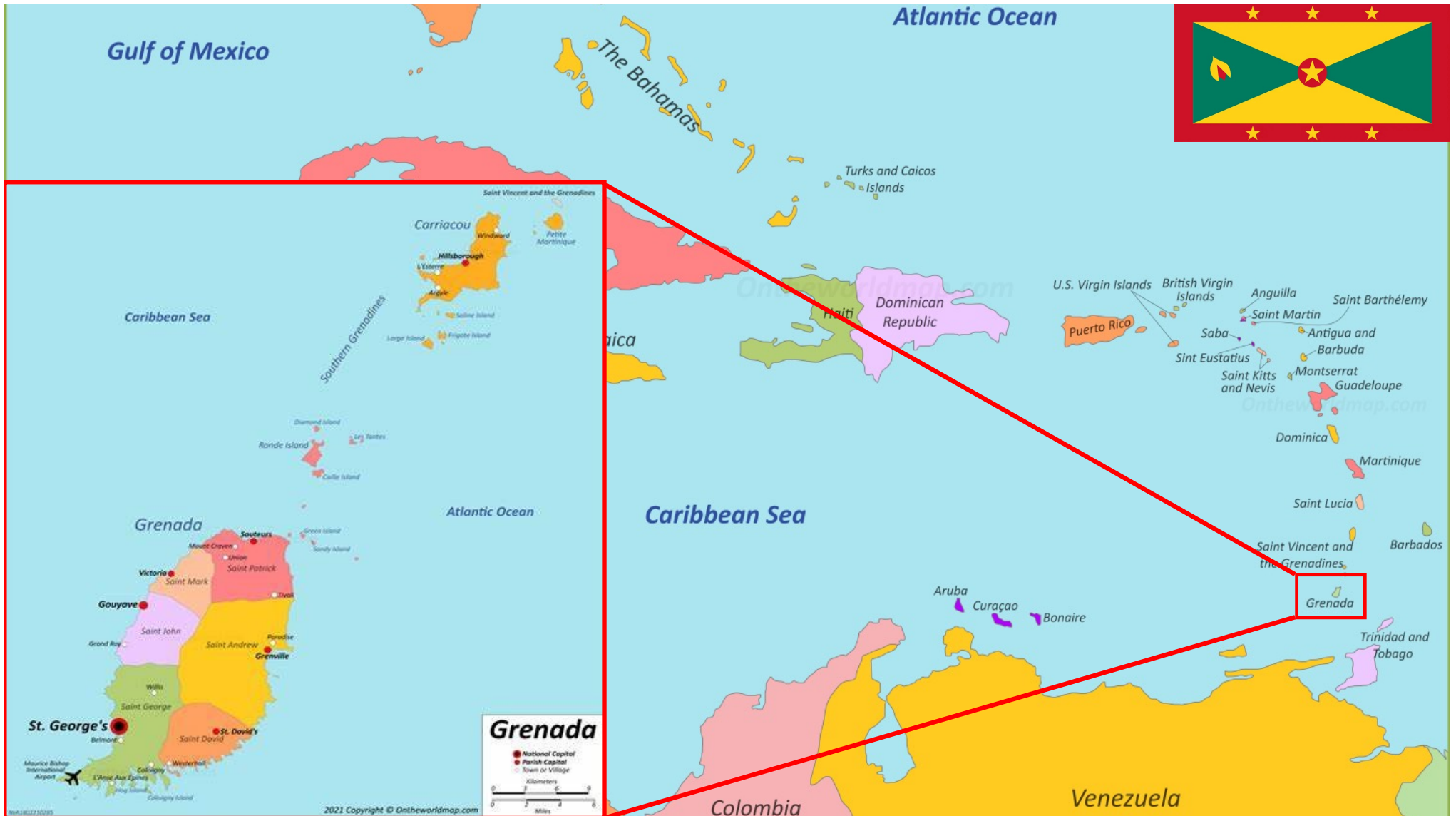


Grenada

Kassia Johnson

Grenada Airports Authority

Meteorological Service



Grenada Background

Spice Isle of the Caribbean

Tri- Island state (Grenada, Carriacou, Petite Martinique)

Size: 133 sq mi, 21 mi long 12 mi wide

Population: 125,434

Topography: Mountainous

Home to 2 crater lakes (Grand Etang and Lake Antoine)

Highest point: Mt. St. Catherine 2757 ft (840 m)





