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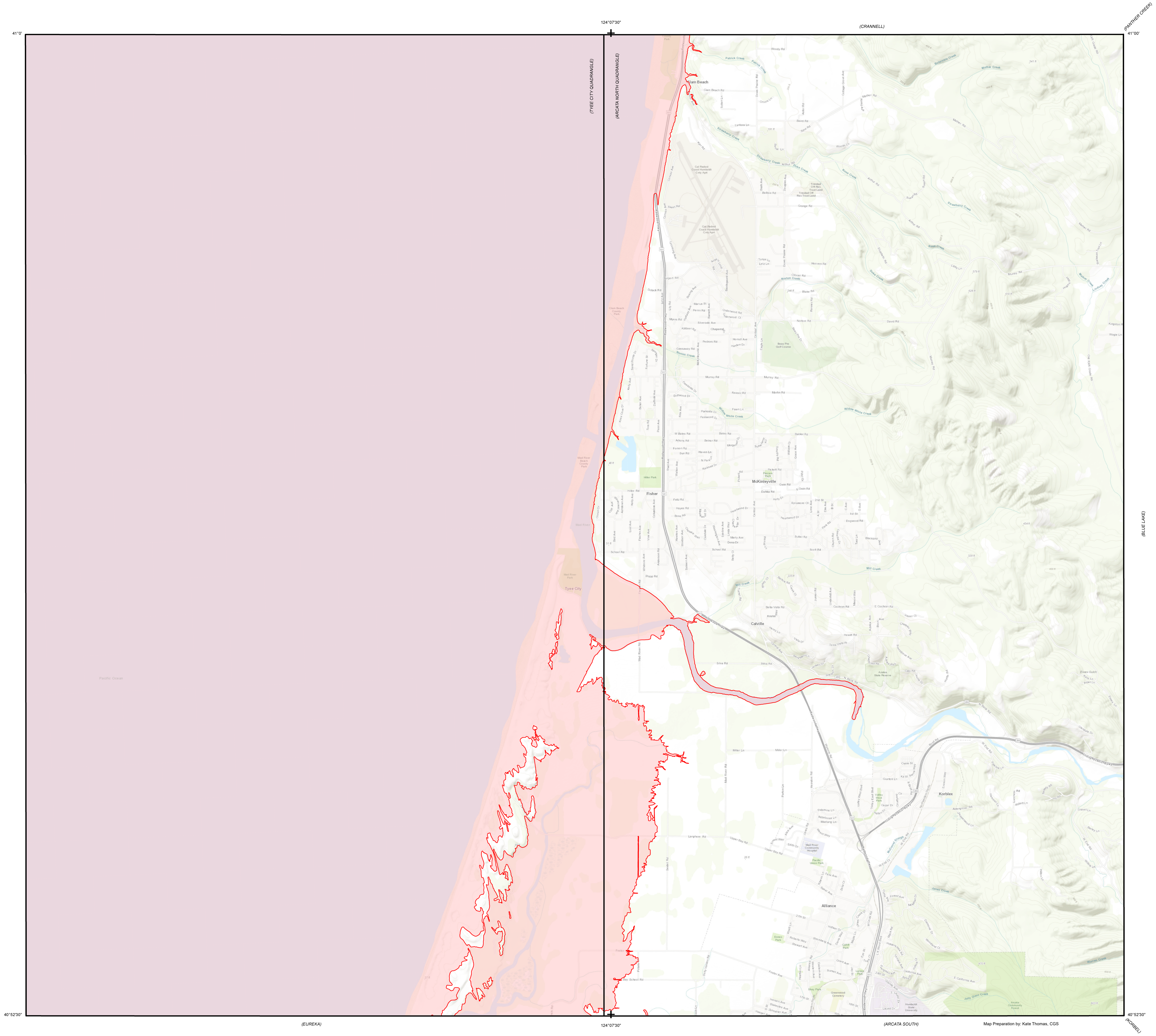
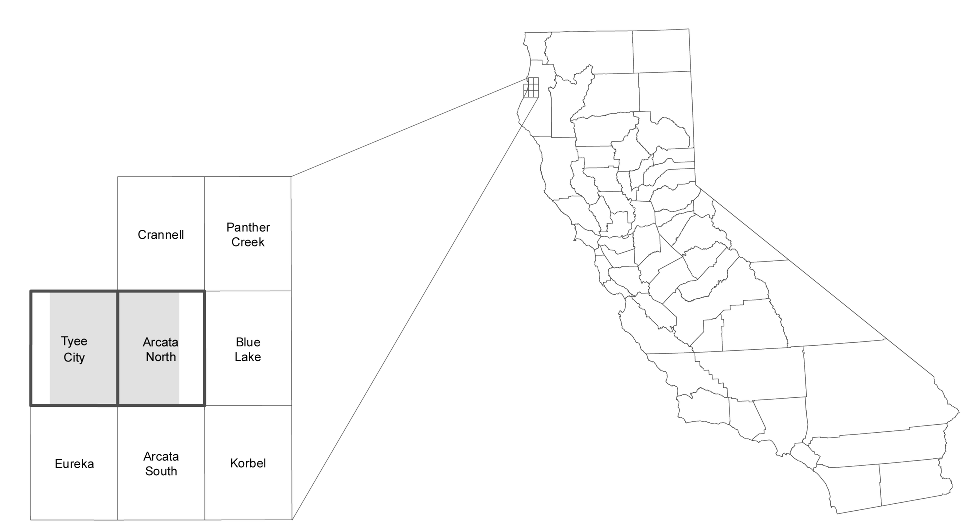


