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12 July 2005

Lincoln County Board of Commissioners Bill Hall, Don Lindly, and Terry Thompson
225 West Olive Street, Room 110
Courthouse
Newport, OR 97365

Dear Commissioners:

Re: June 14 tsunami warning response in Lincoln County. If you wish an email copy of this letter that will allow you to more readily look up some of the sources of information, please email me at rbayer@orednet.org.

Several newspaper articles in the Newport *News-Times* and Lincoln City *News Guard* indicate that Lincoln County officials are suggesting that things went pretty smoothly at the level of local government and that the main glitches were caused by the federal government and an uneducated public. The past work with tsunami preparation and education by Jim Hawley, Sheriff Dotson, and the County Commissioners with local communities in Lincoln County is exemplary (e.g., Gallob 2005c,d), and I commend the County for its efforts.

However, the June 14 warning reveals several issues of concern in the preparation, responses, and public education outreach by Lincoln County. The purpose of this letter is to focus on potential solutions for several crucial issues that have not received much attention. I do not discuss sirens, reverse 9-1-1, or other warning systems that have been and continue to be debated.

I realize that this letter is long and discusses many topics (see Contents on top of next page), but if you only consider one item, please consider "*Create a Plan for Evacuation of People with Limited Mobility*" on p. 6.

Thank you for your time and consideration of public safety issues.

Yours,

Range Bayer

Range Bayer

cc: Jim Hawley, Lincoln County Emergency Management Director, 225 West Olive Street, Courthouse, Room 103, Newport, Oregon 97365
Lynne Iverson, Lincoln County Communications Agency (LinCom) Director, 815 SW Lee Street, Newport, OR 97365
Sheriff Dennis Dotson, Lincoln County Sheriff's Office, 225 West Olive Street, Courthouse, Room 210, Newport, OR 97365
Gail Kimberling, Managing Editor, Newport *News-Times*, P.O. Box 965, Newport, OR 97365
Joe Happ, Editor, Lincoln City *News Guard*, 930 SE Highway 101, Lincoln City, OR 97367

Table of Contents for What Lincoln County Government Could Do to Better Prepare for a Tsunami

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1) Prepare by Determining Relevant Sources of Emergency Tsunami Information Because This Will Be an Ongoing Issue.

The night of June 14, many emergency responders in Lincoln County received tsunami bulletins from NOAA's Pacific Tsunami Warning Center in Hawaii (http://www.prh.noaa.gov/ptwc) and NOAA's West Coast & Alaska Tsunami Warning Center in Alaska (http://wcatwc.arh.noaa.gov/message.shtml) via various emergency channels (Appendix A on p. 14). Many of these channels would have been federal, but some also include Oregon Emergency Management (Appendix A). The federal government's emergency responsibility includes all states and territories in the Pacific Basin, not just Oregon, so it is predictable that they will send out emergency messages that may not be relevant to a particular state in the Basin. **It is the responsibility of receivers of their messages to know if a message is relevant or not for their specific area.** It is possible to prepare by determining which tsunami warning centers are relevant to Oregon by looking at the web sites for these warning centers. After doing this preparation, it is clear that the West Coast is only included within the area of responsibility (AOR) of the West Coast and Alaska Tsunami Warning Center in Alaska.

The night of June 14, an earthquake that was first estimated to be Magnitude 7.4 occurred about 90 miles northwest of Eureka, California at 1951 PDT (7:51 PM PDT, which is 0251 UTC [Z])(Appendix B on p. 15). Five minutes later (0256 UTC), the West Coast and Alaska Tsunami Warning Center in Alaska issued a tsunami warning for coastal areas from the California-Mexico border north to north tip of Vancouver Island (Appendix B)--this would include Oregon. Three minutes later at 0259Z [0259 UTC] or 7:59 PM PDT, the Pacific Tsunami Warning Center in Hawaii issued a Tsunami Information Bulletin that there was no tsunami warning for their area of responsibility (Appendix C on p. 17). But Oregon is not in their area, which is clear from their web site; this was also stated at the top of their message (Appendix C):

> "THIS BULLETIN IS FOR ALL AREAS OF THE PACIFIC BASIN EXCEPT
> ALASKA - BRITISH COLUMBIA - WASHINGTON - OREGON - CALIFORNIA."

Unfortunately, those who read this message and thought there was no warning for Oregon overlooked the crucial word "except." They also did not read the end of the message, which said:

> "THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE BULLETINS
> FOR ALASKA - BRITISH COLUMBIA - WASHINGTON - OREGON - CALIFORNIA."

Lincoln County Emergency Management Director Jim Hawley, LinCom (Lincoln County Communications, the Lincoln County 911 Center), and perhaps other emergency staff in Lincoln County received these messages indirectly (e.g., via Oregon Emergency Management) or directly and became confused whether there was a tsunami warning or not (Card 2005a, Casteel 2005, Choy 2005c, Dillman 2005b, Eberly 2005c, Kimberling 2005a,b,d; Ross 2005; Jim Hawley, June 20 email [Appendix D on p. 18]). Depending upon the number of emergency communication channels they had,

they may have received the same original message from each warning center more than once (Appendix A on p. 14), which may have added to their confusion while reading the messages.

LinCom communicated this confusion by calling local communities and telling emergency responders that there was confusion about whether there was a tsunami warning or not at 8:06 PM (Eberly 2005c). At 8:14 PM, 23 minutes after the earthquake and 18 minutes after the tsunami warning was issued, LinCom called emergency responders in Yachats and perhaps elsewhere that there was indeed a tsunami warning (Eberly 2005c).

Valuable time that could have been spent for evacuation was lost in this confusion. Perhaps more importantly, the spreading confusion cast a shadow of doubt on whether evacuation was needed, so that it was not done in some areas or was delayed too long. For example, in Lincoln City, the confusion resulted in a beach evacuation not starting until around 8:45-9 PM (Choy 2005c). The first tsunami wave was predicted to arrive in Charleston at 8:44 PM and Seaside at 9:26 PM (Appendix B on p. 15); using these predictions and interpolating from the straight line distance between Lincoln City and Charleston and Seaside, the first wave would have arrived in Lincoln City at about 9:10 PM. However, a complete evacuation for Lincoln City takes about two hours (Choy 2005c, Kimberling 2005a,e).

Possible Solutions. LinCom, Jim Hawley, and other emergency staff in Lincoln County can prepare for future tsunami warnings by recognizing that it is very predictable that they will probably also indirectly or directly receive emergency tsunami messages from the Pacific Tsunami Warning Center in Hawaii in the future (see Appendix A on p. 14). NOAA's responsibility for sending out such emergency messages is not limited to only sending out messages directly relevant to Oregon, and emergency managers may have several emergency channels, at least one of which will include messages from the Pacific Tsunami Warning Center (see Appendix A). Oregon Emergency Management may also again relay on Pacific Tsunami Warning Center messages as they did for the June 14 message (Ross 2005; Jim Hawley, June 20 email [Appendix D on p. 18]).

It would be useful for LinCom and Lincoln County Emergency Management to have a prepared written protocol for receiving tsunami messages that includes warning staff and those they notify that messages from the Pacific Tsunami Warning Center in Hawaii may be received but that they are not relevant and that action is required only for messages from the West Coast and Alaska Tsunami Warning Center in Alaska. Written protocols and drills are important because tsunami warnings seldom happen here (the most recent tsunami warnings for Oregon were in May 1986 and October 1994), and emergencies at night (like on June 14) or staff changes may result in staff unfamiliar with these warning centers becoming confused.

Jim Hawley is reported as saying that Lincoln County is unique in that fire departments are responsible for evacuation of their areas (Casteel 2005). Thus, it would also be helpful if Lincoln County periodically reminded coastal fire department staffs that only messages from the West Coast and Alaska Tsunami Warning Center in Alaska are relevant. As the County (LinCom) is responsible for relaying on emergency messages to fire departments, the County could also take the lead in helping fire departments sort relevant from irrelevant messages that they may receive.

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2) Prepare LinCom for Flood of 911 Calls.

LinCom and many other local emergency service agencies (e.g., Depoe Bay Fire Department, the Lincoln City 911 Center, Lincoln City Police Station, Newport Fire Department, and Yachats Fire Department) were overwhelmed with telephone calls the night of June 14 (Card 2005a,b; Casteel 2005, Choy 2005a,c; Eberly 2005c, Kimberling 2005a). Most of the calls were from people who were seeking advice about what to do. The problem is that these calls jam telephone lines, so that LinCom had a more difficult time notifying emergency services (Card 2005a) and seriously injured people or people who need a police officer (Sheriff Dotson quoted in Casteel 2005) or who are reporting a fire may be unable to get through or may be significantly delayed.

The June 14 event also raises the question of how well LinCom would be able to handle other local major emergencies (not just tsunami warnings) when 911 lines would also be jammed.

Possible Solutions. After the June 14 event, Sheriff Dotson and other local emergency officials indicated that the public needs to be prepared for tsunamis and not call 911 for information about what they should do (Casteel 2005, Choy

2005c, Eberly 2005c). **While their suggestion is reasonable, it is not realistic**. It seems that every time there is a possible tsunami that emergency phone lines are jammed. For example, after the local earthquakes last summer, Jim Hawley and Lynne Iverson pleaded that people not call Lincoln County Emergency Management or 911 because their phone lines were jammed (Gallob 2004a,c). Yet, less than a year later, their lines were jammed again for the June 14 event. People have been very successfully educated to call 911 in an emergency, so training them now to not call 911 for what they believe is an emergency is not realistic. Even if 100% of residents were trained to be prepared for tsunamis and did not call 911 (which seems highly unlikely), visitors would still have questions because they receive little or no tsunami education (see section 9 on p. 12) and would call 911 and other emergency lines.

LinCom could work on solutions for when their telephone lines are jammed by people concerned about a tsunami or other local disaster. For example:

a) prepare by having alternative means of communication such as unlisted telephone lines that could be used only for communicating with emergency personnel when the public 911 lines are jammed
b) prepare by establishing a protocol for briefly answering 911 calls in response to a possible tsunami by having operators answer calls, establish quickly if the call is only for tsunami information, and, if so, be like Yachats Fire Chief Frankie Petrie by responding briefly to evacuate if they are in a low-lying area and hang up (Eberly 2005c), route the call to a brief automated response on what to do as has been suggested in Brookings (Friedrichs 2005), and/or direct them to listen to KYTE FM 102.7 or patiently listen to other radio stations that may only intermittently report tsunami information (see next section).
c) call in more operators immediately upon notice of a possible tsunami and not waiting until the phone lines are jammed; the Lincoln City 911 center is considering this (Choy 2005c).

Having alternative means of communication would be useful not only for tsunami warnings, but also in preparation for other local major disasters in which the phone lines will be predictably jammed.

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3) Encourage Local Radio Stations to Continuously Broadcast Tsunami Warning Information.

