

Bermuda coral restoration site suitability

Sarah Brooks and Jason Flower

30-06-2023

Contents

Introduction	1
Methods.....	1
Vessel grounding sites	1
Coral restoration areas for shoreline protection.....	2

Introduction

The purpose of this analysis is to identify areas of Bermuda’s waters that might be suitable for coral restoration.

The following areas have been determined as priority areas for coral restoration:

- Vessel grounding sites
- Coral restoration for shoreline protection: areas with existing coral that has restoration potential, and are located near shoreline infrastructure.
- Priority areas detailed by local expert Dr Samia Sarkis (Living Reefs Foundation).

Vessel grounding sites

- Science Committee recommendation is to prioritize restoration at vessel grounding sites (Figure 1) over other types of coral restoration.
- Coordinates provided by Samia Sarkis.
- Priority sites are known grounding sites:
 - A. Pompano patch reefs - fishing vessel grounding August 4, 2012. Corals from Pompano patch reefs were rescued by the Living Reefs Foundation in July 2020. Following a quick visual survey that same year; several corals are still loose and could be re-attached to hard substrate to aid recovery.
 - B. Cruise ship grounding (2016) off channel marker 12A. A full assessment was made by an overseas company following grounding; video documentation of the damage is available from DENR (P Rouja). A site visit is the first step before restoration action.
- Other vessel grounding sites: these are best guess grid references based on descriptions and are not 100% accurate. Level of accuracy varies depending on the level of detail given in the location description. Ground truthing of the vessel sites is needed to confirm locations and this map should be updated accordingly once that is done.

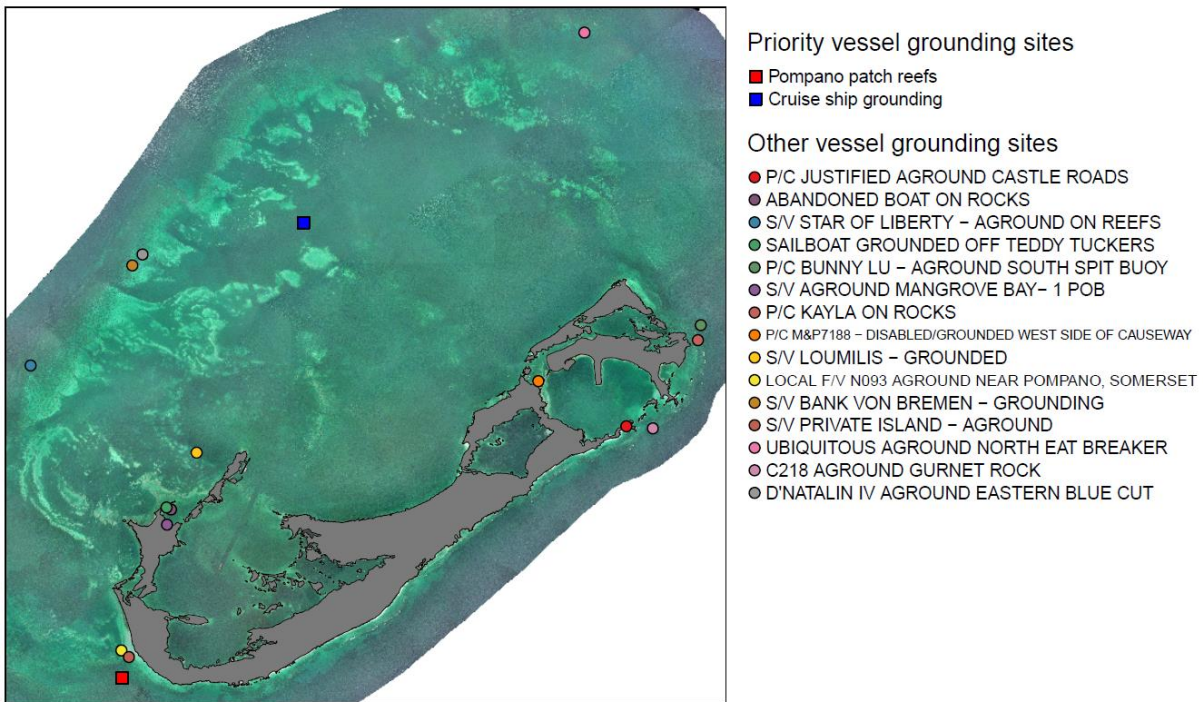


Figure 1: Vessel grounding sites for coral restoration (pending further investigations).

