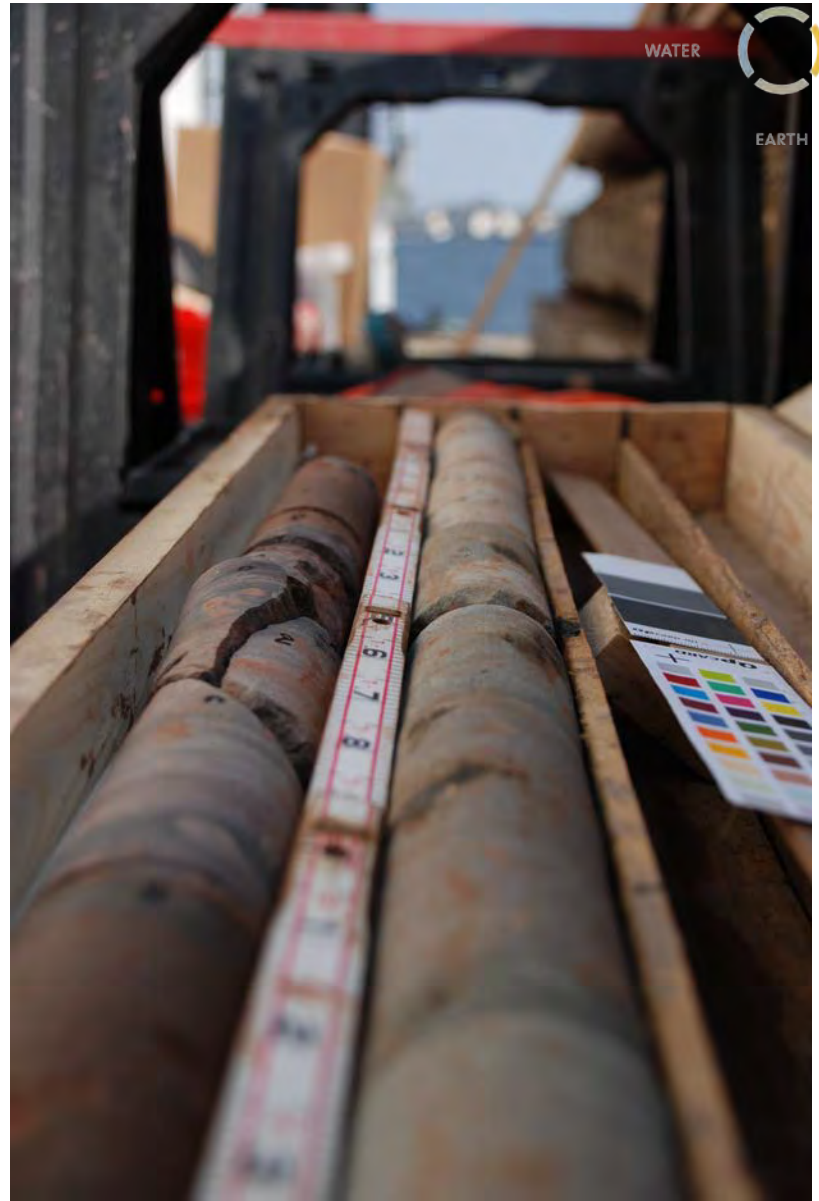
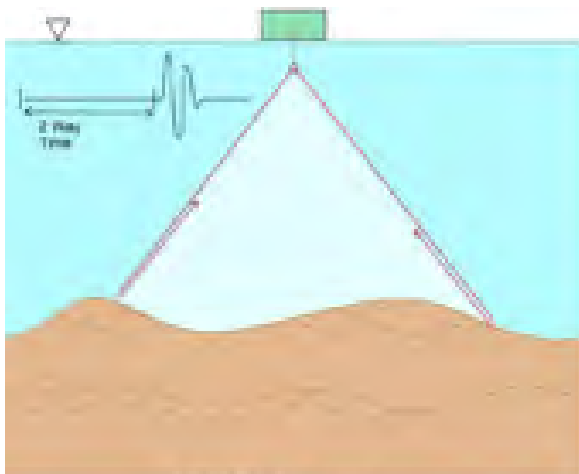


# Estimation of Dredgeability from High-Resolution Marine Reflection Seismic

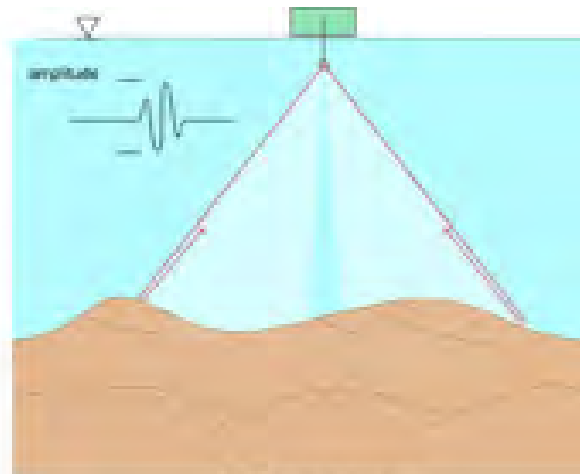
D.A. Rosales Roche, W.F. Murphy III, W.B. Ward, M.B. Art, , J.R. Trotta, A.B. Boyd, L.M. Stewart, C.K. Murphy, W.F. Murphy IV, I.M. Nesbitt, D. C. Herron, L.R. Friedlander



