CREATING A BATHYMETRIC DATABASE & DATUM CONVERSION

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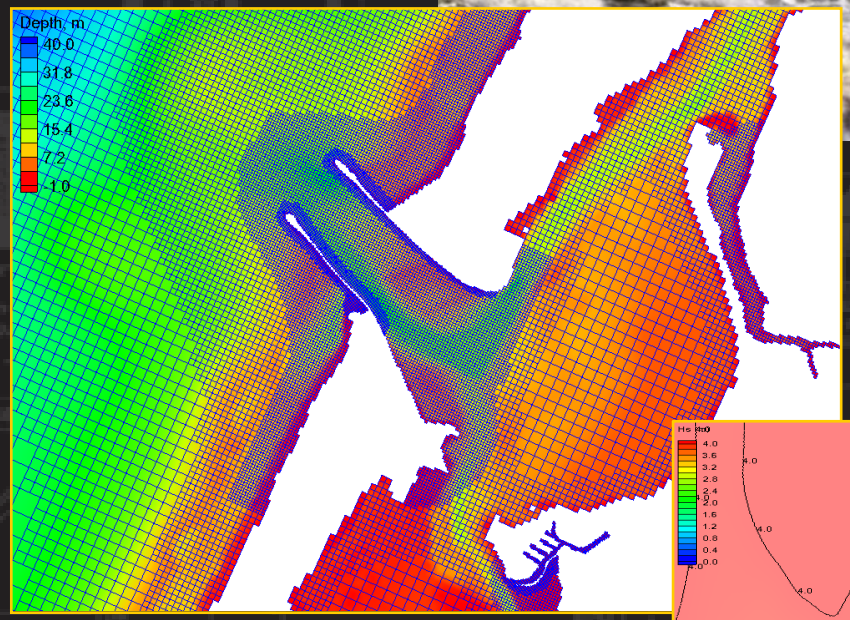

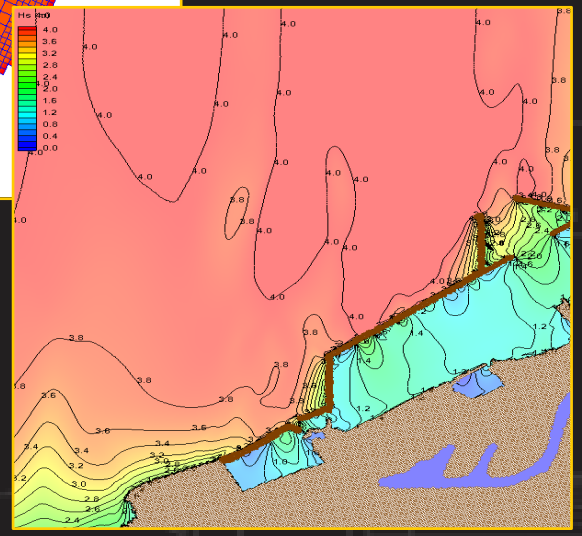

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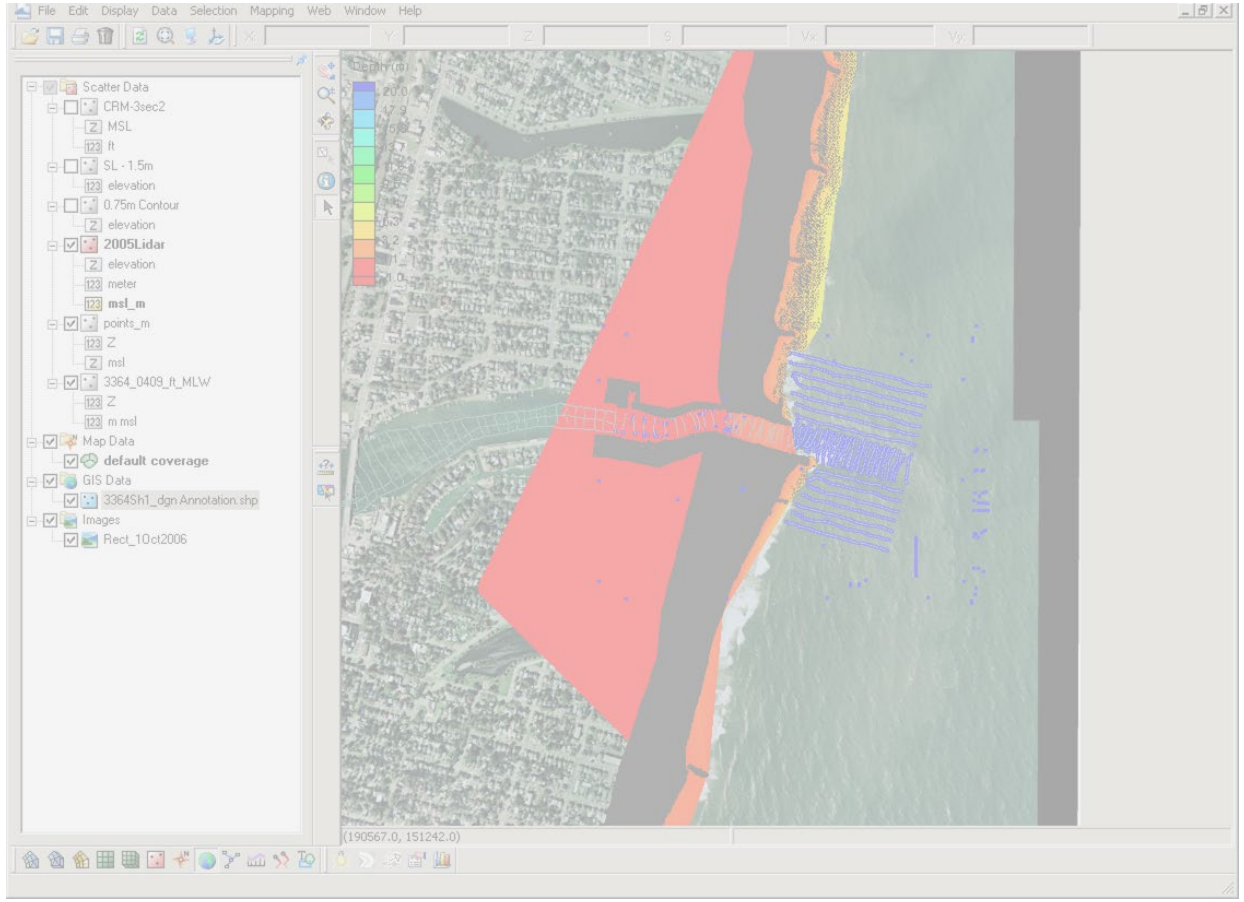
INTRODUCTION TO BATHYMETRIC DATABASES IN SMS