Coral restoration areas for shoreline protection

Identifying vulnerable shoreline infrastructure

Areas of coral that might provide protection for coastal infrastructure (roads and buildings) are suggested as key areas for restoration efforts. These areas were mapped using the following process:

1. Areas of Bermuda that fall within the following specifications of the Water Resources Protection Area, described by the Department of Planning, were mapped using the 2003 Digital Elevation Model and the 2012 Mean High Water coastline layers (Figure 2):
 - a. 4m elevation or less
 - b. less than 12m from the Mean High Water coastline
 - c. less than 17 metres from the coastline of Harrington Sound.
2. Shoreline buildings and roads within the WPA were identified using data provided by the Department of the Environment and Natural Resources (DENR) (Figure 3)
3. Corals within 100m of these shoreline roads and buildings were mapped using coral data as mapped by Dr Thad Murdoch and provided by DENR (Figure 4)
4. A 100m buffer was applied to these corals to show areas suitable for coral restoration (pending further investigation) that could also provide protection to shoreline infrastructure vulnerable to storm damage (Figure 5).

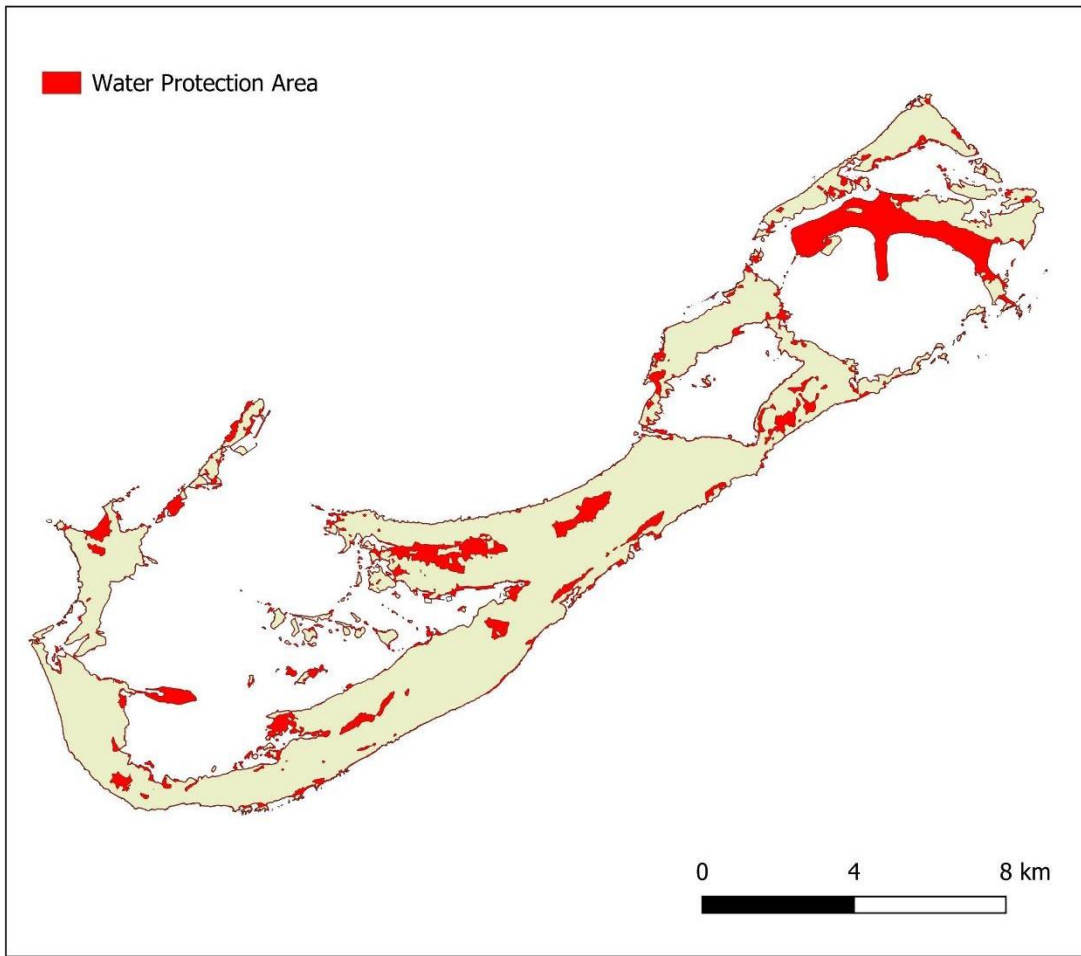


Figure 2: Water Protection Area defined by the Dept of Planning as being areas at 4m elevation or below, less than 12m from the Mean High Water coastline and less than 17m from the coastline of Harrington Sound.

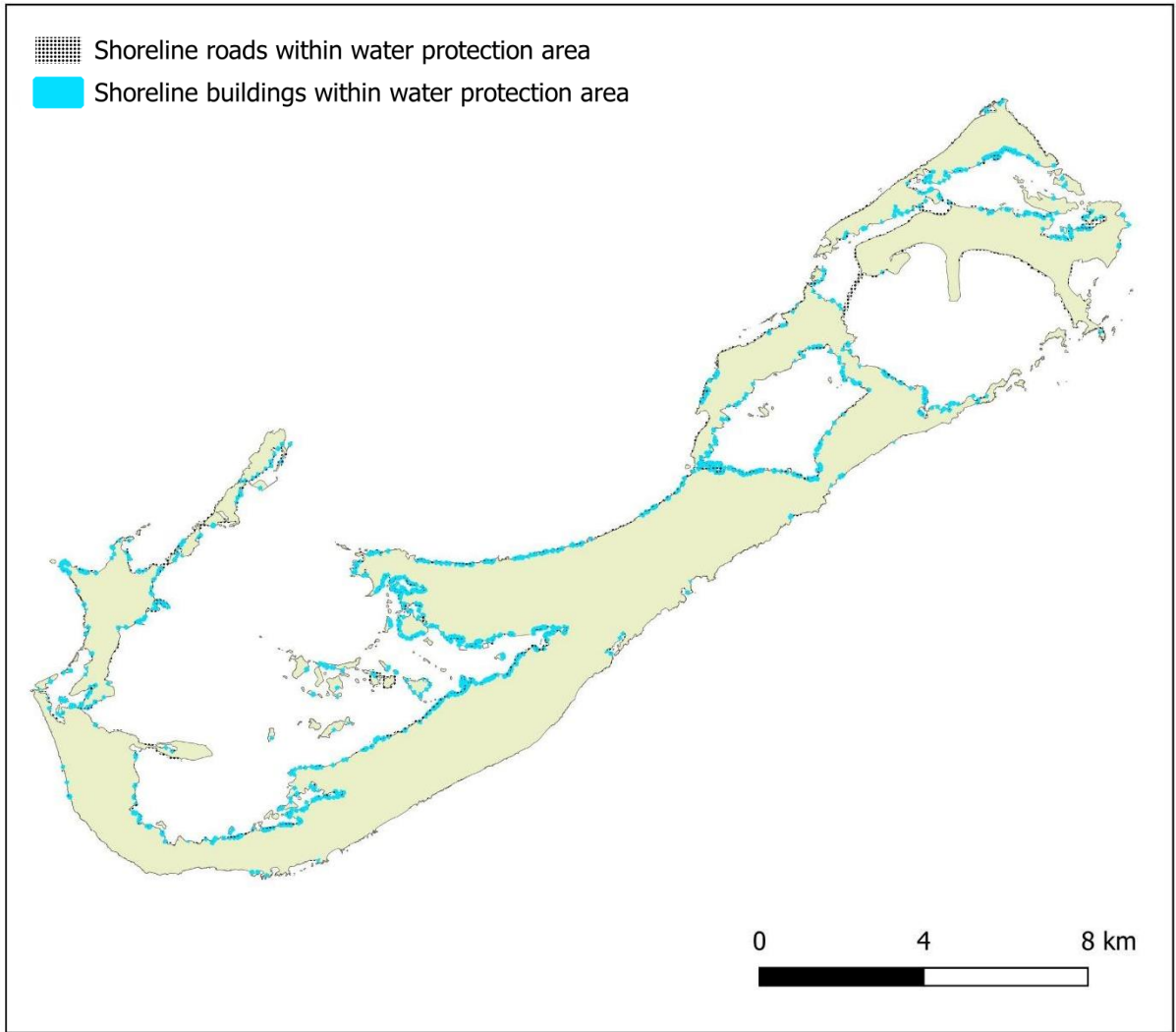


Figure 3: Shoreline roads and buildings located within the Water Protection Area.

