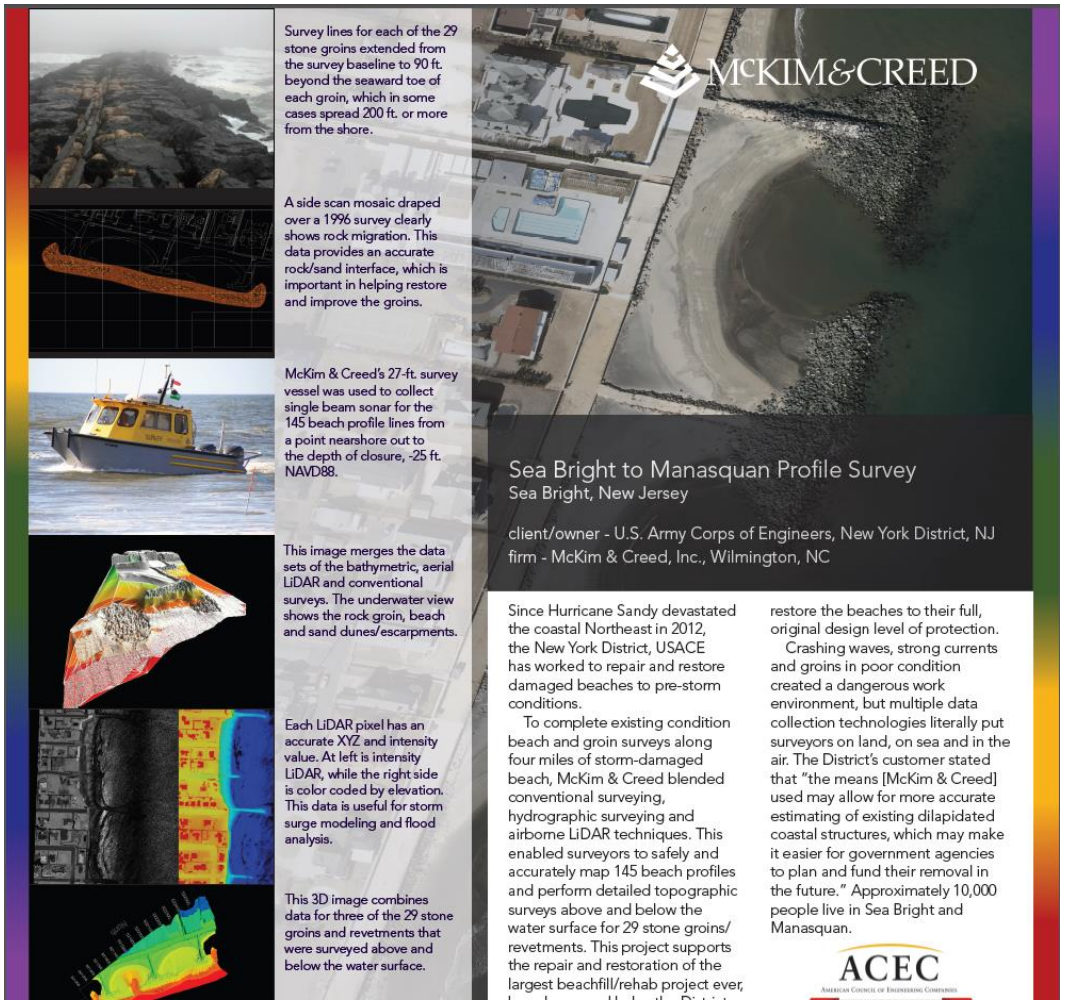
Sea Brite Manasquan Profile Survey
USACE NY District

McKIM&CREED

2015 ACEC Grand Award Winner– Surveying & Mapping Technology Category



Survey lines for each of the 29 stone groins extended from the survey baseline to 90 ft. beyond the seaward toe of each groin, which in some cases spread 200 ft. or more from the shore.

A side scan mosaic draped over a 1996 survey clearly shows rock migration. This data provides an accurate rock/sand interface, which is important in helping restore and improve the groins.

McKim & Creed's 27-ft. survey vessel was used to collect single beam sonar for the 145 beach profile lines from a point nearshore out to the depth of closure, -25 ft. NAVD88.

This image merges the data sets of the bathymetric, aerial LiDAR and conventional surveys. The underwater view shows the rock groin, beach and sand dunes/escarpments.

Each LiDAR pixel has an accurate XYZ and intensity value. At left is intensity LiDAR, while the right side is color coded by elevation. This data is useful for storm surge modeling and flood analysis.

This 3D image combines data for three of the 29 stone groins and revetments that were surveyed above and below the water surface.

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Sea Bright to Manasquan Profile Survey

Sea Bright, New Jersey

client/owner - U.S. Army Corps of Engineers, New York District, NJ
firm - McKim & Creed, Inc., Wilmington, NC

Since Hurricane Sandy devastated the coastal Northeast in 2012, the New York District, USACE has worked to repair and restore damaged beaches to pre-storm conditions.

To complete existing condition beach and groin surveys along four miles of storm-damaged beach, McKim & Creed blended conventional surveying, hydrographic surveying and airborne LiDAR techniques. This enabled surveyors to safely and accurately map 145 beach profiles and perform detailed topographic surveys above and below the water surface for 29 stone groins/ revetments. This project supports the repair and restoration of the largest beachfill/rehab project ever, restore the beaches to their full, original design level of protection.

Crashing waves, strong currents and groins in poor condition created a dangerous work environment, but multiple data collection technologies literally put surveyors on land, on sea and in the air. The District's customer stated that "the means [McKim & Creed] used may allow for more accurate estimating of existing dilapidated coastal structures, which may make it easier for government agencies to plan and fund their removal in the future." Approximately 10,000 people live in Sea Bright and Manasquan.

ACEC

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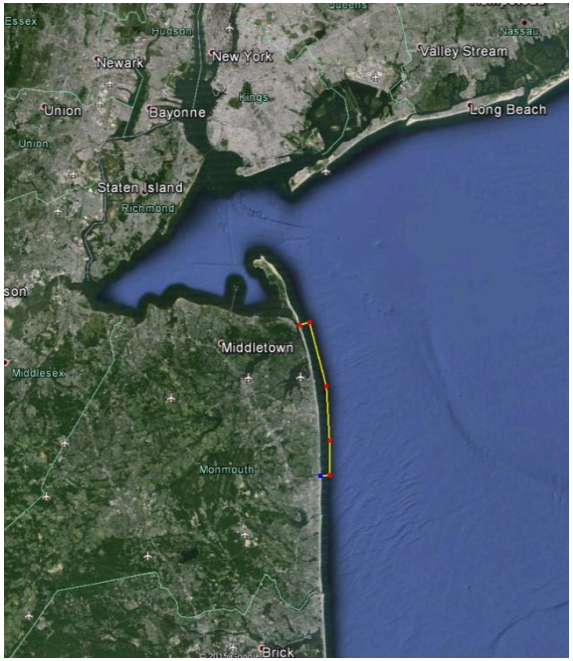
Project Limits – Loch Arbour to Sandy Hook



- 9.5 Miles
- 89 Profiles to -2 NAVD88
- 56 Profiles to -25 Navd88
- 28 Groin Surveys

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Should we take the SOW Literally?

SEA BRIGHT TO MANAQUAN, NEW JERSEY
PLANS AND SPECIFICATION SURVEY
ELBERON TO LOCH ARBOUR

I. OBJECTIVE. The objective of this work is to conduct beach profile surveys as well as profiles along and across the specified groins for preparation of plans and specifications for the Atlantic Coast of New Jersey Sandy Hook to Barnegat Inlet Beach Erosion Control Project (Elberon to Loch Arbour). This scope includes the acquisition of beach and groin profiles.

