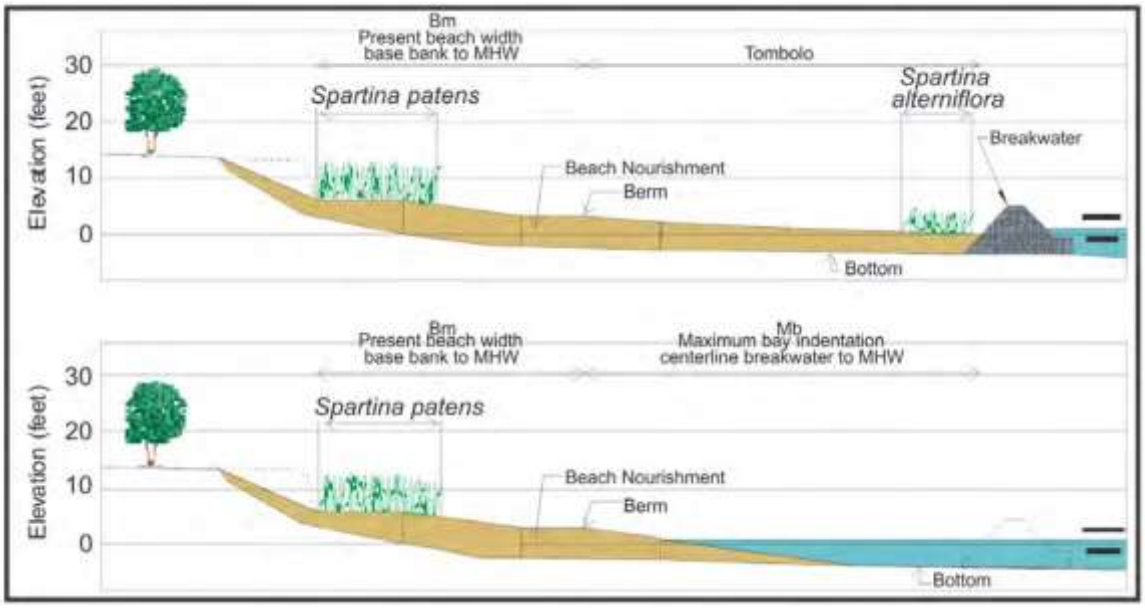

Figure 5-17. Conceptual cross-section of the Yorktown Pocket Beach (Hardaway and Byrne 1999).

Constructed Marsh With Breakwaters: Mobile Bay, Alabama

Region: Gulf Coast
Coastal Risks Addressed: Erosion, waves

Alabama DOT considered a nature-based solution as part of a bridge replacement and highway realignment project across Mobile Bay, AL (see location on Figure 5-18). The replacement of an existing bridge necessitates a new eastbound alignment and bridge to carry U.S. 98 across the confluence of the Tensaw River with the Mobile Bay estuary. The proposed realignment will alter approximately 2,200 feet of bay shoreline within the project footprint. Establishment of the new alignment will result in the loss of benthic habitat, aquatic resources, and SAVs (~1 acre). Alabama DOT considered the use of a nature-based solution in order to enhance the resilience of U.S. 98 and to potentially offset unavoidable impacts on aquatic resources. The existing shoreline is hardened with a vertical concrete seawall.

Shorelines within the study area are subject to a small tide range (~1.5 feet), considerable water level fluctuations as a result of storms, and considerable exposure to wave energy. The wave energy exposure is high because of the 30+-mile-long fetches that stretch to the south. Large shoals are directly offshore from the study area and water depths beyond are typically shallow (< 9 feet). The intertidal and nearshore slopes here are both low. This part of the estuary exhibits low salinity levels and nearby shorelines are a combination of sand and intertidal marsh vegetation. Submerged vegetation exists in shallow water depths adjacent to the site.

The resilience requirements for this highway included shoreline and embankment stabilization during minor to extreme events. Alabama DOT considered using a continuous rock revetment from the edge of the pavement down to the existing bay bottom on a slope of 3:1 (H:V).

Figure 5-18. Mobile Bay, AL, location overview (NOAA Nautical Chart 11376 inset, depths in feet).