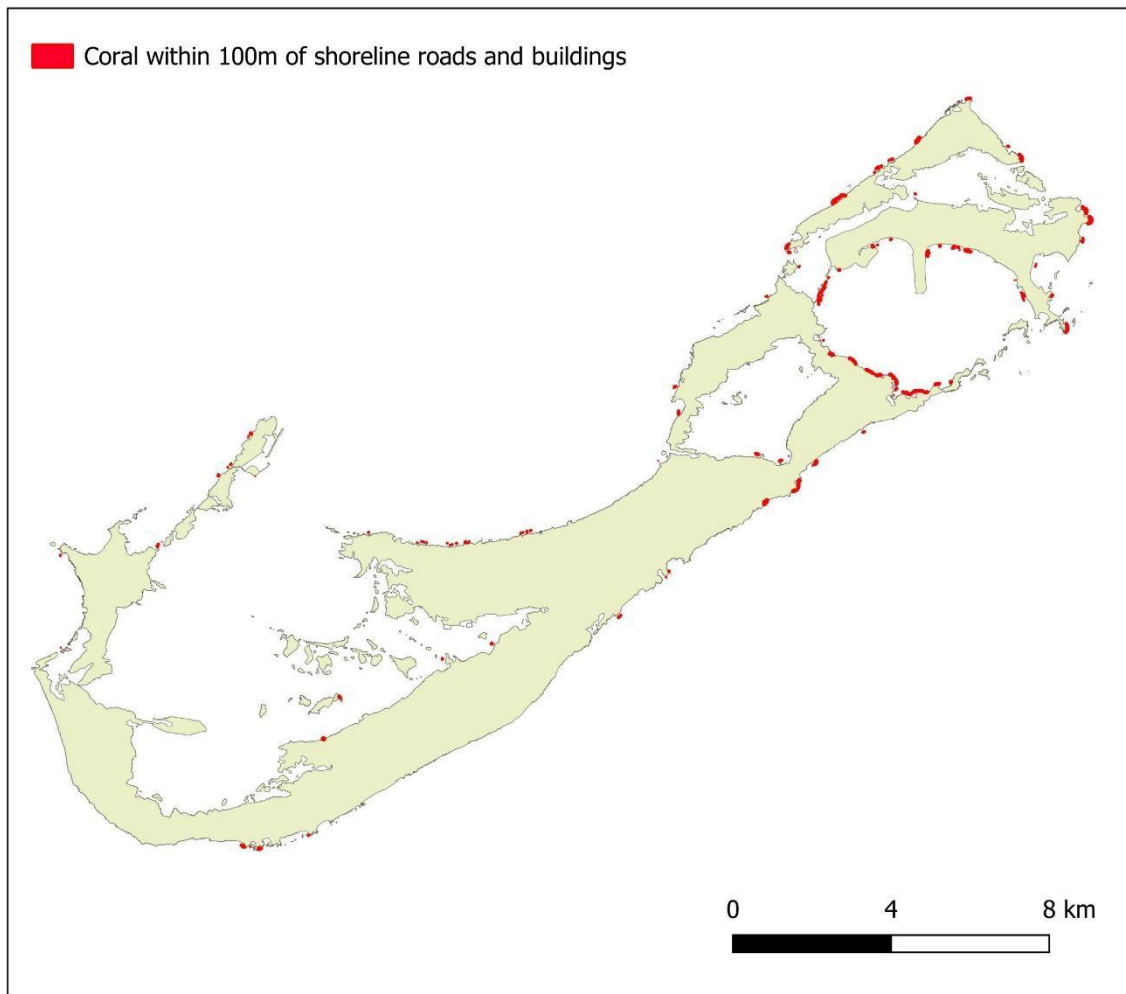


Figure 4: Coral located within 100m of shoreline roads and buildings that fall within the Water Protection Area.

