**NTHMP General Meeting Day 1, Wednesday February 8, 2012**

**Attendees:**

**NOAA/NWS** – Vickie Nadolski, National Weather Service Western Region Dir.

**NOAA/NWS** – Jane Hollingsworth, NWS Tsunami Program Manager

**NOAA/NWS** – Paul Whitmore, Director, West Coast/Alaska Tsunami Warning Center

**NOAA/NWS** – Charles McCreery, Director, Pacific Tsunami Warning Center

**NOAA/NWS** – Jason Tuell, Chief MSD/OCWWS

**NOAA/NWS** – Troy Nicolini, WCM, Eureka, CA

**NOAA/NWS** – Melinda Bailey, NWS Southern Region

**NOAA/NWS** – Jeff Lorens, NWS Western Region

**NOAA/NWS** – Christa von Hillebrandt, Carribbean Tsunami Program

**NOAA/NWS** – Lewis Kozlosky, NWS Tsunami Program

**NOAA/ITIC** – Laura Kong, NOAA International Tsunami Information Center

**NOAA/OAR** – Marie Eble, Pacific Marine and Environmental Laboratories

**NOAA/OAR** – Vasily Titov, Pacific Marine and Environmental Laboratories

**NOAA/NGDC** – Susan McLean, National Geophysical Data Center

**FEMA** – Tamra Biasco, FEMA

**American Samoa –** Lisa Togiai, Dept. of Homeland Security

**AK** - Erv Petty, Alaska Dept. Homeland Security and Emergency Mgmt.

**AK** – Roger Hansen, University of Alaska, Fairbanks

**AL –** Charles Williams, Alabama Emergency Management Agency

**CA** – Kevin Miller, California Emergency Management Agency

**CA** – Rick Wilson, California Geological Survey

**CA** – Chuck Real, California Geological Survey

**MD** – Rainer Dombrowsky, Maryland Emergency Management Agency

**HI -** Kevin Richards, State of Hawaii Civil Defense

**OR –** George Priest, Oregon Department of Geology and Mineral Industries

**OR** – Althea Rizzo, Oregon Emergency Management

**PR** – Victor Huerfano, Puerto Rico Seismic Network, UPR

**WA** - Tim Walsh, Washington Division of Geology and Earth Resources

**WA** – John Schelling, Washington Emergency Management Department

**WA** – Noemi Lachapelle, Washington Emergency Management Department

**USGS** – David Oppenheimer, Menlo Park, CA

**East Coast States** – Rainer Dombrowsky, Maryland Emergency Management Agency

**East Coast States** – Jim Kirby, U. Delaware

**East Coast States** – Stephan Grilli, U. Rhode Island

**East TN State U. –** Chris Gregg

**Gulf Coast States** – Charles Williams, Alabama Emergency Management Agency

**Gulf Coast States** – Juan Horillo, Texas A&M University

**Pacific Islands** – Lisa Togiai, American Samoa DHS

**U.S. Navy** – Matthew Watts, JTWC

**USGS –** Nate Wood

**Canada** – Daniel Ingram, Environment Canada

**Canada** – George Parkes, Environment Canada

**Canada –** Teron Moore, Emergency Management British Columbia

**NTHMP General Meeting Day 1 (Wednesday 2/8) AM**

**Vicki Nadolski: FY 12 Budget constraints**

* Previous budget climate will change; more at the CC closed meeting tomorrow.

