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اللجنة الدولية الحكومية لعلوم المحيطات
政府间海洋学委员会

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IOC Circular Letter No 2902
(Available in English only)

IOC/VR/BA/ah/RB
17 August 2022

To : Tsunami National Contacts (TNCs),
National Tsunami Warning Centres (NTWCs), and
Tsunami Warning Focal Points (TWFPs) of the Intergovernmental Coordination Group of the Pacific Tsunami Warning and Mitigation System (ICG/PTWS)

cc. : Official National Coordinating Bodies for liaison with the IOC,
Permanent Delegates/Observer Missions to UNESCO, and
National Commissions for UNESCO of IOC ICG/PTWS Member States
Directors of UNESCO and IOC Regional Offices in the Asia/Pacific Region
Permanent Observers to ICG/PTWS
Director Pacific Tsunami Warning Center (PTWC)
Director, Northwest Pacific Tsunami Advisory Center (NWPTAC)
Director, South China Sea Tsunami Advisory Center (SCSTAC)
Director, International Tsunami Information Center (ITIC)
ICG/PTWS Officers
ICG/PTWS Steering Committee

Subject: PTWC Interim Procedures and PTWS products for Tsunamis developed after the Hunga Tonga Hunga Ha'apai Volcano event (User's Guide and informational webinar on 6 September 2022)

The massive explosion on the volcanic island of Hunga Tonga-Hunga Ha'apai (HTHH), about 30 km (19 mi) south-southeast of Fonuafo'ou island in Tonga, on 15 January 2022 at about 4:14 UTC, generated a tsunami that caused damages locally, regionally, and across the Pacific.

This was the first time that the Pacific Tsunami Warning Center (PTWC) had to respond to such an event, since its system is primarily focused on earthquake-generated tsunamis representing nearly 90% of the past cases of tsunami in the world.

Following this event and with reference to the information provided in the IOC Circular Letter 2877 regarding the launch of an IOC Post-Event Assessment for the HTHH volcanic eruption and tsunami, we are pleased to confirm that nearly all Member States of the ICG/PTWS did respond to the online survey. The results of this assessment will be published by 30 September 2022.

In response to the HTHH volcanic explosion and tsunami, the Intergovernmental Coordination Group (ICG) for the Pacific Tsunami Warning and Mitigation System (PTWS) established a Task Team on Tsunami Hazard Response and requested it to prepare a PTWS Interim Volcanic Tsunami Alert

Procedures Implementation Plan (its terms of reference can be found in the following link https://oceanexpert.org/downloadFile/50388).

This Implementation Plan (version 1.1) was disseminated by IOC Circular Letter 2882 of 16 March 2022. It describes interim Standard Operating Procedures (SOPs) for responding to the possibility of future tsunamis originating from volcanic eruptions or processes similar to the HTHH event. Effective from 15 March 2022, the SOPs are being implemented by the PTWC acting as a Tsunami Service Provider (TSP) in the PTWS.

The Task Team has now developed the "Hunga Tonga–Hunga Ha`apai type" Volcanic Tsunami Hazard Response: PTWC Interim Procedures and PTWS Products User's Guide attached hereafter. The PTWC interim procedures and PTWS products, have been reviewed by the ICG/PTWS Steering Committee and subsequently approved by the Chair of the ICG/PTWS on 25 July 2022.

In order to brief Member States on the HTHH PTWC interim procedures, the International Tsunami Information Center (ITIC) is organizing an informational webinar on 6 September 2022 at 2200 UTC. Should you wish to participate to it, please use the following link to connect to the webinar: https://meet.goto.com/ITIC/ptws-hthh-webinar-6-sep-2022 – Access Code: 235-383-141.

Further information on the webinar and registration is through the meeting web site: https://www.oceanexpert.org/event/3613

The IOC Secretariat remains at your disposal to answer your comments and questions on the attached document. Please send your questions and comments to: a.haidar@unesco.org

With my assurances of the highest consideration, I remain.

Yours sincerely,

[signed]

Vladimir Ryabinin
Executive Secretary

Enclosure: Hunga Tonga–Hunga Ha`apai Volcanic Tsunami Hazard Response: PTWC Interim Procedures and PTWS Products – User's Guide, Version 1.3, 25 July 2022

Hunga Tonga – Hunga Ha`apai Volcanic Tsunami Hazard Response

Intergovernmental Coordination Group for Pacific Tsunami Warning and Mitigation System (ICG/PTWS)
PTWC Interim Procedures and PTWS Products User's Guide

Version 1.3, 25 July 2022

Due to the potential for another Hunga Tonga–Hunga Ha`apai volcanic eruption and tsunami, immediate development of an Intergovernmental Coordination Group for Pacific Tsunami Warning and Mitigation System (ICG/PTWS) Interim Procedures Implementation Plan for the Hunga Tonga–Hunga Ha`apai Volcanic Tsunami Hazard Response was initiated. This followed the proposal presented to Member States, their feedback, and agreed upon 'Actions Forward' concluded from the PTWS Post-Event Brief I: 15 January 2022: Hunga Tonga–Hunga Ha`apai Volcanic Eruption and Tsunami held on 20 January 2022. Further Member State feedback was provided during PTWS Post-Event Brief II on 3 February 2022 and PTWS Post-Event Brief III on 10 February 2022.

To facilitate implementation of the PTWS Interim Volcano Tsunami Alert Products and Procedures, the ICG/PTWS established a Task Team on the HTHH Volcanic Tsunami Hazard Response. The Task Team finalised the Implementation Plan and it was endorsed by the ICG/PTWS Steering Committee on 1 March 2022 (v1.1).

This document now details the ICG/PTWS PTWC Interim Procedures and PTWS Products User's Guide, which was developed by the Task Team, reviewed in consensus by the ICG/PTWS Steering Committee and subsequently approved by the Chair of ICG/PTWS on 25 July 2022 (v1.3)

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1. INTRODUCTION

The January 15, 2022 explosive eruption of the Hunga Tonga – Hunga Ha`apai (HTHH) Volcano generated tsunami waves that caused inundation, damage, and casualties on the nearby islands of Tonga as well as significant sea level oscillations and damage across most of the Pacific including places as far away as Japan, the U.S. West Coast, and the Pacific coast of South America. The character of this tsunami – that it spread so far with destructive amplitudes – is enigmatic. Any disturbance of the sea with an areal extent similar to that of the volcanic edifice should have attenuated rapidly as it spread across the vast Pacific. But this did not occur and the usual tsunami forecast models driven solely by a deformation of the sea surface at the source were inadequate for this event. Another forcing mechanism related to atmospheric pressure fluctuations from the eruption was likely involved.

As a result, the only information disseminated by Pacific Tsunami Warning Center (PTWC), as a Tsunami Service Provider (TSP) for the Pacific Tsunami Warning and Mitigation System (PTWS), was to report: 1) That there had been a tsunami observed from the eruption of a Tongan volcano; and 2) Tsunami amplitudes as they were observed on sea level gauges across the Pacific. There was no numerical forecast possible, nor even an ad-hoc qualitative forecast utilizing the knowledge and experience of the PTWC staff since there had never been such an event before. This was the first time that the PTWS responded to a volcano-generated tsunami. Given that the PTWS is designed for earthquake-generated tsunamis, which cause nearly 90% of the world's tsunamis, non-standard procedures were required during the event by the PTWS TSP and by Member States.

To move forward, the International Tsunami Information Centre (ITIC) immediately convened three PTWS Post-Event Briefs to share information and experience, and to discuss the development of interim guidance should another HTHH volcanic eruption occur. The PTWS Post-Event Brief I on 20 January 2022 focused on the warning aspects. The ICG/PTWS Working Group 2 and PTWC presented a proposal for immediate interim guidance on warnings for volcanic sources. PTWS Post-Event Brief II on 3 Feb 2022 shared the warning and response by Tonga and by Member States in the nearby region. PTWS Post-Event Brief III on 10 February 2022 shared the warning and response by Member States in distant regions and discussed lessons learned for strengthening national tsunami warning systems and improving the PTWS. Due to the potential for another HTHH volcanic eruption and tsunami, immediate development of PTWS interim volcano tsunami alert procedures began following the proposal presented to Member States, their feedback, and the agreed upon 'Actions Forward' concluded from PTWS Post-Event Brief I. Further Member State feedback was provided during PTWS Post-Event Brief II and PTWS Post-Event Brief III (PTWS Interim Procedures Implementation Plan - v1.0 presented on 10 February 2022).

To facilitate implementation of PTWS Interim Volcano Tsunami Alert Products and Procedures, the ICG/PTWS established a Task Team on the HTHH Volcanic Tsunami Hazard Response under ICG/PTWS Working Group 2 on Detection, Warning, and Dissemination. The TT-HTHH Terms of Reference were to review and finalize the Implementation Plan, and review and provide feedback to the PTWC during the implementation and development of a User's Guide. The TT-HTHH finalized the Implementation Plan on 1 March 2022 (v1.1), which was provisionally adopted by the ICG/PTWS Steering Committee, and announced officially to Member States through IOC Circular Letter 2822 'Interim Volcano-generated Tsunami Alert Products and Procedures of the Pacific Tsunami Warning and Mitigation System' dated 18 March 2022. The ICG/PTWS PTWC Interim Procedures and PTWS Products User's Guide developed by the TT-HTHH, reviewed in consensus by the ICG/PTWS Steering Committee and subsequently approved by the Chair of ICG/PTWS on 25 July 2022 is presented here.

2. INTERIM STANDARD OPERATING PROCEDURES

2.1 **Overview**

Noting the above, the PTWC will use first available information that a tsunami has been generated to underpin PTWC Threat Messages for any future HTHH events. Specifically, PTWC:

- Will use observed tsunami amplitudes as the basis of a forecast. These include amplitudes from the sea level gauge at the Nuku`alofa and the deep ocean NZG DART gauge, which is the nearest DART to the HTHH volcano. Tsunamis generated at the HTHH volcano will arrive at those stations within approximately 20 to 30 minutes. Observations on these stations will likely constitute the first evidence of a tsunami threat.

- Create the forecast for the future HTHH event by scaling observed maximum amplitudes across the Pacific from the 15 January 2022 event with observed amplitudes of the future HTHH event, starting with the observed amplitudes at Nuku`alofa, the NZG DART, or other nearby sea level stations. Forecast values are only for specific sea level locations and do not represent a wider forecast for that coast.

- Calculate estimated tsunami arrival (ETA) times according to tsunami propagation generated by a sea level disturbance at HTHH.

- Re-assess the forecast at least every hour based upon later arriving sea level readings and then revise and re-issue the forecast if necessary.

NTWCs will need to apply their knowledge of what happened along all their coasts during the 15 January event and also scale it accordingly. A useful reference can be the comparison of the barometric pressure change of the 15 January eruption with record(s) during the future HTHH event from any country weather station or nearby stations.

These interim Threat Messages for HTHH are not meant to provide the same level of detail and/or certainty as normal forecasting products delivered during earthquake-generated tsunami responses. It is expected that this interim SOP will evolve based on advancing science as well as recommendations from WG 2. No graphic products will be provided for this interim service.

This will be a best endeavors approach to creating Threat Messages. Some judgement of the PTWC duty staff will be applied to limit or extend the region around the volcano designated to have a threat and to raise or lower forecast amplitudes based upon the evolving observations as the tsunami propagates across the Pacific.

2.2 **Activity Alert**

Should there be future activity at HTHH resulting in another tsunami, PTWC will probably not become aware until the waves reach either the closest coastal sea level gauge at Nuku`alofa (nkfa), the closest deep-ocean gauge (DART 01003 - dnzg) or some other nearby sea level gauge. These signals will cause PTWC alarms to sound and PTWC Duty Scientists to respond. Other early alerts, such as a report of the observation of an ash cloud in Tonga, from satellite observations by Volcanic Ash Advisory Centers, or from detection of an atmospheric pressure wave may be possible.

2.3 **Product Types and Frequency**

Based on the amplitude of the tsunami waves at the closest stations, PTWC will issue either: 1) a Tsunami Information Statement reporting the activity but indicating there is no tsunami threat, or 2) a Tsunami Threat Message indicating that there is a tsunami threat. A Tsunami Information Statement will typically be the only message unless a supplement is issued later to report observations. A Tsunami Threat Message will be followed by additional Threat Messages at least once an hour until the threat has passed and a Final Threat Message is issued.

