

California State Tsunami Five Year Review: 2002-2007

Submitted by James Goltz, Earthquake and Tsunami Program Manager, California Governor's Office of Emergency Services

This report will document the activities, accomplishments and challenges encountered in California's Tsunami Program from 2002 to 2007. The purpose of the report is to provide additional details that could not be elaborated verbally during the May 14 and 15 program at PMEL in Seattle.

This 5-year period has been particularly eventful with the catastrophic Asian Earthquake and Tsunami Disaster of December 26, 2004, the passage of Public Law 109-424 (Tsunami Warning and Education Act) and several events that have resulted in warnings or advisories for California. For the first time since 1964, a California community suffered damage due to a tsunami. On November 15, 2006, Crescent City's small boat harbor experienced approximately \$6 million in damage due to surging following a M8.4 earthquake in the Kuril Islands.

This period has also been one of intense activity by the state program to promote tsunami planning and provide technical assistance in support of that goal. In April, 2007 California State Assembly Bill 319 was introduced, a bill that if passed, will mandate that all California coastal jurisdictions develop tsunami response and mitigation plans.

Planning and Technical Assistance to Local Government

During the past 5 years and particularly from 2005 to the present, the California Tsunami Program has actively sought to facilitate local tsunami planning by developing tsunami inundation maps for the California coast, sponsoring workshops and facilitating exercises.

Inundation Mapping Program: The California Tsunami Program has developed and transferred coarse-grid tsunami inundation maps to all outer coastal counties. Inundation modeling was performed by the Tsunami Research Center at the University of Southern California under the direction of Dr. Costas Synalokis. In 2007, work was initiated to develop fine-grid tsunami inundation maps for all coastal areas including bays, ports and harbors.

Planning Workshops: The California Tsunami Program has sponsored workshops designed to promote tsunami planning since the mid-1990s. Workshops involving all coastal counties were held in December 2004 and April 2005. Based on evaluation feedback obtained at these workshops, plans were made to hold workshops in each county and in July 2005 the California Tsunami Program held the first of these workshops in Ventura County. Since that time similar workshops have been held in Del Norte, Humboldt, Mendocino, Marin, San Francisco, San Mateo, Monterey, Santa Barbara, Orange and San Diego. These workshops are open to all city, county, state and

federal agency representatives who may be called upon to respond to a tsunami warning or event within the host county. They follow a format in which a scientist presents basic information on tsunami generation and propagation as well as the tsunami hazard in that county; a representative of the West Coast and Alaska Tsunami Warning Center (WC/ATWC) explains warning messages and procedures, a NWS Weather Forecast Office meteorologist explains the local role of the Weather Service in tsunami preparedness and response as well as the TsunamiReady Program, an OES staff person describes the role of the state in tsunami planning and response and finally, local emergency managers present the county's plan or outline the process in which a plan will be developed.

Tsunami Exercises: The California Tsunami Program has facilitated tabletop exercises in many of the counties in which workshops have been held. These exercises are tailored to the level of planning achieved by participating jurisdictions; they are driven by scenarios developed by the WC/ATWC; and are conducted in real-time based on bulletins from the WC/ATWC reflecting the scenario. In addition, the California State Warning Center conducts periodic communication exercises and in cooperation with multiple agencies has developed plans to conduct an end-to-end tsunami communications exercise in March 2008. Much of the ground work, including working with the FCC to permit such testing has been accomplished over the past year.

Planning Guidance Document: The OES Earthquake and Tsunami Program developed, published and distributed the document "Local Planning Guidance on Tsunami Response." This document provides recommended procedures for plan development, useful information on the tsunami warning system, the science behind tsunami generation and propagation, model plans and draft PSA's and public information.

Local Planning Committees and Working Groups: California's Tsunami Program has worked closely with local committees and working groups that promote tsunami education and planning. Groups that have been active over the last 5 years include the Tsunami Task Forces for both City and County of Los Angeles, the Redwood Coast Tsunami Working Group, and the Orange County Emergency Managers Organization (OCOMO), Tsunami Subcommittee.

California Tsunami Steering Committee: California OES convenes and chairs the state tsunami steering committee which meets annually to discuss new programs, funding opportunities, events that have triggered advisories, watches and warnings and other matters of importance to emergency managers. The steering committee consists of OES, the California Geological Survey, Caltrans, Parks and Recreation Department, all coastal counties, the four NWS WFOs, the Coastal Commission and other tsunami stakeholders.

