

# TsuInfo Alert

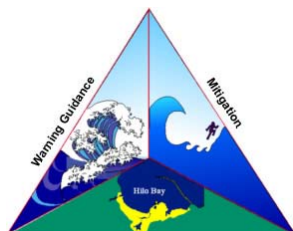
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### In this issue:

California Tsunami Program Hosts Bi-Annual TSC Meeting 1

Vertical Evacuation Structure Panel in Ocean Shores 2

Mitigation and Education Subcommittee Summer Meeting 3

Mapping and Modeling Subcommittee Summer Meeting 5

Celebrating a New Tsunami Vertical Evacuation Refuge for the Shoalwater Bay Indian Tribe 6

Washington State Maritime Guidance Workshop 7

Tsunami Hazard Maps of Anacortes-Bellingham area, Washington 8

NTHMP Events 8

## California Tsunami Program Hosts Bi-Annual California Tsunami Steering Committee Meeting

By Yvette LaDuke and Kevin Miller, California Governor's Office of Emergency Services

On June 14, 2018, the California Tsunami Program hosted its second California Tsunami Steering Committee (TSC) meeting for 2018. The TSC is comprised of the California Governor's Office of Emergency Services (Cal OES), the California Geological Survey, the National Weather Service California Weather Forecast offices, the Federal Emergency Management Agency Region IX, the U.S. Geological Survey, the U.S. Marine Corps Camp Pendleton, University of Southern California Southern California Earthquake Center, the 20 California coastal county emergency managers, California State Parks, the California Coastal Commission, and coastal city managers.

The California Tsunami Program convenes the TSC to prioritize and coordinate statewide tsunami program projects, discuss capabilities, assist with planning efforts, discuss local and state policies, ensure that needs are addressed and public safety is achieved based on vetted science, and identify any other issues that impact California Tsunami Program partners.

During the June meeting, discussion focused on:

- **California Tsunami Program Update:** Cal OES discussed the increase in tsunami preparedness activities that occurred in March and the general increase in tsunami preparedness activities that are occurring throughout the state.
- **Blue Line Project:** Oregon Emergency Management shared detailed information regarding signage and project implementation. This presentation was arranged due to interest by some California coastal partners in implementing this project in their jurisdictions.
- **Tsunami Evacuation Playbook:** Coastal partners requested a playbook guidance document be developed in non-scientific language to assist with implementing the playbooks.
- **January 2018 Tsunami Watch After-Action Recommendations Implementation:** Cal OES has developed a new tsunami event distribution list which will be utilized during future tsunami events impacting California. This will enhance efforts provided by the State Warning Center and the NTWC. Protocols have also been updated to ensure effective communication and information dissemination.
- **Recovery Guidance Update:** The recovery guidance document is anticipated to be completed by fall 2018. A beta test will be conducted with interested California coastal partners.
- **Statewide Evacuation Modeling of Probabilistic Hazards (Pedestrian Evacuation):** The U.S. Geological Survey is modeling data to inform pedestrian evacuation planning efforts for local jurisdictions.



All participating partners indicated that these meetings greatly enhance statewide collaboration and communication and agreed to continue meetings as currently scheduled. The next California TSC meeting is scheduled for January 23, 2019 in Newport Beach, California.

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This publication is free upon request and is available in print by mail and online at:

<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:**

<http://d92019.eos-intl.net/D92019/OPAC/Index.aspx>

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## Vertical Evacuation Structure Panel in Ocean Shores

By Daniel Eungard, Washington Geological Survey

On June 12th, 2018, a tsunami vertical evacuation structure (VE) panel meeting was held in the community of Ocean Shores at the Ocean Shores Convention Center. The panel included representatives from the Washington Geological Survey, University of Washington, NOAA Pacific Marine Environmental Laboratory, Degenkolb Engineers, and Washington Emergency Management Division. Each panelist gave a five-minute lightning talk on their respective part in the process to aid in the construction of VE structures in at-risk communities. The lightning talks were followed by an hour long Q-and-A session to address the public's questions regarding VEs. More than 80 members of the public attended along with a number of emergency management and elected officials. Three NOAA Weather Alert radios were raffled off as prizes for attendance. The entire event was recorded by Washington's public broadcast station and available to view at: <https://www.tvw.org/watch/?eventID=2018061070>.