Introduction to working with bathymetric datasets

– *Importing Datasets (xyz, points, shapefiles, other ascii)*

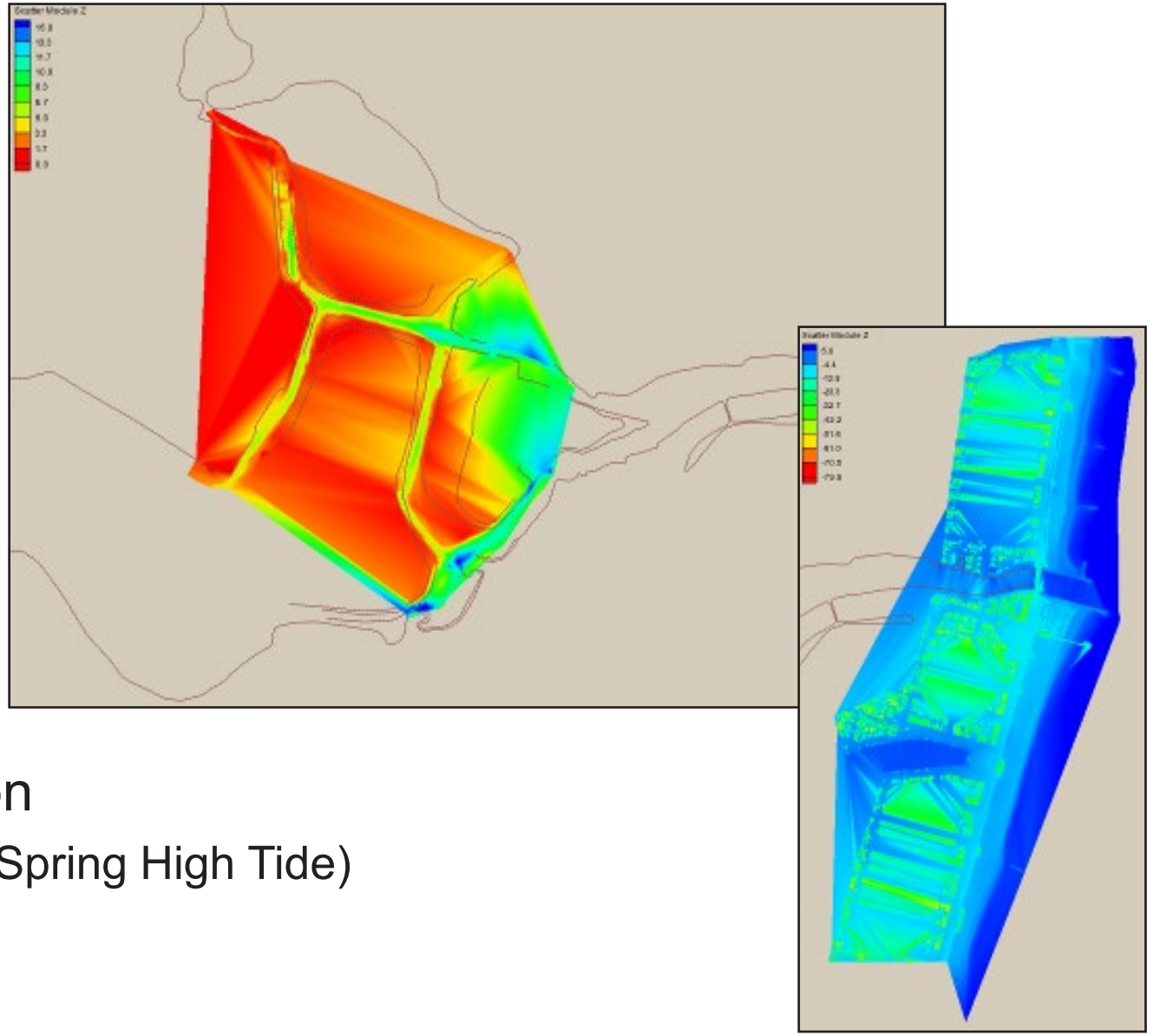
Datum Conversion

– *SMS conversion (Corpscon; Global Mapper)*



Multiple Bathymetric Datasets

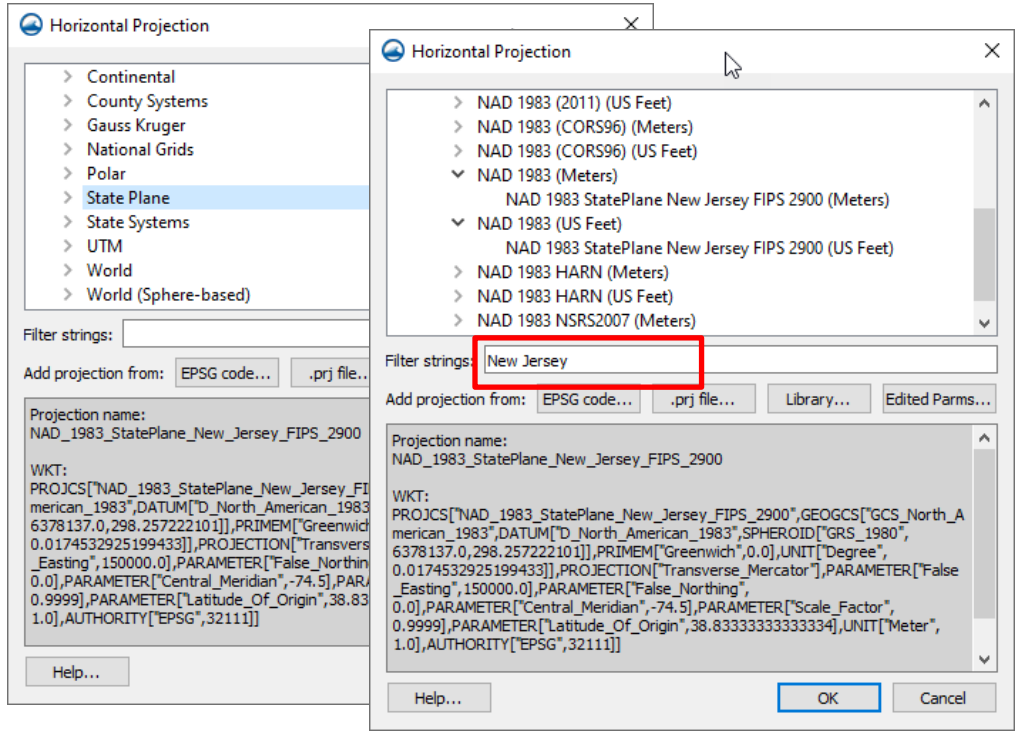
- Limited bay bathymetry
- NOAA – Offshore datasets
- LIDAR – Shoreline and nearshore (important for structure resolution)
- Channel
  - NJ State maintains north channel and north bay channel
  - Federally maintained entrance and south channel (15 years)
- NAN-supported field data collection
  - Included bathymetry of the backbay (Spring High Tide)

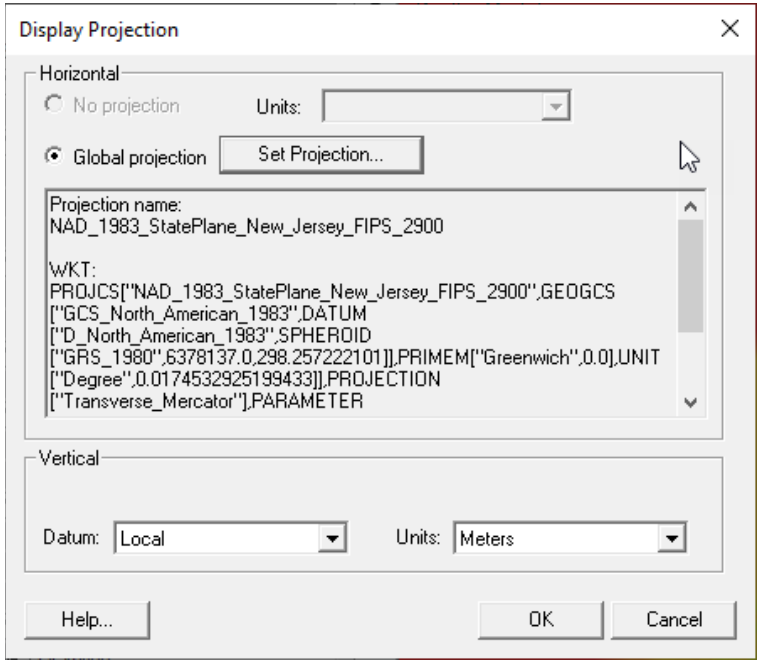


Common Spatial Reference Datum & Vertical Datum

Horizontal Projection & Datum: Pick a system in metric units that is planar (UTM; State Plane)

Vertical Projection & Datum: Must be in metric as well; Datum is not necessary (Local)



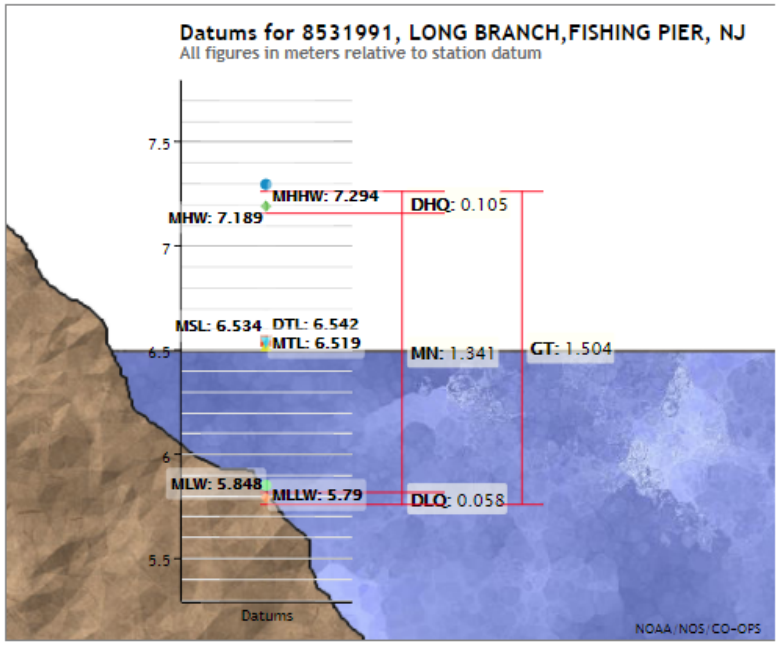


…Need to convert all bathymetric data

Elevations on Station Datum

Station: 8531991, LONG BRANCH,FISHING PIER, NJ
T.M.: 75
Epoch: 1983-2001
Status: Accepted (Apr 17 2003)
Datum: STND
Units: Meters

Datum	Value	Description
MHHW	7.294	Mean Higher-High Water
MHW	7.189	Mean High Water
MTL	6.519	Mean Tide Level
MSL	6.534	Mean Sea Level
DTL	6.542	Mean Diurnal Tide Level
MLW	5.848	Mean Low Water
MLLW	5.790	Mean Lower-Low Water
NAVD88	6.609	North American Vertical Datum of 1988
STND	0.000	Station Datum
GT	1.504	Great Diurnal Range
MN	1.341	Mean Range of Tide
DHQ	0.105	Mean Diurnal High Water Inequality
DLQ	0.058	Mean Diurnal Low Water Inequality
HWI	12.260	Greenwich High Water Interval (in hours)
LWI	6.040	Greenwich Low Water Interval (in hours)
Max Tide	8.269	Highest Observed Tide
Max Tide Date & Time	01/02/1987 09:12	Highest Observed Tide Date & Time
Min Tide	4.389	Lowest Observed Tide
Min Tide Date & Time	01/10/1978 21:00	Lowest Observed Tide Date & Time
HAT		Highest Astronomical Tide
HAT Date & Time		HAT Date and Time
LAT		Lowest Astronomical Tide



Showing datums for
8531991 LONG BRANCH,FI...