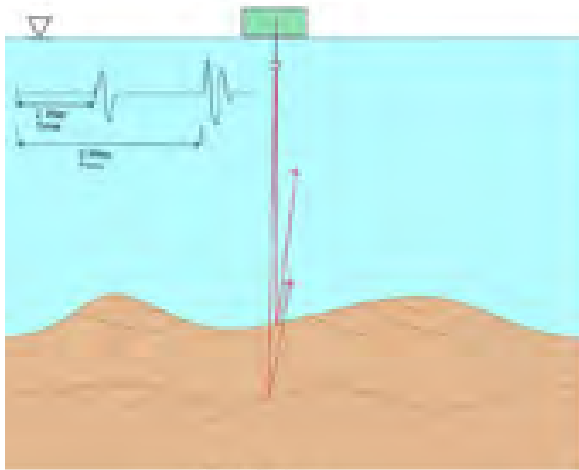




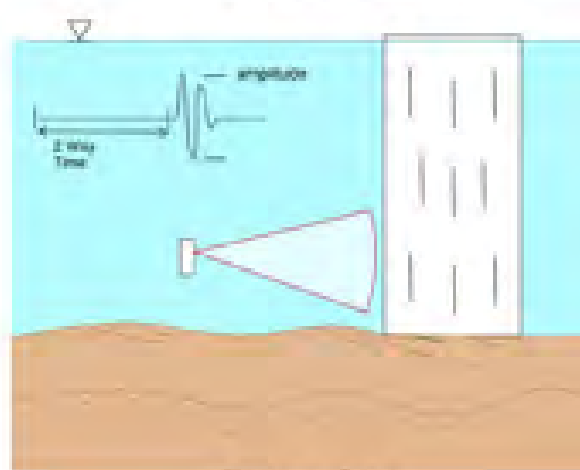
Multibeam sonar



Side-scan sonar

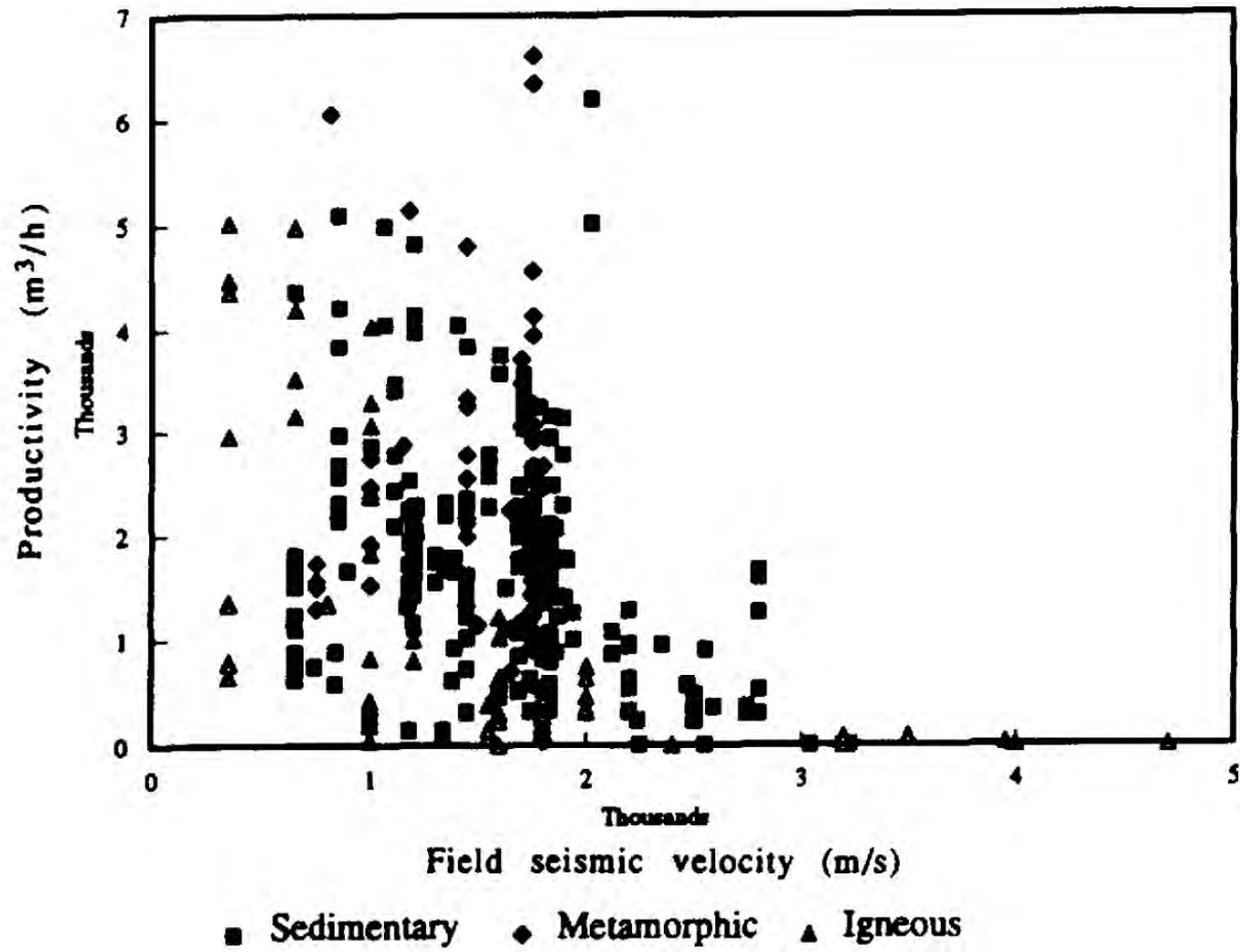


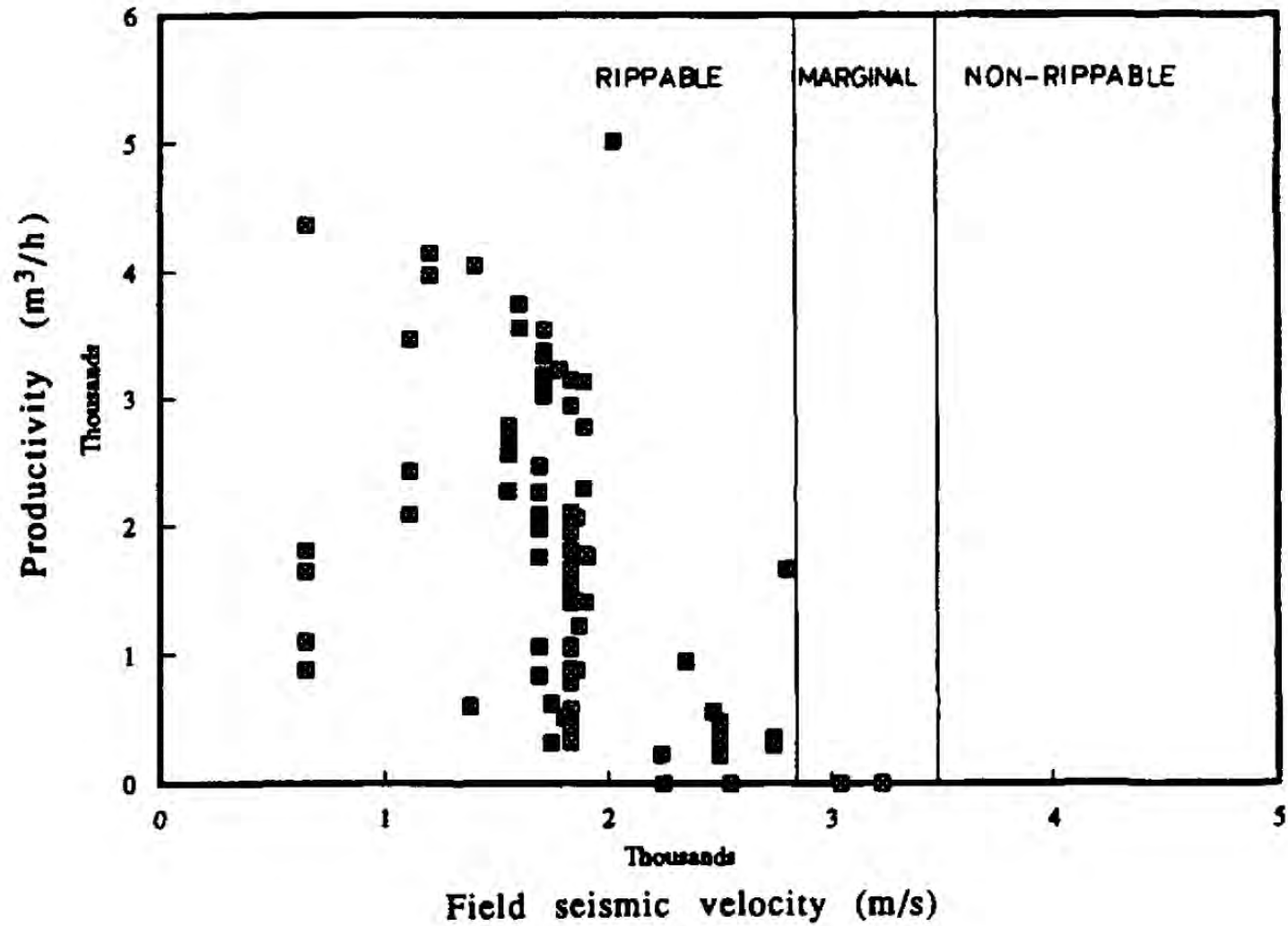
Sub bottom



Sector scanning





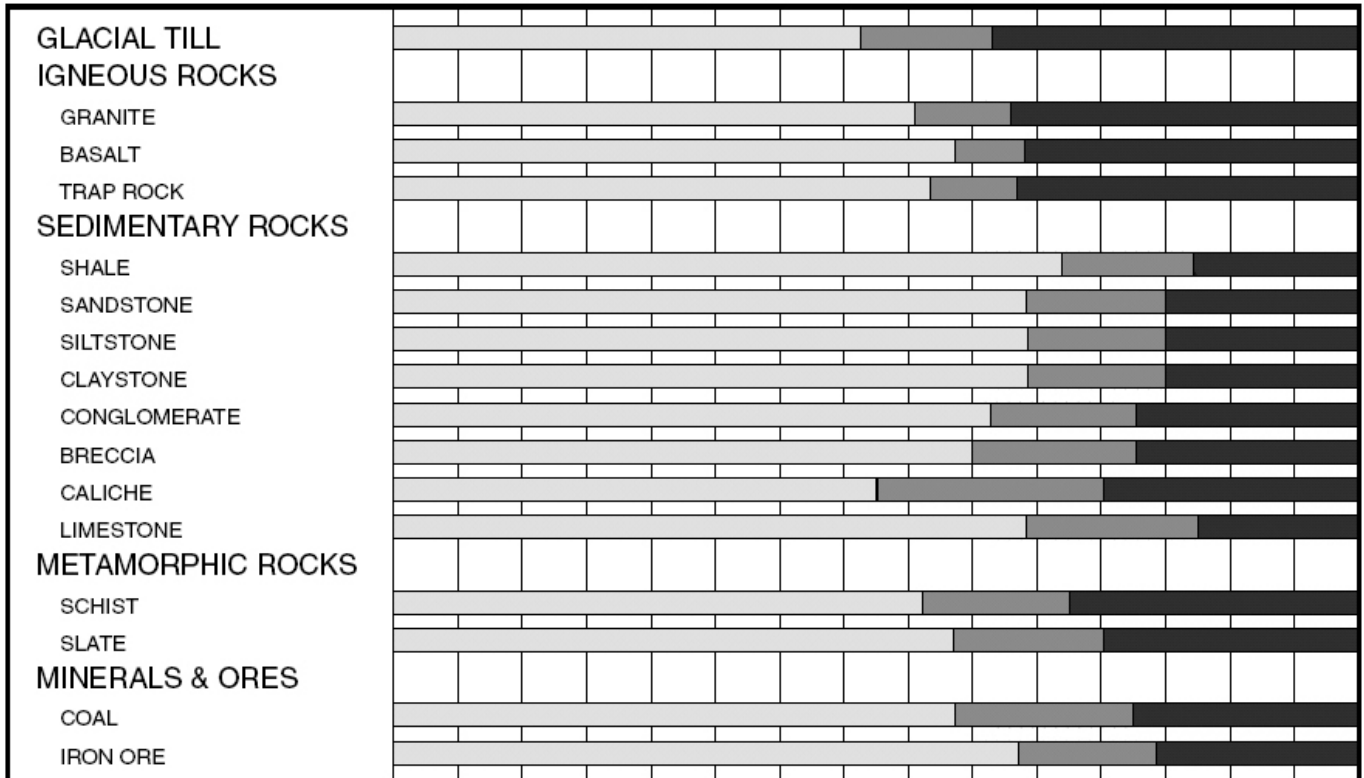
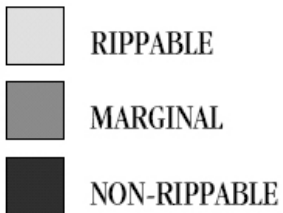
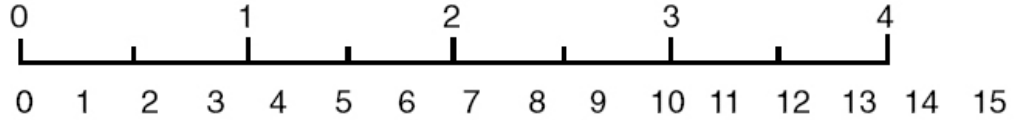


