

2011 Tohoku Tsunami in California

- Large tidal fluctuations = 16 feet in Crescent City (largest surges at low tide)
- Strong currents/debris in harbors
- Potential dangerous tsunami conditions lasted for more than 24 hours.
- Impacts: one fatality; two dozen harbors damaged; Official = \$50M; Total ~\$100M



March 11, 2011 Tohoku Tsunami in California; video at 11AM (about 3 hours after first arrival of tsunami) within Santa Cruz Harbor

For More Information Search
"CGS 2011 tsunami in California"

Maritime Tsunami Response Playbooks

Playbook Plan B

(based on M9 Cascadia Scenario)

Background Information:

Alert level = Advisory
 Peak Amplitude = 0.8 meters
 Peak Velocity = 8 knots
 Projected duration of strong currents (see location map below):
 3 knots = 20 hrs; 6 knots = 5 hrs; 9 knots = 0 hrs

Specific Instructions:

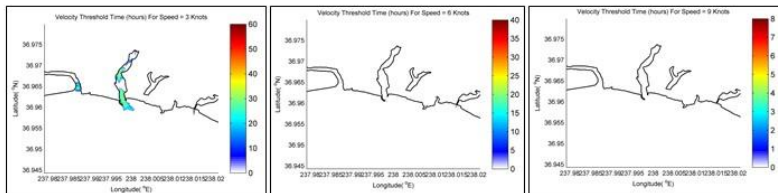
- Follow general guidance for Advisory-level tsunamis (Page 5)
- Strong currents and potential scour are expected in areas identified in blue on the map to the right. Consider relocating vessels located within 100 meters (300 feet) of these areas.
- Specific areas where vessels should be relocated and docks secured:
 - (completed with maritime community input)

Safe areas for repositioning vessels within Santa Cruz Harbor:

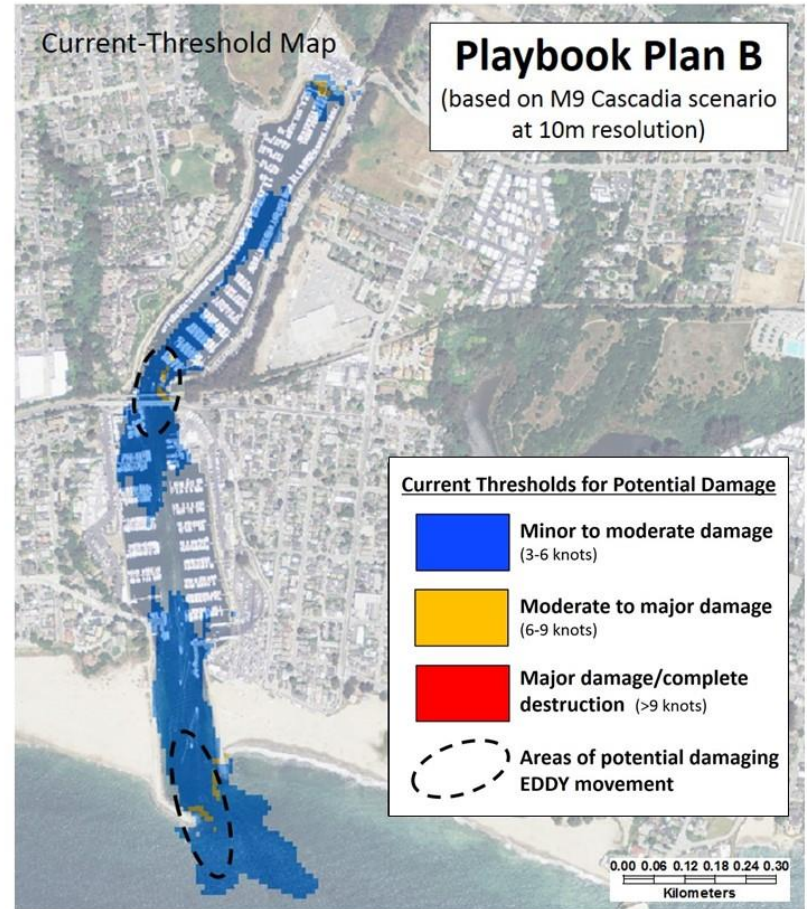
..... (completed with maritime community input)

Time thresholds for currents >3 knots.....>6 knots.....>9 knots

(Colors below represent HOURS of potential activity for blue, yellow, and red zones on opposite page)

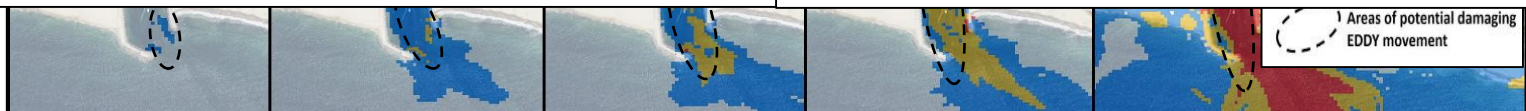


10



11

For
 Info
 Search
 "CGS
 maritime
 Playbooks"



Maritime Response and Mitigation Planning Products

Working Towards More Accurate, Consistent, and Cost-Effective Products Nationally

California

DRAFT 06/16/2015

California Maritime Tsunami Response Playbook And Mitigation Guidance

Crescent City Harbor – Del Norte County

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

California Geological Survey
California Governor's Office of Emergency Services
University of Southern California
Humboldt State University



ACTIONABLE TSUNAMI ALERT LEVELS

Tsunami Advisories and Warnings are the two actionable Alert Levels for communities.

