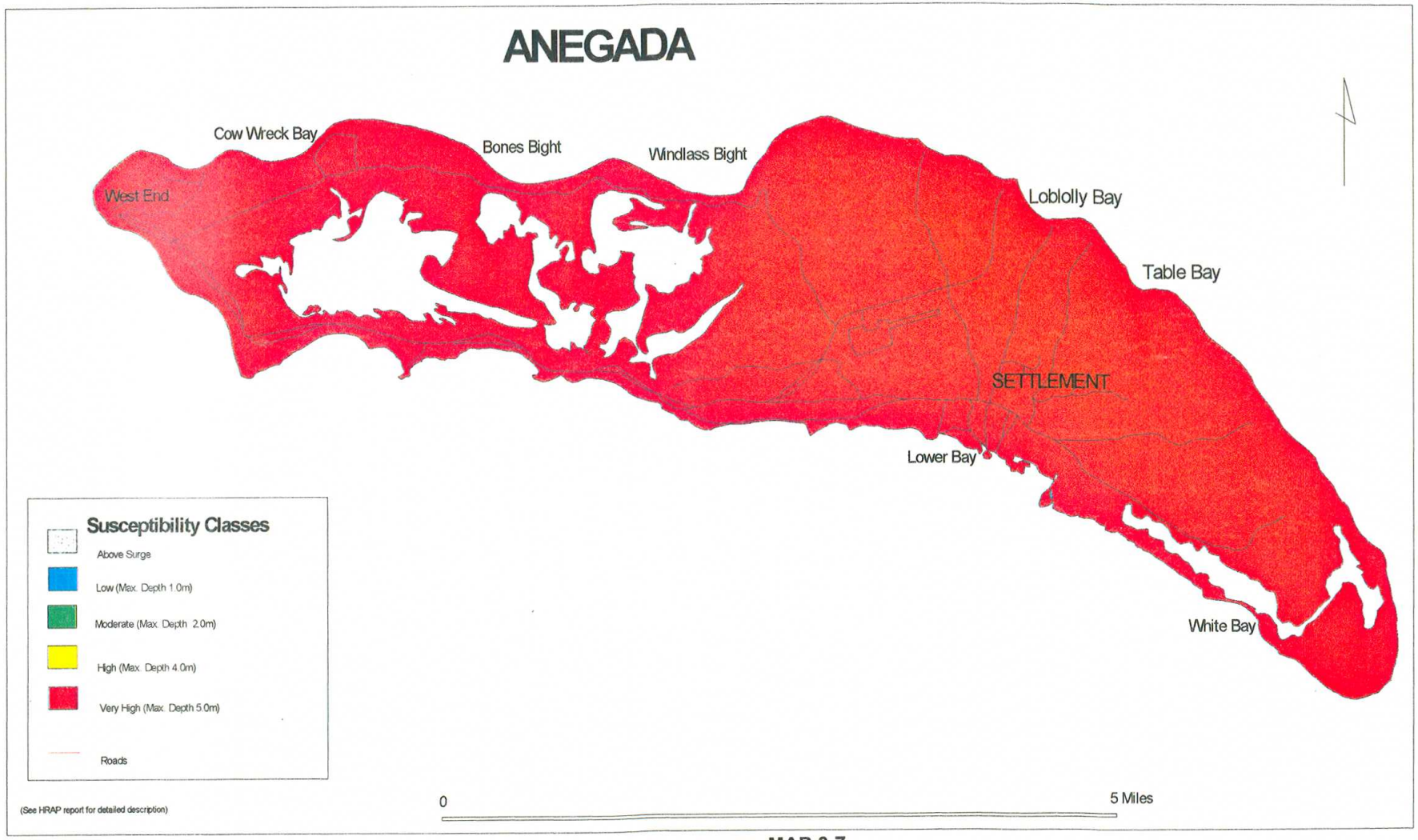
[redacted]



