Proposed and Existing Guidelines for Recognition in the NWS TsunamiReady® Community Program

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Summary

This report was prepared under contract between East Tennessee State University (and Subawardee Institutions─ University of Colorado; University of North Carolina, Wilmington) and the National Weather Service (NWS; Award Number NA10NWS4670015) to support the project, "Incorporating Social Science into NOAA's Tsunami Program." The purpose of this report is to present a set of guidelines for community recognition as TsunamiReady® and supporting summary information that consolidates our focus group-based research in support of the NWS' effort to revise TR guidelines using social science-based research. This report also includes a Checklist for Determining Completion of Mandatory Elements for TsunamiReady® recognition (Appendix 2). A table comparing the 2001 TsunamiReady® Guidelines and the proposed guidelines is also provided as Appendix 3.

The guidelines, checklist and summary discussed in this report are the culmination of our ongoing work with the NWS Tsunami Program and other state and territorial partners over a four year period since late 2010. This work includes findings from a series of focus group meetings held with emergency managers and community stakeholders in seven states and territories in the USA in 2011 and in six of these communities in 2013. The aim of the first focus groups was to obtain community feedback about NWS draft guidelines for becoming recognized as TsunamiReady® and a community rating system for communities with populations larger than 50,000 residents. These draft guidelines represented the outcome of several years of work by the NWS Tsunami Program and their partners in the National Tsunami hazard Mitigation Program (NTHMP), including the NTHMP Mitigation and Education Subcommittee (MES), and NWS Weather Forecast Offices. We developed another draft of the TR guidelines based on the findings from our first focus group meetings and ongoing collaboration with the NWS Tsunami Program, NWS Weather Forecast Offices, and the NTHMP. We then conducted the second round of focus group meetings in 2013 to obtain final community-based comments on the revised guidelines that they helped us develop. From these findings we developed the guidelines presented here. As with the previous version of the guidelines that we developed, this version also agrees better with the on-going improvements to have the NWS StormReady® guidelines align more with the National Incident Management System (NIMS). This contribution was made by Chris Maier of the NWS.

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1.0 Introduction

This report was prepared under contract between East Tennessee State University (and Subawardee Institutions─ University of Colorado; University of North Carolina, Wilmington) and the National Weather Service (NWS; Award Number NA10NWS4670015) to support the project, "Incorporating Social Science into NOAA's Tsunami Program." The purpose of this report is to present: 1) a set of revised guidelines for community recognition as TsunamiReady® and 2) supporting summary information. The summary information includes a discussion of the original 2001 guidelines for recognition in the TsunamiReady® Community Program (included in entirety in Appendix 1). It also consolidates our focus group-based research in support of the NWS' effort to revise TsunamiReady® guidelines using social science-based research. This report also includes a Checklist for Determining Completion of Mandatory Elements for TsunamiReady® recognition and a table comparing the 2001 guidelines with the proposed guidelines (Appendix 2 and Appendix 3).

2.0 The existing 2001-Based Guidelines for TsunamiReady® Recognition

The current TsunamiReady® (TR) program guidelines were instituted in 2001. Actions a community must take to achieve TR recognition are based on the community's population size, so larger communities are required to take more actions than smaller communities. Table 1 summarizes the existing requirements. Appendix 1 shows the information in Table 1, along with additional explanatory text.

Table 1. Existing 2001-based guidelines for recognition in the TsunamiReady® Community program (NWS, 2014. URL: http://www.stormready.noaa.gov/tsunamiready/guidelines.htm).

Guidelines	**Population**			
	< 2,500	2,500 - 14,999	15,000 - 40,000	> 40,000
Guideline 1: Communications and Coordination				
Established 24-hour Warning Point (WP)	**X***	**X***	**X**	**X**
Established Emergency Operations Center (EOC)	**X***	**X***	**X**	**X**
Guideline 2: Tsunami Warning Reception				
Number of ways for EOC/WP to receive NWS tsunami messages. (If in range, one *must* be NWR receiver with tone alert; NWR-SAME is preferred)	**3**	**4**	**4**	**4**
Guideline 3: Local Warning Dissemination				
Number of ways EOC/WP can disseminate warnings to public	**1**	**2**	**3**	**4**
NWR - SAME receivers in public facilities	**X**	**X**	**X**	**X**
For county/borough warning points, county/borough communication network that ensures information flow among communities	**X**	**X**	**X**	**X**
Guideline 4: Community Preparedness				
Number of annual tsunami awareness programs	**1**	**2**	**3**	**4**
Designate/establish tsunami shelter/area in safe zone	**X**	**X**	**X**	**X**
Designate tsunami evacuation areas and evacuation routes, and install evacuation route signs	**X**	**X**	**X**	**X**

Guidelines *–continued from previous page*	**Population**			
	< 2,500	2,500 - 14,999	15,000 - 40,000	> 40,000
Provide written, locally specific, tsunami hazard response material to public	**X**	**X**	**X**	**X**
Schools: Encourage tsunami hazard curriculum, practice evacuations (if in hazard zone), and provide safety material to staff and students.	**X**	**X**	**X**	**X**
Guideline 5: Administrative				
Formal tsunami hazard operations plan	**X**	**X**	**X**	**X**
Biennial meeting between emergency manager and NWS	**X**	**X**	**X**	**X**
Visit by NWS official to community at least every other year	**X**	**X**	**X**	**X**

* For cities or towns with less than 15,000 people, a 24-hour warning point and EOC are required; however, another jurisdiction within the county may provide that resource.

3.0 Development of Revisions to Guidelines for TsunamiReady® Recognition

Over a four year period between 2011 and 2013, our team has worked with the NWS to use social science research methods to make recommendations for improving the TR program. We conducted focus group meetings in several states and territories in 2011 and 2013 to obtain comments on proposed revisions to the guidelines for community recognition as TR. The meetings were held in Washington, Oregon, California, Hawaii, Alaska, North Carolina and the US Virgin Islands in 2011 and follow-up meetings were held in six of these sites in 2013. The version of TR guidelines used in the 2011 meetings were developed over several years by NWS personnel and members of the National Tsunami Hazard Mitigation Program (NTHMP). Findings from those focus groups discussions were used to develop a new version of the guidelines. The new version was submitted for review several times to both the NWS and NTHMP between 2012 and 2014. This report describes the most recent work conducted to develop the latest draft guidelines. Before presenting the actual guidelines in section 3.5, we present some background information concerning:

- *four standard actions* (section 3.1)
- determination of tsunami hazards in communities (section 3.2)
- discussion topics in the 2013 focus group meetings (section 3.3/ 3.3.1)
- results of discussions in the 2013 focus group meetings (section 3.3/ 3.3.2)

3.1 *Four Standard Actions*— critical steps in developing a community ready to meet the demands of their tsunamis

In the previous guidelines we proposed a major distinction of guidelines based on community vulnerability to local and distant tsunamis. All communities were "assumed" to have a distant tsunami hazard, but only a subset of these would also have a local tsunami hazard. In principle, local tsunamis were considered to be the primary threat to human life, at least much more so that distant tsunamis. This subdivision was compatible with the growing understanding that local tsunamis are the primary tsunami threat to human lives because of the combination of reduced response time because of the proximity of the tsunami source and because of delays in evacuation due to damage from a parent earthquake. However, after extensive discussions and debate over the possibility of requiring additional actions for communities with local tsunamis, we abandoned this strict subdivision because of the limitations it inherently has on facilitating each community's ability to address their vulnerability to local, regional or distant tsunamis and ultimately to get their people to safety. For example, some communities require more than 60 minutes to evacuate their population (e.g., Coronado, Waikiki) from even a distant tsunami. The

previous guidelines did not require that these types of vulnerabilities be addressed in the Guidelines for TR. As a result, the current guidelines proposed here primarily reflect actions needed to protect human life in the time available to react, regardless of whether the tsunami is considered local or distant.

In recognizing the inherent limitations of guidelines based on community exposure to local versus distant tsunamis, the new guidelines reflect the need for communities to take *Four Standard Actions* that place an emphasis on the need to save human lives in all tsunamis. The *Four Standard Actions* require that every community determine:

1 *Tsunami arrival time*─ the time it will take the first wave in tsunamis from different sources to arrive in a community;
2 *Inundation zone*─ the area of land expected to be in the tsunami inundation zone (i.e., the flooded area);
3 *Population exposure*─ the number of people and subpopulations of people (e.g., locals, visitors, seasonal workers, schools, and assisted living facilities) expected to be in the inundation zone; and
4 *Evacuation time*─ the time required for people to reach a safe area and whether or not the people can be evacuated in the time available.

While some focus group participants expressed concern over their community's ability to actually comply with these four actions because of the tremendous disparity in seasonal population numbers, all focus groups agreed that a community should not be considered TR if it cannot comply with the *Four Standard Actions*. Consequently, the new guidelines remove the strict subdivision based on local and distant tsunami and instead require communities to address their specific vulnerability to tsunami. This does not deemphasize the importance of distinguishing local and distant tsunami threats that have been recognized by our team, the NWS Tsunami Program, NTHMP and other academic and Federal agency studies. Instead, the new guidelines reflect the real challenges that large populations and/or population densities and the logistics of evacuation routes play in evacuation of people on time scales of minutes to many hours.

3.2 Determination of Tsunami Hazards in Communities

The NWS could develop an Expert Panel to make consistent and precise determinations of which communities face plausible tsunami hazards (i.e., local, regional or distant) and such a panel could be composed of, among others, existing talents in the NTHMP. However, we chose to leave such determination in the hands of the respective communities and TR reviewers. In this situation, communities must consult with either local, regional or national experts such as those in state or federal government agencies and universities or consultants to determine their specific tsunami hazard profile. Whichever source they choose to consult, it would be incumbent on each community to convince the local NWS Weather Forecast Office (WFO) and their representative conducting the TR evaluation of the appropriateness of using a specific tsunami hazard profile. For example, communities will need to determine the source of possible and plausible tsunamis. These could include, among others, tsunamis generated by subduction zones earthquakes or landslides.

3.3 The 2013 Focus Groups: Discussion Topics and Results of Discussions

We conducted our first focus group meetings in 2011. At that time participants commented on a draft set of guidelines that were developed by the NWS and its partners over a period of several years prior to 2011. Following the focus groups, we developed a new set of guidelines based on the findings from the focus groups and additional understanding of tsunami hazard, vulnerability and risk issues in coastal communities. We then conducted follow-up focus group meetings with the participants in 2013. The purpose was to:

1) present to the stakeholders a revised set of draft guidelines that were developed using their comments during the 2011 focus group meetings;

2) provide opportunities for participants to review and comment on the newly developed draft guidelines;

3) obtain specific comments to eight key topics that we identified as essential to help develop the final set of guidelines.

The following two sections provide a brief description of the eight key topics that we discussed with the focus group participants in 2013. The topics and a brief explanation of their importance are detailed below, followed by results of the discussions. Findings from the discussions were critical in influencing our revisions to the draft guidelines presented in Appendix 2.

3.3.1 Eight Discussion Topics

Researchers conducting the focus group meetings used a written protocol to facilitate group discussions of eight key topics. The concepts of the topics are summarized below and, not surprisingly, most of the conversation was associated with topic 1. The *results* of discussions are presented in the next section (3.3.2)

Topic 1. Subdivision of community vulnerability based on local versus distant tsunamis: Is it appropriate in their community to distinguish vulnerability to local versus distant tsunamis or both?