Data Units ○ Feet ◉ Meters

Epoch ◉ Present (1983-2001) ○ Superseded (1960-1978)

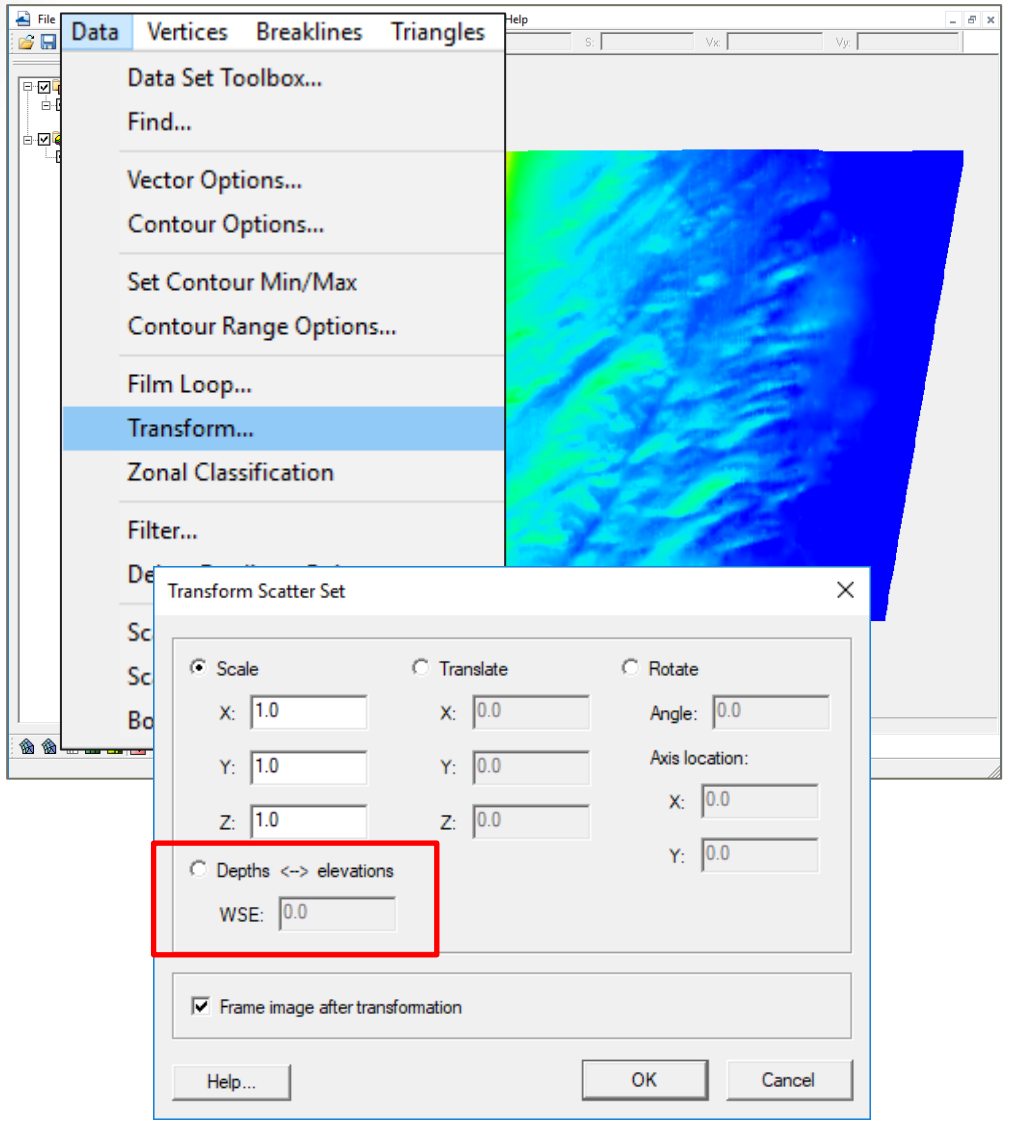
Submit

https://tidesandcurrents.noaa.gov/stations.html?type=Datums

Prep for the Coastal Modeling System

- Based on a Cartesian or Quadtree (telescoping) grid
  - Planar coordinate system
  - CMS Model computation is in metric and depths are positive from zero
    - SMS 13.1 and later works with elevations, but exports depths to CMS files
  - Grid is generated based on a single bathymetry stored in SMS scatterset or raster format
  - Vertical datum is not specified and is assumed local
    - The boundary condition forcing (tidal) must be in the same datum as the bathymetry
    - Typically modeling grids are brought to a mean datum such as mean sea level (msl) or mean tide level (mtl)
- → This requires that all imported datasets projections are defined, and final dataset uses a unified projection, datum, and units
  - Shark River Inlet bathymetry will be converted to State Plane horizontal coordinates in meters with the vertical datum set to MSL in meters

Converting Depths to Elevations (CMS Requirement)



When loading old projects, SMS 13.3 will generally change the sign of the depth dataset. This does not always work. Check the sign of the deep water.

Data → Transform

Can adjust scatterset data by scaling, translating (adding/subtracting), or rotating horizontal or vertical

Select Depths ←→ Elevations

Flips sign from depths to elevations (positive down to positive up).
Necessary for CMS model calculation.

NAN Channel Surveys

15 Year Record of Bathymetry

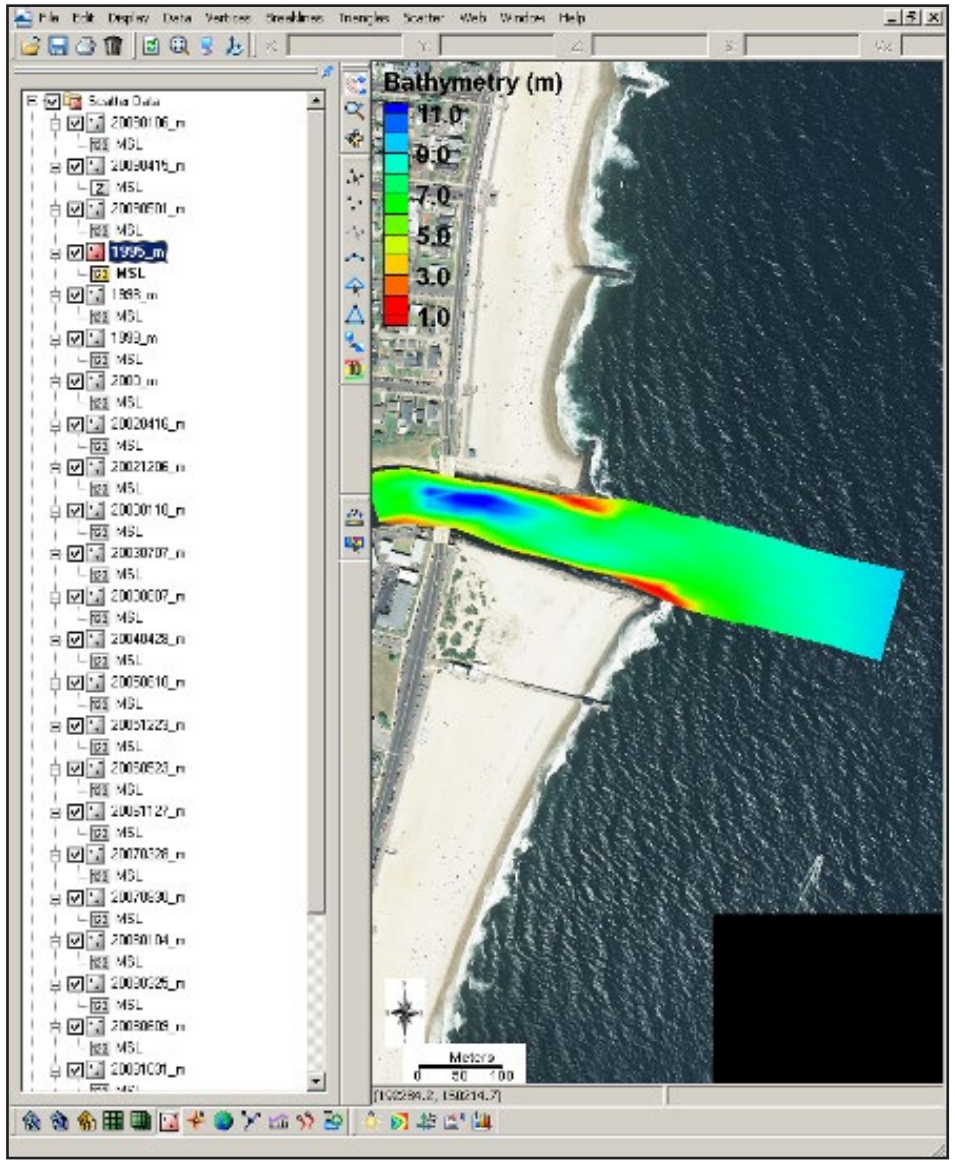
Date	Survey Type	Date	Survey Type
1-Jan-1995	Condition	28-Mar-2007	Condition
6-Jan-1998	Condition	30-Aug-2007	Before Dredge
6-May-1999	Condition	4-Jan-2008	After Dredge
11-Apr-2000	Condition	25-Mar-2008	Condition
16-Apr-2002	Condition	9-Jun-2008	After Dredge
6-Dec-2002	Before Dredge	31-Oct-2008	After Dredge
18-Jan-2003	After Dredge	8-Dec-2008	Before Dredge
7-Jul-2003	Condition	6-Jan-2009	After Dredge
7-Aug-2003	After Dredge	15-Apr-2009	Before Dredge
28-Apr-2004	Condition	1-May-2009	After Dredge
10-Jun-2005	Condition	20-Aug-2009	Before Dredge
23-Dec-2005	After Dredge	10-Dec-2009	After Dredge
23-May-2006	Condition	6-Jan-2010	After Dredge
27-Nov-2006	Condition		

Horizontal Datum:

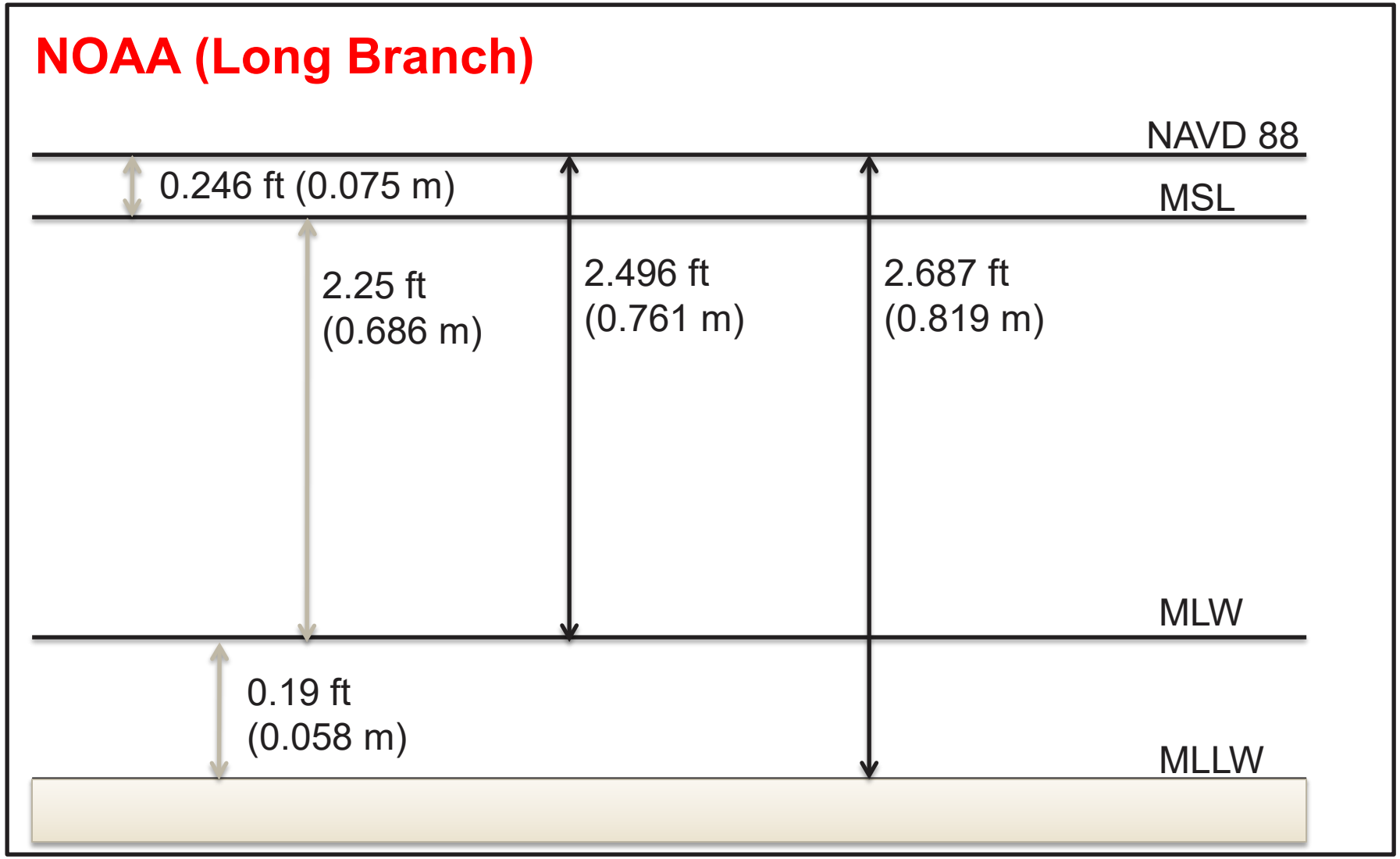
State Plane NAD27 New Jersey 2900 (ft)

Vertical Datum:

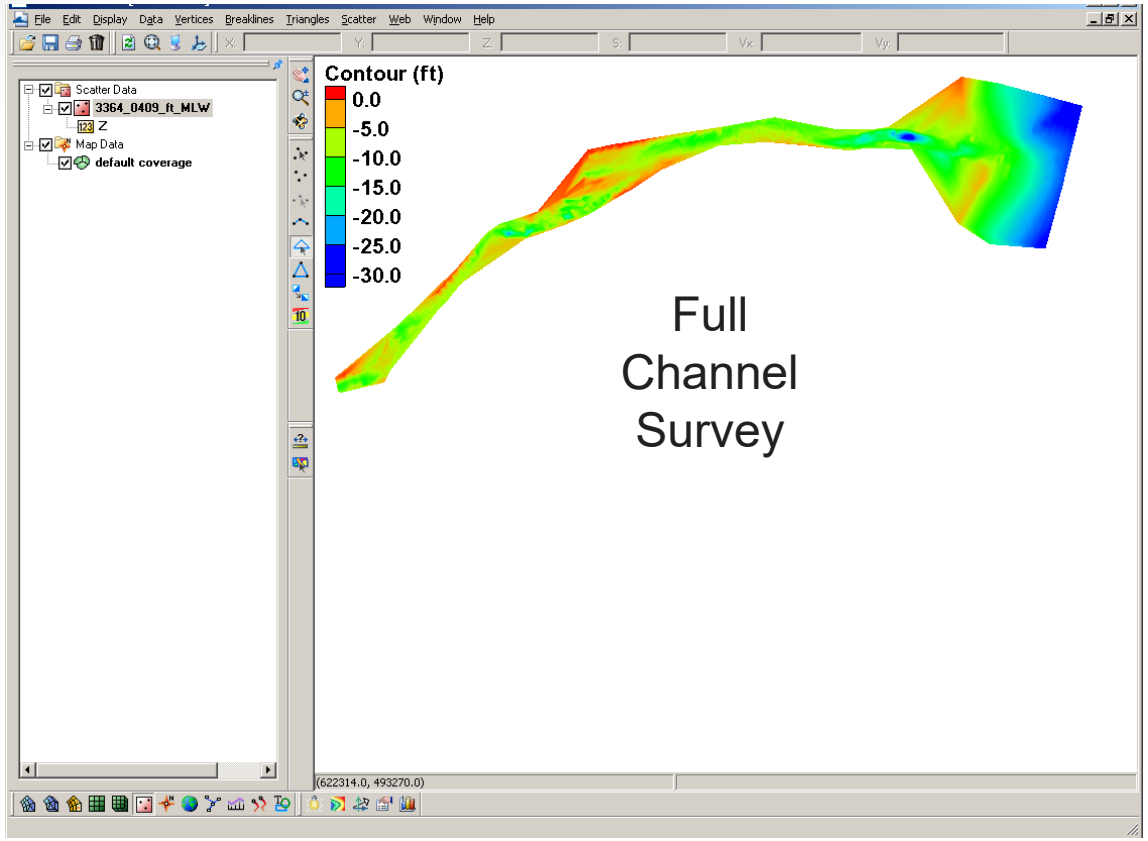
MLW (ft) – COE Datum (not local NOAA benchmark)



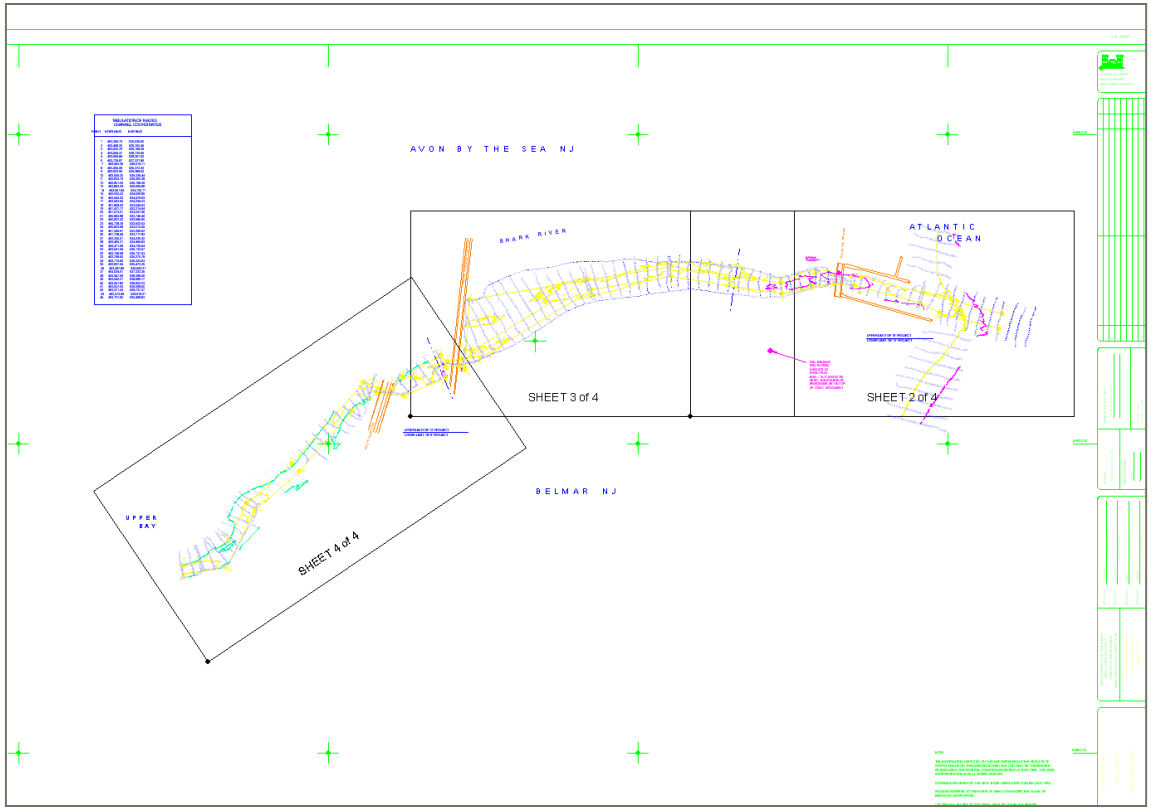
Vertical Datum Relationships



NAN Channel Surveys Extended into Bay



MLW → MSL
2.25 ft (0.686 m)