2.4 **Product Content**

Time of the HTHH Event. An approximate time of the tsunamigenic activity at HTHH will be estimated from the tsunami arrival times at Nuku`alofa (nkfa) and/or DART NZG (dnzg) and/or other gauges, by subtracting the estimated tsunami travel time from HTHH (Table 1 and Figure 1) from the observed tsunami arrival time at the gauge.
Threat Area. For a Tsunami Threat Message, the area initially considered to have a potential tsunami threat will be those areas within three hours of tsunami travel time unless there are sufficient initial data to prescribe a larger or smaller threatened area. The threat area may expand or contract in later messages as additional data are received.
Estimated Arrival Tsunami Times. Tsunami Threat Messages will contain estimated tsunami arrival times within the threatened area using the standard list of PTWS Warning Points. These arrival times will assume the tsunami is generated at the volcano. They will not represent potential earlier wave arrivals that may occur, as they did on January 15, as a result of tsunami waves excited by atmospheric pressure fluctuations from an explosive eruption. Countries can use the January 15 early arrival times to estimate possible early arrival times for future events.
Tsunami Amplitude Forecast. Tsunami Threat Messages will also contain a tsunami amplitude forecast. The forecast will be based upon the maximum tsunami wave amplitudes observed on coastal and deep-ocean (DART) gauges for the January 15, 2022, event (Table 1), but scaled up or down using the initial gauge readings of the current event. Note that the forecast is only for specific gauge locations – it is not a comprehensive coastal forecast like the one produced by PTWC for earthquake-generated tsunamis. Tsunami amplitudes along coasts in the region of each gauge could be different. Coastal impacts observed on January 15 in relation to gauge readings observed on January 15 can be used as a guide to estimate more comprehensive coastal impacts for the current event.

2.5 **Product Dissemination**

Messages will be disseminated to all Member States by the same methods used by PTWC for messages regarding earthquake-generated tsunamis:

1) the WMO's Global Telecommunications System (GTS),
2) The Aeronautical Fixed Telecommunications Network (AFTN),
3) email, and
4) telefax,

using designated contact addresses that have been transmitted by each Member State to the IOC through official channels.
Further, PTWC will call the Tonga National Tsunami Warning Centre using their operational phone numbers.

In addition, for a few key contacts in Tonga an SMS message will be disseminated for the first Tsunami Information Statement or the first Tsunami Threat Message as a rapid heads-up. The content of the SMS follows.

For a Tsunami Information Statement:

The Pacific Tsunami Warning Center has issued a Tsunami Information Statement regarding activity at the HTHH Volcano in Tonga.

For a Tsunami Threat Message:

The Pacific Tsunami Warning Center has issued a Tsunami Threat Message regarding a tsunami from the HTHH Volcano in Tonga.

Lastly, for this interim service, PTWC messages will also appear on the tsunami.gov website but will reference a magnitude 1.0 earthquake at the site of HTHH volcano. It will require much more work to modify the website to reflect a volcano source.

2.6 **Sample Products**

A sample Tsunami Information Statement, Initial Tsunami Threat Message, Supplemental Tsunami Threat Message, and Final Tsunami Threat Message are given in Appendix 1.

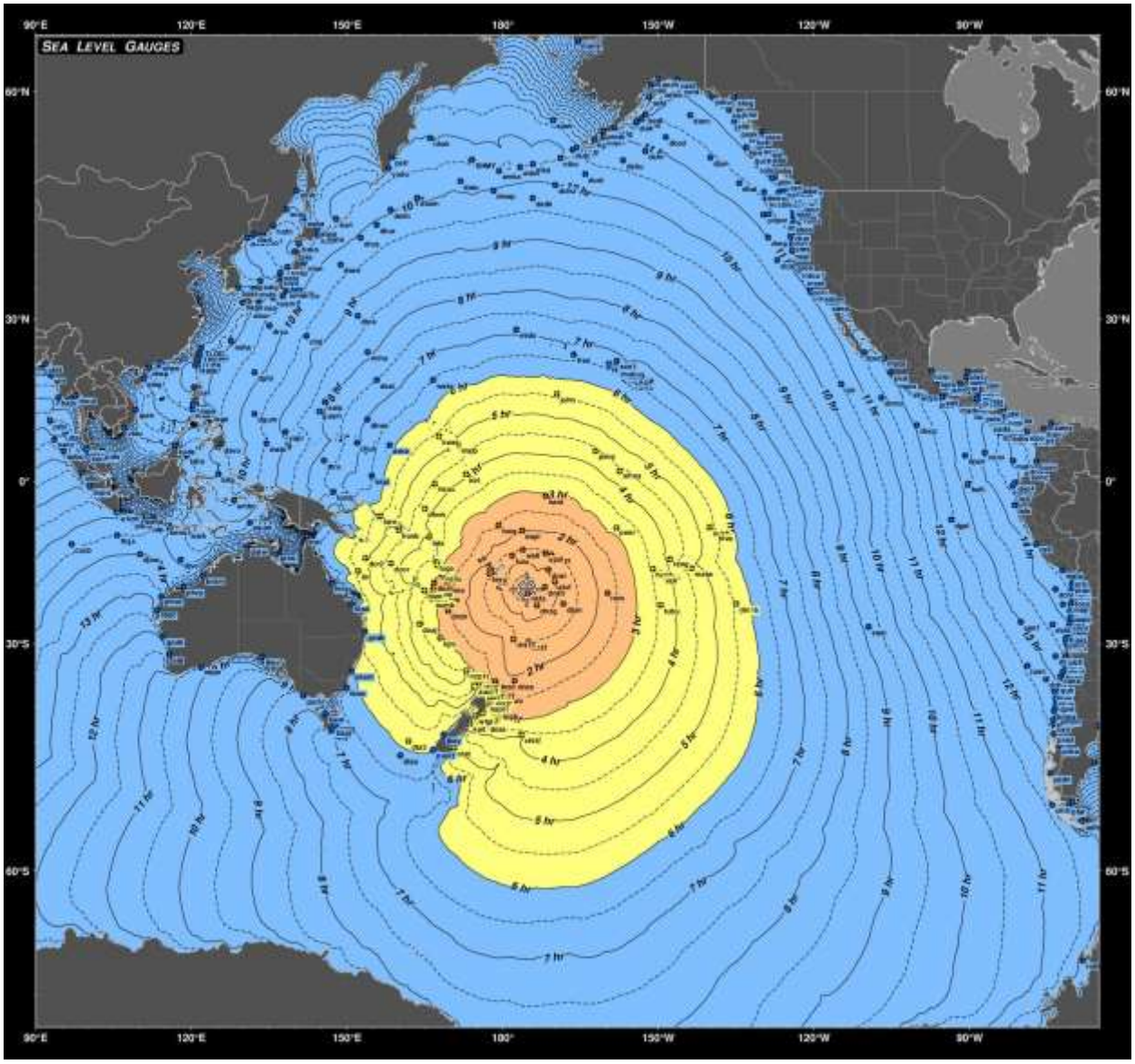

Figure 1. Estimated tsunami travel times from HTHH across the Pacific. On this map are noted the specific coastal and deep-ocean (DART) gauge locations annotated by their respective four-letter code as noted in Table 1.

Table 1. Readings of the maximum tsunami wave amplitude recorded on coastal and deep-ocean (DART) sea level gauges across the Pacific Ocean. Maximum amplitudes were typically measured as half of the trough-to-crest of the largest single wave on each gauge after the tidal component has been removed. In some cases, the maximum amplitude may be the absolute value of the difference between the largest peak or trough and undisturbed sea level at the time. Additional readings may be added to this list. Estimated travel times (ETTs) are the estimated times in hours and minutes for a tsunami wave to travel from HTHH to each gauge.

GAUGE NAME	CODE	ETT	LAT	LON	AMPLITUDE	
NUKUALOFA_TO	**nkfa**	0017	21.1S	175.2W	**0.82M**	2.7FT
DART 01003	**dnzg**	0042	23.4S	173.4W	**0.12M**	0.4FT
PAGO_PAGO_AS	**pago**	0126	14.3S	170.7W	**0.62M**	2.0FT
DART 01002	**dnzf**	0126	29.7S	175.0W	**0.10M**	0.3FT
APIA_UPOLU_WS	**upol**	0136	13.8S	171.8W	**0.17M**	0.5FT
SUVA_VITI_LEVU_FJ	**viti**	0142	18.1S	178.4E	**0.26M**	0.9FT
DART 01001	**dnze**	0208	36.0S	177.7W	**0.07M**	0.2FT
RAROTONGA_CK	**raro**	0215	21.2S	159.8W	**0.90M**	3.0FT
DART 01004	**dnzd**	0227	36.1S	178.6E	**0.11M**	0.4FT
EAST_CAPE_NZ	**lott**	0244	37.6S	178.2E	**0.26M**	0.8FT
FONGAFALE_TV	**fong**	0249	8.5S	179.2E	**0.12M**	0.4FT
LIFOU_NEW_CALEDONIA	**lifo**	0255	20.9S	167.3E	**0.89M**	2.9FT
GISBORNE_EASTLAND_N	**gist**	0304	38.7S	178.0E	**0.68M**	2.2FT
OUVEA_NEW_CALEDONIA	**ouve**	0306	20.5S	166.6E	**0.39M**	1.3FT
OUINNE_NEW_CALEDONI	**ouin**	0313	22.0S	166.7E	**1.13M**	3.7FT
VANUATU	**vanu**	0313	17.8S	168.3E	**1.41M**	4.6FT
THIO_NEW_CALEDONIA	**thio**	0319	21.6S	166.2E	**0.57M**	1.9FT
KINGSTON_NORFOLK_IS	**kjni**	0320	29.1S	168.0E	**0.78M**	2.6FT
HIENGHENE_NEW_CALED	**hien**	0321	20.7S	164.9E	**0.45M**	1.5FT
GREAT_BARRIER_IS_NZ	**gbit**	0326	36.2S	175.5E	**0.70M**	2.3FT
NORTH_CAPE_NZ	**ncpt**	0327	34.4S	173.0E	**0.69M**	2.3FT
LUGANVILLE_VU	**luga**	0328	15.5S	167.2E	**0.37M**	1.2FT
HUAHINE_PF	**huah**	0337	16.7S	151.0W	**0.53M**	1.8FT
TUBUAI_PF	**tubu**	0337	23.3S	149.5W	**0.33M**	1.1FT
PORT_NAPIER_NZ	**napt**	0340	39.5S	176.9E	**0.35M**	1.2FT
VAIRAO_FP_FR	**vair**	0347	17.8S	149.3W	**0.43M**	1.4FT
PAPEETE_TAHITI	**pape**	0347	17.5S	149.6W	**0.27M**	0.9FT
WELLINGTON_NZ	**wlgt**	0401	41.3S	174.8E	**0.18M**	0.6FT
OWENGA_CHATHAM_NZ	**chit**	0419	44.0S	176.4W	**0.44M**	1.4FT
CHRISTMAS_KI	**xmas**	0425	2.0N	157.5W	**0.20M**	0.7FT
NAURU	**nauu**	0429	0.5S	166.9E	**0.15M**	0.5FT
NUKU_HIVA_MARQUESAS	**nukb**	0521	8.9S	140.1W	**0.67M**	2.2FT
HIVA_OA_MARQUESAS	**hiva**	0531	9.8S	139.0W	**0.53M**	1.8FT
LIHOU_REEF_AU	**lirf**	0531	17.1S	152.1E	**0.12M**	0.4FT
RIKITEA_PF	**riki**	0534	23.1S	135.0W	**0.21M**	0.7FT
JOHNSTON_US	**john**	0538	16.7N	169.5W	**0.11M**	0.4FT
TAREKUKURE_WHARF_SB	**tare**	0547	6.7S	156.4E	**0.20M**	0.6FT
GOLD_COAST_SAND_BYP	**gcsb**	0553	27.9S	153.4E	**0.70M**	2.3FT
JACKSON_BAY_NZ	**jbay**	0629	44.0S	168.6E	**0.91M**	3.0FT
HONOKOHAU_HI	**hkhu**	0631	19.7N	156.0W	**0.34M**	1.1FT
TWOFOLD_BAY_AU	**tbwc**	0632	37.1S	149.9E	**0.67M**	2.2FT
WAKE_US	**wake**	0632	19.3N	166.6E	**0.13M**	0.4FT
KAWAIHAE_HAWAII	**kawa**	0638	20.0N	155.8W	**0.37M**	1.2FT
BARBERS_PT_HI	**brpt**	0639	21.3N	158.1W	**0.19M**	0.6FT