## Mitigation and Education Subcommittee Summer Meeting

By Christa von Hillebrandt-Andrade, NWS Caribbean Tsunami Warning Program

Eighteen state, territory, and federal agency partners participated in the summer NTHMP Mitigation and Education Subcommittee (MES) meeting, which took place July 24–26, 2018 in Sacramento, California. The first order of business was to review the status of the 2018 MES Annual Work Plan. Some of the items discussed in more depth were TsuInfo Alert, the Social Science Evaluation Project, the maritime guidance document, and informational resources.

For TsuInfo Alert, there is a goal to increase the readership as well as the contributions of NTHMP partners on their activities. To expand readership, the TsunamiZone.org offered to integrate TsuInfo Alert content on its website. Other tasks, like the Social Science Project and the maritime guidance document, are awaiting award of the FY 18 NOAA/NWS tsunami activities grants. The Tsunami Information Guidebook is in the final stages of review and is envisioned more for Public Information Officers and the public, than the media which was the original focus, while the NWS Tsunami Program Office was still awaiting feedback from FEMA on the Community Rating System (CRS) fact sheets.



Attendees of the Summer 2018 NTHMP Subcommittee Meetings

Deep dives were taken on several activities that will take place during the upcoming year. A new item that was added to the MES Annual Work Plan was the Wireless Emergency Alert with respect to the polygons used for dissemination as well as the development of longer messages. With regard to the Social Science Project to be led by Washington (and includes Oregon, California, Hawaii, and Alaska), the consensus was to first focus on evacuation in support of updated guidelines for evacuation brochures with maps. It was suggested that the project also include a literature review and surveys and seek input of all categories of non-coastal residents, not just tourists.

California is the lead for the NTHMP Guidelines and Best Practices for Tsunami Hazard Analysis, Planning, and Preparedness for Maritime Communities & National Maritime Guidance outline. Suggestions were made on future developments for this project. Laura Kong of the International Tsunami Information Center gave an update on international maritime work and the International Marine & Ports Tsunami Guidance and Structural Design & Vertical Evacuation Guidance document. Much of this work is coordinated through the UNESCO IOC TOWS Task Team on Disaster Management and Preparedness.

A discussion was held about TsunamiZone.org, which has been actively used for several years by California and the Caribbean for tracking event participation and showcasing education and outreach resources. Washington, Oregon, and Alaska requested that webpages be developed for their states. A request was also made to enable joint registration for ShakeOut and TsunamiZone.

*(Continues on Page 4)*

## Mitigation and Education Subcommittee Summer Meeting

By Christa von Hillebrandt-Andrade, NWS Caribbean Tsunami Warning Program

*(Continued from page 3)*

Laurie Johnson led a mitigation and recovery discussion. She shared resources and experiences in the development of a Community Recovery Guidance document designed to assist local government. There was discussion on work being conducted by state and territory partners, as well as lessons from other parts of the world, including Japan and New Zealand. As part of this item, there was a discussion on how to address mitigation and recovery in the NTHMP. This topic was elevated to the NTHMP Coordinating Committee which voted to create a Mitigation and Recovery Working Group under the MES to start addressing these issues as outlined in the new NTHMP Strategic Plan.

One of the highlights of the meeting was the partner updates. Of special interest were the testimonies provided by Mona Barnes (Director of the Virgin Islands Territorial Emergency Management Agency) and Joel Figueroa (Operations Director of the Puerto Rico Emergency Management Bureau) on Hurricanes Irma and Maria. Director Barnes' remark "the worst scenario is not going to be the worst" struck a chord in all, while Figueroa highlighted the extreme challenges due to the collapse of the whole communication infrastructure. Both emergency managers emphasized the specific challenges of islands versus continental locations.



Mona Barnes, Director of the Virgin Islands Territorial Emergency Management Agency



Joel Figueroa, Operations Director of the Puerto Rico Emergency Management Bureau

There were also discussions and updates on vertical evacuation, the FEMA P646 Guidelines for Design of Structures for Vertical Evacuation, alert and notification, and tsunami exercises. The participants indicated that exercise handbooks should be available 2–3 months before exercise, and that scenarios be chosen and scheduled at least one year out (possibly three). There is an interest that future scenarios include a simulation of the 2018 Kodiak event (2019) and Southern Cascadia (2020). It was also recommended that the NTHMP website include a List of Exercises and Related Information. The discussion on TsunamiReady Tier II highlighted the challenges with implementing the recovery planning element. FEMA indicated it has contractors available to provide training for HAZUS and will be developing a guidance document.

