



California

**Department of  
Conservation**

**California Geological Survey**

# **Extreme Hazard Event Preparation & Response for Earthquakes & Tsunami**

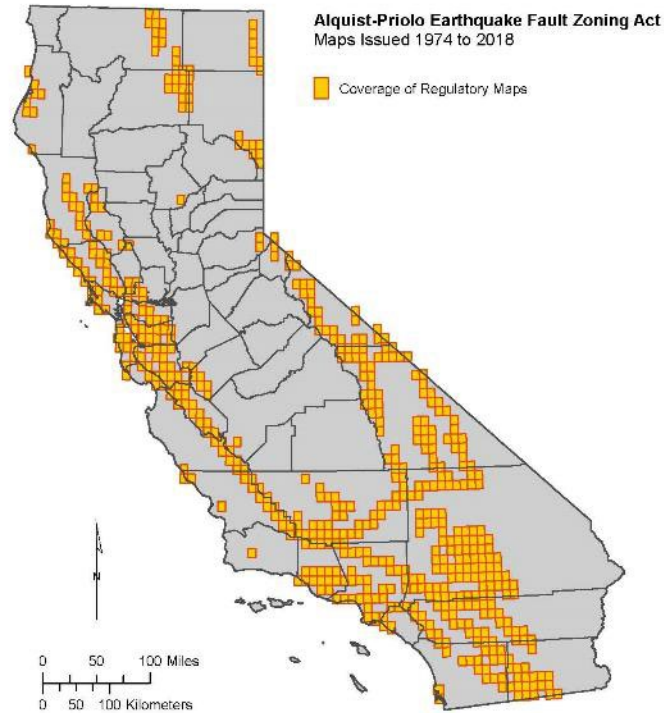
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# Overview of Tools for Fault Rupture Planning