II. LOCATION. The project area is located on the Atlantic Ocean shoreline of Monmouth County, NJ, between Long Branch (near Lake Takanassee) and Deal Lake.

III. PROFILE SURVEY REQUIREMENTS

A. Vertical Datum, Horizontal Coordinate System, and Tidal References. This survey shall be performed and submitted in accordance with ER 1110-2-8160 "Policies for Referencing Project Elevation Grades to Nationwide Vertical Datums". For this survey, vertical datum shall be NAVD88, horizontal coordinate system shall be New Jersey Mercator (2900) NAD 1983 grid. Tidal references shall be to the 1983-2001 epoch.

B. Monumentation. The New York District shall supply documentation of monumentation established and reoccupied during the beach profile monitoring surveys of the area.

C. Baseline and Base maps. The New York District shall supply documentation of a previously used baseline and beach profile stationing which are to be reoccupied for this survey, and previously developed planimetric base maps. Table 1 lists the northing and easting coordinates of profiles to be measured in NAD27. Coordinates are to be converted to **NAD83**. Figures 1 and 2 show profile line locations.

Plan view files in Micro Station shall include attached aerial orthophoto imagery. Post-Hurricane Sandy ortho imagery is available at http://storms.ngs.noaa.gov/storms/sandy/.

D. Beach Profiles.

(1). A total of fifty-six (56) long range profiles are to be surveyed. The coordinates of these ranges are shown in Table 1. Figures 1 and 2 show the approximate location of all lines. The profiles shall be aligned as per azimuths shown in Table 1. The profile Vertical data shall be referenced to the North American Vertical Datum, 1988 (NAVD). The beach profiles shall start at a point behind the seawall, dune or bluff line and extend seaward to closure depth which is -25 feet NAVD, or to a minimum of 1500 ft. The beach profiles should extend at least 25 ft. landward from the baseline and extend as far

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(2). In addition, eighty-nine (89) short ranges extending from a point behind the seawall, dune or bluff line and extending seaward to -2.0 ft NAVD88 shall be taken between long ranges at 200-250 ft. spacing (see Figures 1 and 2). Where physical features such as groins, piers, structures, outfalls, or break lines create anomalous changes in topography between short ranges, random ground elevations shall be included to supplement the short range information.

E. Groin Centerline Profile Lines. Twenty-eight (28) profile lines shall be taken along the centerlines of 28 existing stone groin structures and contiguous stone revetment. The groins to be surveyed are numbered 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102 and 103 and are shown in Figure 3. Lines shall extend from the survey baseline to 200 feet beyond the seaward toe of each groin. Distance from baseline shall be indicated for each elevation. A sufficient number of points shall be taken along each groin's central axis to ensure adequate description of the groin crest elevation. The crest of the groin, seaward toe of the groin and landward end shall be identified, as well as the locations of slope breaks along the structure. The acquisition of the groin profiles shall require locating the control for the appropriate baseline range stations. If necessary, control shall be reestablished.

F. Groin Cross Sections. Groin cross sections shall be taken perpendicular to the centerline profile on the 28 groins specified in the above paragraph. Cross sections shall commence at landward limit of visible stone. Cross sections shall be taken every 25 feet proceeding seaward, and every 15 feet at the seaward toe of the groin. Additional cross sections shall be taken at each slope break (if any) along the structure. For each cross section, distance from the baseline shall be indicated. A sufficient number of points (minimum 9 points consisting of center (1), top of slope (2), midslope (3), toe of groin (4), and 20 ft. from toe (5)) shall be taken along each cross section to adequately describe the structure.

IV. REQUIRED PRODUCTS.

A. **Beach Profile Plan View Plots.** Beach profile lines and ground survey points will be plotted in plan view on a 1"=100' horizontal on NYD supplied base mapping. Plots are to be on paper sheets, for review purposes.

Plan views will be plotted in Intergraph Graphic Design System (IGDS) file format (".dgn"), compatible with Micro Station Version 8 (see paragraph E below). Plan view plots will show on a New Jersey Mercator (2900) NAD 1983 grid. Baseline coordinates, line numbers, and profile origins in New Jersey Mercator NAD83 northings and eastings shall be shown. The beach profiles, spot elevations, ground survey data, MLW and MHW contours, and contour

"It's critical that we locate the transition from rock to sand"

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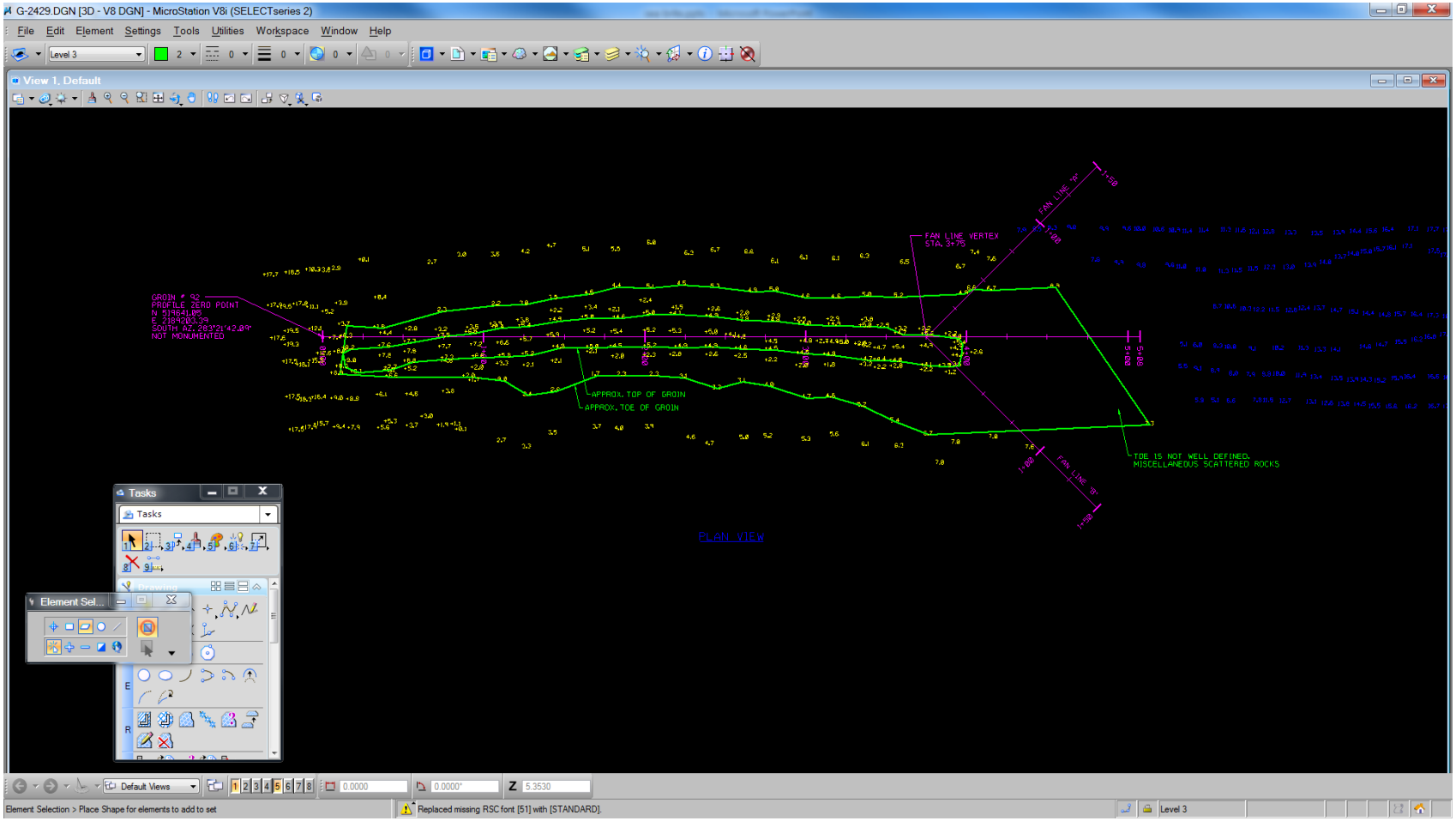
“We don’t care how you do up North!”