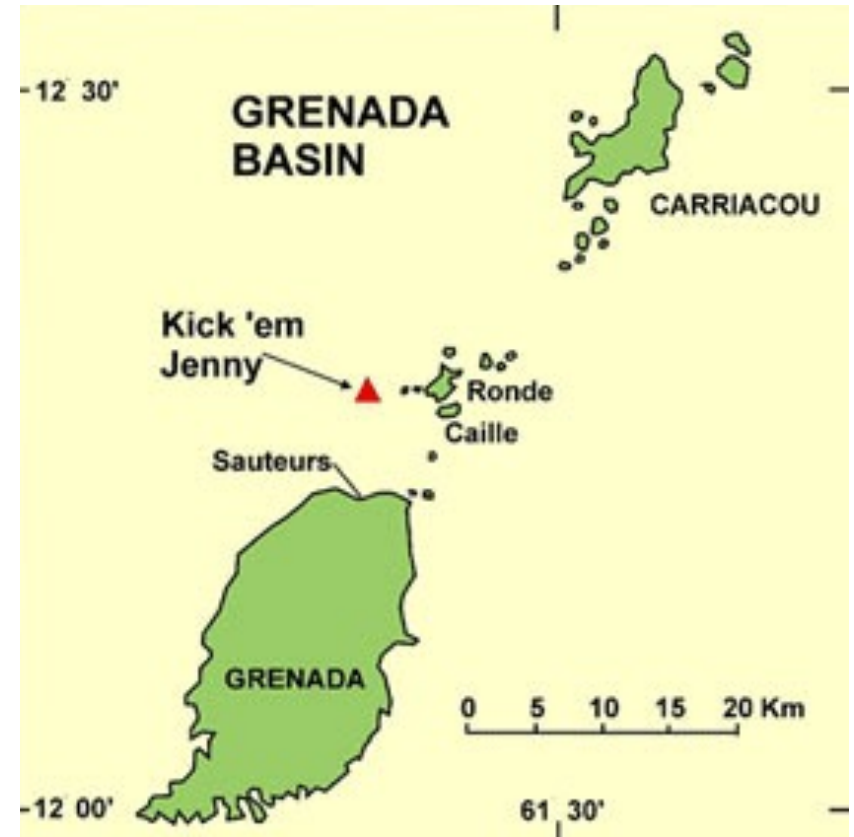
Grand Etang Lake



Lake Antoine

Grenada Background

- Kick 'em Jenny is a submarine volcano located 8km north of Grenada.
- The volcano is about 1300m high, and its summit is currently thought to be about 180m below the surface of the sea.
- As far as we know, Kick 'em Jenny is the only 'live' (likely to erupt again) submarine volcano in the Eastern Caribbean.





The Meteorological Service Roles

- Aeronautical Meteorological Office located at the airport
- Manager, Ass. Manager, 5 forecasters, 2 climatology techs, 2 instrument techs, 7 observers
- Synoptic messages, METARS, SPECI, TAF
- Public forecast, weather advisories and bulletins, warnings, etc.
- Other responsibilities (climatology, marine meteorology, tsunami)

The Meteorological Service Roles as the National Focal Point for Tsunami

- The meteorological office is the focal point for tsunami warnings
- On the first Thursday of each month the office receives a test tsunami message via email from PTWC, GEONETCast, CISN
- The times of receipt and dissemination are noted
- A message is sent to Pacific Tsunami Warning Center (PTWC) when messages are unacceptably delayed or not received
- In the event of a real tsunami alert, its location is relayed to the National Disaster Management Agency (NaDMA).
- NaDMA informs the public.
- The meteorological office also has the responsibility to brief Grenada Airports Authority (GAA).
- If a tsunami were to occur at night or after the regular working hours, the staff on duty should contact the Commissioner of Police, the manager of meteorology and other staff.

NATIONAL DISASTER MANAGEMENT AGENCY (NaDMA)

Disseminates information to:

- Different arms of the Royal Grenada Police Force
- Media houses
- National Agencies
- Grenada's 16 Disaster Management Districts
- Non-government organizations
- Public and private utilities
- Lead evacuation

PTWC Message

Received via email

Information inputted in macro

Advisory/Bulletin generated and emailed

Calls made to police and Nadma

Tsunami macro

INPUT EARTHQUAKE PARAMETERS FROM TSUNAMI INFO STATEMENT

MAGNITUDE:

DEPTH (KM): Kilometers

LATITUDE (N): North

LONGITUDE (W): West

DATE (GMT) MM/DD/YYYY:

TIME (GMT) HH:MM:

TSUNAMI ALERT TYPE:

BULLETIN NUMBER:

LOCAL TIME H:MM AM/PM:

LOCAL DATE (DD/MM/YYYY):

WAVE HEIGHT (FT/M):

WAVE PERIOD (MIN):

PRIMARY EARTHQUAKE PARAMETER

EVALUATION

AN EARTHQUAKE WITH A PRELIMINARY MAGNITUDE OF 8.5 OCCURRED NEAR THE NORTH COAST OF COLOMBIA AT 1500 UTC ON THURSDAY MARCH 21 2024. BASED ON THE PRELIMINARY EARTHQUAKE PARAMETERS... WIDESPREAD HAZARDOUS

TSUNAMI THREAT FORECAST: Hazardous tsunami waves from this earthquake are possible within [insert distance] of the epicenter along the coasts of Grenada.