Further analysis revealed that placing a nature-based solution consisting of stone breakwaters and planted marsh in front of the planned revetment (Figure 5-19) would provide multiple benefits. These benefits include:

- Reducing the amount of rock needed for the revetment, thus reducing the cost of the revetment by $1.2 million.
- Reducing storm impacts on the revetment and roadway by reducing wave heights by more than 50 percent during a moderate storm event.
- Providing environmental benefits, including conversion of nearly 2,000 feet of (proposed) hardened shoreline into a natural intertidal marsh, and creation of more than five new acres of marsh and/or SAV habitat with resulting pollutant uptake and fisheries benefits.
- Providing recreation and education opportunities.
- Offsetting impacts on aquatic resources from the highway project, potentially allowing Alabama DOT to meet compensatory mitigation requirements, saving Alabama DOT more than $0.5 million by not having to purchase credits from a tidal wetlands mitigation bank.

The material cost of the nature-based solution is approximately $1.2 million. Since it would reduce the cost of the revetment by $1.2 million, it is essentially cost neutral, although it would require additional maintenance and monitoring.

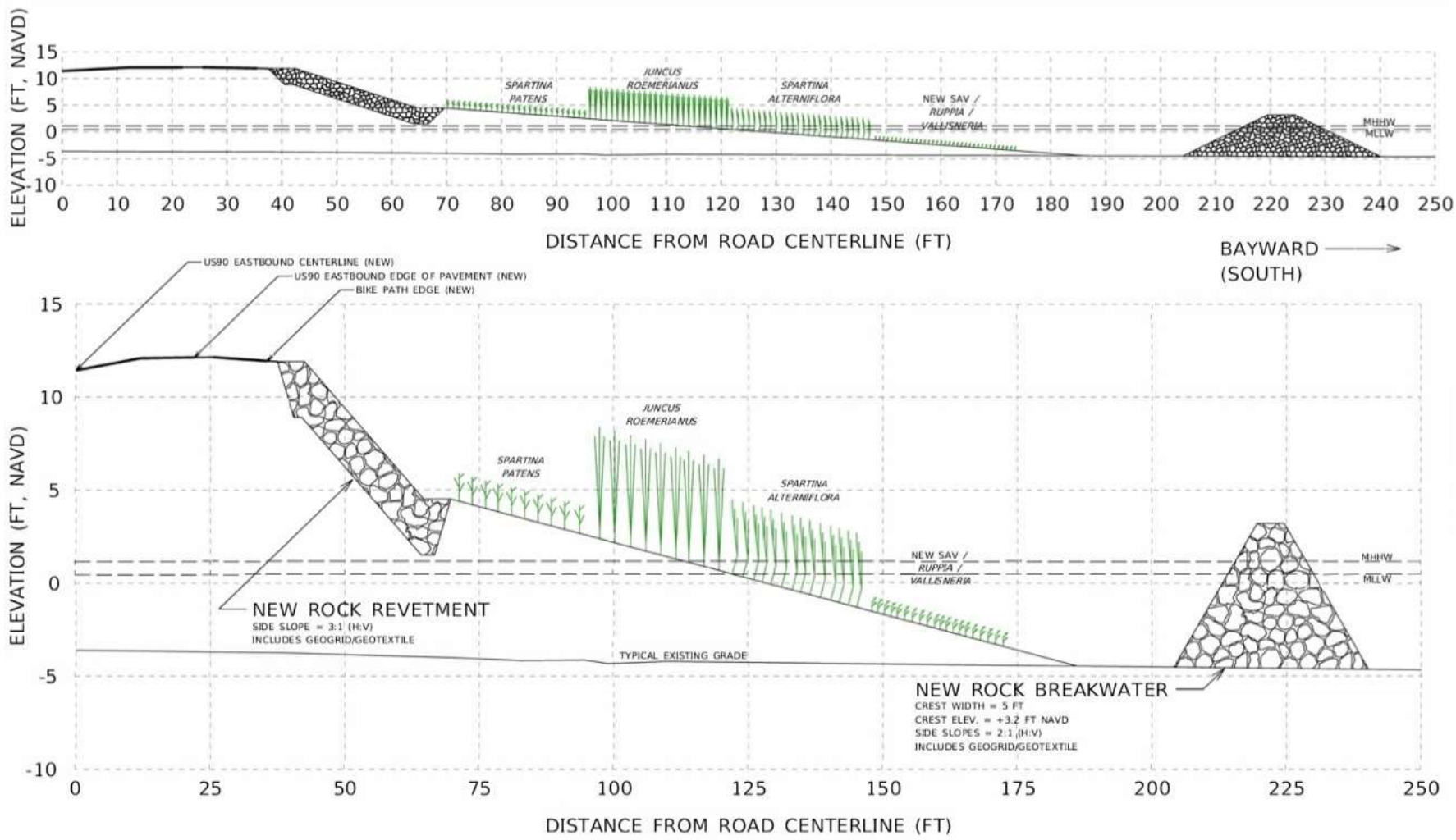

Figure 5-19. Conceptual cross-section diagram of a constructed marsh and breakwater system in Mobile Bay, AL.