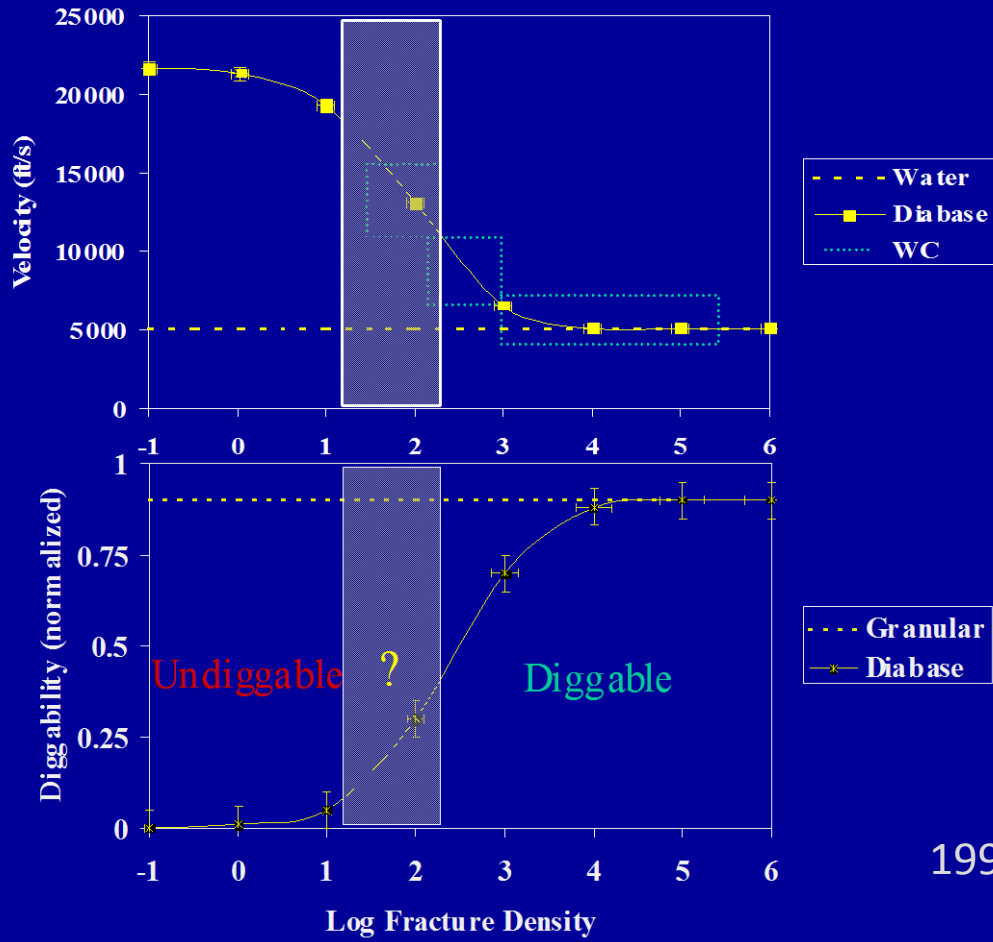
# D11R Ripper Performance

- Multi or Single Shank Ripper
- Estimated by Seismic Wave Velocities

## Seismic Velocity

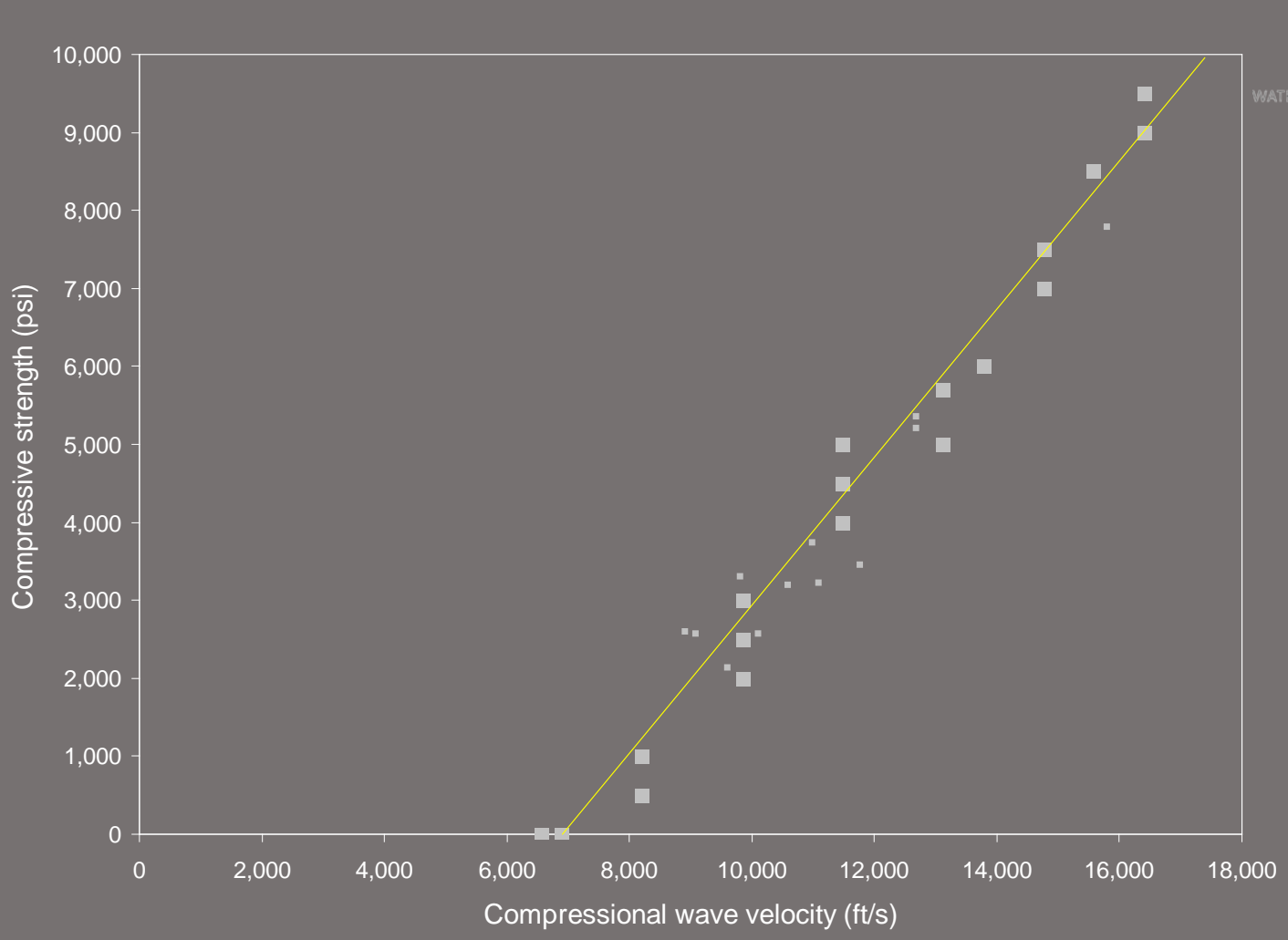
Meters Per Second x 1000  
 Feet Per Second x 1000



