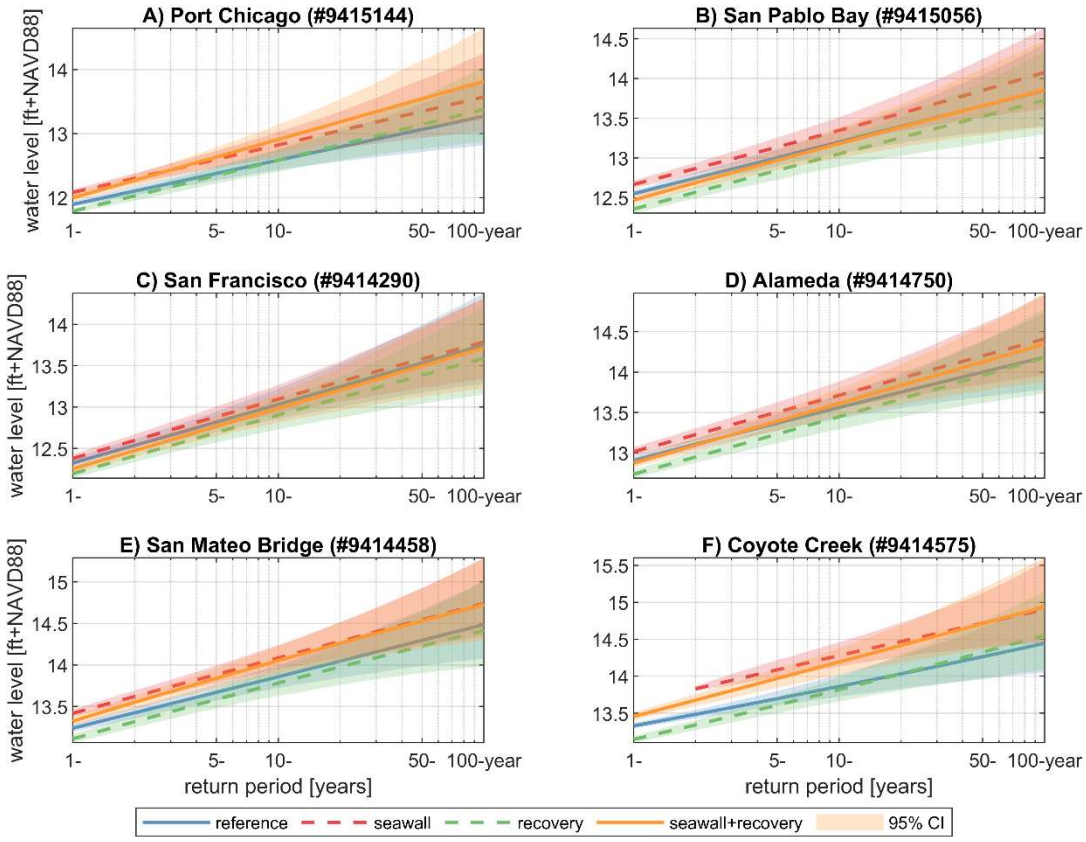

Figure 19. Extreme water level as computed based on model results in combination with POT/GPD for different model simulations: reference simulation (blue), seawall around the edge of development (red), salt pond recovery (green), and seawall + recovery (orange). The solid line represents the mean fit and the shading of the 95% CI. Stations are listed from North to South. Note that these are results with an SLR of 4.8 feet.

Table 10. Extreme water level with a return period of 10 years as computed based on model results in combination with POT/GPD for different model simulations. Note that these are results with an SLR of 4.8 feet.

	reference	the difference with current [inches]		
Name	**10 years [ft+NAVD88]**	**seawall**	**recovery**	**Seawall+recovery**
Port Chicago	12.6	2.9	0.0	3.9
San Pablo Bay	13.2	1.8	-1.8	-0.3
San Francisco	13.0	0.8	-1.6	-0.6
Alameda	13.6	1.8	-1.4	0.6
San Mateo	13.9	2.7	-0.9	2.3
Coyote Creek	13.9	5.0	-0.5	4.0

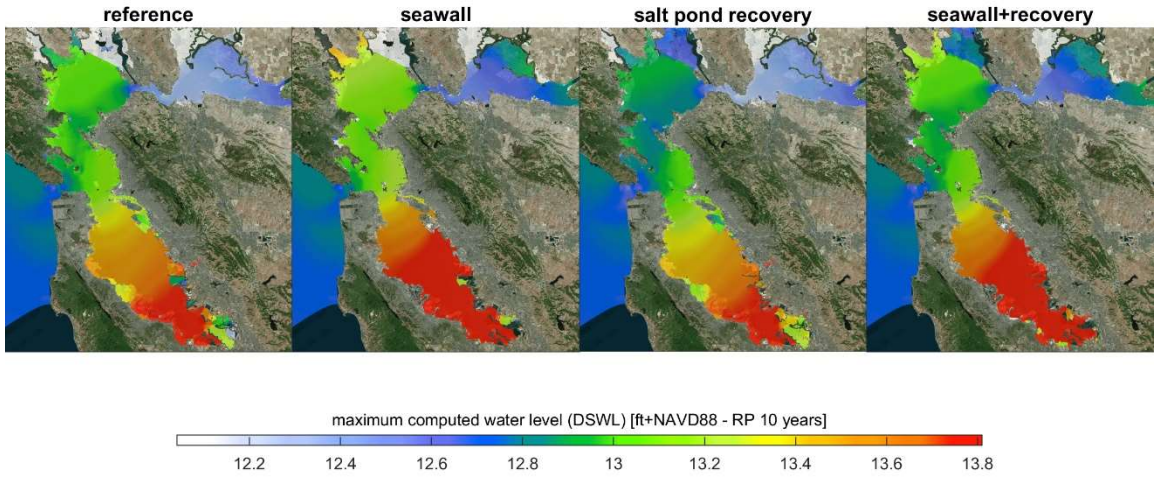

Figure 20. Maximum SWL on AM/GEV for return period 10 years with 4.8 feet SLR.

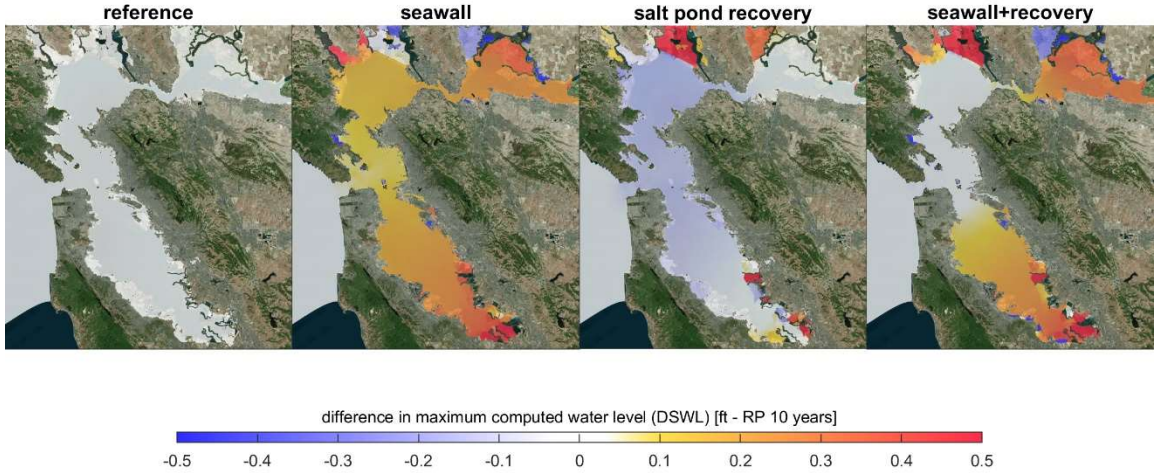

Figure 21. The difference in maximum SWL is based on AM/GEV for a return period of 10 years with 4.8 feet SLR.

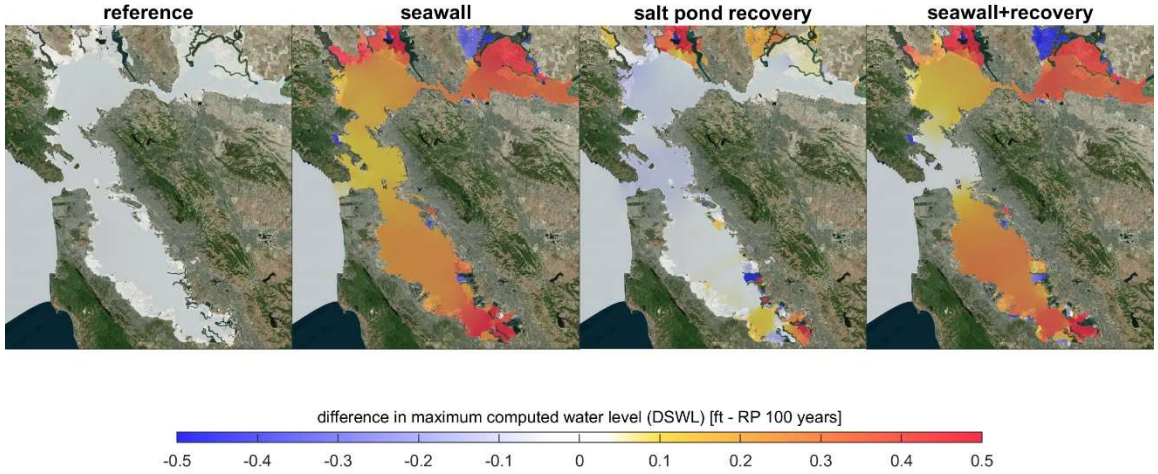

Figure 22. The difference in maximum SWL is based on AM/GEV for a return period of 100 years with 4.8 feet SLR.

5 SWAN (waves)

Chapter 5 focuses exclusively on the wave modeling work with SWAN. While the focus of this study was on the simulation of SWL, waves are of (limited) importance in estimating total water levels and associated flood risk. To quantify their importance, a SWAN model was created that produces a continuous time series of wave parameters in the Bay. This time series of waves across the Bay allowed for quantifying wave-driven processes' effects on the water level.

5.1 Model set-up

SWAN (Simulating WAves Nearshore; Booij et al., 1999) is a state-of-the-art third-generation wave model which computes random, short-crested, wind-generated waves in coastal regions and inland waters. It is fully spectral in frequency and direction. The developer, Delft University of Technology, The Netherlands, continuously improves and maintains the software.

This study used three levels of domains; an overall (6.2 miles; 10 km), intermediate (0.6 miles; 1 km), and detailed (1000 feet; 300 meters) domains were applied (Figure 21). The model offshore boundary conditions are located in the Pacific ocean with data-assimilated wave parameters (height, period, and direction) from ERA5. Moreover, it includes locally-generated waves by ERA5 wind.

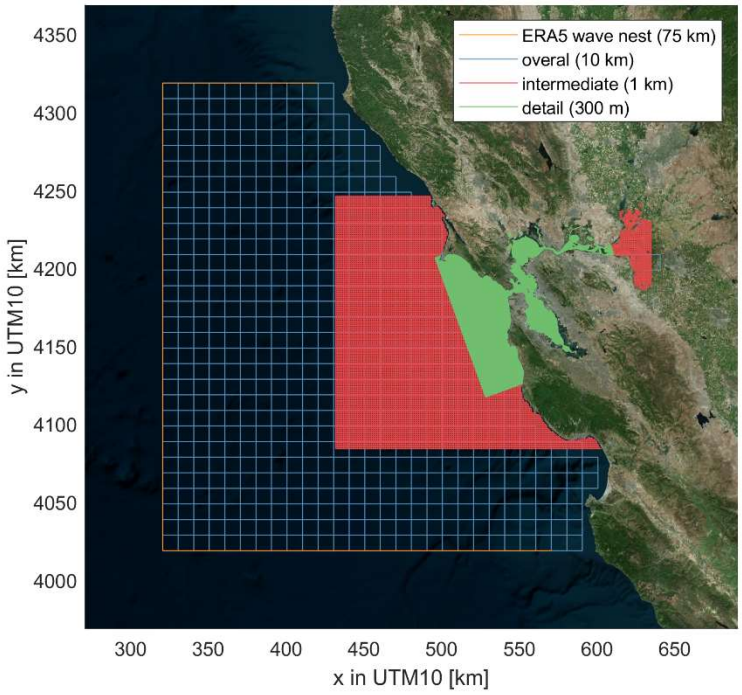

Figure 23. Model domains for the SWAN wave modeling of SF Bay.

5.2 Model results

The model schematization was applied to continuously compute waves across the Bay from 1979-2019. The result was a three-hourly time series of wave parameters across the Bay for almost 40 years. These results can help to quantify the importance of wave-driven processes on top of the SWL. Figure 24

presents the return values for the significant wave height for a return period of 1- and 100 years based on the continuous computed time series and a POT/GPD analysis. Wave heights are generally the largest in the Pacific and (partly) penetrate through the Golden Gate inlet. Model simulations indicate that wave height in the Pacific exceeds 16 feet yearly while the 100-year wave height approximates 33 feet. Waves in the Bay are much smaller. In Central Bay, wave height may reach up to 5 feet, but wave heights are less than ~3 feet (yearly) and 4 feet (100-year) for most of the Bay. Also, wave heights in North Bay and Central Bay are much smaller are all locally generated by wind, and have lower wave periods (not shown).

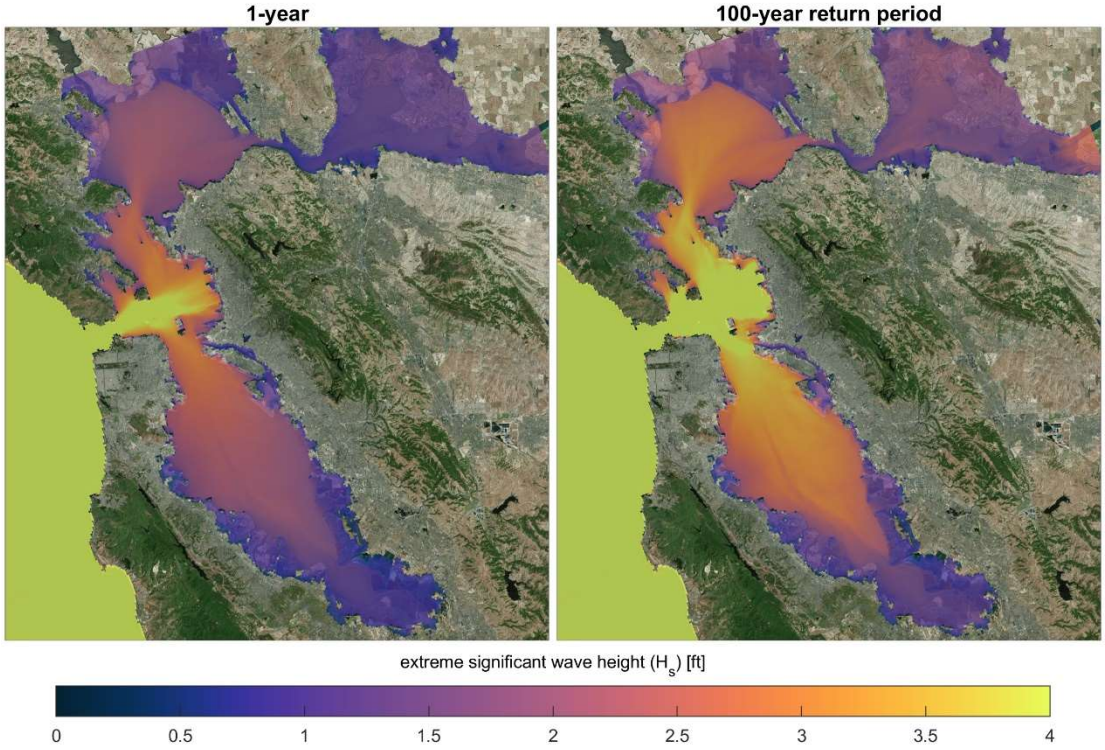

Figure 24. Significant wave height (Hs) in the SF Bay with a return period of 1 (left) and 100-years (right panel)

5.3 Estimate of wave-driven process across the Bay

Total Water Level (TWL) is the result of SWL, wave set-up, and wave swash. Wave set-up and wave swash together are called wave runup. Numerous empirical formulations exist that relate wave parameters such as wave height to wave runup (R2%). This study used the Stockdon et al. (2006) formula to estimate wave runup across the Bay.

Figure 25 presents the yearly and 100-year computed wave runup based on a POT/GPD analysis on the continuous runup time series. Patterns are relatively similar to Figure 24. The largest wave-driven runup occurs in Central Bay, where swell from the Pacific Ocean can penetrate through the Golden Gate inlet. Locally, computations indicate that the yearly runup value exceeds 1.5 feet. In the same area, the yearly SWL approximates 8.2 ft+NAVD88. This results in a Total Water Level (TWL) of 9.7 ft and is thus 1.5 feet *higher* than computed based on the hydrodynamic simulation only. For areas where waves are less high, the runup decreases. For example, in South Bay, the yearly and 100-year runup is estimated to be around ~0.6 ft compared to an extreme SWL of 10.5 ft.

The relative contribution compared of SWL and R2% to TWL varies across the Bay. Figure 26

presents the estimated relative contribution for all return values by dividing the R2% by the TWL compared to MSL. The highest contribution of waves to the TWL is in Central Bay, where this contribution can exceed 25%. For North and South Bay, waves are of less importance, with a relative contribution ranging from 5-10% (i.e. SWL drives more than 90% of the TWL).

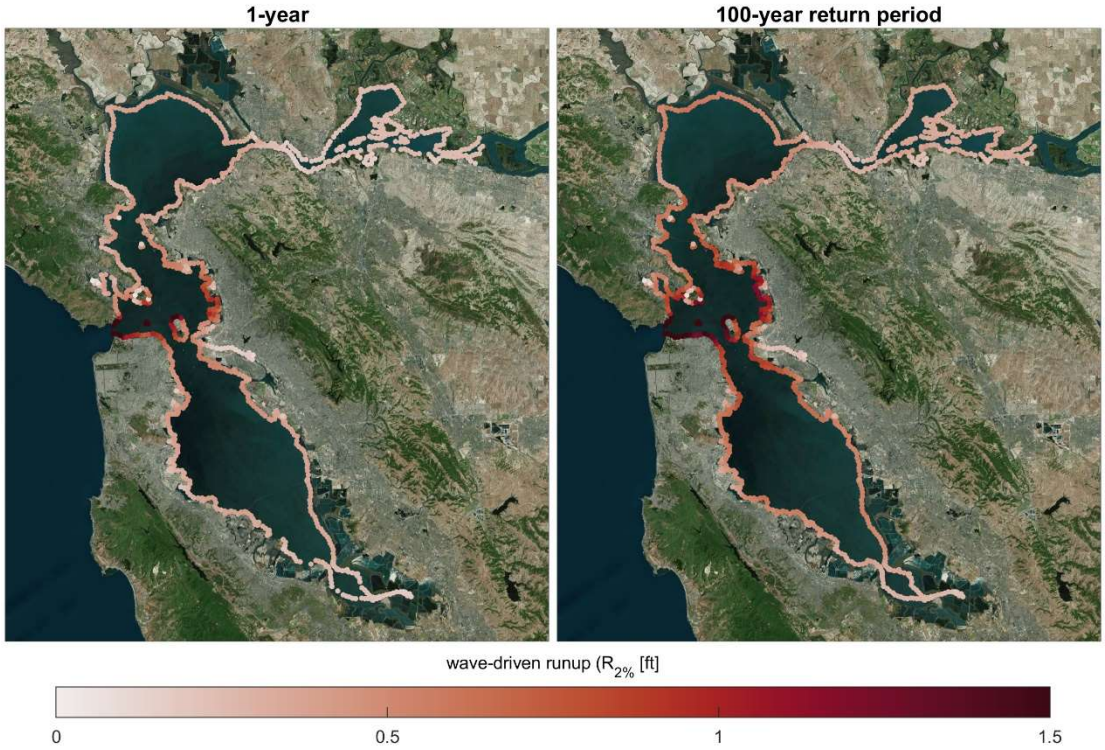

Figure 25. The wave-driven runup in the SF Bay with a return period of 1 (left) and 100-years (right panel)

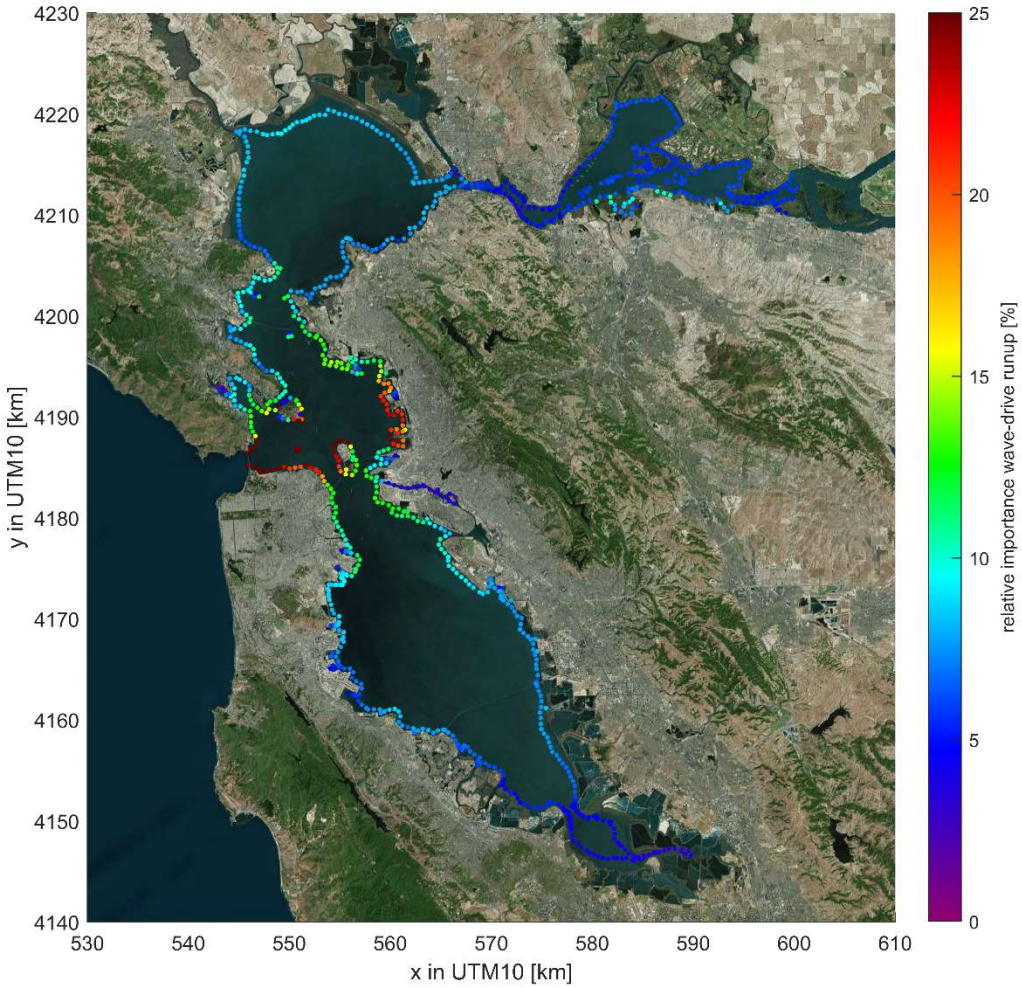

Figure 26. The estimated relative contribution of wave-driven processes to the TWL with a return period of 100 years.