ESTIMATED TIME OF ARRIVAL:

[CREATE TSUNAMI BULLETIN](#)

RECOMMENDED ACTIONS:

TSUNAMI OBSERVATIONS:

LAST UPDATE AND ADDITIONAL INFO:

DUTY OFFICER:

Product Type	Earthquake Parameters	Potential Tsunami Type	Are Possible Hazardous Tsunami Waves Indicated for Grenada	Threatened Coast	Time Left to Initial Wave Arrival (ETA)	NTWC Alert Level for Threatened Coast	Emergency Response Action
SRC, USGS or other Seismological Institution EQ Report	Felt earthquake in Grenada Magnitude of 4.9-6.0	None	No	None	Not Applicable	Bulletin	No immediate action required
PTWC Tsunami Information Statement	Magnitude of 6.0-7.0, or on land, or ≥100km (62mi) depth	None or Very Minor	No	None	Not applicable	Bulletin	No immediate action required
Tsunami Threat Message	Magnitude of 7.5-7.5, undersea or very near the sea, and < 100km (62mi) depth	Local Tsunami	Yes	<100 km (100mi) from earthquake	<1 hr typical	Warning	Evacuate threatened coast
			No	≥100 km (100mi) from earthquake	Not given	Bulletin	No immediate action required
	Magnitude of 7.6-7.8, undersea or very near the sea, and < 100km (62mi) depth	Regional Tsunami	Yes	<1000 km (620 mi) from earthquake	<3 hrs typical	Warning	Evacuate threatened coast
			No	≥1000 km (620 mi) from earthquake	Not given	Bulletin	No immediate action required
Magnitude of 7.9 and greater, undersea or very near the sea, and < 100km (62mi) depth	Basin-wide Tsunami	Yes			< 1 hour	Warning	Evacuate coast within 1 hour of ETA
		No	Potential for a basin-wide tsunami		1 to 6 hours	Watch	Stay Tuned For Further Official Information
		No			> 6 hours	Bulletin	No immediate action required

FOR AUTHORITATIVE INFO. FURTHER INFO. <https://earthquake.usgs.gov/>
www.tsunami.gov

Tsunami macro

Product Type	Earthquake Parameters	Potential Tsunami Type	Are Possible Hazardous Tsunami Waves Indicated for Grenada	Threatened Coast	Time Left to Initial Wave Arrival (ETA)	NTWC Alert Level for Threatened Coast	Emergency Response Answer
SRC, USGS or other Seismological Institution EQ Report	Felt earthquake in Grenada Magnitude of 4.0-6.0	None	No	None	Not Applicable	Bulletin	No immediate action required
PTWC Tsunami Information Statement	Magnitude of 6.0-7.0, or on land, or ≥ 100km (62mi) depth	None or Very Minor	No	None	Not applicable	Bulletin	No immediate action required
Tsunami Threat Message	Magnitude of 7.1-7.5, undersea or very near the sea, and < 100km (62mi) depth	Local Tsunami	Yes	<300 km (186mi) from earthquake	<1 hr typical	Warning	Evacuate threatened coast
			No	≥ 300 km (186mi) from earthquake	Not given	Bulletin	No immediate action required
	Magnitude of 7.6-7.8, undersea or very near the sea, and < 100km (62mi) depth	Regional Tsunami	Yes	<1000 km (620 mi) from earthquake	<3 hrs typical	Warning	Evacuate threatened coast
			No	≥ 1000 km (620 mi) from earthquake	Not given	Bulletin	No immediate action required
	Magnitude of 7.9 and greater, undersea or very near the sea, and < 100km (62mi) depth	Basin-wide Tsunami	Yes	Potential for a basin-wide tsunami	< 3 hours	Warning	Evacuate coast within 3 hours of ETA
			No		3 to 6 hours	Watch	Stay Tuned For Further Official Information
No			> 6 hours		Bulletin	No immediate action required	

Tsunami macro

PTWC Product Type	Earthquake Parameters	Maximum Tsunami Wave Amplitude Indicated for Grenada	Time Left to Initial Wave Arrival	NTWC Alert Level for Threatened Coast	Emergency Response Action
Tsunami Threat Message	Magnitude 7.1 or greater, undersea or very near the sea, and < 100km (62mi) depth	$\geq 1 \text{ m}$ (3.3 ft)	< 3 hrs	Warning	Evacuate threatened coast
			3 to 6 hrs	Watch	Stay Tuned For Further Official Information
			> 6 hrs	Watch	Stay Tuned For Further Official Information
		0.3 to 1 m (1 to 3.3 ft)	< 3 hrs	Advisory	Evacuate beaches and harbors
			3 to 6 hrs	Watch	Stay Tuned For Further Official Information
			> 6 hrs	Watch	Stay Tuned For Further Official Information
		< 0.3 m (1 ft)	Not given	Bulletin	No immediate action required

CaribeWave24 Scenario



Tsunami Message #1 for the State of Grenada

Date: 11:05 AM, Thursday, March 21, 2024

Grenada Meteorological Service

CARIBE WAVE 2024: THIS IS AN EXERCISE!!

A TSUNAMI WARNING IS IN EFFECT FOR ALL COASTAL AREAS OF GRENADA.

REPEAT

A TSUNAMI WARNING IS IN EFFECT FOR GRENADA.

PRELIMINARY EARTHQUAKE PARAMETERS

An earthquake has occurred near the north coast of Colombia with the following preliminary parameters reported by the Pacific Tsunami Warning Center.