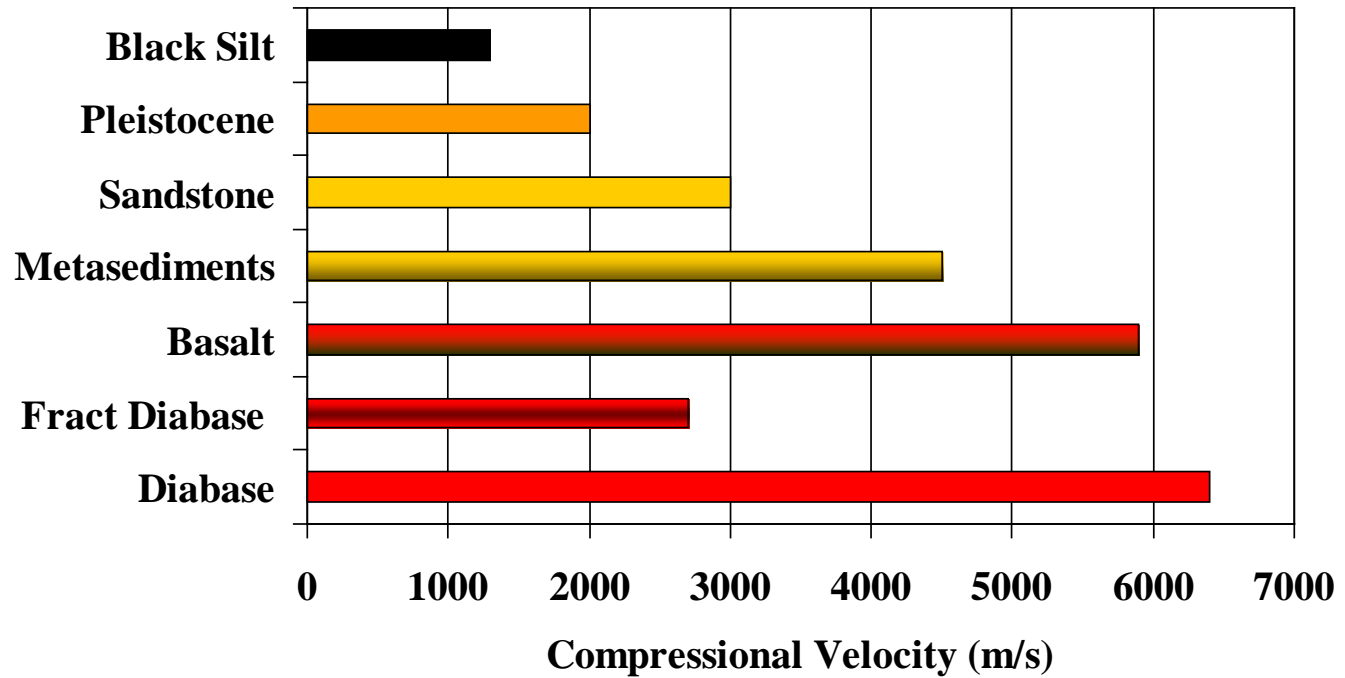


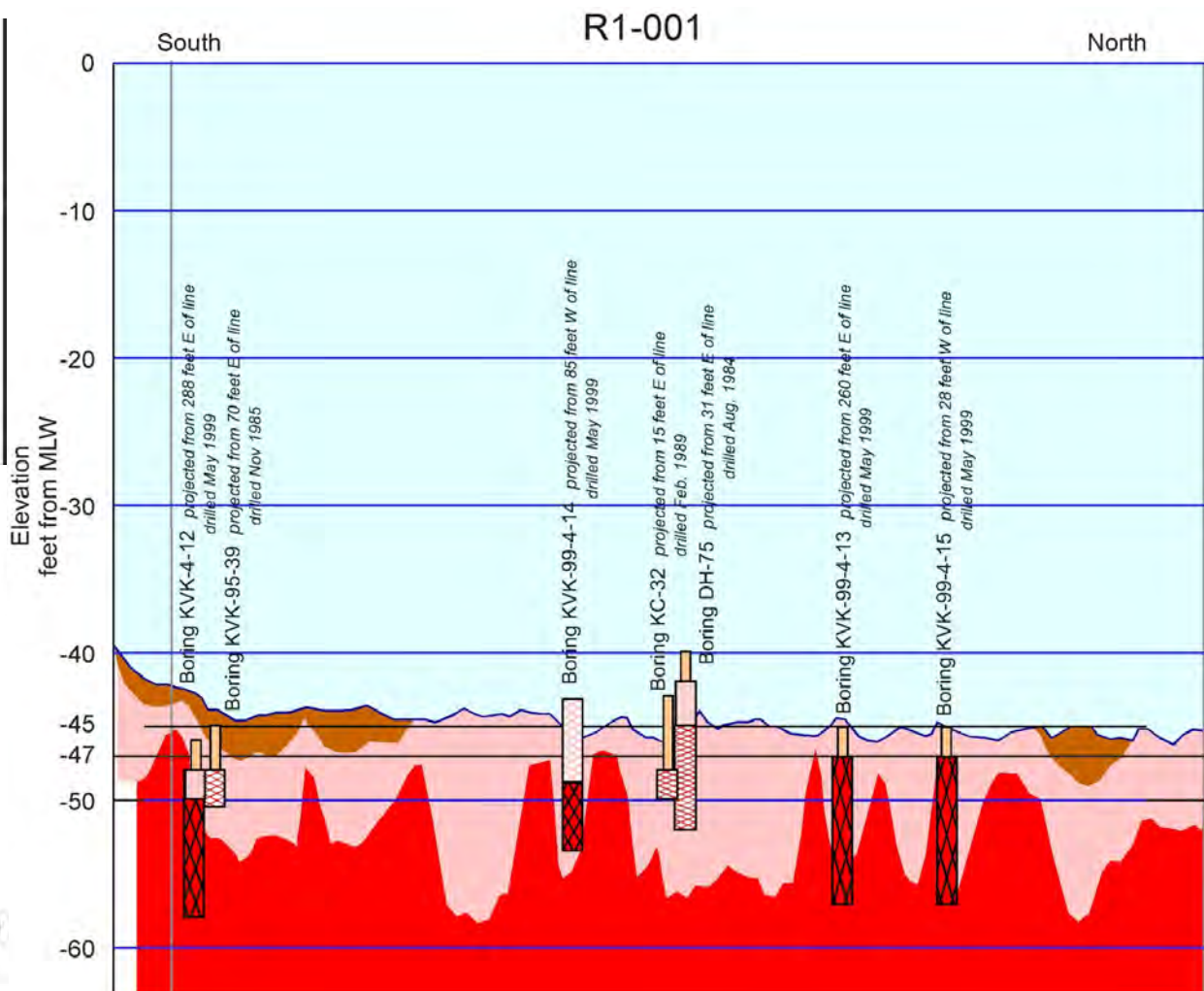
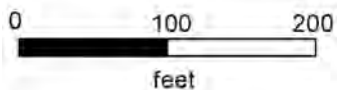
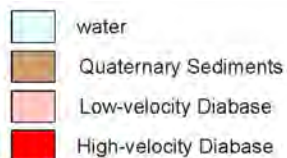
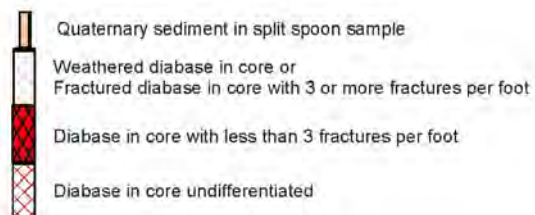
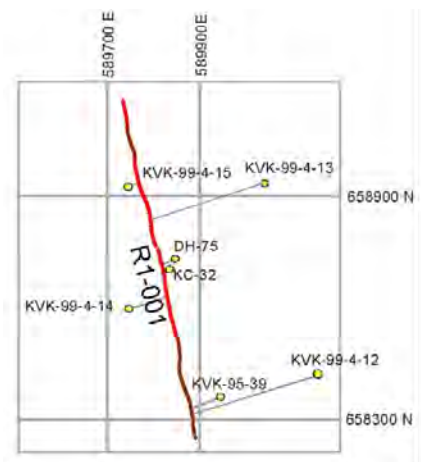
1998-1999