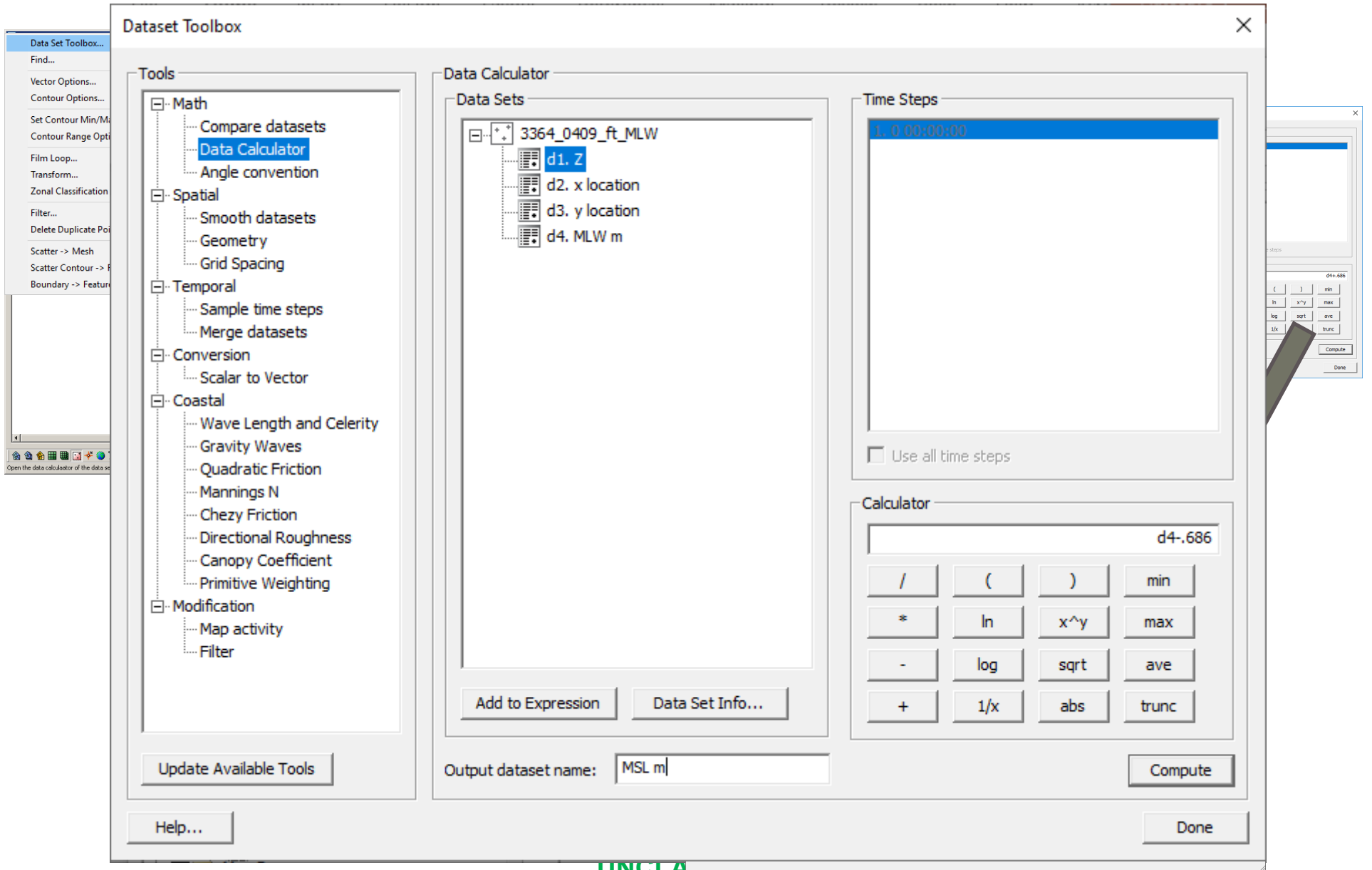
Horizontal Datum:

State Plane NAD27 New Jersey 2900 (ft)

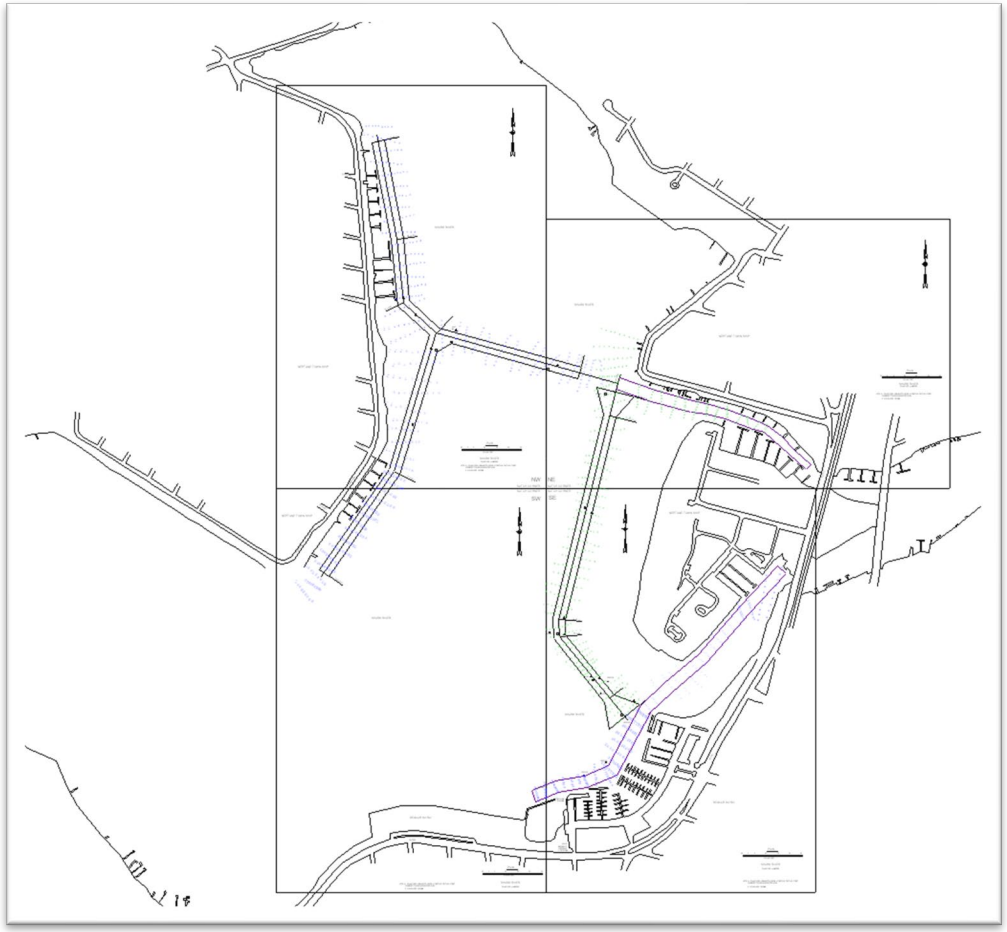
Vertical Datum:

MLW (ft)