**Jane Hollingsworth: Overview / Logistics**

**Paul Whitmore and Charles McCreery: Response to Japan Tsunami**

* Source size: 300Km x 200km; MW 9; slip 50m at trench; 80m max (10-15m more normal for MW9); ruptured all the way to the seafloor 150-200s with rupture in trench with deepest water
* ~16K dead, 4K missing; worst economic loss for any natural disaster; ¼ of national annual budget of Japan; 65% of deaths over 60 years; over 130K remaining in shelters more than 1 month post-event (indication of number saved/evacuated); at coast wave was 15m above sea level; currents about 15 knots in Japan, 9 knots in Crescent City; 2 distant deaths (CA and New Guinea)
* 70,000 trees planted to mitigate inundation snapped and washed away; sea walls mostly overtopped, vertical evacuation sometimes insufficient for event
* Warnings worked, most people in inundation zone evacuated
* Faith in sea walls not good; initial earthquake magnitude underestimated; due to loss of communications following first message – updated information not received
* Distant lessons learned: good to have the time with these large events to take the time initially to fine tune event and impacts (delay of a few hours to US shores) and not have to do significant changes; forecast height had about 30% error; inundation may have larger error due to tide levels (forecasts do not currently incorporate tides);
* Reflections occur – reflections off of South American coast caused significant currents along California 30 hours after event and 3 hours after warnings ended; sparse coastal sea level observations hamper forecasts
* This was a 500-1000 year event; Japan planned for 100 year type event; >2m amplitudes as far away as Chile; damage Pacific-basin wide
* Initial warning was out in 3 minutes; impact in 15-20 minutes; JMA change in procedures for potential mega-tsunami [currently have warning for 1-3m and over 3m, would now add level above for MW8 to broadcast maximum event in database (MW8-9) as conservative higher response]; many of the losses were due to people entering inundation zone to save family members; locate nuclear power plants (and other hazardous facilities) outside inundation zones.
* Lessons learned Chip McCreery - Hawaii: significant impacts many hours after initial wave (Big Island largest impacts 3-4 hours post first wave that came at 3AM); Advisory should have continued longer – near-drowning event after cancelation; gaps in gauges (17’ runup on Oahu north shore not reflected on any gauge); review what is considered a “maximum credible event.”
* Hawaii, Kevin Richards: Most of damage came after 7AM; learned that we need to improve marine planning – duration of warning, paths for navigation large vs. small boats (120+ boats lost when all clear called and significant currents hit after boats returned). Observer program – delayed getting out, but Kevin now has good information and data back from observers.
* California, Kevin Miller: Forecast wave heights right on; currents stronger and longer than expected; Crescent City and Santa Cruz harbors damaged; possibly $100M in damage state-wide; drills paid off! Need to think about rotations for Emergency Management staff to avoid fatigue on big events. Challenge in getting messages out to and communicating with Spanish speaking community.
* Oregon, Althea Rizzo: Drills worked, but did find out that some of the evacuation sites lack facilities; need to do better outreach and more information with marine community to ensure they are prepared for longer evacuations (multi-day); not all shelters tied into Red Cross (ad hoc shelters sprang up as needed); temporary signage to help communities (for beach closures, street closures, etc). Would like to have a set time for the coordination calls with NWS, for example, national call at the hour so the state can schedule a state call at 20 after the hour, and communities can plan their calls at 40 after hour… Enables better planning & scheduling between communities and national effort & provides ability for states to give feedback to the TWC; consider some type of rotating time for calls to limit / minimize time between contacts with WCATWC/PTWC.
* Washington, John Schelling: 100% eggs in the basket of TWC and science – paid off! Washington did not have a warning level event for coasts based on TWC information; did not have to do full-scale evacuation and all paid off; did have some local evacuations partly as safety measure; drills / training paid off! Washington has equivalent of 3 coasts – the challenge is to figure out what coast may be under warning / alert and what level; i.e. 1m amplitude for some coasts but Washington does not have break points for different coastal environments – so if one coast under evacuation, all would be even though may it not be needed; need to look at staffing for long events – fatigue and communication impacts (esp. need to improve outreach and communication to Spanish speaking population). EAS was activated by the Tsunami Watch, and it was the EAS-activating message. Action WCS: Determine a way to communicate hazards from currents etc., that do not require full evacuation.
* Canada (Emergency Management British Columbia), Teron Moore: Lessons – Internal - full event brought staffing challenges – levels insufficient, rotations not efficient; EMBC and community relationships heavily relied on and used (i.e. personal ties to TWC paid off in ensuring conference calls made and messages getting out both internationally and locally); tide gauge data not available until several days after event was a challenge for accurate forecast / verification; damage to some coastal structures; education / outreach programs paid off but need to continue education in terms of currents and hazards that exists even in low inundation events; EMBC is looking at internal processes; not much done for inundation mapping on coasts – taking lessons learned for “maximum credible event” for inundation events.
* Alaska, Irv Petty: Initial MW 7.9 upgraded to MW 8.8 triggered advisory, and was able to respond from EOC to Aleutians rapidly due to staff on-site (serendipity). Dutch Harbor tsunami preparedness training from 2010 paid off for communities knowing what to do and how to react. 10 communities in zone, 5 communities evacuated; 11:45 PM went to warning level for 5 communities; triggered EAS and NOAA Weather Radio – this goes off state-wide, including Barrow, etc. This triggered sirens in areas not in the evacuation zone – trying to address this with community, now in process of reprogramming sirens so do not go off when not in zone. Alaska EM added a person to the TWC – Palmer as a listener and the EOC was able to call directly for updates. 99% of communities were contacted; no major damage, minor boat and dock damage in southeast; waves typically 0.5 – 1 meter; dropped warning to advisory 7:52 AM the next morning with advisory continuing into next day; also similar problem to WA in terms of needing additional breakpoints for fine tuning advisory/warning for different coasts. Feedback from population is saying training was positive!
* California, Rick Wilson: Maritime Impacts – Port of Noda, Japan northern coast – commercial fisherman felt earthquake, headed towards harbor to save boat, but heard warning from fireteam that event was serious – stopped and saw wave coming up coast; evacuated uphill instead; all boats lost except one, but lives were saved. California is working hard with maritime communities – the Japan event was 2x size of the 2010 event, but recent events helped prepare communities; good partnerships in outreach with NWS, locals, etc. A Crescent City fisherman decided not to evacuate then saw waves and decided to ride out wave on boat, “not one of the wiser things done” when he decided to try and evacuate during event; made it but “white knuckle event, now a training film for what not to do.” Southern California had an advisory event with waves under 1m, but significant damage to boats in part due to how the boats were tied up; now looking to improve specific education with maritime community.

