

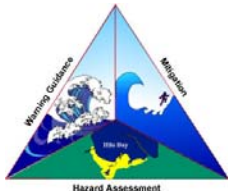
# TsuInfo Alert



prepared by the Washington State Department of Natural Resources on behalf of the  
**National Tsunami Hazard Mitigation Program**  
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## Dedication of the Nation's First Tsunami Vertical Evacuation School Structure

By Ted Buehner, National Weather Service (NWS), Seattle, WA

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This story marks the end of a journey reported here in January 2015, when ground-breaking construction started on a historic structure – the nation's first tsunami vertical evacuation

school. Dedication of the new Ocosta Elementary School, south of Westport, Washington in unincorporated Grays Harbor County, was held on June 11, 2016, with close to 500 people in attendance. The new 37,590 square foot school replaced the outdated building. This new central Washington coast school will begin its service as not only an educational environment, but also as a student, staff, and community refuge from rare yet devastating tsunamis. The



A Washington National Air Guard helicopter pulls a crew member up from the evacuation rooftop in a demonstration of how to extract refugees in the wake of the devastating tsunami following the dedication ceremony. Credit: Ted Buehner

dedication coincidentally followed one of the largest earthquake and tsunami exercises in the nation's history, the 4-day Cascadia Rising exercise that mirrored the last Cascadia Subduction Zone earthquake estimated at 9.0 magnitude and tsunami that occurred in January 1700.



A full house of close to 500 attended the Ocosta Elementary School dedication. The rooftop of this combined gym and cafeteria building is the tsunami vertical evacuation refuge. Credit: Ted Buehner

This stretch of the central Washington coast lies on a highly vulnerable peninsula of land. A Cascadia Subduction Zone earthquake would result in substantial earth shaking and liquefaction, and allow people approximately 30 minutes evacuation time prior to the initial tsunami wave arrival. At 53-feet above mean sea level, the school's rooftop evacuation platform sits

high above the school grounds. The rooftop is accessible via four flanking stair towers enclosed in concrete, and designed to hold 1,000 people. The foundation consists of 24-inch

(Continues on Page 2)



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<http://www.dnr.wa.gov/programs-and-services/geology/geologic-hazards/tsunamis/tsuinfo-alert>

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**NATIONAL TSUNAMI HAZARD MITIGATION PROGRAM LIBRARY CATALOG:**

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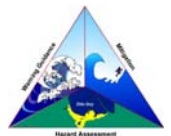
## Dedication of the Nation's First Tsunami Vertical Evacuation School Structure

By Ted Buehner, National Weather Service (NWS), Seattle, WA

*(Continued from Page 1)*

diameter concrete piles that are up to 50 feet deep. While the majority of the facility is constructed to meet standard building codes, this portion of the building is fortified to withstand a 9.2 magnitude quake along with the impacts of incoming tsunami waves such as floating debris and scouring.

This project was the first produced from Project Safe Haven. The NTHMP-funded program used a grassroots process to develop strategies for vertical evacuation along Washington State's vulnerable coastline. In addition, NOAA provided site-specific earthquake and tsunami information in the structure's design, all in collaboration with the State of Washington and University of Washington scientists. As former Washington State Emergency Management Earthquake and Tsunami Program Manager John Schelling stated following the dedication, "This project would not have happened without the National Tsunami Hazard Mitigation Program."



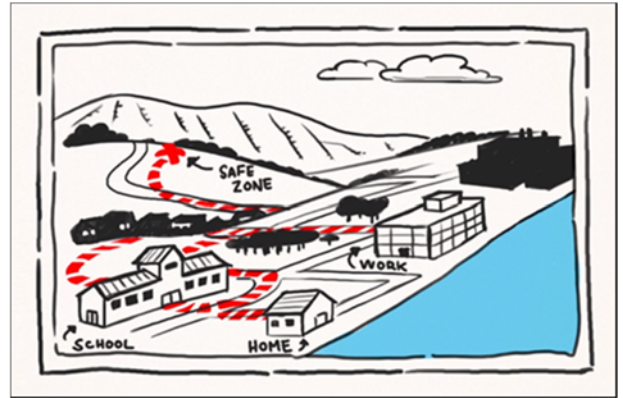
Dr. Paula Akerlund, the Ocosta School District Superintendent, led the dedication ceremony. Her opening remarks offered acknowledgement to all those who contributed to this historic structure including Ted Buehner, warning coordination meteorologist for the NWS Seattle area forecasting office. Among the other dedication ceremony speakers, Washington State Congressman Derek Kilmer noted, "This building is a first step in what other coastal communities can do to help save lives."