MAGNITUDE: 8.5
ORIGIN TIME: 11:00 AM, Thursday, March 21, 2024
DEPTH: 25 Kilometers
COORDINATES: 9.8 North 77.8 West
LOCATION: Near the North Coast of Columbia

EVALUATION

An earthquake with a preliminary magnitude of 8.5 occurred near the north coast of Colombia at 11:00 am on Thursday March 21, 2024. Based on the preliminary earthquake parameters, widespread hazardous tsunami waves are possible.

Authorities and people should take appropriate action to save lives and reduce property damage for this threat.

TSUNAMI THREAT FORECAST

Hazardous tsunami waves from this earthquake are possible within the next 3 hours along some coasts of Grenada.

TSUNAMI TIMES OF ARRIVAL

Estimated times of arrival (ETA) of the initial tsunami wave for Grenada is given below. Actual arrival times may differ, and the initial wave may not be the largest.

LOCAL TIME: 2:08 PM

CaribeWave24 Scenario

RECOMMENDED ACTIONS

This message is intended to trigger appropriate actions by NADMA in accordance with their tsunami warning standard operating procedures. Persons located in or near threatened coasts should stay alert for instructions from national and local authorities.

POTENTIAL IMPACTS

A tsunami is a series of waves and the time between wave crests can vary between five minutes to one hour. The hazard may persist for many hours after the initial wave arrival.

The first wave may not be the largest.

A coastal tsunami of only 1-meter amplitude above tide level can cause strong currents in a harbor, be dangerous to swimmers in the water and be hazardous to persons along inland waterways.

Flooding impacts can vary significantly from one section of coast to the next due to local bathymetry and the shape and elevation of the shoreline.

NEXT UPDATE AND ADDITIONAL INFORMATION

The next NTWC message will be issued hourly or sooner if the situation warrants.

The Tsunami Warning will remain in effect until further notice.

Kassia Johnson

Duty Officer

EXERCISE



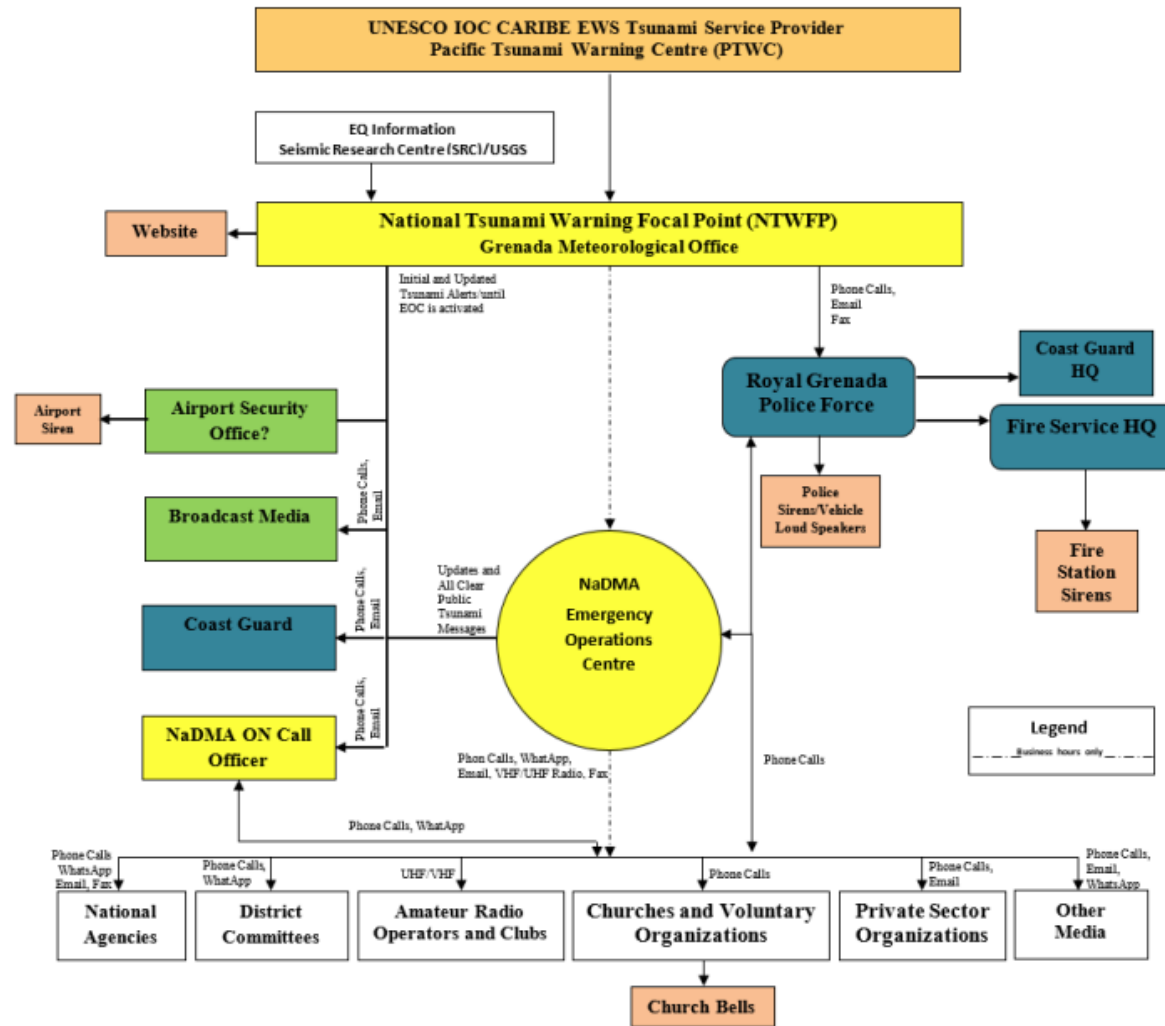
CaribeWave 2024 Exercise
School evacuation