Action taken will depend on the Alert level and the forecasted amplitude for a particular harbor. For both Advisory and Warning that clear and consistent directions are provided to the entire waterfront or pier businesses.

If there is not sufficient time to use the Playbooks, consider the your maritime communities for either Advisory or Warning level.

GENERAL "WARNING" LEVEL RECOMM

- All activities below should be completed no later than 30 minutes tsunami arrival.
- Advise facility maintenance to shut off fuel to fuel oil water services to all docks.
- Secure and strengthen all mooring lines throughout near the entrance or narrow constrictions.
- Evacuate the public and harbor personnel from all at water, as well as all landward areas identified in the evacuation area (last page).
- Do not allow public to re-enter tsunami evacuation a clear "message" is provided by local emergency man.
- Follow instructions for an Advisory if Warning is down.

GENERAL "ADVISORY" LEVEL RECOMM

- All activities below should be completed no later than 30 minutes tsunami arrival.
- Advise facility maintenance to shut off fuel to fuel oil water services to all docks.
- Secure and strengthen all mooring lines throughout near the entrance or narrow constrictions.
- Evacuate the public from all structures and vessels in Coordinate with local law enforcement to limit access areas.
- While the tsunami is active, all personnel working on wear personal flotation devices.
- Do not allow public to re-enter structures and vessel official "all clear" message is provided by local emergency man.

NOTABLE HISTORICAL TSUNAMIS IN

The table provides basic information about historical tsunamis. The largest, most damaging tsunamis occurred in the Alaska-Aleutian Islands region. The table help provide port authorities background for comparing the area. For example, the 2011 Japan tsunami measured below a forecast amplitude (wave height) of 0.43 m (1.4 ft).

Location	Date	Event	(m)	(ft)
Northwest	1792	Alaska	3.5	11.5
South Beach	2009 MB 0.5	Sanca	0.08	0.3
South Beach	2010 MB 3.0	Chad	0.76	2.5
South Beach	2006 MB 3.0	Carl	0.27	0.6
South Beach	2011 MB 0.2	Japan	0.44	1.4

*Alaska 1792 and 1992 (most over all waves high water) *Alert assigned by forecast 0.013m of bay.

Lessons learned in northern California from the

During the March 11, 2011 event, Crescent City boats he realized they were unable to return to Crescent City harbor because of a huge storm approaching the coast. Some Boatings Harbor in Oregon or to Humboldt Bay, California and made the choice to re-enter Crescent City harbor news from to Humboldt Bay and some were returning to sound up creemans. As well, the captain who chose to Humboldt Bay kept in close contact with each other for a tsunami initially impacted the west coast on the morning. Crescent City did not arrive until late in the evening.

Oregon



Maritime Guidance for Distant Source Tsunami Events

Ports of Newport and Toledo Lincoln County, Oregon

Oregon Maritime Tsunami Response Guidance (MTRG) No. 2015-OR-01

Maritime response guidance in this document is based on anticipated effects of a maximum-considered distant tsunami event, scenario A1Kmax of the Oregon Department of Geology and Mineral Industries (see www.oregon.tsunami.org for more information on this scenario). Smaller distant source tsunamis will occur more commonly and are likely to cause significantly less damage than this maximum considered scenario. Check with local authorities for more specific guidance that may be appropriate for smaller distant tsunami events.

INTRODUCTION 2

BACKGROUND ON TSUNAMIS 3

NOTABLE HISTORICAL TSUNAMIS IN NEWPORT AREA 4

Lessons learned in northern California from the March 11, 2011 Japanese tsunami 4

ACTIONABLE TSUNAMI ALERT LEVELS 5

GENERAL GUIDANCE ON RESPONSE TO NOAA ADVISORIES AND WARNINGS 6

In and near the PORT OF TOLEDO 6

In and near the PORT OF NEWPORT 8

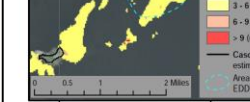
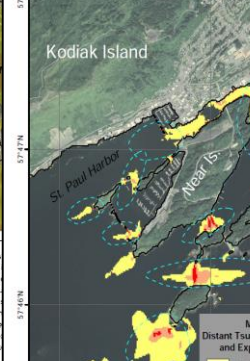
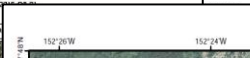
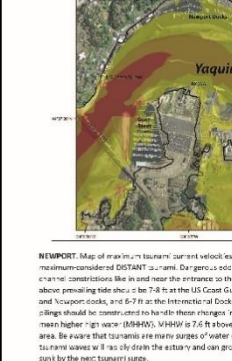
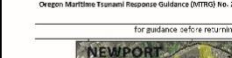
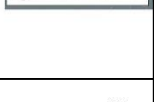
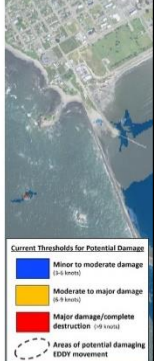
ADDITIONAL GUIDANCE 11