# PROJECT UPDATES

## New Outreach Products from the NTHMP and NOAA

By Christa Rabenold, NOAA/National Weather Service Tsunami Program

In accordance with the 2014 National Tsunami Education and Outreach Plan Update, the National Tsunami Hazard Mitigation Program (NTHMP) has released two new complementary outreach products to help support increased tsunami awareness and preparedness. The first is a summary of the U.S. tsunami hazard. Available as a downloadable two-page fact sheet and a web page, the summary is based largely on the recently released [United States and Territories National Tsunami Hazard Assessment Historical Record and Sources for Waves—Update](#) (Dunbar and Weaver, 2015). It was designed to provide the public with an easily accessible and understandable general overview of the nation's tsunami hazard. The summary is available at <http://nws.weather.gov/nthmp/ushazard.html>.



A screenshot of NOAA's new fast draw video.

Recognizing the threat posed by tsunamis in their states and territories, NTHMP partners have produced tsunami inundation and evacuation maps to help communities and individuals plan for the protection of life and property. The second new product is a compilation of links to these maps, which were largely developed using guidance produced collaboratively by members of the NTHMP to ensure consistent and accurate tsunami mapping of the Nation's coastline. This map compilation is available at <http://nws.weather.gov/nthmp/maps.html>.

Another new tsunami outreach product is a fast draw video from the National Oceanic and Atmospheric Administration (NOAA) that briefly explains how to prepare for and respond to a tsunami. Tsunamis: Be Prepared and Stay Safe! is currently available in English and Spanish, with a Samoan version in the works. The video is available on YouTube, but can also be viewed and downloaded at <http://www.nws.noaa.gov/om/Tsunami/outreach.shtml>.

## Updated Hawaii Historical Events Poster

By Paula Dunbar, NOAA NCEI, and Laura Kong, NOAA ITIC

Hawaii is one of the most unique locations in the world for studying tsunami effects. Not only are there large local tsunami sources, but Hawaii is also in the crosshairs of tsunamis generated around the Pacific from South America to Alaska, Russia, and Japan. The NOAA National Centers for Environmental Information (NCEI, formerly the National Geophysical Data Center) and collocated World Data Service for Geophysics (WDS) provides long-term archive, data management, and access to national and global tsunami data. The Global Historical Tsunami Database includes information on the tsunami source, maximum wave heights, and effects such as deaths and damage. The UNESCO/IOC – NOAA International Tsunami Information Center (ITIC) has worked in collaboration with the NCEI/WDS to collect post-tsunami event information since its inception in 1965.



View poster here: [http://itic.ioc-unesco.org/images/stories/media\\_resources/factsheets/HIHistoricalTsunamiEffects\\_1812-2015\\_small.pdf](http://itic.ioc-unesco.org/images/stories/media_resources/factsheets/HIHistoricalTsunamiEffects_1812-2015_small.pdf)

# PROJECT UPDATES

## The ASCE 7-16 Standard Will Include Tsunami Resilient Design Provisions for Buildings and Other Structures Subject to Building Codes

By Gary Chock, S.E., D.CE, F.SEI, Dist.M. ASCE, Structural Engineer, Hawaii and California

In spite of considerable exposure to tsunamis in the Pacific Ocean, heretofore there has never been a national standard for engineering design for tsunami effects in the coastal zone. Thanks to funding from ASCE and considerable volunteer effort from dedicated members of the ASCE Tsunami Loads and Effects Subcommittee chaired by this author, a new chapter has been added to the ASCE7-16 Standard. On March 11, 2016, the American Society of Civil Engineers/Structural Engineering Institute (ASCE/SEI) Standards Committee completed the technical review and approval process to include design requirements for tsunami loads and effects for the 2016 edition of the ASCE 7 Standard, Minimum Design Loads and Associated Criteria for Buildings and Other Structures. It is also being incorporated by reference in the 2018 International Building Code. Chapter 6 in ASCE 7-16 provides the first comprehensive tsunami design provisions in the world and represents the state of the art tsunami design knowledge presented in enforceable code language.