Directory of Emergency Contacts

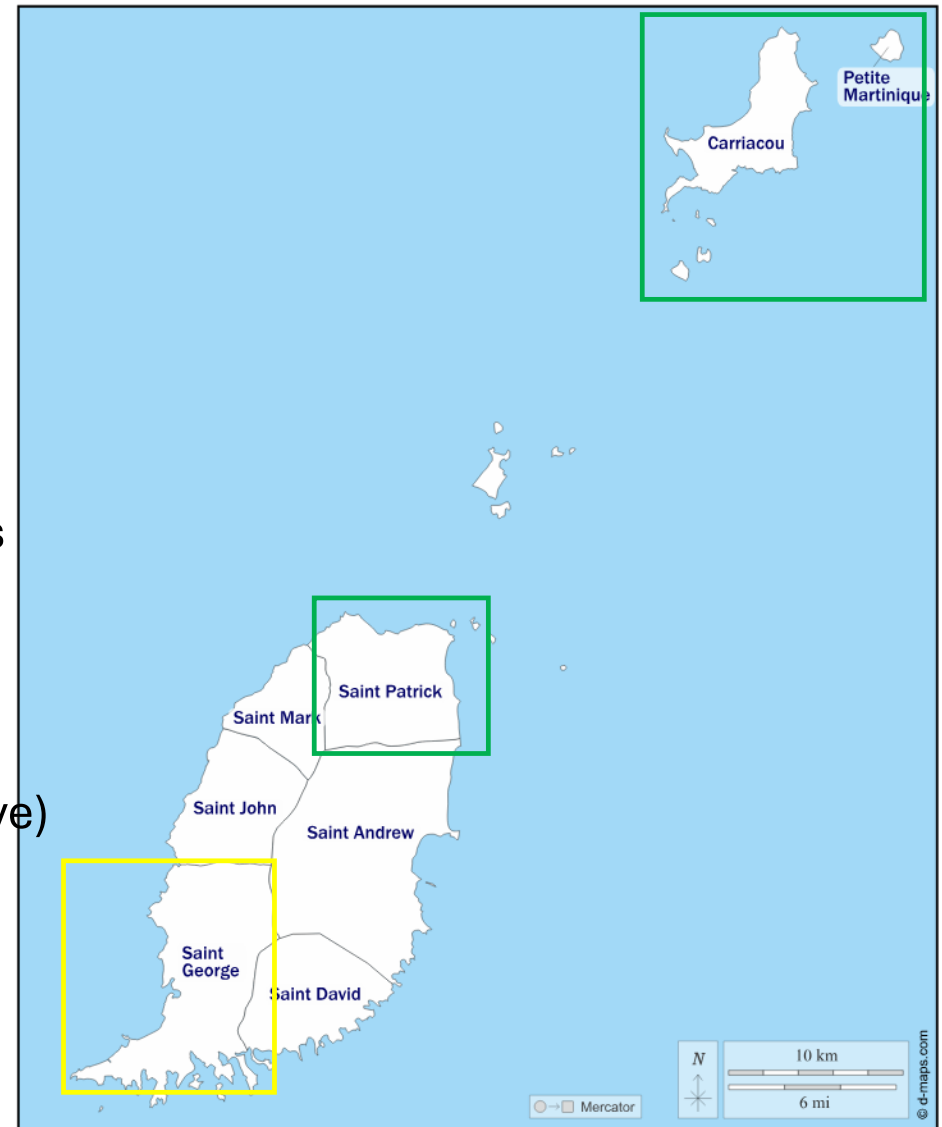
Organization	Name	Numbers		Email Address
		Work	Mobile	
National Disaster Management Agency	Coordinator Sylvan McIntyre	440-8390	405-7451	Sylvamac.biz@gmail.com
Minister Responsible for Disaster Management	Dr. Winston Garraway	440-2255 440-3767	534-5105	chestusw@hotmail.com chestusw4@gmail.com
Mrs. Merina Jessamy	Permenant Secretary	440-2708		Merina.jessamy@Gov.gd
Meteorological Office	Manager Mr. Hubert Whyte	444-4141/2	534-5262	Hwhyte@mbigrenada.com
Royal Grenada Police Force	ACP Jessmon Prince	440-3999 435-8557	407-3123	Jessmon2031@gmail.com
Fire Station	Glenroy Corion	440-3296 440-2112	405-3176	rgpffire@hotmail.com elencori@yahoo.com
General Hospital	Osbert Charles	440-2898 435-0974	418-1969	Oscharles47@gmail.com
Prince's Alice Hospital	Osbert Charles	442-7252	418-1969	
Prince's Royal Hospital	Osbert Charles	443-7169	418-1969	
Grenada Coast Guard	Watson Edwards	444-1931 444-1932	418-6061	Watsonedwards@yahoo.com rgpfcoastguard@soiceisle.com
National and Water and Sewage Authority	Joel Thomas	440-2155	409-9694	
Community Program Officer of the North	Simeon Granger	440-8390	440-6499	cponorth@nadma.gd
Community Program Officer of the South	Roxanne Bonaparte	440-8390	499-2336	cpo@nadma.gd
Grenada Red Cross	Director General Mr. Terry Charles	440-1483 440-1830	403-4824	grercs@spiceisle.com terrycharles grenada@yahoo.com
Commissioner Of Police	Edvin Martin	440-3296 440-2112	405-3176	rgpffire@spiceisle.com wjames@rgpf.gd
Ministry of Works Chief Technical Officer	Mr. John St. Louis	440-2271	417-3809	Johncst.louis@yahoo.com ministryofworks@gov.gd
Ministry of Social Development	Mrs. Chrissie Worme- Charles	440-2269 440-7952	418-0736	chrissieworme@yahoo.com
Government Information Services	Raul Titus	440-2061	434-5107	gisgrenada@yahoo.com
Chief Medical Officer	Dr. George Mitchell	440-4709	534-5331	mitgeorgw@gmail.com
Search and Recue	Insp. Watson Edwards	444-1931/2	418-6061 405-9064	Watson edwards@yahoo.com