“hey y’all watch this!”

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“you want me to do what?”

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Ankle Breaker!

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“get me a shot there…and there….and there..”

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“boss… Roy won’t be coming back with us”

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“you have to time it just right”

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Not Happening

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March 2014

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LiDaR Technology Application

High — Speed and Range of Collection — Low

Large Scale Projects
1 to 25 points per meter
15cm to 30cm Accuracy

Corridors and Medium Scale Projects
30 to 100 points per meter
5cm to 15cm Accuracy

Corridors and Medium Scale Projects
500 to 5000 points per meter
1.5cm to 15cm

Small Scale Projects
5000 to 50000 points per meter
2mm to 6mm

Lower — Point Density — Higher

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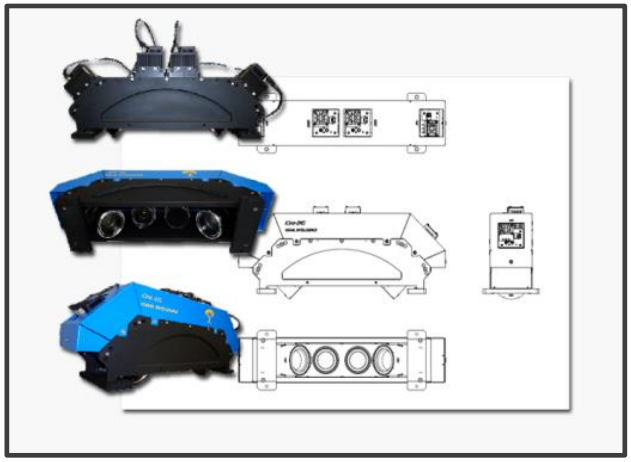
Z
Y
X
GPS
IMU
Pitch
Roll
Yaw
Z
Y
X
GPS Base Station(s)

Airborne Sensors

Reigl - LMS-Q680i

- Full waveform analysis for unlimited number of target echoes
- High laser pulse repetition rate up to 400 kHz
- Up to 266,000 measurements/sec on the ground
- High ranging accuracy up to 20 mm
- High scan speed up to 200 lines/sec
- Wide scan field of view up to 60º

Visual Intelligence – iONE(IMS)



- IMS – Infrastructure Mapping System
- Multi-array
- RGB & NIR Nadir Stereo Cameras
- Forward and Aft Oblique Cameras

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Bathymetric Sensors

EdgeTech - 6205

- Next Generation Bathymetric/SideScan technology
- Wide swath coverage, up to 12 times water depth
- Co-registered dual Freq. side scan and bathymetry
- Improved Depth Performance
- New lightweight Sonar head
- IHO SP-44 Special Order compliance with proven results
- Over 200° view angle with no nadir gap

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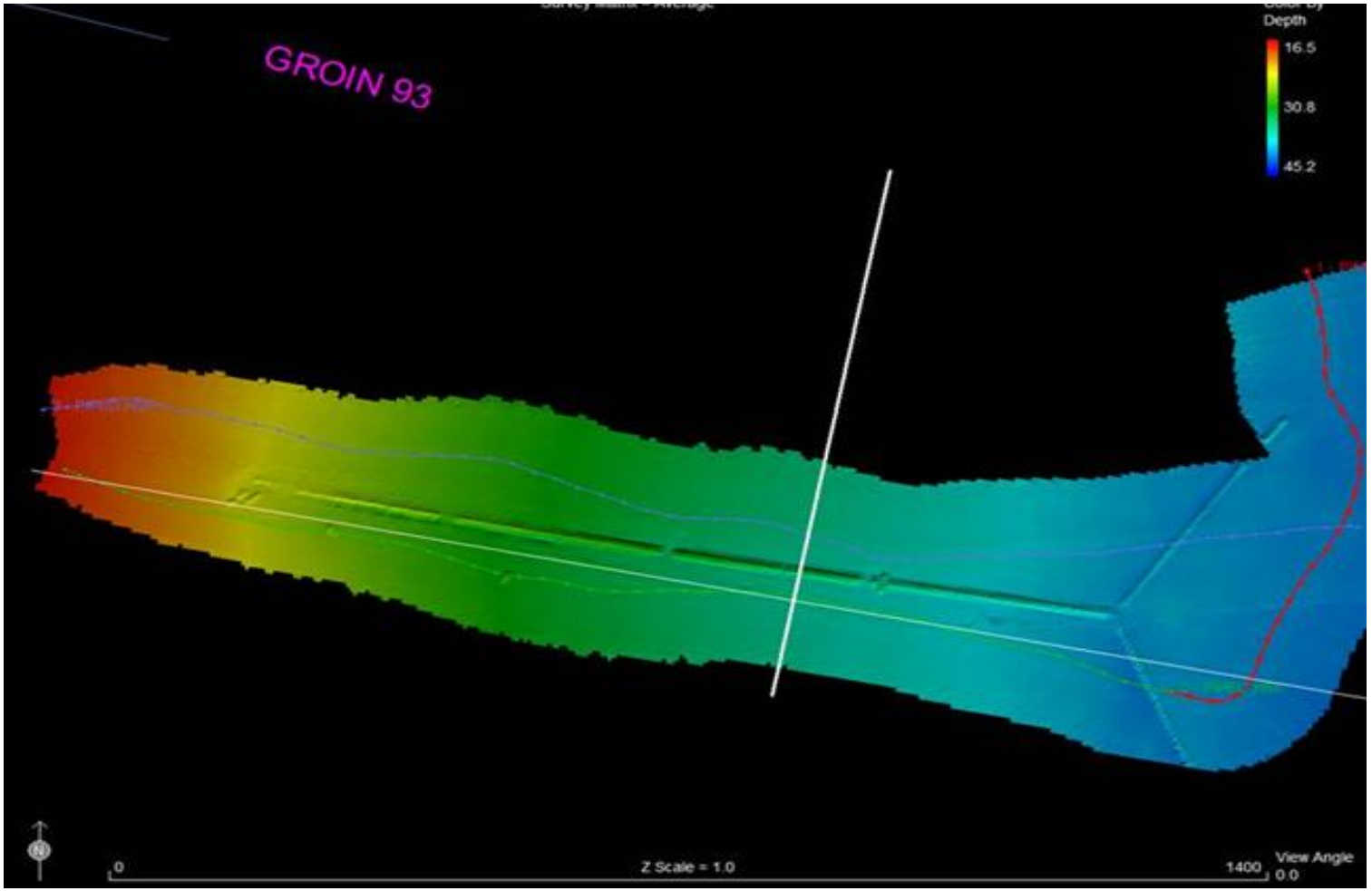
EdgeTech 6205 Image of Outfall Pipe and Defuser