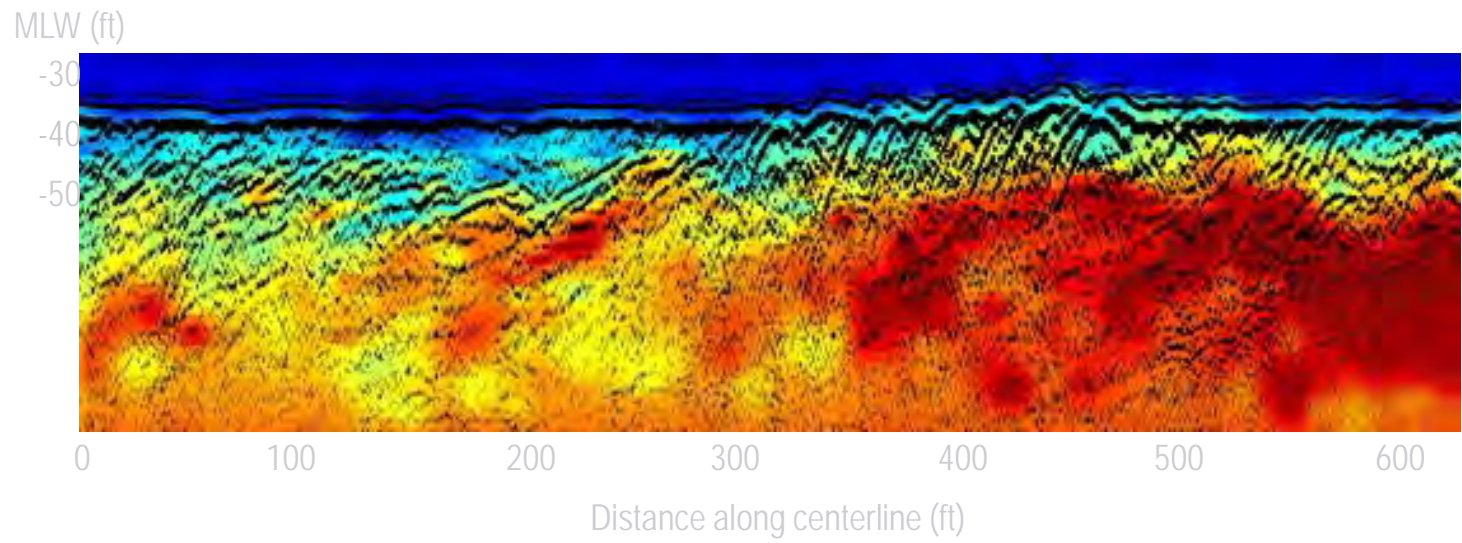
# Materials



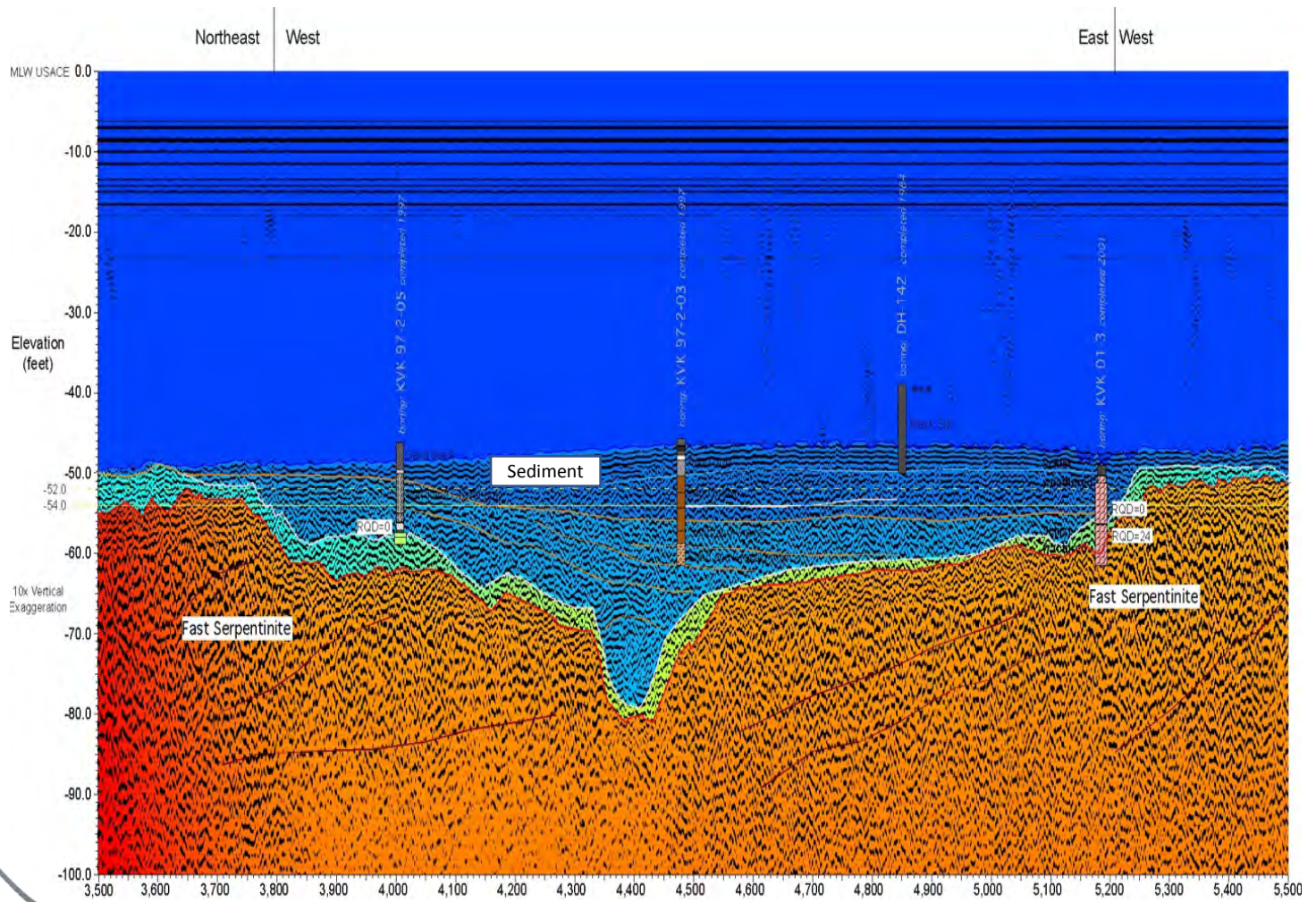




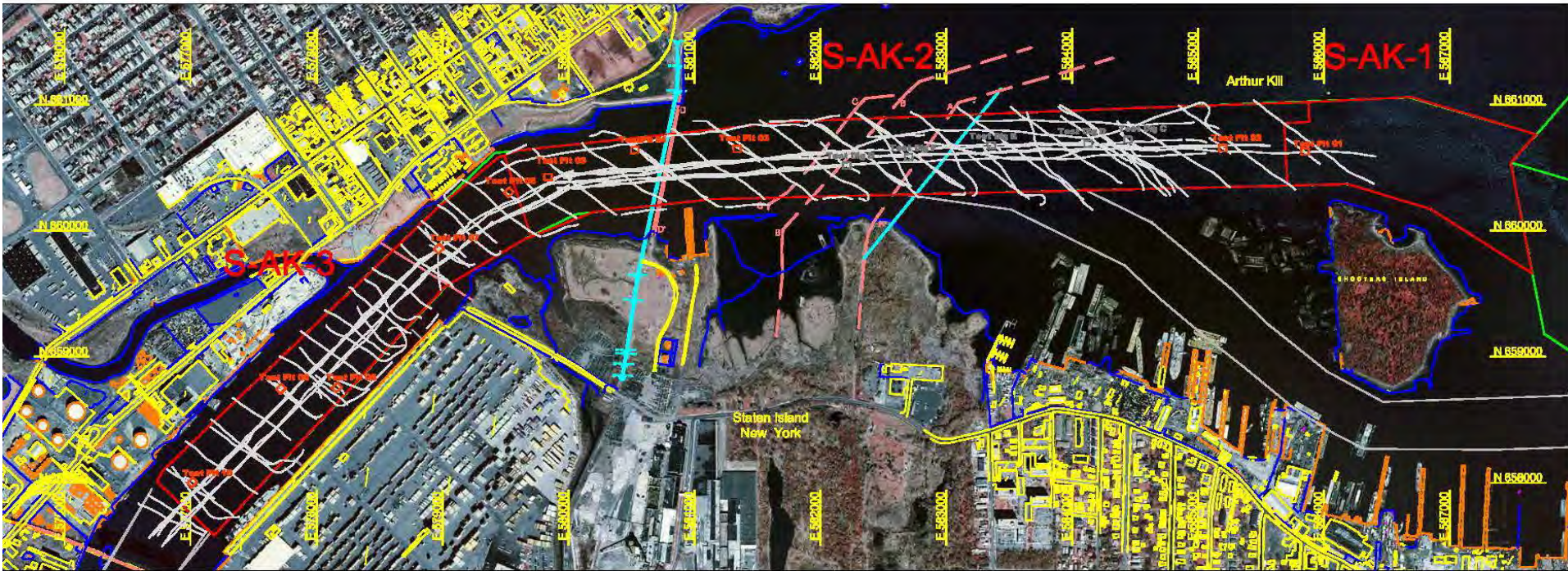
## New York Harbor



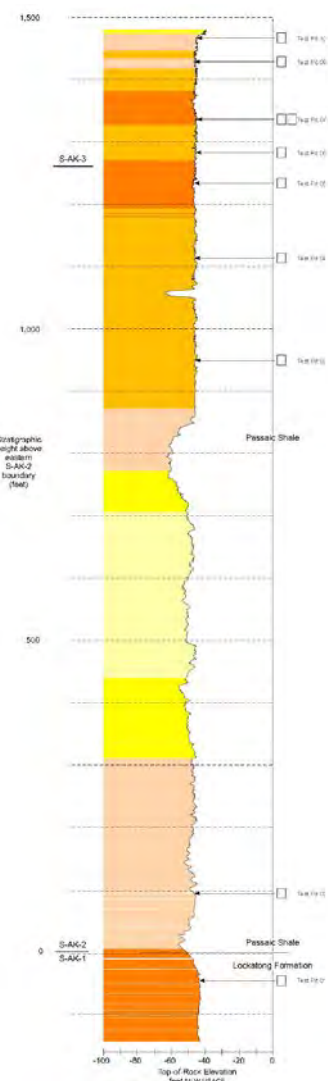
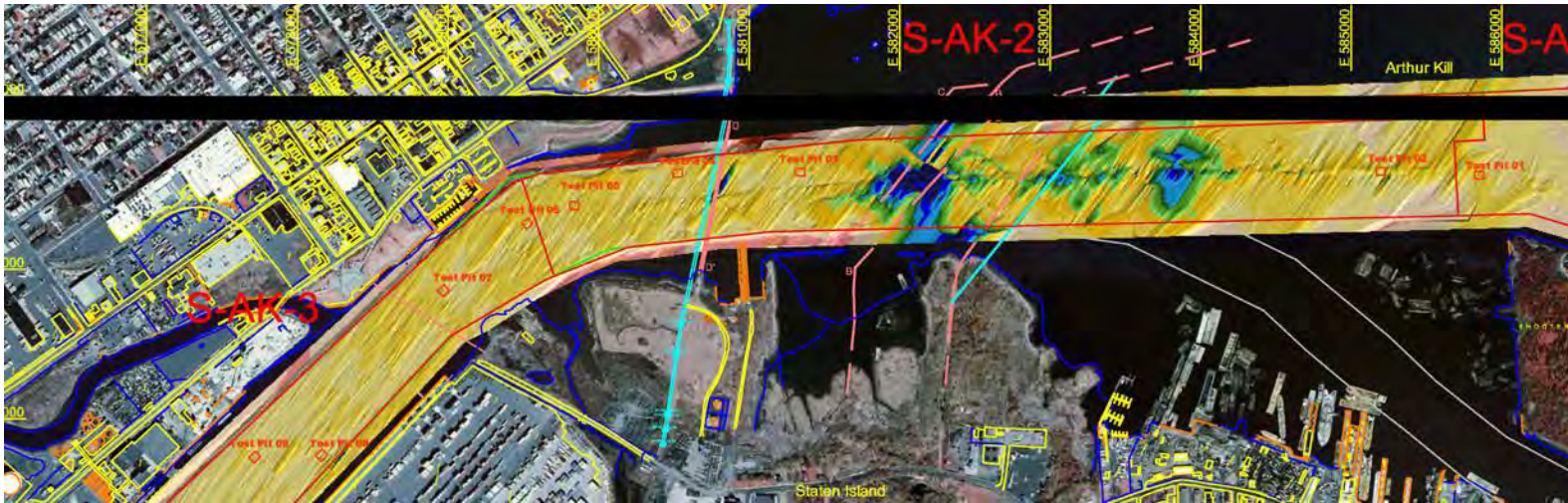






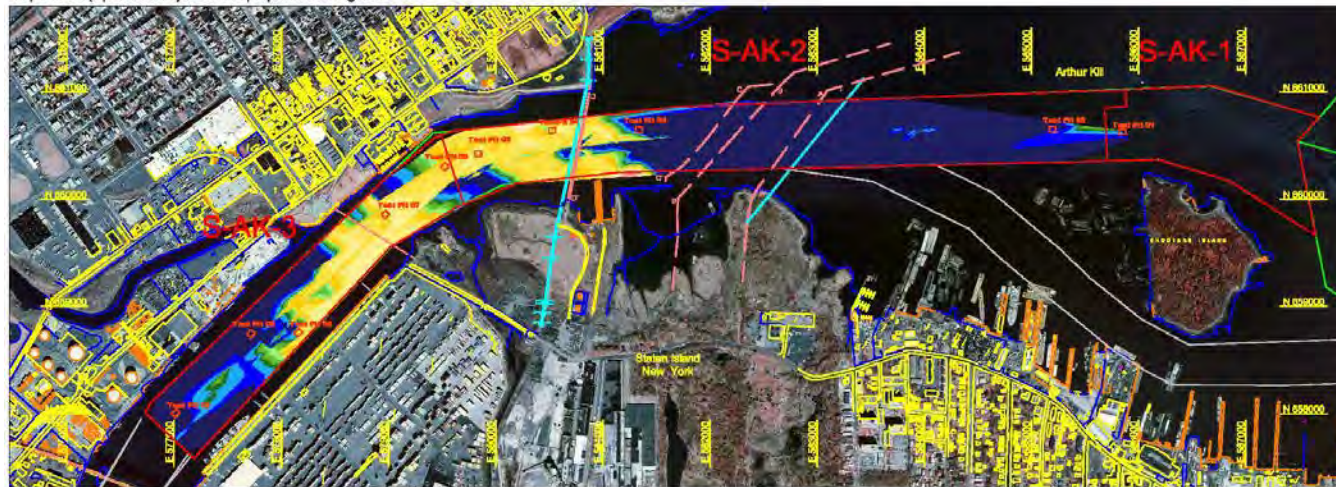




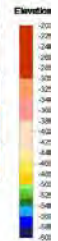
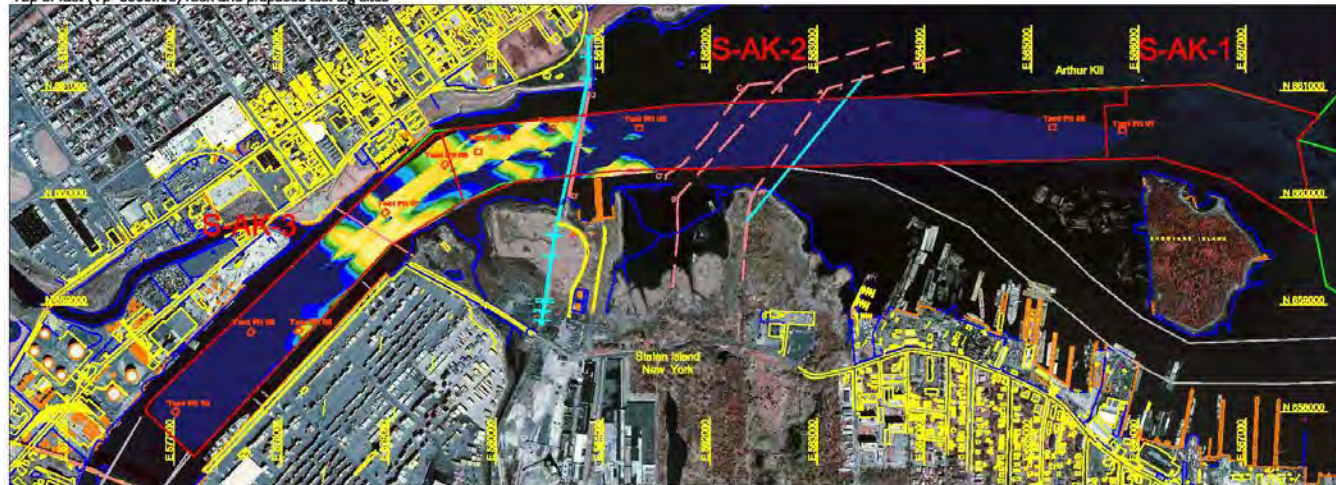




Top of fast ( $V_p > 2800\text{m/s}$ ) rock and proposed test dig sites



Top of fast ( $V_p > 3000\text{m/s}$ ) rock and proposed test dig sites





Jamaica, W.I.