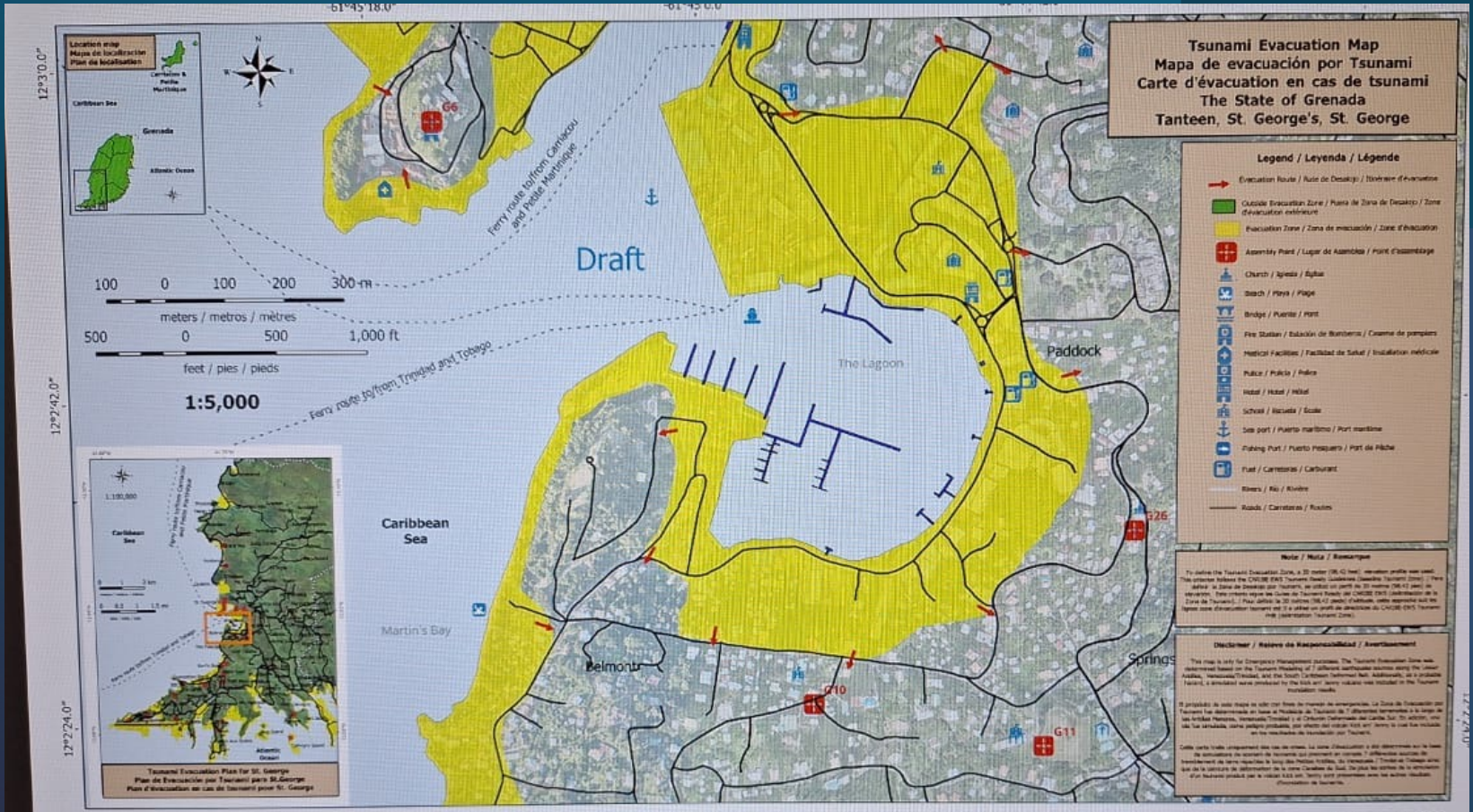
FIGURE 1. GRENADA ADAPTED TSUNAMI WARNING PROTOCOL