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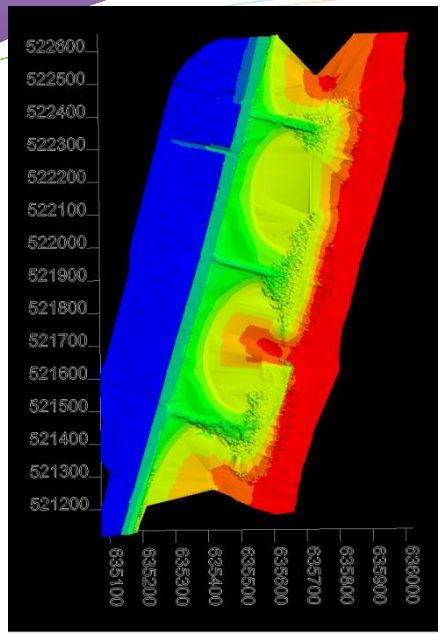
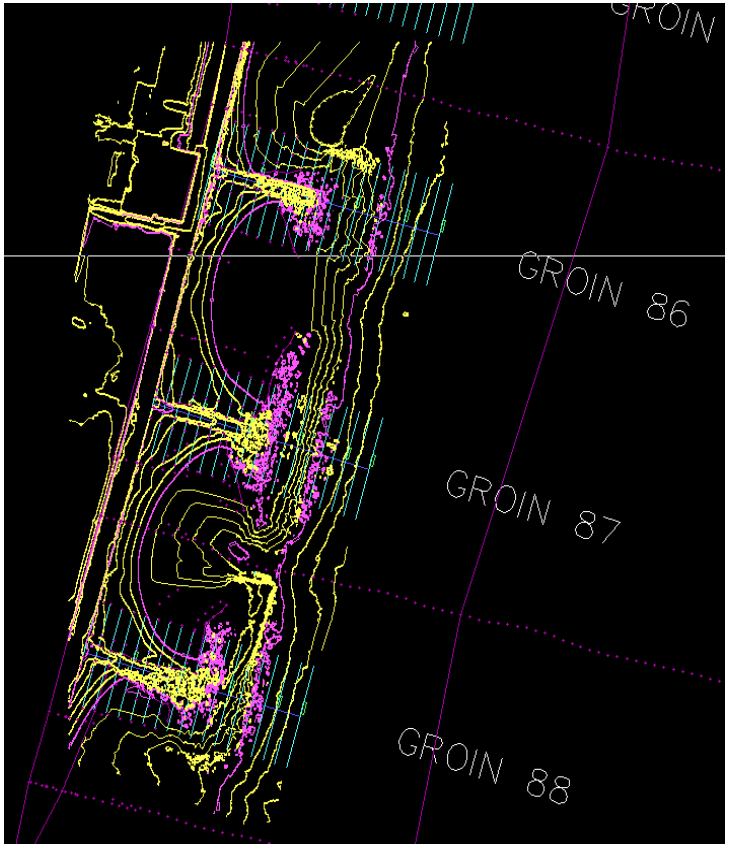
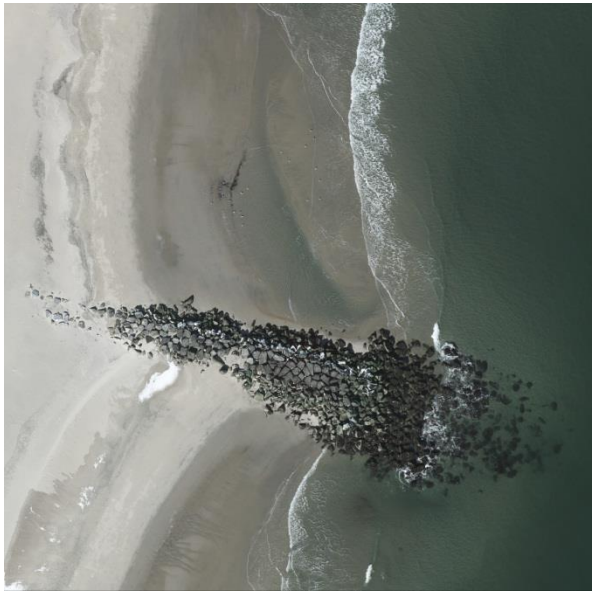


Combined 3D Model

SideScan Imagery



MicroStation CAD Deliverables



Ortho Imagery

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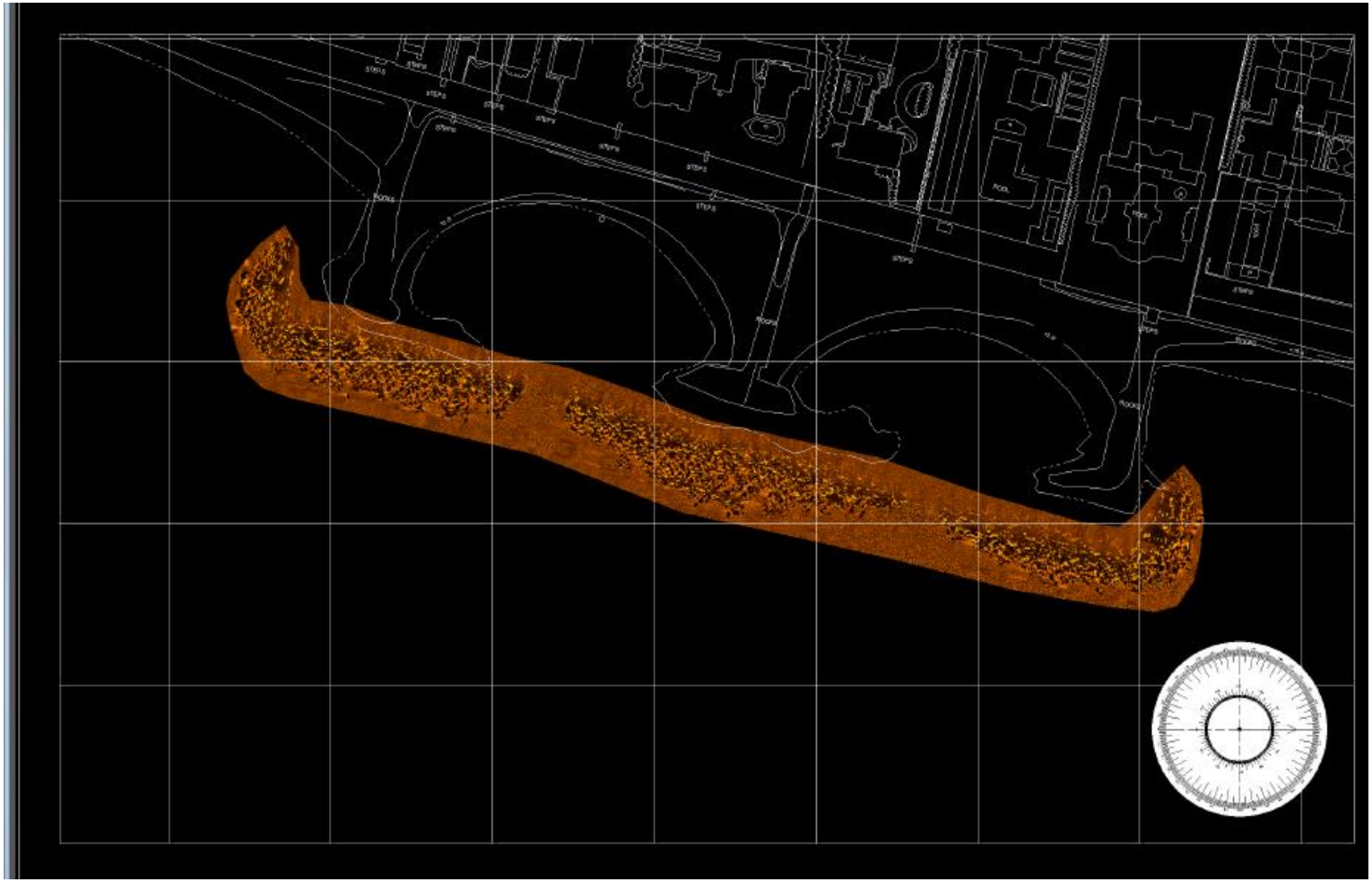
SideScan Imagery Over Previous Survey