GAUGE NAME	CODE	ETT	LAT	LON	AMPLITUDE	
NAWILIWILI_KAUAI	**nawi**	0640	22.0N	159.4W	**0.31M**	1.0FT
HILO_HAWAII	**hilo**	0642	19.7N	155.1W	**0.10M**	0.3FT
HONOLULU_OAHU	**hono**	0642	21.3N	157.9W	**0.12M**	0.4FT
MAKAI_PIER_WAIMANAL	**maka**	0643	21.3N	157.7W	**0.28M**	0.9FT
HALEIWA_HI	**hale**	0643	21.6N	158.1W	**0.41M**	1.3FT
HANALEI_HI	**hanl**	0646	22.2N	159.5W	**0.82M**	2.7FT
KAHULUI_MAUI	**kahu**	0655	20.9N	156.5W	**0.83M**	2.7FT
PORT_KEMBLA_AU	**pkem**	0659	34.5S	150.9E	**0.39M**	1.3FT
MIDWAY	**midw**	0711	28.2N	177.4W	**0.22M**	0.7FT
SPRING_BAY_AU	**sprg**	0720	42.5S	147.9E	**0.35M**	1.1FT
CHUUK_FM	**chuk**	0725	7.5N	151.9E	**0.06M**	0.2FT
LOMBRUM_MANUS_IS_PG	**lomb**	0742	2.0S	147.4E	**0.20M**	0.7FT
SAIPAN_US	**saip**	0812	15.2N	145.7E	**0.11M**	0.4FT
PORTLAND_AU	**porl**	0903	38.3S	141.6E	**0.15M**	0.5FT
EASTER_CL	**east**	0911	27.2S	109.4W	**0.32M**	1.0FT
CHICHIJIMA_JP	**chij**	0933	27.1N	142.2E	**0.74M**	2.4FT
MERA_JP	**mera**	1025	34.9N	139.8E	**0.53M**	1.7FT
BURNIE_TASMANIA_AU	**barn**	1033	41.1S	145.9E	**0.26M**	0.8FT
KUSHIRO_JP	**kush**	1038	43.0N	144.4E	**0.40M**	1.3FT
OFUNATO_HONSHU_JP	**ofun**	1038	39.0N	141.8E	**0.29M**	1.0FT
DART 46403	**dshu**	1042	52.7N	156.8W	**0.06M**	0.2FT
OMAEZAKI_HONSHU_JP	**omae**	1046	34.6N	138.2E	**0.71M**	2.3FT
NIKOLSKI_AK	**niko**	1052	52.9N	168.9W	**0.36M**	1.2FT
ATKA_AK	**atka**	1059	52.2N	174.2W	**0.22M**	0.7FT
VODOPADNAYA_RU	**vodo**	1102	51.7N	158.0E	**0.45M**	1.5FT
LEGASPI_PH	**lega**	1102	13.1N	123.8E	**0.13M**	0.4FT
ABURATSU_JP	**abur**	1110	31.6N	131.4E	**0.65M**	2.1FT
DART 46409	**dkod**	1120	55.3N	148.6W	**0.04M**	0.1FT
TOSASHIMIZU_SHIKOKU	**tosa**	1121	32.8N	133.0E	**0.93M**	3.0FT
HAKODATE_JP	**hako**	1121	41.8N	140.7E	**0.33M**	1.1FT
KUSHIMOTO_JP	**kusm**	1122	33.5N	135.8E	**0.96M**	3.1FT
DUTCH_HBR_UNALASKA	**dutc**	1123	53.9N	166.5W	**0.09M**	0.3FT
DAVAO_PH	**davo**	1128	7.2N	125.7E	**0.22M**	0.7FT
KING_COVE_AK	**kgak**	1153	55.1N	162.3W	**0.32M**	1.1FT
ISHIGAKIJIMA_JP	**ishi**	1157	24.3N	124.2E	**0.15M**	0.5FT
ESPERANCE_AU	**espe**	1205	33.9S	121.9E	**0.17M**	0.6FT
HENSLUNG_COVE_CA	**hens**	1217	54.2N	133.0W	**0.23M**	0.8FT
MAZATLAN_MX	**maza**	1217	23.2N	106.4W	**0.24M**	0.8FT
PUERTO_VALLARTA_MX	**pval**	1219	20.7N	105.2W	**0.39M**	1.3FT
LAZARO_CARDENAS_MX	**laza**	1219	17.9N	102.2W	**0.19M**	0.6FT
WINTER_HARBOUR_CA	**wiha**	1225	50.5N	128.0W	**0.28M**	0.9FT
PORT_ALEXANDER_AK	**paak**	1226	56.2N	134.6W	**0.34M**	1.1FT
ZIHUATANEJO_MX	**zihu**	1227	17.6N	101.6W	**0.46M**	1.5FT
ACAPULCO_MX	**acap**	1236	16.8N	99.9W	**0.13M**	0.4FT
YAKUTAT_AK	**yaku**	1247	59.5N	139.7W	**0.22M**	0.7FT
BAHIA_MANSA_CL	**bmsa**	1302	40.6S	73.7W	**1.03M**	3.4FT
CORRAL_CL	**corr**	1304	39.9S	73.4W	**0.80M**	2.6FT
PUERTO_ANGEL_MX	**ptan**	1304	15.7N	96.5W	**0.38M**	1.2FT
TALCAHUANO_CL	**talc**	1313	36.7S	73.1W	**0.35M**	1.2FT
PUERTO_MELINKA_CL	**pmel**	1321	43.9S	73.7W	**0.11M**	0.4FT
BUCALEMU_CL	**buca**	1322	34.6S	72.0W	**0.52M**	1.7FT
SANTACRUZ_GALAPAGOS	**sant**	1324	0.7S	90.3W	**0.75M**	2.5FT

GAUGE NAME	CODE	ETT	LAT	LON	AMPLITUDE	
QUINTERO_CL	**qtro**	1330	32.8S	71.5W	**0.52M**	1.7FT
PICHIDANGUI_CL	**pich**	1333	32.1S	71.5W	**0.71M**	2.3FT
DART 32402	**dcld**	1340	26.7S	74.0W	**0.09M**	0.3FT
BALTRA_GALAPAGS_EC	**balt**	1340	0.4S	90.3W	**0.40M**	1.3FT
COQUIMBO_CL	**coqu**	1344	30.0S	71.3W	**1.08M**	3.5FT
PUERTO_MADERO_MX	**made**	1358	14.7N	92.4W	**0.21M**	0.7FT
COCOS_ISLAND_CR	**coco**	1401	5.6N	87.0W	**0.01M**	0.0FT
CHANARAL_CL	**chnr**	1404	26.4S	70.6W	**1.74M**	5.7FT
TALTAL_CL	**talt**	1410	25.4S	70.5W	**0.49M**	1.6FT
MEJILLONES_CL	**meji**	1421	23.1S	70.5W	**0.74M**	2.4FT
TALARA_PE	**tala**	1425	4.6S	81.3W	**0.34M**	1.1FT
TOCOPILLA_CL	**toco**	1431	22.1S	70.2W	**0.51M**	1.7FT
CALLAO_LA-PUNTA_PE	**call**	1431	12.1S	77.2W	**0.79M**	2.6FT
PATACHE_CL	**pata**	1439	20.8S	70.2W	**0.15M**	0.5FT
QUEPOS_CR	**quep**	1445	9.4N	84.2W	**0.11M**	0.4FT
PISAGUA_CL	**pisa**	1445	19.6S	70.2W	**0.26M**	0.9FT
LA_LIBERTAD_EC	**lali**	1445	2.2S	80.9W	**0.60M**	2.0FT
MATARANI_PE	**mata**	1445	17.0S	72.1W	**0.48M**	1.6FT
ARICA_CL	**aric**	1451	18.5S	70.3W	**1.22M**	4.0FT
ANTARCTICA_BASE_PRA	**prat**		62.5S	59.7W	**0.27M**	0.9FT
VERNADSKY_UK	**vern**		65.2S	64.3W	**0.28M**	0.9FT

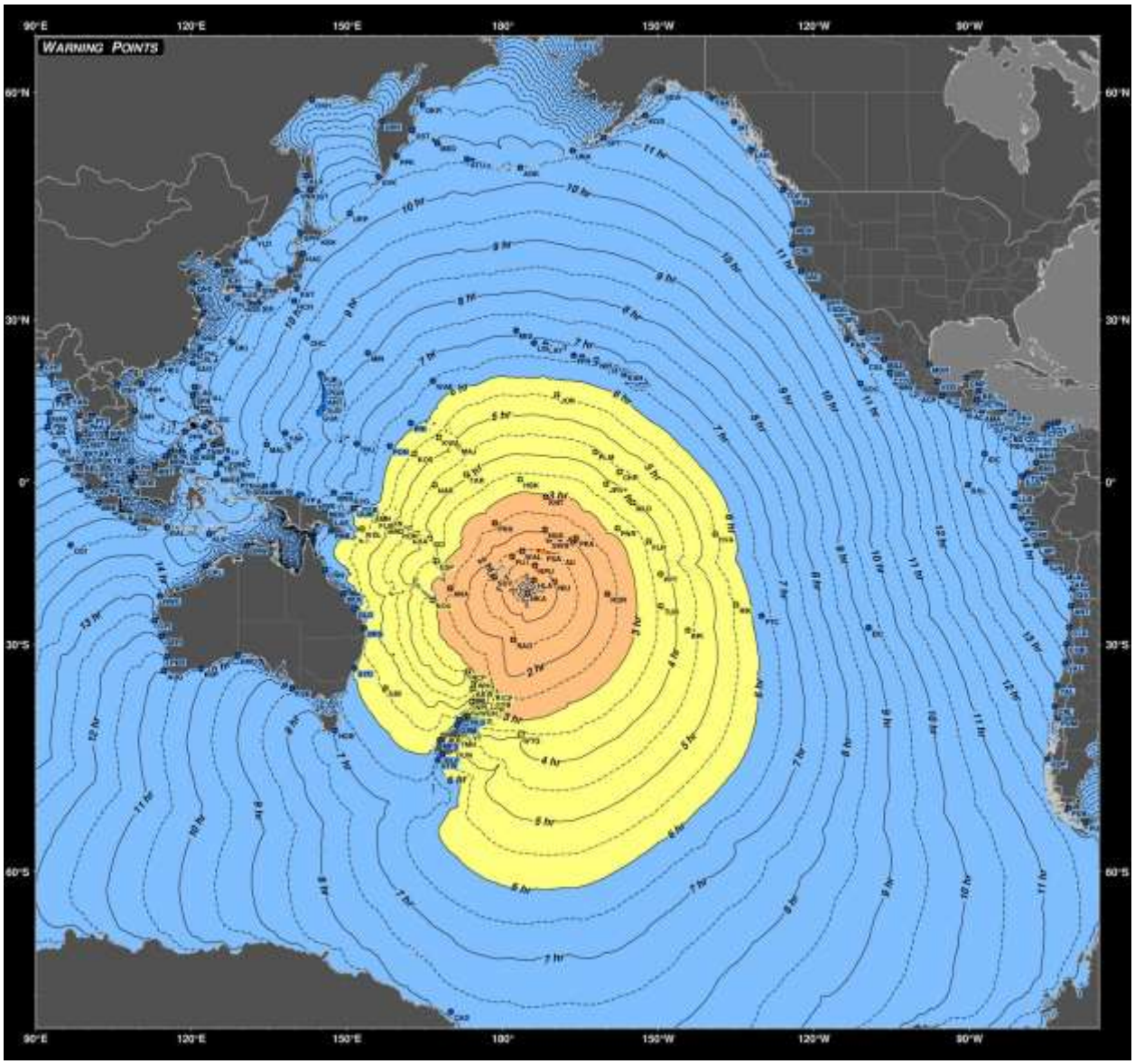

Figure 2. Estimated tsunami travel times from HTHH across the Pacific. On this map are noted the specific Tsunami Warning Point locations annotated by their four-letter code, as noted in Table 2, for each PTWS Member State.

Table 2. Estimated tsunami travel times from HTHH to each of the PTWS Warning Points referred to in PTWC products. Warning Points are listed in increasing travel time order. This list of Warning Points may be revised as needed.