We also discussed some limitations of the guidelines based on vulnerability to local versus distant tsunami. Since the distinction between local and distant tsunamis is based on time (i.e., a local tsunami is one that arrives on shore in less than 60 minutes), it is not necessarily a good method for determining guidelines in all situations. This is because evacuation of populations to safe areas in some communities requires longer than 60 minutes, even for a distant tsunami. Consequently, we asked stakeholders whether or not all communities, regardless of their vulnerability to local or distant tsunamis or both, should be required to take *four standard actions* to determine their vulnerability to tsunamis and if they can evacuate the impacted population from the tsunami hazard zone in the time available. These included determining the:

1 *Tsunami arrival time*─ the time it will take the first wave in tsunamis from different sources to arrive in a community;
2 *Inundation zone*─ the area of land expected to be in the tsunami inundation zone (i.e., the flooded area);
3 *Population exposure*─ the number of people and subpopulations of people (e.g., locals, visitors, seasonal workers, schools, and assisted living facilities) expected to be in the inundation zone; and
4 *Evacuation time*─ the time required for people to reach a safe area and whether or not the people can be evacuated in the time available.

Furthermore, we asked if communities who cannot evacuate their people in the time available should be recognized as TsunamiReady®.

Topic 2. Additional (or different) requirements for communities with local tsunamis: Should communities vulnerable to local tsunamis have to take more or different actions to protect human life than communities only vulnerable to distant threats?

Topic 3. Tsunami evacuation plans or strategies sin their community: We asked about existing evacuation strategies and specifically if people were knowledgeable about communities that had adopted vertical evacuation strategies.

Topic 4. Effective evacuation strategy for communities to be recognized as TR and the proportion of the population to be protected: We asked if evacuation strategies must be able to evacuate everyone in a community, including specific subgroups of populations, which often vary seasonally, such as in cases of seasonal workers and visitors and temporary residents. This included discussion of the proportion of the population that should be able to evacuate to safety in a TR community.

Topic 5. Vertical evacuation: Should communities be required to develop vertical evacuation strategies if no naturally occurring high or inland ground can be reached in the time available? This would include identification of existing structures or construction of new ones.

Topic 6. Mandatory annual evacuation exercises or drills for schools in local tsunami inundation zones: Should they be required?

Topic 7. Accounting for variations in risk tolerance of relevant subpopulations of people in communities: Given this variation, such as that between local residents and visitors, for example, should owners and staff of high occupancy businesses be required to have annual training to help facilitate response?

Topic 8. NIMS and applicability to structure of TR guidelines: structuring of the guidelines according to the categories of mitigation, preparedness, response and recovery.

3.3.2 Results of the Eight Discussion Topics

The following is a summary discussion of findings from the 2013 focus group meetings. Each of the meetings had an ideal turnout and participants actively engaged in the topics presented for discussion. Many participants were interested in knowing how the study might affect the TR program. The results are presented in the order of the topics described in the previous section.

The researchers were in some instances surprised to see how there were wide variations in people's mental models of key terms, processes and concepts. The term mental model is used to describe how people make sense of complex and often abstract information by constructing simplified mental images. Mental models are robust and not easily changed. New information is usually forced to fit within existing mental models rather than people reshaping them. We expected some variation in, for example, people's understanding of the arrival time for local, regional and distant tsunamis. But it was a surprise to learn that, for example, when we discussed *evacuation* for a local tsunami in one community. The researchers' mental model involved people escaping to a safe place on natural high ground some distance inland from the sea and in the forest, where evacuees would be cut off from development and roadways and where they may be forced to remain until the response phase was over (many hours). In contrast, the mental model of at least some participants was very different. In this case, their mental model included evacuation of people to a building where they would be expected to have access to shelter, clothing, food, water, etc. Our surprise was that this is an unlikely scenario for that specific population. The significance is that sometimes people have drastically different mental models where there is an underlying assumption to the contrary. This can form a barrier between focus group facilitators and participants and between individual participants. so care must be taken to provide sufficient background, avoid unnecessarily complex information where possible, periodically restate meanings of key terms, and force people to provide examples of their mental models.

Topic 1 Results. Subdivision of community vulnerability based on local versus distant tsunamis: All sites agreed that the TR guidelines should not be based on community population but as proposed─ by vulnerability associated with plausible tsunami threats.

Topic 2 Results. Additional (or different) requirements for communities with local tsunamis: Participants agreed that communities with a local tsunami hazard should be required to take either more or additional actions than communities with only a distant tsunami hazard and these actions should be aimed at protecting and saving human life. There was an emphasis on actions that protect human life and preparing for local tsunami hazards. Requirements for communities with only a distant tsunami hazard should focus more on preparing communities for more orderly evacuations, securing of ports and harbors, and other critical infrastructure in the hazard zone.

In terms of participant response to the four standard actions, most participants agreed with requiring communities to take the actions, but there were mixed opinions. These appeared to be based on recognition that wave travel times depend on the source and hence there could be many scenarios which they must consider, and uncertainty about how they would obtain some of the information, such as the number of subgroups of the population in the hazard zone. This concern arose primarily over fluctuations in seasonal visitor populations. Regardless of the concerns that were raised, all of the sites agreed that communities should be able to provide or obtain the required information.

Topic 3 Results. Tsunami evacuation plans or strategies in their community: Participants acknowledged that an effective evacuation strategy for any community involves a variety of actions with continual evaluation and evolution. Several sites expressed how the *four standard actions* could be a potential metric for determining the effectiveness of evacuation plans.

A well-defined communications plan was identified as being necessary. This includes a plan for emergency management to receive official warning messages and then pass that onto the public through multiple channels. Testing components of the plan was also mentioned. All agreed that a full-scale, community-wide test of all elements of the plan would be unrealistic but testing of select components was both possible and highly recommended. For example, emergency sirens should be (and in most study sites are) tested regularly throughout the year. All sites agreed that evaluations were needed for any test of the plan to identify areas of strength and areas needing improvement.

Topic 4 Results. Effective evacuation strategy for communities to be recognized as TR and proportion of population to be protected: Most sites identified transient or seasonal population fluctuations as the most significant challenge to developing an effective evacuation for all subpopulations of a community. Populations requiring protection could vary by many thousands depending on the time of year.

The question of what proportion of the population should be protected by evacuation plans was, not surprisingly, the most challenging and difficult question for respondents to discuss and answer. Almost all sites refrained from providing a quantitative value in favor of acknowledging the goal of any plan should be to save 100% of the population. But they acknowledged the extreme challenges of doing so for all tsunami scenarios. Most sites did acknowledge that preference should be given to evacuating certain sub-populations in the hazard zone, such as children at schools and day care centers and elderly individuals at assisted living facilities. Two communities discussed the need for a phased approach to evaluating evacuation plans and capabilities, whereby communities evaluate their current capacity to evacuate the population and work on progressively increasing that number toward 100% as resources become available.

Topic 5 Results. Vertical evacuation: Of the focus-group communities, only Coronado currently uses a vertical evacuation strategy and this was reported as largely consisting of the urging of people to move inland and up to the second floor or higher. Although not a focus-group community, the Waikiki visitor district in Honolulu uses a vertical evacuation strategy; however, the strategy is published in telephone books but the target structures are not identified with signage. There was an expectation that multi-story hotels would be used as evacuation sites but no formal plan was in place. This was said to be because there was concern over who would be liable for damages to hotel property, such as that caused by evacuation but with no subsequent damaging tsunami.

All sites agreed that communities should be required to identify natural high or inland ground for people to use for self-evacuation. They also agreed requiring communities lacking this capability to build vertical evacuation structures was unacceptable and would be a deterrent for some communities to seek TR recognition. However, they agreed that *recommending* the building of vertical evacuation structures was a good idea.

Two communities expressed the need for clarification of an additional step for communities lacking the ability to effectively evacuate people to natural high or inland ground, before they attempted construction of vertical

evacuation structures. This involved communities prioritizing resources to strengthen or expand evacuation before developing vertical evacuation capabilities. Several study sites expressed major concerns or reservations about building vertical evacuation locations. Three major reasons included:

1) people queuing for access during the "panic" of an actual event which would delay or eliminate a person's ability to reach safety;
2) buildings could presumably be overrun by people and exceed the intended capacity; and
3) the false sense of security or safety people might have after being advised to use such structures, which are unlikely to be guaranteed to withstand both the tsunami and seismic hazards associated with an earthquake, in the context of some local tsunamis.

Another common belief expressed about the costs of building vertical evacuation structures was that it was enormously expensive. Terms like "millions" and even "fifty million" were used.

While communities were largely against a vertical evacuation requirement, even when no other means of access to safety was possible, the majority of sites acknowledged that a community should not be recognized as TR if it was unable to provide safe evacuation refuge for its population.

Topic 6 Results. Mandatory annual evacuation exercises or drills for schools in local tsunami inundation zones: Only two of the study sites (Hawaii and Oregon) have state legislation requiring mandatory tsunami evacuation exercises annually for schools in the inundation zone. The remaining sites agreed that their states should adopt the same policy of requiring evacuation exercises. All sites agreed that schools in inundation zones of distant tsunamis should be required to have "a plan," at a minimum. Drills or exercises could be recommended, but not necessarily required. The only uncertainty about these requirements concerned the lack of influence emergency managers had over private schools to comply with the requirement, compared to public schools. Several sites discussed the need to require other facilities in inundation zones to conduct annual evacuation exercises or at least have emergency response plans in place to response. These facilities included day care centers/pre-schools, hospitals, assisted living centers. The majority of sites agreed the facilities should have a plan in place and conduct some type of drill or exercise (table-top, full-scale drill, etc.) a minimum of every three years.

Topic 7 Results. Accounting for variations in risk tolerance of relevant subpopulations of people in communities, providing information to residents and high-occupancy businesses: We asked participants to consider requiring training, education, or outreach to both residents and high occupancy businesses located within tsunami inundation zones. All sites agreed that the provision of educational material to the entire community is one of the most useful actions a community can take to increase preparedness. However, they agreed that educational materials can be expensive in terms of money and time. Concern was expressed about contacting temporary residents because it may be difficult to locate the homeowners. There was concern from several sites that resources could be wasted trying to attract such people unless creative and efficient methods of providing information were developed.

Concerning the requirement to provide mandatory training, education, or outreach to business owners and staff of high occupancy businesses in tsunami inundation zones, participants voiced some concerns. Several sites did not believe emergency managers could get buy-in from the business community. This was mainly because of the costs associated with providing annual training to staff. Furthermore, the majority of sites discussed how they had become frustrated in working with hotels and businesses because few have been willing to provide tsunami risk information to visitors. In contrast, several study sites highlighted the need to educate businesses and residents of the *entire* community, not just those located within an inundation zone or businesses with high occupancy rates.

Kauai participants discussed how they currently work closely with hotel associations and all hotels, in addition to security agencies, to ensure that every hotel has developed and maintained an emergency response plan. Similarly, the Seaside group discusses how they were currently creating a "Business Ready" program modeled

after the TR program. Seaside recognizes the important role businesses play in providing guidance to visitor and seasonal worker populations during crisis situations. Their expectation is that by recognizing businesses as "BusinessReady," businesses will become increasingly interested in tsunami preparedness on a community wide scale.

All sites agreed that communities should always include tsunami education in local schools. Several sites also recognized that one key to building long-term community awareness and preparedness was to educate the children as they grow up in communities. Sites recognized the need to educate children in communities with both distant and local tsunami hazard.

Topic 8 Results. NIMS and applicability to structure of TR guidelines: All study sites unanimously agreed that the proposed TR guidelines format is much more useful and aligns well with current NIMS hazard mitigation and emergency planning templates. Similarly, all participants agreed that this format is acceptable and preferred to the current guidelines format. Though one significant concern raised by all sites was that with the additional mandatory actions, the costs of participation may have increased enough to discourage seeking TR recognition.