6 Conclusions and recommendations

6.1 Conclusions

Alameda Flood Control District commissioned this work to have an open-source model that can be used to:

1. Simulate still water levels (SWL; tide and NTR) in the Bay, Delta channels, and local tributaries, and;
2. To hindcast SWL with sufficient high accuracy and for a sufficient long-term period to perform reliable extreme value analysis (EVA) that can be used for coastal flood determination for Alameda County and the rest of the San Francisco Bay (i.e. Bay; Suisun Bay, San Pablo Bay, Central Bay, and South Bay)

This work is the first step towards a consistent approach for modeling, planning, and developing mitigation alternatives to reduce or eliminate the impacts of existing flooding and future flooding and Sea Level Rise (SLR) in SF Bay.

The model delivers accurate results when calculating water levels. By tweaking tidal elements and bottom friction slightly, it accurately mirrors the Bay's water levels (both tide and surge) with a root-mean-square-error (RMSE) of 3.1 inches and a scatter index (SCI) of 6.5%. The discrepancies observed arise from inaccuracies in tide and NTR measurements. The least errors are noticed near San Francisco, but they tend to rise towards South Bay and the Delta. Running the model for a complete year typically requires 2-3 days, facilitating the detailed computation of the 70-year history.

Using a 70-year hindcast simulation, we deduced extreme water level values and their probable recurrence intervals. The POT/GPD technique allowed for accurate projections of extreme events across the Bay. The anticipated 100-year SWL ranges from 9 to 10.7 ft+NAVD88, with South Bay and the Delta recording the higher levels. Our results align closely with prior research, such as the DHI study in 2013. For those interested, the complete modeling data, including our extreme value analysis, can be accessed at www.d3d-baydelta.org. Evaluations indicate that as sea levels rise, so do extreme water levels, though at a rate slightly below a linear progression. This is due to the reduced tidal amplification with greater water depths. A preliminary look into protective measures like new seawalls in the Bay's urban sectors reveals a rise in tidal amplification, causing a 0.5-foot (6 inches) surge in the SWL. However, restoring salt ponds can counteract some of these negative impacts.

6.2 Recommendations

The present model schematization connects the coastal San Francisco Bay with the fluvial Sacramento–San Joaquin Delta and local tributaries in the Bay. This integrated modeling system for SWL allows for the detailed computation of compound flooding across the estuary. However, calibration and validation for the Delta and local tributaries were not part of the scope of this study. The current schematization misses relevant information such as hydraulic structures and human operations, which is necessary to use model results in these areas. However, an initial verification showed reasonable model skills in the Delta (uRMSE of around 8 inches) and local tributaries in the Bay. We recommend improving the 1D network in the tributaries of the Bay and Delta as one of the following steps of this work. Moreover, this work has simulated conditions until 2019. However, December 2022 – January 2023 was one of the more recent extreme storm events within the SF Bay which can be used for additional validation to increase the confidence in this modeling system.

The joint probability of riverine and coastal extremes refers to the likelihood of experiencing both riverine and coastal flooding events at the same time. These events can devastate coastal communities, leading to loss of life, property damage, and economic disruption. Therefore, understanding the joint probability of these events is critical for risk assessment and planning for coastal resilience. Our recommendation is to perform a detailed examination of this joint probability, leveraging a blend of statistical analysis and numerical modeling.

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A Master definition unstructured (mdu) file used in the Delft3D Flexible Mesh (Delft3D FM)

```
# Generated on 12:17:29, 10-01-2020
# Deltares, D-Flow FM Version 1.2.88.65553M, Dec 03 2019, 20:52:21
# Source:https://svn.oss.deltares.nl/repos/delft3d/trunk/

[General]
Program                 = D-Flow FM          # Program
Version                 = 1.2.88.65553M      # Version number of computational kernel
fileType                = modelDef           # File type. Do not edit this.
fileVersion             = 1.09               # File format version (do not edit this)
AutoStart               = 0                  # Autostart simulation
ModelSpecific           =                    # Optional
PathsRelativeToParent   = 0                  # Default: 0.

[geometry]
NetFile                 = ./network/merged043_utm10_net.nc
GridEnclosureFile       =                    # Enclosure file to clip outer parts from the grid *.pol
BedlevelFile            =                    # Bedlevels points file e.g. *.xyz
DryPointsFile           =                    # Dry points file *.x
WaterLevIniFile         =                    # Initial water levels sample file *.xyz
LandBoundaryFile        =                    # Land boundaries file *.ldb, used for visualization
ThinDamFile             =                    # Polyline file *_thd.pli, containing thin dams
Cutcelllist             =                    # File with names of cutcell polygons, e.g. cutcellpolygons.lst
FixedWeirFile           = ./weirs/1d_channel.pliz
PillarFile              =                    # Polyline file *_pillar.pliz
Gulliesfile             =                    # Polyline file *_gul.pliz,
Roofsfile               =                    # Polyline file *_rof.pliz,
VertplizFile            =                    # Vertical layering file *_vlay.pliz
ProflocFile             = ./transects/profloc.xyz       # Channel profile location file
ProfdefFile             = ./transects/profdef.txt       # Channel profile definition file
ProfdefxyzFile          = ./transects/profdefxyz.pliz   # Channel profile definition file
IniFieldFile            =            # Initial values and parameter fields file
Uniformwidth1D          = 60.        # Uniform width for channel profiles not specified by profloc
Uniformheight1D         = 3.         # Uniform height for channel profiles not specified by profloc
Uniformtyp1Dstreetinlets = -2        # Uniform type street inlets
Uniformtyp1Droofgutterpipes = -2     # Uniform type roof gutter pipes
Dxwuimin2D              = 0.         # Smallest fraction dx/wu , set dx > Dxwuimin2D*wu, Default = 0.1
ManholeFile             =            # File *.ini containing manholes
PipeFile                =            # File *.pliz containing pipe-based 'culverts'
ShipdefFile             =            # File *.shd containing ship definitions
WaterLevIni             = 0.         # Initial water level at missing s0 values
waterdepthini1D         = 2.         # Initial waterdepth in 1D
BedlevUni               = -5.        # Uniform bed level used at missing z values if BedlevType > 2
BedlevType              = 3          # Bathymetry specification
```

```
PartitionFile                =                  # Domain partition polygon file *_part.pol for parallel run
AngLat                       = 39.996           # Angle of latitude S-N (deg), 0: no Coriolis
AngLon                       = 124.9968.        # Angle of longitude E-W (deg), 0: Greenwich
Conveyance2D                 = 3                # -1: R=HU,0: R=H, 1: R=A/P, 2: K=analytic-1D conv, 3: K=analytic-2D
Slotw2D                      = 0.               # -
Sillheightmin                = 0.5              # Weir treatment only if both sills larger than this value (m)
AllowBndAtBifurcation        = 1                # Allow 1d boundary node when connecting branch
Nonlin1D                     = 0                # Non-linear 1D volumes, 1 = pipes open, 2 = pipes closed

[numerics]
CFLMax                       = 0.7              # Maximum Courant number
AdvecType                    = 33               # Advection type
TimeStepType                 = 2                # Time step handling
Icoriolistype                = 5                # 0=No, 5=default
Newcorio                     = 0                # 0=prior to 27-11-2019
Limtypmom                    = 4                # Limiter type for cell center advection velocity
Limtypsa                     = 4                # Limiter type for salinity transport
TransportMethod              = 1                # Transport method (0: Herman's method, 1: transport module)
TransportTimestepping        = 1                # Timestepping method in Transport module, 0 = global, 1 = local
TransportAutoTimestep        =
Vertadvtypsal                = 6                # Vertical advection type for salinity
Vertadvtyptem                = 6                # Vertical advection type for temperature (0: none, 1: upwind explicit, 2:
Vertadvtypmom                = 3                # Vertical advection type for u1:
Zlayercenterbedvel           = 1                # reconstruction of center velocity at half closed bedcells
Icgsolver                    = 4                # Solver type
Noderivedtypes               = 5                # 0=use der. types. , 1 = less, 2 = lesser, 5 = also dealloc der. types
FixedWeirScheme              = 6                # Fixed weir scheme
FixedWeirContraction         = 1.               # Fixed weir flow width contraction factor
Fixedweirfrictscheme         = 1                # Fixed weir friction scheme
Fixedweirtopwidth            = 3.               # Uniform width of the groyne part of fixed weirs
Fixedweirtopfrictcoef        = -999.            # Uniform friction coefficient of the groyne part of fixed weirs
Fixedweirtalud               = 4.               # Uniform talud slope of fixed weirs
Izbndpos                     = 1                # Position of z boundary
Tlfsmo                       = 0.               # Fourier smoothing time (s) on water level boundaries
Logprofkepsbndin             = 0                # inflow: 0=0 keps, 1 = log keps inflow, 2 = log keps in and outflow
Slopedrop2D                  = 0.               # Apply drop losses only if local bed slope > Slopedrop2D
Jbasqbnddownwindhs           = 1                # Water depth scheme at discharge boundaries
cstbnd                       = 0                # Delft-3D type velocity treatment near boundaries
Epshu                        = 1.d-4            # Threshold water depth for wet and dry cells
jaupwindsrc                  = 1                # 1st-order upwind advection at sources/sinks (1) or higher-order (0)
jasfer3D                     = 0                # corrections for spherical coordinates

[physics]
UnifFrictCoef                = 2.3d-2           # Uniform friction coefficient (0: no friction)
UnifFrictType                = 1                # Uniform friction type (0: Chezy, 1: Manning
UnifFrictCoef1D              = 2.3d-2           # Uniform friction coefficient in 1D links (0: no friction)
UnifFrictCoef1D2D            = 2.3d-2           # Uniform friction coefficient in 1D links (0: no friction)
UnifFrictCoefLin             = 0.               # Uniform linear friction coefficient (0: no friction)
UnifFrictCoef1DgrLay         = 5.d-2            # Uniform ground layer friction coefficient
Vicouv                       = 1.               # Uniform horizontal eddy viscosity (m2/s)
```

```
Dicouv                                  = 1.          # Uniform horizontal eddy diffusivity (m2/s)
Smagorinsky                             = 0.          # Smagorinsky factor in horizontal turbulence, e.g. 0.15
Elder                                   = 0.          # Elder factor in horizontal turbulence
irov                                    = 0           # 0=free slip, 1 = partial slip using wall_ks
wall_ks                                 = 0.          # Wall roughness type (0: free slip, 1: partial slip using wall_ks)
Rhomean                                 = 1025.       # Average water density (kg/m3)
Idensform                               = 2           # Density calulation (0: uniform, 1: Eckart, 2: Unesco, 3: baroclinic case)
Ag                                      = 9.81        # Gravitational acceleration
TidalForcing                            = 1           # Tidal forcing, if jsferic=1 (0: no, 1: yes)
SelfAttractionLoading                   = 0           # Self attraction and loading (0=no, 1=yes, 2=only self attraction)
SelfAttractionLoading_correct_wl_with_ini = 0         # correct water level with initial water level in Self attraction
ITcap                                   = 0.          # Upper limit on internal tides dissipation (W/m^2)
VillemonteCD1                           = 1.          # Calibration coefficient for Villemonte
VillemonteCD2                           = 10.         # Calibration coefficient for Villemonte.
Salinity                                = 0           # Include salinity, (0=no, 1=yes)
Temperature                             = 0           # Include temperature (0: no, 1: only transport, 3: excess model of D3D, 5:
composite (ocean) model)
SecondaryFlow                           = 0           # Secondary flow (0: no, 1: yes)

[wind]
ICdtyp                                  = 3                      # Wind drag coefficient type (3=S&B (3 pts)
Cdbreakpoints                           = 1.d-3 2.5d-3 1.5d-3    # Wind drag coefficient break points
Windspeedbreakpoints                    = 0. 28. 50.             # Wind speed break points (m/s)
Relativewind                            = 0                      # Wind speed relative to top-layer water speed, 1=yes, 0 = no)
Rhoair                                  = 1.2                    # Air density (kg/m3)
PavBnd                                  = 0.                     # Average air pressure on open boundaries (N/m2)
Pavini                                  = 0.                     # Average air pressure for initial water level correction
Stericcorrection                        = 0                      # Steric correction on waterlevel bnds,

[time]
RefDate                 = 20180901      # Reference date (yyyymmdd)
Tzone                   = 0.            # Time zone assigned to input time series
DtUser                  = 60.           # Time interval (s) for external forcing update
DtNodal                 = 600.          # Time interval (s) for updating nodal factors in astronomical boundary conditions
DtMax                   = 60.           # Maximal computation timestep (s)
Dtfacmax                = 1.1           # Max timestep increase factor ( )
DtInit                  = 1.            # Initial computation timestep (s)
Timestepanalysis        = 0             # 0=no, 1=see file *.steps
Tunit                   = S             # Time unit for start/stop times (D, H, M or S)
TStart                  = 2419200.      # Start time w.r.t. RefDate (in TUnit)
TStop                   = 34128000.     # Stop  time w.r.t. RefDate (in TUnit)

[restart]
RestartFile             =               # Restart netcdf-file, either *_rst.nc or *_map.nc
RestartDateTime         = yyyymmddhhmmss  # Restart date and time (yyyymmddhhmmss) when restarting from
*_map.nc

[external forcing]
ExtForceFile            = forcing_old_with_meteo.ext    # Old format for external forcings file
ExtForceFileNew         = forcing_new.ext               # New format for external forcings file
```

```
[output]
OutputDir                =                # Output directory of map-, his-, rst-, dat- and timings-files, default:
FlowGeomFile             =                # Flow geometry NetCDF *_flowgeom.nc
ObsFile                  =  ./observations/usgs_coops_obs.xyn
                            ./observations/outfall_obs.xyn
                            ./observations/tidal_analysis_obs.xyn
                            ./observations/storms_entirebay_obs.xyn
CrsFile                  = FlowFM_crs.pli      # Polyline file *_crs.pli defining observation cross sections
FouFile                  = SFBD.fou            # Fourier analysis input file *.fou
FouUpdateStep            = 0                   # Fourier update step type: 0=every user time step
HisFile                  =                     # HisFile name *_his.nc
MapFile                  =                     # MapFile name *_map.nc
HisInterval              = 600.                # History output times, given as "interval" "start period" "end
XLSInterval              = 0.                  # Interval (s) between XLS history
MapInterval              = 0.                  # Map file output, given as "interval" "start period" "end period" (s)
RstInterval              = 0                   # Restart file output times,
WaqOutputDir             =                     # Output directory of WAQ communication
WaqInterval              = 0.                  # DELWAQ output times
WaqHorAggr               =                     # DELWAQ output horizontal aggregation file (*.dwq)
WaqVertAggr              =                     # DELWAQ output vertical aggregation file (*.vag)
ClassMapInterval         = 0.                  # Class map output times, given as "interval" "start period" "
ClassMapFile             =                     # ClassMapFile name *_clm.nc
StatsInterval            = -60.                # Screen step output interval in seconds simulation time,
TimingsInterval          = 86400.              # Timings statistics output interval
TimeSplitInterval        = 0 s                 # Time splitting interval
MapFormat                = 3                   # Map file format, 1: netCDF, 2: Tecplot, 3: netCFD and Tecplot
NcFormat                 = 3                   # Format for all NetCDF output files (3: classic
Wrihis_structure_gen       = 0          # Write general structure parameters to his file (1: yes, 0: no)
Wrihis_structure_dam       = 0          # Write dam parameters to his file (1: yes, 0: no)
Wrihis_structure_pump      = 0          # Write pump parameters to his file (1: yes, 0: no)
Wrihis_structure_gate      = 0          # Write gate parameters to his file (1: yes, 0: no)
Wrihis_structure_weir      = 0          # Write weir parameters to his file (1: yes, 0: no)
Wrihis_structure_orifice   = 0          # Write orifice parameters to his file (1: yes, 0: no)
Wrihis_structure_bridge    = 0          # Write bridge parameters to his file (1: yes, 0: no)
Wrihis_structure_culvert    = 0         # Write culvert parameters to his file (1: yes, 0: no)
Wrihis_structure_damBreak  = 0          # Write dam break parameters to his file (1: yes, 0: no)
Wrihis_structure_uniWeir   = 0          # Write universal weir parameters to his file (1: yes, 0: no)
Wrihis_structure_compound  = 0          # Write compound structure parameters to his file (1: yes, 0: no)
Wrihis_temperature         = 0          # Write temperature to his file (1: yes, 0: no)
Wrihis_heat_fluxes         = 0          # Write heat fluxes to his file (1: yes, 0: no)
Wrihis_salinity            = 0          # Write salinity to his file (1: yes, 0: no)
Wrimap_windstress           = 0         # Write wind stress to map file (1: yes, 0: no)
Writepart_domain           = 1          # Write partition domain info. for postprocessing
WriteDFMinterpretedvalues  = 0          # Write DFMinterpretedvalues (1: yes, 0: no)
MapOutputTimeVector **     =            # File (*.mpt) containing fixed map output times (s) w.r.t. RefDate
FullGridOutput             = 0          # Full grid output mode (0: compact, 1: full time-varying grid data)
EulerVelocities            = 0          # Euler velocities output (0: GLM, 1: Euler velocities)
Wrirst_bnd                 = 1          # Write waterlevel, bedlevel and coordinates of boundaries to restart
Wrimap_flowarea_au         = 1          # Write flow areas au to map file (1: yes, 0: no)  (natte oppervlak)
```

```
Wrimap_flow_flux_q1          = 1          # Write flow flux to map file (1: yes, 0: no) (debiet)
Wrihis_wind                  = 0
Wrihis_waterdepth            = 0
Wrihis_velocity_vector       = 0

[processes]
SubstanceFile                =            # substance file
AdditionalHistoryOutputFile  =            # extra history output file
StatisticsFile               =            # statistics file
ThetaVertical                = 0.         # theta vertical for waq
DtProcesses                  = 0.         # waq processes time step
DtMassBalance                = 0.         # waq mass balance output time step
ProcessFluxIntegration       = 1          # Process fluxes integration option (1: WAQ, 2: D-Flow FM)
VolumeDryThreshold           = 1.d-3
DepthDryThreshold            = 1.d-3
```

B Estimated extreme water level across the SF Bay

The Table below provides the results of the 70-year hindcast with Delft3D Flexible Mesh (Delft3D FM). Values are presented based on the model simulation from 1950-2019 in meter. The coordinates are in in WGS 84 (longitude and latitude in degrees). Mean sea level (MSL), mean lower water (MLW) and mean higher water (MHW) are in ft+NAVD88. Extreme values are presented for a return period of 1-, 2-, 5-, 10-, 25-, 50-, 100- and 500-years. Note that the simulated water levels were detrended to the existing mean sea level (the year 2020) using a least-squares linear fit to remove the historical sea-level rise signal. A shapefile with all these values can be downloaded via the following link https://www.d3d-baydelta.org/.

name	lon	lat	MSL	MLW	MHW	1	2	5	10	25	50	100	500
FEMA_1 Marin	-122.478	37.823	3.02	-0.10	5.74	7.61	7.81	8.10	8.33	8.63	8.83	9.02	9.51
FEMA_2 Marin	-122.476	37.827	3.02	-0.10	5.74	7.58	7.81	8.10	8.33	8.63	8.86	9.06	9.58
FEMA_3 Marin	-122.471	37.830	3.02	-0.13	5.81	7.68	7.87	8.17	8.40	8.69	8.92	9.15	9.68
FEMA_4 Marin	-122.468	37.835	3.05	-0.10	5.81	7.68	7.91	8.20	8.43	8.73	8.96	9.19	9.71
FEMA_5 Marin	-122.470	37.839	3.08	-0.10	5.81	7.68	7.91	8.20	8.43	8.73	8.96	9.19	9.71
FEMA_6 Marin	-122.473	37.843	3.08	-0.10	5.81	7.68	7.91	8.20	8.43	8.73	8.96	9.19	9.71
FEMA_7 Marin	-122.475	37.847	3.12	-0.13	5.84	7.71	7.94	8.23	8.46	8.73	8.96	9.19	9.71
FEMA_8 Marin	-122.475	37.852	3.08	-0.13	5.84	7.71	7.94	8.23	8.46	8.76	8.96	9.19	9.71
FEMA_9 Marin	-122.475	37.857	3.12	-0.13	5.84	7.74	7.97	8.27	8.46	8.76	8.99	9.19	9.68
FEMA_10 Marin	-122.476	37.862	3.12	-0.13	5.87	7.74	7.97	8.27	8.50	8.79	9.02	9.25	9.81
FEMA_11 Marin	-122.482	37.863	3.12	-0.13	5.87	7.74	7.97	8.27	8.50	8.83	9.02	9.25	9.78
FEMA_12 Marin	-122.487	37.866	3.12	-0.16	5.87	7.78	7.97	8.27	8.50	8.83	9.06	9.28	9.84
FEMA_13 Marin	-122.493	37.866	3.12	-0.16	5.87	7.78	8.01	8.30	8.50	8.79	9.02	9.25	9.78