ESTIMATED TRAVEL TIME HR:MN:SC	COUNTRY OR TERRITORY	WARNING_POINT	CODE	LATITUDE +=NORTH -=SOUTH	LONGITUDE 0-180=EAST 180-360=WEST
00:10:36	TONGA	NUKUALOFA	NKA	-21.020	184.770
00:36:55	TONGA	HOLEVA	HLA	-18.643	186.088
01:01:03	NIUE	NIUE_ISLAND	NIU	-19.000	190.000
01:05:53	TONGA	NIUATOPUTAPU	NPU	-15.942	186.233
01:22:59	AMERICAN_SAMOA	PAGO_PAGO	PAG	-14.300	189.300
01:25:41	WALLIS_AND_FUTUNA	FUTUNA_ISLAND	FUT	-14.296	181.840
01:29:38	WALLIS_AND_FUTUNA	WALLIS_ISLAND	WAL	-13.250	183.750
01:36:00	SAMOA	APIA	API	-13.800	188.200
01:39:38	KERMADEC_ISLANDS	RAOUL_ISLAND	RAO	-29.210	182.060
01:42:10	FIJI	SUVA	SUV	-18.137	178.425
02:07:12	TOKELAU	NUKUNONU_ISLAND	NUK	-9.160	188.170
02:09:33	COOK_ISLANDS	PUKAPUKA_ISLAND	PKA	-10.800	194.140
02:15:03	COOK_ISLANDS	RAROTONGA	ROR	-21.200	200.200
02:38:15	VANUATU	ANATOM_ISLAND	ANA	-20.160	169.850
02:40:09	TUVALU	FUNAFUTI_ISLAND	FNA	-7.880	178.500
02:44:15	NEW_ZEALAND	LOTTIN_POINT	LTP	-37.534	178.190
02:59:19	KIRIBATI	KANTON_ISLAND	KNT	-2.820	188.330
03:04:33	NEW_ZEALAND	GISBORNE	GSB	-38.667	178.017
03:13:01	NEW_ZEALAND	NORTH_CAPE	NCP	-34.400	173.300
03:14:04	NEW_ZEALAND	MOUNT_MAUNGANUI	MGN	-37.624	176.173
03:14:13	COOK_ISLANDS	PENRYN_ISLAND	PNR	-8.880	202.160
03:21:41	NEW_ZEALAND	PORT_TAURANGA	PTR	-37.651	176.174
03:22:13	HOWLAND_AND_BAKER	HOWLAND_ISLAND	HBK	0.550	183.380
03:26:12	VANUATU	ESPERITU_SANTO	ESP	-15.110	167.290
03:26:25	NEW_ZEALAND	EAST_CAPE	ECP	-37.667	178.500
03:29:21	NEW_ZEALAND	WHANGAREI	WHG	-35.805	174.514
03:35:28	NEW_CALEDONIA	NOUMEA	NOU	-22.300	166.500
03:36:22	FRENCH_POLYNESIA	TUBUAI	TUB	-23.340	210.490
03:38:23	KIRIBATI	FLINT_ISLAND	FLN	-11.400	208.180
03:40:21	NEW_ZEALAND	NAPIER	NPR	-39.474	176.910
03:46:37	NEW_ZEALAND	KAINGAROA_CHATHAM	KNG	-43.725	183.729
03:47:17	FRENCH_POLYNESIA	PAPEETE	PPT	-17.533	210.433
03:53:52	JARVIS_ISLAND	JARVIS_ISLAND	JRV	-0.370	199.950
03:59:51	KIRIBATI	MALDEN_ISLAND	MLD	-3.940	205.100
04:01:39	NEW_ZEALAND	WELLINGTON	WEL	-41.270	174.837
04:09:57	NEW_ZEALAND	PICTON	PIC	-41.280	174.000
04:15:44	NEW_ZEALAND	WAITANGI_CHATHAM	WTG	-43.941	183.429
04:16:25	NEW_ZEALAND	MARLBOROUGH_SOUNDS	MLB	-41.091	174.387
04:18:20	FRENCH_POLYNESIA	RAPA_ITI	RPI	-27.600	215.700
04:19:26	SOLOMON_ISLANDS	SANTA_CRUZ_ISLAND	SCI	-10.850	165.950
04:25:10	KIRIBATI	CHRISTMAS_ISLAND	CHR	1.980	202.520
04:26:33	PALMYRA_ISLAND	PALMYRA_ISLAND	PLM	5.900	197.900
04:28:57	NAURU	NAURU	NAR	-0.518	166.900
04:29:26	SOLOMON_ISLANDS	KIRAKIRA	KRA	-10.360	161.940
04:30:56	NEW_ZEALAND	AUCKLAND_EAST	AKE	-36.700	175.000
04:37:11	NEW_ZEALAND	AUCKLAND_WEST	AKW	-37.100	174.200
04:54:01	MARSHALL_ISLANDS	MAJURO	MAJ	7.117	171.370
04:58:04	KIRIBATI	TARAWA_ISLAND	TAR	1.500	173.000
05:02:03	SOLOMON_ISLANDS	AUKI	AUK	-8.750	160.620
05:11:36	SOLOMON_ISLANDS	HONIARA	HON	-9.290	159.960
05:16:29	SOLOMON_ISLANDS	GHATERE	GHT	-7.770	159.170

ESTIMATED TRAVEL TIME HR:MN:SC	COUNTRY OR TERRITORY	WARNING_POINT	CODE	LATITUDE +=NORTH -=SOUTH	LONGITUDE 0-180=EAST 180-360=WEST
05:18:16	NEW_ZEALAND	NEW_PLYMOUTH	NPL	-39.053	174.069
05:24:10	NEW_ZEALAND	WANGANUI	WGN	-39.946	174.980
05:25:23	NEW_ZEALAND	DUNEDIN	DUN	-45.883	170.514
05:27:46	NEW_ZEALAND	GREAT_BARRIER_IS	GBI	-37.018	157.414
05:28:51	FRENCH_POLYNESIA	HIVA_OA	HVA	-10.000	221.000
05:29:09	MARSHALL_ISLANDS	KWAJALEIN	KWA	8.700	167.700
05:29:40	KOSRAE	KOSRAE_ISLAND	KOS	5.500	163.000
05:29:41	SOLOMON_ISLANDS	MUNDA	MND	-8.380	157.210
05:30:18	SOLOMON_ISLANDS	PANGGOE	PAN	-6.870	157.160
05:33:25	SOLOMON_ISLANDS	FALAMAE	FLM	-7.360	155.560
05:34:07	FRENCH_POLYNESIA	RIKITEA	RIK	-23.100	225.000
05:36:14	NEW_ZEALAND	LYTTELTON	LYT	-43.617	172.717
05:37:44	JOHNSTON_ISLAND	JOHNSTON_ISLAND	JON	16.738	190.475
05:48:38	NEW_ZEALAND	MILFORD_SOUND	MFS	-44.626	167.877
05:51:14	PAPUA_NEW_GUINEA	KIETA	KIE	-6.070	155.630
05:51:55	PAPUA_NEW_GUINEA	AMUN	AMN	-5.960	154.690
05:52:52	PAPUA_NEW_GUINEA	WOODLARK_ISLAND	WDL	-9.000	152.900
06:01:17	NEW_ZEALAND	WESTPORT	WSP	-41.752	171.583
06:02:32	AUSTRALIA	BRISBANE	BRS	-27.220	153.300
06:08:34	AUSTRALIA	SYDNEY	SYD	-33.860	151.450
06:10:45	PAPUA_NEW_GUINEA	RABAUL	RAB	-4.180	152.270
06:14:37	PITCAIRN	PITCAIRN_ISLAND	PTC	-25.080	229.920
06:16:03	NEW_ZEALAND	GREYMOUTH	GRM	-42.450	171.210
06:16:21	POHNPEI	POHNPEI_ISLAND	PON	7.000	158.218
06:20:59	NEW_ZEALAND	TIMARU	TMR	-44.387	171.269
06:21:44	NEW_ZEALAND	JACKSON_BAY	JKB	-43.962	168.588
06:22:43	NEW_ZEALAND	NELSON	NLS	-41.260	173.266
06:28:25	MARSHALL_ISLANDS	ENIWETOK	ENI	11.400	162.300
06:32:56	WAKE_ISLAND	WAKE_ISLAND	WAK	19.300	166.600
06:39:04	PAPUA_NEW_GUINEA	PORT_MORESBY	PMB	-9.340	146.940
06:39:38	HAWAII	NAWILIWILI	NAW	21.951	200.646
06:41:08	NEW_ZEALAND	STEWART_ISLAND	STW	-47.293	167.505
06:41:52	HAWAII	HILO	HIL	19.700	204.900
06:41:55	HAWAII	HONOLULU	HON	21.300	202.100
06:43:25	NORTHWEST_HAWAII	NECKER	NCK	23.575	195.300
06:44:33	NORTHWEST_HAWAII	FRENCH_FRIGATE	FFR	23.868	193.701
06:45:31	NORTHWEST_HAWAII	NIHOA	NIH	23.060	198.078
06:46:22	PAPUA_NEW_GUINEA	ULAMONA	ULM	-5.000	151.250
06:46:45	PAPUA_NEW_GUINEA	LAE	LAE	-6.760	147.030
06:53:54	NORTHWEST_HAWAII	LISIANSKI	LIS	26.063	186.040
06:54:57	HAWAII	KAHULUI	KAH	20.898	203.528
06:56:46	PAPUA_NEW_GUINEA	KAVIENG	KVG	-2.530	150.690
06:56:54	NORTHWEST_HAWAII	LAYSAN	LAY	25.776	188.256
07:10:13	MIDWAY_ISLAND	MIDWAY_ISLAND	MID	28.200	182.600
07:16:26	AUSTRALIA	CAIRNS	CRN	-16.740	145.790
07:16:45	AUSTRALIA	HOBART	HOB	-43.270	147.650
07:19:33	PAPUA_NEW_GUINEA	MADANG	MDG	-5.170	145.840
07:29:50	PAPUA_NEW_GUINEA	MANUS_ISLAND	MNS	-2.030	147.490
07:33:21	CHUUK	CHUUK_ISLAND	TRU	7.445	151.845
07:36:18	NEW_ZEALAND	BLUFF	BLF	-46.566	168.333
07:49:24	AUSTRALIA	GLADSTONE	GLD	-23.820	151.440
07:51:43	ANTARCTICA	CAPE_ADARE	CAD	-71.000	170.000
07:57:46	PAPUA_NEW_GUINEA	WEWAK	WWK	-3.520	143.650
08:10:11	MINAMITORISHIMA	MINAMITORISHIMA	MIN	24.300	154.000
08:10:46	NORTHERN_MARIANAS	SAIPAN	SAI	15.300	145.800
08:15:42	GUAM	GUAM	GUA	13.436	144.652