Problems: Keeping people away from water; need to get messages out better – work with USCG; If – When – Where (how long); Recovery problems (Crescent City sediment clearing took 9-months to clear and rebuild); new products for harbors – analyzing video, geotechnical reports and improving planning and messaging; Tasks – look at video, compare to models to validate / calibrate velocity data, develop In-harbor hazard maps showing high currents, do evacuation and response planning with harbors, partnership with FEMA for harbor risk maps and guidance, improving offshore safety zones (current guidance is 100 fathoms, which is a water depth that may be well off-shore and take a long time to reach), improving outreach to Recreational community (not very experienced), Commercial fishing (experienced) community, large transport (cruise and Navy – experienced but with large vessels).

Need to look at a national perspective working with NTHMP MMS, MES, WCS, USCG, Navy, etc.; develop guidance and outreach; requires re-authorization of TWEA and stable funding for implementation and on-going outreach; John Schelling (WA) and Christa von Hillebrandt (PR) seconds and supports this type of collaboration and sharing. Need to have a bilingual harbor plan for Puerto Rico, on-line and available as pdf. Teron Moore (CAN) supports the need to collaborate on these types of activity.

* American Samoa, Lisa Togiai: – Bay area signage is complete; bid awarded to extend signage to rest of islands / coast; evacuation mapping completed for 90% of island; enlarging and laminating maps for each of the villages impacted from previous 2009 tsunami. Sirens are up and running (46) with monthly testing first Thursday of month; two sirens pending due to transportation and installation issues; NOAA Weather Radios distributed via NTHMP 2,000 radios; distribution with weekly trivia / outreach questions – correct answer gets a radio; other distribution to village mayors, schools, churches as part of tsunami training; 2012 focus will be training maritime community. A challenge is the 7 languages on the Islands means lots of translation of materials; NOAA partnership is key to success; ITIC outreach materials are very appreciated; 3-year training calendar with outreach to as many groups as possible; Tsunami Advisory Committee (TAC) formed with key government agencies including NOAA/NWS – Key recommendations: emergency planning continue with village preparedness; tsunami modeling study (working with Fai Chung HI, NGDC with CSC developing / updating DEMs); Laura Kong and Chip McCreery introduced new forecast products for American Samoa; presentations from NOAA and others to help educate in terms of when an earthquake requires evacuation, looking at evacuation routes (uphill very arduous, but the National Park Service is helping with planning routes that are uphill but safer and accessible).
* **Laura Kong & Rick Wilson – Post-Tsunami Field Survey Protocol**
	+ USGS, State, NOAA, and other participation – team approach is summarized on a poster hand out.
	+ Over the last 7 years ~60 measured tsunamis, 9 of which caused deaths, each of these have field surveys following that require coordination (American Samoa – more than 40 teams arrived within a few weeks – some coordinated / some not); Chile 17 teams; Japan several teams.
	+ Developing international post-tsunami protocol; requires invitation from country and need to work with country coordinator to arrange; teams provide plan to ITIC, check in with country and share data; encourage all to submit data / share through the WDS/WDC Boulder.
	+ No requirement to share immediately with local government; this could have significant benefit to local government for decision makers / emergency management / media; challenge of supporting decision makers and science.
	+ Information data sharing such as an earthquake information clearing house – needs preplanning and protocols; local, national, and international scientists put stress on the local system, esp. small communities already stressed with emergency response. Requires collaboration and respect; IOC Post Tsunami Event Protocol out, US is following.
	+ Key partners: physical scientists, engineers, social scientists, emergency responders, community.
	+ Need better quality data; data sharing; situational awareness, accountability.