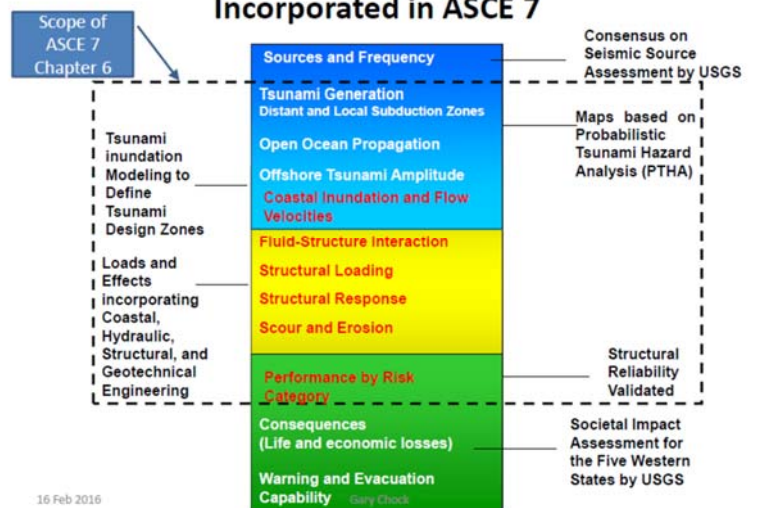
This new Chapter on Tsunami Loads and Effects, provides for the resilient design of coastal structures

to mitigate tsunami loads, scour, and related considerations. These design provisions apply to the states of Alaska, Washington, Oregon, California, and Hawaii, for the design of critical and essential facilities located within mapped tsunami design zones that are based on probabilistic tsunami hazard analysis. Since tsunami inundation depths and flow conditions are more severe at the coastline, there will be an economic advantage to more careful siting of such facilities and appropriate engineering design to lessen the impact of tsunamis.

All of the Pacific basin tsunami sources were considered in development of 2500-year mean recurrence interval (MRI) probabilistic off-shore tsunami wave conditions for the ASCE 7-16 design standard. The structural design will provide high reliability of safety for a Maximum Considered Tsunami, which is taken as having a 2% probability of being exceeded in a 50-year period, or 1:2475 annual probability of exceedance.

The ASCE tsunami design requirements that were five years in the making are a unified set of analysis and design provisions based on fluid mechanics, extensive experimental and analytical modeling, field investigations after past tsunamis, and structural reliability analysis. An extensive commentary is also included with explanatory discussion and references. In addition to essential facilities and critical infrastructure, the local jurisdiction is encouraged to require tsunami design for taller buildings in general with sufficient height to provide emergency refuge for people stranded within the Tsunami Design Zone (TDZ). This will also enhance the resilience of the community since these buildings are

### Tsunami-Resilient Engineering Subject Matter Incorporated in ASCE 7



(Continues on Page 5)



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(Continued from Page 4)

likely to be structurally sound after the tsunami. Moreover, this standard can be utilized in any tsunami-prone community in other countries once the probabilistic tsunami hazard for that location has been established per the specified procedure given in the ASCE 7-16 standard. The tsunami chapter provides comprehensive provisions for the design of buildings and other structures for all loading conditions anticipated during tsunami inundation. Although intended specifically for application to new construction, the provisions in this standard could also be applied to the assessment of existing coastal structures for tsunami resistance.



Publication sales are expected by the end of 2016, with both a traditional print version and a fully digital version becoming available for the first time. ASCE will also provide internet-based hosting of the associated ASCE 7 Tsunami Design Geodatabase of GIS-mapped design parameters. Using the ASCE Tsunami Design Geodatabase to obtain the design level hazard, the design flow depth and velocity at the project site location are then used to determine structural loading and scour effects for which the building or structure must be designed. NOAA PMEL/University of Washington scientist and principal investigator Dr. Yong Wei had a key role in developing and producing the probabilistic Tsunami Design Zone maps of the ASCE 7 Tsunami Design Geodatabase. The format of the TDZ products will include metadata, GIS layers, as well as example pre-plotted pdf maps of 62 coastal communities in the five western states.

*Publication:* Chock, Gary, 2016, Minimum Design Loads and Associated Criteria for Buildings and Other Structures: American Society of Civil Engineers/Structural Engineering Institute Publication 7-16 (in press).