ESTIMATED TRAVEL TIME HR:MN:SC	COUNTRY OR TERRITORY	WARNING_POINT	CODE	LATITUDE +=NORTH -=SOUTH	LONGITUDE 0-180=EAST 180-360=WEST
08:19:01	PAPUA_NEW_GUINEA	VANIMO	VNM	-2.580	141.340
08:22:44	INDONESIA	JAYAPURA	JYP	-2.410	140.760
09:00:03	YAP	YAP_ISLAND	YAP	9.500	138.100
09:10:16	INDONESIA	WARSA	WRS	-0.620	135.790
09:11:02	CHILE	EASTER_ISLAND	EIC	-27.150	250.550
09:17:45	AUSTRALIA	MACKAY	MCK	-21.060	149.270
09:29:08	INDONESIA	MANOKWARI	MNK	-0.810	134.210
09:31:06	JAPAN	CHICHI_JIMA	CHC	27.050	142.250
09:59:20	INDONESIA	SORONG	SRN	-0.810	131.130
10:01:28	PALAU	MALAKAL	MAL	7.300	134.500
10:15:18	JAPAN	KATSUURA	KAT	35.110	140.330
10:17:34	ANTARCTICA	THURSTON_ISLAND	THR	-72.000	260.000
10:19:01	INDONESIA	BEREBERE	BRB	2.460	128.690
10:19:21	JAPAN	HACHIJO_JIMA	HCH	33.130	139.820
10:33:12	INDONESIA	PATANI	PTN	0.430	128.760
10:38:20	JAPAN	KUSHIRO	KSH	42.900	144.330
10:39:16	RUSSIA	URUP_ISLAND	URP	46.120	150.540
10:40:51	INDONESIA	GEME	GME	4.590	126.800
10:52:18	PHILIPPINES	DAVAO	DAV	6.850	125.650
10:57:01	INDONESIA	TABUKAN_TENGAH	TBT	3.600	125.600
10:58:27	JAPAN	HACHINOHE	HAC	40.500	141.500
11:02:27	PHILIPPINES	LEGASPI	LEG	13.200	123.800
11:03:20	MEXICO	SOCORRO	SOC	18.800	249.000
11:10:27	RUSSIA	MEDNNY_ISLAND	MED	54.720	167.430
11:11:08	PHILIPPINES	PALANAN	PAL	17.150	122.610
11:13:58	INDONESIA	MANADO	MND	1.600	124.900
11:16:43	JAPAN	NOBEOKA	NOB	32.500	131.800
11:19:07	JAPAN	SHIMIZU	SHI	32.800	133.000
11:19:53	RUSSIA	UST_KAMCHATSK	UST	56.120	162.580
11:20:21	MEXICO	PUNTA_ABREOJOS	PAB	26.680	246.380
11:22:12	RUSSIA	PETROPAVLOVSK	PPK	53.230	159.580
11:22:54	PHILIPPINES	COTABUTO_CITY	CTB	7.250	124.170
11:25:19	MEXICO	ENSENADA	ENS	31.830	243.220
11:32:00	MEXICO	CABO_SAN_LUCAS	CSL	22.840	250.020
11:34:47	TAIWAN	HUALIEN	HUA	24.000	121.700
11:35:28	TAIWAN	TAITUNG	TTG	22.700	121.200
11:39:18	RUSSIA	SEVERO_KURILSK	SVK	50.830	156.070
11:47:13	RUSSIA	OSTROV_KARAGINSKIY	OKR	58.800	164.500
11:57:46	JAPAN	OKINAWA	OKI	26.200	127.800
12:03:09	PHILIPPINES	LAOAG	LAG	18.200	120.600
12:04:00	TAIWAN	CHILUNG	CHL	25.200	121.800
12:06:02	MEXICO	MANZANILLO	MNZ	19.100	255.700
12:11:46	PHILIPPINES	SAN_FERNANDO	SFR	16.600	120.300
12:15:46	MEXICO	MAZATLAN	MAZ	23.170	253.560
12:16:37	PHILIPPINES	MAIMBUNG	MAB	5.900	121.000
12:17:12	PHILIPPINES	ZAMBOANGA	ZAM	7.000	122.300
12:17:33	TAIWAN	KAOHSIUNG	KAO	22.500	120.300
12:19:09	MEXICO	PUERTO_VALLARTA	PVA	20.650	254.750
12:19:21	MEXICO	LAZARO_CARDENAS	LZC	17.900	257.800
12:21:02	CHILE	GOLFO_DE_PENAS	GDP	-47.100	285.110
12:34:44	MEXICO	SAN_BLAS	SBL	21.500	254.700
12:36:00	MEXICO	ACAPULCO	ACP	16.900	260.100
12:38:10	JAPAN	NAGASAKI	NGS	32.700	129.700
12:45:45	JAPAN	SAPPORO	SPR	43.500	141.000
12:51:26	CHILE	PUNTA_ARENAS	PUN	-53.200	289.100
12:53:34	MEXICO	GUAYMAS	GYM	27.850	249.150
13:02:22	CHILE	CORRAL	CRL	-39.770	286.460

ESTIMATED TRAVEL TIME HR:MN:SC	COUNTRY OR TERRITORY	WARNING_POINT	CODE	LATITUDE +=NORTH -=SOUTH	LONGITUDE 0-180=EAST 180-360=WEST
13:05:38	JAPAN	NIIGATA	NII	38.000	139.000
13:07:22	RUSSIA	GASTELLO	GST	49.100	143.000
13:13:31	CHILE	TALCAHUANO	TAL	-36.700	286.900
13:15:38	PHILIPPINES	PUERTO_PRINCESA	PPR	9.800	118.800
13:21:02	INDONESIA	TARAKAN	TRK	3.300	117.600
13:21:59	RUSSIA	VLADIVOSTOK	VLD	42.750	132.000
13:28:36	PHILIPPINES	ILOILO	ILL	10.700	122.500
13:29:47	CHILE	VALPARAISO	VAL	-33.000	288.400
13:36:57	DPR_OF_KOREA	SINCHANG	SNC	40.130	128.470
13:40:17	ECUADOR	BALTRA_ISLAND	BAL	-0.500	269.700
13:44:01	CHILE	COQUIMBO	CQB	-29.930	288.650
13:45:51	MEXICO	SALINA_CRUZ	SLC	16.500	264.800
13:47:00	REPUBLIC_OF_KOREA	CHEJU_ISLAND	CHJ	33.500	127.000
13:57:42	MEXICO	PUERTO_MADERO	PMD	14.790	267.470
13:58:34	GUATEMALA	SIPICATE	SIP	13.900	268.770
13:58:43	CHILE	CALDERA	CLD	-27.100	289.200
14:00:40	COSTA_RICA	ISLA_DEL_COCO	IDC	5.536	272.919
14:04:50	JAPAN	SHIMANE	SHM	35.750	133.000
14:05:46	TAIWAN	HOMEL	HML	24.200	120.400
14:07:26	MALAYSIA	SANDAKAN	SDK	5.900	118.100
14:07:57	VIETNAM	QUI_NHON	QNH	13.700	109.200
14:16:14	CHINA	HAINAN_ISLAND	HNN	18.750	110.500
14:17:43	PERU	TALARA	TLR	-4.630	278.530
14:20:32	CHILE	ANTOFAGASTA	ANT	-23.320	289.570
14:23:51	RUSSIA	VANINO	VNN	49.050	140.350
14:26:58	EL_SALVADOR	ACAJUTLA	ACJ	13.600	270.200
14:27:13	COSTA_RICA	CABO_SAN_ELENA	CSE	10.850	273.960
14:27:55	PERU	SAN_JUAN	SJN	-15.330	284.760
14:28:44	PERU	LA_PUNTA	LAP	-12.100	282.800
14:30:42	PHILIPPINES	MANILA	MNL	14.600	121.000
14:33:41	ECUADOR	LA_LIBERTAD	LLB	-2.190	278.770
14:38:18	CHINA	WENZHOU	WNZ	27.800	121.200
14:39:14	NICARAGUA	CORINTO	COR	12.500	272.800
14:39:34	NICARAGUA	PUERTO_SANDINO	SAN	12.200	273.200
14:41:25	CHILE	IQUIQUE	IQU	-20.200	289.900
14:42:44	REPUBLIC_OF_KOREA	BUSAN	BUS	35.050	129.100
14:44:51	COSTA_RICA	PUERTO_QUEPOS	PQP	9.400	275.800
14:47:11	PERU	MOLLENDO	MLN	-17.080	288.000
14:47:41	COSTA_RICA	CABO_MATAPALO	CMP	8.350	276.710
14:48:42	NICARAGUA	SAN_JUAN_DL_SUR	SJS	11.200	274.100
14:50:44	CHILE	ARICA	ARI	-18.500	289.700
14:53:11	PERU	CHIMBOTE	CHM	-9.000	281.170
14:54:48	PANAMA	PUNTA_BURICA	PBR	8.020	277.150
14:58:01	MALAYSIA	LAHAD_DATU	LHD	4.900	118.400
15:00:36	CHILE	PUERTO_MONTT	PUM	-41.500	287.000
15:02:11	CHINA	QUANZHOU	QNZ	24.800	118.800
15:04:37	PERU	PIMENTAL	PIM	-6.900	279.980
15:10:53	CHINA	HONG_KONG	HKC	22.300	114.200
15:12:02	ECUADOR	ESMERELDAS	ESM	1.170	280.210
15:12:33	HONDURAS	AMAPALA	AMA	13.230	272.360
15:19:47	RUSSIA	UST_KAHYRYUZOVO	UKH	57.100	156.700
15:28:50	COLOMBIA	TUMACO	TUM	1.820	281.140
15:30:17	MEXICO	SAN_FELIPE	SFL	31.000	245.200
15:38:42	PANAMA	PUNTA_MALA	PML	7.480	280.050
15:49:01	COLOMBIA	BAHIA_SOLANO	BAH	6.300	282.600
15:49:45	RUSSIA	ALEXANDROVSK_SAK	ALX	50.900	142.100
15:51:40	PANAMA	PUERTO_PINA	PPN	7.390	281.950

ESTIMATED TRAVEL TIME HR:MN:SC	COUNTRY OR TERRITORY	WARNING_POINT	CODE	LATITUDE +=NORTH -=SOUTH	LONGITUDE 0-180=EAST 180-360=WEST
16:06:28	MALAYSIA	KOTA_KINABALU	KTK	6.000	116.000
16:12:37	COLOMBIA	BUENAVENTURA	BNV	3.800	282.800
16:16:10	RUSSIA	OKHOTSK	OKH	59.300	143.250
16:36:51	BRUNEI	MUARA	MRA	5.000	115.100
16:54:06	INDONESIA	KEPULAUAN_RIAU	KPR	4.000	108.500
17:13:14	MALAYSIA	BINTULU	BNT	3.200	113.000
17:39:29	CHILE	PUERTO_WILLIAMS	PUW	-54.900	292.400
18:01:06	PANAMA	BALBOA_HEIGHTS	BHP	9.000	280.400
18:06:01	CHINA	SHANGHAI	SGH	31.200	122.300
18:54:38	VIETNAM	VINH	VNH	18.600	105.700
19:46:30	REPUBLIC_OF_KOREA	INCHON	ICH	37.300	126.400
21:37:03	INDONESIA	SINGKAWANG	SKW	1.000	109.000
21:42:29	VIETNAM	BAC_LIEU	BCL	9.300	105.800
21:52:22	DPR_OF_KOREA	NAMPHO	NMP	38.750	125.000
22:12:03	CHINA	QINGDAO	QND	36.000	120.400
22:20:17	MALAYSIA	K_TERENGGANU	KTR	5.300	103.200
25:50:38	SINGAPORE	SINGAPORE	SNG	1.200	103.800
25:52:13	INDONESIA	PANGKALPINANG	PKP	-2.100	106.100
28:06:17	THAILAND	NK_SI_THAMMARAT	NST	8.400	100.000
29:27:38	CAMBODIA	SIHANOUKVILLE	SHN	10.600	103.600
29:50:05	INDONESIA	KUALA_INDRAGIRI	KID	-0.500	103.750
30:00:18	THAILAND	PRA_KHIRI_KHAN	PKK	11.800	99.800
31:55:49	THAILAND	PATTAYA	PTY	12.800	100.850

Appendix 1:

A) TSUNAMI INFORMATION STATEMENT

The following is a sample Tsunami Information Statement that might be issued for small non-hazardous tsunami waves coming from HTHH, such as those that were observed on January 13 and 14, 2022. A Tsunami Information Statement might also be issued in the case of a noteable eruptive event at HTHH that has not produced tsunami waves. Note that the "TEST" language sprinkled throughout the message would be absent in an actual product.

```
ZCZC WEPA42 PHEB 041630
TIBPAC

TEST...TSUNAMI INFORMATION STATEMENT NUMBER 1...TEST
NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
1630 UTC FRI MAR 4 2022

...THIS MESSAGE IS FOR TEST PURPOSES ONLY...
...TEST PTWC TSUNAMI INFORMATION STATEMENT TEST...


**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****

 THIS IS A TEST MESSAGE. THIS STATEMENT IS ISSUED FOR INFORMATION
 ONLY IN SUPPORT OF THE UNESCO/IOC PACIFIC TSUNAMI WARNING AND
 MITIGATION SYSTEM AND IS MEANT FOR NATIONAL AUTHORITIES IN EACH
 COUNTRY OF THAT SYSTEM.

 THIS IS A TEST MESSAGE. NATIONAL AUTHORITIES WILL DETERMINE THE
 APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY AND MAY ISSUE
 ADDITIONAL OR MORE REFINED INFORMATION.

**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****


------------------------------------------------------
TEST... VOLCANIC ACTIVITY IN TONGA HAS OCCURRED ...TEST
------------------------------------------------------


TEST... PRELIMINARY VOLCANO PARAMETERS ...TEST
-----------------------------------------

  * ACTIVITY TIME  1530 UTC MAR 4 2022
  * COORDINATES    20.5 SOUTH  175.4 WEST
  * LOCATION       TONGA


TEST... EVALUATION ...TEST
--------------------------

  * THIS IS A TEST MESSAGE. VOLCANIC ACTIVITY OCCURRED IN THE
    TONGA ISLANDS REGION AT 1530 UTC ON FRIDAY MARCH 4 2022.

  * THIS IS A TEST MESSAGE. BASED ON ALL AVAILABLE DATA... THERE
    IS NO TSUNAMI THREAT FROM THIS VOLCANIC ACTIVITY.
```

TEST... RECOMMENDED ACTIONS ...TEST
---

* THIS IS A TEST MESSAGE. NO ACTION IS REQUIRED.

