

Status Report: PTWC's Seismic Network Upgrade

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Overview

Since late 2005, the Pacific Tsunami Warning Center (PTWC) has been working towards upgrading and expanding its existing seismic network in the Hawaiian Islands in order to improve tsunami warning capabilities there. Progress has been slow due to a number of factors including lack of training, budget shortfalls, and untimely processing of real estate agreements and communications contracts. Table 1 and Figure 1 show the planned stations and completion status.

Island	BB Sites ¹	SM Sites ¹
Kaua`i	2	1
O`ahu	1	4
Moloka`i	1	1
Lana`i	1	0
Maui	2	2
Hawai`i	6	7
Station Totals:	13	15
Completed Stations:	5 (38%)	8 (53%)

Table 1: Station Sites Planned

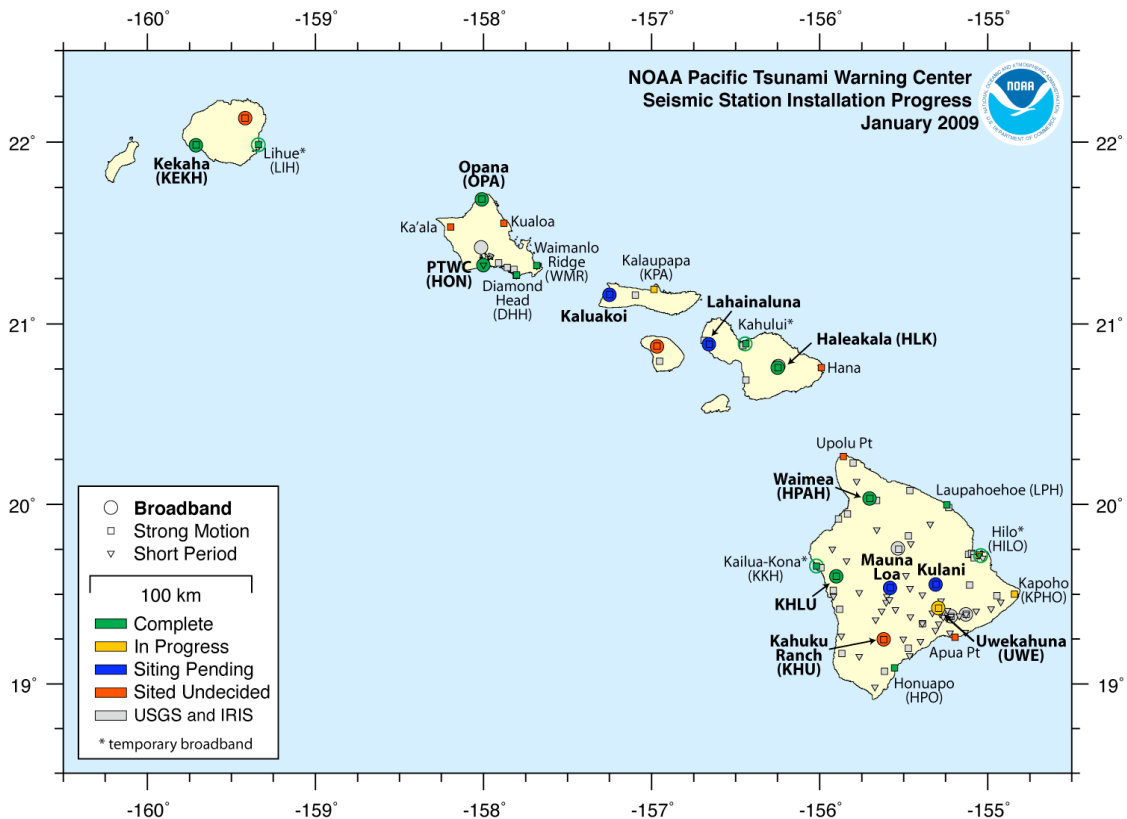


Figure 1: Map of Hawaii Seismic Stations

¹ Abbreviations:

BB Broadband - refers to PTWC seismic sites consisting of a STS-2 broadband seismometer, Kinematics ES-T strong motion accelerometer, Kinematics Q330 digitizer, and Kinematics Marmot field server.

SM Strong Motion - refers to PTWC seismic sites consisting of a Metrozet TSA-100S strong motion accelerometer and NetDAS digitizer.

Complete Stations Status

- 5 of 13 broadband+strong motion stations complete and operational (KEKH, OPA, HLK, HPAH, KHLU)
- 8 of 15 strong motion stations complete and operational (LIH, DHH, WMR, KHLH, KKH, LPH, HPO, HILO)

Incomplete Stations Status

BB Sites (8 incomplete):

- 1 has no telemetry due to delays of over a year in establishing a NOAA Net connection to the Hawaiian Volcano Observatory and subsequent firewall issues (Uwekahuna).
- 2 stations have been in the NOAA real estate permitting process for over a year (Lahainaluna, Kaluakoi).
- 3 proposed stations need decisions on whether to proceed (Mauna Loa, Kulani, Kahuku Ranch).
- 2 stations have not been sited yet (Kauai and Lanai).