FEMA_14 Marin	-122.493	37.871	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.78
FEMA_15 Marin	-122.497	37.875	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.78
FEMA_16 Marin	-122.502	37.876	3.12	-0.13	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.81
FEMA_17 Marin	-122.510	37.879	3.15	0.23	5.91	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.78
FEMA_18 Marin	-122.513	37.883	3.22	0.46	5.91	7.78	8.01	8.30	8.53	8.83	9.06	9.25	9.78
FEMA_19 Marin	-122.507	37.883	3.15	0.16	5.91	7.78	8.01	8.30	8.53	8.79	9.02	9.22	9.71
FEMA_20 Marin	-122.504	37.880	3.12	-0.07	5.91	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.78
FEMA_21 Marin	-122.499	37.877	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.78
FEMA_22 Marin	-122.493	37.876	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.25	9.78
FEMA_23 Marin	-122.493	37.882	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.78
FEMA_24 Marin	-122.496	37.886	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.86	9.09	9.32	9.91
FEMA_25 Marin	-122.499	37.891	3.12	-0.03	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.25	9.78
FEMA_26 Marin	-122.491	37.891	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.86	9.09	9.32	9.88
FEMA_27 Marin	-122.487	37.890	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.86	9.09	9.32	9.88
FEMA_28 Marin	-122.481	37.887	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.84
FEMA_29 Marin	-122.477	37.884	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.84
FEMA_30 Marin	-122.476	37.880	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.25	9.78
FEMA_31 Marin	-122.477	37.876	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.84
FEMA_32 Marin	-122.475	37.871	3.12	-0.13	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.84

FEMA_33 Marin	-122.472	37.867	3.12	-0.13	5.87	7.74	7.97	8.27	8.50	8.83	9.06	9.28	9.81
FEMA_34 Marin	-122.467	37.864	3.12	-0.13	5.87	7.74	7.97	8.27	8.50	8.79	9.02	9.25	9.78
FEMA_35 Marin	-122.463	37.861	3.08	-0.16	5.87	7.74	7.97	8.27	8.50	8.79	9.02	9.25	9.74
FEMA_36 Marin	-122.457	37.860	3.12	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.02	9.25	9.74
FEMA_37 Marin	-122.455	37.863	3.12	-0.13	5.91	7.78	8.01	8.30	8.53	8.86	9.12	9.35	9.97
FEMA_38 Marin	-122.456	37.867	3.12	-0.13	5.91	7.81	8.01	8.33	8.56	8.86	9.12	9.35	9.97
FEMA_39 Marin	-122.453	37.870	3.12	-0.16	5.91	7.81	8.04	8.33	8.56	8.89	9.12	9.38	9.97
FEMA_40 Marin	-122.447	37.871	3.08	-0.16	5.91	7.81	8.04	8.33	8.56	8.86	9.12	9.35	9.91
FEMA_41 Marin	-122.443	37.874	3.08	-0.20	5.94	7.81	8.07	8.37	8.60	8.86	9.09	9.32	9.81
FEMA_42 Marin	-122.439	37.876	3.12	-0.23	5.94	7.84	8.07	8.37	8.60	8.89	9.12	9.32	9.84
FEMA_43 Marin	-122.436	37.879	3.08	-0.23	5.94	7.84	8.07	8.37	8.60	8.89	9.12	9.32	9.84
FEMA_44 Marin	-122.436	37.884	3.08	-0.23	5.94	7.81	8.04	8.33	8.56	8.89	9.12	9.35	9.94
FEMA_45 Marin	-122.439	37.887	3.08	-0.20	5.94	7.84	8.04	8.33	8.56	8.86	9.09	9.32	9.81
FEMA_46 Marin	-122.442	37.891	3.12	-0.20	5.94	7.84	8.07	8.37	8.56	8.86	9.09	9.28	9.81
FEMA_47 Marin	-122.445	37.895	3.12	-0.20	5.94	7.84	8.07	8.37	8.60	8.92	9.15	9.38	9.94
FEMA_48 Marin	-122.451	37.897	3.12	-0.20	5.97	7.84	8.07	8.40	8.63	8.92	9.15	9.38	9.94
FEMA_49 Marin	-122.457	37.897	3.12	-0.20	5.97	7.87	8.10	8.40	8.63	8.92	9.15	9.42	9.94
FEMA_50 Marin	-122.462	37.900	3.15	-0.20	6.00	7.87	8.10	8.40	8.66	8.96	9.19	9.42	10.01
FEMA_51 Marin	-122.466	37.904	3.15	-0.20	6.00	7.87	8.10	8.43	8.66	8.96	9.19	9.42	9.94

FEMA_52 Marin	-122.470	37.907	3.15	-0.20	6.00	7.91	8.10	8.43	8.66	8.96	9.22	9.45	10.04
FEMA_53 Marin	-122.471	37.912	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.42	9.97
FEMA_54 Marin	-122.472	37.917	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.22	9.45	10.01
FEMA_55 Marin	-122.475	37.920	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.42	9.94
FEMA_56 Marin	-122.480	37.921	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.42	9.91
FEMA_57 Marin	-122.486	37.924	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.99	9.22	9.45	10.04
FEMA_58 Marin	-122.491	37.925	3.15	-0.10	6.00	7.91	8.14	8.43	8.66	8.99	9.22	9.48	10.07
FEMA_59 Marin	-122.498	37.927	3.22	0.43	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.45	10.01
FEMA_60 Marin	-122.497	37.933	3.15	-0.03	6.04	7.91	8.14	8.43	8.66	8.96	9.22	9.45	9.97
FEMA_61 Marin	-122.498	37.937	3.15	-0.07	6.04	7.91	8.14	8.43	8.69	8.99	9.22	9.48	10.04
FEMA_62 Marin	-122.493	37.935	3.15	-0.20	6.04	7.91	8.14	8.43	8.69	8.99	9.22	9.48	10.07
FEMA_63 Marin	-122.486	37.935	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.99	9.22	9.45	10.01
FEMA_64 Marin	-122.481	37.938	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.42	9.97
FEMA_65 Marin	-122.476	37.941	3.15	-0.20	6.00	7.91	8.14	8.43	8.69	8.99	9.25	9.51	10.14
FEMA_66 Marin	-122.475	37.944	3.15	-0.20	6.00	7.91	8.14	8.43	8.66	8.96	9.22	9.45	10.01
FEMA_67 Marin	-122.480	37.947	3.15	-0.20	6.04	7.91	8.14	8.43	8.66	8.99	9.25	9.51	10.10
FEMA_68 Marin	-122.484	37.950	3.15	-0.20	6.04	7.91	8.14	8.43	8.66	8.99	9.22	9.45	10.01
FEMA_69 Marin	-122.485	37.955	3.15	-0.20	6.04	7.91	8.14	8.43	8.69	8.99	9.22	9.45	10.01
FEMA_70 Marin	-122.487	37.960	3.15	-0.20	6.04	7.91	8.14	8.46	8.69	8.99	9.25	9.48	10.07

FEMA_71 Marin	-122.488	37.963	3.15	-0.20	6.04	7.91	8.14	8.46	8.69	9.02	9.25	9.51	10.10
FEMA_72 Marin	-122.489	37.967	3.18	0.23	6.04	7.91	8.14	8.46	8.69	9.02	9.25	9.51	10.14
FEMA_73 Marin	-122.483	37.968	3.15	-0.20	6.04	7.94	8.14	8.46	8.69	9.02	9.25	9.51	10.10
FEMA_74 Marin	-122.477	37.969	3.15	-0.23	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_75 Marin	-122.474	37.972	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	9.02	9.25	9.51	10.14
FEMA_76 Marin	-122.472	37.976	3.15	-0.16	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.48	10.01
FEMA_77 Marin	-122.470	37.981	3.15	-0.07	6.04	7.94	8.17	8.46	8.69	9.02	9.28	9.51	10.14
FEMA_78 Marin	-122.465	37.980	3.15	-0.20	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_79 Marin	-122.458	37.978	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	9.06	9.28	9.55	10.20
FEMA_80 Marin	-122.452	37.979	3.12	-0.23	6.04	7.91	8.14	8.46	8.69	9.02	9.25	9.51	10.10
FEMA_81 Marin	-122.447	37.981	3.12	-0.23	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_82 Marin	-122.444	37.985	3.12	-0.23	6.07	7.94	8.17	8.50	8.73	9.02	9.28	9.51	10.07
FEMA_83 Marin	-122.445	37.989	3.15	-0.23	6.07	7.97	8.20	8.50	8.73	9.06	9.28	9.51	10.07
FEMA_84 Marin	-122.447	37.993	3.15	-0.23	6.10	7.97	8.20	8.53	8.76	9.06	9.28	9.55	10.07
FEMA_85 Marin	-122.452	37.996	3.15	-0.23	6.10	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.07
FEMA_86 Marin	-122.455	38.000	3.15	-0.23	6.10	8.01	8.23	8.56	8.79	9.09	9.32	9.55	10.10
FEMA_87 Marin	-122.458	38.004	3.15	-0.23	6.14	8.04	8.27	8.56	8.79	9.12	9.35	9.58	10.14
FEMA_88 Marin	-122.464	38.007	3.15	-0.23	6.14	8.04	8.27	8.60	8.83	9.15	9.38	9.65	10.20
FEMA_89 Marin	-122.470	38.008	3.18	-0.23	6.14	8.04	8.27	8.60	8.83	9.15	9.42	9.65	10.20

FEMA_90 Marin	-122.475	38.010	3.18	-0.23	6.14	8.04	8.30	8.60	8.86	9.19	9.42	9.65	10.24
FEMA_91 Marin	-122.480	38.013	3.18	-0.07	6.17	8.07	8.30	8.60	8.86	9.19	9.42	9.68	10.24
FEMA_92 Marin	-122.485	38.016	3.28	0.52	6.17	8.04	8.30	8.60	8.86	9.15	9.42	9.65	10.20
FEMA_93 Marin	-122.486	38.019	3.28	0.66	6.17	8.04	8.30	8.60	8.83	9.15	9.38	9.58	10.10
FEMA_94 Marin	-122.486	38.023	3.28	0.52	6.17	8.07	8.30	8.60	8.86	9.15	9.38	9.65	10.17
FEMA_95 Marin	-122.487	38.027	3.25	0.36	6.17	8.07	8.30	8.63	8.86	9.19	9.42	9.65	10.20
FEMA_96 Marin	-122.487	38.031	3.22	0.10	6.17	8.07	8.33	8.63	8.86	9.19	9.42	9.65	10.17
FEMA_97 Marin	-122.488	38.036	3.25	0.23	6.17	8.07	8.33	8.63	8.86	9.19	9.42	9.68	10.24
FEMA_98 Marin	-122.486	38.041	3.22	0.07	6.17	8.10	8.33	8.66	8.89	9.22	9.45	9.68	10.24
FEMA_99 Marin	-122.487	38.046	3.22	0.13	6.20	8.10	8.33	8.66	8.89	9.19	9.38	9.61	10.07
FEMA_100 Marin	-122.487	38.051	3.25	0.23	6.20	8.10	8.33	8.66	8.89	9.22	9.45	9.68	10.20
FEMA_101 Marin	-122.486	38.057	3.25	0.23	6.20	8.10	8.33	8.66	8.92	9.22	9.48	9.71	10.30
FEMA_102 Marin	-122.485	38.061	3.25	0.10	6.20	8.14	8.37	8.66	8.89	9.22	9.45	9.68	10.20
FEMA_103 Marin	-122.484	38.066	3.25	0.10	6.20	8.14	8.37	8.69	8.92	9.25	9.51	9.74	10.37
FEMA_104 Marin	-122.481	38.072	3.22	-0.20	6.20	8.14	8.37	8.69	8.92	9.25	9.48	9.71	10.24
FEMA_105 Marin	-122.481	38.077	3.22	-0.07	6.20	8.14	8.37	8.69	8.92	9.22	9.45	9.68	10.20
FEMA_106 Marin	-122.478	38.083	3.22	-0.13	6.23	8.14	8.40	8.69	8.96	9.28	9.55	9.81	10.40
FEMA_107 Marin	-122.476	38.088	3.25	-0.07	6.23	8.14	8.40	8.73	8.96	9.28	9.51	9.78	10.37
FEMA_108 Marin	-122.477	38.092	3.25	0.10	6.23	8.17	8.40	8.73	8.96	9.28	9.51	9.74	10.33

FEMA_109 Marin	-122.477	38.098	3.25	-0.03	6.23	8.17	8.40	8.73	8.96	9.28	9.51	9.78	10.30
FEMA_110 Marin	-122.478	38.102	3.35	0.75	6.23	8.17	8.40	8.69	8.92	9.22	9.45	9.68	10.14
FEMA_111 Marin	-122.480	38.106	3.28	0.10	6.23	8.17	8.40	8.73	8.99	9.32	9.58	9.81	10.43
FEMA_112 Marin	-122.420	37.858	3.08	-0.26	5.91	7.81	8.04	8.33	8.53	8.83	9.06	9.28	9.78
FEMA_113 Marin	-122.418	37.854	3.08	-0.23	5.91	7.81	8.01	8.30	8.53	8.86	9.09	9.32	9.91
FEMA_114 Marin	-122.421	37.853	3.08	-0.23	5.94	7.81	8.04	8.37	8.60	8.89	9.12	9.35	9.88
FEMA_115 Marin	-122.427	37.854	3.08	-0.20	5.94	7.84	8.07	8.37	8.56	8.86	9.09	9.32	9.81
FEMA_116 Marin	-122.433	37.853	3.12	-0.16	5.91	7.84	8.04	8.33	8.56	8.86	9.09	9.28	9.78
FEMA_117 Marin	-122.439	37.854	3.12	-0.16	5.91	7.81	8.04	8.33	8.56	8.86	9.09	9.32	9.84
FEMA_118 Marin	-122.443	37.857	3.12	-0.16	5.91	7.81	8.01	8.33	8.53	8.83	9.06	9.28	9.81
FEMA_119 Marin	-122.447	37.862	3.08	-0.16	5.87	7.78	8.01	8.30	8.53	8.83	9.06	9.28	9.81
FEMA_120 Marin	-122.442	37.864	3.08	-0.20	5.94	7.81	8.04	8.33	8.56	8.86	9.06	9.28	9.78
FEMA_121 Marin	-122.439	37.869	3.12	-0.16	5.94	7.81	8.04	8.33	8.56	8.89	9.12	9.35	9.94
FEMA_122 Marin	-122.435	37.870	3.12	-0.20	5.94	7.84	8.04	8.33	8.60	8.89	9.12	9.38	9.94
FEMA_123 Marin	-122.430	37.873	3.12	-0.16	5.94	7.84	8.07	8.37	8.60	8.89	9.12	9.38	9.94
FEMA_124 Marin	-122.424	37.871	3.12	-0.20	5.94	7.84	8.07	8.37	8.60	8.89	9.12	9.35	9.94
FEMA_125 Marin	-122.421	37.867	3.12	-0.26	5.94	7.81	8.04	8.33	8.56	8.89	9.12	9.35	9.91
FEMA_126 Marin	-122.418	37.863	3.08	-0.26	5.91	7.81	8.04	8.33	8.56	8.86	9.09	9.32	9.84
FEMA_127 Marin	-122.465	37.963	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	8.99	9.22	9.45	10.01

FEMA_128 Marin	-122.471	37.964	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	8.99	9.25	9.48	10.07
FEMA_129 Marin	-122.474	37.967	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	9.02	9.25	9.48	10.07
FEMA_130 Marin	-122.468	37.966	3.15	-0.23	6.04	7.91	8.14	8.46	8.69	8.99	9.25	9.48	10.07
FEMA_131 Sonoma	-122.486	38.109	3.28	0.13	6.23	8.17	8.43	8.73	8.96	9.28	9.51	9.74	10.30
FEMA_132 Sonoma	-122.485	38.111	3.28	0.13	6.23	8.17	8.43	8.73	8.99	9.28	9.51	9.78	10.30
FEMA_133 Sonoma	-122.480	38.113	3.28	0.13	6.23	8.17	8.43	8.73	8.99	9.28	9.51	9.74	10.30
FEMA_134 Sonoma	-122.474	38.112	3.28	0.07	6.23	8.17	8.43	8.73	8.96	9.25	9.48	9.68	10.14
FEMA_135 Sonoma	-122.466	38.111	3.25	-0.03	6.23	8.17	8.43	8.73	8.96	9.25	9.48	9.68	10.17
FEMA_136 Sonoma	-122.460	38.109	3.25	-0.07	6.23	8.17	8.43	8.73	8.96	9.25	9.48	9.68	10.17
FEMA_137 Sonoma	-122.455	38.108	3.25	-0.07	6.23	8.17	8.43	8.73	8.96	9.28	9.51	9.74	10.27
FEMA_138 Sonoma	-122.449	38.108	3.25	0.13	6.23	8.17	8.40	8.73	8.96	9.25	9.48	9.71	10.24
FEMA_139 Sonoma	-122.443	38.109	3.28	0.20	6.23	8.17	8.40	8.73	8.96	9.28	9.51	9.74	10.30
FEMA_140 Sonoma	-122.439	38.109	3.25	0.13	6.23	8.17	8.40	8.73	8.96	9.28	9.51	9.74	10.30
FEMA_141 Sonoma	-122.434	38.112	3.25	0.03	6.23	8.17	8.43	8.73	8.99	9.28	9.55	9.78	10.33
FEMA_142 Sonoma	-122.429	38.114	3.28	0.16	6.23	8.17	8.43	8.73	8.96	9.28	9.51	9.74	10.30
FEMA_143 Sonoma	-122.426	38.117	3.28	0.16	6.23	8.17	8.43	8.73	8.99	9.28	9.51	9.78	10.33
FEMA_144 Sonoma	-122.421	38.119	3.25	0.00	6.23	8.17	8.43	8.73	8.99	9.28	9.55	9.78	10.33
FEMA_145 Sonoma	-122.415	38.120	3.25	-0.03	6.23	8.20	8.43	8.76	8.99	9.28	9.51	9.74	10.30
FEMA_146 Sonoma	-122.410	38.121	3.25	-0.10	6.23	8.20	8.43	8.76	8.99	9.32	9.55	9.78	10.33

FEMA_147 Sonoma	-122.407	38.123	3.25	-0.03	6.23	8.20	8.43	8.76	8.99	9.32	9.55	9.78	10.37
FEMA_148 Sonoma	-122.402	38.125	3.28	0.03	6.27	8.20	8.43	8.73	8.99	9.28	9.51	9.78	10.30
FEMA_149 Sonoma	-122.395	38.125	3.28	0.26	6.27	8.20	8.43	8.73	8.99	9.28	9.55	9.78	10.33
FEMA_150 Sonoma	-122.389	38.125	3.31	0.33	6.27	8.20	8.43	8.73	8.99	9.28	9.51	9.78	10.30
FEMA_151 Solano	-122.386	38.130	3.31	0.52	6.27	8.20	8.43	8.76	8.99	9.28	9.51	9.78	10.30
FEMA_152 Solano	-122.379	38.129	3.31	0.39	6.27	8.20	8.43	8.76	8.99	9.28	9.55	9.78	10.33
FEMA_153 Solano	-122.374	38.126	3.28	0.23	6.27	8.20	8.43	8.76	8.99	9.28	9.55	9.78	10.30
FEMA_154 Solano	-122.366	38.125	3.28	0.23	6.27	8.20	8.43	8.73	8.99	9.28	9.51	9.74	10.30
FEMA_155 Solano	-122.360	38.123	3.28	0.16	6.27	8.20	8.43	8.73	8.99	9.28	9.51	9.74	10.27
FEMA_156 Solano	-122.353	38.122	3.28	0.10	6.23	8.20	8.43	8.73	8.99	9.28	9.55	9.78	10.33
FEMA_157 Solano	-122.347	38.119	3.28	0.03	6.23	8.20	8.43	8.73	8.99	9.28	9.51	9.78	10.33
FEMA_158 Solano	-122.342	38.117	3.28	0.03	6.23	8.20	8.43	8.73	8.99	9.28	9.55	9.78	10.33
FEMA_159 Solano	-122.336	38.114	3.28	0.16	6.23	8.17	8.43	8.73	8.96	9.28	9.55	9.78	10.37
FEMA_160 Solano	-122.331	38.111	3.28	0.03	6.23	8.17	8.40	8.73	8.96	9.28	9.55	9.78	10.37
FEMA_161 Solano	-122.326	38.108	3.28	0.00	6.23	8.17	8.40	8.73	8.96	9.28	9.55	9.78	10.37
FEMA_162 Solano	-122.318	38.107	3.28	0.10	6.23	8.17	8.40	8.73	8.96	9.28	9.51	9.74	10.30
FEMA_163 Solano	-122.313	38.103	3.28	0.07	6.23	8.17	8.40	8.73	8.96	9.25	9.48	9.71	10.24
FEMA_164 Solano	-122.308	38.098	3.28	0.10	6.23	8.17	8.40	8.69	8.92	9.25	9.48	9.71	10.20
FEMA_165 Solano	-122.304	38.094	3.28	0.03	6.20	8.14	8.37	8.69	8.92	9.25	9.51	9.78	10.37

FEMA_166 Solano	-122.299	38.091	3.28	0.13	6.20	8.14	8.37	8.69	8.92	9.25	9.51	9.74	10.33
FEMA_167 Solano	-122.295	38.086	3.28	0.07	6.20	8.14	8.37	8.66	8.92	9.25	9.48	9.74	10.30
FEMA_168 Solano	-122.293	38.082	3.28	0.10	6.20	8.14	8.37	8.66	8.89	9.15	9.38	9.58	10.01
FEMA_169 Solano	-122.290	38.078	3.28	0.23	6.17	8.10	8.33	8.63	8.89	9.19	9.42	9.65	10.20
FEMA_170 Solano	-122.288	38.074	3.28	0.23	6.17	8.07	8.33	8.63	8.86	9.19	9.42	9.65	10.20
FEMA_171 Solano	-122.287	38.069	3.28	0.16	6.17	8.07	8.30	8.60	8.83	9.12	9.35	9.55	10.04
FEMA_172 Solano	-122.291	38.065	3.28	0.07	6.14	8.07	8.30	8.60	8.83	9.12	9.35	9.55	10.01
FEMA_173 Solano	-122.290	38.064	3.25	0.13	6.04	7.97	8.20	8.53	8.76	9.06	9.28	9.51	10.01
FEMA_174 Solano	-122.284	38.064	3.28	0.16	6.04	7.97	8.20	8.50	8.73	9.06	9.28	9.51	10.07
FEMA_175 Solano	-122.277	38.065	3.28	0.20	6.07	7.97	8.20	8.50	8.73	9.06	9.28	9.51	10.04
FEMA_176 Solano	-122.271	38.066	3.28	0.20	6.07	7.97	8.20	8.50	8.73	9.06	9.28	9.51	10.07
FEMA_177 Solano	-122.264	38.066	3.28	0.23	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_178 Solano	-122.258	38.067	3.28	0.26	6.04	7.94	8.17	8.46	8.69	8.99	9.19	9.38	9.84
FEMA_179 Solano	-122.253	38.069	3.31	0.33	6.04	7.94	8.17	8.46	8.69	9.02	9.25	9.51	10.10
FEMA_180 Solano	-122.247	38.072	3.31	0.33	6.04	7.94	8.17	8.46	8.69	9.02	9.28	9.51	10.14
FEMA_181 Solano	-122.244	38.076	3.31	0.33	6.04	7.94	8.17	8.46	8.69	9.02	9.28	9.51	10.10
FEMA_182 Solano	-122.240	38.071	3.31	0.30	6.00	7.91	8.14	8.43	8.69	9.02	9.28	9.55	10.24
FEMA_183 Solano	-122.236	38.067	3.31	0.33	6.00	7.91	8.14	8.43	8.66	8.99	9.25	9.51	10.14
FEMA_184 Solano	-122.231	38.064	3.28	0.30	5.97	7.84	8.07	8.40	8.63	8.96	9.22	9.48	10.10