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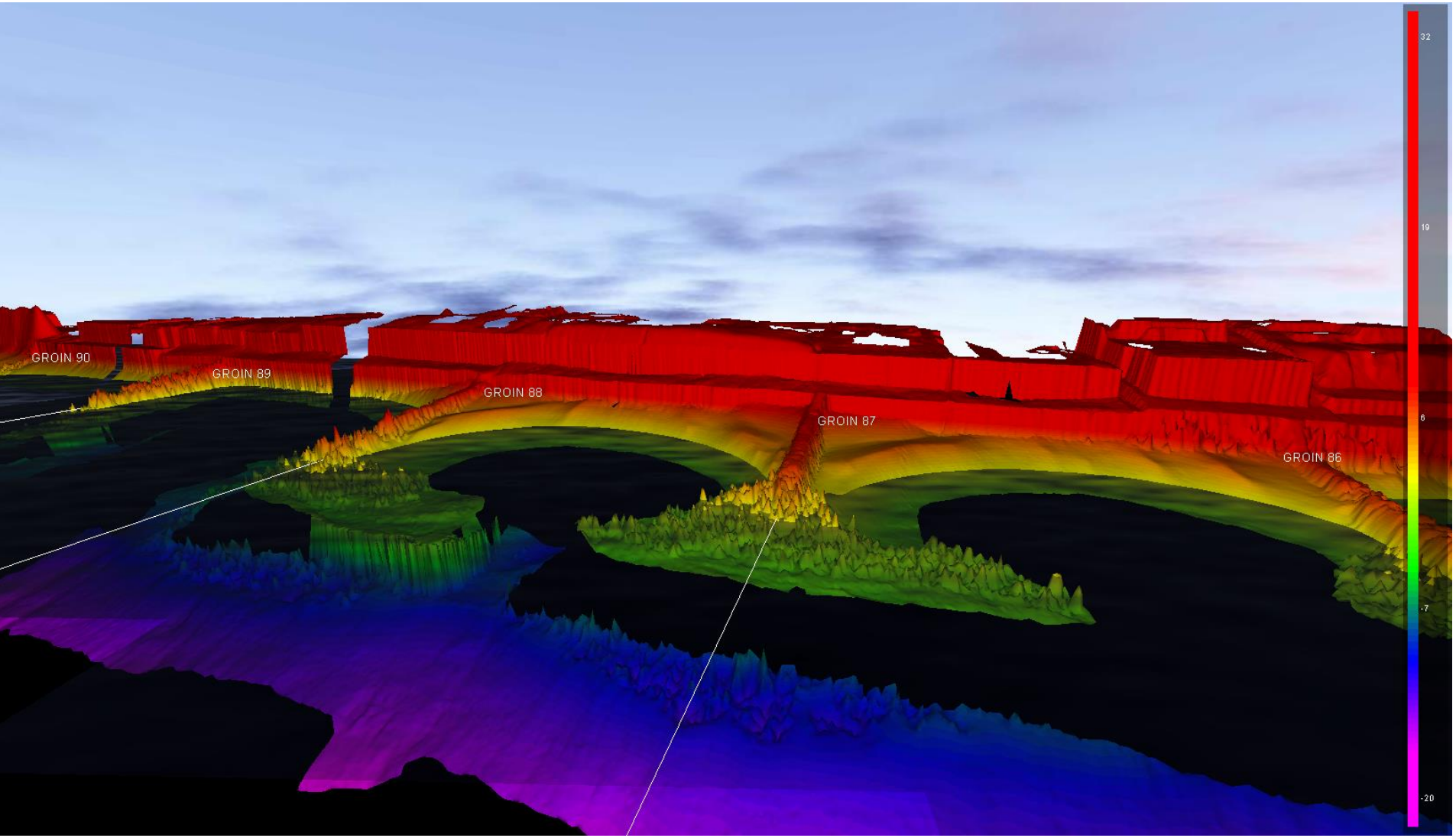
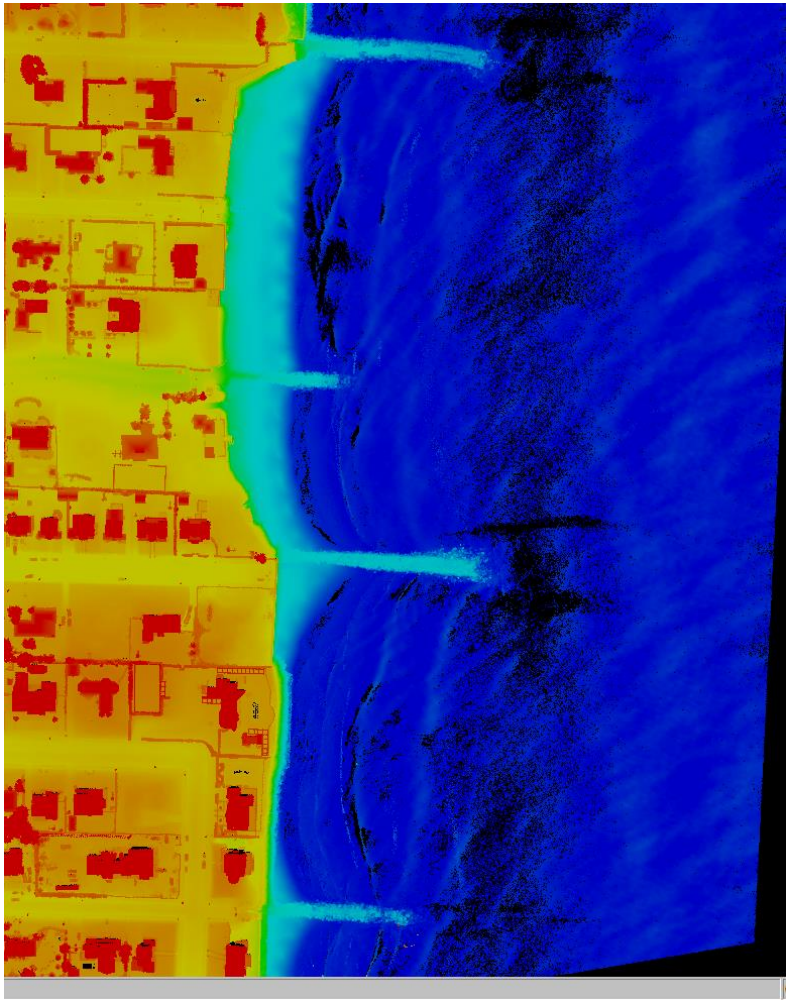
Bathy/Lidar Combined 3D Model (DTM,DEM)



Lidar Mode Displays

Intensity



Elevation

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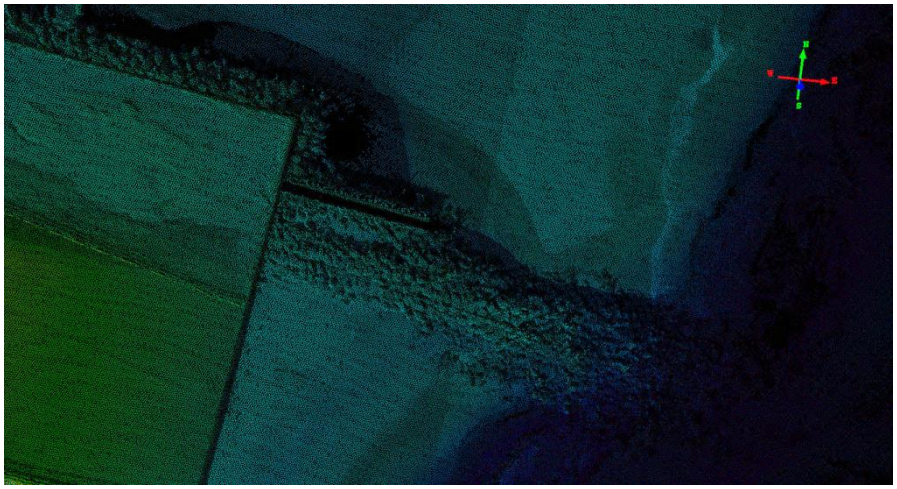