SM Sites (7 incomplete):

- 2 were installed over a year ago but await VSAT or alternative telemetry links (Kalaupapa, Kapoho).
- 3 have not been sited yet (Hāna, `Upolu Pt, `Āpua Pt).
- 2 are of relatively low priority and will be addressed later (Kualoa and Ka`ala)

The Hawai`i Integrated Seismic Network

Following the example provided by the California Integrated Seismic Network (CISN), the seismic network partners in Hawai`i are working to establish a Hawai`i Integrated Seismic Network (HISN) to effectively and efficiently achieve their respective monitoring and reporting goals. A primary objective of the HISN is improved statewide coordination of seismic network operations in order to distribute timely, accurate, and consistent earthquake information. Cooperative station siting, establishment of data sharing and processing standards, and well-defined procedures for earthquake reporting are all critical to an effective HISN. Resource leveraging and implementation of common practices will provide focus to the currently diverse seismic monitoring efforts in Hawai`i.

2008 HISN Meetings:

- 08/12/08: U.S. Geological Survey's National Strong-Motion Project (USGS/NSMP) in Hawaii
USGS, NOAA, and University of Hawaii representatives discussed the future role the NSMP will play in real-time seismic monitoring in the state of Hawaii. PTWC agreed to help NSMP explore real-time communication alternatives and possibly find and relocate an NSMP instrument at the University of Hawaii to the Honolulu Weather Forecast Office.
- 8/27/08: Maui County Civil Defense
PTWC representatives met with Maui County Civil Defense (CD) and Police officers to discuss how to help protect Maui from earthquakes and tsunamis. Our main goal was to discuss options for installing a strong motion station in the Hana area of east Maui, and we came away with a few good possibilities. We also talked about possible station locations on Lana`i, Moloka`i, and Kaho`olawe. Maui County CD is very willing and eager to further our efforts installing seismic and sea level stations in Maui County and on the Big Island. They even offered to help pay for some stations since they had end-of-year money they needed to spend. However, nothing subsequently materialized from the discussion.

A meeting with all HISN partners is tentatively scheduled for April 2009.

While PTWC remains committed to the HISN, organizational challenges within NOAA and the National Weather Service (NWS) have sometimes led to strained relations with HISN partners.

Concerns

For successful long-term maintenance and operation of the seismic network, it is advisable to leverage the resources of other seismic monitoring entities (e.g., USGS, IRIS, etc.). This was a key motivation behind the HISN concept. Overall, the success of the project is in jeopardy due to a number of factors:

1) ET Support

Our Senior Electronics Technician (ET) gave his retirement notice in September 2007 effective December 2007. The position remained vacant for 13 months until January 2009. In that time, almost no fieldwork to install, upgrade, or repair stations occurred due to his absence. Inability to advertise for the open position was the main impediment. PTWC requires additional ET support to maintain its greatly-expanded, modern seismic network.

2) Training

In mid-2005, PTWC purchased expensive, state-of-the-art seismic equipment and processing software, but it did not plan for formal training of its staff to fully realize the new systems' capabilities. For example, PTWC purchased the Antelope system to handle seismic data, but no one on staff had the expertise to use the software, and it failed to consider how to fully integrate Antelope into PTWC operations. Some PTWC staff will attend a training course for the hardware in mid-2009, but no Antelope software training has been authorized.

3) Budget

PTWC management has no local control over its budget, including the seismic network project. A recent inquiry into the matter has shown that much of the allotted \$125k FY08 funds vanished before PTWC could spend them. This significantly affected the scope of what could be accomplished in 2008. Poor accounting practices at the NWS Pacific Region Headquarters poses a major problem for managing the project. PTWC management has withheld some funding requests for equipment and training related to the seismic network due to the funding dilemma.

4) Permitting and MOUs

The requirement to go through the NOAA real estate office for permitting has been a major impediment in establishing new field sites. Pushing paperwork through the bureaucratic system can take as long as two years for one site. Two broadband stations are currently being held up for this reason. The duration of this process can strain relations between PTWC and potential site landowners. Delays are also introduced when MOUs and other interagency agreements are required. For example, an agreement to co-locate equipment with GEOFON on Maui has yet to be finalized after three years.

5) Communications

Establishing communications to acquire data from field sites back to PTWC has also been a problem since PTWC must go through the NWS Pacific Region Headquarters to procure the leased circuits. Citing other obligations, the NWS-PRH communications manager is unable to efficiently procure the communications services this project requires, sometimes taking up to two years to respond to PTWC requests for new telemetry contracts.

Insufficient staffing, budget uncertainties, and bureaucratic delays have contributed to slow progress. The current situation of responsibility without authority leads to frustration, hampers decision-making, and ultimately endangers the project. PTWC needs to appoint one or more official project managers for the seismic network upgrade and give them the required resources (staffing, training, funding and decision-making authority) to accomplish the project goals in a more efficient manner. This is the only way PTWC can begin to approach its goal of reliably providing 90-second tsunami warnings for local events in Hawai'i.