TEST... TSUNAMI OBSERVATIONS ...TEST
---

* THIS IS A TEST MESSAGE. THE FOLLOWING ARE TSUNAMI WAVE OBSERVATIONS FROM COASTAL AND/OR DEEP-OCEAN SEA LEVEL GAUGES AT THE INDICATED LOCATIONS. THE MAXIMUM TSUNAMI AMPLITUDE IS MEASURED WITH RESPECT TO THE NORMAL TIDE LEVEL.

GAUGE LOCATION	GAUGE COORDINATES LAT	LON	TIME OF MEASURE (UTC)	MAXIMUM TSUNAMI AMPLITUDE	WAVE PERIOD (MIN)
NUKUALOFA TO	21.1S	175.2W	1622	0.03M/ 0.1FT	04

TEST... NEXT UPDATE AND ADDITIONAL INFORMATION ...TEST
---

* THIS IS A TEST MESSAGE. THIS WILL BE THE ONLY STATEMENT ISSUED FOR THIS EVENT UNLESS ADDITIONAL DATA ARE RECEIVED OR THE SITUATION CHANGES.

* THIS IS A TEST MESSAGE. FURTHER INFORMATION ABOUT THIS EVENT MAY BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF HAWAII... AMERICAN SAMOA... GUAM... AND CNMI SHOULD REFER TO PACIFIC TSUNAMI WARNING CENTER MESSAGES SPECIFICALLY FOR THOSE PLACES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF CALIFORNIA... OREGON... WASHINGTON... BRITISH COLUMBIA AND ALASKA SHOULD ONLY REFER TO U.S. NATIONAL TSUNAMI WARNING CENTER MESSAGES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST MESSAGE.

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B) INITIAL TSUNAMI THREAT MESSAGE

The following is a sample initial Tsunami Threat Message that might be issued following the detection of potentially hazardous tsunami waves on the nearest sea level gauge(s) to HTHH. In this example, based upon the tsunami amplitude observed at Nuku`alofa, the forecast is for gauge amplitudes that are 0.5 times the size of the amplitudes observed on January 15, 2022. The initial areal extent of the threat has been limited to three hours of tsunami travel time from HTHH. Note that the "TEST" language sprinkled throughout the message would be absent in an actual product.

```
ZCZC WEPA40 PHEB 041555
TSUPAC

TEST...TSUNAMI MESSAGE NUMBER 1...TEST
NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
1555 UTC FRI MAR 4 2022

...THIS MESSAGE IS FOR TEST PURPOSES ONLY...
...TEST PTWC TSUNAMI THREAT MESSAGE TEST...


**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****

 THIS IS A TEST MESSAGE. THIS MESSAGE IS ISSUED FOR INFORMATION
 ONLY IN SUPPORT OF THE UNESCO/IOC PACIFIC TSUNAMI WARNING AND
 MITIGATION SYSTEM AND IS MEANT FOR NATIONAL AUTHORITIES IN EACH
 COUNTRY OF THAT SYSTEM.

 THIS IS A TEST MESSAGE. NATIONAL AUTHORITIES WILL DETERMINE THE
 APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY AND MAY ISSUE
 ADDITIONAL OR MORE REFINED INFORMATION.

**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****


------------------------------------------------------------
TEST... VOLCANIC ACTIVITY IN TONGA GENERATED A TSUNAMI ...TEST
------------------------------------------------------------


TEST... PRELIMINARY VOLCANO PARAMETERS ...TEST
----------------------------------------

  * ACTIVITY TIME  1530 UTC MAR 4 2022
  * COORDINATES    20.5 SOUTH  175.4 WEST
  * LOCATION       TONGA


TEST... EVALUATION ...TEST
--------------------------

  * THIS IS A TEST MESSAGE. VOLCANIC ACTIVITY OCCURRED IN THE
    TONGA ISLANDS AT 1530 UTC ON FRIDAY MARCH 4 2022.


TEST... TSUNAMI THREAT FORECAST ...TEST
---------------------------------------
```

* THIS IS A TEST MESSAGE. HAZARDOUS TSUNAMI WAVES FROM THIS VOLCANIC ACTIVITY ARE POSSIBLE ALONG SOME COASTS OF

  TONGA... NIUE... AMERICAN SAMOA... WALLIS AND FUTUNA... SAMOA... KERMADEC ISLANDS... FIJI... TOKELAU... COOK ISLANDS... VANUATU... TUVALU... NEW ZEALAND... KIRIBATI... HOWLAND AND BAKER... NEW CALEDONIA... FRENCH POLYNESIA... JARVIS ISLAND... SOLOMON ISLANDS... PALMYRA ISLAND... NAURU... MARSHALL ISLANDS... KOSRAE... JOHNSTON ISLAND... PAPUA NEW GUINEA... AUSTRALIA... PITCAIRN... POHNPEI... WAKE ISLAND... HAWAII AND NORTHWEST HAWAII

* THIS IS A TEST MESSAGE. BASED UPON THE INITIAL OBSERVATIONS... THIS TSUNAMI IS FORECAST TO BE ABOUT 0.5 TIMES THE SIZE OF THE JANUARY 15 2022 TSUNAMI FROM THE SAME VOLCANO IN TONGA.

* THIS IS A TEST MESSAGE. THE FOLLOWING ARE FORECAST MAXIMUM TSUNAMI AMPLITUDES RELATIVE TO NORMAL SEA LEVEL AT COASTAL GAUGES WITHIN CURRENT THREAT AREA. THE FORECAST FOR EACH GAUGE IS BASED UPON SCALING THE MAXIMUM TSUNAMI AMPLITUDE MEASURED ON THAT GAUGE FOR THE JANUARY 15 2022 TSUNAMI USING THE SCALE FACTOR GIVEN ABOVE. TSUNAMI WAVES ALONG OTHER COASTS IN THE REGION OF EACH GAUGE MAY BE LARGER OR SMALLER THAN AT THE GAUGE. A SIMILAR SCALING OF ANY KNOWN JANUARY 15 IMPACTS ALONG THOSE COASTS CAN BE USED AS A GUIDE.

GAUGE LOCATION	COORDINATES LAT	LON	FIRST WAVE ETA (UTC)	FORECAST MAX TSUNAMI AMPLITUDE
NUKUALOFA TO	21.1S	175.2W	03/04 1548	0.41M/ 1.34FT
DART 5401003	23.4S	173.4W	03/04 1612	0.10M/ 0.34FT
DART 5401002	29.7S	175.0W	03/04 1655	0.05M/ 0.16FT
PAGO PAGO AS	14.3S	170.7W	03/04 1656	0.31M/ 1.02FT
APIA UPOLU WS	13.8S	171.8W	03/04 1706	0.09M/ 0.28FT
SUVA VITI LEVU FJ	18.1S	178.4E	03/04 1712	0.13M/ 0.43FT
DART 5401001	36.0S	177.7W	03/04 1737	0.04M/ 0.11FT
RAROTONGA CK	21.2S	159.8W	03/04 1745	0.45M/ 1.48FT
DART 5501004	36.1S	178.6E	03/04 1757	0.05M/ 0.18FT
EAST CAPE NZ	37.5S	178.2E	03/04 1814	0.13M/ 0.43FT
FONGAFALE TV	8.5S	179.2E	03/04 1819	0.06M/ 0.20FT
MARE NEW CALEDONIA F	21.5S	167.9E	03/04 1822	0.38M/ 1.23FT
LIFOU NEW CALEDONIA	20.9S	167.3E	03/04 1825	0.44M/ 1.46FT

TEST... RECOMMENDED ACTIONS ...TEST

* THIS IS A TEST MESSAGE. GOVERNMENT AGENCIES RESPONSIBLE FOR THREATENED COASTAL AREAS SHOULD TAKE ACTION TO INFORM AND INSTRUCT ANY COASTAL POPULATIONS AT RISK IN ACCORDANCE WITH THEIR OWN EVALUATION... PROCEDURES AND THE LEVEL OF THREAT.

* THIS IS A TEST MESSAGE. PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD STAY ALERT FOR INFORMATION AND FOLLOW INSTRUCTIONS FROM NATIONAL AND LOCAL AUTHORITIES.

TEST... ESTIMATED TIMES OF ARRIVAL ...TEST

* THIS IS A TEST MESSAGE. ESTIMATED TIMES OF ARRIVAL -ETA- OF THE INITIAL TSUNAMI WAVE FOR PLACES WITHIN THE THREAT REGION. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN WAVES CAN BE FIVE MINUTES TO ONE HOUR.

LOCATION	REGION	COORDINATES	ETA(UTC)
NUKUALOFA	TONGA	21.0S 175.2W	1540 03/04
HOLEVA	TONGA	18.6S 173.9W	1606 03/04
NIUE ISLAND	NIUE	19.0S 170.0W	1631 03/04
NIUATOPUTAPU	TONGA	15.9S 173.8W	1635 03/04
PAGO PAGO	AMERICAN SAMOA	14.3S 170.7W	1652 03/04
FUTUNA ISLAND	WALLIS AND FUTUN	14.3S 178.2W	1655 03/04
WALLIS ISLAND	WALLIS AND FUTUN	13.2S 176.2W	1659 03/04
APIA	SAMOA	13.8S 171.8W	1706 03/04
RAOUL ISLAND	KERMADEC ISLANDS	29.2S 177.9W	1709 03/04
SUVA	FIJI	18.1S 178.4E	1712 03/04
NUKUNONU ISLAND	TOKELAU	9.2S 171.8W	1737 03/04
PUKAPUKA ISLAND	COOK ISLANDS	10.8S 165.9W	1739 03/04
RAROTONGA	COOK ISLANDS	21.2S 159.8W	1745 03/04
ANATOM ISLAND	VANUATU	20.2S 169.9E	1808 03/04
FUNAFUTI ISLAND	TUVALU	7.9S 178.5E	1810 03/04
LOTTIN POINT	NEW ZEALAND	37.5S 178.2E	1814 03/04
KANTON ISLAND	KIRIBATI	2.8S 171.7W	1829 03/04

TEST... POTENTIAL IMPACTS ...TEST

* THIS IS A TEST MESSAGE. A TSUNAMI IS A SERIES OF WAVES. THE TIME BETWEEN WAVE CRESTS CAN VARY FROM 5 MINUTES TO AN HOUR. THE HAZARD MAY PERSIST FOR MANY HOURS OR LONGER AFTER THE INITIAL WAVE.

* THIS IS A TEST MESSAGE. IMPACTS CAN VARY SIGNIFICANTLY FROM ONE SECTION OF COAST TO THE NEXT DUE TO LOCAL BATHYMETRY AND THE SHAPE AND ELEVATION OF THE SHORELINE.

* THIS IS A TEST MESSAGE. IMPACTS CAN ALSO VARY DEPENDING UPON THE STATE OF THE TIDE AT THE TIME OF THE MAXIMUM TSUNAMI WAVES.

* THIS IS A TEST MESSAGE. PERSONS CAUGHT IN THE WATER OF A TSUNAMI MAY DROWN... BE CRUSHED BY DEBRIS IN THE WATER... OR BE SWEPT OUT TO SEA.

TEST... TSUNAMI OBSERVATIONS ...TEST

* THIS IS A TEST MESSAGE. THE FOLLOWING ARE TSUNAMI WAVE OBSERVATIONS FROM COASTAL AND/OR DEEP-OCEAN SEA LEVEL GAUGES

AT THE INDICATED LOCATIONS. THE MAXIMUM TSUNAMI AMPLITUDE IS MEASURED WITH RESPECT TO THE NORMAL TIDE LEVEL.

GAUGE LOCATION	GAUGE COORDINATES LAT	LON	TIME OF MEASURE (UTC)	MAXIMUM TSUNAMI AMPLITUDE	WAVE PERIOD (MIN)
NUKUALOFA TO	21.1S	175.2W	1550	0.39M/ 1.3FT	04

TEST... NEXT UPDATE AND ADDITIONAL INFORMATION ...TEST

* THIS IS A TEST MESSAGE. THE NEXT MESSAGE WILL BE ISSUED IN ONE HOUR... OR SOONER IF THE SITUATION WARRANTS.

* THIS IS A TEST MESSAGE. FURTHER INFORMATION ABOUT THIS EVENT MAY BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF HAWAII... AMERICAN SAMOA... GUAM... AND CNMI SHOULD REFER TO PACIFIC TSUNAMI WARNING CENTER MESSAGES SPECIFICALLY FOR THOSE PLACES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF CALIFORNIA... OREGON... WASHINGTON... BRITISH COLUMBIA AND ALASKA SHOULD ONLY REFER TO U.S. NATIONAL TSUNAMI WARNING CENTER MESSAGES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST MESSAGE.