Many, perhaps most, people in coastal Lincoln County did not hear about the tsunami warning from county or city officials or local radio stations. Most people in Lincoln City seemed to have learned of the tsunami warning from Portland TV stations or telephone calls from friends who were watching TV (Sheridan Jones in Choy 2005c). The same appears to be true in Newport based on my conversations with some people in Newport.

Jim Hawley and other emergency responders have said that people need to listen to local radio stations or look at the Lincoln County web site for information and not call 911 (e.g., Casteel 2005, Kimberling 2005c,e). However, at least one person did not find any information about the tsunami warning on the Lincoln County web site during the time of the tsunami warning on June 14 (Kimberling 2005c), and people also did not find prompt emergency information at the web site after many people were concerned about the earthquake they felt in 2004 (Gallob 2004a).

The night of June 14, friends told me that they were listening to KSHL and KPPT and that those stations did not start broadcasting information about the tsunami warning until about 9 PM (which would have been too late for many to evacuate before the first wave). Other stations were not broadcasting tsunami information or were not broadcasting information continuously (Lincoln City Manager in Kimberling 2005e, Fuller 2005, Henke and Rooney 2005, Kimberling 2005c; friends and my personal experience).

I wrote KNPT, KSHL, and KPPT on June 19 about this issue. I received a response only from Dave Miller, who owns KNPT-AM, KYTE-FM, KNCU-FM, KCRF-FM, and KBCH-AM (Appendix E on p. 20). He responded (Appendix E):

> *We did have information about the tsunami warning on all of them, but the most extensive coverage was on the designated emergency station, 102.7 FM, KYTE.*

Note that he did not say that they had continuous coverage on any of them--only that the most extensive coverage was on KYTE. The problem is that people searching for emergency information are not going to listen for possibly intermittent

information on a station that is broadcasting its normal programming. People are going to try tuning to other stations or, quite predictably, call 911 for information, if they believe it is an emergency.

Dave Miller said that the designated emergency station is now KYTE-FM. But, in 2004, Jim Hawley and then Commissioner Jean Cowan said KNPT-AM was the designated emergency station for Lincoln County (Gallob 2004a,b). Which station is it? Was this change publicized so that people would not be confused about where to listen to?

Other Lincoln County people also noticed the lack of information on local radio stations, especially early during the tsunami warning, when information critical for evacuation was needed. Ellie Fuller (2005) of Depoe Bay wrote about her and her husband's experience in Lincoln City:

> *We went out to our truck, and tried in vain to get accurate or helpful information from the "local" radio station. After two songs, what we finally did get were questionable "guesstimations" and word-of-mouth warnings from a DJ who was obviously rattled.*

The problem with local radio stations not promptly or continuously broadcasting emergency information in Lincoln County is not new. For example, this controversy also arose in 2004, when KPPT did not receive information about whether an earthquake felt locally had caused a tsunami until 45 minutes later (Gallob 2004b), and Dave Miller said that emergency information had been broadcast on his stations, even though some people may not have heard it (Gallob 2004a,b)--if it was broadcast only once, it is predictable that many people would not have heard it unless they were attentively listening at the time of the single broadcast.

For local radio stations to be useful during an emergency, they must have official information that is confidently reported. That does not appear to have been the case for the night of June 14. Besides Fuller's account of a "rattled" DJ, Dave Miller notes that his stations were not informed (Appendix E on p. 20):

> *... no official warning was generated by local officials for us to receive. The information we did have on the air, therefore could not be official. We were only able to announce the quake and that we understood a tsunami warning had been generated, but that we did not have any official information.*

Possible Solutions. The County needs to clearly inform citizens about changes in the designated emergency broadcast station for Lincoln County, so that we know where to listen for information.

The County also needs to work with getting emergency information quickly to local stations so that it can be broadcast. The County's faxes to radio stations went out about an hour after the 2004 earthquake, so they were not helpful (Gallob 2004b). Unfortunately, most of our "local" radio stations do not have live DJ's in the evenings or at night but have pre-recorded programming or satellite feeds (e.g., Gallob 2004b), so it can be expected that getting emergency information out over these radio stations promptly may not be possible.

The County could also encourage at least the designated emergency broadcast station for Lincoln County to not only broadcast emergency information promptly but also continuously. Radio stations elsewhere do so, so why not in Lincoln County? For example, Chris Sargent (2005), who is director of programming for Clear Channel Radio in Eugene-Springfield, writes about their broadcasting the tsunami warning during the night of June 14:

> *There was concern that alerts and warning were not aired. I can speak for Clear Channel Radio stations in Eugene and licensed to Florence. The Emergency Alert System activated properly on the radio stations within minutes of the alert. We followed with continuous announcements and news coverage on KPNW, KODZ, KFLY and KDUK until the warning was dropped. Most of our stations can be heard on the Oregon Coast. We felt it was necessary to have immediate coverage and have several policies in place in our organization to guarantee that we take these issues very seriously and respond very quickly. I hope other operators see this as a serious issue have similar policies in place. A single alert announcement from the automated EAS is not enough, especially in a case like this. As for other broadcasters, if a station did not air the initial warning from the EAS or cover the story, that would be a fineable offense from the Federal Communications Commission. The problem*

is that in some cases the warning would only air once and a station would meet its legal obligation. I choose to read that definition differently. We are here to serve the community and broadcast such warnings repeatedly.

If Lincoln County wants people to be informed during a tsunami warning or other emergency, then it needs to work on providing that information or at least encouraging local radio stations to broadcast it continuously. Kimberling (2005d) reports that the County's Emergency Alert System (EAS) may be soon upgraded to allow the County to broadcast on all local radio stations and local cable channels. That would be helpful, but if the information is not given continuously, concerned listeners may miss the broadcasts as they hurriedly search radio stations for news and then jam the 911 lines.

Lincoln County has negotiated with a Bend radio station to broadcast local emergency information if local and Willamette Valley radio stations are unable to do so (Kimberling 2005d). But will people throughout Lincoln County be able to hear that Bend station? Lack of reception for the Bend station could be particularly a problem during the daytime when people are most active and most apt to act in unwise ways if no emergency information is available.

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4) Create a Plan for Evacuation of People with Limited Mobility.

Fatalities from a tsunami are proportionately greatest for people unable to move quickly because they may not be able to evacuate in time (e.g., Dudley and Lee 1998:255-256, Bryant 2001:166, Lander et al. 2003:27). Preuss (1988:139) notes that evacuating retirement and nursing homes in a tsunami inundation area is difficult because:

Occupants often have limited mobility and therefore, require heavy manpower commitment for evacuation. For a local event, evacuation may not be possible.

The grimness of the situation for people who are not able-bodied is candidly stated in tsunami evacuation maps for Lincoln City, Salishan/Kernville/Gleneden Beach/Lincoln Beach, Waldport, and Yachats by Oregon Dept. of Geology and Mineral Industries (2005) [boldface added]:

***If you need help evacuating, tie something WHITE** (sheet or towel) **to the front door knob**. Make it large enough to be visible from the street. If the emergency is a distant tsunami, then help may arrive. **In the event of a local earthquake and tsunami, it is unlikely that anyone will help you**, so make a plan and be prepared!*

In addition, the American Planning Association's Schwab (2004) writes:

The more troublesome aspect of evacuation usually involves more vulnerable populations, such as the elderly and disabled, which local authorities must be trained to identify and move safely.

In a tsunami after the predicted major Cascadia subduction zone earthquake off the Oregon coast, people with little mobility who live in a tsunami inundation zone will have little chance of survival. Along the Lincoln County Coast, the first tsunami wave is expected to arrive about 15-20 minutes later (see tsunami evacuation maps for Depoe Bay, Lincoln City, Newport, Salishan-Gleneden Beach, Waldport, and Yachats in Oregon Dept. of Geology and Mineral Industries 2005; Gallob 2005a). It is doubtful that all residents of nursing homes, assisted living facilities, and retirement centers in Lincoln County tsunami inundation zones could be evacuated in time. For example, after a daylight, distant tsunami warning in 1994, it took approximately 120 minutes to evacuate about 70 nursing home residents in Washington (Preuss 1997). Evacuation could be expected to take much longer after a major Cascadia subduction zone earthquake that makes roads and bridges impassable (Roddey 2004, Wood and Good 2004:258) or at night, when fewer staff or emergency responders would be available. If the tsunami originates further away, there may or may not be enough time to evacuate them. It is predictable that many caregivers of people unable to evacuate would be reluctant to abandon them, so able-bodied caregivers may be lost also.

In Lincoln County, at least the Spencer House (a senior assisted-living facility in South Beach) (Anonymous 2001c) and two senior retirement centers in Waldport (Mayor Beckstead in Gallob 2005a) are in tsunami inundation zones. There may be others. There are probably also people with limited mobility living outside of special centers. For example, at a Depoe Bay City Council meeting, a Councilor expressed concern for evacuating "*the elderly, the*

handicapped, the hearing impaired" before a tsunami, and it was suggested that neighbors or Neighborhood Watch programs help with their evacuation (Anonymous 2001e).

In Newport, the published policy of the Fire Department is to telephone Spencer House about a tsunami warning, and it is Spencer House's responsibility to evacuate themselves (Anonymous 2001c). On June 17, I talked to Newport Fire Chief Rick Crook, and he said that their policy is that *if they believed* that there was a tsunami threat that they would notify Spencer House, but it is Spencer House's responsibility to evacuate themselves because the Fire Department does not have enough personnel to do so. Since the Fire Dept. is not going to help, they could have promptly notified Spencer House on June 14 to give them the option of evacuating before the wave would have arrived (see section 5 on p. 8), but the Fire Dept. only notified people on beaches because the Fire Dept. believed that the tsunami would only be as great as 5 ft (Card 2005b). On July 7, I talked to Susan Cain of Spencer House (which she said has about 35 residents), and she said that no one notified Spencer House about the tsunami warning the night of June 14; a resident happened to see the warning on a TV station and used her pushcord to alert the staff, and that she first heard about it at about 9 PM. Since the warning, Cain had talked to Chief Crook, and Chief Crook told her that it was up to Spencer House to have their own evacuation plan and that it was Fire Dept. policy to not help. Cain said that she and other Spencer House staff had not been aware of this previously. Cain also asked Chief Crook if Spencer House residents be put on a priority list for receiving oxygen bottles and medications needed by residents in the aftermath of a tsunami, but Chief Crook said that was not possible. Consequently, Cain and other Spencer House staff are exploring options of getting help from the South Beach neighborhood to evacuate and care for Spencer House residents.