 **NTHMP coordination for post-tsunami survey**

* + Post-tsunamis procedures survey on what went well what did not (results presented at NTHMP WCS Tuesday).
	+ Work with ITIC, FEMA, field teams, stakeholder organizations (i.e. NSF, EERI, etc); specifically in terms of coordination and data sharing to support impacted sites.
	+ Rick has copy of protocols (~10 steps now), include designated event coordinator, badging to show official status, coordination, include local experts, check-in onsite so folks know you are there, heed all safety regulations, be prepared, provide plan, check-out when leaving, provide final data to support response and recovery to Data Center.
	+ Lisa Togiai (American Samoa) – very frustrating that no coordination and no sharing of data to local community after survey; they had good collaboration with Japanese survey teams who NOAA introduced and who then shared data with the American Samoa coordinator; generally very negative experience in terms of number of people flooding community, lack of sharing of data, lack of coordination with local organizers, etc. Local support and knowledge key.
	+ Vasily Titov (PMEL) contrasting American Samoa with Japan and Hawaii surveys; emphasized how valuable data are to process and the need to get the data into an archive so it is not lost (as is most of the Hawaii data); need to ensure data is needed to support research / modeling is collected and is collected properly.
	+ Kevin Richards (Hawaii) – the on-site EM is overwhelmed following event. Need to have a coordinator come in to work with EM to coordinate with locals, provide instruction on safety – sensitivity – training – badging; need protocols on what data to collect and what to do with it after.
	+ Charles Williams (Alabama) – Is this effort building on or using the existing NWS tornado and hurricane post-event protocols? ITIC is the NWS Tsunami coordinator, but is not familiar with the tornado protocol.

Action for NWS / NTHMP Post-Event Team: Learn more about other NWS protocols, ensure tsunami protocols are consistent with them, and derive best practices from them.