FEMA_185 Solano	-122.224	38.062	3.28	0.33	5.97	7.84	8.07	8.37	8.63	8.96	9.22	9.51	10.17
FEMA_186 Solano	-122.218	38.063	3.28	0.33	5.94	7.81	8.04	8.37	8.60	8.92	9.19	9.42	10.04
FEMA_187 Solano	-122.212	38.064	3.31	0.36	5.97	7.81	8.04	8.37	8.60	8.92	9.19	9.45	10.07
FEMA_188 Solano	-122.206	38.063	3.31	0.39	5.97	7.84	8.07	8.37	8.63	8.96	9.22	9.48	10.14
FEMA_189 Solano	-122.202	38.060	3.31	0.36	5.94	7.81	8.04	8.37	8.60	8.89	9.12	9.35	9.91
FEMA_190 Solano	-122.196	38.058	3.31	0.39	5.97	7.84	8.07	8.37	8.63	8.96	9.22	9.48	10.10
FEMA_191 Solano	-122.191	38.060	3.31	0.43	5.97	7.84	8.07	8.37	8.63	8.92	9.19	9.42	10.01
FEMA_192 Solano	-122.186	38.064	3.35	0.43	5.97	7.84	8.07	8.40	8.63	8.99	9.25	9.51	10.17
FEMA_193 Solano	-122.180	38.059	3.35	0.43	5.97	7.87	8.10	8.40	8.63	8.89	9.12	9.32	9.74
FEMA_194 Solano	-122.176	38.056	3.35	0.43	5.97	7.84	8.10	8.40	8.63	8.96	9.19	9.45	10.01
FEMA_195 Solano	-122.171	38.053	3.31	0.43	5.97	7.84	8.07	8.40	8.63	8.96	9.19	9.45	10.01
FEMA_196 Solano	-122.167	38.050	3.31	0.39	5.97	7.84	8.07	8.40	8.63	8.92	9.15	9.38	9.91
FEMA_197 Solano	-122.165	38.046	3.31	0.39	5.97	7.84	8.07	8.40	8.63	8.92	9.15	9.38	9.88
FEMA_198 Solano	-122.160	38.041	3.28	0.43	5.91	7.78	8.01	8.33	8.56	8.89	9.15	9.38	9.94
FEMA_199 Solano	-122.154	38.041	3.31	0.43	5.91	7.78	8.04	8.33	8.60	8.92	9.15	9.38	9.94
FEMA_200 Solano	-122.144	38.039	3.31	0.46	5.94	7.81	8.04	8.37	8.63	8.92	9.19	9.45	10.01
FEMA_201 Solano	-122.137	38.040	3.35	0.49	5.94	7.81	8.04	8.37	8.63	8.96	9.19	9.45	10.01
FEMA_202 Solano	-122.131	38.041	3.35	0.56	5.94	7.84	8.07	8.40	8.66	8.99	9.22	9.48	10.04
FEMA_203 Solano	-122.126	38.043	3.38	0.56	5.97	7.84	8.07	8.40	8.66	8.99	9.22	9.48	10.04

FEMA_204 Solano	-122.124	38.050	3.35	0.52	5.97	7.84	8.07	8.40	8.66	8.99	9.25	9.48	10.07
FEMA_205 Solano	-122.120	38.055	3.38	0.56	5.97	7.84	8.10	8.43	8.66	9.02	9.25	9.51	10.10
FEMA_206 Solano	-122.116	38.060	3.38	0.59	5.97	7.84	8.10	8.43	8.69	9.02	9.28	9.51	10.10
FEMA_207 Solano	-122.113	38.065	3.38	0.59	5.97	7.84	8.10	8.43	8.69	9.06	9.32	9.58	10.20
FEMA_208 Solano	-122.107	38.071	3.38	0.62	5.97	7.87	8.10	8.46	8.69	9.02	9.28	9.51	10.10
FEMA_209 Solano	-122.103	38.076	3.41	0.62	5.97	7.87	8.14	8.46	8.69	9.02	9.25	9.48	10.01
FEMA_210 Solano	-122.096	38.080	3.41	0.66	5.97	7.87	8.14	8.46	8.73	9.06	9.28	9.51	10.07
FEMA_211 Solano	-122.090	38.085	3.41	0.66	5.97	7.87	8.14	8.46	8.73	9.06	9.28	9.51	10.04
FEMA_212 Solano	-122.085	38.088	3.41	0.66	5.97	7.87	8.14	8.50	8.73	9.06	9.28	9.55	10.07
FEMA_213 Solano	-122.081	38.092	3.41	0.69	5.97	7.87	8.14	8.50	8.76	9.09	9.32	9.58	10.14
FEMA_214 Solano	-122.077	38.095	3.41	0.69	5.97	7.87	8.14	8.50	8.76	9.09	9.35	9.61	10.20
FEMA_215 Solano	-122.071	38.100	3.44	0.72	5.97	7.91	8.17	8.50	8.76	9.09	9.32	9.58	10.10
FEMA_216 Solano	-122.068	38.104	3.44	0.72	5.97	7.91	8.17	8.53	8.76	9.09	9.35	9.58	10.10
FEMA_217 Solano	-122.065	38.109	3.44	0.72	6.00	7.91	8.17	8.53	8.79	9.12	9.38	9.61	10.20
FEMA_218 Solano	-122.064	38.114	3.44	0.72	6.00	7.94	8.20	8.56	8.83	9.15	9.38	9.65	10.20
FEMA_219 Solano	-122.065	38.120	3.44	0.72	6.00	7.94	8.20	8.56	8.83	9.15	9.38	9.65	10.20
FEMA_220 Solano	-122.062	38.123	3.44	0.72	6.00	7.94	8.20	8.56	8.83	9.15	9.38	9.65	10.20
FEMA_221 Solano	-122.060	38.130	3.44	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.45	9.71	10.33
FEMA_222 Solano	-122.060	38.134	3.44	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.42	9.68	10.27

FEMA_223 Solano	-122.055	38.131	3.44	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.48	9.74	10.40
FEMA_224 Solano	-122.049	38.133	3.48	0.75	6.00	7.94	8.20	8.56	8.83	9.15	9.42	9.68	10.24
FEMA_225 Solano	-122.044	38.135	3.48	0.75	6.00	7.94	8.20	8.56	8.86	9.22	9.48	9.78	10.47
FEMA_226 Solano	-122.037	38.135	3.48	0.75	6.00	7.94	8.20	8.56	8.86	9.22	9.48	9.74	10.40
FEMA_227 Solano	-122.032	38.136	3.48	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.48	9.74	10.37
FEMA_228 Solano	-122.025	38.136	3.48	0.75	6.00	7.94	8.20	8.56	8.86	9.19	9.48	9.74	10.37
FEMA_229 Solano	-122.020	38.135	3.48	0.75	6.00	7.94	8.20	8.56	8.86	9.22	9.51	9.78	10.47
FEMA_230 Solano	-122.014	38.137	3.48	0.72	6.04	7.94	8.23	8.56	8.86	9.19	9.48	9.74	10.37
FEMA_231 Solano	-122.009	38.138	3.48	0.75	6.04	7.94	8.23	8.56	8.86	9.22	9.48	9.74	10.37
FEMA_232 Solano	-122.004	38.135	3.48	0.75	6.04	7.94	8.23	8.60	8.86	9.22	9.48	9.74	10.37
FEMA_233 Solano	-122.000	38.132	3.48	0.75	6.04	7.94	8.23	8.56	8.86	9.19	9.45	9.71	10.33
FEMA_234 Solano	-121.997	38.128	3.48	0.75	6.04	7.97	8.23	8.60	8.86	9.19	9.45	9.71	10.30
FEMA_235 Solano	-121.994	38.123	3.48	0.75	6.04	7.94	8.23	8.60	8.86	9.19	9.45	9.71	10.33
FEMA_236 Solano	-121.991	38.119	3.48	0.75	6.04	7.94	8.23	8.56	8.86	9.22	9.48	9.78	10.43
FEMA_237 Solano	-121.988	38.116	3.48	0.75	6.04	7.94	8.23	8.56	8.86	9.19	9.48	9.74	10.33
FEMA_238 Solano	-121.993	38.111	3.48	0.75	6.00	7.94	8.20	8.56	8.86	9.22	9.48	9.78	10.47
FEMA_239 Solano	-121.999	38.107	3.48	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.45	9.68	10.27
FEMA_240 Solano	-122.003	38.104	3.48	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.48	9.74	10.40
FEMA_241 Solano	-122.011	38.101	3.48	0.75	6.00	7.94	8.20	8.56	8.83	9.19	9.45	9.71	10.33

FEMA_242 Solano	-122.017	38.099	3.48	0.75	6.00	7.91	8.20	8.53	8.83	9.15	9.45	9.71	10.30
FEMA_243 Solano	-122.020	38.097	3.48	0.79	5.97	7.91	8.17	8.53	8.79	9.15	9.45	9.71	10.37
FEMA_244 Solano	-122.015	38.093	3.44	0.82	5.94	7.87	8.14	8.50	8.79	9.15	9.45	9.71	10.37
FEMA_245 Solano	-122.010	38.090	3.48	0.85	5.94	7.84	8.14	8.50	8.79	9.15	9.45	9.74	10.43
FEMA_246 Solano	-122.004	38.087	3.48	0.85	5.91	7.84	8.14	8.50	8.79	9.15	9.42	9.68	10.30
FEMA_247 Solano	-121.999	38.085	3.48	0.89	5.91	7.84	8.14	8.50	8.76	9.12	9.42	9.68	10.27
FEMA_248 Solano	-121.992	38.083	3.48	0.92	5.87	7.84	8.10	8.50	8.79	9.15	9.45	9.71	10.37
FEMA_249 Solano	-121.994	38.080	3.48	0.92	5.87	7.84	8.10	8.50	8.79	9.15	9.45	9.71	10.37
FEMA_250 Solano	-121.989	38.077	3.48	1.02	5.84	7.81	8.10	8.46	8.76	9.12	9.42	9.68	10.30
FEMA_251 Solano	-121.983	38.076	3.48	1.02	5.84	7.81	8.10	8.50	8.79	9.19	9.48	9.81	10.56
FEMA_252 Solano	-121.979	38.077	3.48	1.02	5.84	7.81	8.10	8.50	8.76	9.15	9.42	9.71	10.33
FEMA_253 Solano	-121.978	38.071	3.48	1.05	5.81	7.78	8.07	8.46	8.79	9.19	9.48	9.78	10.50
FEMA_254 Solano	-121.972	38.071	3.51	1.15	5.81	7.78	8.07	8.46	8.79	9.19	9.48	9.78	10.47
FEMA_255 Solano	-121.967	38.073	3.51	1.15	5.81	7.78	8.10	8.50	8.79	9.19	9.48	9.81	10.53
FEMA_256 Solano	-121.959	38.077	3.54	1.15	5.81	7.81	8.10	8.50	8.79	9.22	9.51	9.84	10.56
FEMA_257 Solano	-121.954	38.075	3.54	1.18	5.81	7.81	8.10	8.50	8.79	9.19	9.48	9.78	10.47
FEMA_258 Solano	-121.948	38.075	3.54	1.18	5.81	7.81	8.10	8.50	8.79	9.22	9.51	9.81	10.53
FEMA_259 Solano	-121.943	38.077	3.54	1.18	5.81	7.81	8.10	8.50	8.83	9.22	9.55	9.84	10.56
FEMA_260 Solano	-121.937	38.078	3.54	1.18	5.81	7.81	8.10	8.50	8.83	9.22	9.51	9.81	10.50

FEMA_261 Solano	-121.931	38.079	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.25	9.55	9.88	10.60
FEMA_262 Solano	-121.925	38.079	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.22	9.51	9.81	10.47
FEMA_263 Solano	-121.919	38.080	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.22	9.55	9.84	10.53
FEMA_264 Solano	-121.912	38.080	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.25	9.55	9.88	10.60
FEMA_265 Solano	-121.911	38.077	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.25	9.55	9.88	10.60
FEMA_266 Solano	-121.917	38.073	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.25	9.55	9.88	10.60
FEMA_267 Solano	-121.922	38.071	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.22	9.55	9.84	10.53
FEMA_268 Solano	-121.922	38.066	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.22	9.48	9.78	10.43
FEMA_269 Solano	-121.923	38.060	3.54	1.18	5.81	7.81	8.10	8.53	8.83	9.25	9.55	9.88	10.60
FEMA_270 Solano	-121.928	38.058	3.54	1.18	5.81	7.81	8.10	8.50	8.79	9.15	9.45	9.71	10.27
FEMA_271 Solano	-121.934	38.058	3.54	1.18	5.77	7.78	8.10	8.50	8.83	9.22	9.55	9.88	10.60
FEMA_272 Solano	-121.936	38.053	3.51	1.18	5.74	7.78	8.07	8.50	8.79	9.22	9.51	9.84	10.56
FEMA_273 Solano	-121.930	38.050	3.51	1.18	5.71	7.74	8.07	8.50	8.83	9.25	9.58	9.94	10.73
FEMA_274 Solano	-121.922	38.049	3.54	1.21	5.71	7.74	8.07	8.50	8.83	9.22	9.55	9.84	10.56
FEMA_275 Solano	-121.916	38.049	3.54	1.21	5.71	7.78	8.10	8.53	8.83	9.25	9.58	9.91	10.63
FEMA_276 Solano	-121.909	38.048	3.54	1.21	5.71	7.78	8.10	8.53	8.86	9.28	9.58	9.91	10.63
FEMA_277 Solano	-121.903	38.048	3.54	1.25	5.71	7.78	8.10	8.53	8.86	9.28	9.61	9.94	10.70
FEMA_278 Solano	-121.896	38.049	3.54	1.25	5.71	7.78	8.10	8.53	8.86	9.28	9.61	9.94	10.66
FEMA_279 Solano	-121.892	38.052	3.54	1.28	5.74	7.78	8.10	8.56	8.89	9.32	9.65	9.94	10.70

FEMA_280 Solano	-121.886	38.053	3.54	1.28	5.74	7.81	8.14	8.56	8.89	9.35	9.68	10.04	10.86
FEMA_281 Solano	-121.880	38.053	3.58	1.28	5.74	7.81	8.14	8.56	8.89	9.35	9.68	10.01	10.83
FEMA_282 Solano	-121.875	38.057	3.58	1.28	5.74	7.81	8.14	8.60	8.92	9.35	9.68	10.01	10.76
FEMA_283 Solano	-121.870	38.059	3.58	1.31	5.74	7.81	8.14	8.60	8.92	9.38	9.71	10.04	10.86
FEMA_284 Solano	-121.865	38.062	3.58	1.31	5.71	7.81	8.14	8.60	8.92	9.38	9.71	10.07	10.86
FEMA_285 Solano	-121.863	38.067	3.58	1.38	5.71	7.81	8.17	8.60	8.96	9.42	9.74	10.10	10.89
FEMA_286 Solano	-122.102	38.053	3.38	0.59	5.97	7.84	8.10	8.43	8.69	9.02	9.28	9.55	10.17
FEMA_287 Solano	-122.097	38.057	3.38	0.59	5.97	7.84	8.10	8.43	8.69	9.02	9.25	9.48	10.01
FEMA_288 Solano	-122.091	38.058	3.38	0.66	5.97	7.84	8.10	8.43	8.69	9.02	9.25	9.51	10.04
FEMA_289 Solano	-122.095	38.055	3.38	0.62	5.97	7.84	8.10	8.43	8.69	9.02	9.28	9.51	10.07
FEMA_290 Solano	-122.078	38.062	3.41	0.69	5.94	7.87	8.14	8.46	8.69	9.02	9.25	9.48	10.01
FEMA_291 Solano	-122.072	38.065	3.41	0.69	5.94	7.87	8.14	8.46	8.73	9.06	9.32	9.55	10.10
FEMA_292 Solano	-122.066	38.068	3.41	0.69	5.94	7.87	8.14	8.46	8.73	9.09	9.32	9.58	10.17
FEMA_293 Solano	-122.061	38.068	3.44	0.79	5.94	7.87	8.14	8.46	8.73	9.09	9.38	9.65	10.30
FEMA_294 Solano	-122.057	38.069	3.44	0.85	5.94	7.87	8.14	8.46	8.73	9.09	9.35	9.61	10.24
FEMA_295 Solano	-122.065	38.064	3.44	0.79	5.94	7.84	8.10	8.46	8.73	9.09	9.35	9.65	10.27
FEMA_296 Solano	-122.070	38.063	3.41	0.72	5.94	7.87	8.14	8.46	8.73	9.06	9.28	9.55	10.07
FEMA_297 Solano	-122.047	38.071	3.44	0.85	5.94	7.84	8.14	8.46	8.76	9.12	9.38	9.65	10.30
FEMA_299 Solano	-122.040	38.077	3.44	0.82	5.94	7.87	8.14	8.50	8.76	9.12	9.38	9.65	10.24

FEMA_300 Solano	-122.033	38.076	3.44	0.85	5.94	7.84	8.14	8.50	8.76	9.12	9.42	9.68	10.33
FEMA_301 Solano	-122.026	38.074	3.44	0.89	5.91	7.84	8.10	8.46	8.76	9.12	9.38	9.65	10.24
FEMA_302 Solano	-122.021	38.072	3.48	0.95	5.87	7.84	8.10	8.46	8.76	9.12	9.38	9.68	10.30
FEMA_303 Solano	-122.026	38.069	3.48	0.95	5.87	7.81	8.10	8.46	8.76	9.12	9.38	9.65	10.27
FEMA_304 Solano	-122.030	38.068	3.44	0.92	5.87	7.81	8.10	8.46	8.76	9.12	9.42	9.71	10.37
FEMA_305 Solano	-122.036	38.069	3.44	0.92	5.91	7.84	8.10	8.46	8.73	9.09	9.35	9.61	10.20
FEMA_306 Solano	-122.043	38.070	3.44	0.89	5.91	7.84	8.10	8.46	8.73	9.09	9.38	9.65	10.27
FEMA_307 Solano	-122.037	38.086	3.44	0.79	5.97	7.87	8.14	8.50	8.76	9.12	9.38	9.65	10.24
FEMA_308 Solano	-122.038	38.090	3.44	0.75	5.97	7.91	8.17	8.53	8.79	9.15	9.42	9.71	10.37
FEMA_309 Solano	-122.042	38.093	3.44	0.75	5.97	7.91	8.17	8.53	8.79	9.15	9.42	9.68	10.27
FEMA_310 Solano	-122.038	38.095	3.44	0.75	5.97	7.91	8.17	8.53	8.79	9.15	9.42	9.71	10.33
FEMA_311 Solano	-122.031	38.093	3.44	0.75	5.97	7.91	8.17	8.53	8.79	9.15	9.45	9.74	10.40
FEMA_312 Solano	-122.025	38.092	3.48	0.79	5.97	7.91	8.17	8.53	8.79	9.15	9.42	9.71	10.33
FEMA_313 Solano	-122.019	38.091	3.48	0.79	5.97	7.87	8.17	8.53	8.79	9.15	9.45	9.71	10.37
FEMA_314 Solano	-121.999	38.078	3.48	0.98	5.87	7.84	8.10	8.50	8.76	9.15	9.42	9.71	10.37
FEMA_315 Solano	-122.002	38.075	3.48	1.02	5.87	7.81	8.10	8.50	8.76	9.15	9.42	9.71	10.37
FEMA_316 Solano	-122.008	38.074	3.48	0.98	5.87	7.81	8.10	8.46	8.76	9.15	9.45	9.74	10.40
FEMA_317 Solano	-122.014	38.074	3.48	0.95	5.87	7.81	8.10	8.46	8.76	9.12	9.38	9.68	10.30
FEMA_318 Solano	-122.020	38.075	3.48	0.95	5.87	7.81	8.10	8.46	8.76	9.12	9.38	9.65	10.27