3.4 The Proposed Guidelines for Tsunami Ready® Recognition

3.4.1 Background

All information contained in this section 3.4 reflects the final suggested guidelines for TR recognition developed in this project to date. The document provided to communities should include all of the information beginning with the section below, titled "**Background"** and ending with the section titled, "**IV RECOVERY (REC)"** on page 18. The proposed guidelines outlined below contained some brief, but necessary background information about the TR Program; addressing appropriate tsunami hazards, threats and vulnerabilities in their community; and incentives for becoming TR.

The actual actions required by the guidelines are divided into four groups of Mitigation, Preparedness, Response and Recovery. These correspond to sections I, II, III, and IV, respectively. These sections contain both mandatory elements that are required, in addition to elements that are recommended but not necessarily required. Section I (MITIGATION) contains seven mandatory elements designated (Mit-1, Mit-2, Mit-3, …). Section II (Preparedness) contains 10 mandatory elements. Section III (RESPONSE) contains 5 mandatory elements and section IV (RECOVERY) contains 2 mandatory elements. All mandatory elements are easily identified by their red color (e.g., **Mit-1**). In contrast, recommended or optional elements are color-coded with a green heading (e.g., **Other recommended mitigation efforts to increase community resilience).**

Note that Appendix 2 contains a checklist that can be used by NWS personnel evaluating applications for TR recognition or by communities keeping track of their efforts toward achieving TR recognition. Appendix 3 is a comparative table that contrasts the 2001 TR Guidelines and the proposed guidelines.

3.4.1 The Proposed Guidelines Document

BACKGROUND

The TsunamiReady® Program

The TsunamiReady® Community Program of the National Weather Service (NWS) recognizes coastal jurisdictions and other population centers (e.g., tribes, counties, universities) that take and maintain steps to reduce risk from tsunamis. Communities recognized as TsunamiReady® are more resilient as a result of implementing various preparedness, response, recovery, and mitigation strategies that address their vulnerability to immediate (minutes) and longer-term (hours) tsunamis.

Addressing the appropriate tsunami threats and vulnerabilities in your community

Preparing for tsunamis in the United States (US) and its territories is greatly complicated by the fact that two distinctly different types of tsunami threats exist for its coastal communities─ *distant* and *local* tsunamis. Distant tsunamis are generated by distant earthquakes. The 2011 Tohoku earthquake in Japan, for example, generated a local tsunami for Japan but a distant tsunami for US coastlines. Typically, communities will have several hours to respond to official tsunami warnings before distant tsunamis strike coastal areas. Distant tsunami events are normally most damaging to ports and harbors and specific low-lying coastal areas. Local tsunamis, on the other hand, are generated by local sources, such as an earthquake within the Cascadia subduction zone or landslides in Alaska, or both. They usually involve large-magnitude earthquakes followed by potentially catastrophic tsunami waves striking coastal communities in a matter of minutes. Communities need to respond to environmental cues or natural warning of the tsunami, such as ground motion from the earthquake, because official tsunami warnings may or may not be provided or they are provided minutes later than the ground motion. Damage is typically greater from local tsunamis than distant tsunamis and local tsunamis have been shown to pose a greater hazard to human life. In contrast, distant tsunamis are less of a threat to human life because people have more time to evacuate to a safe area. Occasionally, the term *regional tsunami* is used to distinguish tsunamis with travel times intermediate between local (<60 minutes) and distant (>3 hours).

While the term *local tsunami* certainly implies an urgency to respond to an impending tsunami, preparing communities for the range of tsunami threats from local, regional and distant tsunamis is even more complex than a simple distinction based on the time it takes the first wave to arrive in a community. There are three primary reasons. First, local tsunamis are usually triggered by large earthquakes and ground shaking from the earthquake can affect the integrity of evacuation routes (e.g., roads, bridges) and sheltering structures (e.g., high rise buildings and berms), which increases evacuation times. Second, ground shaking can also disable or delay official warning messages, meaning people must respond to other forms of warning such as environmental and social cues and informal warnings. Third, distant tsunamis may still present life-safety issues in some communities that may require more than 60 minutes of time to evacuate due to high population densities in hazard zones or limited routes for evacuations (e.g., narrow bridges or single roads to high ground).

The TsunamiReady® Program recognizes that reducing risks requires different strategies and provides guidelines that distinguish between actions needed to protect against local threats and those for regional and distant threats. A common recognition, however, is that every community be able to evacuate people in the tsunami hazard area within the time available for a local, regional or distant threat. The maximum time available is the time between the generation of the tsunami and the time of arrival of the first wave on a community's shoreline. Note that for earthquake generated tsunamis, communities are told to assume that strong or prolonged ground motion means an

earthquake has occurred and that the earthquake may have generated a tsunami take protective actions immediately. Given the high velocities of seismic energy producing felt ground motion (1-2 miles per second), an earthquake generated tsunami may have been created tens of seconds to a few minutes before ground motion is felt by local people. In general, for communities with only distant tsunami threats, guidelines emphasize ensuring seamless communication among NWS Tsunami Warning Centers and stakeholders using modern communications capabilities. For communities that also have local tsunami threats, these same communications capabilities between NWS and practitioners are critical to contend with distant tsunamis, but at-risk individuals also must:

- recognize the natural warnings or environmental cues of a possible or imminent tsunami (e.g., ground shaking from an earthquake, unusual rapid rise or fall of a shoreline);
- know where high ground is accessible in the limited time available; and
- take personal responsibility to evacuate inland, to high ground, or up into vertical evacuation structures in the time (minutes) they have to survive.

Addressing your community's hazard and vulnerability to tsunamis

Preparing your community for the range of tsunami threats requires implementing risk-reduction actions that are adapted to local conditions and needs. Therefore, a critical element in preparing your community is understanding the tsunami threat(s), such as the time it takes the first wave in tsunamis from different sources to arrive in your community, the expected areas of flooding (inundation) and run-up (the height a wave reaches above sea level when traveling over land) and the speeds of currents in ports and harbors. Another critical element involves understanding how your community is specifically vulnerable to tsunamis. This includes understanding the types of people and systems that are exposed to tsunami hazards, factors that make them more or less sensitive to threats (e.g., age, language barriers, and certain business sectors such as those catering to visitor populations), and the capacity of individuals to respond effectively to potential or imminent threats. In terms of providing information to people to help reduce risk, social science research suggests that simply making information available to people does not mean those people receive the information, understand it, or act on it in ways that reduce risk. Therefore, community leaders are encouraged to work with communication experts in the development and provision of risk information and to take steps to evaluate the success of outreach efforts in achieving the desired effect.

Incentives for becoming TsunamiReady®

No coastal community is tsunami proof, but being recognized as TsunamiReady® will help decision-makers feel confident that they are engaged in risk-reduction activities that have been acknowledged by tsunami experts and by their peers from multiple states and territories to be necessary. The expectation is that TsunamiReady® communities will have fewer human fatalities and injuries and less property damage, than communities who do not take similar risk-reduction actions.

GUIDELINES

Coastal communities seeking TsunamiReady® recognition must meet all mandatory elements. The specific actions required to meet each element will vary among communities, however, depending on the types of tsunami hazards and related vulnerability. Communities with plausible local tsunami threats will include efforts that enable at-risk individuals to take self-protective actions, in addition to strategies for all coastal communities that address regional and distant tsunamis. Determination of the range of plausible local, regional, and distant tsunami threats in a particular community rests with the TsunamiReady® reviewer, who will be in close communication with tsunami experts from the NTHMP, such as NOAA, the U.S. or State Geological Surveys, State emergency managers, universities, or consultants. In addition to describing mandatory elements, each sub-section provides a list of recommended, but not required, efforts to improve community resilience to tsunamis.

I. MITIGATION (MIT)

Mandatory elements for coastal communities:

Mit-1. Mapped tsunami-hazard zones and estimated wave-arrival times. The primary source for mapping potential tsunami-impact zones is inundation modeling, which illustrates expected areas to be flooded by the tsunami. If this is unavailable, other acceptable sources include guidance from tsunami experts from NOAA, the U.S. or State Geological Surveys, universities, or consultants. Modeling and mapping efforts shall meet NOAA/NTHMP guidelines. As part of a tsunami-hazard mapping effort, a community should have an estimate of the duration or "window" of time they will have to react and evacuate for their various local to distant tsunami threats.

Mit-2. Tsunami hazard and community vulnerability information specified in FEMA-approved Local Multi-Hazard Mitigation Plan. As detailed in section 44CFR Part 201.6 (c)(2) of the Stafford Disaster Mitigation Act, this information shall include: 1) a tsunami-hazard profile, including source locations, extent of inundation, run-up or height that a wave reaches above sea level, previous tsunami occurrences, and likelihood of future tsunamis, and 2) a description of community vulnerability, including areas exposed to inundation and an impact summary of specific sub-populations of people expected to be affected (e.g., individuals with access and functional needs, visitors, seasonal workers), businesses, infrastructure, and critical facilities. Estimates of population exposure in tsunami-hazard zones should be based on local knowledge or on analysis of population data (e.g., Census), and can include ranges of population counts to recognize daily or seasonal fluctuations in workers, visitors and temporary residents.

Mit-3. Designated tsunami hazard areas, evacuation routes, non-hazard areas, and assembly areas (sufficient to support the population), based on tsunami inundation modeling and mapping and in accordance with your tsunami evacuation response plan (Resp-1).

Mit-4. Signage to identify tsunami hazard areas, evacuation routes and assembly areas. Signage should be implemented according to State policies and as determined to be appropriate by local authorities, with possible assistance from partners. Wherever possible, signage should comply with specifications aimed at standardization so that all coastal communities eventually will have identical signage. Continuity of signage benefits domestic residents and international visitors.

Mit-5. Availability of natural high or inland ground has been identified for at-risk populations. If suitable high or inland ground is available, then it should be determined if at-risk populations can reasonably reach these

areas before tsunami waves are predicted to arrive. Evacuation assessments and/or modeling should take into account the types of at-risk individuals present (e.g., elderly, children, tourists, infirm, seasonal workers). They should also take into account the reliability of evacuation routes (e.g., bridges, roads), especially in areas where the tsunami may be triggered by a strong earthquake that could weaken or destroy the road, bridge, etc. If natural high or inland ground is not accessible within the time the first wave is predicted to arrive, see Mit-6.

Mit-6. Strengthened evacuation routes to enable at-risk populations to effectively evacuate to natural high or inland ground in the time available. For communities with local tsunami threats related to earthquakes, strengthening of evacuation routes may mean developing and maintaining foot trails through areas of heavy vegetation, improving roads, and seismic strengthening of bridges and roads. After strengthening evacuation routes, if people are still unable to reach natural high or inland ground in the time available, see Mit-7.

Mit-7. A plan for vertical-evacuation strategies using existing or planned berms and other structures has been established if it is unlikely that at-risk populations would be able to reach natural high ground and inland locations before arrival of first wave. This plan identifies current or proposed locations of vertical evacuation structures, the at-risk populations they would serve, funding sources, land use considerations, and a timeline for implementation. Communities must demonstrate progress in implementing this plan at subsequent reviews for TsunamiReady® recognition.