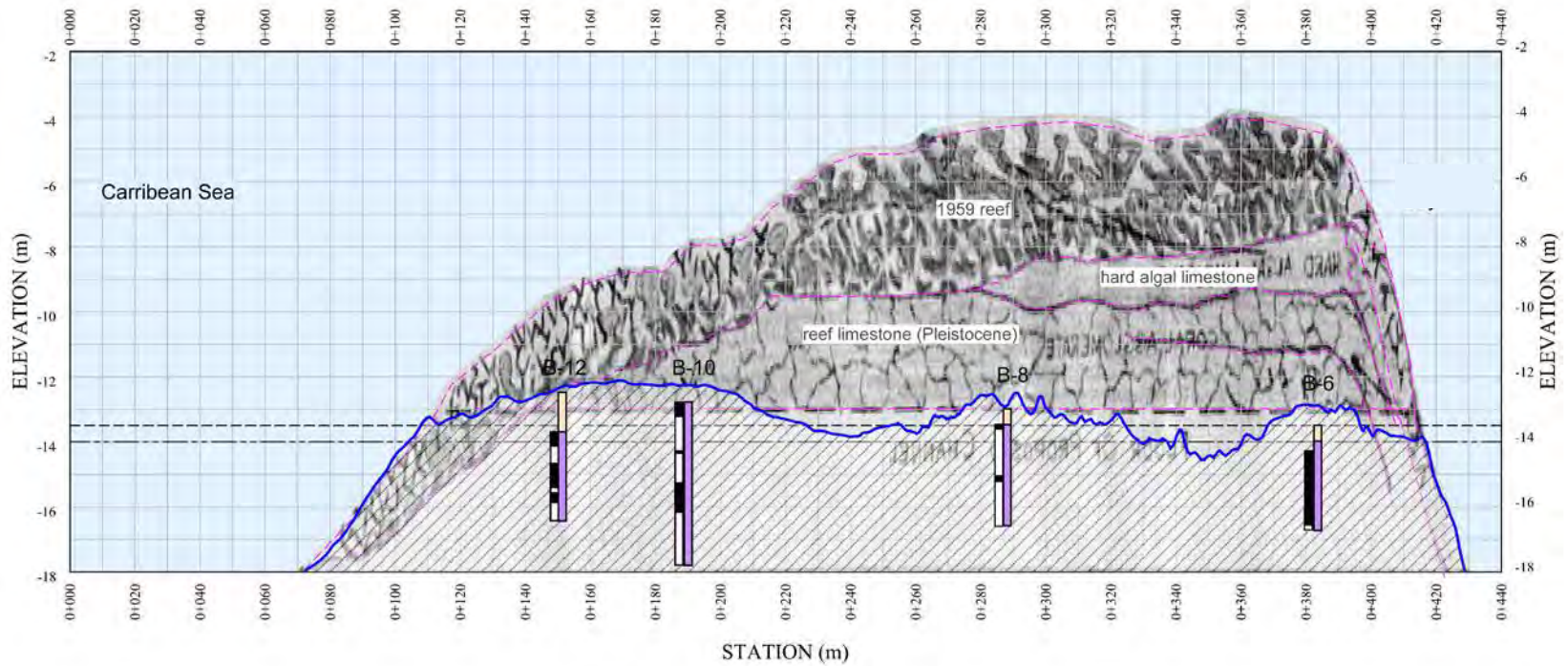




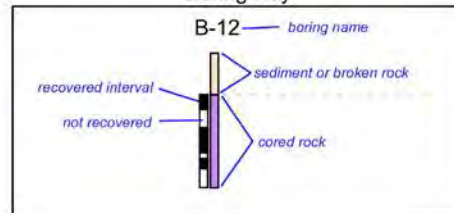
### CHANNEL-WEST LONGITUDINAL PROFILE , OFFSET=-50M