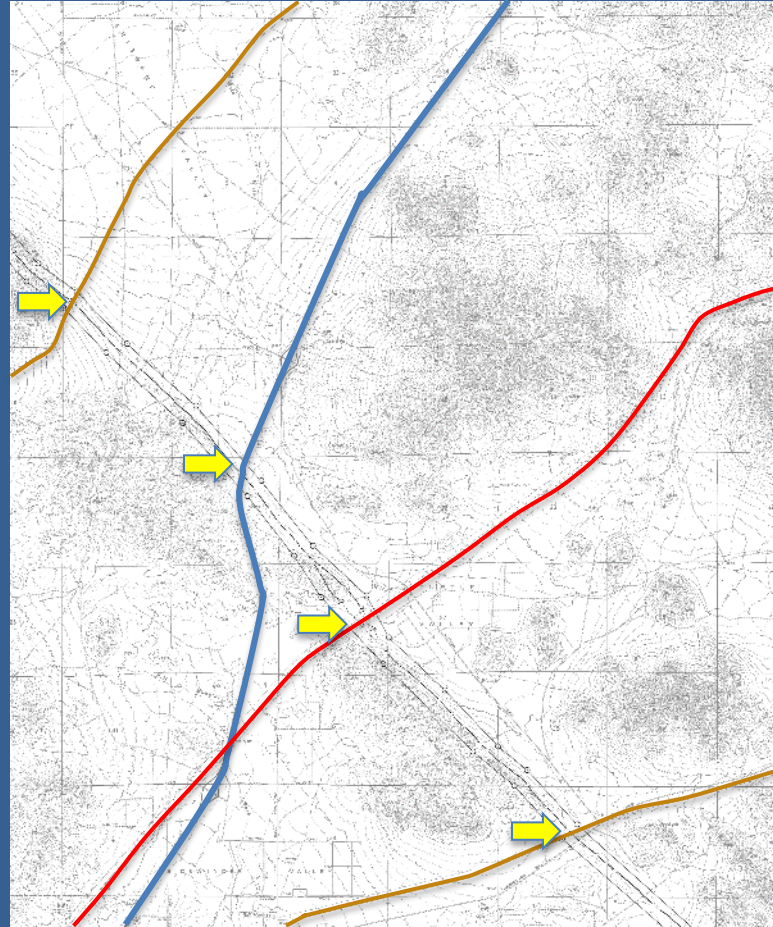


Map data available at: <https://bit.ly/CGSfaults>

# Overview of Tools for Fault Rupture Planning

## PREPARATION

Alquist-Priolo Earthquake  
Fault Zones





# Overview of Tools for Fault Rupture Planning

## RESPONSE

### CGS Field Response

Teams respond within hours to the affected area to document and measure the amount of surface rupture



# Overview of Tools for Fault Rupture Planning

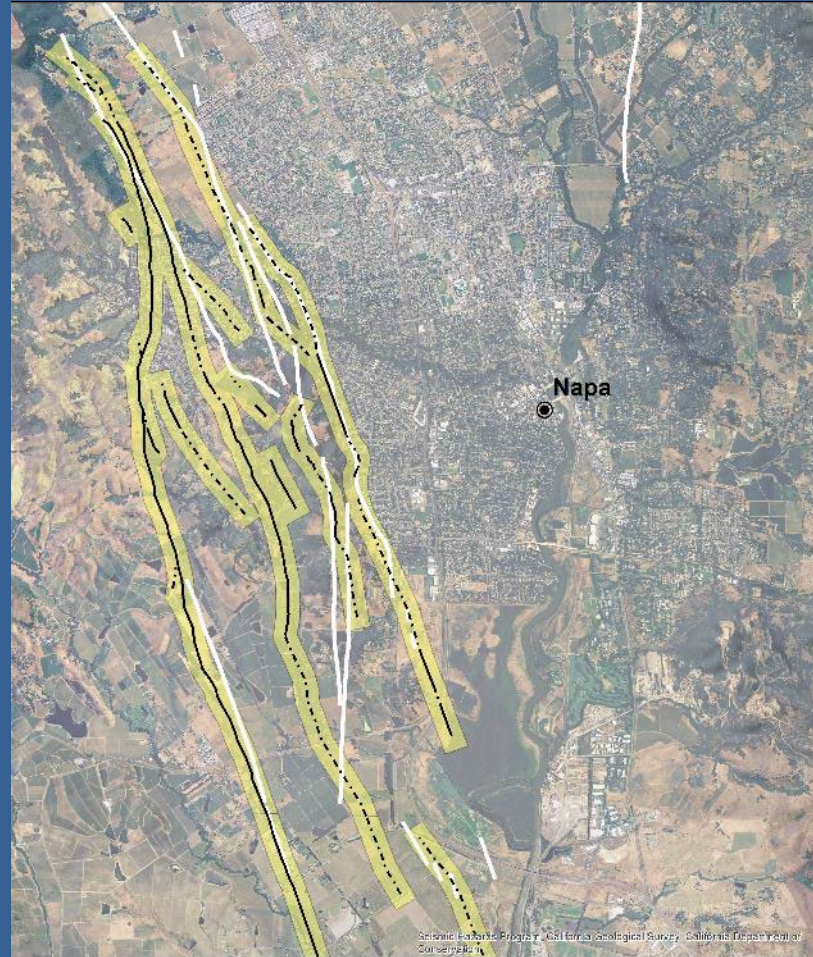
## RECOVERY

### New A-P Fault Maps

New maps showing active surface faults  
for use in Preparation and Response

WHITE lines = 1982 fault mapping considered  
not “sufficiently active”

BLACK lines = post-2014 active fault mapping  
based on rupture mapping and data analysis