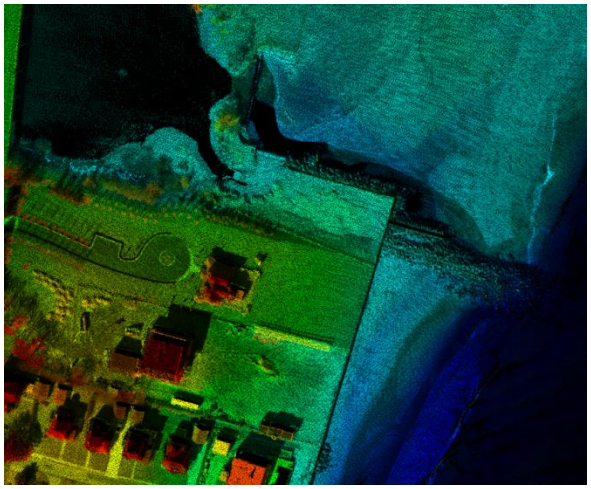

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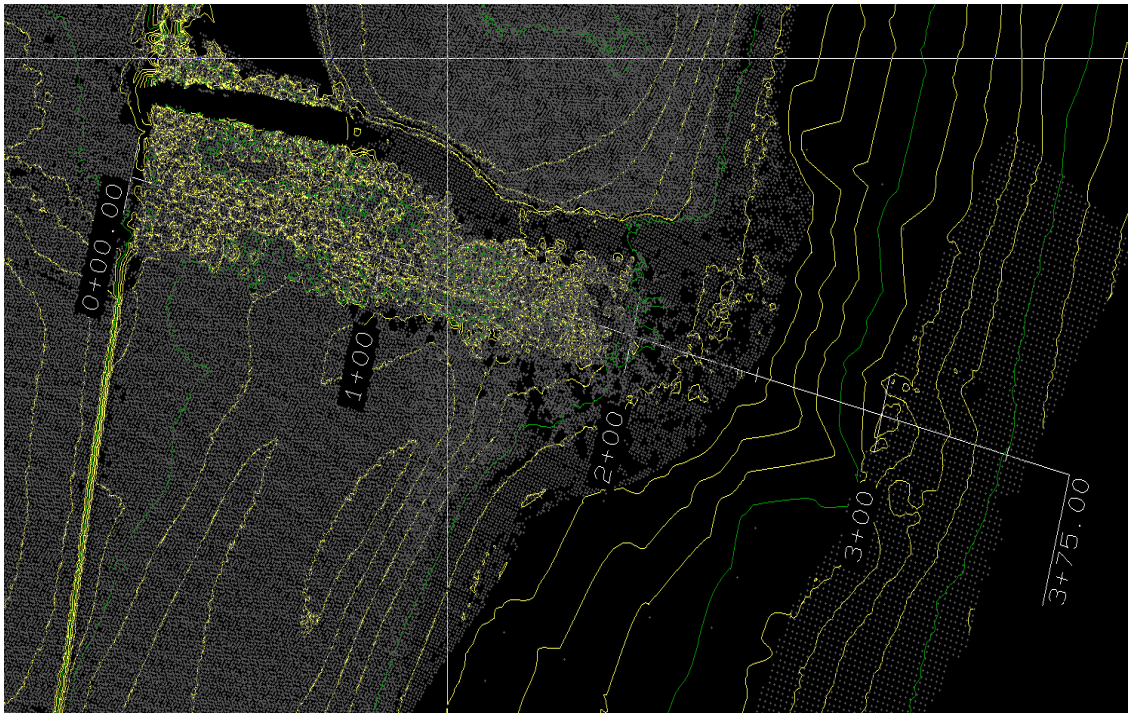
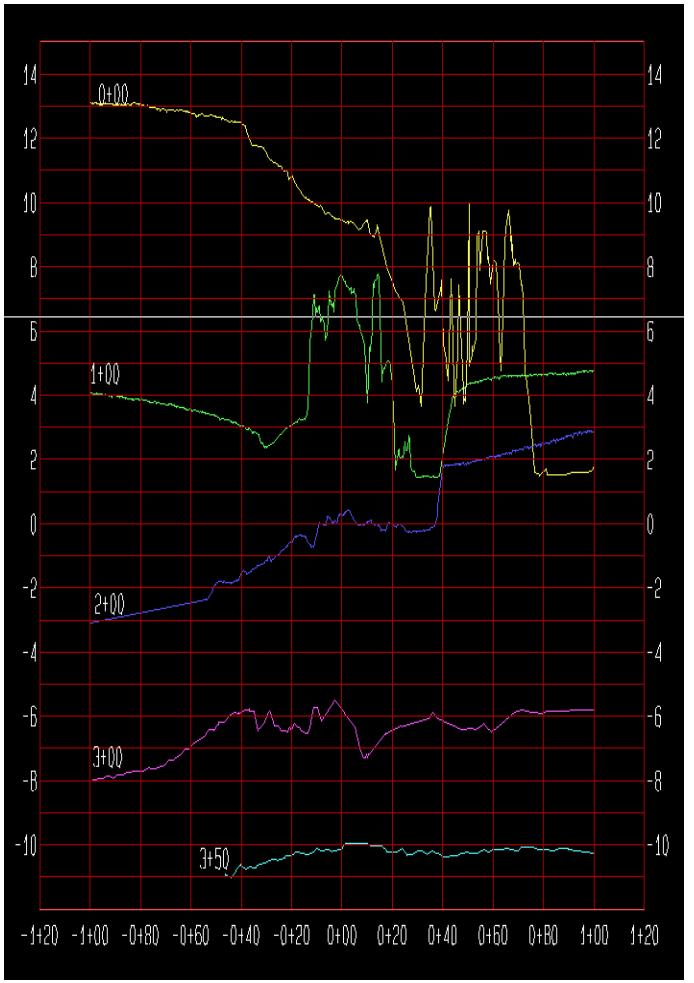
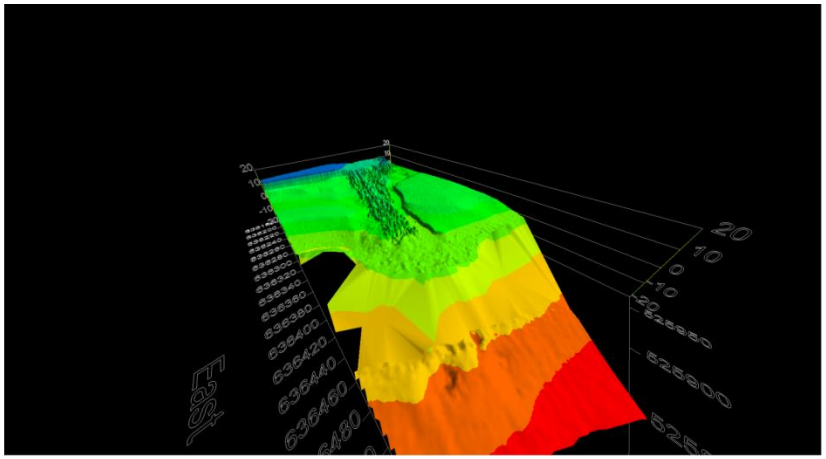
X-Section (typical?)