FEMA_319 Solano	-122.024	38.078	3.44	0.89	5.91	7.84	8.14	8.50	8.76	9.12	9.38	9.65	10.27
FEMA_320 Solano	-122.024	38.082	3.44	0.85	5.94	7.87	8.14	8.50	8.76	9.12	9.42	9.68	10.30
FEMA_321 Solano	-122.026	38.087	3.48	0.85	5.94	7.87	8.14	8.50	8.79	9.15	9.42	9.71	10.37
FEMA_322 Solano	-122.031	38.084	3.44	0.82	5.94	7.87	8.14	8.50	8.76	9.12	9.42	9.68	10.30
FEMA_323 Solano	-122.028	38.079	3.44	0.89	5.91	7.84	8.14	8.50	8.76	9.12	9.38	9.65	10.30
FEMA_324 Solano	-121.994	38.069	3.48	1.02	5.84	7.81	8.10	8.50	8.76	9.15	9.48	9.78	10.47
FEMA_325 Solano	-121.987	38.067	3.51	1.05	5.84	7.81	8.10	8.50	8.79	9.19	9.48	9.78	10.50
FEMA_326 Contra C.	-121.857	38.056	3.54	1.28	5.68	7.81	8.14	8.60	8.92	9.38	9.71	10.04	10.83
FEMA_327 Contra C.	-121.862	38.053	3.54	1.28	5.71	7.81	8.14	8.60	8.92	9.38	9.74	10.07	10.89
FEMA_328 Contra C.	-121.862	38.047	3.58	1.28	5.74	7.81	8.14	8.60	8.92	9.35	9.68	10.01	10.73
FEMA_329 Contra C.	-121.868	38.046	3.58	1.28	5.74	7.81	8.14	8.60	8.92	9.35	9.68	10.01	10.79
FEMA_330 Contra C.	-121.874	38.045	3.58	1.28	5.74	7.81	8.14	8.56	8.92	9.35	9.71	10.07	10.89
FEMA_331 Contra C	-121.879	38.043	3.58	1.28	5.77	7.81	8.14	8.56	8.89	9.35	9.68	10.01	10.79
FEMA_332 Contra C.	-121.870	38.034	3.58	1.38	5.68	7.78	8.10	8.56	8.89	9.35	9.68	10.01	10.76
FEMA_333 Contra C.	-121.877	38.037	3.58	1.31	5.71	7.78	8.14	8.56	8.89	9.32	9.65	9.97	10.73
FEMA_333 Contra C.	-121.882	38.041	3.58	1.28	5.74	7.81	8.14	8.56	8.89	9.32	9.65	9.97	10.70
FEMA_334 Contra C.	-121.885	38.045	3.58	1.28	5.74	7.81	8.14	8.56	8.89	9.32	9.65	9.97	10.76
FEMA_335 Contra C.	-121.892	38.044	3.54	1.25	5.74	7.78	8.10	8.56	8.86	9.28	9.61	9.94	10.63
FEMA_336 Contra C.	-121.898	38.043	3.54	1.25	5.74	7.78	8.10	8.53	8.86	9.28	9.61	9.94	10.73

FEMA_337 Contra C.	-121.905	38.042	3.54	1.25	5.74	7.78	8.10	8.53	8.86	9.28	9.61	9.94	10.70
FEMA_338 Contra C.	-121.912	38.043	3.54	1.25	5.74	7.78	8.10	8.53	8.83	9.25	9.58	9.91	10.66
FEMA_339 Contra C.	-121.918	38.044	3.54	1.25	5.74	7.78	8.07	8.50	8.86	9.28	9.65	9.97	10.79
FEMA_340 Contra C.	-121.925	38.044	3.51	1.21	5.71	7.74	8.07	8.50	8.83	9.25	9.58	9.91	10.70
FEMA_341 Contra C.	-121.931	38.041	5.35	5.28	5.81	7.64	7.97	8.37	8.69	9.12	9.42	9.74	10.53
FEMA_342 Contra C.	-121.936	38.036	6.23	6.14	6.92	7.61	7.94	8.37	8.66	9.02	9.28	9.55	10.10
FEMA_343 Contra C.	-121.940	38.040	6.17	5.68	7.45	7.61	7.94	8.37	8.66	9.06	9.38	9.68	10.37
FEMA_344 Contra C.	-121.944	38.043	6.46	6.46	6.79	7.61	7.91	8.30	8.63	9.02	9.35	9.68	10.47
FEMA_345 Contra C.	-121.947	38.047	4.89	4.72	5.87	7.64	7.97	8.37	8.66	9.06	9.35	9.65	10.30
FEMA_346 Contra C.	-121.957	38.045	4.89	4.69	5.84	7.68	7.97	8.37	8.66	9.06	9.35	9.65	10.30
FEMA_347 Contra C.	-121.964	38.048	3.51	1.15	5.81	7.78	8.10	8.50	8.79	9.19	9.51	9.81	10.53
FEMA_348 Contra C.	-121.971	38.047	3.51	1.15	5.81	7.81	8.10	8.50	8.79	9.19	9.48	9.78	10.43
FEMA_349 Contra C.	-121.977	38.050	3.51	1.15	5.81	7.78	8.10	8.50	8.79	9.19	9.48	9.78	10.47
FEMA_350 Contra C.	-121.983	38.052	3.51	1.12	5.81	7.81	8.10	8.50	8.76	9.15	9.45	9.74	10.40
FEMA_351 Contra C.	-121.988	38.054	3.51	1.08	5.84	7.81	8.10	8.46	8.76	9.12	9.38	9.68	10.27
FEMA_352 Contra C.	-121.994	38.053	3.48	1.08	5.84	7.81	8.10	8.46	8.76	9.12	9.38	9.65	10.24
FEMA_353 Contra C.	-122.000	38.051	6.40	6.36	6.46	7.64	7.94	8.30	8.60	8.96	9.22	9.51	10.14
FEMA_354 Contra C.	-122.007	38.053	6.17	6.14	6.43	7.64	7.91	8.30	8.56	8.92	9.15	9.42	10.01
FEMA_355 Contra C.	-122.015	38.055	6.00	5.97	6.43	7.61	7.91	8.27	8.56	8.96	9.25	9.55	10.27

FEMA_356 Contra C.	-122.019	38.059	3.44	0.98	5.84	7.81	8.07	8.46	8.73	9.12	9.42	9.71	10.37
FEMA_357 Contra C.	-122.025	38.060	3.44	0.92	5.87	7.81	8.10	8.46	8.73	9.12	9.38	9.65	10.30
FEMA_358 Contra C.	-122.031	38.059	3.44	0.92	5.87	7.81	8.10	8.46	8.73	9.09	9.38	9.65	10.27
FEMA_359 Contra C.	-122.038	38.059	3.44	0.92	5.91	7.84	8.10	8.46	8.73	9.12	9.38	9.65	10.30
FEMA_360 Contra C.	-122.043	38.057	3.44	0.92	5.91	7.84	8.10	8.46	8.73	9.09	9.35	9.65	10.27
FEMA_361 Contra C.	-122.047	38.058	3.44	0.82	5.91	7.84	8.10	8.46	8.73	9.09	9.32	9.58	10.17
FEMA_362 Contra C.	-122.047	38.054	3.44	0.85	5.91	7.84	8.10	8.46	8.73	9.09	9.35	9.61	10.20
FEMA_363 Contra C.	-122.043	38.048	6.40	6.40	6.82	7.19	7.55	8.01	8.37	8.83	9.15	9.48	10.24
FEMA_364 Contra C.	-122.038	38.042	5.74	3.71	7.12	7.25	7.61	8.10	8.50	9.09	9.51	10.01	11.19
FEMA_365 Contra C.	-122.046	38.045	6.07	6.04	6.27	7.32	7.64	8.04	8.33	8.73	9.06	9.35	10.07
FEMA_366 Contra C.	-122.043	38.040	5.97	5.41	6.89	7.19	7.51	8.04	8.40	8.96	9.38	9.81	10.93
FEMA_367 Contra C.	-122.044	38.035	6.07	6.04	6.20	7.12	7.48	7.97	8.37	8.89	9.32	9.78	10.86
FEMA_368 Contra C.	-122.052	38.044	6.04	5.97	6.17	7.35	7.68	8.07	8.37	8.79	9.12	9.42	10.14
FEMA_369 Contra C.	-122.053	38.042	6.07	6.04	6.27	7.32	7.64	8.04	8.37	8.76	9.06	9.35	10.07
FEMA_370 Contra C.	-122.051	38.034	5.94	5.54	6.66	7.15	7.51	8.01	8.37	8.89	9.28	9.68	10.66
FEMA_371 Contra C.	-122.056	38.037	5.94	5.81	6.14	7.25	7.61	8.04	8.37	8.79	9.12	9.48	10.24
FEMA_372 Contra C.	-122.063	38.039	6.00	5.97	6.17	7.48	7.78	8.17	8.46	8.83	9.09	9.32	9.88
FEMA_373 Contra C.	-122.063	38.043	6.04	6.00	6.17	7.51	7.81	8.20	8.46	8.83	9.06	9.28	9.81
FEMA_374 Contra C.	-122.062	38.053	3.41	0.79	5.94	7.84	8.10	8.46	8.73	9.09	9.35	9.61	10.20

FEMA_375 Contra C.	-122.067	38.045	6.20	6.17	6.36	7.51	7.81	8.20	8.46	8.83	9.09	9.35	9.91
FEMA_376 Contra C.	-122.068	38.050	6.04	6.00	6.46	7.64	7.91	8.23	8.50	8.86	9.15	9.45	10.20
FEMA_377 Contra C.	-122.073	38.051	3.41	0.69	5.94	7.84	8.10	8.46	8.69	9.02	9.28	9.51	10.04
FEMA_378 Contra C.	-122.080	38.050	3.41	0.69	5.94	7.84	8.10	8.46	8.69	9.02	9.28	9.51	10.07
FEMA_379 Contra C.	-122.084	38.046	6.07	6.07	6.33	7.68	7.91	8.23	8.50	8.86	9.12	9.42	10.10
FEMA_380 Contra C.	-122.091	38.047	3.38	0.62	5.97	7.84	8.10	8.43	8.69	9.06	9.32	9.58	10.17
FEMA_381 Contra C.	-122.098	38.045	3.38	0.59	5.97	7.84	8.10	8.43	8.69	9.02	9.28	9.51	10.10
FEMA_382 Contra C.	-122.103	38.042	3.38	0.59	5.97	7.84	8.10	8.43	8.66	9.02	9.25	9.51	10.10
FEMA_383 Contra C.	-122.108	38.039	4.36	3.84	5.94	7.74	7.97	8.30	8.56	8.86	9.12	9.35	9.88
FEMA_384 Contra C.	-122.115	38.039	3.35	0.52	5.94	7.84	8.07	8.40	8.66	8.99	9.22	9.48	10.04
FEMA_385 Contra C.	-122.121	38.038	3.35	0.52	5.97	7.84	8.10	8.40	8.66	8.99	9.22	9.48	10.04
FEMA_386 Contra C.	-122.125	38.033	3.38	0.56	5.97	7.84	8.07	8.40	8.66	8.99	9.22	9.48	10.04
FEMA_387 Contra C.	-122.131	38.031	3.38	0.56	5.97	7.84	8.10	8.43	8.66	8.99	9.25	9.51	10.14
FEMA_388 Contra C.	-122.135	38.029	3.38	0.56	5.97	7.84	8.10	8.40	8.66	8.99	9.25	9.51	10.17
FEMA_389 Contra C.	-122.141	38.029	3.38	0.56	5.97	7.84	8.10	8.40	8.66	8.99	9.25	9.48	10.10
FEMA_390 Contra C.	-122.145	38.026	3.38	0.56	6.00	7.87	8.10	8.43	8.66	8.96	9.15	9.38	9.84
FEMA_391 Contra C.	-122.151	38.025	3.38	0.52	6.00	7.87	8.10	8.43	8.66	8.96	9.19	9.38	9.88
FEMA_392 Contra C.	-122.157	38.027	3.38	0.52	6.00	7.87	8.10	8.43	8.66	8.96	9.19	9.38	9.88
FEMA_393 Contra C.	-122.162	38.030	3.35	0.52	5.97	7.87	8.10	8.40	8.63	8.92	9.12	9.35	9.78

FEMA_394 Contra C.	-122.167	38.033	3.35	0.49	5.97	7.87	8.10	8.40	8.63	8.92	9.12	9.35	9.81
FEMA_395 Contra C.	-122.170	38.036	3.35	0.46	5.97	7.84	8.07	8.40	8.63	8.89	9.12	9.32	9.78
FEMA_396 Contra C.	-122.172	38.039	3.31	0.43	5.97	7.84	8.07	8.40	8.60	8.89	9.09	9.32	9.74
FEMA_397 Contra C.	-122.175	38.043	3.31	0.43	5.97	7.84	8.07	8.40	8.63	8.92	9.15	9.38	9.88
FEMA_398 Contra C.	-122.178	38.047	3.31	0.39	5.97	7.84	8.07	8.37	8.60	8.89	9.12	9.35	9.84
FEMA_399 Contra C.	-122.181	38.051	3.31	0.39	5.94	7.81	8.04	8.37	8.60	8.89	9.09	9.32	9.81
FEMA_400 Contra C.	-122.186	38.054	3.28	0.36	5.94	7.81	8.04	8.33	8.56	8.83	9.06	9.25	9.68
FEMA_401 Contra C.	-122.191	38.055	3.31	0.36	5.94	7.81	8.04	8.37	8.60	8.89	9.12	9.35	9.91
FEMA_402 Contra C.	-122.199	38.056	3.31	0.39	5.97	7.84	8.07	8.37	8.60	8.92	9.19	9.42	10.01
FEMA_403 Contra C.	-122.205	38.057	3.31	0.39	5.94	7.81	8.04	8.37	8.60	8.89	9.12	9.35	9.84
FEMA_404 Contra C.	-122.212	38.060	3.28	0.36	5.94	7.81	8.04	8.33	8.60	8.89	9.15	9.38	9.97
FEMA_405 Contra C.	-122.217	38.060	3.28	0.33	5.94	7.81	8.04	8.33	8.56	8.89	9.15	9.42	10.04
FEMA_406 Contra C.	-122.224	38.060	3.28	0.30	5.97	7.81	8.04	8.37	8.60	8.92	9.19	9.45	10.07
FEMA_407 Contra C.	-122.230	38.060	3.31	0.33	5.97	7.87	8.10	8.40	8.63	8.96	9.22	9.48	10.10
FEMA_408 Contra C.	-122.237	38.060	3.28	0.30	5.97	7.87	8.10	8.40	8.63	8.96	9.22	9.45	10.07
FEMA_409 Contra C.	-122.244	38.060	3.28	0.26	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
FEMA_410 Contra C.	-122.249	38.059	3.28	0.23	6.00	7.87	8.10	8.43	8.66	8.99	9.22	9.48	10.07
FEMA_411 Contra C.	-122.254	38.056	3.28	0.23	6.00	7.91	8.14	8.43	8.66	8.99	9.25	9.51	10.17
FEMA_412 Contra C.	-122.259	38.055	3.28	0.23	6.04	7.91	8.17	8.46	8.66	8.96	9.19	9.38	9.88

FEMA_413 Contra C.	-122.265	38.053	3.28	0.20	6.04	7.97	8.20	8.50	8.73	8.99	9.22	9.42	9.88
FEMA_414 Contra C.	-122.266	38.047	3.28	0.20	6.07	7.97	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_415 Contra C.	-122.268	38.043	3.28	0.16	6.10	8.01	8.23	8.56	8.79	9.09	9.32	9.55	10.04
FEMA_416 Contra C.	-122.275	38.042	3.28	0.16	6.10	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.04
FEMA_417 Contra C.	-122.278	38.037	3.28	0.13	6.14	8.07	8.30	8.60	8.83	9.12	9.35	9.58	10.07
FEMA_418 Contra C.	-122.279	38.032	3.28	0.13	6.14	8.07	8.30	8.60	8.83	9.12	9.32	9.51	9.97
FEMA_419 Contra C.	-122.282	38.028	3.28	0.10	6.14	8.07	8.30	8.63	8.83	9.12	9.32	9.55	10.01
FEMA_420 Contra C.	-122.289	38.024	3.28	0.10	6.14	8.07	8.30	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_421 Contra C.	-122.295	38.024	3.28	0.07	6.17	8.07	8.33	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_422 Contra C.	-122.294	38.019	3.35	0.66	6.17	8.07	8.30	8.63	8.86	9.15	9.42	9.65	10.20
FEMA_423 Contra C.	-122.301	38.015	3.28	0.03	6.17	8.10	8.33	8.63	8.86	9.19	9.42	9.65	10.17
FEMA_424 Contra C.	-122.308	38.013	3.28	0.00	6.17	8.10	8.33	8.63	8.86	9.15	9.38	9.61	10.10
FEMA_425 Contra C.	-122.314	38.015	3.25	0.00	6.17	8.10	8.33	8.63	8.86	9.19	9.42	9.65	10.20
FEMA_426 Contra C.	-122.320	38.013	3.25	0.00	6.17	8.10	8.33	8.63	8.86	9.19	9.42	9.65	10.17
FEMA_427 Contra C.	-122.324	38.009	3.25	-0.03	6.17	8.10	8.33	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_428 Contra C.	-122.327	38.007	3.25	-0.03	6.17	8.10	8.33	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_429 Contra C.	-122.333	38.005	3.25	-0.03	6.17	8.10	8.33	8.63	8.86	9.19	9.42	9.65	10.17
FEMA_430 Contra C.	-122.337	38.004	3.25	-0.07	6.17	8.10	8.33	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_431 Contra C.	-122.342	38.006	3.25	-0.07	6.17	8.07	8.33	8.63	8.86	9.15	9.38	9.61	10.14

FEMA_432 Contra C.	-122.347	38.008	3.22	-0.10	6.17	8.07	8.30	8.63	8.86	9.15	9.38	9.61	10.14
FEMA_433 Contra C.	-122.353	38.010	3.22	-0.13	6.17	8.07	8.30	8.63	8.86	9.15	9.38	9.61	10.17
FEMA_434 Contra C.	-122.358	38.010	3.22	-0.10	6.17	8.07	8.30	8.60	8.83	9.15	9.38	9.61	10.10
FEMA_435 Contra C.	-122.361	38.014	3.18	-0.16	6.14	8.07	8.30	8.60	8.86	9.15	9.42	9.65	10.24
FEMA_436 Contra C.	-122.366	38.015	3.18	-0.16	6.14	8.07	8.30	8.60	8.83	9.15	9.38	9.65	10.20
FEMA_437 Contra C.	-122.370	38.012	3.18	-0.20	6.14	8.07	8.30	8.60	8.83	9.15	9.38	9.58	10.10
FEMA_438 Contra C.	-122.371	38.008	3.18	-0.20	6.14	8.04	8.30	8.60	8.83	9.15	9.38	9.61	10.17
FEMA_439 Contra C.	-122.370	38.003	3.18	-0.20	6.14	8.04	8.27	8.60	8.83	9.12	9.38	9.61	10.17
FEMA_440 Contra C.	-122.369	37.998	3.18	-0.16	6.14	8.04	8.27	8.60	8.83	9.12	9.35	9.58	10.14
FEMA_441 Contra C.	-122.365	37.995	3.22	0.10	6.14	8.01	8.27	8.56	8.83	9.15	9.38	9.65	10.24
FEMA_442 Contra C.	-122.366	37.989	3.22	0.13	6.14	8.01	8.27	8.56	8.79	9.12	9.35	9.58	10.14
FEMA_443 Contra C.	-122.368	37.986	3.18	-0.20	6.14	8.01	8.27	8.56	8.79	9.12	9.38	9.61	10.20
FEMA_444 Contra C.	-122.372	37.982	3.18	-0.10	6.14	8.01	8.23	8.56	8.79	9.12	9.35	9.61	10.17
FEMA_445 Contra C.	-122.378	37.981	3.18	-0.16	6.10	8.01	8.23	8.56	8.79	9.15	9.42	9.68	10.33
FEMA_446 Contra C.	-122.384	37.981	3.15	-0.23	6.10	8.01	8.23	8.56	8.79	9.12	9.35	9.61	10.17
FEMA_447 Contra C.	-122.389	37.978	3.15	-0.20	6.10	7.97	8.23	8.53	8.79	9.09	9.35	9.58	10.14
FEMA_448 Contra C.	-122.391	37.974	3.18	0.03	6.10	7.97	8.20	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_449 Contra C.	-122.396	37.972	3.15	-0.23	6.10	7.97	8.20	8.53	8.76	9.09	9.32	9.58	10.17
FEMA_450 Contra C.	-122.402	37.971	3.15	-0.23	6.07	7.97	8.20	8.50	8.73	9.06	9.28	9.55	10.10

FEMA_451 Contra C.	-122.405	37.966	3.15	-0.03	6.07	7.94	8.17	8.50	8.73	9.02	9.28	9.51	10.07
FEMA_452 Contra C.	-122.407	37.962	3.15	-0.07	6.07	7.94	8.17	8.50	8.73	9.06	9.32	9.58	10.20
FEMA_453 Contra C.	-122.411	37.965	3.12	-0.26	6.07	7.94	8.17	8.50	8.73	9.02	9.28	9.51	10.10
FEMA_454 Contra C.	-122.417	37.968	3.12	-0.26	6.04	7.94	8.17	8.46	8.69	9.02	9.25	9.48	10.07
FEMA_455 Contra C.	-122.422	37.968	3.12	-0.26	6.04	7.91	8.14	8.43	8.69	8.99	9.25	9.51	10.10
FEMA_456 Contra C.	-122.429	37.968	3.12	-0.26	6.04	7.91	8.14	8.43	8.66	8.99	9.22	9.45	10.01
FEMA_457 Contra C.	-122.429	37.959	3.12	-0.23	6.00	7.87	8.10	8.43	8.66	8.96	9.22	9.45	10.01
FEMA_458 Contra C.	-122.427	37.954	3.12	-0.26	6.00	7.87	8.10	8.40	8.63	8.92	9.15	9.38	9.94
FEMA_459 Contra C.	-122.424	37.950	3.12	-0.26	6.00	7.87	8.10	8.40	8.63	8.92	9.15	9.35	9.88
FEMA_460 Contra C.	-122.426	37.946	3.12	-0.23	6.00	7.87	8.10	8.40	8.63	8.92	9.19	9.42	9.97
FEMA_461 Contra C.	-122.420	37.943	3.12	-0.23	6.00	7.87	8.10	8.40	8.63	8.92	9.12	9.35	9.84
FEMA_462 Contra C.	-122.414	37.941	3.12	-0.23	6.00	7.87	8.10	8.40	8.63	8.92	9.12	9.32	9.81
FEMA_463 Contra C.	-122.417	37.937	3.12	-0.23	6.00	7.87	8.10	8.40	8.63	8.96	9.22	9.48	10.10
FEMA_464 Contra C.	-122.413	37.932	3.12	-0.23	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.45	10.04
FEMA_465 Contra C.	-122.408	37.929	3.12	-0.20	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
FEMA_466 Contra C.	-122.401	37.927	3.15	-0.20	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	9.97
FEMA_467 Contra C.	-122.396	37.924	3.15	-0.20	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
FEMA_468 Contra C.	-122.393	37.921	3.15	-0.20	5.97	7.87	8.07	8.40	8.63	8.96	9.19	9.45	10.04
FEMA_469 Contra C.	-122.391	37.916	3.15	-0.20	5.97	7.84	8.07	8.40	8.63	8.92	9.15	9.38	9.91