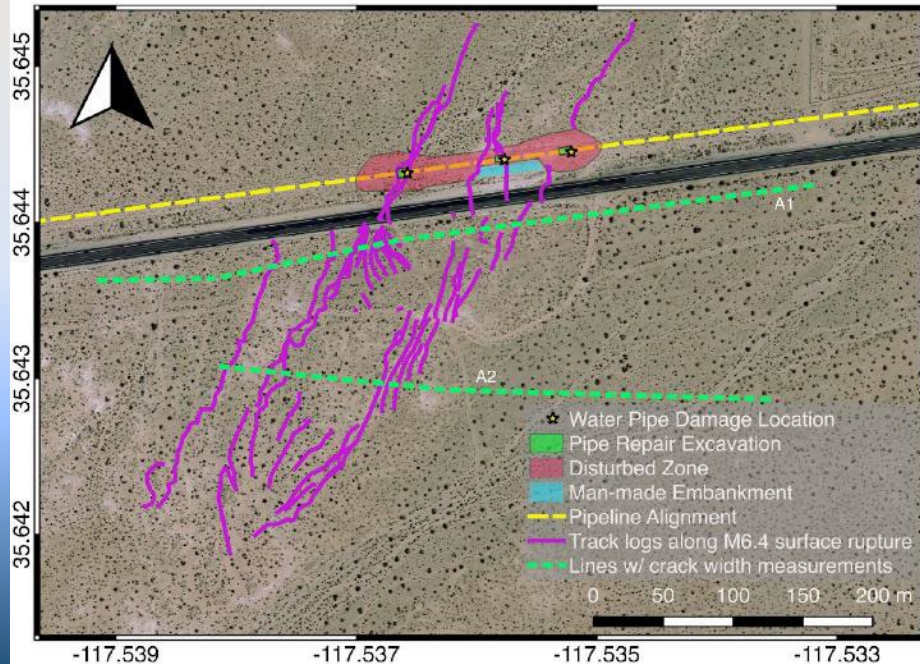


# 2019 Ridgecrest Earthquakes – Fault Rupture Breaks Water Pipelines

## LESSONS LEARNED

*Rupture on an unmapped fault severed the only domestic water line into Trona.*

*Town was without water for 6 days in July desert heat*



# Overview of Tools for Tsunami Planning

## PREPARATION

### Tsunami Hazard Area Maps

Areas that could be exposed to tsunami hazards (flooding or strong currents) during a tsunami event.

2013 USGS SAFRR study finding: Improving overall tsunami planning could reduce casualties and damage by 80-90%



Map data available at: <https://bit.ly/CGStsunami>



# Overview of Tools for Tsunami Planning

## RESPONSE

### Tsunami Response “Playbooks”

Decision support tools designed for emergency managers to plan and respond to distant-source tsunamis.

Accounts for forecasted heights & current tide/storm conditions

2013 USGS SAFRR study finding: Improving overall tsunami planning could reduce casualties and damage by 80-90%

#### California Maritime Tsunami Response Playbook And Mitigation Guidance

### Oakland/Alameda – Alameda County

Maritime Tsunami Response Playbook (MTRP) No. 2015-Alam-01

**DURING AN EMERGENCY, USE THE “QUICK REFERENCE” SHEET  
ON THE BACK PAGE (PAGE 22).**

(For the expanded Playbook format, use directions on page 7)



California Maritime Tsunami Response Playbook No. 2015-Alam-01

California Geological Survey  
California Governor's Office of Emergency Services  
University of Southern California  
Humboldt State University  
National Oceanic and Atmospheric Administration



Funded by the Federal Emergency Management Agency  
and the National Tsunami Hazard Mitigation Program