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C) SUPPLEMENTAL TSUNAMI THREAT MESSAGE

The following is a sample supplemental Tsunami Threat Message that might be issued as part of a sequence of messages following the observation of potentially hazardous tsunami waves from HTHH. In this example representing the third message issued an hour and 45 minutes after the event, tsunami waves have now been observed at Nuku`alofa, Apia, and Pago Pago. Based on the maximum amplitudes from those gauges, the forecast for gauges is now 0.8 times the amplitudes observed on January 15, 2022. The areal extent of the threat has been extended to six hours of tsunami travel time from HTHH. Note that the "TEST" language sprinkled throughout the message would be absent in an actual product.

```
ZCZC WEPA40 PHEB 041715
TSUPAC

TEST...TSUNAMI MESSAGE NUMBER 3...TEST
NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
1715 UTC FRI MAR 4 2022

...THIS MESSAGE IS FOR TEST PURPOSES ONLY...
...TEST PTWC TSUNAMI THREAT MESSAGE TEST...


**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****

 THIS IS A TEST MESSAGE. THIS MESSAGE IS ISSUED FOR INFORMATION
 ONLY IN SUPPORT OF THE UNESCO/IOC PACIFIC TSUNAMI WARNING AND
 MITIGATION SYSTEM AND IS MEANT FOR NATIONAL AUTHORITIES IN EACH
 COUNTRY OF THAT SYSTEM.

 THIS IS A TEST MESSAGE. NATIONAL AUTHORITIES WILL DETERMINE THE
 APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY AND MAY ISSUE
 ADDITIONAL OR MORE REFINED INFORMATION.

**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****


------------------------------------------------------------
TEST... VOLCANIC ACTIVITY IN TONGA GENERATED A TSUNAMI ...TEST
------------------------------------------------------------


TEST... PRELIMINARY VOLCANO PARAMETERS ...TEST
-----------------------------------------

  * ACTIVITY TIME  1530 UTC MAR 4 2022
  * COORDINATES    20.5 SOUTH  175.4 WEST
  * LOCATION       TONGA


TEST... EVALUATION ...TEST
--------------------------

  * THIS IS A TEST MESSAGE. VOLCANIC ACTIVITY OCCURRED IN THE
    TONGA ISLANDS AT 1530 UTC ON FRIDAY MARCH 4 2022.
```

TEST... TSUNAMI THREAT FORECAST...UPDATED ...TEST
---

* THIS IS A TEST MESSAGE. HAZARDOUS TSUNAMI WAVES FROM THIS VOLCANIC ACTIVITY ARE POSSIBLE ALONG SOME COASTS OF

  TONGA... NIUE... AMERICAN SAMOA... WALLIS AND FUTUNA... SAMOA... KERMADEC ISLANDS... FIJI... TOKELAU... COOK ISLANDS... VANUATU... TUVALU... NEW ZEALAND... KIRIBATI... HOWLAND AND BAKER... NEW CALEDONIA... FRENCH POLYNESIA... JARVIS ISLAND... SOLOMON ISLANDS... PALMYRA ISLAND... NAURU... MARSHALL ISLANDS... KOSRAE... JOHNSTON ISLAND... PAPUA NEW GUINEA... AUSTRALIA... PITCAIRN... POHNPEI... WAKE ISLAND... HAWAII... NORTHWEST HAWAII... MIDWAY ISLAND... CHUUK... ANTARCTICA... MINAMITORISHIMA... NORTHERN MARIANAS... GUAM... INDONESIA... YAP... CHILE AND JAPAN

* THIS IS A TEST MESSAGE. BASED UPON THE INITIAL OBSERVATIONS... THIS TSUNAMI IS FORECAST TO BE ABOUT 0.8 TIMES THE SIZE OF THE JANUARY 15 2022 TSUNAMI FROM THE SAME VOLCANO IN TONGA.

* THIS IS A TEST MESSAGE. THE FOLLOWING ARE FORECAST MAXIMUM TSUNAMI AMPLITUDES RELATIVE TO NORMAL SEA LEVEL AT COASTAL GAUGES WITHIN CURRENT THREAT AREA. THE FORECAST FOR EACH GAUGE IS BASED UPON SCALING THE MAXIMUM TSUNAMI AMPLITUDE MEASURED ON THAT GAUGE FOR THE JANUARY 15 2022 TSUNAMI USING THE SCALE FACTOR GIVEN ABOVE. TSUNAMI WAVES ALONG OTHER COASTS IN THE REGION OF EACH GAUGE MAY BE LARGER OR SMALLER THAN AT THE GAUGE. A SIMILAR SCALING OF ANY KNOWN JANUARY 15 IMPACTS ALONG THOSE COASTS CAN BE USED AS A GUIDE.

GAUGE LOCATION	COORDINATES LAT	LON	FIRST WAVE ETA (UTC)	FORECAST MAX TSUNAMI AMPLITUDE
NUKUALOFA TO	21.1S	175.2W	03/04 1548	0.66M/ 2.15FT
DART 5401003	23.4S	173.4W	03/04 1612	0.17M/ 0.55FT
DART 5401002	29.7S	175.0W	03/04 1655	0.08M/ 0.26FT
PAGO PAGO AS	14.3S	170.7W	03/04 1656	0.50M/ 1.63FT
APIA UPOLU WS	13.8S	171.8W	03/04 1706	0.14M/ 0.45FT
SUVA VITI LEVU FJ	18.1S	178.4E	03/04 1712	0.21M/ 0.68FT
DART 5401001	36.0S	177.7W	03/04 1737	0.06M/ 0.18FT
RAROTONGA CK	21.2S	159.8W	03/04 1745	0.72M/ 2.36FT
DART 5501004	36.1S	178.6E	03/04 1757	0.09M/ 0.29FT
EAST CAPE NZ	37.5S	178.2E	03/04 1814	0.21M/ 0.68FT
FONGAFALE TV	8.5S	179.2E	03/04 1819	0.10M/ 0.31FT
MARE NEW CALEDONIA F	21.5S	167.9E	03/04 1822	0.60M/ 1.97FT
LIFOU NEW CALEDONIA	20.9S	167.3E	03/04 1825	0.71M/ 2.34FT
GISBORNE EASTLAND NZ	38.7S	178.0E	03/04 1834	0.54M/ 1.78FT
OUVEA NEW CALEDONIA	20.5S	166.6E	03/04 1836	0.31M/ 1.02FT
VANUATU	17.8S	168.3E	03/04 1842	1.13M/ 3.70FT
OUINNE NEW CALEDONIA	22.0S	166.7E	03/04 1842	0.90M/ 2.97FT
THIO NEW CALEDONIA F	21.6S	166.2E	03/04 1848	0.46M/ 1.50FT
KINGSTON NORFOLK IS	29.1S	168.0E	03/04 1850	0.62M/ 2.05FT
HIENGHENE NEW CALEDO	20.7S	164.9E	03/04 1851	0.36M/ 1.18FT
GREAT BARRIER IS NZ	36.2S	175.5E	03/04 1856	0.56M/ 1.84FT

NORTH CAPE NZ	34.4S 173.0E	03/04 1856	0.55M/ 1.81FT
LUGANVILLE VU	15.5S 167.2E	03/04 1857	0.30M/ 0.97FT
TUBUAI PF	23.3S 149.5W	03/04 1906	0.26M/ 0.87FT
HUAHINE PF	16.7S 151.0W	03/04 1907	0.42M/ 1.39FT
PORT NAPIER NZ	39.5S 176.9E	03/04 1910	0.28M/ 0.92FT
VAIRAO FP FR	17.8S 149.3W	03/04 1916	0.34M/ 1.13FT
PAPEETE TAHITI	17.5S 149.6W	03/04 1917	0.22M/ 0.71FT
WELLINGTON NZ	41.3S 174.8E	03/04 1931	0.14M/ 0.47FT
OWENGA CHATHAM NZ	44.0S 176.4W	03/04 1949	0.35M/ 1.15FT
CHRISTMAS KI	2.0N 157.5W	03/04 1955	0.16M/ 0.52FT
NAURU	0.5S 166.9E	03/04 1958	0.12M/ 0.39FT
NUKU HIVA MARQUESAS	8.9S 140.1W	03/04 2051	0.54M/ 1.76FT
LIHOU REEF AU	17.1S 152.1E	03/04 2100	0.10M/ 0.31FT
HIVA OA MARQUESAS	9.8S 139.0W	03/04 2101	0.42M/ 1.39FT
RIKITEA PF	23.1S 135.0W	03/04 2104	0.17M/ 0.55FT
JOHNSTON US	16.7N 169.5W	03/04 2107	0.09M/ 0.29FT
TAREKUKURE WHARF SB	6.7S 156.4E	03/04 2116	0.16M/ 0.52FT
GOLD COAST SAND BYPA	27.9S 153.4E	03/04 2122	0.56M/ 1.84FT

TEST... RECOMMENDED ACTIONS ...TEST

* THIS IS A TEST MESSAGE. GOVERNMENT AGENCIES RESPONSIBLE FOR THREATENED COASTAL AREAS SHOULD TAKE ACTION TO INFORM AND INSTRUCT ANY COASTAL POPULATIONS AT RISK IN ACCORDANCE WITH THEIR OWN EVALUATION... PROCEDURES AND THE LEVEL OF THREAT.

* THIS IS A TEST MESSAGE. PERSONS LOCATED IN THREATENED COASTAL AREAS SHOULD STAY ALERT FOR INFORMATION AND FOLLOW INSTRUCTIONS FROM NATIONAL AND LOCAL AUTHORITIES.

TEST... ESTIMATED TIMES OF ARRIVAL ...TEST

* THIS IS A TEST MESSAGE. ESTIMATED TIMES OF ARRIVAL -ETA- OF THE INITIAL TSUNAMI WAVE FOR PLACES WITHIN THE THREAT REGION. ACTUAL ARRIVAL TIMES MAY DIFFER AND THE INITIAL WAVE MAY NOT BE THE LARGEST. A TSUNAMI IS A SERIES OF WAVES AND THE TIME BETWEEN WAVES CAN BE FIVE MINUTES TO ONE HOUR.

LOCATION	REGION	COORDINATES	ETA(UTC)
NUKUALOFA	TONGA	21.0S 175.2W	1540 03/04
HOLEVA	TONGA	18.6S 173.9W	1606 03/04
NIUE ISLAND	NIUE	19.0S 170.0W	1631 03/04
NIUATOPUTAPU	TONGA	15.9S 173.8W	1635 03/04
PAGO PAGO	AMERICAN SAMOA	14.3S 170.7W	1652 03/04
FUTUNA ISLAND	WALLIS AND FUTUN	14.3S 178.2W	1655 03/04
WALLIS ISLAND	WALLIS AND FUTUN	13.2S 176.2W	1659 03/04
APIA	SAMOA	13.8S 171.8W	1706 03/04
RAOUL ISLAND	KERMADEC ISLANDS	29.2S 177.9W	1709 03/04
SUVA	FIJI	18.1S 178.4E	1712 03/04
NUKUNONU ISLAND	TOKELAU	9.2S 171.8W	1737 03/04
PUKAPUKA ISLAND	COOK ISLANDS	10.8S 165.9W	1739 03/04
RAROTONGA	COOK ISLANDS	21.2S 159.8W	1745 03/04
ANATOM ISLAND	VANUATU	20.2S 169.9E	1808 03/04