FEMA_470 Contra C.	-122.394	37.911	3.12	-0.20	5.97	7.84	8.07	8.37	8.60	8.89	9.12	9.35	9.88
FEMA_471 Contra C.	-122.391	37.907	3.12	-0.20	5.97	7.87	8.10	8.40	8.63	8.92	9.15	9.42	9.94
FEMA_472 Contra C.	-122.384	37.905	3.12	-0.20	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
FEMA_473 Contra C.	-122.377	37.905	3.12	-0.20	5.97	7.87	8.10	8.40	8.63	8.92	9.15	9.38	9.91
FEMA_474 Contra C.	-122.373	37.904	3.15	-0.20	5.97	7.87	8.14	8.43	8.66	8.96	9.19	9.42	9.94
FEMA_475 Contra C.	-122.365	37.902	3.15	-0.20	6.00	7.91	8.14	8.46	8.69	8.99	9.22	9.45	10.01
FEMA_476 Contra C.	-122.360	37.904	3.15	-0.20	6.00	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_477 Contra C.	-122.362	37.909	3.15	-0.23	6.00	7.94	8.17	8.46	8.69	8.99	9.22	9.45	10.01
FEMA_478 Contra C.	-122.357	37.907	3.15	-0.23	6.00	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_479 Contra C.	-122.350	37.905	3.15	-0.26	6.04	7.97	8.20	8.50	8.73	9.02	9.25	9.45	9.97
FEMA_480 Contra C.	-122.343	37.905	3.15	-0.26	6.04	7.97	8.20	8.53	8.73	9.02	9.25	9.48	10.01
FEMA_481 Contra C.	-122.336	37.906	3.15	-0.16	6.07	8.01	8.23	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_482 Contra C.	-122.329	37.905	3.15	-0.23	6.07	8.01	8.23	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_483 Contra C.	-122.329	37.901	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_484 Contra C.	-122.328	37.896	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_485 Contra C.	-122.323	37.894	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_486 Contra C.	-121.983	38.064	3.51	1.15	5.81	7.78	8.07	8.46	8.79	9.19	9.48	9.78	10.50
FEMA_487 Contra C.	-121.988	38.063	3.51	1.08	5.81	7.78	8.07	8.46	8.76	9.15	9.45	9.74	10.43
FEMA_488 Contra C.	-121.995	38.064	3.48	1.02	5.84	7.81	8.10	8.46	8.73	9.09	9.35	9.58	10.14

FEMA_489 Contra C.	-122.003	38.064	3.48	1.02	5.84	7.81	8.10	8.46	8.76	9.15	9.45	9.74	10.47
FEMA_491 Contra C.	-122.432	37.964	3.12	-0.23	6.00	7.91	8.14	8.43	8.66	8.96	9.19	9.45	9.97
FEMA_492 Contra C.	-122.436	37.962	3.12	-0.23	6.04	7.91	8.14	8.43	8.66	8.99	9.22	9.48	10.04
FEMA_493 Contra C.	-122.431	37.931	3.12	-0.23	5.97	7.87	8.10	8.40	8.63	8.89	9.12	9.35	9.84
FEMA_494 Contra C.	-122.432	37.927	3.12	-0.23	5.97	7.84	8.07	8.40	8.63	8.96	9.19	9.45	10.04
FEMA_495 Contra C.	-122.429	37.928	3.12	-0.23	5.97	7.87	8.10	8.40	8.63	8.92	9.15	9.42	9.97
FEMA_496 Contra C.	-122.392	37.903	3.12	-0.23	5.97	7.87	8.10	8.40	8.63	8.96	9.19	9.42	10.01
FEMA_497 Contra C.	-122.386	37.902	3.12	-0.23	6.00	7.91	8.14	8.43	8.66	8.96	9.22	9.45	10.01
FEMA_498 Contra C.	-122.379	37.901	3.15	-0.23	6.00	7.94	8.14	8.46	8.66	8.96	9.19	9.42	9.94
FEMA_499 Contra C.	-122.372	37.899	3.15	-0.23	6.00	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_500 Contra C.	-122.366	37.898	3.15	-0.26	6.04	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.94
FEMA_501 Contra C.	-122.360	37.896	3.15	-0.26	6.04	7.97	8.20	8.50	8.73	9.02	9.25	9.48	10.04
FEMA_502 Contra C.	-122.355	37.894	3.15	-0.26	6.04	7.97	8.20	8.50	8.73	9.02	9.25	9.48	9.97
FEMA_503 Contra C.	-122.350	37.894	3.15	-0.26	6.04	7.97	8.20	8.50	8.73	9.02	9.25	9.48	10.01
FEMA_504 Contra C.	-122.353	37.898	3.15	-0.03	6.04	7.94	8.17	8.50	8.73	9.02	9.25	9.48	10.01
FEMA_505 Contra C.	-122.357	37.902	3.15	-0.23	6.00	7.94	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_506 Alameda	-122.330	37.892	3.15	-0.26	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.48	10.01
FEMA_507 Alameda	-122.331	37.888	3.15	-0.26	6.07	8.01	8.23	8.53	8.73	9.02	9.25	9.48	9.97
FEMA_508 Alameda	-122.325	37.885	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07

FEMA_509 Alameda	-122.320	37.885	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.48	10.01
FEMA_510 Alameda	-122.317	37.881	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_511 Alameda	-122.312	37.878	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_512 Alameda	-122.311	37.873	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_513 Alameda	-122.314	37.876	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_514 Alameda	-122.319	37.879	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_515 Alameda	-122.324	37.877	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_516 Alameda	-122.329	37.874	3.15	-0.26	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_517 Alameda	-122.326	37.870	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_518 Alameda	-122.322	37.867	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_519 Alameda	-122.321	37.862	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.32	9.55	10.10
FEMA_520 Alameda	-122.319	37.857	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_521 Alameda	-122.314	37.857	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.10
FEMA_522 Alameda	-122.310	37.861	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.28	9.55	10.07
FEMA_523 Alameda	-122.305	37.858	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_524 Alameda	-122.304	37.853	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.10
FEMA_525 Alameda	-122.304	37.848	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.10
FEMA_526 Alameda	-122.301	37.844	3.15	-0.30	6.10	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.10
FEMA_527 Alameda	-122.304	37.842	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.14

FEMA_528 Alameda	-122.310	37.841	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.14
FEMA_529 Alameda	-122.311	37.845	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.10
FEMA_530 Alameda	-122.317	37.844	3.15	-0.30	6.07	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.04
FEMA_531 Alameda	-122.319	37.839	3.15	-0.30	6.10	8.01	8.23	8.53	8.76	9.06	9.28	9.48	9.97
FEMA_532 Alameda	-122.317	37.835	3.15	-0.30	6.10	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.14
FEMA_533 Alameda	-122.310	37.835	3.15	-0.30	6.10	8.04	8.23	8.53	8.76	9.09	9.32	9.55	10.07
FEMA_534 Alameda	-122.304	37.834	3.15	-0.03	6.10	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.07
FEMA_535 Alameda	-122.304	37.829	3.18	0.26	6.10	8.01	8.23	8.53	8.76	9.06	9.25	9.48	9.97
FEMA_536 Alameda	-122.309	37.830	3.18	0.16	6.10	8.01	8.23	8.53	8.76	9.06	9.28	9.51	10.07
FEMA_537 Alameda	-122.315	37.831	3.15	-0.30	6.10	8.01	8.23	8.53	8.76	9.09	9.32	9.55	10.07
FEMA_538 Alameda	-122.320	37.827	3.12	-0.30	6.10	8.04	8.23	8.53	8.76	9.06	9.28	9.48	9.97
FEMA_539 Alameda	-122.326	37.825	3.12	-0.30	6.10	8.04	8.23	8.53	8.76	9.06	9.28	9.48	10.01
FEMA_540 Alameda	-122.331	37.824	3.12	-0.33	6.10	8.04	8.23	8.56	8.76	9.09	9.28	9.51	10.07
FEMA_541 Alameda	-122.334	37.820	3.12	-0.33	6.10	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_542 Alameda	-122.328	37.818	3.12	-0.33	6.10	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_543 Alameda	-122.322	37.818	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_544 Alameda	-122.312	37.821	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_545 Alameda	-122.317	37.818	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_546 Alameda	-122.323	37.814	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.28	9.51	10.04

FEMA_547 Alameda	-122.329	37.813	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.28	9.51	10.04
FEMA_548 Alameda	-122.336	37.812	3.12	-0.36	6.14	8.04	8.27	8.56	8.79	9.09	9.28	9.51	9.97
FEMA_549 Alameda	-122.341	37.810	3.12	-0.36	6.14	8.07	8.27	8.56	8.79	9.09	9.32	9.55	10.04
FEMA_550 Alameda	-122.346	37.808	3.12	-0.36	6.14	8.07	8.30	8.60	8.79	9.09	9.32	9.51	10.01
FEMA_551 Alameda	-122.345	37.803	3.12	-0.36	6.14	8.07	8.30	8.60	8.83	9.12	9.35	9.58	10.10
FEMA_552 Alameda	-122.340	37.801	3.12	-0.39	6.17	8.10	8.33	8.60	8.83	9.12	9.32	9.51	10.01
FEMA_553 Alameda	-122.334	37.802	3.12	-0.39	6.17	8.10	8.33	8.63	8.83	9.12	9.35	9.55	10.04
FEMA_554 Alameda	-122.328	37.798	3.12	-0.39	6.17	8.10	8.33	8.63	8.86	9.15	9.38	9.61	10.10
FEMA_555 Alameda	-122.321	37.796	3.12	-0.39	6.20	8.14	8.37	8.63	8.86	9.12	9.35	9.55	10.01
FEMA_556 Alameda	-122.314	37.794	3.12	-0.39	6.20	8.14	8.37	8.66	8.86	9.15	9.38	9.58	10.04
FEMA_557 Alameda	-122.306	37.793	3.12	-0.39	6.20	8.14	8.37	8.66	8.89	9.15	9.35	9.55	10.01
FEMA_558 Alameda	-122.299	37.792	3.12	-0.39	6.20	8.17	8.40	8.66	8.89	9.19	9.38	9.58	10.04
FEMA_559 Alameda	-122.293	37.793	3.12	-0.39	6.20	8.17	8.40	8.69	8.89	9.19	9.42	9.61	10.10
FEMA_560 Alameda	-122.287	37.793	3.12	-0.43	6.23	8.17	8.40	8.69	8.89	9.19	9.42	9.61	10.10
FEMA_561 Alameda	-122.280	37.793	3.12	-0.43	6.23	8.17	8.40	8.69	8.92	9.22	9.42	9.65	10.17
FEMA_562 Alameda	-122.274	37.791	3.12	-0.43	6.23	8.20	8.40	8.69	8.92	9.22	9.45	9.68	10.20
FEMA_563 Alameda	-122.269	37.788	3.12	-0.43	6.23	8.20	8.43	8.69	8.92	9.22	9.45	9.68	10.20
FEMA_564 Alameda	-122.263	37.786	3.12	-0.43	6.23	8.20	8.43	8.73	8.92	9.22	9.45	9.68	10.20
FEMA_565 Alameda	-122.256	37.783	3.12	-0.43	6.27	8.20	8.43	8.73	8.96	9.22	9.45	9.68	10.17

FEMA_566 Alameda	-122.252	37.786	3.12	-0.43	6.27	8.20	8.43	8.73	8.96	9.22	9.45	9.68	10.17
FEMA_567 Alameda	-122.245	37.783	3.12	-0.43	6.27	8.20	8.43	8.73	8.96	9.22	9.45	9.65	10.14
FEMA_568 Alameda	-122.246	37.777	3.12	-0.43	6.27	8.20	8.43	8.73	8.96	9.25	9.48	9.71	10.24
FEMA_569 Alameda	-122.252	37.780	3.12	-0.43	6.27	8.20	8.43	8.73	8.96	9.22	9.45	9.65	10.10
FEMA_570 Alameda	-122.335	37.798	3.12	-0.39	6.17	8.10	8.33	8.63	8.86	9.12	9.35	9.58	10.07
FEMA_571 Alameda	-122.334	37.793	3.08	-0.39	6.20	8.14	8.37	8.66	8.86	9.15	9.35	9.55	10.01
FEMA_572 Alameda	-122.334	37.788	3.08	-0.43	6.20	8.17	8.37	8.66	8.89	9.19	9.38	9.58	10.07
FEMA_573 Alameda	-122.336	37.783	3.08	-0.43	6.23	8.17	8.40	8.69	8.92	9.25	9.48	9.74	10.33
FEMA_574 Alameda	-122.333	37.779	3.08	-0.46	6.27	8.20	8.43	8.73	8.96	9.25	9.45	9.68	10.20
FEMA_575 Alameda	-122.327	37.779	3.08	-0.49	6.27	8.23	8.43	8.73	8.96	9.25	9.51	9.74	10.30
FEMA_576 Alameda	-122.321	37.777	3.08	-0.49	6.30	8.27	8.46	8.76	8.99	9.28	9.51	9.74	10.30
FEMA_577 Alameda	-122.316	37.774	3.08	-0.49	6.30	8.27	8.50	8.79	9.02	9.28	9.51	9.74	10.24
FEMA_578 Alameda	-122.309	37.774	3.12	-0.52	6.30	8.27	8.50	8.79	9.02	9.32	9.51	9.74	10.20
FEMA_579 Alameda	-122.303	37.771	3.12	-0.52	6.30	8.27	8.50	8.79	9.02	9.32	9.51	9.74	10.24
FEMA_580 Alameda	-122.317	37.770	3.08	-0.52	6.33	8.27	8.50	8.79	9.02	9.32	9.51	9.74	10.20
FEMA_581 Alameda	-122.311	37.767	3.12	-0.56	6.36	8.33	8.53	8.83	9.06	9.35	9.55	9.78	10.27
FEMA_582 Alameda	-122.306	37.767	3.08	-0.59	6.36	8.33	8.56	8.86	9.09	9.38	9.58	9.81	10.30
FEMA_583 Alameda	-122.299	37.767	3.12	-0.59	6.40	8.37	8.60	8.89	9.12	9.38	9.61	9.84	10.33
FEMA_584 Alameda	-122.293	37.766	3.12	-0.59	6.40	8.37	8.60	8.89	9.12	9.38	9.61	9.81	10.30

FEMA_585 Alameda	-122.288	37.763	3.12	-0.62	6.43	8.40	8.63	8.92	9.12	9.42	9.65	9.84	10.33
FEMA_586 Alameda	-122.282	37.761	3.12	-0.62	6.43	8.43	8.63	8.96	9.15	9.48	9.71	9.94	10.47
FEMA_587 Alameda	-122.277	37.764	3.12	-0.62	6.46	8.43	8.66	8.96	9.19	9.45	9.68	9.88	10.37
FEMA_588 Alameda	-122.275	37.760	3.12	-0.66	6.46	8.43	8.66	8.96	9.15	9.45	9.68	9.91	10.40
FEMA_589 Alameda	-122.269	37.758	3.12	-0.66	6.46	8.43	8.66	8.96	9.19	9.48	9.71	9.91	10.43
FEMA_590 Alameda	-122.262	37.756	3.12	-0.66	6.46	8.46	8.66	8.96	9.19	9.48	9.71	9.94	10.47
FEMA_591 Alameda	-122.258	37.753	3.15	-0.62	6.46		8.69	8.96	9.15	9.42	9.61	9.81	10.30
FEMA_592 Alameda	-122.252	37.751	3.15	-0.43	6.46	8.46	8.66	8.96	9.19	9.48	9.71	9.91	10.43
FEMA_593 Alameda	-122.257	37.749	3.12	-0.66	6.46	8.46	8.66	8.96	9.19	9.48	9.71	9.94	10.43
FEMA_594 Alameda	-122.263	37.746	3.12	-0.69	6.46	8.46	8.66	8.96	9.19	9.48	9.71	9.94	10.50
FEMA_595 Alameda	-122.265	37.741	3.12	-0.69	6.50		8.73	8.96	9.15	9.42	9.61	9.81	10.27
FEMA_596 Alameda	-122.262	37.737	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.48	9.68	9.91	10.37
FEMA_597 Alameda	-122.258	37.734	3.12	-0.69	6.50	8.50	8.73	8.99	9.22	9.48	9.71	9.91	10.37
FEMA_598 Alameda	-122.254	37.730	3.12	-0.69	6.53		8.76	8.99	9.19	9.45	9.65	9.84	10.30
FEMA_599 Alameda	-122.254	37.727	3.12	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_600 Alameda	-122.253	37.722	3.12	-0.75	6.53	8.53	8.76	9.06	9.25	9.55	9.74	9.94	10.43
FEMA_601 Alameda	-122.249	37.719	3.12	-0.79	6.56	8.56	8.76	9.06	9.28	9.58	9.81	10.04	10.56
FEMA_602 Alameda	-122.245	37.716	3.12	-0.79	6.59	8.56	8.79	9.09	9.32	9.61	9.84	10.07	10.60
FEMA_603 Alameda	-122.239	37.712	3.12	-0.82	6.59	8.60	8.83	9.09	9.32	9.58	9.81	10.01	10.47

FEMA_604 Alameda	-122.235	37.709	3.12	-0.82	6.63		8.86	9.12	9.32	9.55	9.74	9.94	10.40
FEMA_605 Alameda	-122.231	37.705	3.12	-0.85	6.63	8.63	8.86	9.12	9.35	9.61	9.84	10.04	10.50
FEMA_606 Alameda	-122.226	37.702	3.12	-0.89	6.66	8.66	8.86	9.15	9.35	9.65	9.84	10.04	10.50
FEMA_607 Alameda	-122.219	37.698	3.12	-0.92	6.66	8.66	8.89	9.19	9.38	9.65	9.84	10.04	10.47
FEMA_608 Alameda	-122.216	37.697	3.15	-0.92	6.69	8.69	8.89	9.19	9.42	9.68	9.91	10.10	10.63
FEMA_609 Alameda	-122.210	37.698	3.15	-0.95	6.69		8.96	9.19	9.38	9.65	9.84	10.04	10.50
FEMA_610 Alameda	-122.208	37.703	3.15	-0.89	6.73	8.73	8.92	9.22	9.45	9.71	9.94	10.17	10.66
FEMA_611 Alameda	-122.208	37.709	3.18	-0.43	6.73		8.96	9.19	9.38	9.65	9.84	10.07	10.53
FEMA_612 Alameda	-122.206	37.709	3.22	-0.39	6.73		8.96	9.19	9.38	9.65	9.84	10.07	10.53
FEMA_613 Alameda	-122.205	37.706	3.18	-0.62	6.73		8.96	9.22	9.42	9.65	9.88	10.07	10.53
FEMA_614 Alameda	-122.202	37.702	3.15	-0.92	6.73	8.73	8.92	9.22	9.45	9.71	9.94	10.17	10.66
FEMA_615 Alameda	-122.197	37.702	3.18	-0.69	6.73	8.73	8.92	9.22	9.42	9.71	9.91	10.14	10.60
FEMA_616 Alameda	-122.194	37.702	3.18	-0.72	6.73	8.73	8.92	9.22	9.45	9.71	9.94	10.17	10.66
FEMA_617 Alameda	-122.195	37.699	3.15	-0.92	6.73	8.73	8.92	9.22	9.45	9.74	9.94	10.17	10.66
FEMA_618 Alameda	-122.197	37.699	3.15	-0.95	6.73	8.73	8.92	9.22	9.45	9.74	9.94	10.17	10.66
FEMA_619 Alameda	-122.196	37.695	3.15	-0.95	6.73	8.73	8.92	9.22	9.45	9.71	9.91	10.10	10.56
FEMA_620 Alameda	-122.192	37.694	3.15	-0.95	6.73	8.73	8.92	9.22	9.45	9.71	9.91	10.14	10.60
FEMA_621 Alameda	-122.195	37.693	3.15	-0.95	6.73	8.73	8.92	9.22	9.45	9.74	9.97	10.24	10.79
FEMA_622 Alameda	-122.193	37.691	3.15	-0.95	6.73		8.96	9.22	9.42	9.68	9.88	10.07	10.50

FEMA_623 Alameda	-122.188	37.688	3.18	-0.79	6.73		8.96	9.22	9.42	9.68	9.88	10.07	10.47
FEMA_624 Alameda	-122.183	37.685	3.15	-0.85	6.76	8.76	8.96	9.25	9.45	9.71	9.91	10.10	10.53
FEMA_625 Alameda	-122.180	37.681	3.18	-0.72	6.76	8.76	8.96	9.25	9.45	9.74	9.94	10.17	10.66
FEMA_626 Alameda	-122.177	37.677	3.18	-0.59	6.76		8.99	9.25	9.45	9.71	9.88	10.07	10.50
FEMA_627 Alameda	-122.172	37.675	3.22	-0.20	6.76	8.76	8.96	9.25	9.48	9.74	9.97	10.17	10.70
FEMA_628 Alameda	-122.173	37.669	3.18	-0.49	6.76		8.99	9.25	9.45	9.71	9.91	10.10	10.56
FEMA_629 Alameda	-122.174	37.665	3.18	-0.56	6.76		8.99	9.25	9.45	9.71	9.91	10.10	10.53
FEMA_630 Alameda	-122.170	37.662	3.18	-0.56	6.79	8.76	8.99	9.28	9.48	9.78	10.01	10.20	10.73
FEMA_631 Alameda	-122.165	37.659	3.22	-0.39	6.79		9.02	9.28	9.48	9.71	9.91	10.10	10.53
FEMA_632 Alameda	-122.162	37.656	3.22	-0.36	6.79		9.02	9.28	9.48	9.74	9.91	10.10	10.53
FEMA_633 Alameda	-122.159	37.652	3.25	-0.16	6.79	8.79	8.99	9.28	9.51	9.81	10.01	10.24	10.76
FEMA_634 Alameda	-122.159	37.647	3.22	-0.56	6.79	8.79	9.02	9.28	9.51	9.81	10.01	10.24	10.73
FEMA_635 Alameda	-122.158	37.642	3.22	-0.49	6.82	8.79	9.02	9.28	9.51	9.81	10.01	10.24	10.73
FEMA_636 Alameda	-122.156	37.638	3.25	-0.07	6.82	8.79	9.02	9.28	9.51	9.81	10.01	10.24	10.76
FEMA_637 Alameda	-122.156	37.634	3.22	-0.43	6.82	8.83	9.02	9.32	9.51	9.81	10.04	10.24	10.76
FEMA_638 Alameda	-122.156	37.629	3.22	-0.56	6.82	8.83	9.02	9.32	9.55	9.84	10.04	10.27	10.79
FEMA_639 Alameda	-122.155	37.624	3.25	-0.03	6.82	8.83	9.02	9.32	9.55	9.81	10.04	10.27	10.76
FEMA_640 Alameda	-122.156	37.618	3.22	-0.33	6.82	8.83	9.06	9.32	9.55	9.84	10.07	10.27	10.79
FEMA_641 Alameda	-122.157	37.617	3.18	-0.75	6.86	8.86	9.06	9.35	9.55	9.84	10.04	10.24	10.73