**LEGEND:**

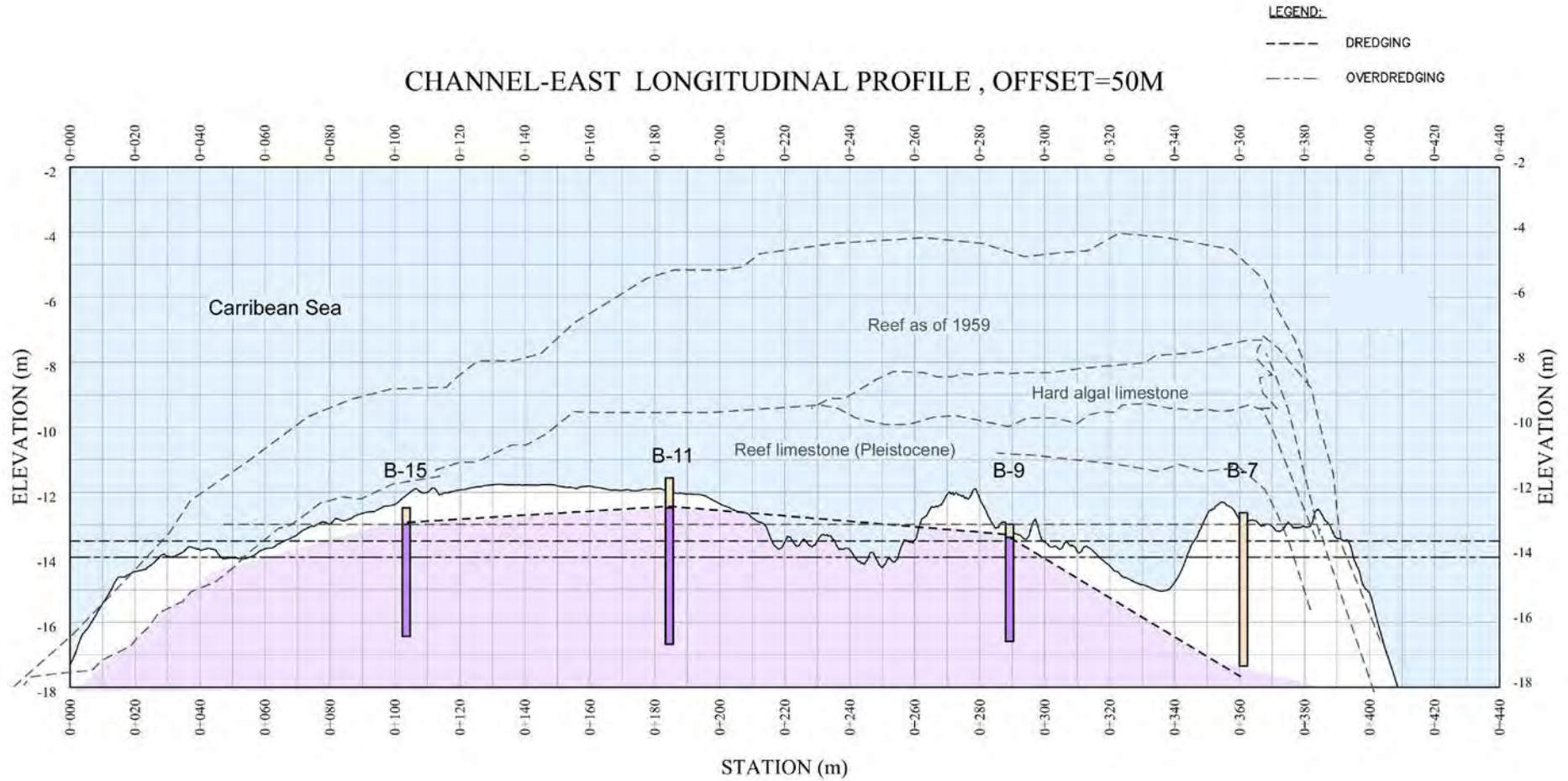
- - - DREDGING
- - - OVERDREDGING



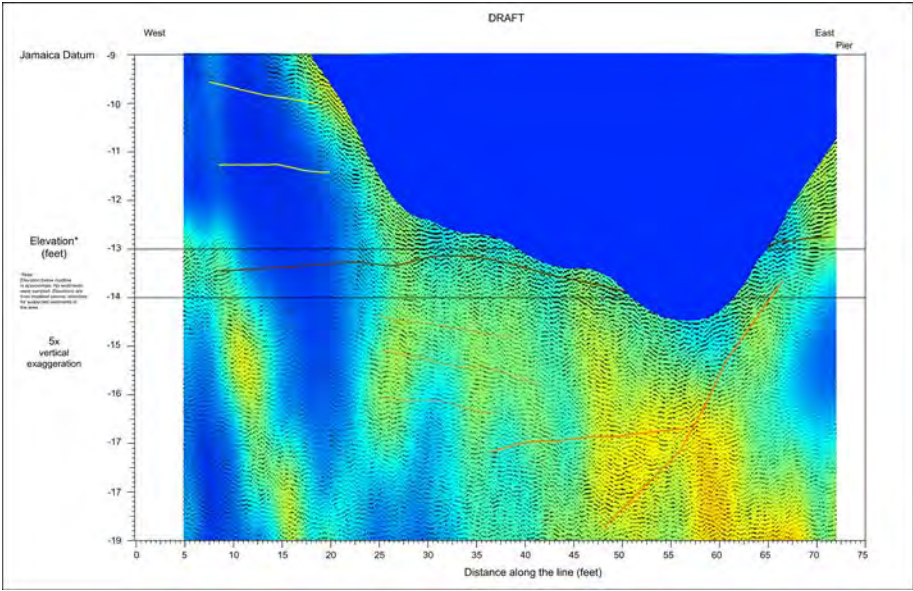
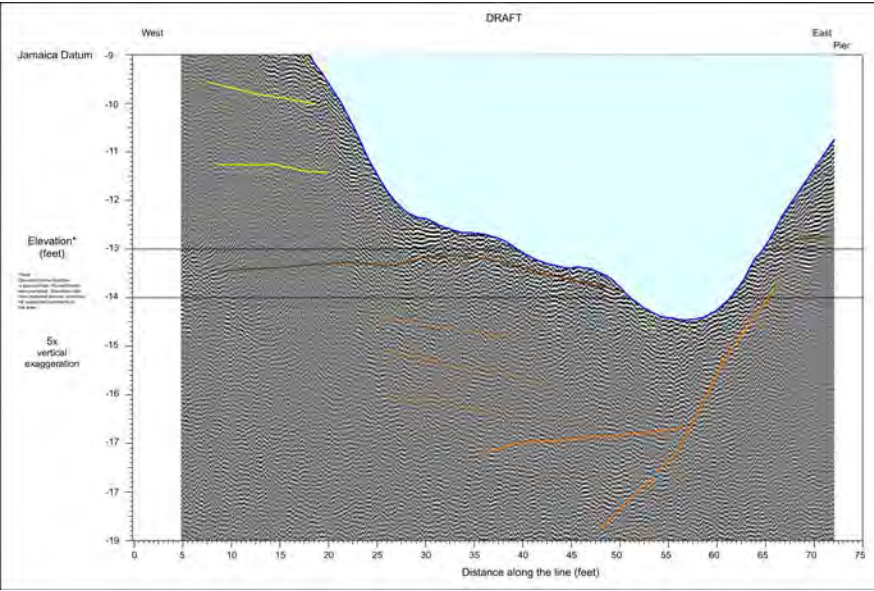
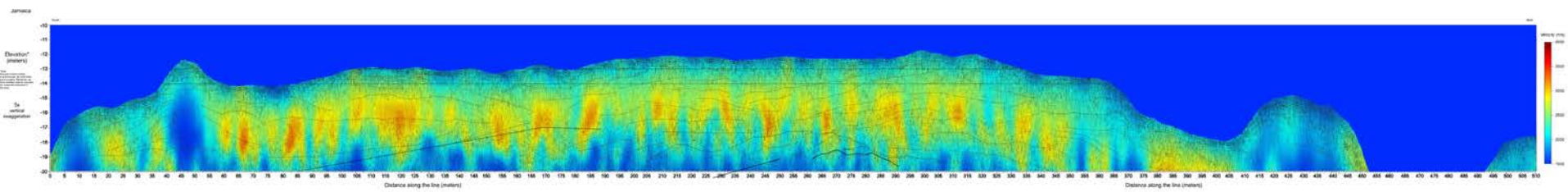
**Boring Key**



# CHANNEL-EAST LONGITUDINAL PROFILE , OFFSET=50M

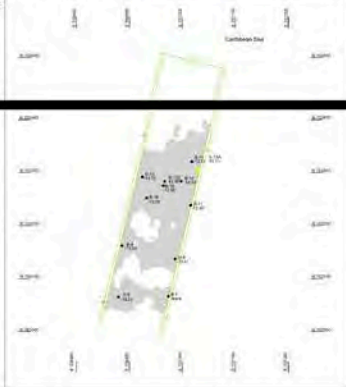




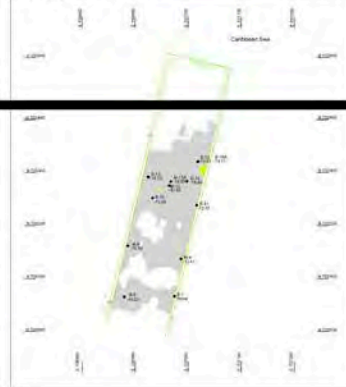


>2500 m/s, rock  
R-8 unrippable

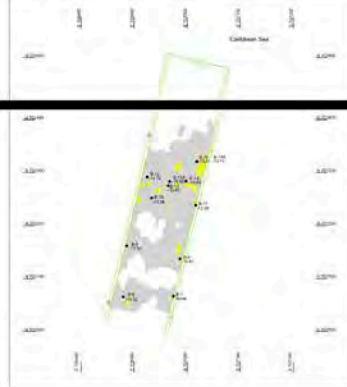
Slice maps at -12.00m



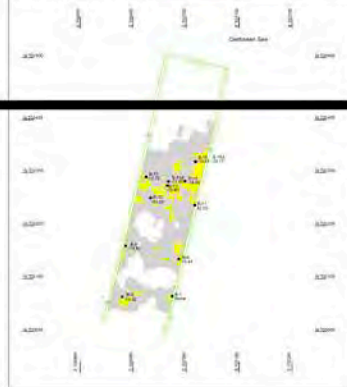
Slice maps at -12.50m



Slice maps at -13.00m



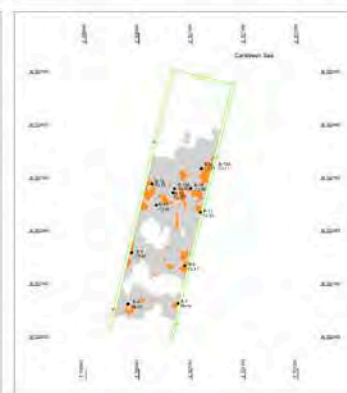
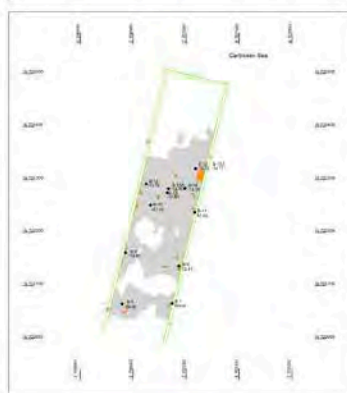
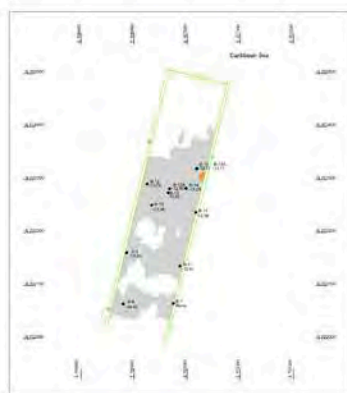
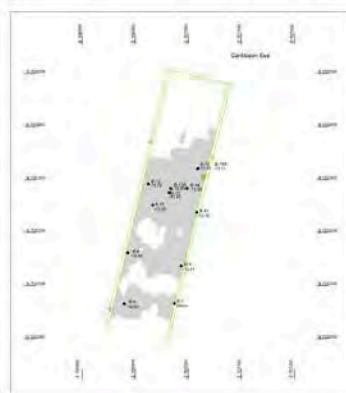
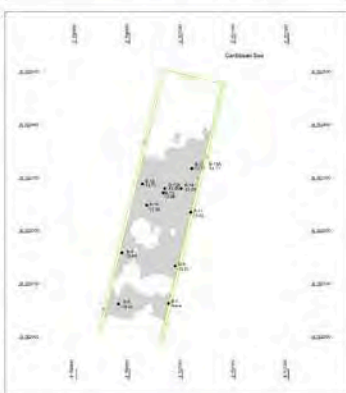
Slice maps at -13.50m



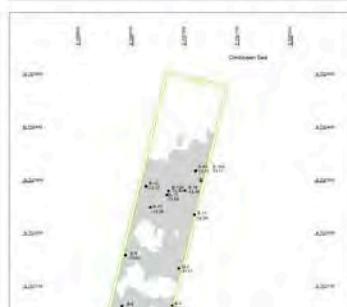
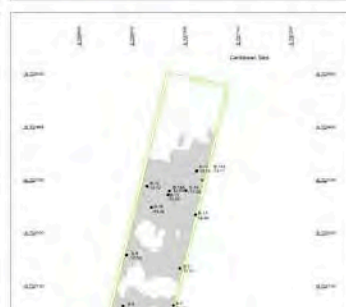
Slice maps at -14.00m