* **Chris Gregg (East Tennesse State University) – Incorporating Social Science into the Tsunami Program**
	+ Nate Wood, David Johnston, Liesel Ritchie, Steve Menhold (Courtney Farnham at CU one of several grad students participating)
	+ Belmont Report (NIH 1970s) requires Social Scientist to get approval from institutional review board prior to doing research; Low risk research where benefits far outweigh costs is easy to get approved. Chris thinks the American Samoa-type problem will be resolved as Physical Scientists become more aware of the protocols of the Social Sciences.
	+ Goal: reduce tsunami impacts by integrating social science into the tsunami program.
		- Objectives: 1) Evaluate TWC warning products, 2) assist with implementation of proposed *TsunamiReady* improvement plan (TRIP); 3) develop a searchable, online compendium of social science research on tsunami; 4) develop GIS-based social vulnerability map. Need to coordinate with Paula Dunbar and physical hazard on-line GIS-based map services.
		- Looking at various social issues (i.e. how does trust in TWC vary with demographics, how does understanding of evacuation routes vary with demographics.
		- Looking at 8 communities across country / hazard area / and TsunamiReady status.
		- Objectives 1 & 2 are in focus group data gathering mode; Objective 3 in start-up mode; Objective 4 – analysis of existing data from prior NSF study and almost complete.
	+ Focus on improvements – participants highlighted themes of message control.
		- Warning Products: Strengths – most information in existing messages, people with military or operational background ideally suited and easily interpreted products; those not from this background confused.
		- Weaknesses: formatting and organization of content; inconsistencies in types of messages between TWCs; most important information must be up front; want a way to hone in on information applicable to their area of interest; (Tsunami Local Message may be an answer to improve this problem – consistent message but focused to local area).
		- Looked at bulletins 3 & 4 from WCATWC Japan event; want better information on runup including tides (how will tides amplify or attenuate tsunami wave); replication largely unavoidable to ensure each message complete; formatting largely considered poor; rebroadcast of messages common – results in EM getting “bombarded” by messages (i.e. PTWC, WCATWC, USCG, Navy, etc); wanted something such as an atlas of how impacts at coast over time from past events including information on how tides effected impact at coast;
		- Next: Merge various focus group findings with WCS message review findings; derive consolidated set of recommendations.
		- Presented on two popular US-based Models 1) warning response model (Denis Meleti – argue that content of warning is key) and 2) protective action decision model (Lindel et al, person receiving message key, past experience / belief plays lead roll in response).
		- TWCs can address message content and style, cannot address receiver characteristics (this is where training, outreach, TsunamiReady come in).
		- Warning confirmation process can be improved by consistent messaging, repeated multiple times from multiple sources (consistency is key), matching dissemination routes with technology innovations in communication (social media, mobile technology).
		- Communities did not like TR guidelines; did not like ratings, wanted condensed guidelines with supplemental content.
		- Participants did not like mandatory guidelines that were not controlled at local level; turnover of political leadership challenge.
		- Mandatory guidelines should be reasonably achievable for both large and small communities (with large and small tax bases).
		- Challenge reluctance to promote tsunami awareness for tourism; potential impacts on tourism feared.
		- Tiered structure for “bronze, silver, gold” a disincentive to tsunami ready; communities perceive value in being tsunami ready as trust of community that their government is doing something to protect them; this breaks down with the “doing something”, “doing more”, “doing most”; would like to see constraint on the 192 metrics based on life safety to filter and focus key requirements to be tsunami ready.
		- Site reports prepared for site focus groups; need to get input from Tsunami program on how/if to share these reports. Rick Wilson – from focus groups, was there any awareness of State involvement in TR? No, communities could benefit from condensed information about what is available to help communities; Marie Eble – did you check whether text-based or graphical messaging better – No, did not do formal study, but groups did indicate prefer graphical.

**NTHMP General Meeting Day 1 (Wednesday 2/8) PM**

**John Schelling – WA Report**

* Hazard profile: Cascadia source with seniors and tourist population at significant risk; tsunami vertical evacuation option augmenting evacuation routes to high ground / inland areas, especially in areas where high ground / safe ground not accessible in timely manner or at risk due to fragile infrastructure (bridges likely to be damaged or down in EQ).
* Nate Wood study on evacuation time / vulnerable populations; WA outer coast 33% of population found to be in zone, major driver for community-based Project Safe Haven.
	+ Common themes: School safety (make sure kids are safe), seniors and special needs, more conservative estimates for how high (based on FEMA 626) need to be, towers – buildings – berms give communities options. Planning process in place to assist community in developing plan (Long Beach, WA – big or tall building not compatible with community / environment – reinforced berm as park works; North Peninsula has some high ground – focus on evacuation routes; Tokeland Cove world renown birding area with casinos – towers (supporting birding) and parking structures most desired.
	+ Determine community look based on 15-minute travel time and capacity requirements; bring in design architect and bring in other opinions (i.e. high school students wanted bleachers / seating supports other uses; trail systems incorporated into plan; step 3 figure out cost – and cost – benefit (i.e. $5M per life saved); Long Beach Berm total project not including land cost ~$800K;
	+ Harry Yeh also did modeling evacuees reaching safety
	+ Focus on Clallam County; finish County and Tribal presentations; additional modeling underway based on new lidar to verify minimum heights; continue working with partnerships to investigate funding (possibly non-profits).