Map Preparation by: Kate Thomas, CGS

ESRI Basemap: The map provides coverage for the world down to a scale of ~1:72k. Coverage is provided down to ~1:4k for the continental United States. Tsunami inundation line boundaries may reflect updated digital orthophotographic and topographic data that can differ significantly from contours shown on the base map.The study area defined by USGS quadrangle boundaries using NAD 27, represented by the visible map extent. Data are maintained and distributed in California Albers (meters), NAD 83, [EPSG:3310] as shown by tics and coordinates.

Scale 1: 24,000



California Department of Conservation

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California Geological Survey

Tsunami Inundation Map For Emergency Planning

Tyee City and Arcata North Quadrangles

County Of Humboldt

August 13, 2020

PURPOSE AND LIMITATIONS OF THIS MAP

The tsunami inundation area is prepared to assist cities and counties in identifying their tsunami flood area hazard. The inundation map has been compiled with the best currently available scientific information. The inundation area represents the maximum considered tsunami runup from several extreme, infrequent, and realistic tsunami sources. The inundation area is the base scientific data used by local communities as input to the development of the Tsunami Hazard Evacuation Maps (State of California, 2020).

These data are intended for local jurisdictional, coastal emergency planning uses only. This map and these data, and the information presented herein, is not a legal document and does not meet disclosure requirements for real estate transactions nor for any other regulatory purpose. Tsunamis are rare events; due to a lack of known occurrences in the historical record, this map and these data include no information about the likelihood of any tsunami affecting any area within a specific time period.

MAP EXPLANATION

Tsunami Inundation Area

Map explanation footnote: Unshaded regions of the map indicate areas that would not be inundated under the modeled conditions.

METHOD OF PREPARATION

Tsunami modeling was performed by AECOM Technical Services funded through the California Governor's Office of Emergency Services by the National Tsunami Hazard Mitigation Program. This tsunami modeling uses probabilistic tsunami hazard analysis to compute tsunami waves from sources from around the Pacific Ocean and results in inundation models that are associated with different probabilities of exceedance (Thio et al., 2010; Thio, 2019). The tsunami modeling process allows for wave evolution over a variable bathymetry and topography used for the inundation mapping (Titov and Synolakis, 1998). The CGS, Seismic Hazards Program, Tsunami Unit selected the 975-year average return period tsunami model, with a 5% probability of exceedance in 50 years, as a basis for the maximum inundation extent for inundation mapping.

The bathymetric/topographic data used in the tsunami models consist of a series of nested elevation grids. Deep ocean modeling is prepared using SRTM30+ bathymetric data (30 arc second resolution; Becker et al., 2009). Near-shore grids with a 1/3 arc-second (~10-meters) resolution or higher, were adjusted to "Mean High Water" sea-level conditions, representing a conservative sea level for the intended use of the tsunami modeling and mapping (Eakins and Taylor, 2010).

Previous maps and data (State of California, 2009) also were used as a basis for the current inundation mapping because the earlier modeling incorporated additional tsunami sources not considered for the probabilistic modeling. In 2009, a suite of tsunami source events was selected for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. Local tsunami sources that were considered include offshore reverse-thrust faults, restraining bends on strike-slip fault zones and large submarine landslides capable of significant seafloor displacement and tsunami generation. Distant tsunami sources that were considered include great subduction zone events that are known to have occurred historically (1960 Chile and 1964 Alaska earthquakes) and others which can occur around the Pacific Ocean.

