

**NOAA SCIENCE ADVISORY BOARD
POST-TSUNAMI REVIEW**

**NOAA Tsunami Science and Technology Advisory Panel Post-Tsunami
Review Report on the February 8, 2025, Tsunami Advisory Puerto Rico
and the US Virgin Islands**

**BY THE TSUNAMI SCIENCE AND TECHNOLOGY ADVISORY PANEL (TSTAP)
APPROVED BY THE NOAA SCIENCE ADVISORY BOARD**

MARCH 11, 2026

TSTAP Review of the National Tsunami Warning System and Response Activities During the Tsunami Advisory Issued After the February 8, 2025, Magnitude (M) 7.6 Earthquake along the Swan Island Transform Fault

Executive Summary

This report by the NOAA Tsunami Science and Technology Advisory Panel (TSTAP) provides a summary of actions taken by the NWS-Tsunami Warning Centers (TWCs), state and local emergency managers, and the public during the February 8, 2025 M7.6 Swan Island Transform earthquake in the Caribbean. Although the initial earthquake magnitude would require a tsunami warning alert level, the Pacific Tsunami Warning Center (PTWC), responsible for alerting the US Territories in the Caribbean, evaluated the earthquake and forecast a tsunami advisory level instead. Initial observations and findings from this event that require follow up from Federal, state/territory, and local officials, include:

- Responses to near-warning threshold events continue to be a challenge as protocols are best designed for far-field earthquakes and near-field larger magnitude earthquakes.
- Tsunami observation instruments (buoys and tide gauges) are limited and/or inoperable in the region, complicating monitoring and alerting.
- Both emergency managers and the public were confused about what actions to take during a tsunami advisory.
- Automated translation of tsunami messages was incorrect on many social media platforms.

Although ongoing work by the NOAA Tsunami Program to align and modernize its Tsunami Warning System will help address some of these issues, other issues may need additional evaluation and attention beyond the present work plan. Past TSTAP reports, such as the 2021 Quadrennial Report to NOAA/Congress and the 2024 White Paper “*Prioritizing Upgrades to Tsunami Forecast Capabilities to Protect Public Safety in Large Coastal Population Centers and Complicated Waterways*,” have been referenced as they provide findings that reinforce similar findings in this paper. The findings provided by the TSTAP help inform past and future recommendations for Congress, NOAA, and state and local tsunami response decision makers.

Event Summary

This report summarizes the events after the earthquake, the timeline of the Pacific Tsunami Warning Center (PTWC) and response of emergency responders and the public. This report also includes TSTAP observations and recommendations for a more consistent and targeted response to future Tsunami Advisory events.

Tsunami Source, Forecast, and Alerts

On February 8, 2025, at 23:23 UTC, a M7.6 earthquake occurred along the Swan Island Transform fault southwest of the Cayman Islands. The earthquake was similar in location and magnitude to another M7.5 earthquake that occurred along the same fault in 2018. No shaking impacts were recorded in the Puerto Rico-Virgin Islands (PRVI) region nor expected given the location and size of the event. Initial PTWC magnitude of the earthquake was M8.0 which under protocol would have initiated a tsunami Warning, but duty analysts at PTWC did further rapid assessment to determine that only an Advisory was necessary based on the rapid analysis and knowledge of the local tectonics. It is possible that recent experience with the 2018 Swan Island Fault M7.5 earthquake which did not generate a significant tsunami may have influenced the behavior of the duty analysts. A tsunami advisory was issued for the PRVI at 23:37, 14 minutes after the earthquake origin time. At 23:38 the USGS issued a preliminary magnitude of M6.7 via the Email Notification Service (ENS) service and the California Integrated Seismic Network (CISN) display which was received by emergency management, stakeholders, and some public/press in the region. The USGS magnitude was updated to M7.6 at 23:42. The NTWC released a “No Threat” message for the mainland United States at 23:49 via FEMA National Warning System (NAWAS) received in PR and the USVI. Original messaging of the NAWAS message indicated no threat for the United States based on the NTWC assessment for mainland states. Though rapidly clarified, this did cause momentary conflict in the messaging as PR and the USVI are part of FEMA Region 2 along with the US Eastern seaboard. The PTWC cancelled the advisory after a minor tsunami observation (<10 cm) was observed at Isla de Mujeres, Mexico at approximately February 9, 2025, 01:00 UTC.

Tsunami Response and Outcomes

What went well:

- Because of annual training supported by NTHMP, most Emergency Managers in PR correctly understood the Advisory-level alert, preventing unnecessary evacuations.
- The initial PTWC magnitude of the event was M8.0, which would trigger a tsunami Warning by protocol. However, the on-duty analysts chose to wait before issuing a Warning based on the time available before any potential tsunami impacts to coastal areas and the experience gained from a previous similar earthquake in 2018. After their analysis and consideration, PTWC issued a tsunami Advisory instead of a Warning.

There were many issues and examples that require additional attention at the Federal, state, and local levels:

- The USGS released a temporary magnitude of 6.7 via email and CISN display, which generated confusion among the public and responding agencies
- Sea level station and DART coverage:
 - Due to maintenance issues, several sea level stations were not transmitting data delaying the cancellation of the advisory.