FEMA_642 Alameda	-122.157	37.616	3.18	-0.75	6.86	8.86	9.06	9.35	9.55	9.84	10.04	10.24	10.73
FEMA_643 Alameda	-122.156	37.614	3.25	-0.26	6.86	8.86	9.06	9.35	9.55	9.84	10.04	10.27	10.73
FEMA_644 Alameda	-122.154	37.610	3.22	-0.36	6.86	8.86	9.06	9.35	9.58	9.84	10.04	10.27	10.73
FEMA_645 Alameda	-122.152	37.605	3.25	-0.36	6.86	8.86	9.09	9.35	9.58	9.88	10.07	10.30	10.79
FEMA_646 Alameda	-122.151	37.601	3.25	-0.16	6.89	8.86	9.09	9.35	9.58	9.88	10.10	10.30	10.83
FEMA_647 Alameda	-122.151	37.595	3.28	-0.10	6.89	8.86	9.09	9.38	9.58	9.88	10.10	10.33	10.86
FEMA_648 Alameda	-122.153	37.590	3.25	-0.39	6.89	8.89	9.09	9.38	9.61	9.88	10.10	10.33	10.83
FEMA_649 Alameda	-122.152	37.586	3.25	-0.36	6.89	8.89	9.12	9.38	9.61	9.88	10.10	10.30	10.79
FEMA_650 Alameda	-122.152	37.580	3.25	-0.33	6.92	8.89	9.12	9.42	9.61	9.88	10.10	10.30	10.79
FEMA_651 Alameda	-122.151	37.576	3.25	-0.23	6.92	8.92	9.12	9.42	9.61	9.91	10.10	10.33	10.83
FEMA_652 Alameda	-122.148	37.572	3.25	-0.39	6.96	8.92	9.15	9.42	9.65	9.91	10.14	10.33	10.83
FEMA_653 Alameda	-122.145	37.568	3.25	-0.33	6.96	8.96	9.15	9.45	9.65	9.91	10.14	10.33	10.79
FEMA_654 Alameda	-122.143	37.564	3.25	-0.26	6.96	8.96	9.15	9.45	9.65	9.91	10.14	10.33	10.76
FEMA_655 Alameda	-122.141	37.560	3.28	-0.03	6.96	8.96	9.19	9.45	9.68	9.94	10.14	10.33	10.83
FEMA_656 Alameda	-122.139	37.555	3.25	-0.26	6.99	8.96	9.19	9.45	9.68	9.94	10.17	10.37	10.83
FEMA_657 Alameda	-122.134	37.552	3.25	-0.33	6.99	8.99	9.19	9.48	9.68	9.97	10.17	10.40	10.89
FEMA_658 Alameda	-122.131	37.548	3.25	-0.39	6.99	8.99	9.19	9.48	9.71	9.97	10.20	10.43	10.93
FEMA_659 Alameda	-122.128	37.545	3.22	-0.66	7.02	9.02	9.22	9.51	9.71	9.97	10.20	10.40	10.89
FEMA_660 Alameda	-122.124	37.541	3.25	-0.30	7.02	9.02	9.22	9.51	9.71	10.01	10.20	10.43	10.93

FEMA_661 Alameda	-122.121	37.537	3.28	-0.20	7.02	9.02	9.22	9.51	9.71	10.01	10.20	10.40	10.86
FEMA_662 Alameda	-122.119	37.533	3.28	-0.23	7.02	9.02	9.25	9.51	9.71	10.01	10.20	10.40	10.83
FEMA_663 Alameda	-122.116	37.529	3.28	-0.13	7.05	9.02	9.25	9.51	9.71	10.01	10.20	10.40	10.86
FEMA_664 Alameda	-122.114	37.525	3.28	-0.30	7.05	9.06	9.25	9.51	9.74	10.01	10.24	10.43	10.93
FEMA_665 Alameda	-122.115	37.520	3.25	-0.33	7.05	9.06	9.25	9.55	9.74	10.04	10.24	10.43	10.89
FEMA_666 Alameda	-122.114	37.515	3.25	-0.39	7.05	9.06	9.28	9.55	9.78	10.07	10.30	10.56	11.15
FEMA_667 Alameda	-122.114	37.512	3.22	-0.62	7.09	9.09	9.28	9.55	9.78	10.04	10.24	10.43	10.93
FEMA_668 Alameda	-122.115	37.509	3.22	-0.69	7.09	9.09	9.28	9.58	9.78	10.04	10.24	10.43	10.86
FEMA_669 Alameda	-122.114	37.508	3.25	-0.36	7.09	9.09	9.28	9.58	9.78	10.07	10.27	10.50	10.99
FEMA_670 Alameda	-122.115	37.508	3.25	-0.36	7.09	9.09	9.28	9.58	9.78	10.07	10.27	10.50	10.99
FEMA_671 Alameda	-122.116	37.507	3.15	-1.54	7.09	9.12	9.32	9.61	9.81	10.07	10.27	10.47	10.89
FEMA_672 Alameda	-122.115	37.505	3.15	-1.57	7.09	9.12	9.32	9.61	9.81	10.07	10.27	10.47	10.89
FEMA_673 Alameda	-122.113	37.503	3.15	-1.57	7.09	9.12	9.32	9.61	9.81	10.10	10.33	10.56	11.12
FEMA_674 Alameda	-122.110	37.500	3.15	-1.57	7.12	9.12	9.35	9.61	9.84	10.10	10.33	10.53	11.06
FEMA_675 Alameda	-122.108	37.499	3.15	-1.57	7.12	9.15	9.35	9.65	9.84	10.14	10.33	10.56	11.06
FEMA_676 Alameda	-122.107	37.499	3.15	-1.57	7.12	9.15	9.35	9.65	9.84	10.14	10.33	10.56	11.06
FEMA_677 Alameda	-122.105	37.498	3.15	-1.57	7.12	9.15	9.38	9.65	9.88	10.14	10.33	10.56	11.06
FEMA_678 Alameda	-122.099	37.497	3.15	-1.61	7.15	9.19	9.38	9.68	9.88	10.17	10.40	10.60	11.15
FEMA_679 Alameda	-122.093	37.497	3.22	-1.18	7.15	9.19	9.38	9.68	9.88	10.17	10.40	10.60	11.12

FEMA_680 Alameda	-122.091	37.498	3.28	-0.56	7.15	9.19	9.42	9.68	9.88	10.17	10.37	10.56	11.02
FEMA_681 Alameda	-122.091	37.496	3.15	-1.61	7.15	9.19	9.42	9.68	9.91	10.17	10.40	10.60	11.12
FEMA_682 Alameda	-122.089	37.495	3.18	-1.61	7.15	9.22	9.42	9.71	9.91	10.20	10.40	10.63	11.12
FEMA_682 Alameda	-122.089	37.495	3.18	-1.61	7.15	9.22	9.42	9.71	9.91	10.20	10.40	10.63	11.12
FEMA_683 Alameda	-122.083	37.494	3.18	-1.57	7.19	9.22	9.42	9.71	9.94	10.24	10.47	10.70	11.22
FEMA_684 Alameda	-122.077	37.492	3.22	-1.15	7.19	9.22	9.42	9.71	9.94	10.24	10.47	10.70	11.29
FEMA_685 Alameda	-122.074	37.492	3.28	-0.43	7.19	9.22	9.42	9.71	9.94	10.24	10.47	10.70	11.25
FEMA_686 Alameda	-122.075	37.490	3.28	-0.56	7.19	9.22	9.42	9.71	9.94	10.24	10.47	10.70	11.25
FEMA_687 Alameda	-122.071	37.487	3.31	-0.13	7.19	9.22	9.42	9.71	9.91	10.20	10.40	10.60	11.06
FEMA_688 Alameda	-122.070	37.482	3.35	0.07	7.19	9.22	9.42	9.71	9.91	10.20	10.40	10.60	11.09
FEMA_689 Alameda	-122.071	37.477	3.18	-1.64	7.19	9.25	9.45	9.74	9.94	10.24	10.43	10.66	11.15
FEMA_690 Alameda	-122.067	37.474	3.18	-1.64	7.19	9.25	9.45	9.74	9.94	10.24	10.47	10.66	11.19
FEMA_691 Alameda	-122.062	37.471	3.18	-1.64	7.22	9.25	9.45	9.74	9.94	10.24	10.43	10.63	11.12
FEMA_692 Alameda	-122.059	37.467	3.18	-1.61	7.22	9.25	9.48	9.74	9.94	10.24	10.43	10.63	11.09
FEMA_693 Alameda	-122.055	37.464	3.22	-1.51	7.22	9.25	9.48	9.74	9.94	10.24	10.43	10.63	11.12
FEMA_694 Alameda	-122.049	37.461	3.25	-1.25	7.22	9.25	9.48	9.74	9.94	10.24	10.43	10.63	11.12
FEMA_695 Alameda	-122.043	37.461	3.28	-1.12	7.22	9.25	9.45	9.74	9.97	10.24	10.47	10.70	11.22
FEMA_696 Alameda	-122.038	37.462	3.31	-1.08	7.22	9.25	9.48	9.74	9.94	10.24	10.43	10.63	11.09
FEMA_697 Alameda	-122.032	37.463	3.31	-1.08	7.22	9.25	9.48	9.74	9.97	10.27	10.47	10.70	11.22

FEMA_698 Alameda	-122.026	37.464	3.31	-1.05	7.22	9.25	9.48	9.74	9.97	10.27	10.47	10.70	11.22
FEMA_699 Alameda	-122.020	37.465	3.35	-1.02	7.22	9.25	9.48	9.74	9.97	10.24	10.47	10.66	11.15
FEMA_700 Alameda	-122.015	37.466	3.38	-0.92	7.22	9.25	9.48	9.74	9.97	10.24	10.47	10.66	11.19
FEMA_701 Alameda	-122.009	37.468	3.38	-0.72	7.22	9.25	9.45	9.71	9.94	10.24	10.43	10.66	11.19
FEMA_702 Alameda	-122.003	37.468	3.44	-0.52	7.22	9.22	9.45	9.71	9.94	10.20	10.40	10.63	11.09
FEMA_704 Alameda	-121.995	37.467	3.44	-0.52	7.19	9.22	9.42	9.68	9.91	10.17	10.37	10.56	10.99
FEMA_705 Alameda	-121.988	37.465	3.58	0.36	7.12	8.99	9.19	9.45	9.65	9.94	10.14	10.37	10.89
FEMA_706 Santa Clara	-121.985	37.461	3.61	0.43	7.12	8.99	9.19	9.48	9.68	9.94	10.14	10.37	10.86
FEMA_707 Santa Clara	-121.991	37.463	3.58	0.26	7.12	8.99	9.19	9.48	9.68	9.94	10.17	10.37	10.89
FEMA_708 Santa Clara	-121.996	37.466	3.44	-0.52	7.19	9.22	9.42	9.68	9.91	10.17	10.37	10.56	10.99
FEMA_710 Santa Clara	-122.037	37.461	3.35	-0.72	7.22	9.25	9.45	9.74	9.94	10.24	10.43	10.63	11.09
FEMA_711 Santa Clara	-122.042	37.459	3.31	-1.12	7.22	9.25	9.48	9.74	9.97	10.24	10.47	10.66	11.15
FEMA_712 Santa Clara	-122.048	37.459	3.31	-0.66	7.22	9.25	9.45	9.74	9.94	10.20	10.43	10.63	11.09
FEMA_713 Santa Clara	-122.049	37.457	3.31	-0.66	7.22	9.25	9.45	9.74	9.94	10.20	10.43	10.63	11.09
FEMA_714 Santa Clara	-122.050	37.458	3.35	-0.59	7.22	9.25	9.45	9.74	9.94	10.24	10.43	10.63	11.09
FEMA_715 Santa Clara	-122.057	37.460	3.25	-1.44	7.22	9.25	9.48	9.74	9.94	10.24	10.43	10.63	11.09
FEMA_716 Santa Clara	-122.062	37.459	3.41	0.20	7.22	9.22	9.45	9.71	9.94	10.20	10.43	10.63	11.12
FEMA_717 Santa Clara	-122.068	37.460	3.38	-0.03	7.22	9.22	9.45	9.71	9.94	10.24	10.43	10.66	11.19
FEMA_718 Santa Clara	-122.072	37.460	3.48	0.59	7.22	9.22	9.42	9.71	9.91	10.20	10.43	10.66	11.19

FEMA_719 Santa Clara	-122.078	37.460	3.44	0.52	7.19	9.22	9.42	9.71	9.91	10.20	10.40	10.60	11.09
FEMA_720 Santa Clara	-122.083	37.460	3.44	0.49	7.19	9.22	9.42	9.71	9.91	10.17	10.40	10.60	11.09
FEMA_721 Santa Clara	-122.089	37.462	3.41	0.30	7.19	9.22	9.42	9.71	9.91	10.20	10.40	10.63	11.12
FEMA_722 Santa Clara	-122.093	37.463	3.38	0.26	7.19	9.22	9.42	9.68	9.91	10.20	10.40	10.63	11.12
FEMA_723 Santa Clara	-122.098	37.465	3.38	0.23	7.19	9.19	9.42	9.68	9.91	10.20	10.43	10.66	11.19
FEMA_724 Santa Clara	-122.102	37.467	3.35	0.10	7.19	9.19	9.42	9.68	9.91	10.17	10.40	10.63	11.12
FEMA_725 Santa Clara	-122.107	37.470	3.35	0.03	7.19	9.19	9.38	9.68	9.91	10.20	10.43	10.66	11.22
FEMA_726 San Mateo	-122.111	37.473	3.25	-0.59	7.15	9.19	9.42	9.68	9.88	10.14	10.30	10.50	10.86
FEMA_727 San Mateo	-122.117	37.476	3.25	-0.59	7.15	9.19	9.38	9.68	9.91	10.20	10.43	10.70	11.29
FEMA_728 San Mateo	-122.118	37.481	3.22	-0.85	7.15	9.19	9.38	9.68	9.88	10.14	10.33	10.53	10.96
FEMA_729 San Mateo	-122.119	37.486	3.15	-1.51	7.15	9.19	9.38	9.65	9.88	10.14	10.37	10.56	11.06
FEMA_730 San Mateo	-122.119	37.488	3.15	-1.51	7.15	9.15	9.38	9.65	9.88	10.14	10.37	10.56	11.06
FEMA_731 San Mateo	-122.120	37.490	3.25	-0.39	7.12	9.12	9.35	9.61	9.84	10.10	10.30	10.50	10.96
FEMA_732 San Mateo	-122.119	37.492	3.18	-1.21	7.12	9.15	9.35	9.65	9.84	10.14	10.33	10.56	11.06
FEMA_733 San Mateo	-122.119	37.494	3.22	-0.79	7.12	9.12	9.35	9.61	9.84	10.17	10.40	10.63	11.22
FEMA_734 San Mateo	-122.119	37.496	3.25	-0.33	7.12	9.12	9.32	9.61	9.81	10.07	10.27	10.47	10.89
FEMA_735 San Mateo	-122.121	37.498	3.25	-0.39	7.12	9.12	9.32	9.58	9.81	10.07	10.27	10.47	10.96
FEMA_736 San Mateo	-122.122	37.501	3.15	-1.54	7.09	9.12	9.32	9.61	9.84	10.14	10.37	10.63	11.22
FEMA_737 San Mateo	-122.123	37.502	3.15	-1.54	7.09	9.12	9.32	9.58	9.81	10.07	10.27	10.47	10.89

FEMA_738 San Mateo	-122.124	37.503	3.18	-0.98	7.09	9.09	9.32	9.58	9.78	10.07	10.27	10.47	10.89
FEMA_739 San Mateo	-122.126	37.503	3.28	-0.20	7.09	9.09	9.28	9.58	9.78	10.04	10.24	10.47	10.93
FEMA_740 San Mateo	-122.128	37.505	3.18	-0.98	7.09	9.09	9.28	9.58	9.78	10.04	10.20	10.40	10.79
FEMA_741 San Mateo	-122.132	37.508	3.18	-0.92	7.05	9.06	9.28	9.55	9.74	10.01	10.20	10.37	10.76
FEMA_742 San Mateo	-122.139	37.510	3.22	-0.66	7.05	9.02	9.25	9.51	9.74	10.01	10.24	10.43	10.93
FEMA_743 San Mateo	-122.143	37.511	3.22	-0.72	7.02	9.02	9.25	9.51	9.74	10.01	10.24	10.43	10.96
FEMA_744 San Mateo	-122.146	37.507	3.25	-0.23	7.02		9.25	9.51	9.68	9.94	10.10	10.27	10.63
FEMA_745 San Mateo	-122.152	37.506	3.28	-0.23	7.02	9.02	9.22	9.51	9.71	10.01	10.20	10.43	10.96
FEMA_746 San Mateo	-122.158	37.505	3.28	-0.03	7.02	9.02	9.22	9.51	9.71	10.01	10.20	10.43	10.93
FEMA_747 San Mateo	-122.165	37.506	3.28	-0.07	7.02	8.99	9.22	9.48	9.71	10.01	10.24	10.43	10.96
FEMA_748 San Mateo	-122.170	37.509	3.25	-0.26	7.02	8.99	9.22	9.48	9.71	9.97	10.17	10.37	10.86
FEMA_749 San Mateo	-122.176	37.510	3.28	-0.10	6.99	8.99	9.22	9.48	9.68	9.97	10.17	10.37	10.86
FEMA_750 San Mateo	-122.179	37.514	3.22	-0.52	6.99	8.99	9.22	9.48	9.68	9.97	10.17	10.37	10.86
FEMA_751 San Mateo	-122.181	37.518	3.22	-0.56	6.99	8.99	9.19	9.48	9.68	9.97	10.17	10.40	10.86
FEMA_752 San Mateo	-122.187	37.520	3.25	-0.33	6.99	8.99	9.19	9.45	9.68	9.94	10.17	10.37	10.86
FEMA_753 San Mateo	-122.192	37.522	3.28	-0.13	6.99	8.96	9.19	9.45	9.68	9.94	10.14	10.33	10.83
FEMA_754 San Mateo	-122.195	37.526	3.22	-0.72	6.96	8.96	9.19	9.45	9.68	9.94	10.14	10.37	10.83
FEMA_755 San Mateo	-122.198	37.526	3.15	-1.41	6.99	8.99	9.19	9.48	9.68	9.94	10.17	10.37	10.83
FEMA_757 San Mateo	-122.195	37.528	3.15	-1.41	6.96	8.99	9.19	9.48	9.68	9.94	10.14	10.33	10.76

FEMA_758 San Mateo	-122.194	37.531	3.15	-1.41	6.96	8.99	9.19	9.48	9.68	9.94	10.14	10.33	10.76
FEMA_759 San Mateo	-122.194	37.535	3.15	-1.38	6.96	8.96	9.19	9.45	9.68	9.94	10.17	10.37	10.86
FEMA_760 San Mateo	-122.198	37.539	3.18	-0.69	6.92	8.92	9.15	9.42	9.61	9.91	10.10	10.33	10.83
FEMA_761 San Mateo	-122.204	37.542	3.22	-0.52	6.92	8.92	9.12	9.38	9.61	9.88	10.10	10.30	10.79
FEMA_762 San Mateo	-122.210	37.543	3.22	-0.33	6.89	8.89	9.09	9.38	9.61	9.91	10.10	10.33	10.86
FEMA_763 San Mateo	-122.214	37.546	3.25	-0.26	6.89	8.89	9.09	9.38	9.58	9.88	10.07	10.27	10.76
FEMA_764 San Mateo	-122.220	37.546	3.35	0.33	6.89	8.86	9.09	9.35	9.58	9.84	10.04	10.24	10.70
FEMA_765 San Mateo	-122.222	37.546	3.38	0.49	6.89	8.86	9.06	9.35	9.55	9.84	10.07	10.27	10.79
FEMA_766 San Mateo	-122.224	37.544	3.44	0.62	6.86	8.83	9.06	9.32	9.55	9.81	10.01	10.20	10.70
FEMA_767 San Mateo	-122.223	37.548	3.35	0.43	6.89	8.86	9.06	9.35	9.55	9.84	10.04	10.27	10.79
FEMA_768 San Mateo	-122.221	37.551	3.22	-0.39	6.89	8.86	9.09	9.35	9.58	9.84	10.04	10.24	10.66
FEMA_769 San Mateo	-122.227	37.554	3.25	-0.13	6.86	8.86	9.06	9.35	9.55	9.84	10.04	10.24	10.70
FEMA_770 San Mateo	-122.231	37.557	3.22	-0.43	6.86	8.86	9.06	9.35	9.55	9.81	10.04	10.24	10.70
FEMA_771 San Mateo	-122.234	37.560	3.15	-1.08	6.86	8.86	9.06	9.35	9.55	9.81	10.01	10.20	10.66
FEMA_772 San Mateo	-122.238	37.562	3.18	-0.72	6.86	8.83	9.06	9.32	9.55	9.81	10.01	10.24	10.70
FEMA_773 San Mateo	-122.239	37.560	3.22	-0.39	6.86	8.83	9.06	9.32	9.51	9.81	10.01	10.20	10.63
FEMA_774 San Mateo	-122.240	37.558	3.28	0.10	6.86	8.83	9.06	9.32	9.51	9.81	10.01	10.20	10.66
FEMA_775 San Mateo	-122.244	37.559	3.25	-0.10	6.86	8.83	9.02	9.32	9.51	9.81	10.01	10.24	10.73
FEMA_776 San Mateo	-122.245	37.563	3.18	-0.56	6.82	8.83	9.06	9.32	9.51	9.78	9.97	10.17	10.56