Dataset Toolbox | Data Calculator

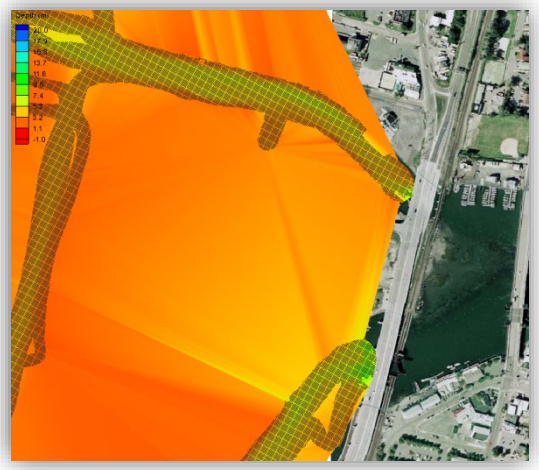


NJ DEP Channel Surveys



XYZ pulled out of drawing and changed to ASCII format

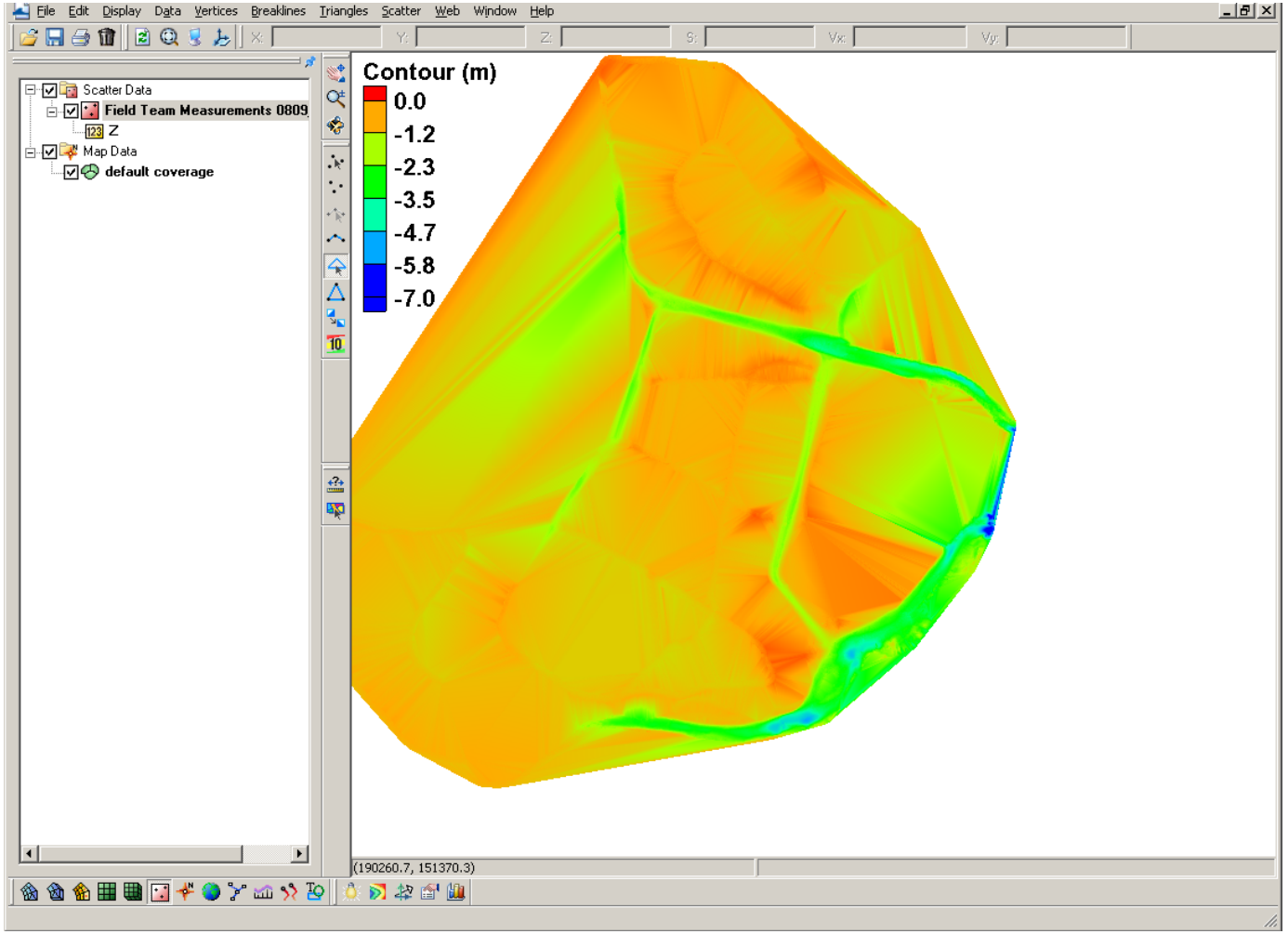
June 2009 Survey



Provided conversion from local datum to MSL:

MLW → MSL
2.25 ft (0.686 m)

Field Data Collection – Multibeam Bay Bathymetry (August 2009)



Horizontal Datum:

State Plane NAD83
New Jersey 2900 (m)

Vertical Datum:

NAVD88 (m)

LIDAR

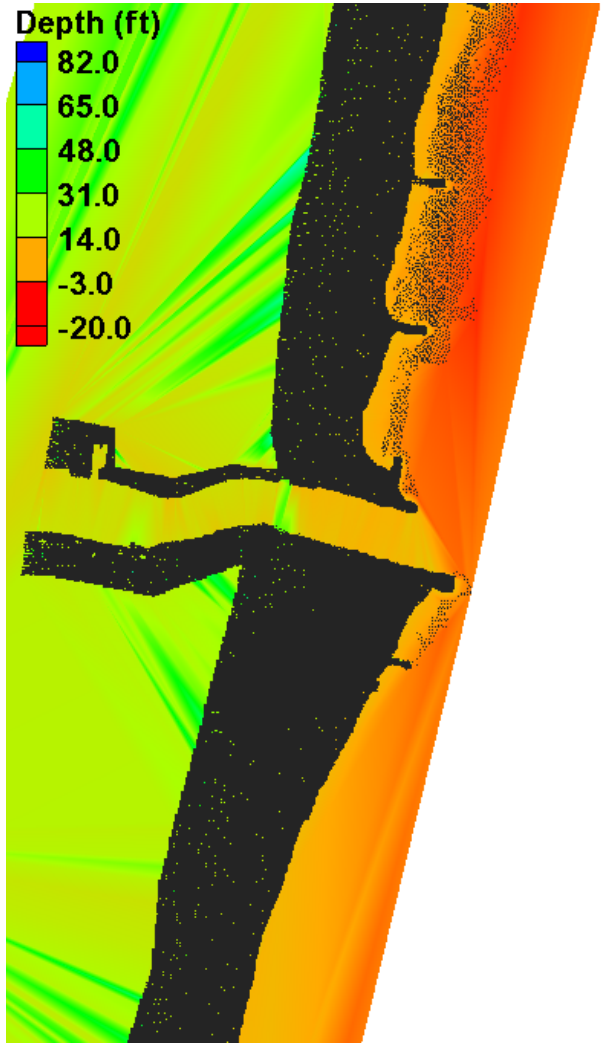
- Files are emailed in separate sections from the NOAA CSC Archive
  - Typically, several to 10s of files that are 5 - 100 mb in size
- Compiling takes time
  - Points have been sampled/filtered and cropped to area of interest

Horizontal Datum:

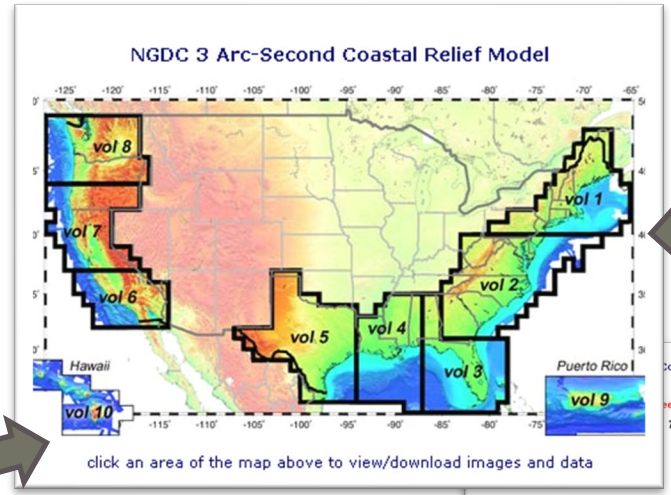
State Plane NAD83 New Jersey 2900 (ft)

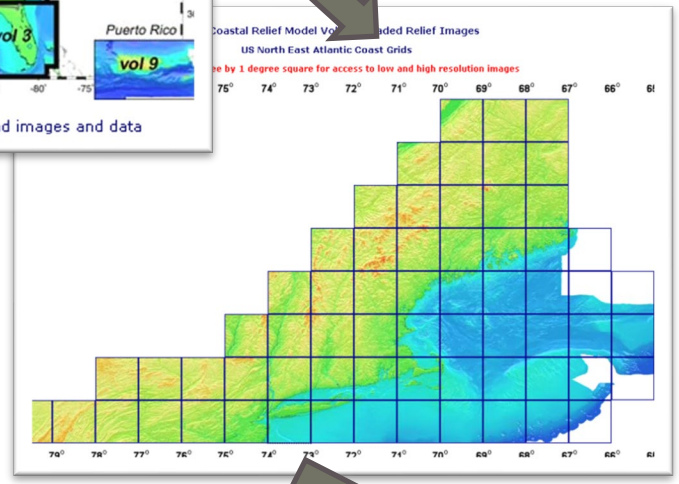
Vertical Datum:

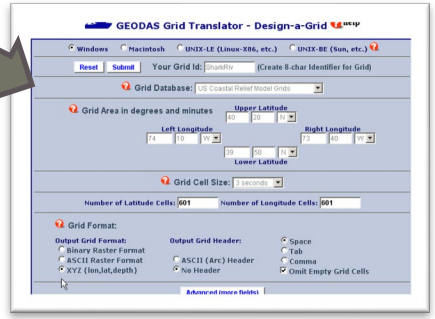
NAVD88 (ft)



Coastal Relief Model (DTM/DEM)

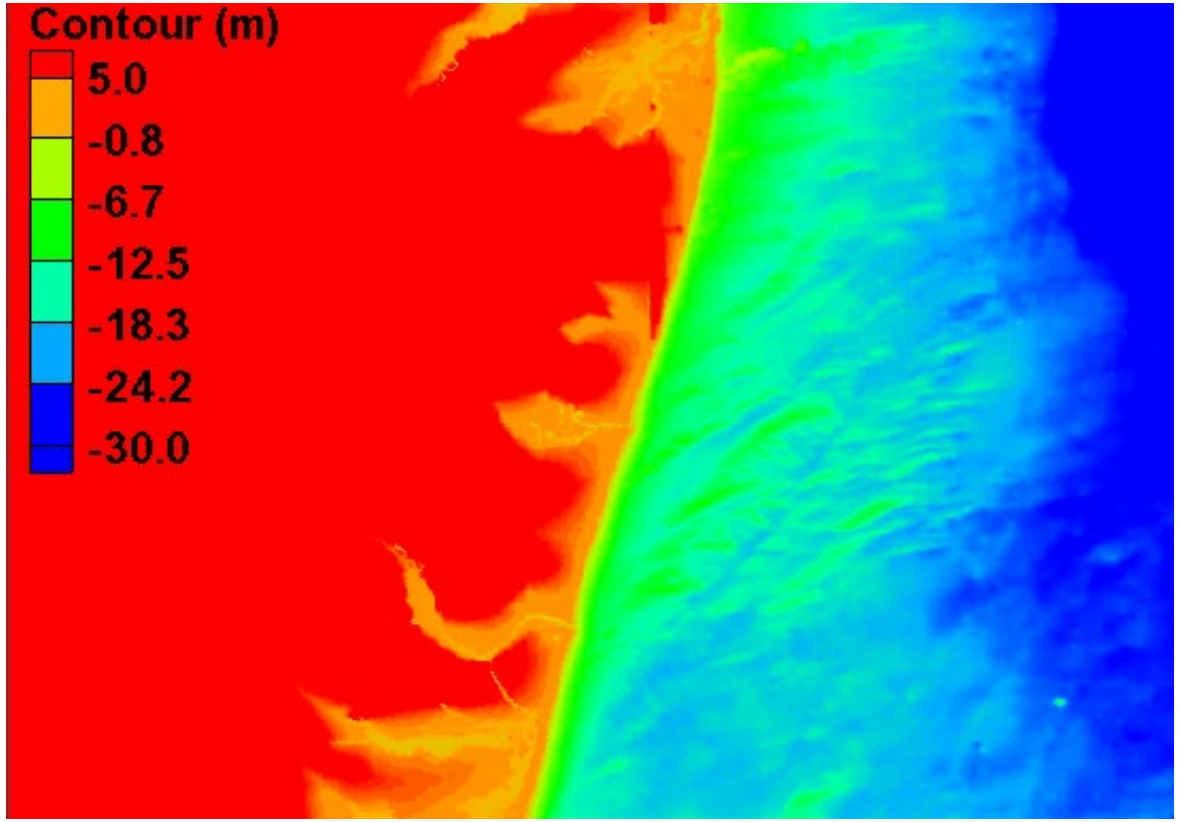






Generate a 3-sec
(1 pt per 3rd second) grid

Coastal Relief Model



Horizontal Datum:

Geographic NAD83

Vertical Datum:

MSL (m) - Not accurate for shallow bathymetry (used for offshore)

Extra Bathymetry

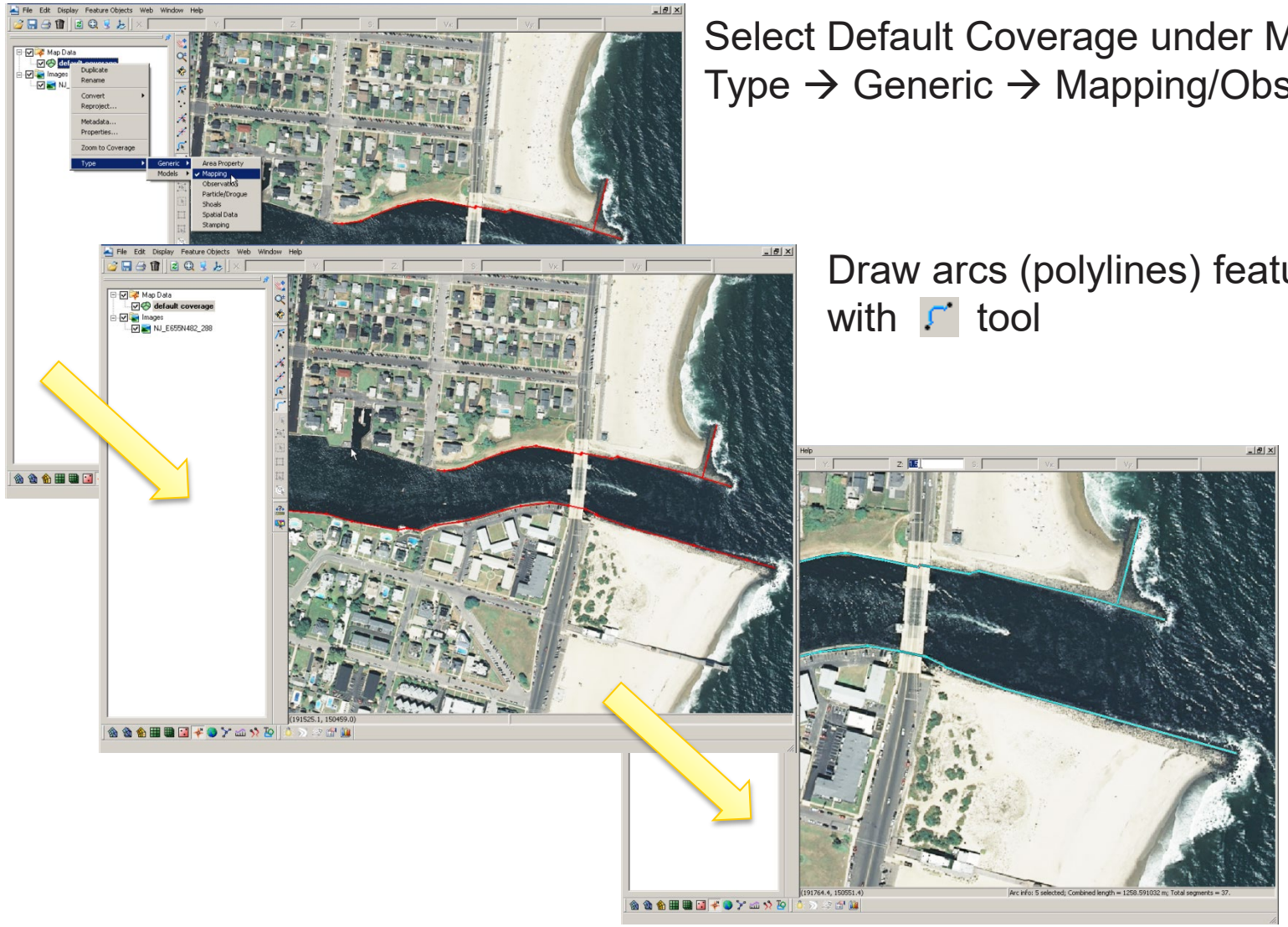
- Convert shoreline shapefile in SMS

Horizontal Datum:

State Plane NAD83
New Jersey 2900 (ft)

- Added extra bay contour (set to 0.75 m above MSL)

Create a Contour Polyline in the Map Module

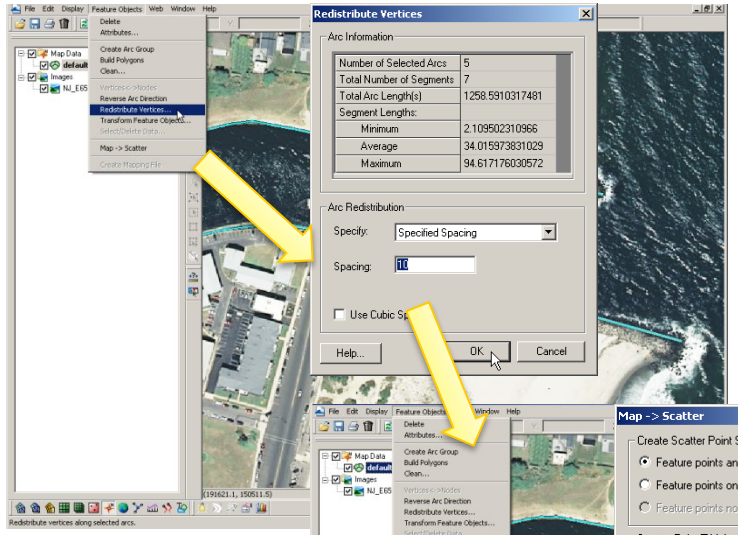


Select Default Coverage under Map Data
Type → Generic → Mapping/Observation/Shoals