For the next summer meetings, it was agreed to have a workshop format. Potential topics included TsunamiReady Tier II, maritime guidance, and an update on the Social Science Project.

The meeting notes, presentations, and supporting documents of this meeting are available at: <https://nws.weather.gov/nthmp/2018mesmms/index.html>

## Summary of the Mapping and Modeling Subcommittee Meetings—July 24–26, 2018

By Rick Wilson, California Geological Survey

The Mapping and Modeling Subcommittee (MMS) held their summer meeting in Sacramento, California, from July 24–26, 2018. Much of the focus of the MMS meetings centered on projects and tasks identified in its Annual Workplan, and individual state/territory projects which were discussed in a poster session. Although the MMS primarily met independently, several joint meetings were held with the Mitigation and Education Subcommittee to discuss mutual projects such as maritime tsunami planning guidance.

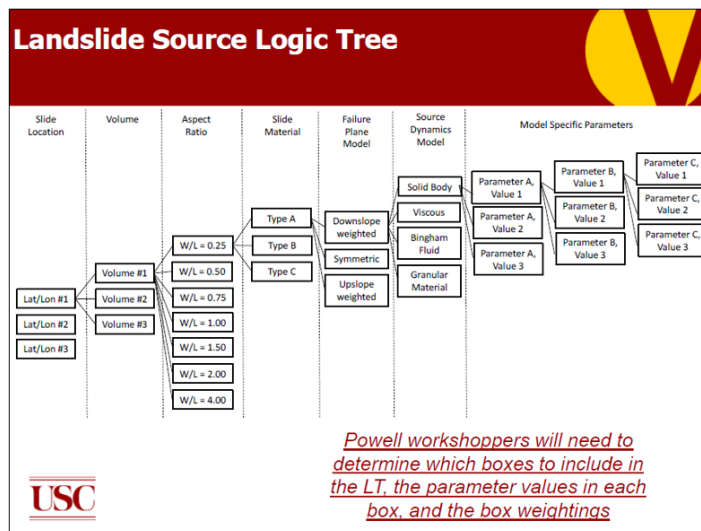
An overview of the meteotsunami hazard analysis project was provided by Juan Horrillo (Texas A & M University) and Stephan Grilli (University of Rhode Island). The group discussed how meteotsunamis could be addressed with respect to evacuation and response planning, and how this hazard compares to tectonic and landslide tsunami source hazards.

Dmitry Nicolsky (University of Alaska; MMS co-chair) facilitated discussions about updating the existing MMS inundation modeling and mapping guidance as well as the draft maritime hazard analysis and mapping guidance.

Although portions of the inundation guidance were last updated in 2016, there were a number of sections involving numerical model resolution and map accuracy which required further review. The maritime guidance, where sections on response, mitigation, and recovery planning are being updated by representatives from California, will hopefully be finalized by the end of 2018. In another session on developing guidance, Jim Kirby (University of Delaware) provided an update on outcomes from the landslide modeling workshop, including guidance being developed for numerical models.

Stephanie Ross (USGS) led a session on the outcomes from the initial April 2018 Powell Center Workshop which addresses continuity in tsunami source development. A number of MMS members attended the first workshop and many others will be attending future workshops focusing on various regions of the United States. The first regional workshop in October 2018 will focus on the Alaska–Aleutian Island tsunami sources; Dmitry Nicolsky presented background information on sources in this region. Hong Kie Thio (AECOM) and Patrick Lynett (USC) presented logic-tree approaches for developing tectonic and landslide sources, respectively. Development of the logic trees will help define the attributes and possible recurrence of plausible maximum tsunami scenarios for the coast at danger. In a related session, Rick Wilson presented a summary of the initial tsunami source database developed for existing sources being used by NTHMP states and territories.

Multiple partners presented information about sediment transport models they are developing. Although most partners admitted that the state-of-the-science is still developing, the needs are important for both maritime and on-shore communities. Tsunami currents in harbors can cause scour and sediment buildup leading to delays in recovery, and tsunami inundation can be impacted by scouring of dunes and/or barrier islands. The MMS members agreed to continue to test sediment transport models and work towards developing benchmarks for testing models in the future.