**Jim Kirby- East Coast Report**

* Progress report on EC inundation mapping / modeling. First cycle for EC modeling so still in early stages.
* EC risk is primary landslide as opposed to co-seismic for many other areas; landslide modeling and monitoring at less developed stage scientifically and operationally.
* 5 tasks originally proposed
	+ 1-3 due by this summer; Literature review (100% complete), Monte Carlo modeling of EC Submarine Mass Failures (SMF); simulation of co-seismic sources and flank collapses of Cumbre Vieja Volcano using 3-D multi-fluid VOF model;
	+ Tasks 4-5; Inundation for high risk EC communities (20%); slope analysis also ~20% complete.
* Challenge is validating or verifying modeling scenario events based on any type of geological / geophysical context; working with USGS WHOI for this activity; challenge on how to define parameters for probabilistic approach, esp. on return periods – MMS meeting helped provide guidance, but varies across MMS; more input anticipated at MMS summer workshop to help define probabilistic modeling.
* 3 large distant sources (Lisbon convergence, Canary Island volcanic slope failure, Caribbean EQ); other major concern are large under water slope failures (landslide)
* Shifting initial mapping from north-central (landslide hazard) to southern (NC area distant hazard); Atlantic City, NJ hotspot for Caribbean source (Azores events not as strong as Caribbean or possibly landslide events);
* Probabilistic v.s. maximum plausible event – NRC still wants maximum plausible, not probabilistic event modeling;
* Monte Carlo probability based on likelihood of acceleration event (i.e. seismic event) with geologic / sediment assessment and slope; get a distribution of different return periods (100 year and 500 year) runup estimates (some areas on EC have 500 year at 3-5 meters, dropping off significantly as shelf widens south of SC (transition to trans-oceanic events as primary hazard source).
* For landslide events, look at bathymetry to identify likely past events (slump areas) and try to determine from sediment properties whether there would be significant slump with water displacement capabilities; (need slide location, mass, movement).

**Rick Wilson & Marie Eble - MMS Report**

* MMS expanded membership in 2011 to include USGS source expertise; Lisa Togiai replaced John Goeke for American Samoa; still have a vacancy for USVI representative;
* Overview of past work and summary of accomplishments in 2011;
* Model validation workshop (co-located with NTHMP landslide workshop ) in Galveston, TX (Juan Horillo host); tested models against established benchmarks and identified new potential benchmarks; draft document from workshop out now and anticipate final in June 2012; consensus of expert group of modelers agreed that models did validate against appropriate benchmarks (some models only validated against certain use/benchmarks).
* Boulder working meeting in August; Updated Task 1.1 (mapping and modeling guidelines) and finalized task 1.5 (low hazard map guidelines) and worked with MES to incorporate mapping guidelines.
* Updated and identified DEMs for NTHMP development, based on data availability and need to coordinate with NOAA forecast DEM development;
* Tasks 1.7 and 1.8 – Compared current maps to inundation guidelines (all deemed to be minimally acceptable), but also identified areas where consistency – especially across states – could be improved.
* 2012 – Two meetings funded to 1) Probabilistic hazard / risk / vulnerability state of the science; and 2) Working meeting focus on finalize benchmarking procedures, update maps, look at probabilistic hazard / risk / vulnerability analysis.
* Future steps: Lessons learned from Japan and Chile, especially in terms of mapping “worst probable scenario”; continue to improve DEM, including identifying key areas for data collection to help inform NOAA / IOCM data collection; guidelines for numerical analysis (Nate Wood), vulnerability, etc., impacts on community hazard / evacuation maps; informing Land Use Planning especially in terms of building codes (resistance to currents); National Guidance to the Maritime Community (when to evacuate, where to evacuate, how long / when & how sound all clear); how to incorporate tides into tsunami maps and models – velocities – currents.

**Vasily Titov – Brainstorming Modeling / Forecasting Lessons Learned from Japan and Impacts for Cascadia**

* TWC short-term forecasting; NTHMP “long term forecasting” for planning, mitigation; Model testing is great first step, but need to follow with consistent data and products.
* Forecast models are constrained with input data and verify with impact / observed data.
* Advocating to move away from “amplitude” or “wave height” and simply report threat level; Japan moving toward this method to avoid false security from “amplitude” under sea wall height.
* Data driven models, even on NCEP, available within few minutes for local event with 15-30 minute response time; results of model provides useful information for response.
* New engineering would allow DARTs to be located closer to sources; seismic inversion starts model and then other data refines and improves forecast.
* American Samoa first test of forecast model accuracy, but done 2 months after because forecast model was not complete and on-line; Japan was first done closer to real-time; model was ready and data available.
* David Oppenheimer – How far are we from going with a data-driven model forecast for complete shorelines that enable site-specific (GPS) forecasts that would do away with the break point forecasts (CA, WA, issue raised earlier)? – Vasily believes we are there now; could provide model results.