Other recommended mitigation efforts to increase community resilience

- Tsunami-related elements in nationally-recognized planning efforts, such as:
  - FEMA's National Flood Insurance Program, including the Community Rating System
  - No Adverse Impact (NAI) coastal floodplain management as outlined by the Association of State Floodplain Managers (ASFPM).
  - Multi-Objective Management/Special Area Management Plans (SAMPs) in accordance with the Coastal Zone Management Act (CZMA)
- Tsunami-related elements in local planning efforts, such as:
  - Adoption of appropriate seismic standards and building codes
  - Local zoning ordinances to minimize or steer development away from tsunami-hazard zones
  - Critical-facility ordinance to minimize having critical facilities in tsunami-hazard zones
  - Tsunami hazard disclosure for permit applicants
  - Tsunami-resistant design and construction regulations
  - Open space in tsunami-hazard zone, such as parks, greenways, and natural areas
  - Incentives (e.g., density bonuses, fee waivers, set asides) to encourage mitigation
  - Plans that establish and/or preserve coastal buffers to slow shoreline erosion
- Tsunami-related mitigation projects, such as
  - Port- and harbor-related efforts, such as tying down refueling-tanks, automatic shut-off valves, caps on pier moorings, minimal long-term storage of material that would become potential debris (e.g., empty shipping containers, logs and lumber)
  - Automatic shut off valves on major supply gas lines
  - Relocation of buildings, hazardous materials, and critical infrastructure out of hazard zone
  - Protection of structures using NFIP coastal flood-resistant design and construction requirements and the FEMA Coastal Construction Manual if relocation is not feasible
  - Store important documents where they will not be damaged or lost, such as in remote archives.

II. PREPAREDNESS (PREP)

Mandatory elements for coastal communities:

Prep-1. **Annual tsunami exercise**, such as a tabletop, functional or full-scale exercise. This requirement is in addition to the annual exercise required for selected schools in the inundation zone (see Prep-6).

Prep-2. **First Responder training** that includes tsunami hazard, warning and evacuation protocols

Prep-3. **Evacuation maps** of tsunami hazard areas, evacuation routes, non-hazard areas and assembly areas are available in appropriate print and digital media.

Prep-4. **Written materials** that include tsunami information, hazard maps, evacuation routes, safety tips, and response protocols. Information on response protocols includes how official agencies and the general public disseminate and receive official warning messages. Information on natural warnings or environmental cues (e.g., ground motion from the earthquake or sight of a rising or receding shoreline), social cues, and informal warnings should be included to address local tsunami threats where official warnings may not be realistic. Information should include details on both sources of these warning messages and cues and the channels through which information may be received and subsequently disseminated. It should also be tailored to reflect local conditions and demographics such as appropriate languages or recognizing workforce differences between businesses where necessary. Information shall be disseminated using three or more of the following:

A. Visitor centers and local tourist businesses (e.g., restaurants, bars, hotels)
B. Local hotel and motel staff
C. Historical markers and interpretative signs
D. Radio and television spots
E. Libraries
F. Public utility/service industry bill safety notices.
G. Billboard, highway, or beach entry signs.
H. Local faith-based and civic organization bulletins/mailings.
I. Bulk mailings of tsunami safety information to local residents and businesses

Prep-5. **Events (at least one per year)** to educate the people on tsunami hazards, evacuation routes, safety and response, such as:

A. Community tsunami safety workshop and education campaign
B. Door-to-door safety awareness campaign with residents and businesses in your community's tsunami inundation/hazard zone.
C. Local business workshop to help them to develop response and business continuity plans
D. Local Emergency Planning Committee (LEPC) meetings.
E. Local Area Emergency Communications Committee
F. State Tsunami Technical Review/Advisory Committee
G. Presentations or workshops for faith-based organizations, community or civic groups
H. Booths at community events and county fairs.
I. Local public safety campaigns, such as "Tsunami Awareness" week/month.
J. Requirement to have weather radios in new buildings.

Prep-6. Public schools in tsunami-hazard zones have an Emergency Operations Plan to respond to the tsunami threats in their community. Private schools are encouraged to have the same plans and actions as public schools. It is recommended that all schools in tsunami-hazard zones practice their plan annually in an evacuation drill, but it is required for those with a local tsunami hazard.

Prep-7. Emergency management informs all schools and child care centers annually of their risk of tsunami hazards and provide information on warning and evacuation procedures. Emergency Management must provide information on recommended evacuation sites to schools, including vertical evacuation sites if necessary. An offer for an in-person presentation from the local Emergency Management office should be included in the information that is sent to schools.

Prep-8. Information provided annually to business owners for employee training, outreach or education that targets high-occupancy businesses in the tsunami-hazard zones (e.g., hotels, restaurants, fisheries, industrial sites). Visitors and seasonal workers in coastal areas are known to be less familiar with coastal processes, including tsunamis and tsunami evacuation routes and sheltering areas, than permanent and temporary residents. As such, it is necessary that information is not only available and provided to the owners and staff of high occupancy businesses (preferably to small businesses too), but steps be taken to ensure that the recipients of such information receive, process, and understand it. This could be supported by use of a simple and inexpensive small pre-test and post-test for training.

Prep-9. Annual training, outreach or education that targets individuals living or working in tsunami-hazard zones. Training, outreach or education efforts should address evacuation routes, safety and personal actions needed to effectively respond to the tsunami hazard profile of the community and during different seasons and times of day (e.g., during work or school, at the beach on a weekend, etc).

Prep-10. Participation in NOAA/NWS Tsunami Warning Center communication tests

Other recommended preparedness efforts to increase community resilience

- School-based training, such as:
  - Tsunami education program, including science and safety in primary and secondary schools
  - Tsunami awareness presentations by subject matter experts
- Evacuation plans for facilities with access and functional need individuals (e.g., assisted living facilities, child-day-care centers)
- Community-based training, such as:
  - COMET
  - "TsunamiReady Champions" to spearheads tsunami hazard education and awareness
  - "Map your Neighborhood," Citizens Corp, or Community Emergency Response Team
  - FEMA's "Are You Ready?" workshop or others from Emergency Management Institute
  - State Emergency Training Services
  - American Red Cross sheltering training
- Business-based preparedness training, such as:
  - Education materials distributed to guests (e.g. evacuation plans).
  - Appropriate tsunami evacuation signage placed at site
  - Employees trained in the site's procedures for a tsunami emergency.
  - Tsunami response policies and procedures, including MOUs/MOAs, plan annexes,

- Participation in national emergency-management programs, such as:
    - Emergency Management Accreditation Program (EMAP)
    - Certified Emergency Manager® or Associate Emergency Manager® through the International Association of Emergency Managers
- Preparedness projects
    - Designated harbor and marine vessel-evacuation areas in offshore deep-water areas
    - Interpretative tsunami hazard zone signs along beach/shore access points
    - Participation in annual end-to-end communications test, including EAS activation, use of real event code (TSW) or EAS test message (e.g., RMT), evacuation drills/exercises, siren systems, and telephone mass notification system
    - Surveys to assess the success of your community tsunami awareness program.

III. Response (RESP)

Mandatory elements for coastal communities:

Resp–1. Tsunami hazards are addressed in the Emergency Operations Plan, including

A. Identify tsunami as a hazard and provide a risk assessment
B. Detail Communication/Dispatch Center procedures relating to tsunamis
C. Specify EOC activation criteria and demobilization procedures
D. Specify tsunami criteria and procedures for the activation of the public warning system in its area of responsibility
    a. Criteria and procedures for siren activation, cable television override, and/or local activation in accordance with state EAS plans, warning fan-out procedures, and communication to functional and access needs populations.
E. Provide contact information for all jurisdictional agencies and response partners including the NWS
F. Evacuation plans for both distant and local events, roles of community entities/agencies, hazard zones map with evacuation routes, and protocols for access and functional needs populations.
G. Procedures for updating information and "all-clear" messages after initiating a tsunami incident response
H. Procedures for providing security for evacuated zone.

Resp–2. Emergency Operations Center (EOC) that is staffed during tsunami incidents and capable of achieving the elements listed in bullet form below. Note that this applies only for jurisdictions of 15,000 or more people. For communities smaller than 15,000, there must be ties to an EOC.

A. Executing tsunami warning functions based on predetermined guidelines related to NWS tsunami information and/or tsunami incidents
B. 24 hour operations or plan to activate the EOC for tsunami incidents in accordance with the EOP
C. Warning reception and dissemination capability
D. Staffed with trained and credentialed emergency management personnel
E. Has ability and authority to activate the public warning system in its area of responsibility
F. Maintains ability to communicate within and across jurisdictions (e.g., with other EOCs including those maintained by private organizations, Incident Command Posts, etc.) through resilient and redundant methods. Should have communication capabilities equal to or better than the Communication/Dispatch Center

G. Maintains established communication links with NWS (e.g., NWSChat, phone, etc.) to relay real-time weather and flood reports to support the warning decision making process.

Resp–3. Redundant and reliable means for 24-Hour Warning Point and/or EOC to receive official tsunami watch, warning and advisory messages from NOAA Tsunami Warning Centers, local NWS Offices, or other officially-recognized warning centers**.** At least three of the following must be met:

A. Public Alert™ certified NOAA Weather Radio (NWR) receiver: ***Required*** *for recognition only if within reliable reception range of a NWR transmitter*
B. National Warning System (NAWAS) drop: FEMA-controlled, 24-hour, continuous-private-line telephone system used to convey warnings to federal, state and local governments, as well as the military and civilian population.
C. NWSChat: An instant messaging program available via the Internet used by NWS operational personnel to share critical warning decision expertise and other significant weather information InteractiveNWS (iNWS): An experimental real-time, user-defined, warning messaging service for mobile devices intended for emergency management/response personnel
D. Emergency Management Weather Information Network (EMWIN) receiver: Device that receives satellite feed and/or VHF radio transmission of NWS products
E. Statewide Telecommunications System: Automatic relay of NWS products, usually on law enforcement systems
F. CMAS/WEA Alerts: Commercial Mobile Alert System (CMAS)/Wireless Emergency Alerts (WEA) service that allows public safety authorities to use FEMA's IPAWS Open Platform for Emergency Networks (IPAWS-OPEN) to send geographically targeted, text-like wireless emergency alerts to the public
G. Amateur Radio transceiver: Potential communications directly to NWS office.
H. Alerts provided through an AWCI provider: Typically received via email and/or a texting service to a smartphone, tablet, or computer
I. Television: Access to local network or cable TV
J. Local Radio: Emergency Alert System, LP1/LP2
K. Internet monitoring capability, including social media such as Facebook and Twitter
L. NOAA Weather Wire drop: Satellite downlink data feed from NWS.
M. Direct e-mail from Tsunami Warning Center
N. Direct fax from Tsunami Warning Center
O. Text message or direct pager message from Tsunami Warning Center
P. US Coast Guard Broadcasts: WP monitoring of USCG marine channels
Q. Satellite Phone
R. Other Communications channel (please explain): For example, active participation in a state-run warning network, two-way, local emergency responder radio network, etc.

Resp–4. Redundant and reliable means for 24-Hour Warning Point and/or EOC to disseminate official tsunami watch, warning and advisory messages to the public. At least three of the following capabilities must be met:

A. Emergency Alert System (EAS) message initiation and broadcast
B. Cable television audio/video overrides
C. Local flood warning systems ideally with no single point of failure

D. Plan for siren/megaphone notification on emergency vehicles
E. Outdoor warning sirens
F. Other local alert broadcast system
G. Local pager/texting system
H. CMAS/WEA Alerts available capability throughout the jurisdiction
I. Amateur Radio Operator network (Ham Radio)
J. Telephone mass notification system
K. Telephone tree to critical facilities
L. Coordinated jurisdiction-wide radio network
M. Counties, Parishes, Boroughs, etc. - A countywide communications network that ensures the flow of information between all cities and towns within its borders. This would include acting as the surrogate WP and/or EOC for jurisdictions without those capabilities.
N. Social Media usage (Twitter, Facebook, etc.)
O. Other, please explain

Resp–5. Public Alert Certified* NOAA Weather Radio (NWR) receivers in critical facilities and public venues in and around the tsunami inundation zone (where reception is available) including:

A. **Required Locations:**
   a. Communication/Dispatch Center serving as the 24-hour WP
   b. EOC
   c. City Hall
   d. Public School Superintendent office

B. **Recommended, but not required, locations:**
   - Courthouses
   - Public libraries
   - Hospitals
   - All schools, usually located in Principal's or designee office
   - Fairgrounds, parks and recreation areas*
   - Public utilities*
   - Large-event venues, e.g., arenas, stadiums, etc.*
   - Transportation departments*
   - Nursing homes/Assisted living facilities*
   - Harbor Masters' Offices

*__Note__: Usually, the NWR receivers would be located in the primary management office/facility that has the authority to alter operations and the ability to order protective actions based on the NWS hazardous weather or flood warning received.