## Celebrating a New Tsunami Vertical Evacuation Refuge for the Shoalwater Bay Indian Tribe

By Steven R. Friederich, Washington State Emergency Management Division

A long-planned tsunami vertical evacuation tower in Tokeland received \$2.2 million in federal funding on June 26 to help pay for the construction of a safe refuge for hundreds of residents.

The Shoalwater Bay Indian Tribe had long sought ways to help its tribal members evacuate when there could just be 22 minutes of notice that a giant wave is coming following a huge earthquake, said Shoalwater Emergency Management Director Lee Shipman. The effort was amplified six years ago following discussions with the University of Washington and the Washington Emergency Management Division, which looked at the types and locations of safe refuges up and down the outer coast of Washington.

These efforts were referred to as Tsunami Project Safe Haven. Shipman said that much of the Shoalwater Bay Indian Tribe's land have hills that residents can safely evacuate to when a tsunami hits. But the Tokeland area was the most vulnerable.

"In the end, this isn't just about helping our members, but the entire community," Shipman said. "This is about being a good neighbor. We know that resources are scarce in the area, so we make sure that the surrounding community members are always included and informed of impending Emergency Management issues. We feel strongly that we are all in this together."

The Shoalwater Bay Indian Tribe, as a recognized sovereign nation, applied for the funds directly from FEMA using the federal Pre-Disaster Mitigation Grant Program.

Still, Shipman said she relied on help from members of the Washington Emergency Management Division to guide her efforts, citing specifically the work of Mitigation Program Manager Tim Cook and Earthquake Program Manager Maximilian Dixon in the crafting of the document with additional support of Human Services Program Manager Casey Broom and Mitigation, Response & Recovery Section Manager Stacey McClain.

"We're looking forward to continuing our relationship with our friends at Washington EMD," Shipman said.

The Tribe and the members from the surrounding communities have participated together in the Project Safe Haven meetings. Shipman participates in the state's Tsunami Workgroup meetings along with the other coastal emergency managers like Scott McDougall from Pacific County and Charles Wallace from Grays Harbor County.

This is the first time federal funding from FEMA has gone toward construction of a vertical evacuation structure in Washington State. Previously, the state worked with local jurisdictions in Long Beach and Pacific County Fire District 1 at Ocean Park to do design work toward potential vertical evacuation structures.

The first tsunami vertical evacuation structure in North America was unveiled in 2016 at Ocosta Elementary School near Westport. It can accommodate at least 1,000 people. Cook says that school district officials applied for federal funding and were determined to be eligible by FEMA, but didn't get the funding. Instead, taxpayers voted to foot the entire bill, noting it was critical to protect the kids.

"This was an important step, though, because before this, FEMA hadn't even said these kinds of structures were eligible," Cook said. "Now, they are, and it opens up an opportunity for local jurisdictions to apply for funding."



The design of the new structure at Tokeland

*(Continues on Page 7)*

# NTHMP NEWS

## Celebrating a New Tsunami Vertical Evacuation Refuge for the Shoalwater Bay Indian Tribe

By Steven R. Friederich, Washington State Emergency Management Division  
(Continued from Page 6)

In June, officials from Washington Emergency Management Division, the University of Washington's Project Safe Haven project and the Washington Geological Survey met with city officials in Ocean Shores to discuss what it would take to build a new tsunami shelter there. A public forum was also conducted with residents.

In August, a similar event is being planned for the city of Aberdeen. Dixon said he's recently had discussions with the mayor of Aberdeen and the superintendent of the Aberdeen School District, looking at tsunami vertical evacuation structures and strengthening its existing tsunami evacuation plans.

Later this year, the Washington State Emergency Management Division will be publishing a new Roadmap Manual. The manual will help coastal communities better plan for and build tsunami vertical evacuation refuges.

The safe refuge platforms being constructed by the Shoalwaters will be two levels, built at 40 and 50 feet above grade, which is greater than the tsunami wave crest height of 32 feet above grade. With a total useable area of 3,400 square feet, it will accommodate 386 people. The structure will be built of steel with concrete pilings that go down 45 to 50 feet.

The structure has been designed by engineering firm Degenkolb, who also designed the structure at Ocosta Elementary. Shipman says a celebratory ceremony is planned for mid-July.

"This is exciting not just for the Shoalwater Bay Indian Tribe, but for the entire state," Dixon said. "Once built, this would be the second tsunami vertical evacuation structure in our state, following the successful opening of the new building at Ocosta Elementary in 2016, which will save hundreds of lives when a tsunami eventually hits our coast. This is just a start, though, and we need many more of these structures up and down the coast."

