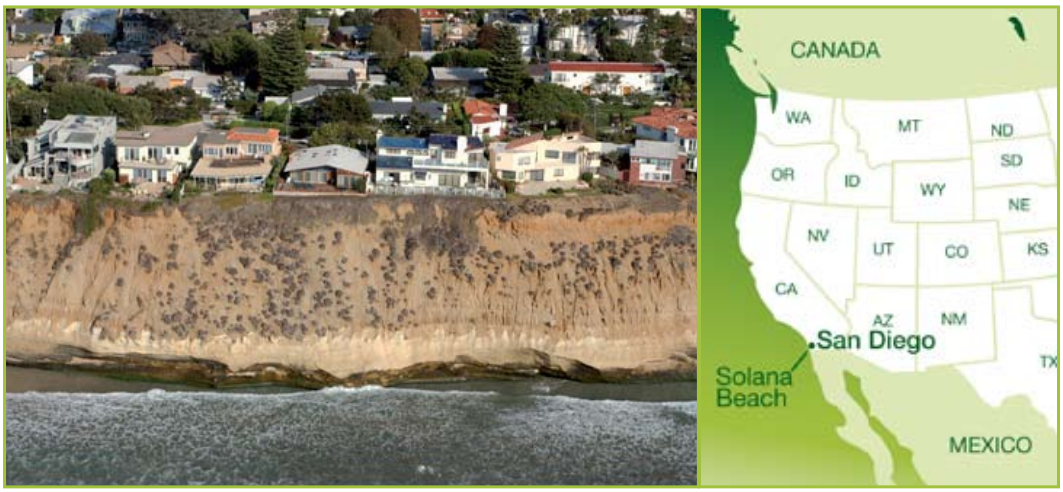
Laser scanning tackles beach erosion

Research on beach erosion by University of California scientists made use of laser scanning. This research indicates that erosion from coastal bluffs and cliffs could in fact account for about half of the region's beach sand.



Aerial photograph of Solana Beach

HIGHLIGHTS

- I-Site provides scientists with a quick and effective tool when scanning the beach sites
- Allows identification of volumes of sand that are falling onto the beach
- Pinpoints the areas of slow moving erosion on the bluffs

Previous belief was that erosion from coastal bluffs and cliffs was only a minor source of beach sand. New research indicates that over half of the region's beach sand may be coming from this coastal erosion.

Coastal geologists have assumed for years that sediment-laden rivers entering the Pacific Ocean along the Central and Southern California coast supply up to 90% of the sand on the region's beaches.

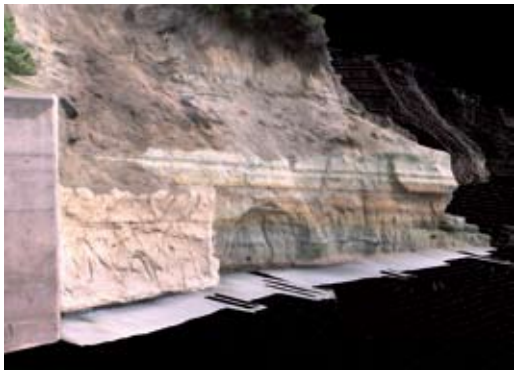
Determining the source of sand is the logical first step in any effort to preserve Southern Californian beaches.

The San Diego coastline has been scanned many times since 2004, most recently with the Maptek I-Site™ 4400 scanner. This instrument was mounted on top of a lifeguard truck which was driven down the beach along the bluff.

Scans took only about four minutes for each setup location, allowing rapid advancement down the beach.

As scanning could only take place during low tide, it took nine hours scanning over three days to capture approximately 100 scans along a 10 km (7 mile) strip.

Comparing current data to that acquired previously allows scientists to calculate volumes of material on the beach.



Point cloud of the bluff with beach in the foreground reveals loss of material onto the beach as well as the lithology of the face

Mounting the scanner on the truck streamlined scanning along the Solana beachfront

Lifeguard truck moving down the beach during periods of low tide to scan the bluff face

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I-Site technology provides scientists with accurate measurements and volume calculations for analysing material movements over time.

Researchers can therefore identify the volume of sand that has fallen from the bluff onto the beach, as well as pinpoint the areas of slow moving erosion on the bluffs. The loss of material from the beaches can also be quantified.

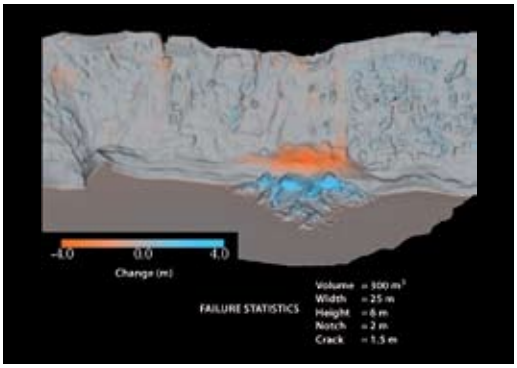
Photograph of the bluff showing material dumped onto the beach

A GPS receiver was mounted on the scanner to allow accurate positioning of each scan into the coordinate system.

I-Site Studio's three degrees of freedom surface registration tool was the key to accurate registration. This allows the scanner orientation to be correctly aligned and the scan to be automatically located into the correct position without moving the known origin of the scan.

The scans are merged into a full 3D triangulation using I-Site Studio's 'fusion surface'. This surface is then compared to previous months, using the 'distance from surface' option, highlighting where changes have occurred.

Volumes can be determined for areas of both lost and gained material. Based on the volume of material that has fallen from the bluffs during the study period, researchers concluded that half of the beach sand in the Oceanside Littoral Cell, an 80 km (50 mile) stretch of California coast from La Jolla north to Dana Point, was likely to have been derived from the bluffs.



Comparing triangulated surfaces of 3D data with that of previous laser scan surveys allowed scientists to calculate material movements and assess the scale of erosion in this section of the bluff

High resolution panoramic image of Solana Beach captured using the I-Site 4400 in this section of the bluff