FEMA





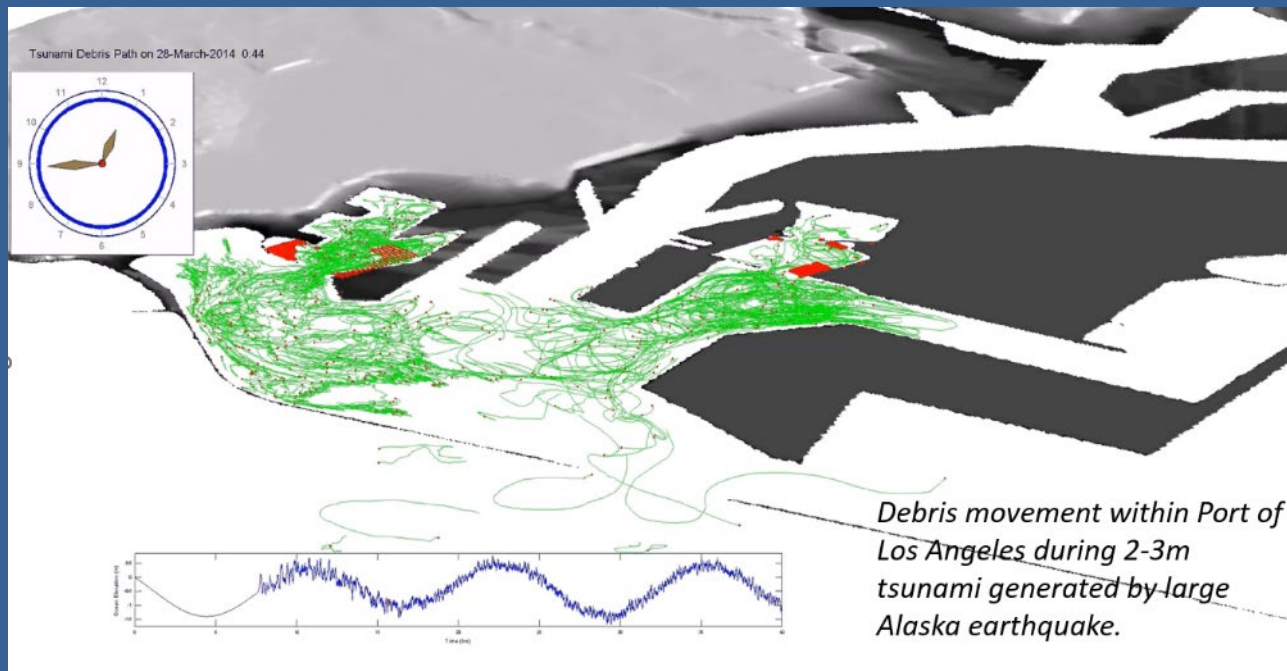
# Overview of Tools for Tsunami Planning

## RECOVERY

### Sediment & Debris Movement Modeling

Estimates total debris and flow paths to identify areas where hazardous debris may accumulate

**Sediment & debris clean-up leads to delays in recovery and accounts for ~40% of recovery costs.**



# 2022 Tsunami from Tonga Volcanic Event – Moderate/strong currents and minor flooding

## LESSONS LEARNED



*January 15, 2022, tsunami in California from Tonga volcanic eruption; photos from Santa Cruz Harbor and Beach Boardwalk, hours after first wave arrival*

***This was an Advisory-level event (tsunami smaller than 2011) but coincided with a High tide – produced more localized flooding on beaches and in some***



*2022 flooding of harbor and beach at Santa Cruz (photo top left provided by Santa Cruz Harbor Patrol; lower left-video still from KCRA; lower right photo from Santa Cruz Sentinel)*



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# THANK YOU

Questions?