## Scientists Work on Survival Plans for US West Coast Tsunami

By Bill Condie, Cosmos News Editor

Geologists are searching for evidence of past tsunamis on the US West Coast as part of scientists' coordinated efforts to manage the risk of a future disaster in the region.



"Despite the fact that we have learned a significant amount about the earthquake sources for tsunamis, there are gaps in our understanding of past tsunamis, especially prehistoric tsunamis," Rick Wilson of the California Geological Survey told the Seismological Society of America's Annual Meeting in Reno, Nevada.

"If we can demonstrate when and where tsunamis occurred in the past, that information will give us a better understanding of the return periods in these areas, and that can go into the probabilistic analyses that help us understand our hazard and risk better."

The authorities in California, Oregon, Washington and Alaska set about preparing the plan following the 2011 Tohoku earthquake and tsunami that devastated northeastern Japan.

Scientists told the Reno meeting that evolving risk management plans included the development of tsunami hazard maps that guide the development of personal and community evacuation routes to detailed "playbooks" to help guide harbour and port officials.

See full article: <https://cosmosmagazine.com/climate/scientists-work-survival-plans-us-west-coast-tsunami>

# TSUNAMI NEWS

## Disaster Risk Reduction & Resilience: The Indigenous People of American Samoa Set an Example

By Kimberly Arsenault, Emergency and Disaster Management Digest

When planning for emergencies and disasters, current guidelines provide little in the way of how to effectively incorporate indigenous people into the planning – it mostly indicates the necessity of their involvement.

How to effectively incorporate their culture and values is a critical part in ensuring their safety and cooperation, and just might provide some needed guidance for everyone else.

**American Samoa and the 2009 Tsunami**—A recent study regarding the indigenous people of American Samoa and the 2009 tsunami efforts may help set an example for others. The indigenous community played a large role in providing Disaster Risk Reduction (DRR) and community resilience during the tsunami, even saving the lives of hundreds by issuing early warnings to protect villages.



American Samoa is located in the South Pacific Ocean and consists of small islands and coral atolls. Since the main islands are formed from volcanoes, inner lands are steeply sloped and mostly uninhabitable. Most of the population reside along coastal areas on low-lying lands, placing them at high-risk for natural disasters and climate change impacts such as rising sea level.

See full article: <http://edmdigest.com/news/disaster-risk-reduction-and-resilience-from-an-indigenous-perspective/>

## First Ever World Tsunami Awareness Day Set to Debut in November

By Matt Mills, Managing Editor of Emergency and Disaster Management Digest

In an effort to increase global awareness of tsunamis and the devastating impact of these natural disasters, the first-ever World Tsunami Awareness Day is now set to take place later this year.

The United Nations Office for Disaster Risk Reduction (UNISDR) recently announced that World Tsunami Awareness Day makes its debut this November. The single-day awareness campaign will aim to put a strong spotlight on these infrequent natural events that can, and typically do, cause so much death and destruction when they do strike.

Over the past century, a total of 58 tsunamis have resulted in about 260,000 deaths. Using these figures, the average calculates to approximately 4,600 deaths per tsunami, which, according to the UNISDR, makes tsunamis the most severe and deadly of all natural hazards.

The Indian Ocean tsunami that occurred in December 2004 is perhaps the deadliest of all time. There were an estimated 227,000 deaths in 14 countries associated with that tsunami, which hit Indonesia, Sri Lanka, India and Thailand particularly hard. As the UNISDR put it, “tsunamis are rare events, but that very fact makes risk understanding vital.”



See full article: <http://edmdigest.com/news/first-ever-world-tsunami-awareness-day-set-to-debut-in-november/>

# TSUNAMI NEWS & RESEARCH

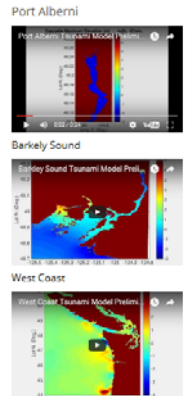
## Tsunami Models Used for Preparedness Exercise in Port Alberni

By Ocean Networks Canada

Ocean Networks Canada's preliminary tsunami models for Barkley Sound and the City of Port Alberni were integrated into Emergency Management BC's first ever full-scale earthquake and tsunami response exercise: Exercise Coastal Response in Port Alberni June 7 - 10.