All response requirements should recognize that during a local tsunami event initial response would be performed primarily by at-risk individuals. Individuals in local tsunamis, including emergency personnel, will need to take personal responsibility for evacuating after recognizing the natural warnings or environmental cues of a possible or imminent tsunami (e.g., ground shaking from an earthquake, unusual rapid rise or fall of a shoreline). Official communications and warnings may be difficult to perform given the potential for infrastructure and telecommunication damage from the preceding earthquake and the limited time between the generation and arrival of the first wave in the tsunami.

Other recommended response efforts to increase community resilience

- Additional elements in Emergency Response Plan
    - Response plan for businesses to notify and evacuate visitors and employees
    - Exercises with businesses (e.g. seminar, table-top, meeting, etc.)
    - Transportation plans for contra flow and traffic maintenance for distant tsunami incidents.
    - Notification plan for marinas and harbormasters to expedite relocating vessels
    - MOUs with private land owners to allow evacuees access through gates and across land
    - Procedures for keeping evacuees and other impacted individuals informed throughout the incident
    - Procedures for opening assembly areas and evacuation shelters
    - Emergency Management Assistance Compact (EMAC) for tsunami response/recovery
- Ensuring Critical Facilities such as hospitals, police stations, fire stations, utilities, etc. in and near the tsunami inundation zone have the tsunami hazard addressed in their Emergency Operations Plans.
    - Emergency service facilities and equipment (fire stations; police stations; custodial facilities, such as jails and juvenile detention centers, hospitals, and other health care facilities; rescue squads; public works facilities, etc.).
    - Communications networks (telephones, emergency service radio systems, repeater sites and base stations, television and radio stations, etc.).
    - Water supply system/facilities, to include waste water treatment.
    - Utilities (power plants, substations, power lines, etc.)
    - Transportation networks (roads, bridges, airports, rail terminals, maritime ports).
- Additional elements in Emergency Operation Center (EOC) communications – County-, parish-, or borough-wide communications network including warning points
- Additional suggested places for NOAA weather radios: communications centers for life guards, courthouses, public libraries, fairgrounds, sports arenas, parks and recreation areas, public utilities, transportation departments, City Hall, other critical public facility

IV. RECOVERY (REC)

Mandatory elements for coastal communities:

Rec–1. A plan that considers how communities will continue to operate and recover after a tsunami disaster.

Rec–2. A plan that considers how communities will manage debris after a tsunami disaster.

Other recommended recovery efforts to increase community resilience

- Identification of Long-Term Recovery Coordinator (local expert) in accordance with ESF-14
- Plan for conducting a post-tsunami incident Interagency After Action Review. Goals would include identifying lessons learned and best practices, and evolving the Emergency Operations Plan as necessary.
- Plan that addresses a community's housing strategy, both temporarily and long-term, for individuals/families that were directly impacted by a tsunami disaster.

4.0 Conclusions

The guidelines produced for and presented in this report represent the culmination of several years of effort on the part of the NWS Tsunami Program, NTHMP partners, NWS Weather Forecast Offices and our team. Using social science research methods, in this case qualitative focus group discussions in 2011, we solicited end-user comments to the original draft guidelines developed by the NWS and NTHMP and presented to our team. End-users represented a broad spectrum of agencies and agency representatives. A new draft of the guidelines was produced and again presented to end-users in focus groups in 2013. From this second series of focus group meetings we developed the final version of proposed guidelines for TsunamiReady® recognition presented in this report (in section 3.4.1). The most important and salient conclusions that can be drawn from this study include the following list.

1. Focus group participants largely favored the new proposed guidelines. While they sometimes had concerns over how they would get things done, they agreed with the intent of the elements in the guidelines. This suggests that communities will be receptive to the new guidelines, in part because we followed a process of involving community participation in decisions concerning the guidelines.
2. Focus group participants were very highly engaged in the topics raised for discussion.
3. The complexity of disaster risk reduction actions such as those outlined in the TR guidelines involve the use of technical jargon and concepts that are not easily understood by everyone, even some people fairly closely aligned to emergency management. This means that there is a diversity of mental models to make sense of the information. We found that in some instances focus group participants lacked an accurate understanding of some basic terms as intended for the purpose of conversation. Consequently, care should be taken to ensure that sufficient background is provided before future discussions about the guidelines, including definitions of even basic technical terms that represent complex and dynamic processes (e.g., evacuation).
4. Communities agree that local tsunamis represent a greater threat to human life and safety in comparison to regional and distant tsunamis, which represent a greater threat to development than to human life.
5. Communities did not support TR guidelines based on population data, but they did support a risk-based distinction, such as by vulnerability as proposed in this study.
6. Communities acknowledged that regardless of designation of tsunami threats as local, regional or distant, all TR communities should be able to evacuate their vulnerable populations in the time available for all plausible scenarios of tsunami threat.
7. Communities believed that a community unable to evacuate its population (including highly variable populations due to seasonal changes in temporary resident, seasonal worker and visitor rates) should not be recognized as TR.
8. The *Four Standard Actions* discussed in this report focus on determining whether or not there is sufficient time to evacuate populations of people during specific tsunamis threats. Doing so involves determination of: 1) the *time* it takes for the first wave in a specific tsunami to arrive on a community's shoreline and 2) the *time* it takes to evacuate the population to safety, coupled with 3) understanding the expected *area* of the inundation zone and 4) the *number* of people in the inundation zone. This provides support for a metric based on the evolution of community capacity to meet the *Four Standard Actions*. It could be much more meaningful than the current metric— number of communities recognized annually as TR.
9. Communities agreed that the subdivision of requirements should reflect more rigorous elements for communities with local tsunami hazards than communities with only distant tsunami hazards.
10. There is broad support for mandatory annual evacuation exercises in all schools in local tsunami inundation zones and at least an Emergency Operations Plan for schools in distant tsunami hazard zones.
11. Communities recognize the benefit of tsunami education of all sorts. This includes their support of providing information to high occupancy business and to residents, seasonal workers, temporary residents and visitors. However, they perceive some difficulties in doing so. This includes obtaining: 1) buy-in and participation from local business, even large occupancy businesses, and 2) funding for development and distribution of educational material, including written material and in person training.

12. With regard to community member uncertainty about how to obtain participation of high occupancy businesses and funding, there is great uncertainty about what has been tried elsewhere and what has been effective.
13. Communities support the idea that evacuation to natural high or inland ground is preferable over vertical evacuation, especially where there are no existing, suitable vertical evacuation structures.
14. When no natural high or inland ground exists to which the population can safely evacuate in the time available, communities recognize the need to strengthen and perhaps expand existing evacuation routes to achieve success in evacuation, before committing time and money to construction of vertical evacuation structures.
15. Some communities expressed concern over the success of vertical evacuation strategies in US cities, citing potential problems with people queuing or choosing proximal vertical structures over more distal horizontal evacuation.
16. Community members lack knowledge of examples of vertical evacuation experiences in other cities, both existing ones such as in Waikiki, Hawaii and new ones planned for Washington state. There too is a lack of understanding of the costs of siting, constructing and maintaining vertical evacuation structures.
17. Communities recognize the need to evaluate risk reduction efforts. They have evolved beyond traditional and erroneous beliefs that simply making information available to people will result in people receiving, processing, understanding and acting on the information to an appreciation for the need to evaluate educational efforts. Our concern, however, is that communities lack insight of options for cost-effective evaluations.
18. There is widespread lack of knowledge of what has been tried in communities seeking TR recognition and the possible reasons for success and failure. This suggests a need for new coordination and collaboration among WFOs and between communities that are and are not recognized as TR.
19. The new NIMS formatting developed in early revisions to the guidelines by NTHMP and NWS was favorably received.

Appendices

Appendix 1. Existing 2001-based TsunamiReady® Guidelines

Appendix 2: Proposed Checklist for Use in Evaluating Applications for TsunamiReady® Recognition

Appendix 3: Comparative Table of 2001 TsunamiReady® Guidelines and the Proposed Guidelines

Appendix 1. Existing 2001-based TsunamiReady® Guidelines

TsunamiReady® Guidelines

Guidelines for being designated TsunamiReady are given in the following table. Each guideline is fully discussed following the table. The guidelines are based on four population-based categories.

Guidelines	**Population**			
	< 2,500	2,500 - 14,999	15,000 - 40,000	> 40,000
Guideline 1: Communications and Coordination				
Established 24-hour Warning Point (WP)	**X***	**X***	**X**	**X**
Established Emergency Operations Center (EOC)	**X***	**X***	**X**	**X**
Guideline 2: Tsunami Warning Reception				
Number of ways for EOC/WP to receive NWS tsunami messages. (If in range, one *must* be NWR receiver with tone alert; NWR-SAME is preferred)	**3**	**4**	**4**	**4**
Guideline 3: Local Warning Dissemination				
Number of ways EOC/WP can disseminate warnings to public	**1**	**2**	**3**	**4**
NWR - SAME receivers in public facilities	**X**	**X**	**X**	**X**
For county/borough warning points, county/borough communication network that ensures information flow among communities	**X**	**X**	**X**	**X**
Guideline 4: Community Preparedness				
Number of annual tsunami awareness programs	**1**	**2**	**3**	**4**
Designate/establish tsunami shelter/area in safe zone	**X**	**X**	**X**	**X**
Designate tsunami evacuation areas and evacuation routes, and install evacuation route signs	**X**	**X**	**X**	**X**
Provide written, locally specific, tsunami hazard response material to public	**X**	**X**	**X**	**X**
Schools: Encourage tsunami hazard curriculum, practice evacuations (if in hazard zone), and provide safety material to staff and students.	**X**	**X**	**X**	**X**
Guideline 5: Administrative				
Formal tsunami hazard operations plan	**X**	**X**	**X**	**X**
Biennial meeting between emergency manager and NWS	**X**	**X**	**X**	**X**
Visit by NWS official to community at least every other year	**X**	**X**	**X**	**X**

* For cities or towns with less than 15,000 people, a 24-hour warning point and EOC are required; however, another jurisdiction within the county may provide that resource.

Guideline 1: Communications and Coordination Center

A key to effective hazards management is effective communication. This is especially true in tsunami emergencies, since wave arrival times may be measured in just minutes. Such a "short fused" event requires an immediate but careful response. To ensure such a proper response, communities must have set up the following:

1. 24-Hour Warning Point. To receive recognition under the TsunamiReady program, an agency needs to have a 24-hour Warning Point (WP) able to receive NWS Tsunami information and provide local reports and advice. Typically, this might be a law enforcement or fire department dispatching point. For cities or towns without a local dispatching point, a county/borough agency could act for them in that capacity. The warning point needs to have:
    - 24 hour operations
    - Warning reception capability
    - Warning communication/dissemination capability
    - Ability and authority to activate local warning system(s)
2. Emergency Operations Center. Agencies serving jurisdictions of more than 2,500 people will need an emergency operations center (EOC). It must be staffed during tsunami events to execute the warning point's tsunami warning functions. Summarized below are tsunami-related roles of an EOC:
        - Activate based on predetermined guidelines related to NWS tsunami information and/or tsunami events
        - Staffed by emergency management director or designee
        - Possess warning reception/dissemination capabilities equal to or better than the warning point
        - Ability to communicate with adjacent EOCs/Warning Points C Ability to communicate with local NWS office.

