

Note that these volumes are cumulative across each profile. Therefore, although the table shows a net volumetric loss over each entire profile, the losses since June 1990 and over the one-year period occurred above approximately elevation -3 ft (actually most above elevation 0). As described, in seasonal changes since June there was re-deposition in the bar areas waterward of elevation -4 or -5 ft.

Protect-tube II Impacts

The principal conclusion from two years of monitoring is that the Protect-tubes are not having any adverse impact on the natural processes and have offered protection under the effects of seasonal weather patterns, unusually high tides and at least two more severe storms. They have served to retain sand in the natural upland system, conserving it from loss under seasonal conditions and ensuring that it will be available as protection if needed for future severe storm events.

Since the Protect-tube erosion control devices are installed along the northern section of the property (the area showing the greater volumetric losses) it is tempting to draw a cause-effect relationship. However, we believe that this would be a false conclusion based on examining the shape of the profile plots and the portions of each profile where losses occur.

At most stations the profile moved landward in a zone from about elevation -2 ft to +4 ft, and did so parallel to the original slope. Since the Protect-tube is placed on the profile typically from elevation +2 to +6 ft (within this same zone), and it obviously did not move landward, the volumetric losses must reflect erosion of the sand fill initially placed over the containers. Neither can the apparent volumetric losses be accounted for by settlement of the tubes, since no changes have occurred on the profile at elevations near the crest (+6), the profile retreat occurs smoothly onto unprotected sections well below the elevation of the toe, and the overall slope of the face of the tube is still between 1V to 3 or 4H.

It is also clear that the tubes are not adversely influencing normal wave action or water levels. The fact that during a two-year period we have seen very predictable seasonal changes in the profile shape and variability in the shoreline position along the length of the property, further supports the view that the tubes are not significantly influencing littoral processes in the area. The positions of the winter erosion escarpment on the profiles protected by the Protect-tube have varied from the seaward-most toe of the tube structure to the landward edge, depending on the combination of tide height and wind direction at the time of wave attack. These situations have occurred 6 to 8 times in the year that the extension has been monitored, including during the impact of Hurricane Marco. Similar responses were observed the previous year at the original tube. That year included the passage of Tropical Storm Keith.

On the other hand, during Marco and other periods of higher water levels and wave energy, the devices have prevented under-cutting of the profile and creation of an erosional bluff. A natural recovery of the beach width seaward of the container toe has occurred in each case. The recovery has frequently included natural re-deposition of most of the sand over the tubes themselves. Subsequent placement of off-site fill has replaced any losses at higher elevations on the profile.

This positive performance is the result of the relatively flat slope of the seaward face of the container which allows normal wave uprush to replace the sand. The typical 1V on 3H to 4H slope of the tubes provides an effective energy dissipating transition between the flatter, but narrow natural beach face (1:10) and the abrupt vertical bluff toe. In contrast, when an erosion bluff has been cut by storm action on adjacent beach sections without the Protect-tube, even though the beach width and water line position eventually recover, the volume of sand which was stored in the dune system at higher elevations is not replaced naturally and the net result is a continuing reduction in the protection afforded by that natural system.

Although the required monitoring was not intended to include observations of sea turtle activity, it is interesting to note that in May 1989 a turtle nested in the sand fill over the Protect-tube installation (verified by Mote Marine Laboratory). This was the first nesting activity on the property in several years apparently because of the very narrow width of beach (20 to 30 ft) waterward of the eroded natural dune escarpment. Seasonal storms do periodically erode a portion of the sand cover from over the tubes; however, this occurs principally in the winter when nesting activity is not expected and the property owner has complied with permit conditions and subsequently replaced any sand volume not naturally restored with additional off-site fill.

Site Inspection

A general inspection of the site was conducted at the time of each of the monitoring survey. No damage or other effects to the structure were noted. Lateral pedestrian access along the beach was not being impaired. Attached are several photographs taken during the monitoring surveys.

Please contact us if you have any questions.

Yours truly,
COASTAL PLANNING & ENGINEERING, INC.



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