

A Scale Model Sediment Bypassing and Back-passing System on Galveston Island, Texas Innovative Technology for Regional Sediment Management

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PROJECT BACKGROUND

Field deployment for scale model evaluation of an innovative sediment bypassing/back-passing system developing technologies to support present and future sustainable beach nourishment programs and projects on Galveston Island. This is a field scale demonstration project modeling a system designed to harvest beach quality sand using a hybrid, closed system that collects transported bedload material using gravity and natural energies, without any suction component, as sediment is mobilized along the coast through longshore currents and wave energy. The analysis and results of the field deployment will be presented.

SEDIMENT BEDLOAD COLLECTOR SYSTEM

The Bedload Sediment Collector allows energy of streams and coastal longshore currents to selectively capture bedload sediment using simple physical principles. Coarse-grained sediment, fine sands to gravel, migrates as bedload, passes through the grate system to collect within hoppers. Finer sediments, silts and clays, and other organic matter, remain in suspension passing unimpeded over the hopper grates. As the hoppers fill, sediment is pumped to a placement area or dewatering site for beneficial reclamation of harvested sediments. The grated hopper of the collector systems allows operators to target particle sizes captured in the internal hoppers of the collector. Multiple series of hoppers can be built into a collector system allowing the Sediment Collector to act as a natural classifier in the water and selectively capture migrating bedload at its natural flow and movement.



Figure 1 -Bedload Monitoring Collectors (2-ft and 4-ft).

FIELD DATA COLLECTION

Our team deployed Bedload Monitoring Collectors within the surf zone capturing sediment traveling with the littoral drift at two locations:

- Galveston Island's East Beach, and
- Point San Luis.

The deployment of the Bedload Monitoring Collectors

was accomplished through accessing the surf zone from the beach using floating deployment platforms. A single 3-inch clear PVC hose was attached to each Monitoring Collector which then connected to an onshore portable gasoline powered pump and collection recovery tank.

FIELD PROJECT OBJECTIVE

The purpose of the field effort was to collect multiple samples of transported sediments at various locations throughout the East Beach and Point San Luis zones. The scale modeling tests determined bedload sediment migration within the littoral zone quantifying total sediments transported by longshore currents and cross-shore wave energy. The collected data provides the baseline for analysis of sediment transport characteristics for extrapolation to full-scale harvesting system within the nearshore coastal system at East Beach and Point San Luis for the purpose of beneficially using the harvested sediments for beach renourishment.



Figure 2 - Scale Model Sampling Equipment for Sediment Bypassing/Back-passing System.

PROJECT PARTNERS

Bathymetric, water-level, and meteorological and oceanographic data collection efforts were performed in conjunction with the U.S. Army Corps of Engineers - Galveston District and U.S. Army Corps of Engineers - Coastal Hydraulics Laboratory - Engineering Research and Design Center; and project data support from Texas A&M University - Galveston for optical back-scatter sensors, conductance and pressure gauges for waves and water levels, single beam echo sounder, and shallow water flow meters.

REFERENCES

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