Guideline 2: Tsunami Warning Reception

Warning points and EOCs each need multiple ways to receive NWS Tsunami Warnings. TsunamiReady guidelines to receive NWS warnings in an EOC/WP require a combination of the following, based on population:

- NOAA Weather Radio (NWR) receiver with tone alert. Specific Area Message Encoding (SAME) is preferred. Required for recognition only if within range of transmitter
- NOAA Weather Wire drop: Satellite downlink from NWS.
- Emergency Management Weather Information Network (EMWIN) receiver: Satellite feed and/or VHF radio transmission of NWS products
- Statewide Telecommunications System: Automatic relay of NWS products on statewide emergency management or law enforcement system
- Statewide Warning Fan-out System: State authorized system of passing message throughout warning area
- NOAA Weather Wire via Internet NOAAPort Lite: Provides alarmed warning messages through a dedicated Internet connection
- Direct link to NWS office: For example, amateur or VHF radio
- E-mail from Tsunami Warning Center: Direct e-mail from Warning Center to emergency manager

- Pager Message from Tsunami Warning Center: Page issued from Warning Center directly to EOC/WP
- Radio/TV via Emergency Alert System: Local radio/TV or cable TV
- US Coast Guard Broadcasts: WP/EOC monitoring of USCG marine channels
- National Warning System (NAWAS) drop: FEMA-controlled civil defense hot-line

Guideline 3: Warning Dissemination

1. Upon receipt of NWS tsunami warnings or other reliable information suggesting a Tsunami is imminent, local emergency officials should communicate the threat to as much of the population as possible. Receiving TsunamiReady recognition requires having one or more of the following means of ensuring timely warning dissemination to citizens (based on population):
    - A community program subsidizing the purchase of NWR.
    - Outdoor warning sirens
    - Television audio/video overrides
    - Phone messaging (dial-down) systems
    - Other locally-controlled methods, e.g., local broadcast system or emergency vehicle sirens.
2. Once NWS Tsunami Warnings are received, or local information suggests an imminent tsunami threat, the local emergency officials should communicate with as much of the population as possible. To be recognized as TsunamiReady, a community must have NOAA Weather Radio in the following facilities:

    Required Locations:

    - 24 hour Warning Point
    - Emergency Operations Center
    - City Hall
    - School superintendent office or equivalent

    Recommended Locations:

    - Courthouses
    - Public libraries
    - Hospitals
    - All schools
    - Fairgrounds
    - Parks and recreation areas
    - Public utilities
    - Sports arenas
    - Transportation departments
    - Nursing Homes/Assisted Living
    - Harbors

    Receivers with SAME capability are preferred (this is required for recognition only if locations are within range of NWR transmitter). In addition, recognition will be contingent on having one or more of the following means (based on population) of ensuring timely warning dissemination to citizens:

    - Cable television audio/video overrides.

- Local Flood warning systems with no single point of failure.
- Other locally-controlled methods like a local broadcast system or sirens on emergency vehicles.
- Outdoor warning sirens.

3. Counties/Boroughs Only: A county/borough-wide communications network ensuring the flow of information among all cities and towns within its borders. This would include provision of a warning point for the smaller towns, and fanning out of the message as required by state policy. Critical public access buildings should be defined by each community's tsunami warning plan.

Guideline 4: Awareness

Public education is vital in preparing citizens to respond properly to Tsunami threats. An educated public is more likely to take steps to receive tsunami warnings, recognize potentially threatening Tsunami events, and respond appropriately to those events. Communities seeking recognition in the TsunamiReady program must:

1. Conduct or sponsor Tsunami awareness programs. Possible locations may include schools, hospitals, fairs, workshops, and community meetings (number of presentations per year is based on population).
2. Define Tsunami evacuation areas and evacuation routes, and install evacuation route signs.
3. Designate a Tsunami shelter/area outside the hazard zone.
4. Provide written Tsunami hazard information to the populace, including:
   - Hazard zone maps
   - Evacuation routes
   - Basic tsunami information

   These instructions can be distributed through mailings, i.e, utility bills, within phone books, and poste at common meeting points such as libraries and public buildings throughout the community.

5. Local schools must meet the following criteria:
   - Encourage the inclusion of Tsunami information in primary and secondary school curriculums. NWS will help identify curriculum support material.
   - Provide an opportunity biennially for a Tsunami awareness presentation by the local NWS office and/or the local Emergency Manager.
   - Schools within the defined hazard zone must have Tsunami evacuation drills at least biennially.
   - Written safety material should be provided to all staff and students.
   - Have an earthquake plan.

Guideline 5: Administrative

No program can be successful without formal planning and a pro-active administration. To be recognized in the TsunamiReady Program:

1. A Tsunami warning plan must be in place and approved by the local governing body. This plan must address the following:
   - Warning point procedures
   - EOC activation criteria and procedures
   - Warning point and EOC personnel specification

- Hazard zone map with evacuation routes
- Procedures for canceling an emergency for those less-than-destructive Tsunamis
- Criteria and procedures for activation of sirens, cable television override, and/or local systems activation in accordance with state Emergency Alert System (EAS) plans, and warning fan-out procedures, if necessary
- Annual exercises.

2. Yearly visit/discussion with local NWS Office or Tsunami Warning Center personnel. Due to distance and other logistical constraint in the Alaska and Pacific Regions, this guideline can be met by a visit to the NWS office, phone discussion, or e-mail.

NWS officials will commit to visit recognized communities, at least every other year, to tour EOCs/Warning points and meet with key officials.

Appendix 2: Proposed Checklist for Use in Evaluating Applications for TsunamiReady® Recognition

Community:		**Reviewer Name & Date:**		
Code	**Action Short Name**	**Planned**	**Achieved**	**Reviewer Notes**
Mit-1	Mapped tsunami-hazard zones and estimated wave-arrival times			
Mit-2	Tsunami hazard and vulnerability are addressed in FEMA-approved Local Multi-Hazard Mitigation Plan			
Mit-3	Designated tsunami hazard areas, evacuation routes, safe zones, and assembly areas			
Mit-4	Signage to identify tsunami hazard areas, evacuation routes, safe zones, and assembly areas			
Mit-5	Availability of natural high or inland ground has been identified for at-risk populations, based on evacuation assessments			
Mit-6	Strengthened and maintained evacuation routes			
Mit-7	A plan for vertical-evacuation strategies has been established if at-risk populations have insufficient time to reach natural high ground			
Prep-1	Annual tsunami exercise, such as a tabletop, functional or full-scale			
Prep-2	First Responder training that includes tsunami hazard, warning, and evacuation protocols			
Prep-3	Evacuation maps of tsunami hazard areas, evacuation routes, safe zones, and assembly areas made available to the public			
Prep-4	Written materials that include tsunami information, hazard maps, evacuation routes, safety tips, and response protocols			
Prep-5	Events (at least 1 per year) to educate all citizens on tsunami hazards, evacuation routes, safety and response			

Code	Action Short Name	Planned	Achieved	Notes
Prep-6	Public schools in tsunami-hazard zones have an Emergency Operations Plan			
Prep-7	Annual presentations by emergency management to public schools and child-care centers in tsunami-hazard zones			
Prep-8	Information provided annually to business owners for employee training that targets high-occupancy businesses			
Prep-9	Annual training, outreach or education that targets residents living or working in tsunami-hazard zones			
Prep-10	Participation in NOAA/NWS Tsunami Warning Center communication tests			
Resp-1	Tsunami hazards addressed in Emergency Operations Plan			
Resp-2	Emergency Operations Center (EOC)			
Resp-3	Redundant and reliable means for Communication/Dispatch Center and/or EOC to receive official messages			
Resp-4	Redundant and reliable means for Communication/Dispatch Center and/or EOC to disseminate official messages			
Resp-5	Public Alert Certified* NOAA Weather Radio receivers in critical facilities and public venues			
Rec-1	Plan for continuity of operations plan and/or continuity of government			
Rec-2	Plan for management of debris			

Appendix 3: Comparative Table of 2001 TsunamiReady® Guidelines and the Proposed Guidelines

Line	2001 Guidelines	Proposed Guidelines	Notes
1	**Guideline 1 Communication & Coordination** *For cities or towns with <15,000 people, a 24-hour warning point and EOC are required; however, another jurisdiction within the county may provide that resource.	✓ Resp–2: EOC that is staffed during tsunami incidents and capable of achieving the elements listed in bullet form below. Note that this applies only for jurisdictions of 15,000 or more people. For communities smaller than 15,000, there must be ties to an EOC.	Resp-2 is one of few examples where community population is still used. It specifies "ties to an EOC," and does not specify within county
2	1. Established 24-hour Warning Point (WP). To receive recognition under the TsunamiReady program, an agency needs to have a 24-hour Warning Point (WP) able to receive NWS Tsunami information and provide local reports and advice. Typically, this might be a law enforcement or fire department dispatching point. For cities or towns without a local dispatching point, a county/borough agency could act for them in that capacity. The warning point needs to have:	✓ Resp-2: see above	
3	• 24 hr operations	✓ Resp-2B: 24-hour operations or plan to activate the EOC for tsunami incidents in accordance with the EOP	
4	• Warning reception capability	✓ Resp-2C: Warning reception and dissemination capability	
5	• Warning dissemination capability		
6	• Ability & authority to activate local warning sirens	✓ Resp-2E: Has ability and authority to activate the public warning system in its area of responsibility	

Line	2001 Guidelines	Proposed Guidelines	Notes
7	2. Emergency Operations Center (EOC). Agencies serving jurisdictions of > 2,500 people will need an EOC. It must be staffed during tsunami events to execute the WP's tsunami warning functions. Summarized below are tsunami-related roles of an EOC:	✓ Resp-2: see above	2001 Guideline 2 states EOCs are needed with populations >2,500, but the tabular data use 15,000 population as cut-off.
8	• Activate based on predetermined guidelines related to NWS tsunami information and/or tsunami events	✓ Resp-2A: Executing tsunami warning functions based on predetermined guidelines related to NWS tsunami information and/or tsunami incidents	
9	• Staffed by emergency management director or designee	✓+ Resp-2D: Staffed with trained and credentialed emergency management personnel	More specific language.
10	• Possess warning reception/ dissemination capabilities equal to or better than the warning point	✓ + Resp-2F: Maintains ability to communicate within and across jurisdictions (e.g., with other EOCs including those maintained by private organizations, Incident Command Posts, etc.) through resilient and redundant methods. Should have communication capabilities equal to or better than the Communication/Dispatch Center	More specific language. Reception/ dissemination covered in RESP-3 & 4. Merges the two 2001 items. Refers to WP as "Communication/ Dispatch Center"
11	• Ability to communicate with adjacent EOCs/Warning Points		
12	• Ability to communicate with local NWS office	✓+ Resp-3C: NWSChat: An instant messaging program available via the Internet used by NWS operational personnel to share critical warning decision expertise and other significant weather information InteractiveNWS (iNWS): An experimental real-time, user-defined, warning messaging service for mobile devices intended for emergency management/response personnel ✓+ Resp-2G: Maintains established communication links with NWS (e.g., NWSChat, phone, etc.) to relay real-time weather and flood reports to support the warning decision-making process.	More specific language.