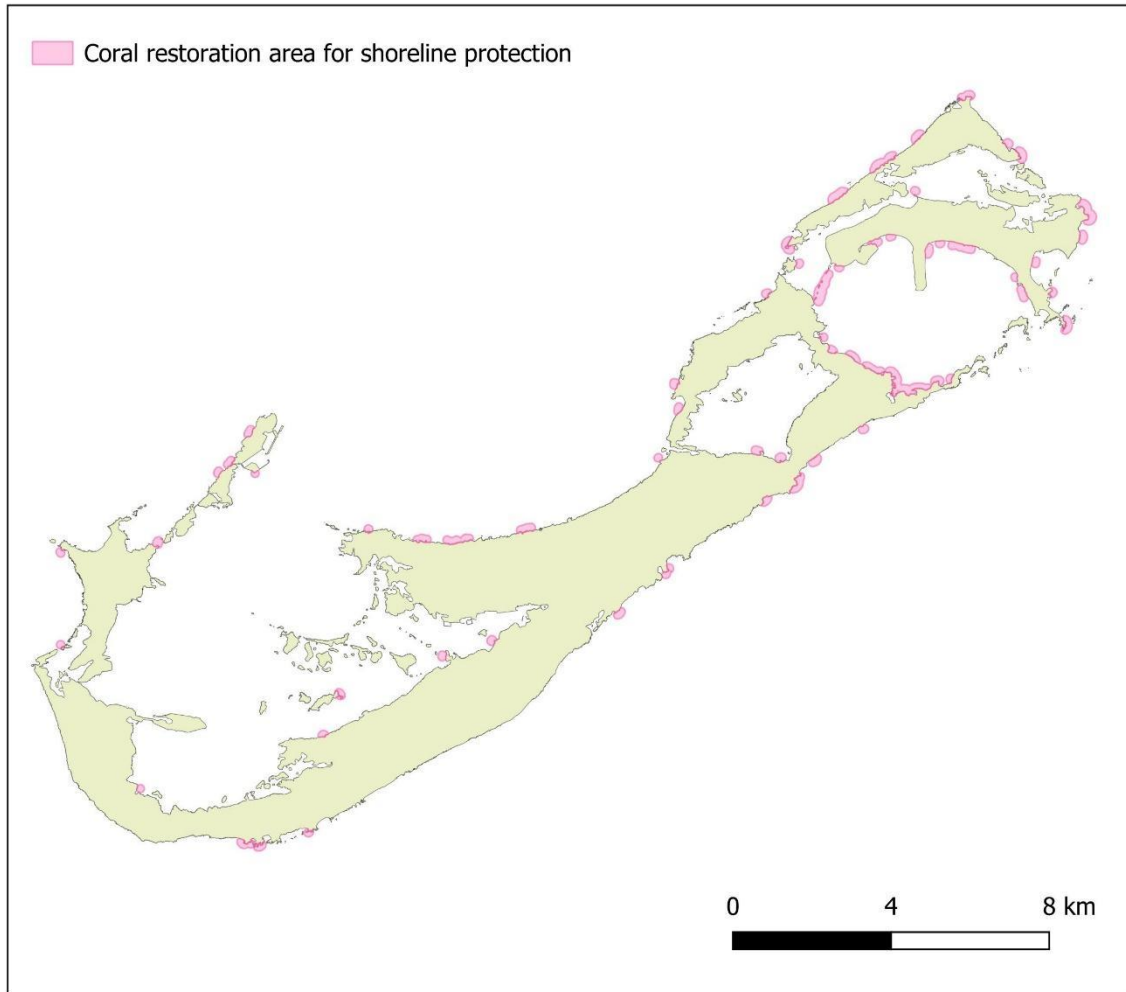


Figure 5: Areas potentially suitable for coral restoration (pending further investigation) that could also provide shoreline protection to shoreline infrastructure vulnerable to storm damage.

Additional areas for coral restoration for shoreline protection

These were identified based on local expert knowledge by Dr Samia Sarkis. Priority areas include:

1. Continue coral restoration efforts on patch reefs of Castle Harbour:
 - i) West Coastline from Frick's Point to Causeway.
 - ii) East Coastline Cooper's Island to Finger (location of solar panels).