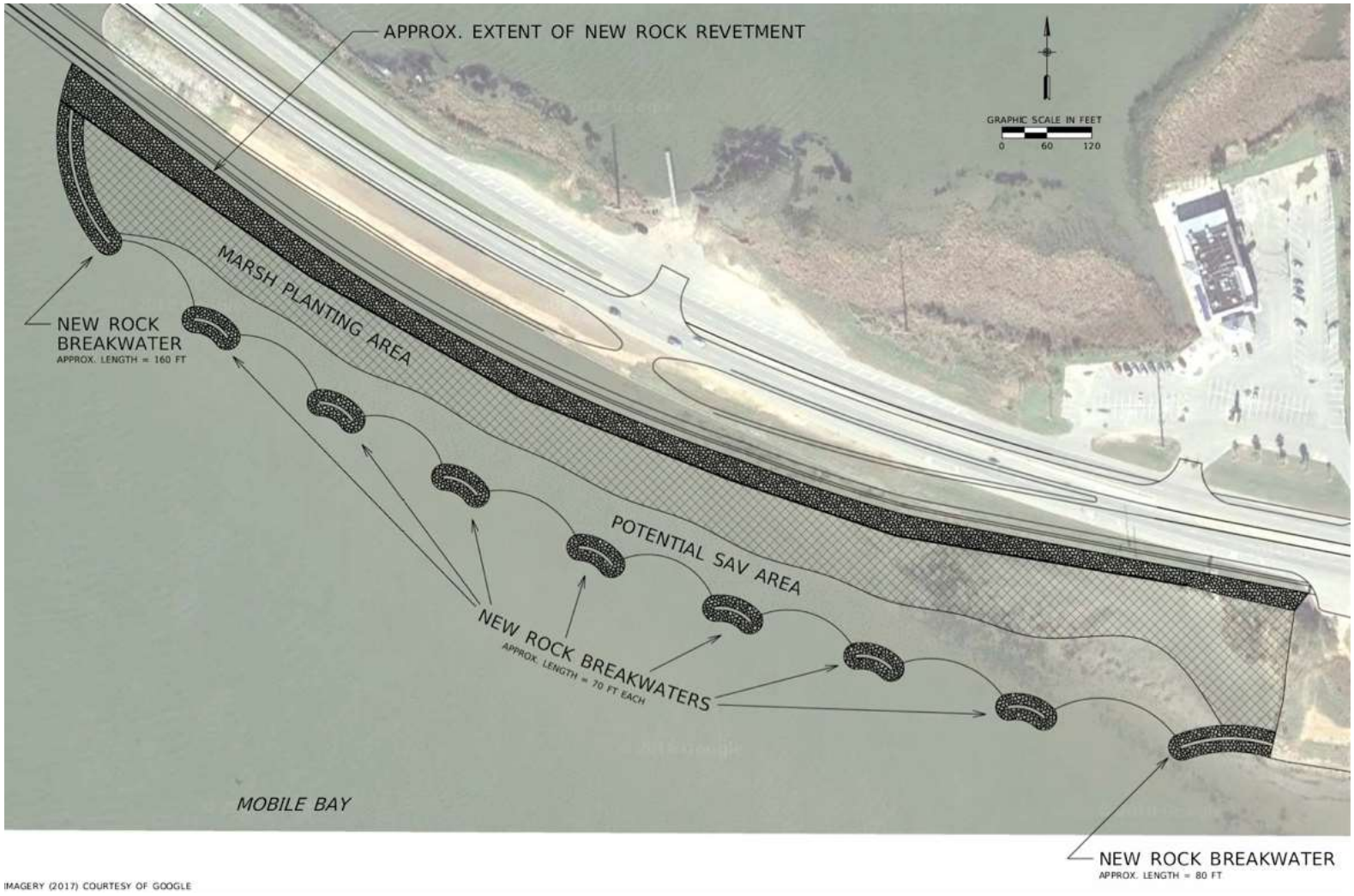

Figure 5-20. Conceptual planform diagram of a constructed marsh and breakwater system for Mobile Bay, AL. (Credit: FHWA)