FEMA_777 San Mateo	-122.248	37.567	3.15	-0.98	6.82	8.83	9.02	9.32	9.51	9.81	10.04	10.27	10.76
FEMA_778 San Mateo	-122.251	37.571	3.15	-1.18	6.82	8.83	9.02	9.32	9.51	9.81	10.01	10.24	10.73
FEMA_779 San Mateo	-122.255	37.574	3.15	-1.05	6.79	8.79	9.02	9.28	9.51	9.78	10.01	10.20	10.70
FEMA_780 San Mateo	-122.260	37.576	3.15	-1.15	6.79	8.79	9.02	9.28	9.48	9.74	9.94	10.14	10.60
FEMA_781 San Mateo	-122.261	37.576	3.15	-1.15	6.79	8.79	9.02	9.28	9.48	9.74	9.94	10.10	10.53
FEMA_782 San Mateo	-122.267	37.575	3.15	-0.95	6.79	8.79	8.99	9.25	9.48	9.74	9.94	10.14	10.56
FEMA_783 San Mateo	-122.272	37.573	3.15	-0.79	6.76	8.76	8.99	9.25	9.45	9.71	9.91	10.10	10.53
FEMA_784 San Mateo	-122.278	37.576	3.15	-0.95	6.76	8.76	8.99	9.25	9.45	9.74	9.94	10.14	10.63
FEMA_785 San Mateo	-122.284	37.577	3.15	-1.02	6.76	8.76	8.96	9.25	9.45	9.74	9.94	10.14	10.63
FEMA_786 San Mateo	-122.290	37.576	3.15	-1.02	6.76	8.76	8.96	9.25	9.45	9.74	9.94	10.17	10.66
FEMA_787 San Mateo	-122.293	37.575	3.18	-0.72	6.76	8.76	8.96	9.22	9.42	9.68	9.88	10.04	10.43
FEMA_788 San Mateo	-122.294	37.574	3.22	-0.43	6.76	8.73	8.96	9.22	9.42	9.68	9.88	10.07	10.50
FEMA_789 San Mateo	-122.295	37.577	3.15	-1.02	6.76	8.76	8.96	9.22	9.45	9.71	9.91	10.07	10.50
FEMA_790 San Mateo	-122.301	37.579	3.15	-0.92	6.73	8.73	8.96	9.22	9.45	9.71	9.94	10.14	10.66
FEMA_791 San Mateo	-122.307	37.580	3.15	-0.85	6.73	8.73	8.92	9.22	9.42	9.71	9.91	10.14	10.60
FEMA_792 San Mateo	-122.311	37.583	3.15	-0.79	6.73	8.73	8.92	9.22	9.42	9.71	9.94	10.17	10.70
FEMA_793 San Mateo	-122.309	37.588	3.15	-0.98	6.73	8.73	8.92	9.22	9.42	9.71	9.94	10.20	10.76
FEMA_794 San Mateo	-122.311	37.593	3.15	-1.02	6.73	8.69	8.92	9.22	9.45	9.74	9.97	10.24	10.86
FEMA_795 San Mateo	-122.315	37.595	3.15	-1.02	6.73	8.69	8.92	9.19	9.42	9.68	9.88	10.04	10.47

FEMA_796 San Mateo	-122.321	37.594	3.15	-1.02	6.69	8.69	8.89	9.19	9.42	9.68	9.91	10.14	10.70
FEMA_797 San Mateo	-122.327	37.593	3.15	-0.98	6.69	8.69	8.89	9.19	9.38	9.68	9.91	10.14	10.66
FEMA_798 San Mateo	-122.331	37.591	3.15	-0.98	6.69	8.69	8.89	9.19	9.38	9.68	9.91	10.14	10.66
FEMA_799 San Mateo	-122.332	37.594	3.15	-0.98	6.69	8.69	8.89	9.19	9.38	9.68	9.91	10.14	10.66
FEMA_800 San Mateo	-122.339	37.595	3.15	-0.98	6.69	8.69	8.89	9.19	9.38	9.68	9.91	10.10	10.63
FEMA_801 San Mateo	-122.345	37.595	3.15	-0.85	6.69	8.69	8.89	9.15	9.38	9.65	9.88	10.07	10.56
FEMA_802 San Mateo	-122.347	37.596	3.15	-0.79	6.69	8.69	8.89	9.15	9.38	9.65	9.88	10.07	10.56
FEMA_803 San Mateo	-122.352	37.599	3.15	-0.79	6.69	8.69	8.89	9.15	9.38	9.65	9.84	10.07	10.53
FEMA_804 San Mateo	-122.356	37.602	3.15	-0.89	6.69	8.66	8.89	9.19	9.38	9.68	9.91	10.10	10.63
FEMA_805 San Mateo	-122.381	37.642	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.56
FEMA_806 San Mateo	-122.387	37.642	3.15	-0.62	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.04	10.56
FEMA_807 San Mateo	-122.385	37.645	3.18	-0.30	6.63	8.60	8.83	9.09	9.32	9.61	9.84	10.07	10.63
FEMA_808 San Mateo	-122.379	37.646	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.56
FEMA_809 San Mateo	-122.376	37.650	3.15	-0.85	6.63	8.60	8.83	9.12	9.32	9.61	9.84	10.07	10.63
FEMA_810 San Mateo	-122.372	37.655	3.15	-0.85	6.59	8.60	8.79	9.09	9.32	9.61	9.84	10.07	10.63
FEMA_811 San Mateo	-122.374	37.657	3.15	-0.85	6.59	8.60	8.79	9.09	9.32	9.61	9.84	10.07	10.63
FEMA_812 San Mateo	-122.373	37.659	3.15	-0.85	6.59	8.60	8.79	9.09	9.32	9.61	9.84	10.07	10.63
FEMA_813 San Mateo	-122.372	37.664	3.15	-0.82	6.59	8.56	8.79	9.09	9.28	9.58	9.81	10.04	10.53
FEMA_814 San Mateo	-122.377	37.665	3.15	-0.82	6.56	8.56	8.79	9.09	9.28	9.61	9.84	10.07	10.60

FEMA_815 San Mateo	-122.381	37.669	3.15	-0.82	6.56	8.56	8.79	9.06	9.28	9.61	9.84	10.07	10.60
FEMA_816 San Mateo	-122.387	37.669	3.15	-0.79	6.56	8.56	8.79	9.06	9.28	9.58	9.81	10.04	10.56
FEMA_817 San Mateo	-122.381	37.671	3.15	-0.82	6.56	8.56	8.76	9.06	9.28	9.61	9.84	10.07	10.63
FEMA_818 San Mateo	-122.378	37.670	3.15	-0.82	6.56	8.56	8.76	9.06	9.28	9.58	9.81	10.04	10.60
FEMA_819 San Mateo	-122.377	37.673	3.15	-0.79	6.56	8.56	8.76	9.06	9.28	9.58	9.81	10.04	10.56
FEMA_820 San Mateo	-122.377	37.678	3.15	-0.79	6.56	8.53	8.76	9.06	9.28	9.58	9.81	10.07	10.63
FEMA_821 San Mateo	-122.383	37.680	3.15	-0.79	6.53	8.53	8.76	9.06	9.25	9.58	9.81	10.04	10.63
FEMA_822 San Mateo	-122.385	37.684	3.15	-0.75	6.53	8.53	8.73	9.02	9.25	9.55	9.81	10.04	10.60
FEMA_823 San Mateo	-122.386	37.688	3.15	-0.75	6.53	8.53	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_824 San Mateo	-122.388	37.693	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_825 San Mateo	-122.389	37.695	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.81	10.04	10.60
FEMA_826 San Mateo	-122.389	37.697	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_827 San Mateo	-122.389	37.701	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_828 San Mateo	-122.390	37.702	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_829 San Fran.	-122.388	37.706	3.15	-0.75	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_830 San Fran.	-122.386	37.706	3.15	-0.72	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.01	10.56
FEMA_831 San Fran.	-122.382	37.706	3.15	-0.72	6.53	8.50	8.73	9.02	9.25	9.55	9.78	10.04	10.60
FEMA_832 San Fran.	-122.379	37.706	3.12	-0.72	6.50	8.50	8.73	9.02	9.25	9.55	9.78	10.04	10.60
FEMA_833 San Fran.	-122.375	37.706	3.12	-0.72	6.50	8.50	8.69	8.99	9.22	9.55	9.78	10.01	10.60

FEMA_834 San Fran.	-122.373	37.706	3.12	-0.72	6.50	8.46	8.69	8.99	9.22	9.51	9.78	10.01	10.56
FEMA_835 San Fran.	-122.371	37.709	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.78	10.01	10.60
FEMA_836 San Fran.	-122.372	37.710	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.97	10.53
FEMA_837 San Fran.	-122.375	37.712	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	10.01	10.56
FEMA_838 San Fran.	-122.373	37.714	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.97	10.53
FEMA_839 San Fran.	-122.375	37.716	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.94	10.47
FEMA_840 San Fran.	-122.379	37.722	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.55	9.78	10.01	10.60
FEMA_841 San Fran.	-122.374	37.718	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.97	10.53
FEMA_842 San Fran.	-122.372	37.716	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.97	10.53
FEMA_843 San Fran.	-122.369	37.715	3.12	-0.69	6.50	8.46	8.69	8.99	9.22	9.51	9.74	9.97	10.53
FEMA_844 San Fran.	-122.368	37.714	3.12	-0.69	6.46	8.43	8.66	8.96	9.19	9.51	9.78	10.01	10.63
FEMA_845 San Fran.	-122.363	37.714	3.12	-0.69	6.46	8.43	8.66	8.96	9.19	9.51	9.74	9.97	10.56
FEMA_846 San Fran.	-122.359	37.718	3.12	-0.66	6.43	8.40	8.63	8.92	9.19	9.48	9.74	10.01	10.60
FEMA_847 San Fran.	-122.358	37.719	3.12	-0.66	6.43	8.40	8.63	8.92	9.19	9.48	9.74	10.01	10.66
FEMA_848 San Fran.	-122.358	37.720	3.08	-0.66	6.43	8.40	8.63	8.92	9.12	9.42	9.65	9.88	10.37
FEMA_849 San Fran.	-122.355	37.723	3.08	-0.62	6.43	8.40	8.60	8.89	9.12	9.42	9.65	9.88	10.40
FEMA_850 San Fran.	-122.354	37.728	3.12	-0.62	6.40	8.37	8.60	8.89	9.12	9.38	9.61	9.81	10.30
FEMA_851 San Fran.	-122.356	37.732	3.12	-0.59	6.40	8.37	8.56	8.86	9.09	9.38	9.58	9.81	10.33
FEMA_852 San Fran.	-122.363	37.734	3.12	-0.59	6.36	8.33	8.56	8.83	9.06	9.35	9.58	9.81	10.33

FEMA_853 San Fran.	-122.367	37.736	3.12	-0.56	6.36	8.33	8.53	8.83	9.06	9.35	9.55	9.78	10.27
FEMA_854 San Fran.	-122.369	37.736	3.12	-0.56	6.36	8.33	8.56	8.83	9.06	9.35	9.58	9.81	10.33
FEMA_855 San Fran.	-122.374	37.737	3.12	-0.56	6.36	8.33	8.56	8.86	9.06	9.35	9.58	9.78	10.27
FEMA_856 San Fran.	-122.364	37.739	3.12	-0.56	6.36	8.30	8.53	8.83	9.06	9.35	9.58	9.81	10.33
FEMA_857 San Fran.	-122.367	37.742	3.12	-0.56	6.33	8.30	8.53	8.83	9.02	9.32	9.55	9.78	10.30
FEMA_858 San Fran.	-122.369	37.746	3.12	-0.52	6.33	8.27	8.50	8.79	9.02	9.28	9.51	9.71	10.20
FEMA_859 San Fran.	-122.372	37.750	3.12	-0.52	6.30	8.27	8.46	8.76	8.99	9.28	9.51	9.74	10.27
FEMA_860 San Fran.	-122.374	37.754	3.12	-0.49	6.30	8.23	8.46	8.76	8.99	9.28	9.51	9.74	10.30
FEMA_861 San Fran.	-122.378	37.758	3.12	-0.49	6.27	8.23	8.43	8.73	8.96	9.25	9.48	9.68	10.20
FEMA_862 San Fran.	-122.380	37.762	3.12	-0.46	6.27	8.20	8.43	8.73	8.96	9.25	9.48	9.71	10.24
FEMA_863 San Fran.	-122.382	37.766	3.12	-0.46	6.23	8.17	8.40	8.69	8.92	9.22	9.45	9.68	10.17
FEMA_864 San Fran.	-122.380	37.770	3.08	-0.46	6.23	8.17	8.40	8.69	8.89	9.15	9.35	9.55	9.97
FEMA_865 San Fran.	-122.380	37.775	3.08	-0.43	6.20	8.14	8.37	8.66	8.89	9.19	9.45	9.71	10.30
FEMA_866 San Fran.	-122.384	37.779	3.08	-0.43	6.17	8.10	8.33	8.63	8.83	9.12	9.32	9.51	9.94
FEMA_867 San Fran.	-122.385	37.784	3.08	-0.39	6.17	8.10	8.33	8.60	8.83	9.09	9.28	9.48	9.94
FEMA_868 San Fran.	-122.383	37.788	3.05	-0.39	6.17	8.07	8.30	8.60	8.83	9.12	9.35	9.58	10.14
FEMA_869 San Fran.	-122.385	37.792	3.05	-0.36	6.14	8.07	8.27	8.56	8.79	9.09	9.28	9.51	10.01
FEMA_870 San Fran.	-122.389	37.795	3.05	-0.33	6.10	8.04	8.27	8.56	8.76	9.09	9.32	9.55	10.07
FEMA_871 San Fran.	-122.393	37.799	3.05	-0.33	6.07	8.01	8.23	8.53	8.73	9.02	9.25	9.48	9.97

FEMA_872 San Fran.	-122.395	37.803	3.05	-0.33	6.07	7.97	8.20	8.50	8.73	8.99	9.22	9.45	9.94
FEMA_873 San Fran.	-122.399	37.806	3.05	-0.30	6.04	7.94	8.17	8.46	8.69	8.96	9.19	9.38	9.88
FEMA_874 San Fran.	-122.402	37.809	3.02	-0.30	6.00	7.94	8.14	8.43	8.66	8.92	9.12	9.35	9.78
FEMA_875 San Fran.	-122.407	37.811	3.02	-0.26	5.97	7.87	8.10	8.40	8.63	8.92	9.15	9.38	9.91
FEMA_876 San Fran.	-122.412	37.813	3.02	-0.23	5.97	7.84	8.07	8.37	8.60	8.89	9.12	9.35	9.84
FEMA_877 San Fran.	-122.419	37.811	3.02	-0.23	5.94	7.81	8.04	8.33	8.56	8.86	9.09	9.32	9.84
FEMA_878 San Fran.	-122.426	37.811	3.05	-0.20	5.91	7.81	8.04	8.30	8.53	8.83	9.06	9.28	9.78
FEMA_879 San Fran.	-122.432	37.810	3.05	-0.20	5.87	7.78	8.01	8.30	8.50	8.79	9.02	9.25	9.74
FEMA_880 San Fran.	-122.438	37.811	3.08	-0.16	5.87	7.74	7.97	8.27	8.50	8.79	9.02	9.25	9.78
FEMA_881 San Fran.	-122.444	37.811	3.08	-0.13	5.84	7.71	7.94	8.23	8.46	8.76	8.99	9.22	9.78
FEMA_882 San Fran.	-122.449	37.809	3.08	-0.13	5.84	7.71	7.94	8.23	8.46	8.73	8.96	9.19	9.68
FEMA_883 San Fran.	-122.456	37.808	3.08	-0.10	5.81	7.68	7.91	8.20	8.43	8.73	8.96	9.15	9.68
FEMA_884 San Fran.	-122.462	37.807	3.05	-0.10	5.77	7.64	7.84	8.14	8.37	8.66	8.89	9.09	9.61
FEMA_885 San Fran.	-122.467	37.810	3.05	-0.10	5.74	7.58	7.81	8.10	8.33	8.60	8.83	9.06	9.58
FEMA_886 San Fran.	-122.474	37.812	3.02	-0.07	5.71	7.55	7.78	8.07	8.30	8.60	8.83	9.06	9.55
FEMA_887 San Fran.	-122.480	37.813	2.99	-0.10	5.71	7.58	7.81	8.07	8.30	8.60	8.79	9.02	9.51
FEMA_888 San Fran.	-122.368	37.609	3.22	-0.23	6.69	8.66	8.89	9.15	9.38	9.65	9.84	10.04	10.47
FEMA_889 San Fran.	-122.361	37.608	3.15	-0.79	6.69	8.66	8.89	9.19	9.38	9.68	9.88	10.10	10.60
FEMA_890 San Fran.	-122.361	37.607	3.15	-0.85	6.69	8.66	8.89	9.19	9.38	9.68	9.88	10.10	10.60

FEMA_891 San Fran.	-122.358	37.607	3.15	-0.85	6.69	8.66	8.89	9.15	9.38	9.68	9.88	10.10	10.63
FEMA_892 San Fran.	-122.355	37.608	3.15	-0.95	6.69	8.66	8.89	9.15	9.38	9.68	9.91	10.14	10.66
FEMA_893 San Fran.	-122.352	37.613	3.15	-0.95	6.66	8.66	8.89	9.15	9.38	9.68	9.88	10.10	10.60
FEMA_894 San Fran.	-122.353	37.617	3.15	-0.95	6.66	8.66	8.86	9.15	9.38	9.65	9.88	10.10	10.60
FEMA_895 San Fran.	-122.358	37.620	3.15	-0.92	6.66	8.66	8.86	9.15	9.35	9.65	9.84	10.04	10.53
FEMA_896 San Fran.	-122.363	37.623	3.15	-0.92	6.66	8.63	8.86	9.15	9.35	9.65	9.88	10.07	10.60
FEMA_897 San Fran.	-122.362	37.628	3.15	-0.92	6.63	8.63	8.86	9.12	9.35	9.65	9.88	10.07	10.60
FEMA_898 San Fran.	-122.365	37.631	3.15	-0.92	6.63	8.63	8.83	9.12	9.35	9.65	9.88	10.10	10.63
FEMA_899 San Fran.	-122.372	37.631	3.15	-0.89	6.63	8.63	8.83	9.12	9.32	9.61	9.84	10.04	10.53
FEMA_900 San Fran.	-122.376	37.634	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.56
FEMA_901 San Fran.	-122.378	37.632	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.04	10.53
FEMA_902 San Fran.	-122.383	37.630	3.15	-0.92	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.60
FEMA_903 San Fran.	-122.388	37.631	3.15	-0.92	6.63	8.63	8.86	9.12	9.35	9.65	9.84	10.07	10.56
FEMA_904 San Fran.	-122.384	37.634	3.15	-0.92	6.63	8.63	8.83	9.12	9.35	9.65	9.88	10.07	10.60
FEMA_905 San Fran.	-122.378	37.635	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.56
FEMA_906 San Fran.	-122.378	37.638	3.15	-0.89	6.63	8.63	8.83	9.12	9.35	9.61	9.84	10.07	10.56
FEMA_907 San Fran.	-122.361	37.804	3.12	-0.36	6.14	8.07	8.27	8.56	8.79	9.09	9.32	9.55	10.04
FEMA_908 San Fran.	-122.369	37.805	3.08	-0.33	6.10	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.14
FEMA_909 San Fran.	-122.374	37.807	3.08	-0.30	6.10	8.01	8.23	8.53	8.76	9.02	9.25	9.45	9.94

FEMA_910 San Fran.	-122.376	37.812	3.08	-0.30	6.07	8.01	8.20	8.50	8.73	9.02	9.25	9.45	9.94
FEMA_911 San Fran.	-122.376	37.817	3.08	-0.30	6.04	7.97	8.20	8.50	8.73	8.99	9.22	9.45	9.94
FEMA_912 San Fran.	-122.379	37.821	3.08	-0.30	6.04	7.97	8.17	8.46	8.69	8.99	9.22	9.45	9.97
FEMA_913 San Fran.	-122.382	37.825	3.12	-0.26	6.04	7.94	8.17	8.46	8.69	8.99	9.19	9.42	9.88
FEMA_914 San Fran.	-122.382	37.830	3.12	-0.23	6.04	7.94	8.17	8.46	8.69	8.96	9.19	9.38	9.88
FEMA_915 San Fran.	-122.378	37.834	3.12	-0.23	6.04	7.94	8.17	8.46	8.69	8.99	9.19	9.42	9.91
FEMA_916 San Fran.	-122.372	37.835	3.12	-0.26	6.04	7.97	8.17	8.46	8.69	8.99	9.22	9.42	9.94
FEMA_917 San Fran.	-122.366	37.833	3.12	-0.26	6.07	7.97	8.20	8.50	8.73	8.99	9.22	9.42	9.91
FEMA_918 San Fran.	-122.363	37.829	3.12	-0.30	6.07	8.01	8.20	8.50	8.73	9.02	9.22	9.45	9.94
FEMA_919 San Fran.	-122.361	37.825	3.12	-0.30	6.07	8.01	8.23	8.53	8.76	9.02	9.25	9.45	9.94
FEMA_920 San Fran.	-122.360	37.820	3.12	-0.33	6.10	8.04	8.27	8.56	8.76	9.06	9.28	9.51	10.01
FEMA_921 San Fran.	-122.361	37.818	3.12	-0.33	6.10	8.04	8.27	8.56	8.76	9.06	9.28	9.51	10.01
FEMA_922 San Fran.	-122.357	37.817	3.12	-0.33	6.10	8.04	8.27	8.56	8.76	9.06	9.28	9.51	10.01
FEMA_923 San Fran.	-122.356	37.813	3.12	-0.33	6.14	8.04	8.27	8.56	8.79	9.09	9.32	9.55	10.10
FEMA_924 San Fran.	-122.358	37.808	3.12	-0.36	6.14	8.07	8.27	8.56	8.79	9.09	9.32	9.55	10.07
FEMA_925 San Fran.	-122.421	37.826	3.08	-0.20	5.94	7.84	8.04	8.33	8.56	8.86	9.09	9.28	9.81
FEMA_926 San Fran.	-122.425	37.826	3.05	-0.20	5.91	7.81	8.04	8.33	8.56	8.86	9.09	9.32	9.84
FEMA_927 San Fran.	-122.424	37.828	3.05	-0.20	5.91	7.81	8.04	8.33	8.53	8.86	9.09	9.32	9.84