Justification: West coastline by Rosewood Tucker's Hotel supports a coral ocean-based nursery and has been a study site since 2016; it is a demonstration of the restoration concept on coral garden frames and the reef base (led by Living Reefs Foundation- LRF). It is likely that the methodology can be applied to the rest of Castle Harbour- recognized as a whole to have suffered physical damage in the 50's during construction of the international airport.

2. Building of a coastal barrier in Castle Harbour directly protecting the causeway bridge.

Justification: This is key infrastructure for Bermuda, linking the airport to the rest of Bermuda. It is vulnerable to storm events, and is currently protected by the presence of boulders, installed by the Department of Works & Engineering, among the existing patch reef. These boulders erode, and need replacement or additions every 4 years. Through restoration of existing patch reef and planting of corals on boulders, the coastal protection barrier will grow stronger over time rather than erode. This is a relatively small area, making restoration feasible, and would set a great precedent for any other key infrastructure needing storm protection in Bermuda. (LRF has approached Works & Engineering with the idea).

3. South Rd. near John Smith Bay. An area where the road is frequently damaged by storms. Restoration could help reduce damage.

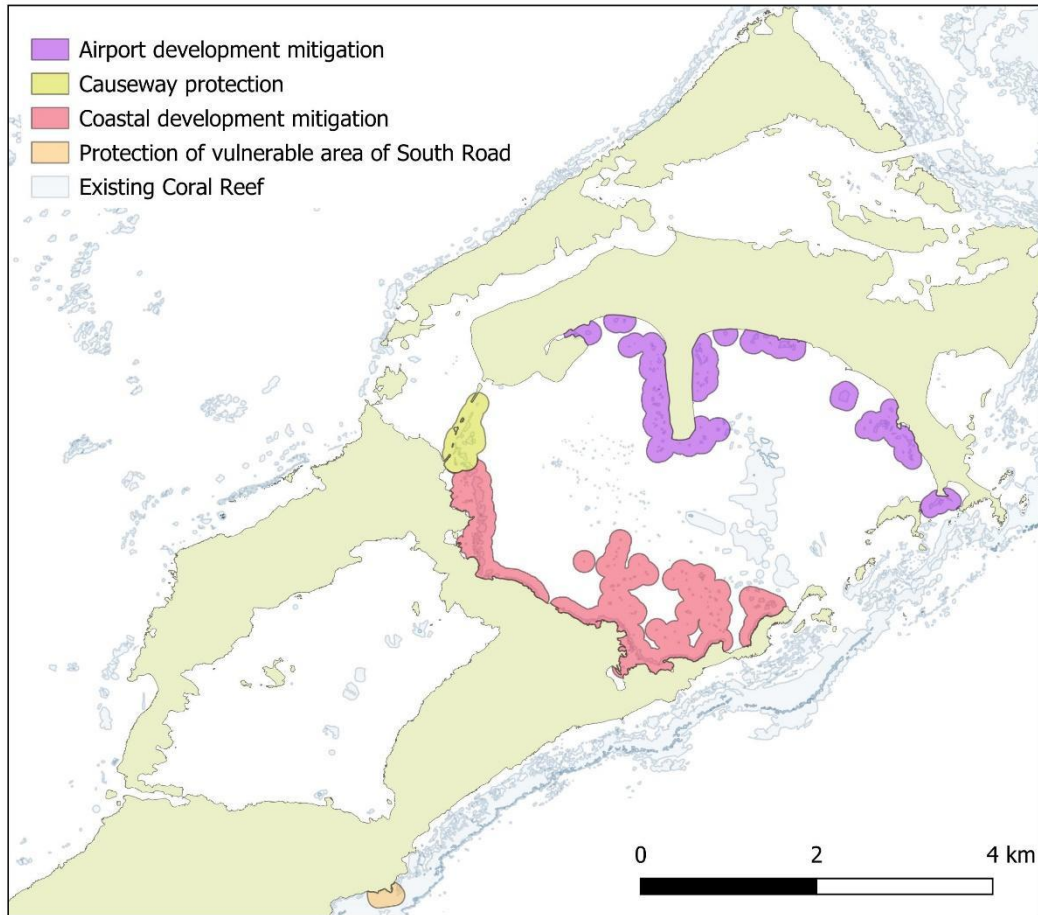


Figure 6: Areas potentially suitable for reef restoration (pending further investigation) as suggested by Dr Samia Sarkis based on expert opinion. Existing reefs as mapped by Thad Murdoch.