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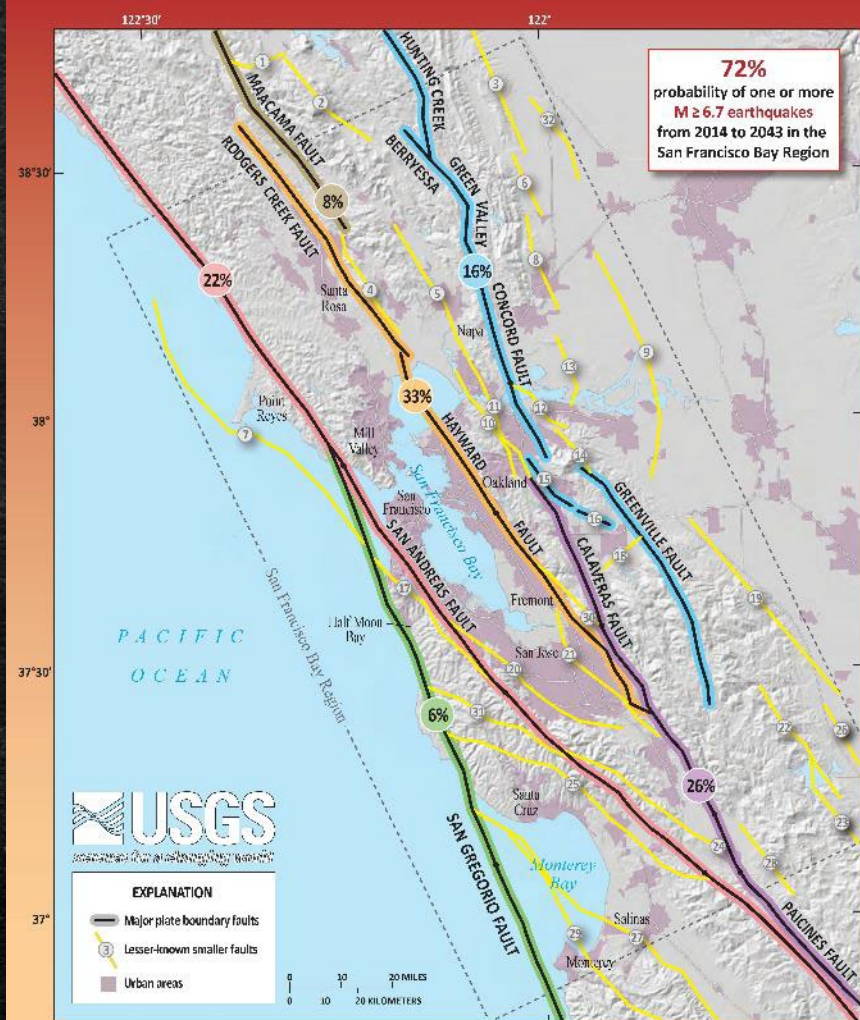


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# Earthquake Outlook for the San Francisco Bay Region 2014–2043

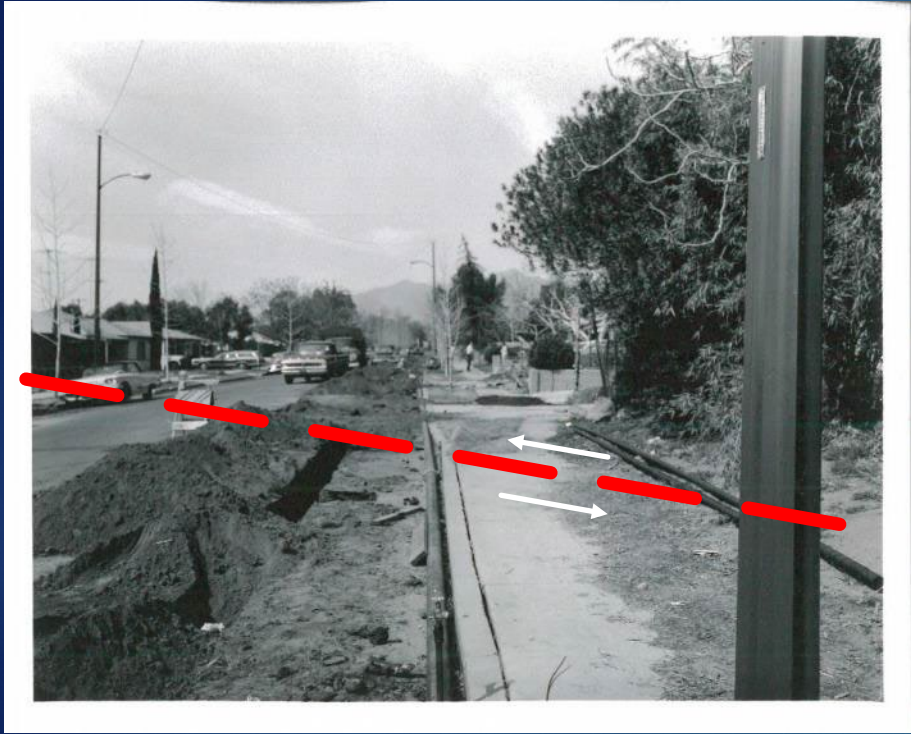
Map of known active faults in the San Francisco Bay region.