Learn more about tsunami preparedness at <https://www.mil.wa.gov/tsunami>

View original article: <https://www.mil.wa.gov/blog/news/post/celebrating-a-new-tsunami-vertical-evacuation-refuge-for-the-shoalwater-bay-indian-tribe>

## Washington State Maritime Guidance Workshop

By Daniel Eungard, Washington Geological Survey

On June 20th, 2018, a tsunami maritime guidance workshop meeting sponsored by the Cascadia Region Earthquake Workgroup (CREW) was held in Seattle, Washington to bring a number of maritime stakeholders together to understand and better prepare the maritime response to tsunami threats. The workshop included presentations on local tsunami science by representatives from Washington Sea Grant, Washington Geological Survey, and Oregon Department of Geology and Mineral Industries, and the current alert and warning procedures by Washington Emergency Management Division. Special guests from the California Geological Survey and California Office of Emergency Service shared presentations on tsunami port recovery best practices, response planning, lessons learned, and revised maritime guidance. Attendees included members of local/tribe emergency management, U.S. Coast Guard, U.S. Navy, FEMA, researchers, and numerous individuals representing private organizations from ports and harbors. Presentations, resources links, and a recording of the workshop can be found at [maritime.crew.org](http://maritime.crew.org).



# TSUNAMI MAPS & NTHMP EVENTS

## Tsunami Hazard Maps of Anacortes-Bellingham area, Washington—Model Results from a ~2,500-year Cascadia Subduction Zone Earthquake Scenario

By Daniel W. Eungard, Corina Forson, Timothy J. Walsh, Edison Gica, and Diego Arcas

**ABSTRACT:** New finite-difference tsunami inundation modeling in the areas surrounding Anacortes and Bellingham uses a simulated magnitude 9 earthquake event with a maximum slip of ~89 ft (27 m), inferred to be a ~2,500-year event, called the LI scenario. This new modeling closely approximates the design requirements in the building code standard for critical facilities, and is more conservative (greater inundation) than previous tsunami modeling. Modeling results indicate that the first tsunami wave trough will reach the study area approximately one and a half hours following the earthquake. Inundation depths may reach as much as 18 ft (5.5 m). Current velocities from the tsunami waves locally exceed 20 knots, presenting a significant navigational hazard to the maritime community. Tsunami wave inundation is expected to continue over 8 hours and remain hazardous to maritime operations for more than 24 hours. This study is limited in that modeling does not account for changes in tide stage, liquefaction, or minor topographic changes that would locally modify the effects of tsunami waves. Due to these limitations, this modeling should not be used for site-specific tsunami inundation assessment or for determining effects on the built environment. However, this model is a useful tool for evacuation and recovery planning.



**CITATION:** Eungard, D. W.; Forson, Corina; Walsh, T. J.; Gica, Edison; Arcas, Diego, 2018, Tsunami hazard maps of the Anacortes–Bellingham area, Washington—Model results from a ~2,500-year Cascadia subduction zone earthquake scenario: Washington Geological Survey Map Series 2018-02, 6 sheets, scale 1:30,000, 10 p. text.

[http://www.dnr.wa.gov/publications/ger\\_ms2018-02\\_tsunami\\_hazard\\_anacortes\\_bellingham.zip](http://www.dnr.wa.gov/publications/ger_ms2018-02_tsunami_hazard_anacortes_bellingham.zip)

## UPCOMING NTHMP & RELATED EVENTS

- ◆ September 15–23, 2018—Association of Environmental & Engineering Geologists (AEG) 61<sup>st</sup> Annual Meeting & XIII IAEG Congress (San Francisco, California)  
<https://www.aegannualmeeting.org/>
- ◆ November 4–7, 2018—Geological Society of America (GSA) Annual Meeting (Indianapolis, Indiana) <https://community.geosociety.org/gsa2018/home>
- ◆ December 10–14, 2018—American Geophysical Union Fall Meeting (Washington, D.C.)  
<https://fallmeeting.agu.org/2017/future-meetings/>
- ◆ April 23–26, 2019—Seismological Society of America (SSA) Annual Meeting (Seattle, Washington) <https://www.seismosoc.org/>
- ◆ September 16–20, 2019—OceanOBS'19 (Honolulu, Hawaii)  
<http://www.oceanobs19.net/>