MAP 3.7

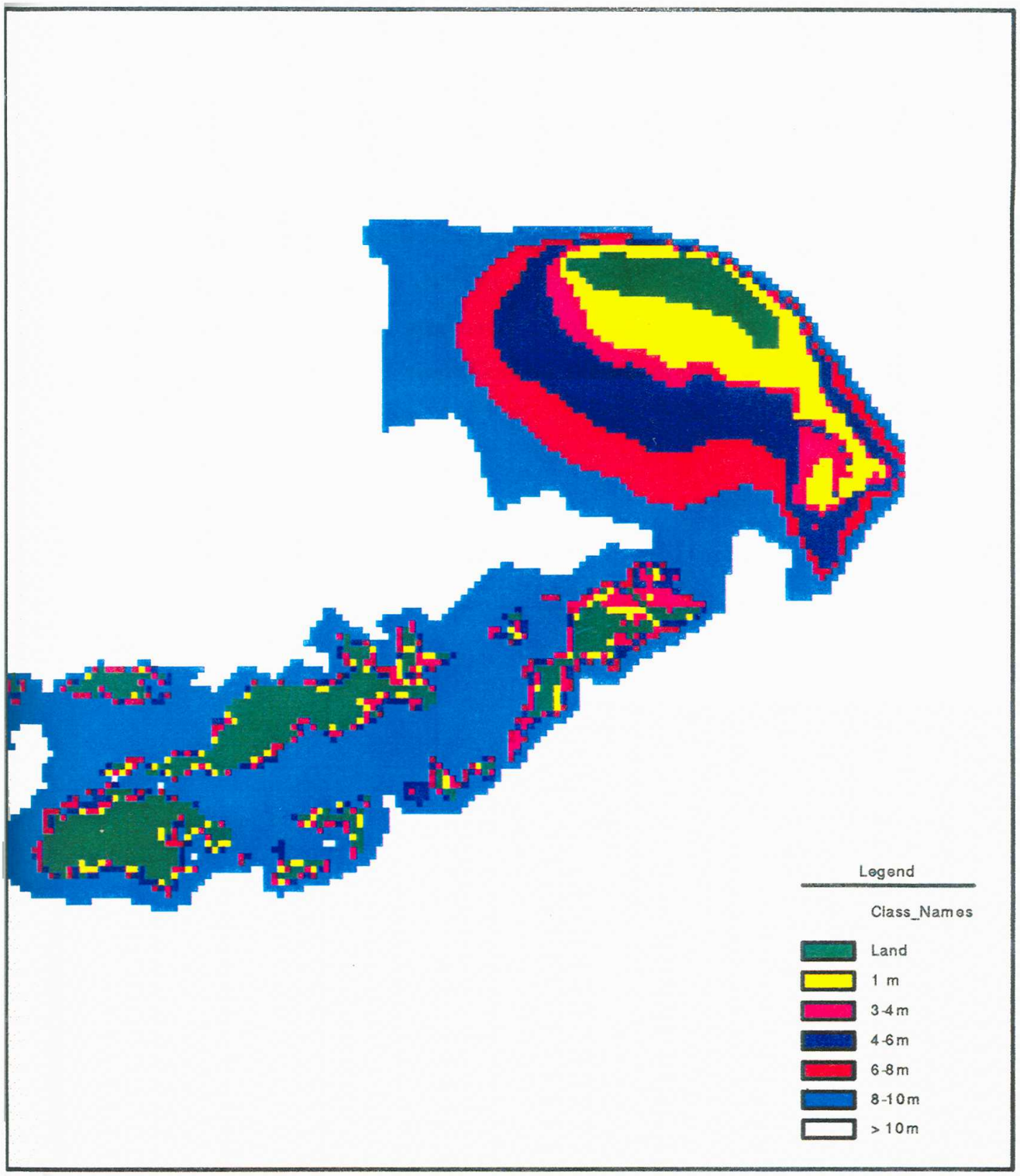
3.7.2 WAVE ACTION

To ascertain the likely wave conditions which might be generated by hurricane force winds a simple spectral wave model developed by the US Army Corps of Engineers (USA COE) was applied to the bathymetric data base derived from a combination of satellite images and charts supplied by the BVI ODP. The driving wind fields were supplied by the TAOS hurricane model. The maximum sustainable wave height was calculated from the energy available, fetch length, and the depth of water at each point. Note that in-shore wave modeling is not a well established science, and this data is based on statistical/dynamic methods.