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    FUNAFUTI ISLAND  TUVALU             7.9S 178.5E   1810 03/04
    LOTTIN POINT     NEW ZEALAND       37.5S 178.2E   1814 03/04
    KANTON ISLAND    KIRIBATI           2.8S 171.7W   1829 03/04
    GISBORNE         NEW ZEALAND       38.7S 178.0E   1834 03/04
    NORTH CAPE       NEW ZEALAND       34.4S 173.3E   1843 03/04
    MOUNT MAUNGANUI  NEW ZEALAND       37.6S 176.2E   1844 03/04
    PENRYN ISLAND    COOK ISLANDS       8.9S 157.8W   1844 03/04
    PORT TAURANGA    NEW ZEALAND       37.7S 176.2E   1851 03/04
    HOWLAND ISLAND   HOWLAND AND BAKE   0.6N 176.6W   1852 03/04
    ESPERITU SANTO   VANUATU           15.1S 167.3E   1856 03/04
    EAST CAPE        NEW ZEALAND       37.7S 178.5E   1856 03/04
    WHANGAREI        NEW ZEALAND       35.8S 174.5E   1859 03/04
    NOUMEA           NEW CALEDONIA     22.3S 166.5E   1905 03/04
    TUBUAI           FRENCH POLYNESIA  23.3S 149.5W   1906 03/04
    FLINT ISLAND     KIRIBATI          11.4S 151.8W   1908 03/04
    NAPIER           NEW ZEALAND       39.5S 176.9E   1910 03/04
    KAINGAROA CHATH  NEW ZEALAND       43.7S 176.3W   1916 03/04
    PAPEETE          FRENCH POLYNESIA  17.5S 149.6W   1917 03/04
    JARVIS ISLAND    JARVIS ISLAND      0.4S 160.1W   1923 03/04
    MALDEN ISLAND    KIRIBATI           3.9S 154.9W   1929 03/04
    WELLINGTON       NEW ZEALAND       41.3S 174.8E   1931 03/04
    PICTON           NEW ZEALAND       41.3S 174.0E   1939 03/04
    WAITANGI CHATHA  NEW ZEALAND       43.9S 176.6W   1945 03/04
    MARLBOROUGH SOU  NEW ZEALAND       41.1S 174.4E   1946 03/04
    RAPA ITI         FRENCH POLYNESIA  27.6S 144.3W   1948 03/04
    SANTA CRUZ ISLA  SOLOMON ISLANDS   10.9S 165.9E   1949 03/04
    CHRISTMAS ISLAN  KIRIBATI           2.0N 157.5W   1955 03/04
    PALMYRA ISLAND   PALMYRA ISLAND     5.9N 162.1W   1956 03/04
    NAURU            NAURU              0.5S 166.9E   1958 03/04
    KIRAKIRA         SOLOMON ISLANDS   10.4S 161.9E   1959 03/04
    AUCKLAND EAST    NEW ZEALAND       36.7S 175.0E   2000 03/04
    AUCKLAND WEST    NEW ZEALAND       37.1S 174.2E   2007 03/04
    MAJURO           MARSHALL ISLANDS   7.1N 171.4E   2024 03/04
    TARAWA ISLAND    KIRIBATI           1.5N 173.0E   2028 03/04
    AUKI             SOLOMON ISLANDS    8.8S 160.6E   2032 03/04
    HONIARA          SOLOMON ISLANDS    9.3S 160.0E   2041 03/04
    GHATERE          SOLOMON ISLANDS    7.8S 159.2E   2046 03/04
    NEW PLYMOUTH     NEW ZEALAND       39.1S 174.1E   2048 03/04
    WANGANUI         NEW ZEALAND       39.9S 175.0E   2054 03/04
    DUNEDIN          NEW ZEALAND       45.9S 170.5E   2055 03/04
    GREAT BARRIER I  NEW ZEALAND       37.0S 157.4E   2057 03/04
    HIVA OA          FRENCH POLYNESIA  10.0S 139.0W   2058 03/04
    KWAJALEIN        MARSHALL ISLANDS   8.7N 167.7E   2059 03/04
    KOSRAE ISLAND    KOSRAE             5.5N 163.0E   2059 03/04
    MUNDA            SOLOMON ISLANDS    8.4S 157.2E   2059 03/04
    PANGGOE          SOLOMON ISLANDS    6.9S 157.2E   2100 03/04
    FALAMAE          SOLOMON ISLANDS    7.4S 155.6E   2103 03/04
    RIKITEA          FRENCH POLYNESIA  23.1S 135.0W   2104 03/04
    LYTTELTON        NEW ZEALAND       43.6S 172.7E   2106 03/04
    JOHNSTON ISLAND  JOHNSTON ISLAND   16.7N 169.5W   2107 03/04
    MILFORD SOUND    NEW ZEALAND       44.6S 167.9E   2118 03/04
    KIETA            PAPUA NEW GUINEA   6.1S 155.6E   2121 03/04
    AMUN             PAPUA NEW GUINEA   6.0S 154.7E   2121 03/04
    WOODLARK ISLAND  PAPUA NEW GUINEA   9.0S 152.9E   2122 03/04


TEST... POTENTIAL IMPACTS ...TEST
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  * THIS IS A TEST MESSAGE. A TSUNAMI IS A SERIES OF WAVES. THE
    TIME BETWEEN WAVE CRESTS CAN VARY FROM 5 MINUTES TO AN HOUR.
    THE HAZARD MAY PERSIST FOR MANY HOURS OR LONGER AFTER THE
    INITIAL WAVE.

  * THIS IS A TEST MESSAGE. IMPACTS CAN VARY SIGNIFICANTLY FROM
    ONE SECTION OF COAST TO THE NEXT DUE TO LOCAL BATHYMETRY AND
    THE SHAPE AND ELEVATION OF THE SHORELINE.

  * THIS IS A TEST MESSAGE. IMPACTS CAN ALSO VARY DEPENDING UPON
    THE STATE OF THE TIDE AT THE TIME OF THE MAXIMUM TSUNAMI
    WAVES.

  * THIS IS A TEST MESSAGE. PERSONS CAUGHT IN THE WATER OF A
    TSUNAMI MAY DROWN... BE CRUSHED BY DEBRIS IN THE WATER... OR
    BE SWEPT OUT TO SEA.


TEST... TSUNAMI OBSERVATIONS ...TEST
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  * THIS IS A TEST MESSAGE. THE FOLLOWING ARE TSUNAMI WAVE
    OBSERVATIONS FROM COASTAL AND/OR DEEP-OCEAN SEA LEVEL GAUGES
    AT THE INDICATED LOCATIONS. THE MAXIMUM TSUNAMI AMPLITUDE IS
    MEASURED WITH RESPECT TO THE NORMAL TIDE LEVEL.

                          GAUGE      TIME OF   MAXIMUM     WAVE
                       COORDINATES   MEASURE   TSUNAMI   PERIOD
    GAUGE LOCATION      LAT   LON     (UTC)    AMPLITUDE    (MIN)
    ---------------------------------------------------------------
    PAGO PAGO AS       14.3S 170.7W    1620   0.49M/ 1.6FT  08
    APIA UPOLU WS      13.8S 171.8W    1702   0.14M/ 0.5FT  10
    NUKUALOFA TO       21.1S 175.2W    1710   0.61M/ 2.0FT  04


TEST... NEXT UPDATE AND ADDITIONAL INFORMATION ...TEST
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  * THIS IS A TEST MESSAGE. THE NEXT MESSAGE WILL BE ISSUED IN
    ONE HOUR... OR SOONER IF THE SITUATION WARRANTS.

  * THIS IS A TEST MESSAGE. FURTHER INFORMATION ABOUT THIS EVENT
    MAY BE FOUND AT WWW.TSUNAMI.GOV.

  * THIS IS A TEST MESSAGE. COASTAL REGIONS OF HAWAII... AMERICAN
    SAMOA... GUAM... AND CNMI SHOULD REFER TO PACIFIC TSUNAMI
    WARNING CENTER MESSAGES SPECIFICALLY FOR THOSE PLACES THAT
    CAN BE FOUND AT WWW.TSUNAMI.GOV.

  * THIS IS A TEST MESSAGE. COASTAL REGIONS OF CALIFORNIA...
    OREGON... WASHINGTON... BRITISH COLUMBIA AND ALASKA SHOULD
    ONLY REFER TO U.S. NATIONAL TSUNAMI WARNING CENTER MESSAGES
    THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST
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MESSAGE.

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D) FINAL TSUNAMI THREAT MESSAGE

The following is a sample final Tsunami Threat Message that might be issued once tsunami wave amplitudes have fallen below the minimum threat level of 0.3 m on all or most gauges across the Pacific. In this example that represents a Pacific-wide tsunami, the final message is number 17 issued about 15 hours after the event. based upon the tsunami amplitude observed at Nuku`alofa, the forecast is for gauge amplitudes that are 0.5 times the size of the amplitudes observed on January 15, 2022. The initial areal extent of the threat has been limited to three hours of tsunami travel time from HTHH. Note that the "TEST" language sprinkled throughout the message would be absent in an actual product.

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ZCZC WEPA40 PHEB 050618
TSUPAC

TEST...TSUNAMI MESSAGE NUMBER 17...TEST
NWS PACIFIC TSUNAMI WARNING CENTER HONOLULU HI
0618 UTC FRI MAR 5 2022

...THIS MESSAGE IS FOR TEST PURPOSES ONLY...
...TEST PTWC FINAL TSUNAMI THREAT MESSAGE TEST...


**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****

 THIS IS A TEST MESSAGE. THIS MESSAGE IS ISSUED FOR INFORMATION
 ONLY IN SUPPORT OF THE UNESCO/IOC PACIFIC TSUNAMI WARNING AND
 MITIGATION SYSTEM AND IS MEANT FOR NATIONAL AUTHORITIES IN EACH
 COUNTRY OF THAT SYSTEM.

 THIS IS A TEST MESSAGE. NATIONAL AUTHORITIES WILL DETERMINE THE
 APPROPRIATE LEVEL OF ALERT FOR EACH COUNTRY AND MAY ISSUE
 ADDITIONAL OR MORE REFINED INFORMATION.

**** NOTICE **** NOTICE **** NOTICE **** NOTICE **** NOTICE *****

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TEST... VOLCANIC ACTIVITY IN TONGA GENERATED A TSUNAMI ...TEST
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TEST... PRELIMINARY VOLCANO PARAMETERS ...TEST
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  * ACTIVITY TIME  1530 UTC MAR 4 2022
  * COORDINATES    20.5 SOUTH  175.4 WEST
  * LOCATION       TONGA


TEST... EVALUATION ...TEST
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  * THIS IS A TEST MESSAGE. VOLCANIC ACTIVITY OCCURRED IN THE
    TONGA ISLANDS AT 1530 UTC ON FRIDAY MARCH 4 2022.

  * THIS IS A TEST MESSAGE. BASED ON ALL AVAILABLE DATA... THE
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TSUNAMI THREAT FROM THIS VOLCANIC ACTIVITY HAS NOW PASSED.

TEST... TSUNAMI THREAT FORECAST...UPDATED ...TEST
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* THIS IS A TEST MESSAGE. THE TSUNAMI THREAT HAS NOW LARGELY PASSED.

TEST... RECOMMENDED ACTIONS ...TEST
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* THIS IS A TEST MESSAGE. GOVERNMENT AGENCIES RESPONSIBLE FOR ANY IMPACTED COASTAL AREAS SHOULD MONITOR CONDITIONS AT THE COAST TO DETERMINE IF AND WHEN IT IS SAFE TO RESUME NORMAL ACTIVITIES.

* THIS IS A TEST MESSAGE. PERSONS LOCATED NEAR IMPACTED COASTAL AREAS SHOULD STAY ALERT FOR INFORMATION AND FOLLOW INSTRUCTIONS FROM LOCAL AUTHORITIES.

* THIS IS A TEST MESSAGE. REMAIN OBSERVANT AND EXERCISE NORMAL CAUTION NEAR THE SEA.

TEST... POTENTIAL IMPACTS ...TEST
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* THIS IS A TEST MESSAGE. MINOR SEA LEVEL FLUCTUATIONS OF UP TO 0.3 METERS ABOVE AND BELOW THE NORMAL TIDE MAY CONTINUE OVER THE NEXT FEW HOURS.

TEST... NEXT UPDATE AND ADDITIONAL INFORMATION ...TEST
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* THIS IS A TEST MESSAGE. THIS WILL BE THE FINAL STATEMENT ISSUED FOR THIS EVENT UNLESS NEW INFORMATION IS RECEIVED OR THE SITUATION CHANGES.

* THIS IS A TEST MESSAGE. FURTHER INFORMATION ABOUT THIS EVENT MAY BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF HAWAII... AMERICAN SAMOA... GUAM... AND CNMI SHOULD REFER TO PACIFIC TSUNAMI WARNING CENTER MESSAGES SPECIFICALLY FOR THOSE PLACES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

* THIS IS A TEST MESSAGE. COASTAL REGIONS OF CALIFORNIA... OREGON... WASHINGTON... BRITISH COLUMBIA AND ALASKA SHOULD ONLY REFER TO U.S. NATIONAL TSUNAMI WARNING CENTER MESSAGES THAT CAN BE FOUND AT WWW.TSUNAMI.GOV.

THIS IS A TEST MESSAGE. DO NOT TAKE ACTION BASED ON THIS TEST MESSAGE.

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