The percentage shown within each colored circle is the probability that a magnitude 6.7 or greater earthquake will occur somewhere on that fault system by the year 2043.





# Seismic Hazards



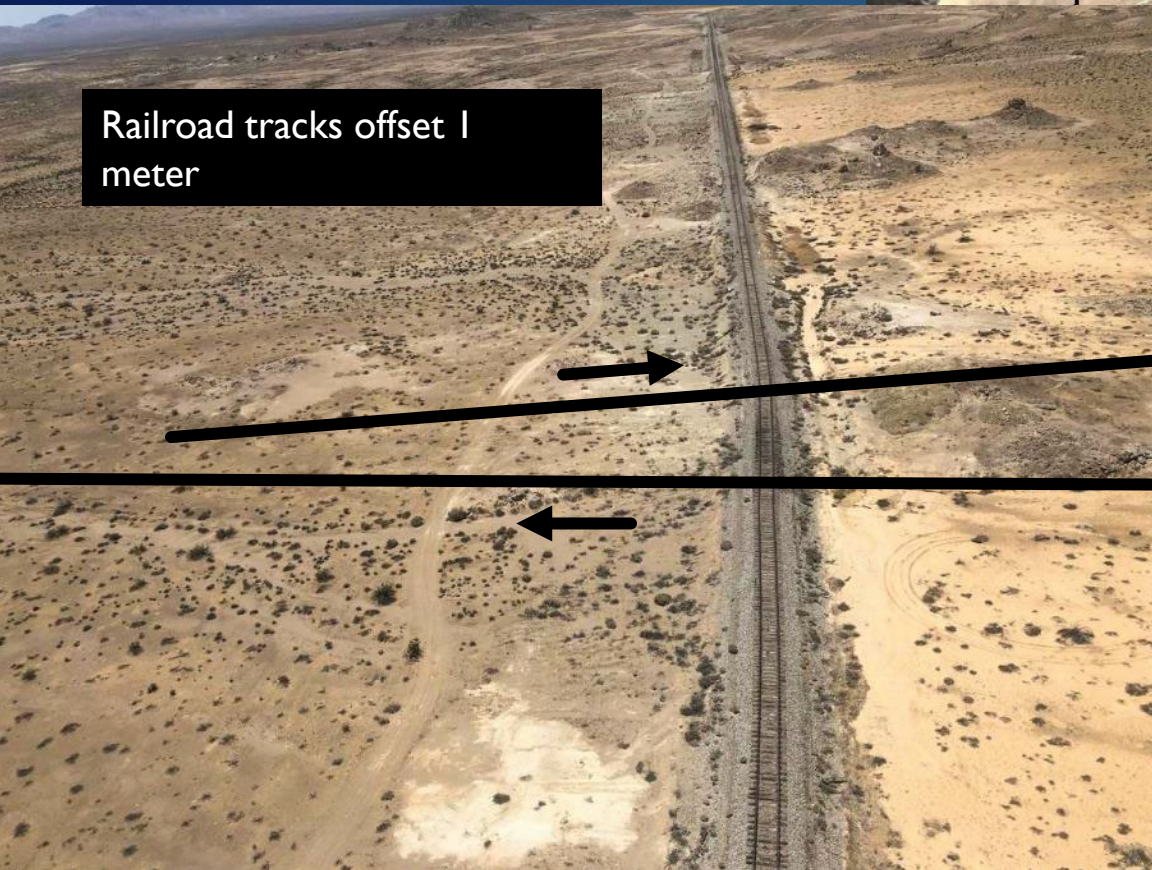
Left-laterally offset street, Cometa Ave, Sylmar