Do Your Homework 11

Know real-time and permanent mitigation measures appropriate for your area 11

Consult local tsunami evacuation maps 11

REFERENCES CITED 14



Alaska

1 | DRAFT

Maritime Guidance for Distant and Local Source Tsunami Events

Kodiak and St. Paul Harbors, Alaska

Maritime response guidance in this document follows the draft guidance developed by the National Tsunami Hazard Mitigation Program (NTHMP) is based on anticipated effects of a maximum-considered distant and locally generated tsunami event. Although smaller tsunamis occur more frequently, they are unlikely to cause significant damage compared with the maximum considered scenario. Check with local authorities for more specific guidance that may be appropriate for smaller distant tsunamis.

INTRODUCTION

Tsunamis are typically triggered by earthquakes and will cause sudden water level and current changes for many hours after their first arrival. The location of the earthquake plays an important role in determining the tsunami travel time to the coastal community. Distant earthquakes far away from the Southcentral Alaska coast may produce tsunami that strike approximately 4 hours or more after the earthquake, whereas locally occurring earthquakes near Kodiak Island may generate waves that hit the shore within minutes. This document provides response guidance in the event of tsunamis for SMALL CRAFT (vessels under 300 gross tons) such as recreational sailing and motor vessels, and commercial fishing vessels. The first part of this document outlines the guidance for DISTANT TSUNAMI, whereas the second part is devoted to LOCAL TSUNAMIS.

Tsunami wave impacts are greatest in and around ocean beaches, low-lying coastal areas, and bounded water bodies such as harbors and estuaries. These areas should always be avoided during tsunamis. Any tsunami event can threaten harbors, facilities, and vessels.

TSUNAMI HAZARDS that can directly affect boats include:

- Sudden water level fluctuations
- Large waves
- Coastal waves, and surges hitting grounded boats

Oregon Maritime Tsunami Response Guidance (MTRG) No. 2015-OR-01



MITIGATION PLANNING

In addition to using these Playbooks for tsunami response, the California Tsunami Program, FEMA, and its partners encourage maritime communities to utilize this information to help mitigate damages and loss of life from future tsunamis. These products and plans should be used by maritime communities to pre-identify real time response mitigation measures, determine where infrastructure enhancements should be initiated, and provide a mechanism for pre-disaster hazard mitigation funding through additions to their Local Hazard Mitigation Plans (see the list of potential mitigation measures below). Although these products, plans, and related mitigation efforts will not eliminate all casualties and damages from future tsunamis, they will provide a basis for greatly reducing future tsunami impacts on life-safety, infrastructure, and recovery in California maritime communities. Therefore, we recommend the following steps/actions:

1. Review the maps within this Playbook guidance document to identify where strong currents could potentially damage docks, structures, and/or infrastructure, especially where aging or run-down facilities exist.
2. Review the Mitigation Measures below for both real-time response actions, or "soft" mitigation, or permanent measures, or "hard" mitigation.
3. Incorporate these measures/actions into the community Local Hazard Mitigation Plan, and work with the community, the state tsunami program, and/or FEMA to develop a strategy to request funding to implement these improvements.

Mitigation Measures for Reducing Impacts in Maritime Communities

Real-time response ("soft") mitigation measures	Permanent ("hard") mitigation measures
<ul style="list-style-type: none"> Reposition ships within harbor Move boats and structures of harbor Remove small boats/assets from water Shut down infrastructure before tsunami arrives Prevent public behavior from water front areas Secure boats from moving during tsunami Prevent boats from entering harbor during event Secure boat slip moorings Prevent flotation devices from being lost Remove hazardous materials away from water Remove buoyant assets away from water Stage emergency equipment outside of affected areas Activate Mutual Aid System in response Activate the Incident Command & Emergency Response Alert key first responder at local level Restrict traffic entering harbor, and traffic evacuating Identify large vessels, sailing, and salvage personnel Identify boat owners/the-aboard; establish phone tree, or other notification process 	<ul style="list-style-type: none"> Increase size and stability of docks Facility and armor breakwaters Improve location positions of docks Increase flexibility of interconnected docks Improve mooring along dock/pier connections Increase height of piles to prevent overtopping Deepen/Design channels near high hazard zones Move docks/assets away from high hazard zones Install debris deflection booms to protect docks Reduce exposure of petroleum/chemical facilities Strengthen boat slip moorings Construct flood gates Prevent spill of fuel by stabilizing platforms Install debris deflection booms to protect docks Ensure harbor structures are tsunami resistant Construct breakwaters further away from harbor Install Tsunami Warning Signs Identify equipment/assets (pilot/flag/flag boats, cranes, etc.) to assist response activities