**Althea Rizzo, Paul Whitmore, and Chip McCreery - WCS Report**

* Annual table top exercise by 2010 completed; two additional (Atlantic and Pacific) this year.
* Provide decision support tools for EM; ongoing including graphical support tools.
* All states with high/very high hazard create high-level structure to address tsunami response by 2012; USVI, Guam not sure if a tsunami advisory group exists; the rest have.
* 97% of 2011 TWC comms test responded (exceeding 90% milestone).
* Developed post-event tsunami survey; Conducted three surveys in 2011; Working with MES baseline survey for local warning reception capability and improve annually.
* Question to revise TOR to include director of ITIC as part of WCS.
* Issue on how to get information out to constituency when advisory (non-activating event) in place and not a watch – including events that impact marine community but not land; WCS to report back to the CC by end of May.
* Looking at how to improve understandability of TWC messages; including issue of amplitude vs. height and Japan / Australia trend away from numbers and into threat level.
* Chris Gregg will talk to focus groups to look at utility of posting tsunami travel times, including travel times with information statements.
* 2013 exercise planning; repost effectiveness survey from 2011 to capture larger audience
* WCS/Paul Whitmore: Look at scheduling conference calls during events at specific times (pros and cons).

**Jane Hollingsworth & Paul Whitmore - Tsunami.gov Update**

* Single source for all tsunami products, warning status, most updated capability implemented by June, with ongoing capability improvements.
* Driven by tsunami XML; has all products to generate web, RSS, etc.
* Web map with multiple layers; arrival times, amplitudes/height; tide gauges with real-time tide levels, DART buoys with information; forecasts and observations now collected into single table sortable; list of last 20 products generated; KML available for download.
* Previous bulletins stored in a searchable database.
* Currently operating in parallel with WCATWC site; next week notice will go up that new site will be solely operational in 60 days.
* Can add SIFT google earth overlays to map.
* Long-term plan is to migrate to NIDS for redundancy of server information.
* Christa – need to limit the “light up” to the coastline only, example was all of Russia lit red under threat; i.e. take outline of island / country and thicken line but still need to focus e.g. Pacific coastline of country and not GOM or Caribbean coasts.
* USGS EQ program started down this path with Google Maps but ran into an issue with licensing that scrapped program.

**John Schelling & Tamara Biasco - MES Summary**

* Will be at 90% of milestones this year; focusing on decision support tools; support for tsunami mitigation week (renamed from tsunami awareness); NTHMP Repository going to CC for discussion / decision.

 **Lewis Kozlosky - TsunamiReady Program Overview**

* + Current program establishes basic level of tsunami preparedness.
	+ Improved program looking at strengthening preparedness / resiliency; looking at Chris Gregg’s study and need to condense requirements.
	+ Currently 101 communities; 17 new communities (record) in 2011; Los Angeles largest, Anguilla first international community; 20 communities in PR are TS.
	+ Funding post-2005 coincides with increase in number of communities per year.
	+ Responding to the GAO Reports, NAS reports and TWEA.
	+ Budget uncertainties in 2011 cancelled workshops.
	+ Next steps – review and approval of new guidelines by CC; national roll-out strategy to plan out.
	+ John Schelling: Smart plan to have Chris Gregg look at TR program and to look at implementation of strengthened TR – could have rolled out a plan that would have resulted in a drawback of participation; look at making modifications to guidelines possibly by May (Chris Gregg) to enable rapid roll-out.