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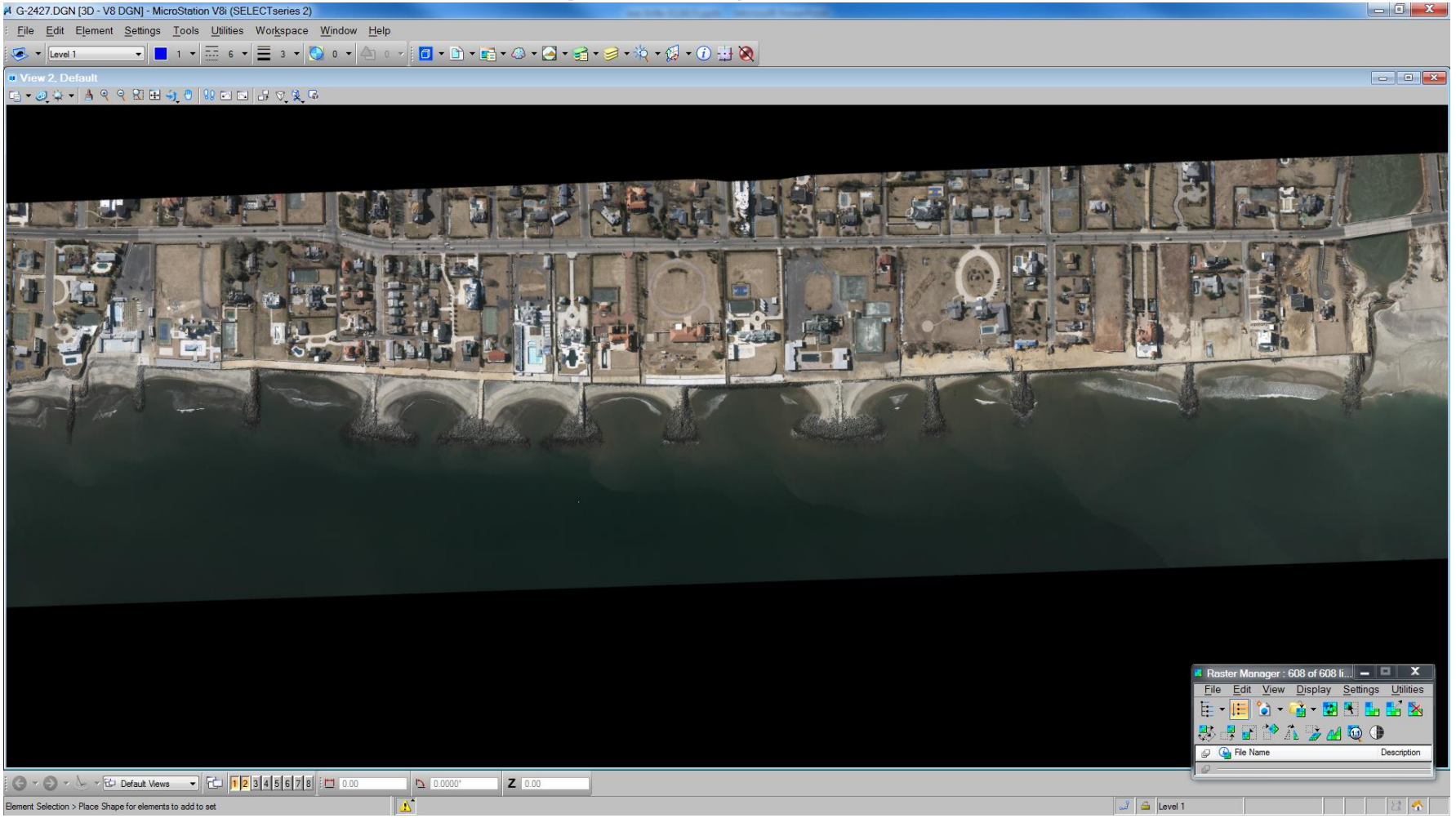
Orthophotography 1.5” Resolution



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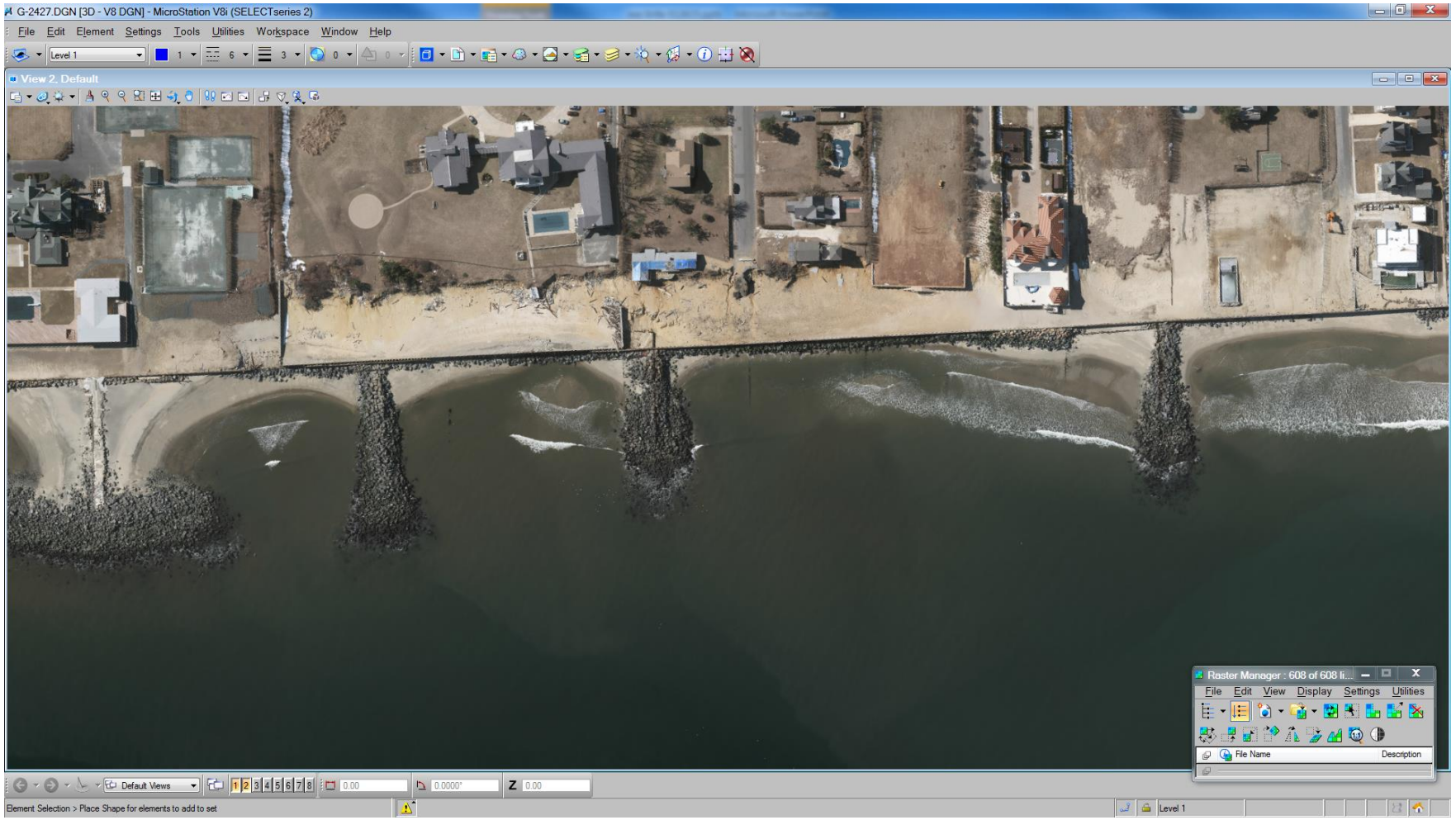

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Orthophotography 1.5” Resolution

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Colorized Pointcloud Fly-Through