- o DART coverage in the source zone is limited.
- There was limited public awareness of tsunami risk zones and appropriate response actions, including confusion about what a tsunami advisory means.
- Communication of the advisory was effective from the PTWC to the Tsunami Warning Focal Points(TWFPs) in PR and the USVI, however there was a communication gap of the advisory between the local TWFPs and local decision makers.
- The release of a “non-threat” message by the NTWC via FEMA NAWAS caused additional confusion. In the future, explicit wording or training focused on FEMA regions may be needed. Because PR and the USVI are part of Region 2, which also includes the mainland eastern seaboard, a single regional “no threat” message caused confusion due to a discrepancy with messaging from the PTWC.
- Additional public confusion arose from an incorrect translation by automatic systems on social media. In Caribbean Spanish, the word for advisory is “advertencia,” but automatic translation systems on Facebook translated “advertencia” to “warning” instead of “advisory” because they use a different dialect of Spanish.

Summary of findings from the TSTAP analysis of the event

- **Challenges in responding to near-warning threshold earthquake events:** Responses to near-warning threshold events continue to be a challenge as protocols are best designed for far-field earthquakes and near-field catastrophic earthquakes. The Feb 8, 2025, event represents a regional earthquake (neither near-field nor far-field) with an initial magnitude at the threshold for a tsunami warning. Human analyst intervention and real-time decision making at the PTWC prevented unnecessary evacuation.
- **Tsunami detection systems:** Tsunami alerts are only cancelled upon the observation or non-observation of tsunami waves at sea level (tide gauge) stations or observational buoys. At the time of the event a significant portion of these systems were inoperable resulting in the delay of the alert cancellation. Instrumentation to detect and analyze tsunamis are a critical component to the tsunami observation system. Additional stations and regular maintenance of existing stations would provide critical data to TWCs.
- **Improved and expanded emergency management training and public outreach:** Confusion around the meaning of the tsunami “advisory” alert was prevalent in the response. Markedly, while the majority of emergency officials in PR understood the term, there was confusion over the meaning of the alert among decision makers, the public, and emergency responders in the USVI.
- **Challenges with information/communication:** Given the increased use and dependence of social media/internet media as an information source, the mistranslation of Spanish messages into English by automatic systems is a concern. Information providers may want to consider ways to reformat information messages to prevent such auto-translate issues, or add systems that recognize different dialects of Spanish used in different geographic regions.

- **Improvements to TWC alignment and modernization:** Differences between FEMA regions and TWC responsibility is a potential point of information conflict. The ongoing work to develop a Common Analytic System (CAS) should help address these issues.

We note that the judgement shown by PTWC analysts in issuing an Advisory instead of a Warning likely resulted in considerably less confusion and disruption than if strict protocol had been followed as the preliminary M8.0 magnitude would have indicated. Had a similar judgement call be made by NTWC staff following the December 5, 2024 M7.0 off the coast of Northern California, over evacuations and public confusion would have been far less (see the TSTAP report on the event.)

The Tsunami Advisory and the observed response to the February event touches on seven of the 22 recommendations from the 2021 TSTAP Quadrennial Report (Table 1, below). The TSTAP will refer to these findings and observations when writing the 2025 Quadrennial Report, currently in preparation. TSTAP findings and recommendations support NOAA's mission to protect lives and property, and improve emergency response during future tsunami events.

Table 1. TSTAP findings from assessment of the February 8, 2025, Tsunami Warning event Puerto Rico and the U.S. Virgin Islands, and relevant, corresponding recommendations from the TSTAP’s 2021 Quadrennial Report.

TSTAP Findings from an Assessment of Feb 8, 2025 Advisory-Level Event For Puerto Rico and the Virgin Islands	Supported Recommendations from 2021 TSTAP Quadrennial Report (with Section Numbers) and Potential Future TSTAP Recommendations
• Lack of functioning sea level (tide gauge) stations in the region extended the time of the active advisory: Maintenance and installation of sea level stations are critical for tsunami observations and determining alert levels.	• 2. Improve tsunami detection and observation systems. • 2.1 Increase development and improve dissemination of observation networks like tide gauges, web-cameras, and real-time observer programs.
• Limited public understanding of the tsunami “advisory” level • Communication breakdown from the state level TWFP to relevant decision makers. • Automatic translators on social media incorrectly translated “advertencia” to “warning” rather than “advisory.”	• 3.2. Improve tsunami message composition and dissemination methods including updating the tsunami.gov website, creating a single domestic bulletin, and early messaging before a tsunami forecast is developed.
• Temporary release of a magnitude M6.7 via ENS and CISON generated confusion at the local level agencies despite the rapid correction to M7.6. • Messaging on the FEMA NAWAS system from the NTWC could be misinterpreted by PR and USVI stakeholders	• 1.1. Align and consolidate TWCs and overhaul the forecast system to unify detecting earthquake parameters and produce the same products (e.g., forecast wave heights) • 1.2. Undertake a comprehensive, enterprise-wide technology upgrade for the warning system/program. • 1.3. Strengthen the collaborative relationship and expand MOU with the USGS for identifying earthquake parameters and source mechanism. • 3.1. Improve the integration of TWC warning functions with USGS, state, and local warning needs and functions