For the June 14 event, it was not reported whether the Waldport retirement centers were evacuated or not (Eberly 2005b). There seems to be a plan for trying to evacuate those that are unable to do so, but statements that I have boldfaced by the Chairman of the Waldport City Council Safety Committee (Welch 2000) indicates that there may not be enough time:

> *I have led the effort for tsunami warning and preparedness on the Waldport City Council and personally walked each of the evacuation routes and determined that a person in average physical condition can walk at a steady pace to high ground safety from the vulnerable flood plan areas of Waldport in under 20 minutes, which is the approximate minimum evacuation time if an earthquake should occur on the Cascadia Fault off the central Oregon coast.* ***Chief Bill Grimm of the Central Oregon Coast Fire District has developed a specific plan for rescue and evaluation for those persons unable to travel to high ground due to age or disability. The actual time available for a tsunami evacuation would be the limiting factor as to what could be done under the circumstances.***

The Waldport fire department's plan is "*to evacuate disabled persons to the extent possible*" (Anonymous 2001f), and their concern about evacuating people with impaired mobility is ongoing (Gallob 2005c):

> *The Waldport City Council met Monday with county, school, fire and law enforcement officials and began to piece together an agenda of preparations for the tsunami and coastal earthquake geologists say will someday hit the coast. With its downtown core, city hall, fire, medical and* ***senior facilities,*** *two of its three schools and much of its population in a tsunami zone, Waldport is the city most vulnerable in this county to a series of tidal waves. Facing this reality, Mayor Scott Beckstead called the meeting with a hope of generating a "to do list" the city and other entities could work on.* ***Not all issues were dealt with successfully.*** *Councilman Herman Welch asked, at the start of the session, who will collect the bodies, and where they will go for sanitary burial.* ***That remained open at the end of the meeting. So, too, was the question of how to get seniors out of the town's senior apartments and up to high ground, when many use wheelchairs or walkers.***

Possible Solutions. Lincoln County could promptly notify nursing homes, assisted-living facilities, and retirement centers about a tsunami warning, so they can start their evacuation plan as soon as possible.

Lincoln County could also work with local communities to ensure that vulnerable people have a better chance of being evacuated. For example, in Gold Beach on June 14, the Curry County Sheriff's Office, Gold Beach Police Department, Gold Beach Volunteer Fire Department, and local residents teamed together to evacuate an assisted-living

community in less than 30 minutes (Walker 2005). **Why can't Lincoln County be as caring for people with limited mobility in tsunami inundation zones as those in Curry County?**

There is also an alternative that would not help the current situation, but at least would stop adding to the problem of inadequate resources to evacuate people with limited mobility. Since evacuation of people with major health concerns (e.g., those on ventilators) could in itself lead to death, this alternative would also not add to that problem. This alternative is for Lincoln County to adopt an ordinance to prohibit construction of facilities for incapacitated people in Lincoln County tsunami inundation zones. Presently Oregon statutes and Oregon Administrative Rules allow the construction of nursing homes, assisted-living facilities, and retirement centers in tsunami inundation zones, with the only restriction being a nonbinding consultation (Oregon Administrative Rules 632-005-0020[1][d] and 632-005-0060[3]) with the Oregon Department of Geology and Mineral Industries for medical facilities with more than 50 incapacitated residents (see [1(e)(D)] in Appendix F on p. 21; Olmstead 2003). Oregon Measure 37 would not stop this option because it allows compensation to landowners if government regulations restrict the use of their property and reduces its value, but does not apply to public health and safety regulations (State of Oregon 2004). Lincoln County would not be the first to establish such an ordinance because other counties and cities outside of Oregon have already placed restrictions on construction in tsunami areas for safety concerns (Appendix G on p. 22). Please also consult National Tsunami Hazard Mitigation Program (2001a,b), which are invaluable resources about construction in tsunami areas.

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5) Encourage Evacuation of Tsunami Inundation Zones Before the First Wave Arrives.

Although it seems that evacuation should be promptly done, it was not done or was greatly delayed on June 14 in at least Newport, Lincoln City, and Toledo (e.g., Card 2005b, Choy 2005c, Dillman 2005a, Kimberling 2005a,c,e).

The night of June 14, the tsunami warning was issued by the West Coast & Alaska Tsunami Warning Center in Alaska at 7:59 PM, when they also gave predicted arrival times in Oregon for Charleston, Seaside, and Astoria (second page of Appendix B on p. 15). Jay Wilson (Earthquake and Tsunami Program Coordinator at Oregon Emergency Management) said that the West Coast and Alaska Tsunami Warning Center made the "right call" by sending out the warning because there is such a short time frame for evacuating Oregon's coastline after a strong off-shore earthquake and that waiting any longer for updated seismic information could have cost valuable time that could have been used for evacuation (Roddey 2005). Wilson noted that "warnings for this type of event are prudent." Oregon State University geologist Jason Chaytor agreed that it was important for the West Coast and Alaska Tsunami Warning Center to send out the June 14 tsunami warning because it would have taken more time to determine the exact location and type of earthquake and subsequently its potential for creating a tsunami (Stauth 2005). Chaytor also said that the warning "should be taken seriously." If the West Coast and Alaska Tsunami Warning Center had waited a half hour or more to send out a tsunami warning, local officials would have justifiably complained that they would not have had time to do an evacuation.

On June 14, LinCom notified local emergency responders at 8:06 PM that there was confusion about whether there was a tsunami warning or not and confirmed the tsunami warning at 8:14 PM (Eberly 2005c). The first wave could be calculated as arriving in Lincoln City at about 9:10 PM (section 1) and in Newport at about 9:05 PM, based on predictions of the first tsunami wave in Charleston and Seaside (Appendix B on p. 15) and straight line distances between Newport, Charleston, and Seaside. While some communities such as Yachats and Bayshore Beach chose to evacuate promptly (Eberly 2005a,c), Lincoln City didn't start evacuation notification until 8:45-9 PM, so they would have been able to complete very little of their evacuation by the 9:10 PM tsunami arrival, since their complete evacuation takes two hours (Choy 2005c, Kimberling 2005a,e). Toledo had not yet decided what to do by the time the tsunami warning was cancelled (Dillman 2005a).

Newport chose to do a partial evacuation and only asked people on beaches to evacuate (Card 2005b, Kimberling 2005c). Newport Fire Chief Rick Crook said that if a tsunami had landed at Crescent City (where the predicted arrival time was 8:29 PM) or at a buoy, then they would have notified various groups such as Spencer House, the Hatfield Marine Science Center, and Oregon Coast Aquarium (see Anonymous 2001c), but it was up to those facilities to do their own evacuation as it was Fire Dept. policy to not help (e.g., for Spencer House, see section 4 on p. 6). Even if the Fire Dept. instantaneously knew if a tsunami hit Crescent City (which is unlikely), it took the Fire Chief 15 minutes to make his telephone contacts in 2001 during the daytime (Anonymous 2001c), so it could be expected that not all facilities would have even been notified by 8:44 PM at night when making contacts is not as easy as during "business" hours. It is

doubtful that these facilities (especially Spencer House, see section 4 on p. 6) could have completed evacuation by the time the first tsunami arrived at about 9:05 PM. Further, people living in the South Beach tsunami inundation zone or on the Newport Bayfront in the tsunami inundation zone that were not on the Chief's list would not have had any warning from local government at all. The Chief said that they were monitoring buoys, but the tsunami from the June 14 earthquake would not have arrived at the first buoy sensitive to tsunamis until 48 minutes after the June 14 earthquake (8:39 PM), according to geophysicist Bruce Turner (Director of the West Coast and Alaska Tsunami Warning Center)(Ross 2005); this would have been DART Buoy 46405, which is west of Coos Bay (National Data Buoy Center 2005b). There were buoys closer to the epicenter of the earthquake that night, but although their online web pages may appear at first glance as if these buoys continuously monitor wave height, they only do so for 20 minutes every 30 minutes at Buoys 46212 and 46213 or for 20 minutes every hour at Buoys 46022 and 46027, and they update information only every 30 minutes or hour, respectively (National Data Buoy Center 2005c). Consequently, these closer buoys could have missed recording a tsunami wave and, if by chance, one of these buoys had recorded the wave, 30 minutes or an hour that could have been used for evacuation would have been lost. Tide gauges at Crescent City and other locations have online graphs that could be mistakenly interpreted as continuous, but they only measure water height every 6 minutes (National Ocean Service 2005), so they could have also missed a tsunami.

Jim Hawley reportedly said that local officials had reasonable assurance that there would be no tsunami when Crescent City was not hit at 8:29 PM (Casteel 2005). I asked Jim for his source of information that there was no wave striking at 8:29 PM, and he replied in his June 29 email that the National Warning System would have alerted them, if there had been a wave (Appendix D on p. 19). Perhaps, but with all the other glitches that happened that night , it is also very possible that there could have been a tsunami wave, but that for some reason that there would be a delay in reporting it (see my June 27 and July 2 emails in Appendix D). I asked Jim in my July 2 email if he had received word that specifically said there was no tsunami wave, and I have not yet received a response (Appendix D). Since there are often multiple tsunami waves and the first is often not the largest (section 7 on p. 10), I asked Jim in my June 27 email how he could be sure there would be no later large tsunami wave, if none was reported at 8:29 PM in Crescent City, but he has not responded (Appendix D). Further, the predicted times were only that--predictions based on models that haven't been tested very often with real events. It is possible that the first tsunami wave could have arrived before or after the predicted times.

Possible Solutions. Lincoln County could better encourage emergency managers and people to complete evacuation in tsunami evacuation zones before the predicted first tsunami wave like Sheriff Dotson, who was reported in Casteel (2005) as supporting timely evacuation:

> *He [Sheriff Dotson] also said when [tsunami] warnings are issued, people need to get out of the way. "It is like getting a hurricane warning," Dotson said. "It's going to happen, folks, so move. People need to understand that."*

On the other hand, Jim Hawley's reported comments after the June 14 event encourage people to put off evacuating and supports local fire departments waiting to notify people in tsunami inundation zones to evacuate (Casteel 2005, see June 27 and 29 emails in Appendix D on p. 19) until there may not be enough time for an evacuation to be completed. For example, Hawley reportedly said that the Newport evacuation "went really well" (Kimberling 2005c). By postponing evacuation, it is more likely that an evacuation will be more panicky and lead to accidents because of the little time before the first wave. Hawley could have used the June 14 event to educate the public about the importance of promptly evacuating, but he is not reported as having done so and his email (Appendix D) does not do so either.

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6) Educate Public Officials that Even a 5 ft Tsunami Wave May Cause Considerable Damage to Docks and Boats.

Jim Hawley was reported as saying that if there had been a tsunami wave on June 14 that it would have only been about 5 ft high (Casteel 2005). In my June 27 email, I asked for his source of the 5 ft tsunami information, but he did not give the source in his June 29 reply (Appendix D on p. 19). I have been researching the response of emergency staff to the June 14 tsunami warning along the entire Oregon Coast, and so far the only sources I have found who have said the wave would be 5 ft high is the Newport Fire Dept. (Card 2005b) and Jim Hawley (Casteel 2005).