As with the hurricane model, the resolution of this data is 500 meters /cell. **Map 3.8** shows the likely maximum significant wave height around the BVI. For more exact effects of wave action, highly detailed analysis is required using resolutions in the 10 meter/cell range. Many areas of the BVI are protected by reefs or shallow water which would dissipate wave energy prior to reaching the shoreline.

A good planning guideline is that the wave height at a location in a hurricane will be 'depth limited', if not exposed to direct wave attack. Using the simple relationship from the (USA COE, Shore Protection Manual) the height at breaking = depth/1.28, the probable wave height affecting a structure may be determined. In a similar manner, the wave crest elevation may be calculated as 60% of the wave height above the still water level.

Example: A structure is located 1.8 meters above Road Town. In a Category 4 hurricane this area may expect a surge level of about 3 meters. The structure will have a still water level of 1.2 meters. The wave maps indicate a wave height of 3 meters. If the location is exposed to the sea with no protective reef and minimal foreshore this value would be used. However, in this example, the site is protected, so a depth limited case is used as follows: The breaking height of waves in 1.2 meters of water is 1.2/1.28 = 0.94 meters. Using another relationship from the USA COE Shore Protection manual, wave crest height is 60% of the wave height above the still water level. For this example, this works out to be 0.56 meters. Therefore, our structure should be able to withstand 0.94 meter wave: the wave crest height will be 1.2 m + 1.76 meters.



Maximum Significant Wave Height (Hs)

Max. Hs based on Deep Water Sig Wave Height (Ho) of 18.5m Period of 16.6s. Wave heights are the max. significant wave height which can be sustained with out breaking. See text for details.

British Virgin Islands Storm Hazard Assessment

The Arbiter of Storms (TAOS) Output System, Version 2.1
Watson Technical Consulting
110 Deerwood Court
Rincon, Georgia USA 31326

N

Scale

10 0 Kilometers

MAP 3.8

Upon breaking, the forward momentum of the waves will carry water up the shore creating uprush which increases the sea water level at the immediate shoreline. Uprush tends to be greater where slopes adjacent to the shore are steep.

The maps indicate that wave energy is likely to be greater on the northern coasts of Tortola, Jost Van Dyke and Anegada and along the northwestern and eastern coast of Virgin Gorda. The wave height map indicates that the maximum sustainable height of waves arriving at the shores of Tortola and Virgin Gorda are mostly in the order of 3-4 meters with some sections as high as 4-6 meters.

3.8 CONCLUSIONS

The tropical cyclone study provides useful information for decision making relating to development planning and disaster management. The return period analysis suggests that category 5 hurricanes are rare in this part of the Atlantic/Caribbean basin. This together with the relatively low return period of 65 years for a direct hit from a category 4 hurricane suggests that category 4 storms be used as the design storms for planning purposes.

The results of the wind hazard analysis while general, does provide a clear picture of the areas which are likely to experience the highest velocity winds. These high risk areas which include the narrow areas along ridge lines and locations above 1000 feet in elevation, suggest areas where mitigation efforts relating to wind hazard should be emphasized. In other areas wind hazard should be treated as having equal potential for damage.

Despite the sheltering of the south coasts of Tortola by small offshore islands, the areas of Road Town, West End and East End/Long Look, as well as Great Harbour in Jost Van Dyke and the whole island of Anegada face the greatest threat from storm surge. Using the category 4 hurricane as the design storm, means that inundation depths of up to 4 meters (12 feet) should be planned for at the coastline in these areas except for Anegada where the corresponding depth would be 5 meters (15 feet). These areas can also be expected to face the greatest threat from wave action together with the northern coasts of Tortola, Jost Van Dyke and Anegada and along the northwestern and eastern coast of Virgin Gorda.