Line	2001 Guidelines	Proposed Guidelines	Notes
13	**Guideline 2 Tsunami Warning <u>Reception</u>:** Warning points and EOCs each need multiple ways to <u>receive</u> NWS Tsunami Warnings. **<u>Requirements</u>** for a combination of the following are based on population:	Resp-3: Redundant and reliable means for 24-Hour Warning Point and/or EOC to <u>receive</u> official tsunami watch, warning and advisory messages from NOAA TWCs, local NWS Offices, or other officially-recognized warning centers. ✓ Multiple ways to receive are maintained. x No population requirement.	Requires at least 3 ways to receive messages, but is not linked to population. Requires at least 3 of a list (see guidelines)
14	• <u>NOAA Weather Radio (NWR)</u> receiver with tone alert. • Specific Area Message Encoding (SAME) is preferred. • **<u>Required</u>** for recognition only if within range of transmitter	✓ Resp-3A: Public Alert® certified NOAA Weather Radio (NWR) receiver: ***Required*** *for recognition only if within reliable reception range of a NWR transmitter.* x ✓	Refers to Public Alert.® SAME is not mentioned. Maintained requirement.
15	• <u>NOAA Weather Wire drop</u>: Satellite downlink from NWS	x Resp-3B: NWS (NAWAS) drop: FEMA-controlled, 24-hour, continuous-private-line telephone system used to convey warnings to federal, state and local governments, as well as the military and civilian population.	Notes: Refers to NAWAS drop instead of NOAA Weather Wire drop
16	• <u>Emergency Management Weather Information Network (EMWIN)</u> receiver: Satellite feed and/or VHF radio transmission of NWS products	✓ Resp-3D: Emergency Management Weather Information Network (EMWIN) receiver: Device that receives satellite feed and/or VHF radio transmission of NWS products.	
17	• <u>Statewide Telecommunications System</u>: Automatic relay of NWS products on statewide emergency management or law enforcement system	✓ Resp-3E: Statewide Telecommunications System: Automatic relay of NWS products, usually on law enforcement systems.	
18	• <u>Statewide Warning Fan-out System</u>: State authorized system of passing message throughout warning area	x	Only mention fan-out in RESP-1Da

Line	2001 Guidelines	Proposed Guidelines	Notes
19	• NOAA Weather Wire via Internet NOAAPort Lite: Provides alarmed warning messages through a dedicated Internet connection	✓ x Resp-3L: NOAA Weather Wire drop: Satellite downlink data feed from NWS.	Different language. No mention of NOAAPort Lite
20	• Direct link to NWS office: e.g., amateur or VHF radio	✓ x Resp-3G: Amateur Radio transceiver: Potential communications directly to NWS office.	
21	• E-mail from Tsunami Warning Center (TWC): Direct e-mail from TWC to emergency manager	✓ Resp-3M: Direct e-mail from TWC. + Resp-3N: Direct fax from TWC	Resp-3N mentioned direct fax from TWC . Old guidelines do not.
22	• Pager Message from TWC: Page issued from TWC directly to EOC/WP	✓ Resp-3O: Text message or direct pager message from TWC	Text or pager message.
23	• Radio/TV via Emergency Alert System: Local radio/TV or cable TV	✓ + Resp-3I: Television: Access to local network or cable TV ✓ + Resp-3J: Local Radio: EAS, LP1/LP2	Resp-3J mentions LP1/LP2
24	• US Coast Guard Broadcasts: WP/EOC monitoring of USCG marine channels	✓ Resp-3P: US Coast Guard Broadcasts: WP monitoring of USCG marine channels	Slightly different language
25	• National Warning System (NAWAS) drop: FEMA-controlled civil defense hot-line	✓+ Resp-3B: National Warning System (NAWAS) drop: FEMA-controlled, 24-hour, continuous-private-line telephone system used to convey warnings to federal, state and local governments, as well as the military and civilian population.	More specific language.
26		+ Resp-3F: CMAS/WEA Alerts: Commercial Mobile Alert System (CMAS)/Wireless Emergency Alerts (WEA) service that allows public safety authorities to use FEMA's IPAWS Open Platform for Emergency Networks (IPAWS-OPEN) to send geographically targeted, text-like wireless emergency alerts to the public + Resp-3G: Amateur Radio transceiver: Potential communications directly to NWS office.	Additional ways to receive information:

Line	2001 Guidelines	Proposed Guidelines	Notes
27	…..continued from previous page	…..continued from previous page….. + Resp-3H: Alerts provided through an AWCI provider: Typically received via email and/or a texting service to a smartphone, tablet, or computer + Resp-3I: Television: Access to local network or cable TV + Resp-3J: Local Radio: Emergency Alert System, LP1/LP2 + Resp-3K: Internet monitoring capability, including social media such as Facebook and Twitter + Resp-3Q: Satellite Phone + Resp-3R: Other communications channel (please explain): For example, active participation in a state-run warning network, two-way, local emergency responder radio network, etc.	…..continued from previous page…..
28	**Guideline 3 Local Warning <u>Dissemination</u>** 1. Upon receipt of NWS tsunami warnings or other reliable information suggesting a Tsunami is imminent, local emergency officials should communicate the threat to as much of the population as possible. **<u>Requirement</u>** to disseminate with the following means is based on population.	✓x + Resp–4. Redundant and reliable means for 24-Hour Warning Point and/or EOC <u>to disseminate</u> official tsunami watch, warning and advisory messages to the public. <u>At least three</u> of the following capabilities must be met: [see Resp-4 elements below]	No population based requirement. Requires at least 3 channels be used.
29	○ A community program subsidizing the purchase of NWR	x	Not mentioned.
30	○ Outdoor warning sirens	✓ Resp-4E: Outdoor warning sirens	
31	○ Television audio/video overrides	✓ Resp-4B: Cable television audio/video overrides	
32	○ Phone messaging (dial-down) systems	✓+ Resp-4K: Telephone tree to critical facilities	Uses “critical facilities” instead of dial-down
33	○ Other locally-controlled methods, e.g., local broadcast system or emergency vehicle sirens	✓+ Resp-4D: Plan for siren/megaphone notification on emergency vehicles ✓+ Resp-4F: Other local alert broadcast system ✓+ Resp-4O: Other, please explain	Resp-4D: slightly different language. Resp-4F: uses “alert”

Line	2001 Guidelines	Proposed Guidelines	Notes
34	…..continued from previous page…..	Additional items in Resp-4…: A. Emergency Alert System (EAS) message initiation and broadcast G. Local pager/texting system H. CMAS/WEA Alerts available capability throughout the jurisdiction I. Amateur Radio Operator network (Ham Radio) J. Telephone mass notification system L. Coordinated jurisdiction-wide radio network M. Counties, Parishes, Boroughs, etc. - A countywide communications network that ensures the flow of information between all cities and towns within its borders. This would include acting as the surrogate WP and/or EOC for jurisdictions without those capabilities. N. Social Media usage (Twitter, Facebook, etc.)	Additional items …
35	2. Once NWS Tsunami Warnings are received, or local information suggests an imminent tsunami threat, the local emergency officials should communicate with as much of the population as possible. **Required locations of NWRs**	✓+ Resp–5. Public Alert Certified* NOAA Weather Radio (NWR) receivers in critical facilities and public venues in and around the tsunami inundation zone (where reception is available) including: ✓	Specific about tsunami inundation zone Maintains *nearly* identical required locations in Resp-5Aa- d.
36	• 24 hour Warning Point	✓ Resp5-Aa: Communication/Dispatch Center serving as the 24-hour WP	
37	• Emergency Operations Center	✓ Resp-5Ab: EOCs	
38	• City Hall	✓ Resp-5Ac: City Hall	
39	• School superintendent office or equivalent	✓+ Resp-5Ad: Public School Superintendent office	Specifies public schools and drops “or equivalent”

Line	2001 Guidelines	Proposed Guidelines	Notes
40	Receivers with SAME capability are required only if locations are within range of NWR transmitter.	x	No mention of SAME
41	One or more of the following means of ensuring timely warning dissemination to citizens is **required** based on population:	✓ Maintain a requirement, but …. x No population requirement.	None of the 4 items below (Resp-4b through 4f)are **required**, but could be included in the 3 required for all populations
42	○ Cable television audio/video overrides.	✓x Resp-4B: Cable television audio/video overrides	
43	○ Local Flood warning systems with no single point of failure.	✓ x Resp-4C: Local flood warning systems ideally with no single point of failure	
44	○ Other locally-controlled methods like a local broadcast system or sirens on emergency vehicles.	✓ x Resp-4D: Plan for siren/megaphone notification on emergency vehicles. ✓ x Resp-4F: Other local alert broadcast system	Slightly different language
45	○ Outdoor warning sirens.	✓ x Resp-4E: Outdoor warning sirens	
46	3. For county/borough warning points, county/borough communication network that ensures information flow among communities	✓ x Counties, Parishes, Boroughs, etc. - A countywide + communications network that ensures the flow of information between all cities and towns within its borders. This would include acting as the surrogate WP and/or EOC for jurisdictions without those capabilities.	More specific language
47	**Guideline 4: Awareness**		Includes: MITIGATION (MIT) and PREPARENDESS (PREP). Requirements are not based on population.
48	Public education … **Requirements**: 1. Conduct or sponsor Tsunami awareness programs. Required number of annual presentations is based on population.	✓ + Prep-1. Annual tsunami exercise, such as a tabletop, functional or full-scale exercise. This requirement is in addition to the annual exercise required for selected schools in the inundation zone (see Prep-6). ✓ + Prep-2. First Responder training that includes tsunami hazard, warning and evacuation protocols	Prep-1, 2, 5, 6,-7, 8, 9 and 10 expand education. Annual exercise. First-responder training.

Line	2001 Guidelines	Proposed Guidelines	Notes
49	6. …..continued from previous page….. Conduct or sponsor Tsunami awareness programs. Required number of annual presentations is based on population.	✓ + Prep-5A-J: Events (<u>at least one per year</u>) to educate people on tsunami hazards, evacuation routes, safety and response, such as: K. Community tsunami safety workshop and education campaign L. Door-to-door safety awareness campaign with residents and businesses in your community's tsunami inundation/hazard zone. M. Local business workshop to help them to develop response and business continuity plans N. Local Emergency Planning Committee meetings. O. Local Area Emergency Communications Committee P. State Tsunami Technical Review/Advisory Committee Q. Presentations or workshops for faith-based organizations, community or civic groups R. Booths at community events and county fairs. S. Local public safety campaigns, such as "Tsunami Awareness" week/month. T. Requirement to have NW radios in new buildings.	Events to be held at least annually. Communities determine what is reasonable and justify actions during application & review.
		+ Prep-6. Public schools in tsunami-hazard zones have an EOP to respond to the tsunami threats in their community. Private schools are encouraged to have the same plans and actions as public schools. It is recommended that all schools in tsunami-hazard zones practice their plan annually in an evacuation drill, but it is required for those with a local tsunami hazard.	Prep-6: EOP for public & private schools. Required annual evacuation drill for public schools in inundation zone.

Line	2001 Guidelines	Proposed Guidelines	Notes
50	1. …..continued from previous page….. Conduct or sponsor Tsunami awareness programs. Required number of annual presentations is based on population.	+ Prep-7. Emergency management informs all schools and child care centers annually of their risk of tsunami hazards and provide information on warning and evacuation procedures. Emergency Management must provide information on recommended evacuation sites to schools, including vertical evacuation sites if necessary. An offer for an in-person presentation from the local Emergency Management office should be included in the information that is sent to schools.	Prep-7: Emergency management visits to schools, child care centers annually.
51		+ Prep-8. Information provided annually to business owners for employee training, outreach or education that targets high-occupancy businesses in the tsunami-hazard zones (e.g., hotels, restaurants, fisheries, industrial sites). Visitors and seasonal workers in coastal areas are known to be less familiar with coastal processes, including tsunamis and tsunami evacuation routes and sheltering areas, than permanent and temporary residents. As such, it is necessary that information is not only available and provided to the owners and staff of high occupancy businesses (preferably to small businesses too), but steps be taken to ensure that the recipients of such information receive, process, and understand it. This could be supported by use of a simple and inexpensive small pre-test and post-test for training. + Prep-9. Annual training, outreach or education that targets individuals living or working in tsunami-hazard zones. Training, outreach or education efforts should address evacuation routes, safety and personal actions needed to effectively respond to the tsunami hazard profile of the community and during different seasons and times of day (e.g., during work or school, at the beach on a weekend, etc).	Prep-8: Information provided to business owners annually for high-occupancy business. Information available for visitors and seasonal workers. Prep-9: Information provided annually that targets people living or working in inundation zone.