Dr Sarkis also suggests considering restoring coral near shoreline areas that claimed for flood damage after hurricane Fabian in 2003. This data could not be obtained in spatial format to incorporate into BOPP's official mapping, but a JPEG of these areas is shown below.

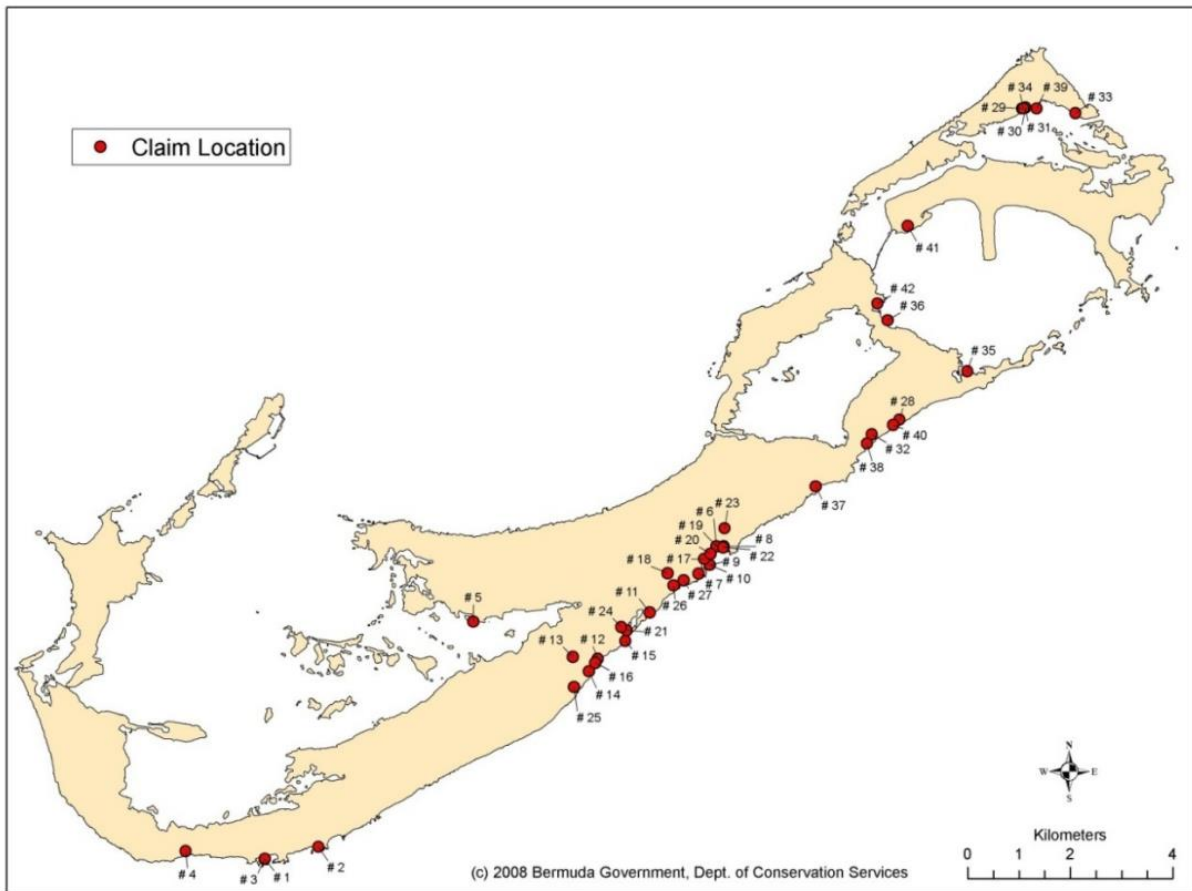


Figure 7: Hurricane Fabian flood damage claim locations. Image from 'Total Economic Value of Bermuda's Coral Reefs: Valuation of Ecosystem Services' (2010) by Samia Sarkis, Pieter J. H. van Beukering and Emily McKenzie.