Ocean Networks Canada in collaboration with University of Rhode Island has been developing new tsunami wave models for the area of Barkley Sound and the City of Port Alberni. New fault rupture models have been developed by Natural Resources Canada and University of Victoria personnel. Digital elevation models that reflect the morphology of these two areas have been developed in collaboration with NOAA-NCEI, Department of Fisheries and Oceans, GeoBC and the Alberni-Clayoquot Regional District.

See full article: <http://www.oceannetworks.ca/tsunami-models-used-preparedness-exercise-port-alberni>



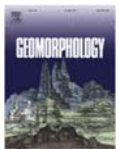
## NEW TSUNAMI RESEARCH

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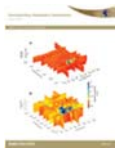


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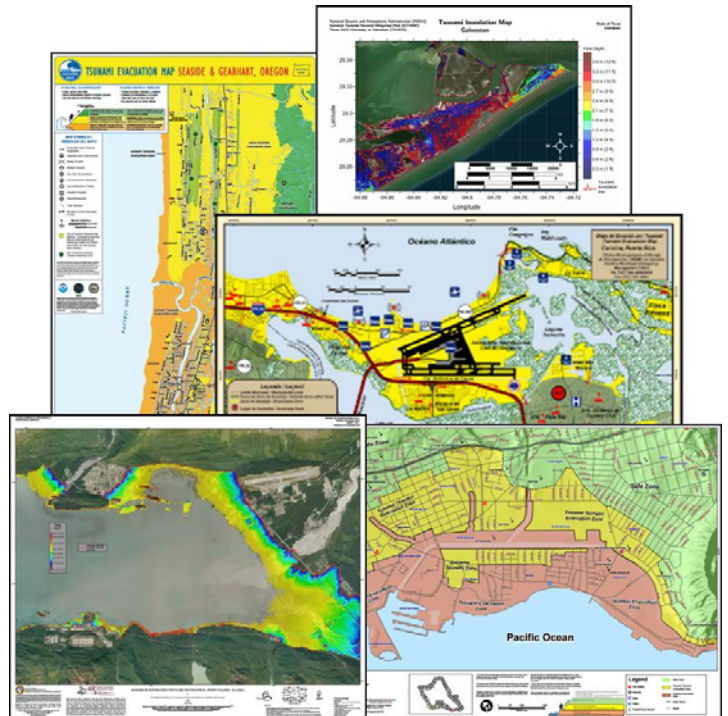
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# NTHMP NEWS & EVENTS

## NTHMP Website Compiles Links to NTHMP Partner State/Territorial Tsunami Inundation and Evacuation Maps

In order to understand the potential for tsunami impacts on U.S. coastlines and help communities plan for the protection of life and property, NTHMP states and territories produce maps for their coastlines that identify tsunami inundation and evacuation areas. These maps are based largely on guidance produced collaboratively by members of the NTHMP to ensure consistent and accurate tsunami mapping of the Nation's coastline.

- ◆ **Tsunami inundation maps** show the coastal areas that may be flooded by tsunami waves. Based on tsunami inundation models, these maps are used to create evacuation maps and guide tsunami-related emergency response and land-use planning.
- ◆ **Tsunami evacuation maps** show the coastal areas from which people must be evacuated to avoid harm from tsunami waves. These maps may also include evacuation routes and assembly areas.



See maps: <http://nws.weather.gov/nthmp/maps.html>

## UPCOMING NTHMP & RELATED EVENTS

- ◆ July 26-28, 2016—2016 NTHMP Mitigation and Education Subcommittee Meeting (Lynnwood, WA) <http://nws.weather.gov/nthmp/2016messummer/index.html>
- ◆ July 31-August 5, 2016—Asia Oceania Geosciences Society Annual Meeting (Beijing, China) <http://www.asiaoceania.org/aogs2016>
- ◆ September 12-15, 2016—7<sup>th</sup> Tsunami Society International Tsunami Symposium (Ispra, Italy) [http://www.drgeorgepc.com/7TSI\\_ISPRA2016Announce2.pdf](http://www.drgeorgepc.com/7TSI_ISPRA2016Announce2.pdf)
- ◆ November 5, 2016—United Nations Office for Disaster Risk Reduction (UNISDR) World Tsunami Awareness Day <https://www.unisdr.org/archive/48820>
- ◆ January 30-February 3, 2017—2017 NTHMP Annual Meeting (Portland, Oregon) <http://nws.weather.gov/nthmp/2017annualmeeting/>