The Newport Fire Dept. only evacuated the ocean beaches (Card 2005b), and Jim Hawley reportedly said it was justifiable to only focus on the "lowest-lying areas" (Casteel 2005). The Newport Fire Dept. did not notify the Newport Bayfront because "*a five-foot wave would not pose a threat to that area*" (Card 2005b). However, a 5 ft wave could injure or sweep away people walking on docks, so a warning would be appropriate to people along the **docks** at the Newport Bayfront, South Beach Marina, Embarcadero, Sawyer's Landing, and other docks in Yaquina Bay. Further, as a friend pointed out to me, a 5 foot tsunami wave could cause considerable damage to unprepared fishing boats, charter boats, Undersea Gardens (which is effectively a floating barge), and pleasure boats. While a 5 ft wave may or may not require evacuation of the Bayfront, boat, barge, and dock owners could have used the time to better secure their boats or barges to withstand the tsunami wave or to remove valuables before the first tsunami wave was predicted to arrive.

The 1964 tsunami from the Alaskan earthquake caused considerable damage in Oregon harbors (Lander et al. 1993). I have also read than tsunami waves are more powerful that normal waves, but I don't have those references readily available to cite.

Possible Solution. Lincoln County could educate emergency responders that notifying people on docks and boat and barge owners is important because people could evacuate from docks and, if there is time, property owners may be able to reduce their property losses.

****

7) Create a Plan for Traffic and People Control Before and After Tsunami Waves.

There are two types of situations where traffic and people control are crucial for tsunamis. First, if there is several hours of warning for a distant tsunami, it is very predictable that people will to come to the coastline to see the tsunami, even though this is not wise, because people in the Pacific Northwest have done so in the past (Tomlinson 1993, Bacon 1994, Preuss 1997:37, 40, 41; Anonymous 2001a, Hamner 2004). Vehicles driving towards the coastline coupled with the departure of people evacuating can be expected to lead to traffic jams.

Second, traffic and people control is crucial after the first tsunami wave arrives. A tsunami is not a single wave but usually includes several waves occurring intermittently during several hours with the first wave often not being the largest as was demonstrated in Oregon bays during the 1964 tsunami from the Alaskan earthquake (Schatz et al. 1964). At Yaquina Bay in 1964, George Priest of DOGAMI noted that the fifth wave was the largest, and it occurred two hours after the first tsunami wave (Anonymous 2003), and the four children that were killed at Beverly Beach awakened after the first wave but died after a later wave (Teal 1964). At eight other Oregon Coast bays in 1964, tsunami waves continued to arrive 3-4 hours after the first wave, with different sequences and chronologies at each bay (Schatz et al. 1964). The Center for Coastal & Land-Margin Research (1996) says waves of large magnitude may arrive in Oregon "more than 6-8 hours after the earthquake." Consequently, there is also a high risk of sightseers or evacuees going into a tsunami inundation zone too soon because of curiosity, to inspect property, or to recover belongings because they have done so in the past (Weller 1972:223, 224, 226; Lander et al. 1993, Dudley and Lee 1998:265, 271-272; Bryant 2001:286). In Crescent City in 1964, the tsunami warning was received and people evacuated, but police let some people and business owners return because the first two waves seemed inconsequential--most people were then killed by the fourth wave (Lander et al. 1993:102-103).

Unfortunately, in 1998, 22% of Oregon coastal residents believed that it was safe to return after the first wave, and only 31% knew that it was safe to return only after receiving approval from local authorities (Appendix H on p. 24). It is to be expected that even a smaller percentage of visitors would know when it is safe to go into tsunami areas. Accordingly, the initial tsunami evacuation may be successful, but it is predictable that people may lose their lives after the first or second wave when they go into a tsunami inundation zone.

The night of June 14, there does not appear to have been any traffic control in at least Newport. The Newport Police Chief was not notified by LinCom, and the Police Dept. did not have an emergency plan (Card 2005b). Further, there were traffic blockages along Highway 101 during the tsunami warning that could have had tragic consequences if there had been a tsunami. During the tsunami warning, construction workers on the Yaquina Bay Bridge stopped traffic, which caused delays (Card 2005a; John Hagan, pers. comm.), and construction workers in South Beach stopped traffic in the tsunami inundation zone along Highway 101 (Susan Cain, pers. comm.; a friend who wishes to remain anonymous, pers. comm.).

The Lincoln County Sheriff's Department is not involved in evacuation efforts (Gallob 2005f). For example, Sheriff Dotson was reported to have said about their policy for a tsunami warning (Casteel 2005):

> *Sheriff's deputies are instructed to find high ground and stay there. Because of the training and equipment, Dotson said the sheriff's office is one of the agencies best prepared to respond afterwards. "If we don't do something to protect equipment and personnel, who's going to do it?" Dotson said. "If fire and police go down on the beach with loudspeakers, people will get in their cars and plug the highways. When we try to leave with the equipment, we will not be able to get through the mess and become a victim."*

Sheriff's deputies would reportedly help in traffic control during a tsunami emergency in Waldport (Anonymous 2001f), but does the Sheriff's Department have a plan to help in traffic and people control to try to keep people out of tsunami areas until an "All Clear" in other areas?

Possible Solutions. If it does not already have such a plan, the Lincoln County Sheriff's Department could work with community police departments on a cooperative plan for traffic and people control for when people are driving to the coastline to see a tsunami and also to try to keep sightseers, residents, and property owners from going into tsunami inundation zones until an official "All Clear" has been issued. State Parks staff (Hamner 2004) and fire departments can evacuate people, but law enforcement agencies have the authority to try to manage traffic and people.

Unfortunately, it must be recognized that the Sheriff's Dept. and community police departments would not have enough staff to keep people out of tsunami inundation zones because they are so extensive. So it would be important to prioritize areas and to also enlist the help of other community staff to help as Waldport has proposed (Anonymous 2001f).

****

8) Distribute Evacuation Maps to Residents.

Jim Hawley has done an outstanding job of trying to educate people in Lincoln County about being prepared for tsunamis. However, with jamming of phone lines of 911 and other emergency services after the June 14 event, it is clear that many residents are not aware of what they need to do. It is also probable that many residents who were safely above tsunami inundation zones did not know that they did not have to evacuate. Some people in Newport unnecessarily evacuated all the way to Toledo (e.g., Dillman 2005a, Henke and Rooney 2005), which could cause traffic congestion as well as increase the risk of accidents.

Lincoln County Emergency Services/Management and many communities were involved in creating six color tsunami evacuation maps for Lincoln County communities (e.g., see black and white reproduction of Waldport map in Appendix I on p. 25-26 and Oregon Dept. of Geology and Mineral Industries 2005). These maps contain a remarkable amount of essential information in a compact form. They specifically show what areas need or do NOT need to be evacuated and where to evacuate to in these communities (Appendix I). They give instructions for what to do in an earthquake or for a tsunami warning. The maps for Lincoln City, Salishan-Gleneden Beach, Waldport, and Yachats also include directions for an emergency kit (Appendix I). The maps for Lincoln City and Waldport indicate that those towns have marked their street signs for tsunami safety: a yellow band near the top of a street sign indicates the site is in a tsunami hazard zone, while a green band indicates that the site is not (Appendix I).

The color maps are available on the Internet at the "Earthquake and Tsunami" link of Lincoln County Emergency Management's http://www.lincolncoemergencyservices.us and the Oregon Dept. of Geology and Mineral Industries' http://www.oregongeology.com/earthquakes/Coastal/Tsubrochures.htm. Unfortunately, many residents do not know that these maps exist or have not printed them out beforehand and become familiar with them.

Possible Solutions. It would be very helpful to widely distribute copies of these maps. I believe that one Lincoln County community may have already distributed copies of the tsunami map for their community with their water bill, but I may be mistaken. The County could encourage other communities to distribute maps like that, though that method of distribution would not reach people who do not receive water bills (e.g., those living in apartments).

Since many Lincoln County residents live in one town but work in another or may have family or friends in another, it would be very useful to distribute maps of all Lincoln County communities in something like a newspaper

insert that could also be published in newspapers as well as being made available for free at Chamber of Commerce, City Hall, or other community facilities. Then residents could see which areas need to be evacuated or not and also to see what they need to do in all Lincoln County communities. Because the original maps are in color and color reproduction is expensive, cost would be a deterrent to wide distribution of color copies of these maps. However, black and white copies show details adequately (e.g., Appendix I on p. 25-26) and would be more economical to distribute. The *News-Times* printed the Lincoln City evacuation maps on p. A2 of the 29 December 2004 paper, but it would have been more legible if it had been printed larger, and if the original color map had been more legible. Other evacuation maps show better detail than the Lincoln City map. The advantage of something like a newspaper insert is that people could easily save it, and it could also be made available in other facilities. The County could partner with communities to prepare and distribute copies at regular intervals (e.g., every five years), so that the maps continue to be available.

****

9) Educate Visitors.

Emergency Management Director Jim Hawley, Sheriff Dotson, LinCom Director Lynne Iverson, and other local emergency responders point to the need for better public education about tsunamis (e.g., Gallob 2004a,c; Card 2005a,b; Casteel 2005, Choy 2005a, Eberly 2005c; Kimberling 2005a). However, previous and current public education is mostly directed to coastal residents, and Lincoln County's Emergency Services Department Manager Jim Hawley reportedly said that earthquake and tsunami education efforts have been successful with locals, but visitors are often unaware of potential dangers (Richins 2004). This has been documented in Washington, where only 24-26% of residents had not seen tsunami hazard maps or heard or received information for preparing for a tsunami compared to 76-80% of visitors (Appendix H on p. 24). Further, no visitors had received tsunami information from federal, state, or local governments (Appendix H).

Visitors are often more numerous than residents, so, if they are not educated about tsunamis, most casualties could be of visitors. For example, it has been reported that "*Lincoln County has a population of 43,000, but eight months out of the year that number increases to 100,000 because of vacationers who head to motels, campgrounds and beach houses*" (Geist 2004).

Possible Solutions. If Lincoln County encourages tourism, then Lincoln County also has a responsibility for the safety of its guests. Lincoln County could continue current tsunami educational methods, but unless there is a change, doing so will not reach all visitors. Education could be done in a way to not scare visitors--simply inform them that there is a very small risk of a tsunami, but if there is one, then give them information about what to do.

One method is to encourage more tsunami hazard and evacuation route signs to be put up by city governments. The County could contact city governments and give them sources of tsunami warning and evacuation signs and try to persuade them that it is important to put up signs. With more signs, visitors would be more likely to know what to do and less anxious. Fear is more likely among people who do not what to do and who are not prepared.