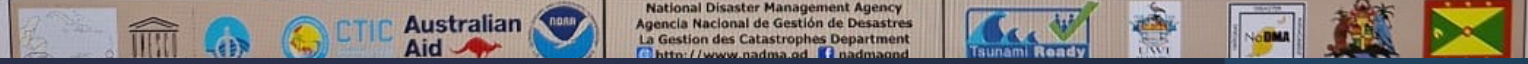
Tsunami Ready Parishes

- Message blasts
- Signs erected
- Inundation maps
- Fire truck sirens
- Church bells
- Annual Tsunami drills (CaribeWave)

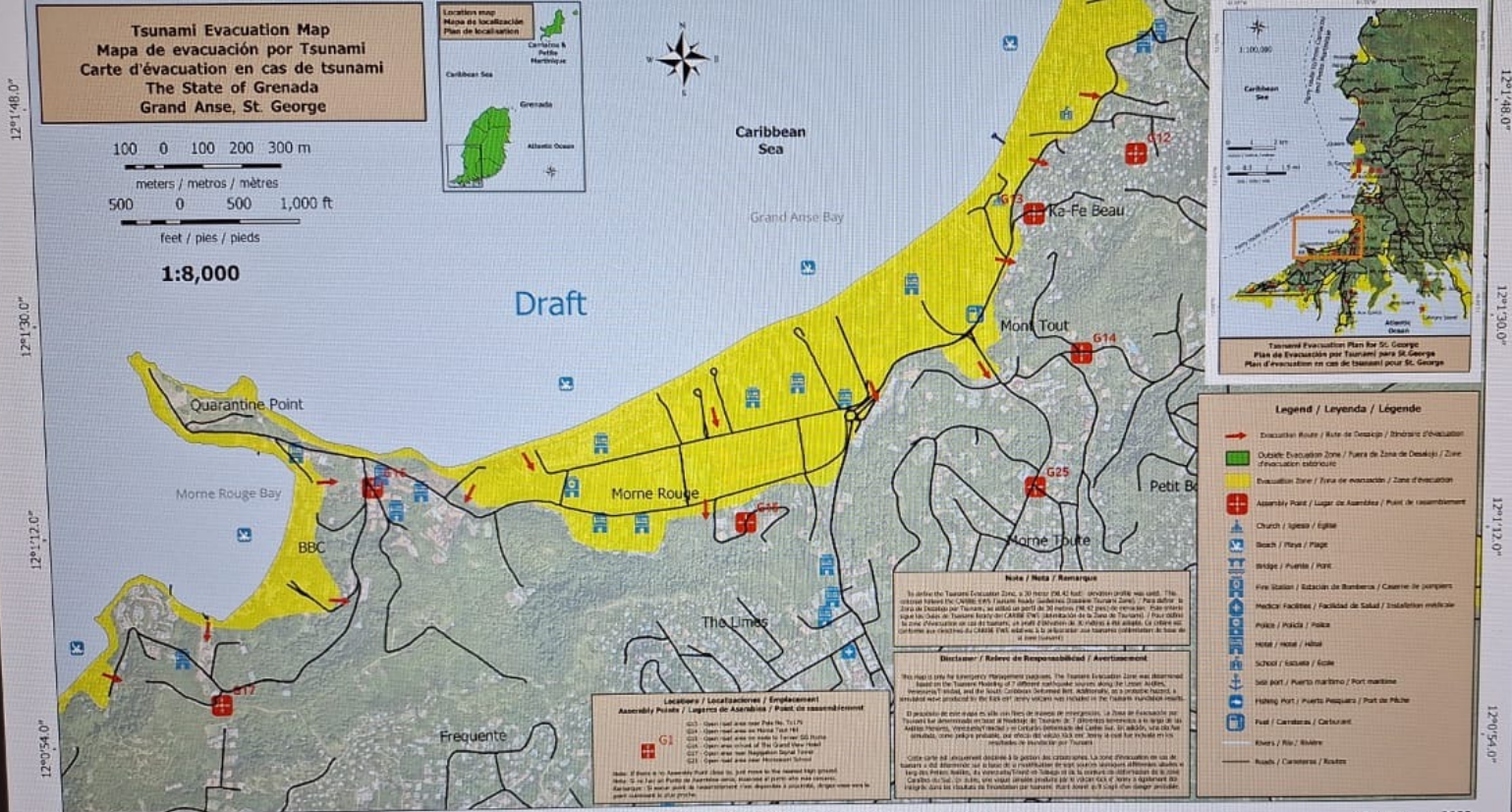




The Grenada Tsunami Early Warning System Project is supported by the Australian Government and Intergovernmental Oceanographic Commission of UNESCO. 10th January, 2023