In order to enhance the results from the 10-meter resolution inundation data, we use higher-resolution digital topographic data (e.g., 1-meter resolution LiDAR digital elevation models) to refine the location of the maximum inundation area (Dewberry, 2013). The location of the inundation area was determined by using digital imagery (e.g., recent National Agriculture Imagery Program imagery) and digital terrain data (e.g., contours, cross-sections) on a GIS platform with consideration given to historic inundation information (Lander, et al., 1993). This information was verified, where possible, by field work coordinated with local county personnel.

The accuracy of the inundation area shown on these maps is subject to limitations in the accuracy and completeness of available terrain and tsunami source information, and the current understanding of tsunami generation and propagation phenomena as expressed in the models. Although an attempt has been made to identify a credible upper bound to inundation at any location along the coastline, it remains possible that actual inundation could be greater in a major tsunami event.

The inundation map represents the maximum inundation from multiple sources. For this reason, not all areas of the inundation map may be inundated during a single tsunami event. The regions that are not included in the inundation area are not currently considered at risk for tsunami inundation, but this may change in future updates to the Tsunami Inundation Maps for Emergency Planning.

ADDITIONAL INFORMATION

Please refer to the following websites for additional information on the construction and/or intended use of the tsunami inundation map:

State of California Geological Survey Tsunami Information:
http://tsunami.ca.gov/

California Governor's Office of Emergency Services, Earthquake, Tsunami, and Volcano Program:
https://www.caloes.ca.gov/cal-oes-divisions/earthquake-tsunami-volcano-programs/

Humboldt County Office of Emergency Services
https://humboldtgov.org/356/Office-of-Emergency-Services/

Redwood Coast Tsunami Work Group tsunami and earthquake information:
https://rctwg.humboldt.edu/

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Dewberry, 2013. Coastal California Data Merge Project, Report Produced for the National Oceanic and Atmospheric Administration (NOAA), NOAA Contract: EA133C-11-CQ-0007 Task Order Number: 11 Report Date: 10/31/2013, 57 p.

Eakins, B.W., and L.A. Taylor, 2010. Seamlessly integrating bathymetric and topographic data to support tsunami modeling and forecasting efforts, in Ocean Globe, ed. by J. Breman, ESRI Press, Redlands, p. 37-56

Lander, J.F., Lockridge, P.A., and Kozuch, M.J., 1993. Tsunamis Affecting the West Coast of the United States 1806-1992: National Geophysical Data Center Key to Geophysical Record Documentation No. 29, NOAA, NESDIS, NGDC, 242 p.

State of California, 2009. Tsunami Inundation Map for Emergency Planning, Arcata North and Tyee City Quadrangles, Humboldt County; produced by California Emergency Management Agency, California Geological Survey, and University of Southern California – Tsunami Research Center; dated June 1, 2009, mapped at 1:24,000 scale

Thio, H.K., Somerville, P., and Polet, J., 2010. Probabilistic Tsunami Hazard in California, PEER Report 2010/108, Pacific Earthquake Engineering Research Center, College of Engineering, University of California, Berkeley, October 2010, 331 p.

Thio, H.K., 2019. Probabilistic Tsunami Hazard Maps for the State of California (Phase 2), report prepared for the California Geological Survey by AECOM Technical Services, 172 p.

Titov, V.V., and Synolakis, C.E., 1998. Numerical modeling of tidal wave runup in Journal of Waterways, Port, Coastal and Ocean Engineering, ASCE, v. 124, no. 4, p. 157-171

CITATION FOR THIS MAP

State of California, 2020. Tsunami Inundation Maps for Emergency Planning, Humboldt County; produced by the California Geological Survey and the California Governor's Office of Emergency Services; dated 2020, displayed at 1:24,000 scale.

DISCLAIMERS

The California Governor's Office of Emergency Services (Cal OES), the University of Southern California (USC), AECOM Technical Services, and the California Geological Survey (CGS) make no representation or warranties regarding the accuracy of this inundation map nor the data from which the map was derived. The State of California shall not be liable under any circumstances for any direct, indirect, special, incidental or consequential damages with respect to any claim by any user or any third party on account of or arising from the use of this map.

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