Another option is to encourage motels, hotels, and tourist facilities in tsunami inundation zones to have signs posted or evacuation maps available to all--not just to those visitors who request information because only the already educated visitor would know to ask for information. The Oregon Department of Geology and Mineral Industries (2003) has put out information "*Tsunami preparedness guide for Oregon lodging facilities*" that would be helpful. Choy (2005a) reported that Carole Barkhurst, manager of the Depoe Bay Chamber of Commerce visitor center, favors education of tourists as well as residents:

> *Barkhurst said she believes it's valuable to try to make tsunami information readily available for residences and motels. She would eventually like to see every single residence and motel in town have tsunami warning information, she said.*

And Gallob (2005e) also reported the need for education of visitors:

> *Oregon Coastal Zone Management Association director Onno Husing suggests we "need to create a 'culture of preparedness.'" Since there will be so little time to warn people (locals and visitors), we need to have tsunami preparedness bred into our thinking," he believes. Visitors must know in advance, Husing argues, what to do and not to do. For that to happen, the information must be widely known and accepted - a part of the culture. One way of getting information to tourists is to place tent-cards in every hotel and motel room, Husing said, telling visitors that while tsunamis come only every several hundred years, they need to know certain information, just in case.*

Vittek (2005) also reported about liability issues:

> *Hotels are required to post fire evacuation routes and warnings but nothing about tsunamis. ... "Hotels might become liable civilly if some guests didn't get out," [Sandy] Pfaff [of the Lincoln City Visitor and Convention Bureau] said.*

Some lodging facilities in Lincoln City have voluntarily put out tsunami information. For example, Barker (2005) reported:

> *[Hotel manager Kevin] Winters' hotel, the D-Sands, sits right on the beach. He voluntarily posted signs in every room that warn guests what to do in case of a tsunami. "Guests want to know what we are doing, so putting something up like this should put our guests at ease," he says, however signs are not required in every hotel room.*

Further, Robert Eaton, who formerly was the manager of the Inn at Spanish Head in Lincoln City, had been a strong advocate of putting out information for his guests (Ross 2003, Vittek 2005), and the press release for Oregon Dept. of Geology and Mineral Industries (2003) indicates that he helped in its preparation. Matt Foley has replaced Robert Eaton, who recently retired (Stanfill 2005). Stanfill (2005) wrote:

> *One of Eaton's passions was tsunami preparedness, and Foley said he plans to continue Eaton's "visionary" work. "I am personally vested," Foley said. "We could have 200 guests. I am responsible for these people's safety. That's part of the innkeepers' code." Each room in the oceanfront inn has a tsunami evacuation map as well as a two-sided, bright yellow piece of paper detailing what to do in case of a tsunami. The sheet suggests visitors head to high ground, and lists several local emergency assembly areas as well as a series of questions and answers. ... "People trust their safety with us," he said.*

The third option is for Lincoln County to pass an ordinance requiring lodgings in tsunami inundation zones to require that tsunami information is made available because some lodging facilities have resisted tsunami information efforts, since they are afraid it might hurt their business. A Bill in the 2003 Oregon Senate to require coastal lodgings in tsunami inundation zones to display tsunami warnings and evacuation routes failed because of concern from the coastal tourism industry (Ross 2003, Welch 2005). After the Bill was re-introduced in 2005, the executive director of the Newport Chamber of Commerce and Mayor of Florence objected (Welch 2005), and the Bill was amended to meaninglessness and appears unlikely of passing (Appendix J on p. 27). The original text of the Bill introduced in 2005 could serve as a template for a Lincoln County Ordinance that applies only to lodgings in tsunami inundation zones.

APPENDIX A. 1 July 2005 email from Tyree Wilde (Warning Coordination Meteorologist, NOAA's National Weather Service, Portland, OR) to Range Bayer.

Date: Fri, 01 Jul 2005 14:52:16 -0700
From: Tyree Wilde <Tyree.Wilde@noaa.gov>
To: Range Bayer
Subject: Re: June 14 Tsunami Warning Along the Oregon Coast

Range

Sorry it's taken awhile to get back to you, but I've been out of the office most of the week. Anyway, here's some answers to your questions.

I agree that the two bulletins from the Alaska Tsunami Warning Center (ATWC) and Pacific Tsunami Warning Center (PTWC) caused confusion. As you know, ATWC is responsible for issuing Tsunami Watches and warnings for the west coast of the US, BC, and AK. The PTWC has responsibility for the rest of the Pacific Basin, to include Hawaii, US territories, and other islands/countries in the Pacific. It is important when one center issues a warning for their area , that the other center issues an information bulletin to let people in their area (or elsewhere) know what's going on. Many people like and have requested to get bulletins from both centers so they're aware of any Tsunami activity. This is especially true since the Indonesian Tsunami since PTWC has been issuing info information bulletins for quakes in that area. People are very interested in this phenomena.

However, since these two bulletins did create confusion (as people didn't read the bulletin carefully, which can be justified in the heat of the moment), our agency has taken an action item to improve the format of these bulletins so they are clear and complement one another. For example, if the same scenario were to happen again, the ATWC would issue the warning, but PTWC could clearly state in their bulletin for their AOR that "A Tsunami Warning is in effect for the West Coast of the US", but no Tsunami Warning is in effect for the rest of the Pacific Basin. Vice versa if PTWC issued a tsunami warning for Hawaii, the ATWC could issue a info bulletin to let people on the west coast know what going on in the other part of the Pacific.

As for the notification, the ATWC issued the Tsunami Warning at 7:56 pm PDT on June 14 via various communication methods. Some examples (not inclusive) are the National Warning Alert System (NAWAS), NOAA Weather Wire, NWS communication circuits, FAA comm circuits, US Coast Guard comm circuits, internet, email, EMWIN, etc. Immediately after the message was transmitted the ATWC used NAWAS (basically a telephone hotline) to contact each state warning point (AK, WA, OR, CA) and BC to verbally relay the warning. In Oregon, the state warning point is the Oregon Emergency Response (OERS) facility at Oregon Emergency Management in Salem. Once the NAWAS call between ATWC and the state warning pts occurred, the OERS folks contacted the county warning pts via NAWAS on the coast (usually a County Sheriff's office or County 911 center). The county warning points then notified county and community officials (EMs, police, fire, community officials) within their county using several dissemination methods each county uses. The Tsunami Warning was also disseminated on the Oregon Law Enforcement Dissemination System (LEDS), which is an automated feed from the NOAA Weather Wire downlink in Salem. These messages via LEDS goes to several communities/agencies. So, the ATWC bulletin may have been received at different times--depending on how an individual or agency received it. It may have been 1 minute after to a few minutes after. Also, several people/agencies received the bulletin several methods. We also transmitted the warning over our NOAA Weather Radio transmitters at 8:11 pm PDT with an EAS activation.

The PTWC bulletin was issued at 7:59 pm PDT. It was disseminated over the LEDS network just like the ATWC bulletin. Many people/agencies (including media markets) also received this bulletin via email, subscriber services, internet, etc.

[The part of his message answering my specific questions is not included because they are effectively answered above.]

I hope I have answered your questions. Please feel free to contact me if you need additional information. It would probably be better to discuss via phone since it's hard to capture the entire dissemination process via email.

Tyree Wilde
Warning Coordination Meteorologist
NOAA's National Weather Service, Portland, OR
email: tyree.wilde@noaa.gov voice: 503/326-2340 x223 fax: 503/326-2598 web: www.wrh.noaa.gov/portland
address: 5241 NE 122nd Ave, Portland, OR 97230-1089

APPENDIX B. The tsunami warning issued by the West Coast and Alaska Tsunami Warning Center in Alaska for the 14 June 2005 earthquake off northern California. I downloaded this message from http://wcatwc.arh.noaa.gov/old_msg.txt on 18 June 2005. As new messages are added, older messages are removed, so this message may no longer be available. The message below is in the same format as it was on their web site and is in a format appropriate for teletypes.

```
WEPA41 PAAQ 150256
TSUWCA

TO      - TSUNAMI WARNING SYSTEM PARTICIPANTS IN
          ALASKA/BRITISH COLUMBIA/WASHINGTON/OREGON/CALIFORNIA
FROM    - WEST COAST AND ALASKA TSUNAMI WARNING CENTER/NOAA/NWS
SUBJECT - TSUNAMI WARNING BULLETIN - INITIAL
BULLETIN NUMBER 1
ISSUED 06/15/2005 AT 0256 UTC

...A TSUNAMI WARNING IS IN EFFECT FOR THE COASTAL AREAS
   FROM THE CALIFORNIA-MEXICO BORDER TO THE NORTH TIP OF
   VANCOUVER I.-BC. INCLUSIVE...

...A TSUNAMI WATCH IS IN EFFECT FOR THE COASTAL AREAS FROM
   THE NORTH TIP OF VANCOUVER I.-BC. TO SITKA-AK...

...AT THIS TIME THIS BULLETIN IS FOR INFORMATION ONLY FOR
   OTHER AREAS OF ALASKA...

EARTHQUAKE DATA
 PRELIMINARY MAGNITUDE - 7.4
 LOCATION -  41.3N  125.7W -  90 MILES NW OF EUREKA-CA.
                             300 MILES NW OF SAN FRANCISCO-CA.
 TIME     - 1851 ADT 06/14/2005
            1951 PDT 06/14/2005
            0251 UTC 06/15/2005

EVALUATION
 IT IS NOT KNOWN - REPEAT NOT KNOWN - IF A TSUNAMI EXISTS BUT A
 TSUNAMI MAY HAVE BEEN GENERATED.  THEREFORE PERSONS IN LOW
 LYING COASTAL AREAS SHOULD BE ALERT TO INSTRUCTIONS FROM THEIR
 LOCAL EMERGENCY OFFICIALS. PERSONS ON THE BEACH SHOULD MOVE TO
 HIGHER GROUND IF IN A WARNED AREA. TSUNAMIS MAY BE A SERIES OF
 WAVES WHICH COULD BE DANGEROUS FOR SEVERAL HOURS AFTER THE
 INITIAL WAVE ARRIVAL.

$$
PZZ130-131-133-134-132-135-150-153-156-110-250-210-255-350-
353-356-450-455-550-530-535-555-670-673-650-655-750-WAZ001-
002-005-006-007-008-009-010-011-013-014-015-016-021-ORZ001-
002-021-022-CAZ001-002-005-007-006-075-074-009-034-035-039-
040-046-041-042-043-150456-
COASTAL AREAS FROM THE CALIFORNIA-MEXICO BORDER TO THE
NORTH TIP OF VANCOUVER I.-BC. INCLUSIVE.

...A TSUNAMI WARNING IS IN EFFECT FOR THE COASTAL AREAS
   FROM THE CALIFORNIA-MEXICO BORDER TO THE NORTH TIP OF
   VANCOUVER I.-BC. INCLUSIVE...
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[see next page for the rest of the message]

[message continued]

ESTIMATED TIMES OF INITIAL WAVE ARRIVAL

CRESCENT CITY-CA	2029 PDT JUN 14	ASTORIA-OR	2154 PDT JUN 14
CHARLESTON-OR	2044 PDT JUN 14	TOFINO-BC	2157 PDT JUN 14
SAN FRANCISCO-CA	2123 PDT JUN 14	SAN PEDRO-CA	2200 PDT JUN 14
SEASIDE-OR	2126 PDT JUN 14	LA JOLLA-CA	2214 PDT JUN 14
NEAH BAY-WA	2148 PDT JUN 14		

$$
PKZ032-031-042-034-033-035-041-036-AKZ023-024-025-026-028-
029-027-150456-
COASTAL AREAS FROM THE NORTH TIP OF VANCOUVER I.-BC. TO
SITKA-AK.

...A TSUNAMI WATCH IS IN EFFECT FOR THE COASTAL AREAS FROM
   THE NORTH TIP OF VANCOUVER I.-BC. TO SITKA-AK...

ESTIMATED TIMES OF INITIAL WAVE ARRIVAL

LANGARA-BC	2244 PDT JUN 14	KETCHIKAN-AK	2257 ADT JUN 14
SITKA-AK	2227 ADT JUN 14		

$$
PKZ176-175-172-170-171-155-150-132-136-138-137-130-141-140-
120-121-129-127-125-126-128-052-051-053-022-012-043-013-
011-021-AKZ191-185-181-171-145-111-101-121-125-131-135-017-
020-018-019-021-022-150456-
COASTAL AREAS FROM SITKA-AK. TO ATTU-AK.

...TSUNAMI INFORMATION STATEMENT...

NO - REPEAT NO - TSUNAMI WATCH OR WARNING IS IN EFFECT FOR
   THE COASTAL AREAS FROM SITKA-AK. TO ATTU-AK.

FOR INFORMATION ONLY - ESTIMATED TIMES OF INITIAL WAVE ARRIVAL

YAKUTAT-AK	2317 ADT JUN 14	CORDOVA-AK	0007 ADT JUN 15
KODIAK-AK	2332 ADT JUN 14	DUTCH HARBOR-AK	0013 ADT JUN 15
JUNEAU-AK	2334 ADT JUN 14	COLD BAY-AK	0034 ADT JUN 15
SEWARD-AK	2339 ADT JUN 14	ADAK-AK	0038 ADT JUN 15
VALDEZ-AK	2357 ADT JUN 14	HOMER-AK	0044 ADT JUN 15
SAND PT.-AK	2358 ADT JUN 14	SHEMYA-AK	0119 ADT JUN 15

$$

THE PACIFIC TSUNAMI WARNING CENTER AT EWA BEACH HAWAII WILL
ISSUE BULLETINS FOR OTHER AREAS OF THE PACIFIC.

BULLETINS WILL BE ISSUED HOURLY OR SOONER IF CONDITIONS
WARRANT. THE TSUNAMI WATCH/WARNING WILL REMAIN IN EFFECT
UNTIL FURTHER NOTICE. REFER TO THE INTERNET SITE
WCATWC.ARH.NOAA.GOV FOR MORE INFORMATION AND ETA SITES.

APPENDIX C. The only tsunami bulletin issued by the Pacific Tsunami Warning Center in Hawaii for the 14 June 2005 earthquake off northern California. I downloaded this message from http://www.prh.noaa.gov/pr/ptwc/olderwmsg on 18 June 2005. As new messages are added, older messages are removed, so this message may no longer be available. The message below is in the same format as it was on their web site and is in a format appropriate for teletypes.

I have **enlarged and boldfaced** critical words or sentences that were missed by readers who thought this message said there was no tsunami warning or watch for Oregon.