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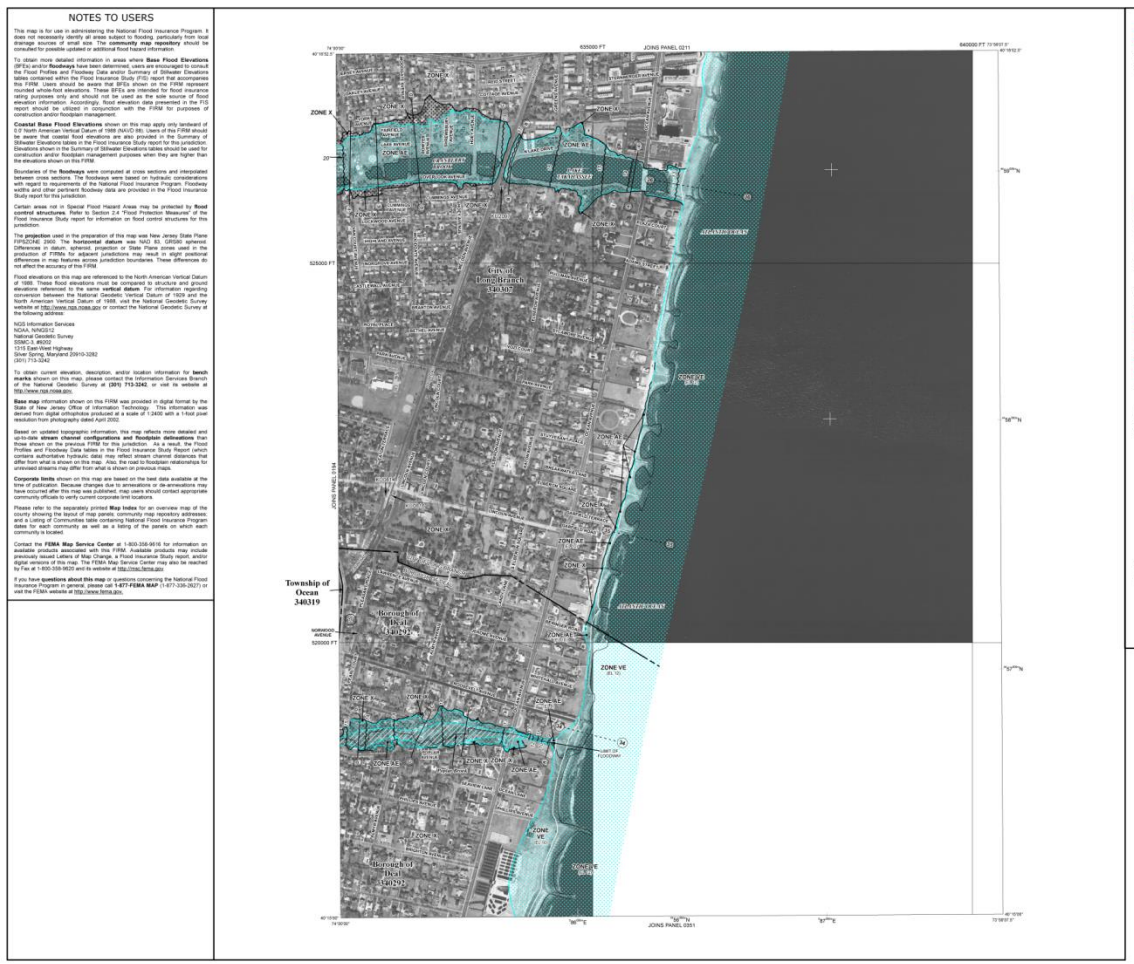
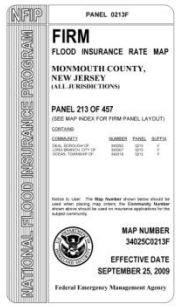
FEMA FIRM BE 12’





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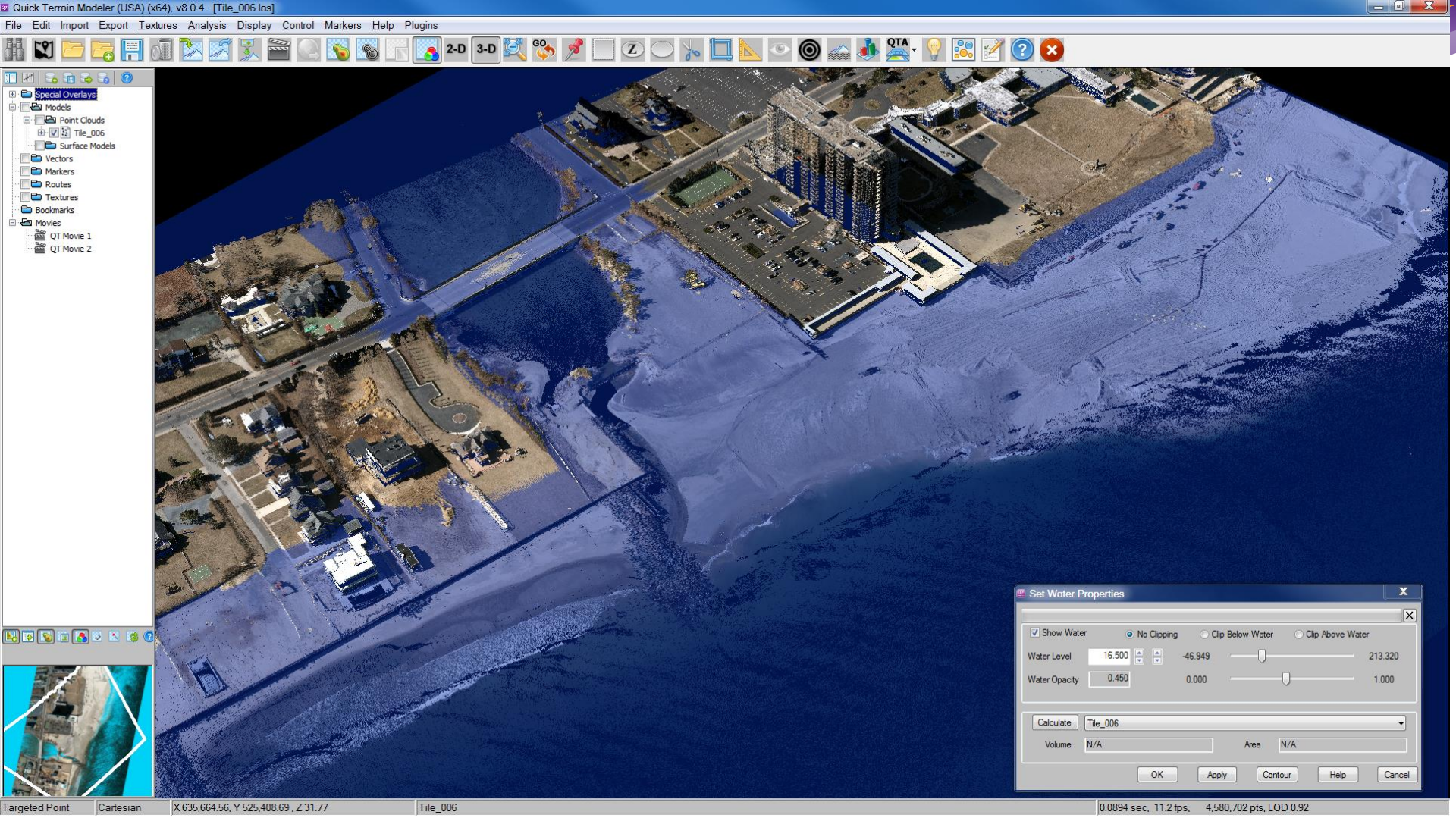

Surge Model Using a Colorized Point Cloud

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What's Next?

Nope…That's Not It!

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2017

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