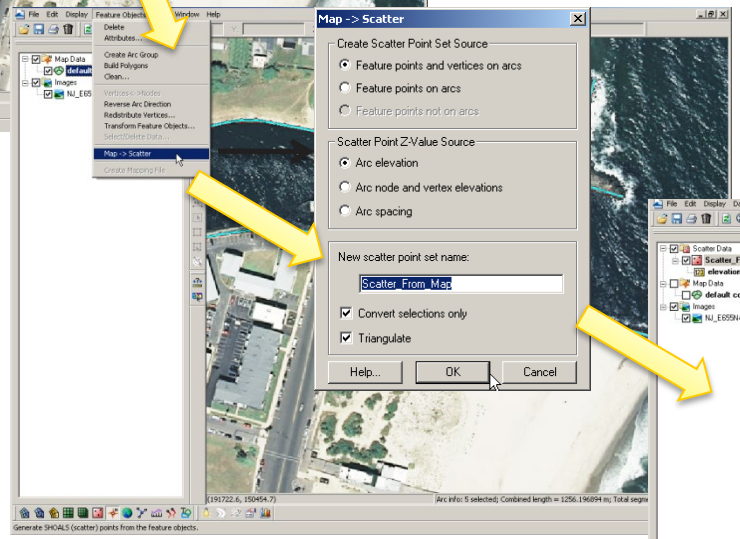
Draw arcs (polylines) feature with tool

Select arcs  and convert the z elevation to the desired contour elevation

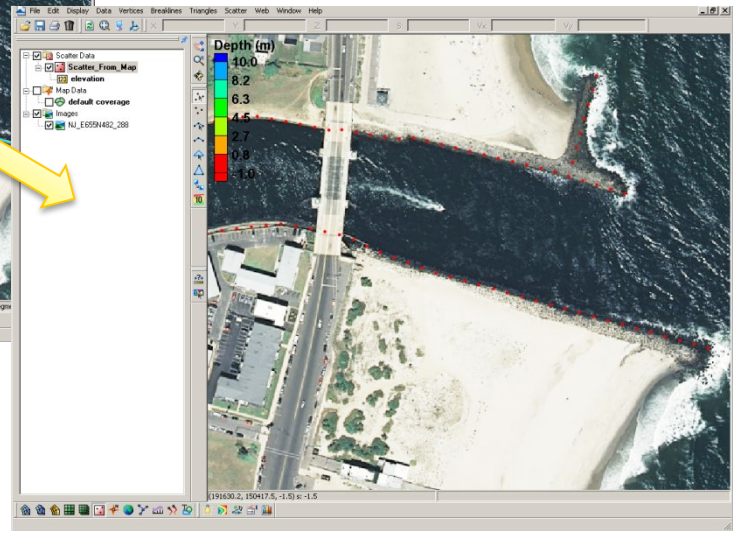
Create Scatterset Points from Map Data



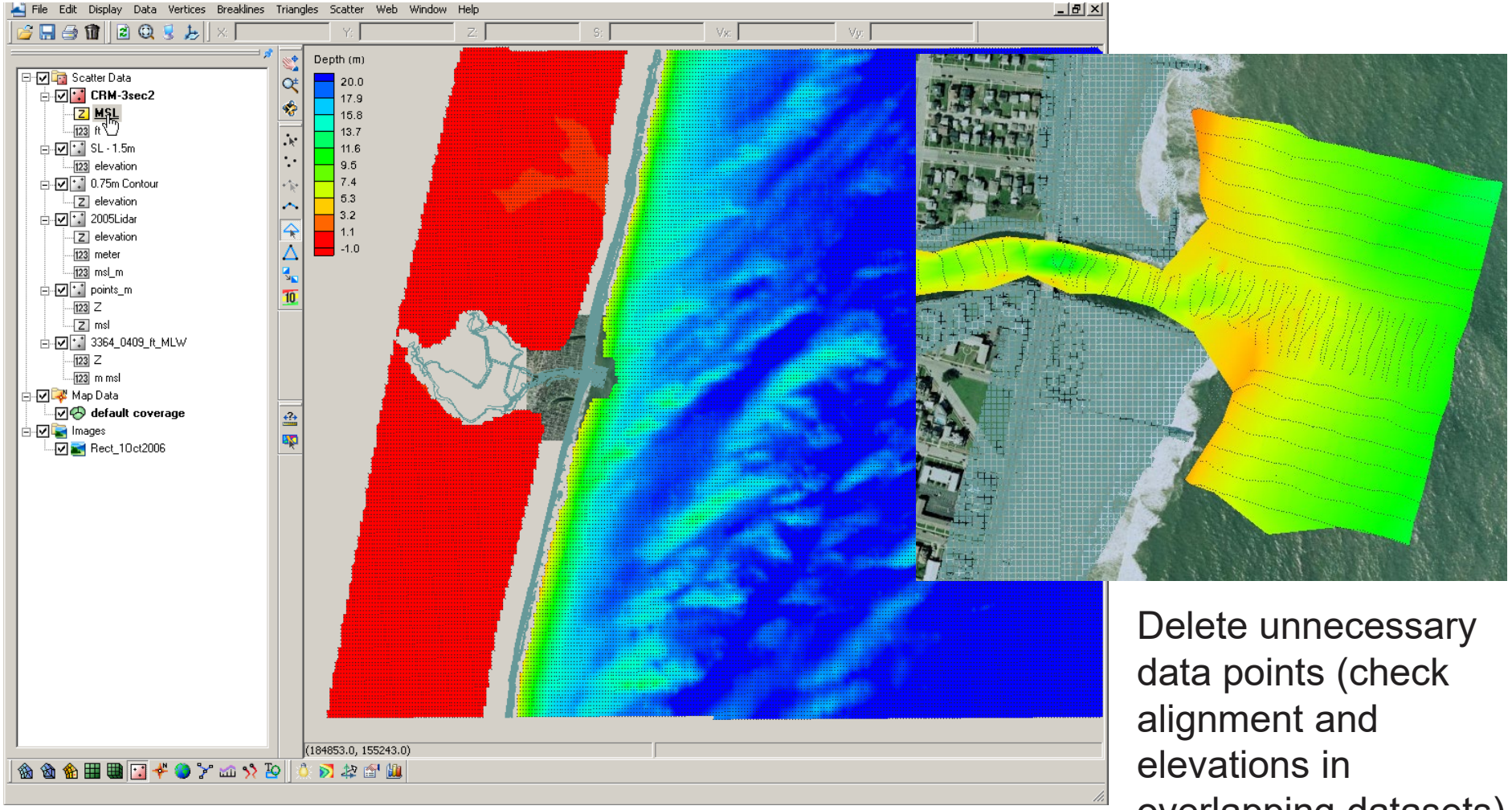
Select arcs to redistribute the spacing of vertices
Feature Objects → Redistribute Vertices
Specify Spacing based on horizontal coordinate system units (metric in this case)



Feature Objects → Map>Scatter
Include Feature Pts and vertices and the Arc Elevations



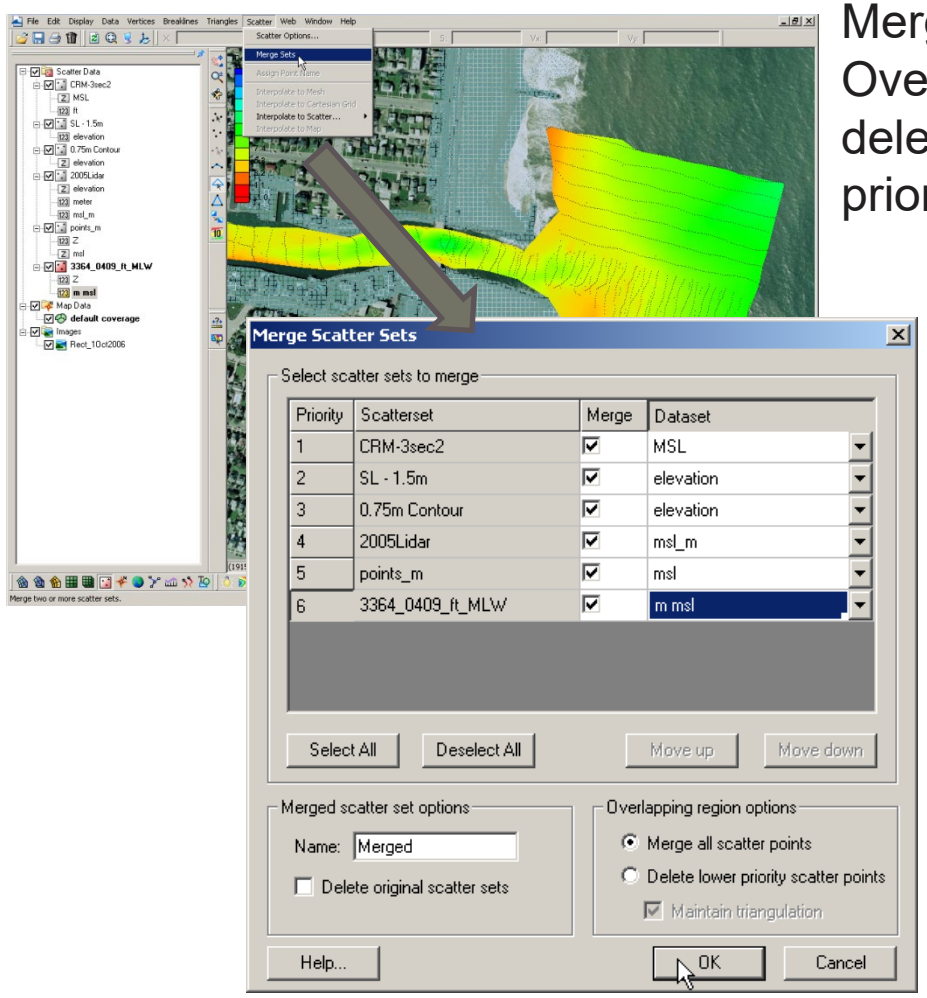
All Files Referenced to Same Horizontal and Vertical Datum



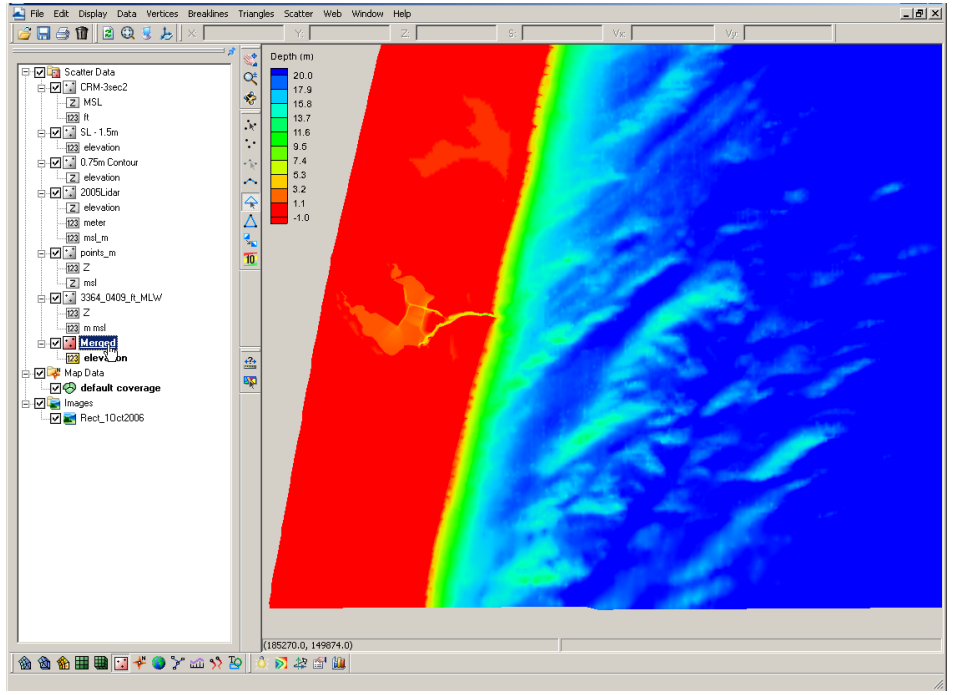
Delete unnecessary data points (check alignment and elevations in overlapping datasets)

Merging Scattersets

Merging all scattersets will integrate all points. Overlapping areas of scattersets should either be deleted or use a separate method of merging (by prioritizing using triangles).



Select the dataset



QUESTIONS?

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