61°46'30.0" -61°46'12.0" -61°45'54.0" -61°45'36.0" -61°45'18.0" -61°45'0.0" -61°44'42.0"



Tsunami Evacuation Map
Mapa de evacuación por Tsunami
Carte d'évacuation en cas de tsunami
The State of Grenada
Grand Anse, St. George

100 0 100 200 300 m
 meters / metros / mètres
 500 0 500 1,000 ft
 feet / pies / pieds

1:8,000

12°1'48.0"
 12°1'30.0"
 12°1'12.0"
 12°0'54.0"

12°1'48.0"
 12°1'30.0"
 12°1'12.0"
 12°0'54.0"

Locations / Localizaciones / Emplacements
Asamblea / Lugares de Asamblea / Points de rassemblement

G1 - Open area near Park No. 11/12
 G2 - Open area near Morne Rouge
 G3 - Open area near Morne Rouge
 G4 - Open area near The Grand View Hotel
 G5 - Open area near Hospital General
 G6 - Open area near Hospital General

Note: All areas are Assembly Points unless otherwise specified.
 Note: Si un área es un Punto de Asambleo, a menos que se especifique lo contrario.
 Note: Si une zone est un lieu de rassemblement, à moins qu'il n'y ait une autre indication.

Note / Nota / Remark

The Tsunami Evacuation Zone, a 30 meter (98.42 feet) evacuation profile was used. This evacuation profile was based on the 1997 Tsunami Study conducted by the United States Geological Survey (USGS) for the Caribbean Sea. The evacuation profile was based on the 1997 Tsunami Study conducted by the United States Geological Survey (USGS) for the Caribbean Sea. The evacuation profile was based on the 1997 Tsunami Study conducted by the United States Geological Survey (USGS) for the Caribbean Sea.

Disclaimer / Réserve de Responsabilité / Avertissement

This map is only for Emergency Management purposes. The Tsunami Evacuation Zone was determined based on the Tsunami Hazard of 7 different earthquake sources along the Lesser Antilles, Venezuela, Trinidad, and the South Caribbean. Information is not intended to be used for insurance purposes. A disclaimer was produced by the Risk and Safety Services Unit, Grenada, in 2007 for the purpose of this map.

El propósito de este mapa es sólo para fines de gestión de emergencias. La Zona de Evacuación por Tsunami fue determinada en base al estudio de 7 terremotos de la zona de las Antillas Menores, Venezuela/Trinidad y el Caribe Oriental del Caribe Sur, el Caribe del Sur, el Caribe del Sur y el Caribe del Sur. La información no debe ser utilizada para fines de seguros. Una declaración de responsabilidad fue producida por el Servicio de Riesgos y Seguridad, Grenada, en 2007 para el propósito de este mapa.

- Legend / Leyenda / Legende**
- Evacuation Route / Ruta de Evacuación / Itinerario d'évacuation
 - Outside Evacuation Zone / Fuera de Zona de Evacuación / Zone d'évacuation extérieure
 - Evacuation Zone / Zona de evacuación / Zone d'évacuation
 - Assembly Point / Lugar de Asamblea / Point de rassemblement
 - Church / Iglesia / Église
 - Beach / Playa / Plage
 - Bridge / Puente / Pont
 - Fire Station / Estación de Bomberos / Casernes de pompiers
 - Medical Facility / Facultad de Salud / Installations médicales
 - Police / Policía / Police
 - Hotel / Hotel / Hôtel
 - School / Escuela / École
 - Sea Port / Puerto marítimo / Port maritime
 - Harbour Port / Puerto Pesquero / Port de pêche
 - Post / Correo / Courrier
 - River / Río / Rivière
 - Road / Carretera / Routes

The Grenada Tsunami Early Warning System Project is supported by the Australian Government and Intergovernmental Oceanographic Commission of UNESCO. 10th January, 2023

National Disaster Management Agency / Agencia Nacional de Gestión de Desastres / La Gestion des Catastrophes Department
<http://www.nadma.gd> | [Facebook](https://www.facebook.com/nadmagnd) | [Instagram](https://www.instagram.com/nadmagnd) | [YouTube](https://www.youtube.com/nadmagnd)

CTIC Australian Aid INDR Tsunami Ready UNVI NoDMA

Gaps and challenges

- Updated alarm system needed (NaDMA)
- Need for more instruments (buoys, tide guage)
- Inhouse training for Meteorological staff
- Improvements in the tsunami macro
- Back up plan (location of NTWC)

Thank you

Contact Information

Email: meteorology@gaa.gd

Phone: 1-473-444-4142



: spiceweather473