```
**********************************************************************************
TSUNAMI BULLETIN NUMBER 001
PACIFIC TSUNAMI WARNING CENTER/NOAA/NWS
ISSUED AT 0259Z 15 JUN 2005

THIS BULLETIN IS FOR ALL AREAS OF THE PACIFIC BASIN EXCEPT
ALASKA - BRITISH COLUMBIA - WASHINGTON - OREGON - CALIFORNIA.

... TSUNAMI INFORMATION BULLETIN ...

THIS MESSAGE IS FOR INFORMATION ONLY. THERE IS NO TSUNAMI WARNING
OR WATCH IN EFFECT.

AN EARTHQUAKE HAS OCCURRED WITH THESE PRELIMINARY PARAMETERS

 ORIGIN TIME -  0251Z 15 JUN 2005
 COORDINATES -  41.3 NORTH  125.7 WEST
 LOCATION    -  OFF COAST OF NORTHERN CALIFORNIA
 MAGNITUDE   -  7.4

EVALUATION

 NO DESTRUCTIVE PACIFIC-WIDE TSUNAMI THREAT EXISTS BASED ON
 HISTORICAL EARTHQUAKE AND TSUNAMI DATA.

 HOWEVER - EARTHQUAKES OF THIS SIZE SOMETIMES GENERATE LOCAL
 TSUNAMIS THAT CAN BE DESTRUCTIVE ALONG COASTS LOCATED WITHIN
 A HUNDRED KILOMETERS OF THE EARTHQUAKE EPICENTER. AUTHORITIES
 IN THE REGION OF THE EPICENTER SHOULD BE AWARE OF THIS
 POSSIBILITY AND TAKE APPROPRIATE ACTION.

THIS WILL BE THE ONLY BULLETIN ISSUED FOR THIS EVENT UNLESS
ADDITIONAL INFORMATION BECOMES AVAILABLE.

THE WEST COAST/ALASKA TSUNAMI WARNING CENTER WILL ISSUE BULLETINS
FOR ALASKA - BRITISH COLUMBIA - WASHINGTON - OREGON - CALIFORNIA.
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APPENDIX D. Jim Hawley's email responses to Range Bayer's emailed questions.

>>> Range Bayer <rbayer@orednet.org> wrote on 6/19/2005 11:29:27 AM >>>
Hi Jim,

Thank you for our telephone conversation last Friday about the June 14 tsunami watch. In our telephone conversation, you mentioned that the first report was from Hawaii that there was no Tsunami Watch. I am curious, who sent that information to you?

Thank you for your time and consideration.

Yours,

Range Bayer, rbayer@orednet.org, 265-2965, PO Box 1467, Newport, OR 97365

======= Jim Hawley's Response =====
Date: Mon, 20 Jun 2005 09:39:27 -0700
From: Jim Hawley <JHawley@co.lincoln.or.us>
To: rbayer@orednet.org
Subject: Re: Conflicting Information about June 14 Tsunami Watch

The first information, on our state warning system, indicated a 7.4 earthquake had occurred 90 miles NW of Eureka. A tsunami watch and warning are not in effect, according to Hawaii. This information was for Hawaii and Alaska, and although not for us, was received by the state and transmitted to us. A few minutes later, Palmer said that was not correct and gave us their information and said there was a tsunami warning. The cutoff for notification is 7.0 and up. The next day, a 6.9 occurred in the same area and of course, nothing was issued.

Thank you for your interest.

(Appendix D continued on next page)

>>> Range Bayer <rbayer@orednet.org> wrote on 6/27/2005 12:25:38 PM >>>
Dear Jim,

I continue to research the June 14 tsunami warning along the Oregon coast.

Ezra Casteel in the Lincoln City News Guard reported that you said that local officials had reasonable assurance before the tsunami warning was cancelled after 9 PM that there would be no tsunami when Crescent City was not hit at 8:29 PM. What was your source of information that a tsunami did not hit Crescent City before 9 PM? The Crescent City tide gage? Radio contact with Crescent City? TV news?

Since there can be multiple tsunami waves and the 3rd or later waves can be larger than the first, how were you sure that there would be no tsunami if there was no wave when the first wave was predicted to land?

Casteel also reported that you predicted the tsunami height would be about 5 ft or less? What was your source of information for this? Or, if you made the calculations, how did you do so?

Thank you for your time and consideration.

Yours,

Range Bayer

======= Jim Hawley's Response =====
Date: Wed, 29 Jun 2005 13:27:54 -0700
From: Jim Hawley <JHawley@co.lincoln.or.us>
To: rbayer@orednet.org
Subject: Re: June 14 Tsunami Warning

Re: Had Crescent had a tsunami, we would have been alerted on our national Warning System. We also have direct communication on the warning system with Curry County in the event they had a wave/s. No evidence of water receding, etc. At the board meeting, I mention I had heard a comment the wave would not have been 5 feet, but I only can report what I hear from the scientific folks, not what I hear.

Date: Sat, 2 Jul 2005 12:03:26 -0700 (PDT)
From: Range Bayer <rbayer@orednet.org>
To: Jim Hawley <JHawley@co.lincoln.or.us>
Subject: Re: June 14 Tsunami Warning

Hi Jim,

Thank you for your message. At what time did the National Warning System report that there was no tsunami in Crescent City? Or is this a case that they only report if there is one, so it is ambiguous if there was indeed no tsunami wave or that a tsunami wave may have occurred but a technical or human glitch may have prevented the tsunami from being reported?

The night of June 14, who said that the wave would only be 5 ft or less? In my research of the response along the Oregon Coast that night, the only place that I have found it mentioned is for Lincoln County.

Do you have a log of messages that your office received that night and the time that they were received?

Thank you for your time and consideration.

Yours,

Range Bayer

======= **Jim Hawley has not responded as of 12 July 2005.**

APPENDIX E. Email response to my letter to KNPT-AM radio about the lack of tsunami warning information on their radio station during the June 14 tsunami warning. I have added boldface to items of particular interest.

Date: Tue, 28 Jun 2005 12:03:38 -0700
From: Yaquina Bay Communications <yaquinabay@charter.net>
To: rbayer@orednet.org
Subject: letter

Mr. Bayer, in your letter you did not indicate which one of our stations you attempted to listen to. **We did have information about the tsunami warning on all of them, but the most extensive coverage was on the designated emergency station, 102.7FM, KYTE.** The biggest problem with the entire event was that National Weather Service failed to initiate a tsunami warning in Lincoln County. Their transmitter did not work which is one of four sources that we monitor for EAS emergencies. Two of the others are the state relay network from radio station KWAX in Eugene and the commercial relay network from radio station KKNU in Eugene. NWS programmed the tsunami warning that those stations received and transmitted as only a Lane county event, therefore our receiver was not triggered to receive it. NWS now understands that problem and they are working on the failure of their equipment in Lincoln County. They also failed in Clatsop and Coos Counties. **The fourth source we monitor is county emergency services, but no official warning was generated by local officials for us to receive.**

The information we did have on the air, therefore could not be official. **We were only able to announce the quake and that we understood a tsunami warning had been generated, but that we did not have any official information.** I hope this proves helpful for your understanding. I believe all officials know what needs to happen next time.

djm
David Miller
Owner/General Manager
KNPT (AM) Radio, knptam.com
KYTE (FM) Radio, kytefm.com
KNCU (FM) Radio, u92fm.com
KCRF (FM) Radio, kcrffm.com
KBCH (AM) Radio, kbcham.com

=== On July 2, I emailed Dave Miller and asked: "*Did KNPT and your other stations other than KYTE have warning announcements and then resume normal broadcasting?*" because his email above suggests this. As of July 12, I have not received a reply.