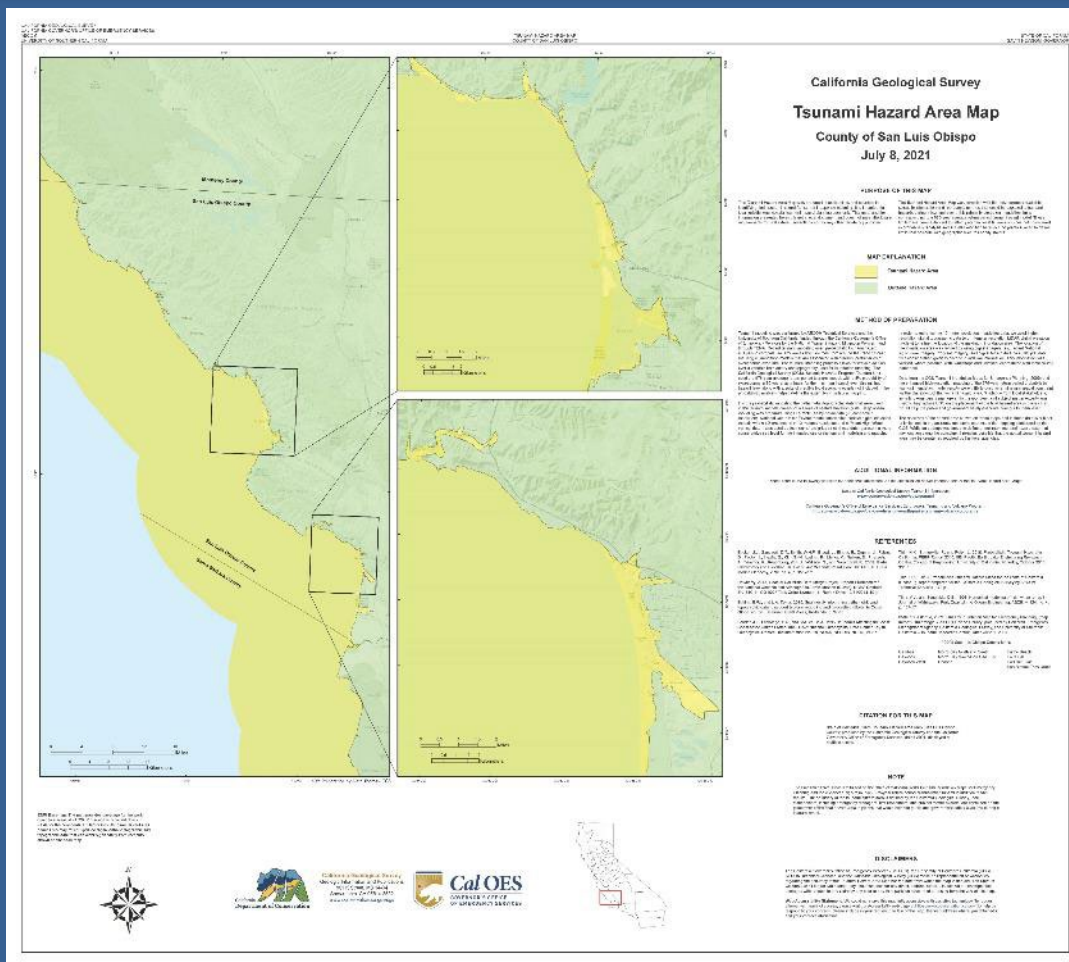


$M_w 7.1$  event

Railroad tracks offset 1 meter







**County-Wide Poster  
Maps Available!**

**Contact Us For Printed Copy**

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