 **Laura Kong – ITIC Partner Briefing**

International, located in HI in 1965 to support Pacific countries; service organization for US

ITIC supports / is TWEA mandate for “international”; US organization supported by NOAA and established by UNESCO

* + Monitor and recommend improvements; assist in establishing regional and national systems; technology transfer; capacity building; maintain historical database of events (through WDC at NGDC)
	+ TWC -> Country / Regional alert system -> Community outreach / understanding
	+ Functioning community requires triumvirate of Warning & Management Officials, Public Education / Practitioners, Scientific community
	+ Conduct international and national training, participate as technical expert on ICG, develop and distribute support tools, develop – revise – distribute outreach and education materials; mostly English, but do have some in Spanish
	+ TSUDig – ITIC/NGDC collaboration based on open source public domain GIS (UDig) to deliver the global tsunami event / impacts data bases (NGDC online) in offline model for developing countries and emergency managers
	+ Tsunami Teacher – needs updating; numerous other outreach materials
	+ 6 staff: including Laura Kong director, Miguel Vasquez Associate Director (SHOA Chile), and Brian Yanagi.

 **Irv Petty - Comet Modules**

* + 5 modules completed and on-line; www.meted.ucar.edu
	+ Community Tsunami Preparedness (EM – updated and soon in Spanish), 2 Warning modules, Kids module, Caribbean module (need account, no cost)
	+ Tsunami Strike – animated directed towards kids (8-12)
	+ Tsunami Strike Caribbean edition – Kids in role of journalist (middle and high school)

**Victor Huerfano – Puerto Rico Report**

* Starting year 3 of 4 year grant
* Challenges for PR: two subduction zones with local source generation; significant tourist population visiting beaches and harbors (single cruise ship may hold 800 passengers, have up to 10 ships visiting in single day)
* More than 54,000 people live in the top 10 exposed communities
* Stood up NTHMP clearinghouse for NTHMP with the exception of mapping data (over 10Tb data) some material in Spanish only
* New inundation maps developed; significant improvement over older model/maps; using NOAA MOST and consistent high resolution (nested) DEMs developed by NGDC for forecast / warning.
* Now working on landslide source modeling from Puerto Rico Trench; testing model outputs based from 1918 event. No evidence for regional or distant tsunami events impacting PR (Lisbon did impact other Caribbean countries).
* Next steps to generate worst case scenario inundation maps
* 20 communities now have tsunami response plans out of 44; some plans are as simple as evacuate for any message; 10 municipalities pending approval; State is moving for law to require mandatory tsunami response plan
* Facilitate the inclusion of tsunami hazard in critical facilities emergency response plans; 100% of facilities are in tsunami inundation zone; current plans are to shut down facility in warning; working to engage planners, building, and permitting officials
* 20 multi-lingual maps approved; 13 in progress; maps are on-line and include google overlay layers
* Organize and participate in educational events – on-going with schools, state, local, and federal government; faith-based organizations; over 36000 attendees; 500+ conferences, 2 webinars; conduct annual full day training for EM on Disaster Decision Support Tool; on-line Media tool kit; Prepared tsunami response plan for Caribbean Summer Games for over 100,000 people
* Working with CA and OR to have first PR Great Shake Out; ITIC / FEMA providing training (2012)
* Problem with small event this past year; only one of two systems functioning; partly due to lack of training on how to maintain system (flushing memory, etc.).
* PR has 20 communities TR, 4 more are in final stages; recognition is for 3-years so coming up on re-TR for some communities and they will need signage support.
* Conducted first Tsunami Ready Summit in Mayaguez in 2010

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* Collaboration between OR – WA – NANOOS on new tsunami web portal (nanoos.org/nvs);
* Interactive on-line web map with evacuation maps, tsunami status (link to tsunami.gov), descriptive and informative material; all assembly areas / evacuation maps on-line in web map
* Developing phone apps
* 19 Cascadia Subduction Zone (CSZ) earthquakes and tsunamis over past 10,000 years; great variability in mass of turbidites indicating segment breaks; some turbidites significantly larger some smaller; tsunami inundation mapping at 6 levels of inundation from very small to extra-large (40m slip) similar to Tohoku. Large events capture about 90% of variability of all CSZ events. 90-95% of events could be covered by vertical evacuation structures. Segment events modeling shows first arrival between 45–90 minutes with maximum arrival 3-4 hours later due to reflection / refraction (modeling for Cannon Beach, OR); segment ruptures have small waves early and larger waves later; can warn in similar mode to distant event.