APPENDIX F. Facsimile of "Requirements for Construction in Tsunami Zone" in Table 1802.1 on p. 363R of the 2004 Oregon Structural Specialty Code (OSSC). This Table gives Oregon Revised Statutes (ORS) 455.446 and 455.447 building categories in a tabular form that is much easier to understand than the written text of these Statutes in Table 3. A similar table is also in Olmstead (2003:8). Note that exceptions (ORS 455.446[1][d] and Oregon Administrative Rule 632-005-0080[2]) and exemptions (Oregon Administrative Rule 632-005-0070) can be given to construct even prohibited structures.

TABLE 1802.1
REQUIREMENTS FOR CONSTRUCTION IN TSUNAMI ZONE

BUILDING CATEGORY PER ORS 455.447 ORS 455.447 SECTION REFERENCE IS IN [BRACKETS]	NEW CONSTRUCTION PROHIBITED IN TSUNAMI INUNDATION ZONE UNLESS GRANTED AN EXCEPTION THROUGH PROCESS ADMINISTERED BY DOGAMI[1]	NEW CONSTRUCTION PROHIBITED IN TSUNAMI INUNDATION ZONE, UNLESS STRATEGIC LOCATION CONFLICT EXISTS OR GRANTED AN EXCEPTION THROUGH PROCESS ADMINISTERED BY DOGAMI[1]	PRIOR TO NEW CONSTRUCTION IN TSUNAMI INUNDATION ZONE, MUST REQUEST ADVICE FROM DOGAMI	MAY BE CONSTRUCTED IN TSUNAMI INUNDATION ZONE WITHOUT ADVICE FROM DOGAMI
[1(a)] Essential facilities				
[1(a)(A)] Hospitals and other medical facilities with surgery	X			
[1(a)(b)] Fire and police stations		X		
[1(a)(C)] Tanks and similar structures				X
[1(a)(D)] Emergency vehicle shelters				X
[1(a)(E)] Structures and equipment in emergency preparedness centers			X	
[1(a)(F)] Standby-power-generating equipment				X
[1(a)(G)] Structures and equipment in government communication centers and other emergency response facilities	X			
[1(b)] Hazardous facilities			X	
[1(c)] Major structures			X	
[1(e)] Special occupancies				
[1(e)(A)] Covered structures with assembly greater than 300 persons			X	
[1(e)(B)] (Part) Buildings with capacity greater than 50[2] for nonpublic schools through secondary level or child care centers	X			
[1(e)(B)] (Part) Buildings with capacity greater than 50[2] for public schools through secondary level		X		
[1(e)(C)] Buildings for colleges or adult education with capacity greater than 500	X			
[1(e)(D)] Medical facilities with 50 or more residents, incapacitated patients			X	
[1(e)(E)] Jails and detention facilities	X			
[1(e)(F)] Structures and occupancies with a capacity greater than 5,000			X	

1. These facilities and structures may be granted an exception by the DOGAMI Governing Board to allow new construction in the tsunami inundation zone. If the exception is granted, then advice must be sought from DOGAMI. See OAR Chapter 632, Division 5.
2. ORS 455.446 specifies an occupancy load of 50 for this category.

Note: Reference Table 1802.1 is not a part of this code but is provided here for the reader's convenience. This table summarizes the requirements of ORS 455.446 and 455.447.

APPENDIX G. Counties (A) and cities (B) with restrictions on building in tsunami areas. I did not do a thorough search, so there could well be more. I found these while Google searching for "tsunami land use critical facilities."

=-

A. COUNTIES WITH RESTRICTIONS ON CONSTRUCTION IN TSUNAMI AREAS

Hawai'i (Hawaii). County Code (County of Hawaii [no year]). Chapter 27, Section 27-23 indicates that tsunami inundation areas are coastal high hazard areas and that all new construction and substantial improvements in these areas must be built to resist flood damage. Also see National Tsunami Hazard Mitigation Program (2001b: p. 3-8 through 3-10).

Kauai (Hawaii). P. 4-10 of the County Hazard Mitigation Strategy (County of Kauai [no year])(also see the National Tsunami Hazard Mitigation Program 2001b:p. 3-5 and 3-6) states:

> *Chapter 8 (Comprehensive Zoning Ordinance): establishes constraint districts, drainage districts, flood districts, shore districts, and tsunami districts. Zoning permits and variance are required for development with these areas pursuant to the National Flood Insurance Program.*

Mendocino (California). General Plan (County of Mendocino 1991). Definitions from Table 2 on p. General Plan V-12 that are used in tsunami restrictions:

> *Importance Factor 1: Structures whose continued functioning is critical, or whose failure might be catastrophic: nuclear reactors, large dams, power intertie systems, plants manufacturing or storing explosives or toxic materials.*
>
> *Importance Factor 2: Structures whose use is critically needed after a disaster: important utility centers; hospitals, fire, police, and emergency communication facilities; fire stations; and certain bridges and overpasses that are part of a critical transportation element; also smaller dams.*
>
> *Importance Factor 3: Structures of high occupancy, or whose use after a disaster would be particularly convenient: schools, churches, theaters, large hotels, and other high-rise buildings housing large numbers of people, other places normally attracting large concentrations of people, civic buildings, secondary utility structures, extremely large commercial enterprises, most roads, alternative or non-critical bridges and overpasses.*
>
> *Importance Factor 4: The vast majority of structures: most commercial and industrial buildings, small hotels and apartment buildings, and single-family residences*

An excerpt from p. General Plan V-29 with tsunami restrictions:

> *1. Proposed construction of importance factors 1 and 2, as shown in Table 2, shall not be constructed within areas subject to tsunami unless it can be conclusively demonstrated that the facilities can remain functioning after any potential tsunami occurs. New construction of importance factor 3, located within areas subject to tsunami, should be designed to resist possible wave damage.*
>
> *2. Restrict land uses in areas subject to tsunami to open space, agriculture, and those uses which, due to their dependency upon ocean access, could not be located elsewhere. Prohibit the construction of high occupancy structures within tsunami hazard areas.*

Whatcom County (Washington). Critical Areas Ordinance (County of Whatcom 2005). An excerpt from p. 11 of 16.16:

> *Critical facilities still prohibited in all hazard areas including tsunami, volcanic, and seiche hazard areas.*

(Appendix G continued on next page)

==========

B. CITIES WITH RESTRICTIONS ON CONSTRUCTION IN TSUNAMI AREAS

Arcata (California). General Plan (City of Arcata [no year]). An excerpt from PS-1d states:

> *New critical facilities shall not be located in areas with high physical hazards, including high liquefaction potential, flood zones, and tsunami hazards.*

El Segundo (California). General Plan (City of El Segundo 1992) Goal PS2: Faulting and Seismicity/Structural Hazards:

> *Program PS2-1.4A. The City shall require that proposals for construction or expansion of large and critical facilities which are located in tsunami and coastal inundation areas to assess the risk of inundation and provide adequate flood mitigation measures as conditions for project approval.*

Ft. Bragg (California). General Plan (City of Fort Bragg 2002). Policy SF-1.3 is to minimize development in areas subject to tsunami and:

> *Program SF-1.3.2: Review development proposals to ensure that new development is not in an area subject to tsunami damage or, if such development is allowed, that it is designed to withstand tsunami damage.*

Hilo (Hawaii). According to the National Tsunami Hazard Mitigation Program (2001a:18 and 27), open spaces such as parks and tsunami forests were allowed in tsunami areas and any structure below 20 foot was required to be designed to withstand the force of a major tsunami.

Honolulu (Hawaii). Revised Ordinances (City of Honolulu [no year]). Article 11, Section 16-11.5(c)(5) and Section 16-11.5(f) give requirements for building design and construction to resist tsunamis. Also see the National Tsunami Hazard Mitigation Program (2001b: p. 3-22 through 3-33.and 5-14 through 5-24) for discussion of these measures.

Kodiak (Alaska). According to the National Tsunami Hazard Mitigation Program (2001b: p. 3-11 and 3-12), critical facilities in the 1964 tsunami area were moved to upland areas.

Seward (Alaska). According to the National Tsunami Hazard Mitigation Program (2001b: p. 3-14), no permanent habitable structures are allowed in the high-risk area along the waterfront.

Valdez (Alaska). According to the National Tsunami Hazard Mitigation Program (2001b: p. 3-12), the site destroyed by the 1964 tsunami is only allowed to be used for public open space and park and recreation uses.

APPENDIX H. Response to questions about tsunamis by Oregon coastal residents in 1998 (Oregon Dept. of Geology and Mineral Industries 1998) and Washington coastal residents and visitors to the Washington coast in 2001 (Johnston et al. 2002). -=data not available or question not asked.

	Oregon Residents (%)	Washington Residents (%)	Washington Visitors (%)
Did not know that tsunami is large amount of water	20	-	-
Had not seen tsunami hazard maps	-	26	76
Had not heard or received information about preparing for tsunami	-	24	80
Received tsunami information from federal, state, or local government	-	64	0
If tsunami warning, do not know how long they have to respond	-	26	28
If tsunami warning, do not know to listen to radio for official advice	-	27	87
If tsunami warning, do not know to go at least 1/2 mile inland or 100 feet above sea level	-	17	26
If earthquake, do not know that must respond within 30 minutes	69	55	52
Believe it is safe to return to low areas after first tsunami wave	22	-	-
Know that is safe to return to low areas only after approval from local authorities	31	-	-

APPENDIX I. Black and white copy of Waldport tsunami evacuation map. The color original is available at Lincoln County Emergency Management's http://www.lincolncoemergencyservices.us and the Oregon Dept. of Geology and Mineral Industries' http://www.oregongeology.com/earthquakes/Coastal/Tsubrochures.htm. Note that this black and white reproduction shows areas to evacuate well, but that the word "green" for the color of band on sign posts to indicate that "you are outside the tsunami hazard zone" does not show up. The only other evacuation map with this problem is that for Lincoln City.