Line	2001 Guidelines	Proposed Guidelines	Notes
52	1. …..continued from previous page…..	+ Prep-10. Participation in NOAA/NWS TWC communication tests	Prep-10: TWC tests.
53	7. Define Tsunami evacuation areas and evacuation routes, and install evacuation route signs.	✓ + Mit-3. Designated tsunami hazard areas, evacuation routes, non-hazard areas, and assembly areas (sufficient to support the population), based on tsunami inundation modeling and mapping and in accordance with your tsunami evacuation response plan (Resp-1). ✓ + Mit-4. Signage to identify tsunami hazard areas, evacuation routes and assembly areas. Signage should be implemented according to State policies and as determined to be appropriate by local authorities, with possible assistance from partners. Wherever possible, signage should comply with specifications aimed at standardization so that all coastal communities eventually will have identical signage. Continuity of signage benefits domestic residents and international visitors.	
54	8. Designate a Tsunami shelter/area outside the hazard zone.	✓ + Mit-3: see above	
55	9. Provide written Tsunami hazard information to the populace, including:	✓ Prep-4: Written materials that include tsunami information, hazard maps, evacuation routes, safety tips, and response protocols. Information on response protocols includes how official agencies and the general public disseminate and receive official warning messages. Information on natural warnings or environmental cues (e.g., ground motion from the earthquake or sight of a rising or receding shoreline), social cues, and informal warnings should be included to address local tsunami threats where official warnings may not be realistic. Information should include details on both sources of these warning messages and cues and the channels through which information may be received and subsequently disseminated.	More specific language about content. Requires 3 or more options be used to disseminate information.

Line	2001 Guidelines	Proposed Guidelines	Notes
56	4. …..continued from previous page….. Provide written Tsunami hazard information to the populace, including:	Prep-4A-I*.....continued from previous page.....* It should also be tailored to reflect local conditions and demographics such as appropriate languages or recognizing workforce differences between businesses where necessary. Information shall be disseminated using <u>three or more of the following</u>: J. Visitor centers and local tourist businesses (e.g., restaurants, bars, hotels) K. Local hotel and motel staff L. Historical markers and interpretative signs M. Radio and television spots N. Libraries O. Public utility/service industry bill safety notices. P. Billboard, highway, or beach entry signs. Q. Local faith-based and civic organization bulletins/mailings. Bulk mailings of tsunami safety information to local residents and businesses	
57	o Hazard zone maps	✓ + Prep-3. Evacuation maps of tsunami hazard areas, evacuation routes, non-hazard areas and assembly areas are available in appropriate print and digital media.	
58	o Evacuation routes	✓ + Prep-3 Evacuation maps of tsunami hazard areas, evacuation routes, non-hazard areas and assembly areas are available in appropriate print and digital media.	
59	o Basic tsunami information	✓ Prep-4 Written materials…. (see guidelines for details)	See line 56 above
60	10. Local schools must meet the following criteria: o Encourage the inclusion of Tsunami information in primary and secondary school curriculums. NWS will help identify curriculum support material.	x not in proposed guidelines per se, but see Prep-6 and 7	Schools (private & public) discussed in Prep-6 and Prep-7

Line	2001 Guidelines	Proposed Guidelines	Notes
61	○ Provide an opportunity biennially for a Tsunami awareness presentation by the local NWS office and/or the local Emergency Manager.	✓ + Prep-7. Emergency management informs all schools and child care centers annually of their risk of tsunami hazards and provide information on warning and evacuation procedures. Emergency Management must provide information on recommended evacuation sites to schools, including vertical evacuation sites if necessary. An offer for an in-person presentation from the local Emergency Management office should be included in the information that is sent to schools.	More specific information about evacuation
62	○ Schools within the defined hazard zone must have Tsunami evacuation drills at least biennially.	✓ + Prep-6. Public schools in tsunami-hazard zones have an Emergency Operations Plan to respond to the tsunami threats in their community. Private schools are encouraged to have the same plans and actions as public schools. It is recommended that all schools in tsunami-hazard zones practice their plan annually in an evacuation drill, but it is required for those with a local tsunami hazard.	Notes: All schools in inundation zone recommended to practice evacuation drill annually, but it is **<u>required</u>** only for this schools with a local tsunami hazard. **<u>Private schools</u>** are encourage to have same plans as **public schools.**
63	○ Written safety material should be provided to all staff and students.	✓ x subsumed in Prep-7.	
64	○ Have an earthquake plan.	x not in proposed guidelines	

Line	2001 Guidelines	Proposed Guidelines	Notes
65	**Guideline 5: Administrative** 3. A Tsunami warning plan must be in place and approved by the local governing body. This plan must address the following:	✓ + Mit-2. Tsunami hazard and community vulnerability information specified in FEMA-approved Local Multi-Hazard Mitigation Plan. As detailed in section 44CFR Part 201.6 (c)(2) of the Stafford Disaster Mitigation Act, this information shall include: 1) a tsunami-hazard profile, including source locations, extent of inundation, run-up or height that a wave reaches above sea level, previous tsunami occurrences, and likelihood of future tsunamis, and 2) a description of community vulnerability, including areas exposed to inundation and an impact summary of specific sub-populations of people expected to be affected (e.g., individuals with access and functional needs, visitors, seasonal workers), businesses, infrastructure, and critical facilities. Estimates of population exposure in tsunami-hazard zones should be based on local knowledge or on analysis of population data (e.g., Census), and can include ranges of population counts to recognize daily or seasonal fluctuations in workers, visitors and temporary residents. Also, see details under Resp-1: Tsunami hazards are addressed in the Emergency Operations Plan, including:	More specific about hazard profiles, exposure and vulnerability, including residents, temporary residents/workers and visitors.
66	o Warning point procedures	✓ + Resp-1B: Detail Communication/Dispatch Center procedures relating to tsunamis	
67	o EOC activation criteria and procedures	✓ Resp-1C: Specify EOC activation criteria and demobilization procedures	
68	o Warning point and EOC personnel specification	✓ + Resp-1E: Provide contact information for all jurisdictional agencies and response partners including the NWS	

Line	2001 Guidelines	Proposed Guidelines	Notes
69	○ Hazard zone map with evacuation routes	✓ + Resp-1F: Evacuation plans for both distant and local events, roles of community entities/agencies, hazard zones map with evacuation routes, and protocols for access and functional needs populations.	Resp-1- address content of EOP.
70		✓ + Mit-1: Mapped tsunami-hazard zones and estimated wave-arrival times. The primary source for mapping potential tsunami-impact zones is inundation modeling, which illustrates expected areas to be flooded by the tsunami. If this is unavailable, other acceptable sources include guidance from tsunami experts from NOAA, the U.S. or State Geological Surveys, universities, or consultants. Modeling and mapping efforts shall meet NOAA/NTHMP guidelines. As part of a tsunami-hazard mapping effort, a community should have an estimate of the duration or "window" of time they will have to react and evacuate for their various local to distant tsunami threats.	More detailed content, including: • tsunami inundation mapping and • estimation of available time to respond.
71		✓ + Mit-3. Designated tsunami hazard areas, evacuation routes, non-hazard areas, and assembly areas (sufficient to support the population), based on tsunami inundation modeling and mapping and in accordance with your tsunami evacuation response plan (Resp-1).	Designation of specific zones (hazard, evacuation routes, etc).
72		✓ + Mit-4. Signage to identify tsunami hazard areas, evacuation routes and assembly areas. Signage should be implemented according to State policies and as determined to be appropriate by local authorities, with possible assistance from partners. Wherever possible, signage should comply with specifications aimed at standardization so that all coastal communities eventually will have identical signage. Continuity of signage benefits domestic residents & international visitors.	Signage to identify specific zones.

Line	2001 Guidelines	Proposed Guidelines	Notes
73	…..continued from previous page…..	Mit-5. Availability of **natural high or inland ground** has been identified for at-risk populations. If suitable high or inland ground is available, then it should be determined if at-risk populations can reasonably reach these areas before tsunami waves are predicted to arrive. Evacuation assessments and/or modeling should take into account the types of at-risk individuals present (e.g., elderly, children, tourists, infirm, seasonal workers). They should also take into account the reliability of evacuation routes (e.g., bridges, roads), especially in areas where the tsunami may be triggered by a strong earthquake that could weaken or destroy the road, bridge, etc. If natural high or inland ground is not accessible within the time the first wave is predicted to arrive, see Mit-6.	Major & new additional guidelines.
74		Mit-6**. Strengthened evacuation routes** to enable at-risk populations to effectively evacuate to natural high or inland ground in the time available. For communities with local tsunami threats related to earthquakes, strengthening of evacuation routes may mean developing and maintaining foot trails through areas of heavy vegetation, improving roads, and seismic strengthening of bridges and roads. After strengthening evacuation routes, if people are still unable to reach natural high or inland ground in the time available, see Mit-7.	

Line	2001 Guidelines	Proposed Guidelines	Notes
75	…..continued from previous page…..	Mit-7. A plan for **vertical-evacuation** strategies using existing or planned berms and other structures has been established if it is unlikely that at-risk populations would be able to reach natural high ground and inland locations before arrival of first wave. This plan identifies current or proposed locations of vertical evacuation structures, the at-risk populations they would serve, funding sources, land use considerations, and a timeline for implementation. Communities must demonstrate progress in implementing this plan at subsequent reviews for TsunamiReady® recognition.	Major & new additional guideline.
76	o Procedures for canceling an emergency for those less-than-destructive Tsunamis	✓+ Resp-1G: Procedures for updating information and "all-clear" messages after initiating a tsunami incident response	More specific information about updates & different language about all-clear.
77	o Criteria and procedures for activation of sirens, cable television override, and/or local systems activation in accordance with state Emergency Alert System (EAS) plans, and warning fan-out procedures, if necessary	✓+ Resp-1: Tsunami hazards are addressed in the Emergency Operations Plan, including: …Resp-1D. Specify tsunami criteria and procedures for the activation of the public warning system in its area of responsibility …Resp-1Da. Criteria and procedures for siren activation, cable television override, and/or local activation in accordance with state EAS plans, warning fan-out procedures, and communication to functional and access needs populations.	
79		x Resp-1H: Procedures for providing security for evacuated zone.	Not in the 2001 Guidelines
80		x Rec–1. A plan that considers how communities will continue to operate and recover after a tsunami disaster.	
81		X Rec–2. A plan that considers how communities will manage debris after a tsunami disaster.	

Line	2001 Guidelines	Proposed Guidelines	Notes
82	2. Yearly visit/discussion with local NWS Office or Tsunami Warning Center personnel. Due to distance and other logistical constraint in the Alaska and Pacific Regions, this guideline can be met by a visit to the NWS office, phone discussion, or e-mail.	x	Not in the proposed Guidelines
83	NWS officials will commit to visit recognized communities, at least every other year, to tour EOCs/Warning points and meet with key officials.	x	Not in the proposed Guidelines