Tsunami Hazard Mitigation

The California OES Earthquake and Tsunami Program has actively promoted tsunami hazard mitigation through planning and technical assistance to coastal counties and by participation in national programs under the NTHMP.

ATC-64: Guidelines for Design and Management of Structures for Vertical Evacuation from Tsunami: the former Earthquake and Tsunami Program Manager serves on the Project Review Panel for this important product which is now in a 90% draft and will become available to the wider community in approximately six months.

Tsunami Hazard Mapping: an essential component of the California tsunami mapping program is to identify critical infrastructure and facilities that are subject to inundation in a major tsunami event. Through planning assistance, plan review, workshops and exercises California OES attempts to promote mitigation through the identification of structures at risk and the identification of strategies for hazard reduction through zoning, relocation and land use planning.

Public Education and Outreach

In cooperation with other state and federal agencies and the private sector, the California OES Earthquake and Tsunami Program has participated in the ongoing effort to raise public awareness and promote public education for tsunami hazards in coastal communities.

TsunamiReady: the state program works cooperatively with the National Weather Service Forecast Offices in encouraging communities to become Tsunami Ready. Over the past five years this cooperation has taken the form of joint exhibitions at conferences and meetings, public lectures and information forums and the distribution of literature.

Public-Private Partnerships: In cooperation with the NWS, Weather Forecast Office in Monterey, California, the state has facilitated the development and implementation of a new program in which a private company has donated funds for tsunami public education. This project will provide grants to local jurisdictions on a competitive basis to develop transferable public education products.

Brochures and Materials: The state has worked with local jurisdictions to develop and distribute brochures that inform coastal residents and visitors of the tsunami hazard and measures to take for self-protection during tsunami warnings and events. OES has encouraged local jurisdictions to incorporate localized tsunami inundation maps into brochures that are distributed to coastal residents and made available to tourists.

Signage: tsunami signs identifying hazard zones, evacuation routes, safe areas and shelter locations in coastal areas play an important role in public education and are vital components of the tsunami warning and response procedures of local government. The OES Earthquake and Tsunami Program has worked with the California Coastal Commission and the California Department of Transportation to develop consensus on the placement of signs and arrange funding for construction and implementation of signage programs.

Participation in NTHMP

The California OES Earthquake and Tsunami Program has been an active participant in the National Tsunami Hazard Mitigation Program and in committees and sub-committees created in the context of the NTHMP.

NTHMP Subcommittee on Warning: California OES participated in the subcommittee and played a role in the re-definition of basic terms for expressing advisories, watches and warnings.

NTHMP Subcommittee on Mitigation and Outreach: California has also been represented in this subcommittee and worked on several projects including the incorporation of social science research into the NTHMP program.

Outlook for the Next Five Years

Greater Demands on State Programs: the Asian Tsunami Disaster of 2004 and several recent tsunami or potential tsunami events affecting the West Coast have heightened the visibility of tsunami hazards in California and both local and state government agencies have come under increased pressure from elected officials to plan and mitigate. To meet these demands, funding levels must increase.

Cooperation between State and Federal Programs: in California over the past five years, the state's Earthquake and Tsunami Program and NOAA's TsunamiReady programs have been on parallel tracks, approaching the same target audiences but largely operating independently of one another. These programs must develop a new level of cooperation and integration to achieve maximum benefit from public investment for optimal planning, mitigation and public education.

Multi-State Planning and End-to-End Testing: the very significant earthquake and tsunami risks posed by the Cascadia Subduction Zone as well as distant source events require multi-state planning efforts and exercises that test the full range of warning, response and recovery capabilities. Testing of tsunami communication capabilities and protocols is particularly important, including the testing of the Emergency Alert System using live TSW codes.

Tsunami Modeling and Mapping: tsunami modeling and mapping will continue to improve and the NTHMP can provide useful guidance on data collection, monitor improvements in modeling capabilities and recommend mapping strategies.

New Federal Legislation: Public Law 109-424 (Tsunami Warning and Education Act) will guide the national tsunami program and states must continue to be full partners in the implementation of the program. Funding levels to NTHMP participating states must reflect tsunami hazard as well as population at risk.