If you feel an earthquake:

Move immediately inland

Follow evacuation route signs

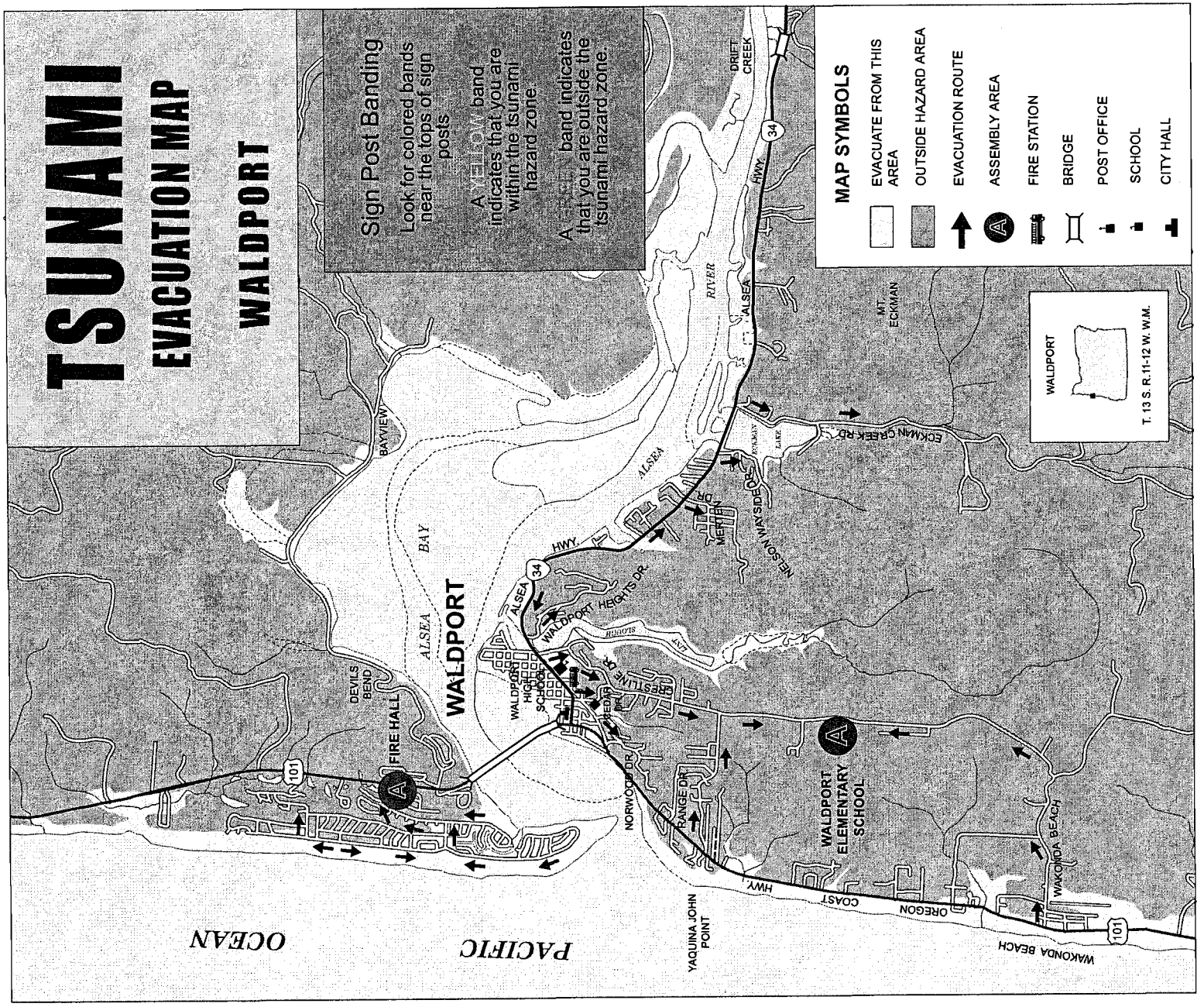
Do not wait for an official warning

TSUNAMI EVACUATION ROUTE

NOTICE

The evacuation zone on this map was developed by the Oregon Department of Geology and Mineral Industries in consultation with local officials. It is intended to represent a worst-case scenario for a local tsunami from an earthquake near the Oregon Coast. The evacuation routes were developed by local emergency officials and reviewed by the Oregon Department of Emergency Management.

The Oregon Department of Geology and Mineral Industries is publishing this brochure because the information furthers the mission of the Department. The map is intended for emergency response, and should not be used for site-specific planning.



CONTACTS

Oregon Emergency Management
3225 State Street
P.O. Box 14370
Salem, OR 97309-5062
http://www.osp.state.or.us/oem

City of Waldport
125 Alsea Hwy
P.O. Box 1120
Waldport, OR 97394
Phone (541) 563-3561
http: www.waldport.org

Central Oregon Coast Fire and Rescue District
P.O. Box 505
Waldport, OR 97394
(541) 563-3121

Lincoln County Emergency Management
225 W. Olive St.
Newport, OR 97365
(541) 265-4199
http://www.co.lincoln.or.us

Oregon Department of Geology and Mineral Industries
800 NE Oregon Street #28, Suite 965
Portland, OR 97232
(503) 731-4100
http://www.oregongeology.com

Nature of the Northwest Information Center
800 NE Oregon Street #5, Suite 177
Portland, OR 97232
(503) 872-2750
http://www.naturenw.org

International Tsunami Information Center
737 Bishop Street, Suite 2200
Honolulu, HI 96813-3203
(808) 532-6422
http://www.pr.noaa.gov/itic

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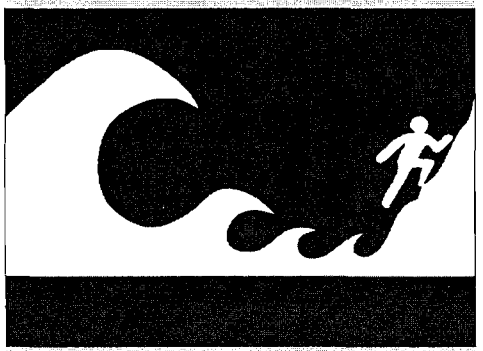
TSUNAMI
EVACUATION MAP
Waldport



IF YOU FEEL AN EARTHQUAKE:

- DROP, COVER, HOLD until the earthquake is over, protect yourself
- MOVE IMMEDIATELY INLAND to high ground and away from low-lying coastal areas
- GO ON FOOT if at all possible
- DO NOT WAIT for an official warning
- DO NOT PACK or delay
- DO NOT RETURN to the beach
- WAIT for an "all clear" from local emergency officials before returning to low-lying areas

A TSUNAMI MAY BE COMING IN A FEW MINUTES. LARGE WAVES MAY CONTINUE TO COME ONSHORE FOR SEVERAL HOURS.

The information in this brochure could save your life. Please read it and share it with your family and friends.

TSUNAMI EVACUATION ROUTE

A tsunami is a series of sea waves, usually caused by a displacement of the ocean floor by an undersea earthquake. As tsunamis enter shallow water near land, they increase in height and can cause great loss of life and property damage.

Recent research suggests that tsunamis have struck the Oregon Coast on a regular basis. They can occur any time, day or night. Typical wave heights from tsunamis occurring in the Pacific Ocean, over the last 80 years, have been 20–45 feet at the shoreline. However, because of local conditions a few waves have been much higher—as much as 100 feet or more.

We distinguish between a tsunami caused by an undersea earthquake **near** the Oregon coast (LOCAL TSUNAMI) and an undersea earthquake **far away** from the coast (DISTANT TSUNAMI).

A LOCAL TSUNAMI can come onshore within 15 to 20 minutes after the earthquake—before there is time for an official warning from the national warning system. **Ground-shaking from the earthquake may be the only warning you have. Evacuate quickly!**

A DISTANT TSUNAMI will take four hours or more to come onshore. You will feel no earthquake, and the tsunami will generally be smaller than that from a local earthquake. Typically there is time for an official warning and evacuation to safety.

Evacuation for a distant tsunami will generally be indicated by a **STEADY 3-MINUTE SIREN BLAST** and an announcement over NOAA weather radio that the local area has been put into an official TSUNAMI WARNING. In isolated areas along beaches and bays you may not hear a warning siren. Here, **A SUDDEN CHANGE OF SEA LEVEL** should prompt you to move immediately inland to high ground. If you hear the 3-minute blast or see a sudden sea level change, first evacuate away from shoreline areas, then turn on your local broadcast media or NOAA weather radio for further information.

FOR BOTH LOCAL AND DISTANT TSUNAMIS:

1. **Evacuate on foot,** if at all possible. Follow evacuation route signs and arrows.
2. **If you need help evacuating, tie something WHITE** (sheet or towel) to the front door knob. Make it large enough to be visible from the street. If the emergency is a distant tsunami, then help may arrive. In the event of a local tsunami, it is unlikely that anyone will help you, so make a plan and be prepared!
3. **Stay away from potentially hazardous areas until you receive an ALL CLEAR** from local officials. Tsunamis often follow river channels and dangerous waves can persist for several hours. Local officials must inspect all flooded or earthquake-damaged structures before anyone can go back into them.
4. **After evacuation,** check with local emergency officials if you think that you have special skills and can help, or if you need assistance with locating lost family members.

Be prepared! Assemble emergency kits with at least a 3-day supply for each family member.

1. First aid kit and reference guide.
2. Water—1 gallon per person per day; for drinking, hygiene, and cooking.
3. Food (packaged, canned, no-cook, as well as baby food and food for special diets).
4. Can opener (non-electric).
5. Blankets or sleeping bags.
6. Fire extinguisher (standard).
7. Essential medications.
8. Money.
9. Food and water for pets.
10. Portable radio, NOAA weather radio, flashlights, and batteries.
11. Alternate cooking source & matches.
12. Heavy gloves and sturdy shoes.
13. Crescent wrench for utility shut off (12" or longer).

APPENDIX J. The portion of Senate Bill 557 as introduced to the 2005 Legislature about posting information. This is from http://www.leg.state.or.us/05reg/measures/sb0500.dir/sb0557.intro.html. The Bill was amended severely in committee to change the mandatory requirement (see A-Engrossed version at http://www.leg.state.or.us/05reg/measures/sb0500.dir/sb0557.a.html), so that Oregon Emergency Management could only "Facilitate and encourage broad distribution of the tsunami warning information and evacuation plans to transient lodging facilities and other locations within tsunami inundation zones frequented by visitors to the area."

As of 11 July 2005, even the amended Bill is still in a Senate committee (http://www.leg.state.or.us/searchmeas.html), and it seems doubtful that it will be passed.

A BILL FOR AN ACT

Relating to tsunami warning system; and declaring an emergency. Be It Enacted by the People of the State of Oregon:

SECTION 1. { + (1) As used in this section:

(a) 'Transient lodging facility' means a hotel, motel, inn, condominium, any other dwelling unit or a public or private park that is made available for transient occupancy or vacation occupancy as those terms are defined in ORS 90.100.

(b) 'Tsunami inundation zone' means an area of expected tsunami inundation, based on scientific evidence that may include geologic field data and tsunami modeling, determined by the governing board of the State Department of Geology and Mineral Industries, by rule, as required by ORS 455.446 (1)(b) and (c).

(2) A transient lodging facility that is located in a tsunami inundation zone shall post tsunami warning information and evacuation plans developed under subsection (3) of this section.

(3) The Office of Emergency Management, in consultation with the State Department of Geology and Mineral Industries, shall develop and adopt by rule tsunami warning information and evacuation plans required to be posted under subsection (2) of this section.

(4) A transient lodging facility that is located in a tsunami inundation zone and is:

(a) A hotel, motel, inn, condominium or other similar facility shall post the tsunami warning information and evacuation plans in each guest room.

(b) A single-family dwelling unit shall post the tsunami warning information and evacuation plans in at least one prominent location in the dwelling unit.

(c) A public or private park shall post the tsunami warning information and evacuation plans in at least one prominent location, such as the office, the pay station or another central location in the park at which park information is distributed to park users. + }

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