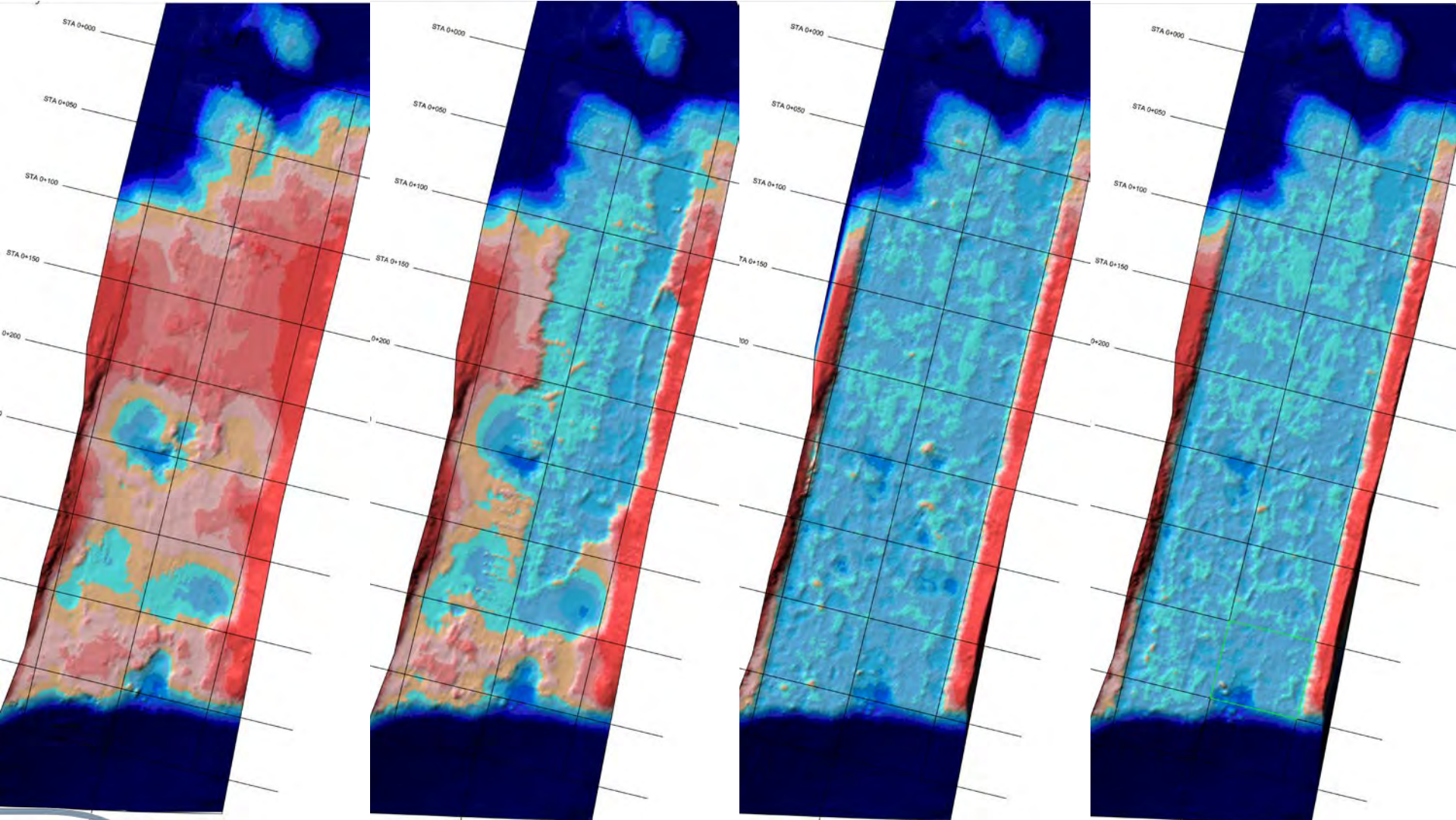
>2700 m/s, rock  
R-9 unrippable



>3000 m/s, rock  
R-10 unrippable



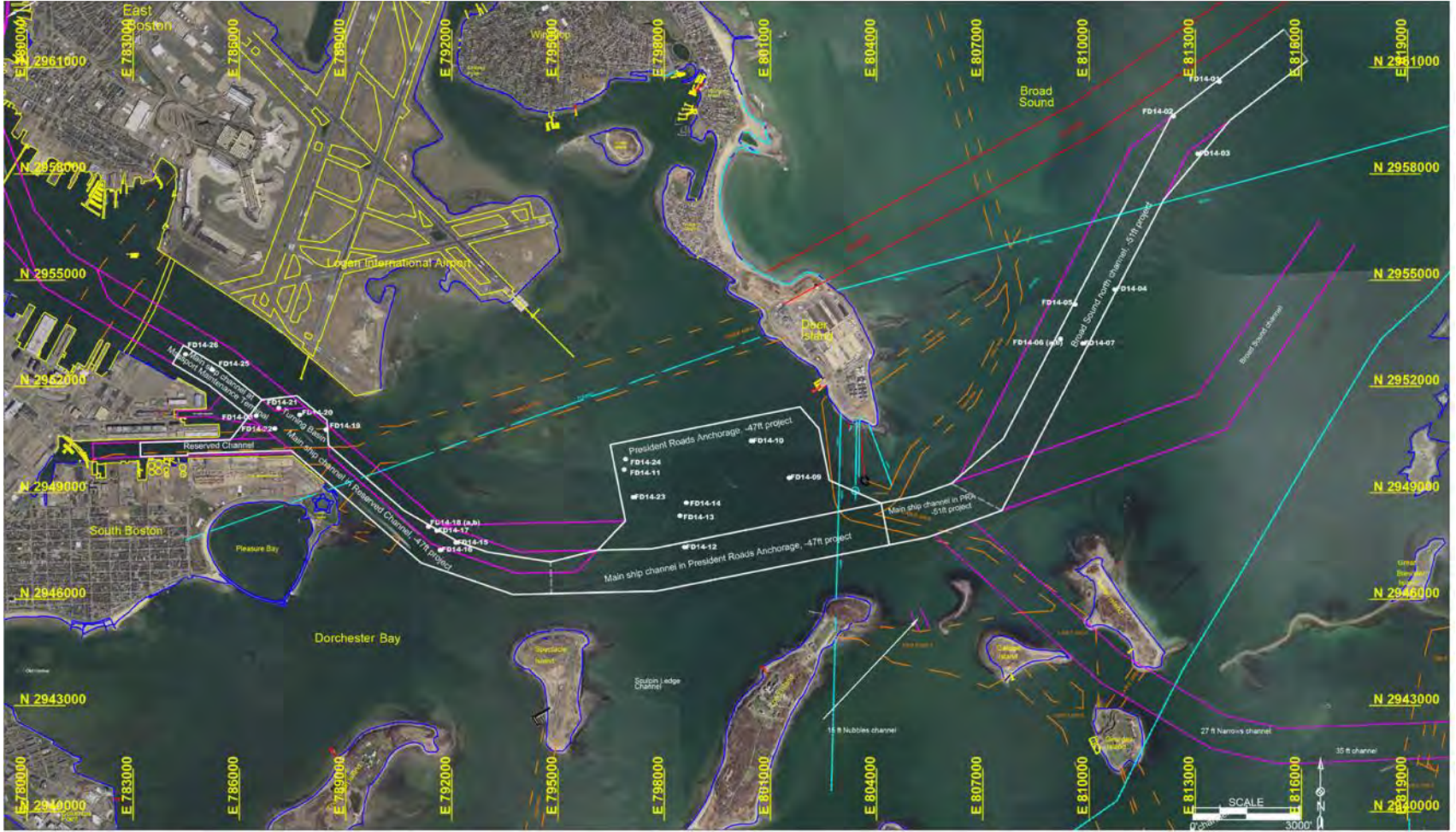















## Boston Harbor, MA





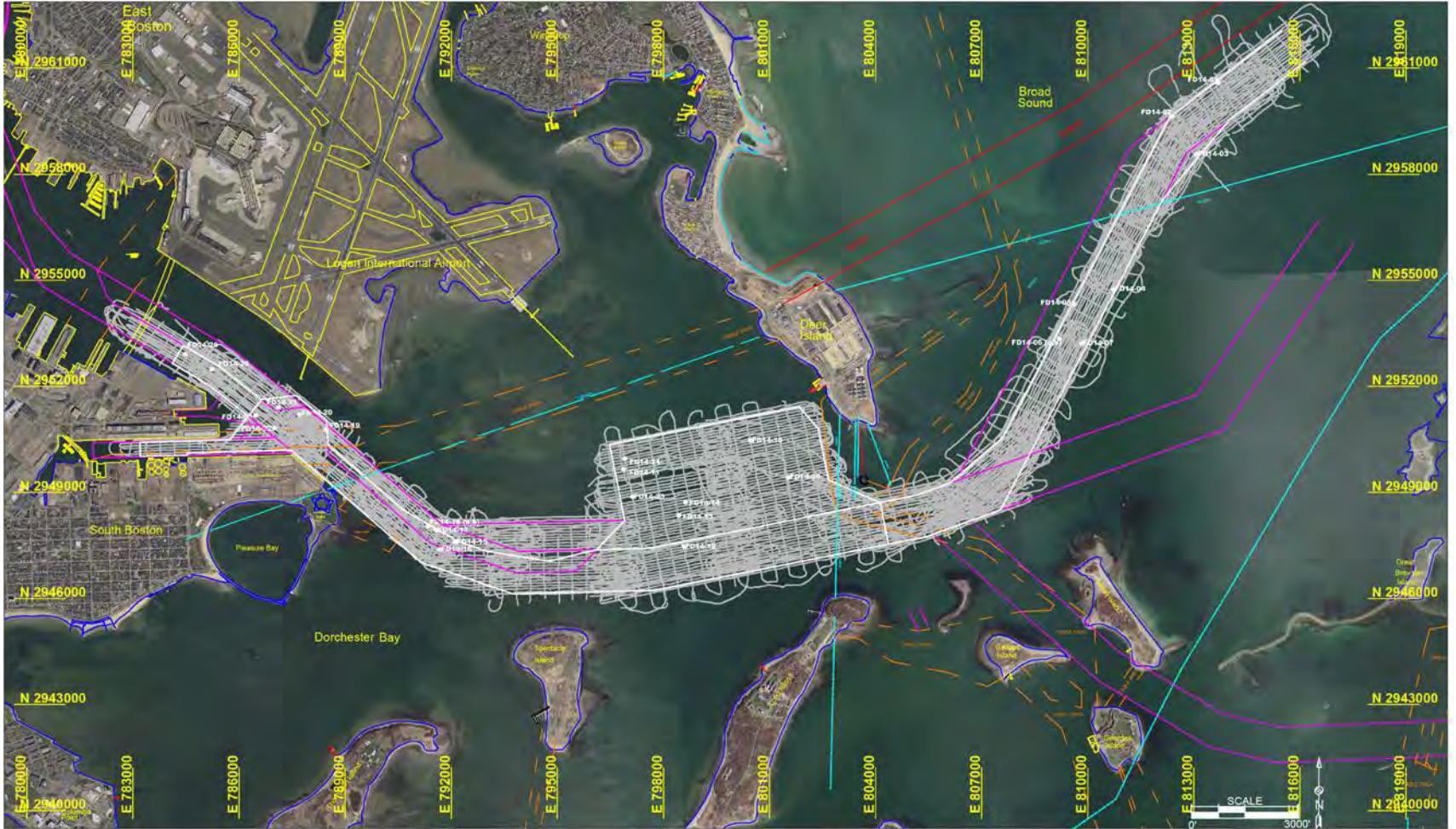
Planimetrics provided by USACE-NAE, New England District

- |   |                           |   |                       |   |                       |
|---|---------------------------|---|-----------------------|---|-----------------------|
|  | Proposed channel          |  | Sewer area            |  | Channel outline, 2010 |
|  | e4sciences area divisions |  | Sewer and tunnel area |  | Shoreline and dock    |
|   |                           |  | Cable area            |  | Land planimetrics     |











 As drilled boring locations

Massachusetts Mainland State Plane Feet Coordinate System  
 North American Datum of 1983 (NAD83)  
 Vertical datum: MLLW (NAVD 1988)  
 2013 Orthophotos: USGS and Massachusetts



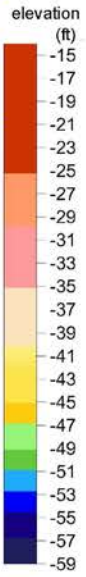
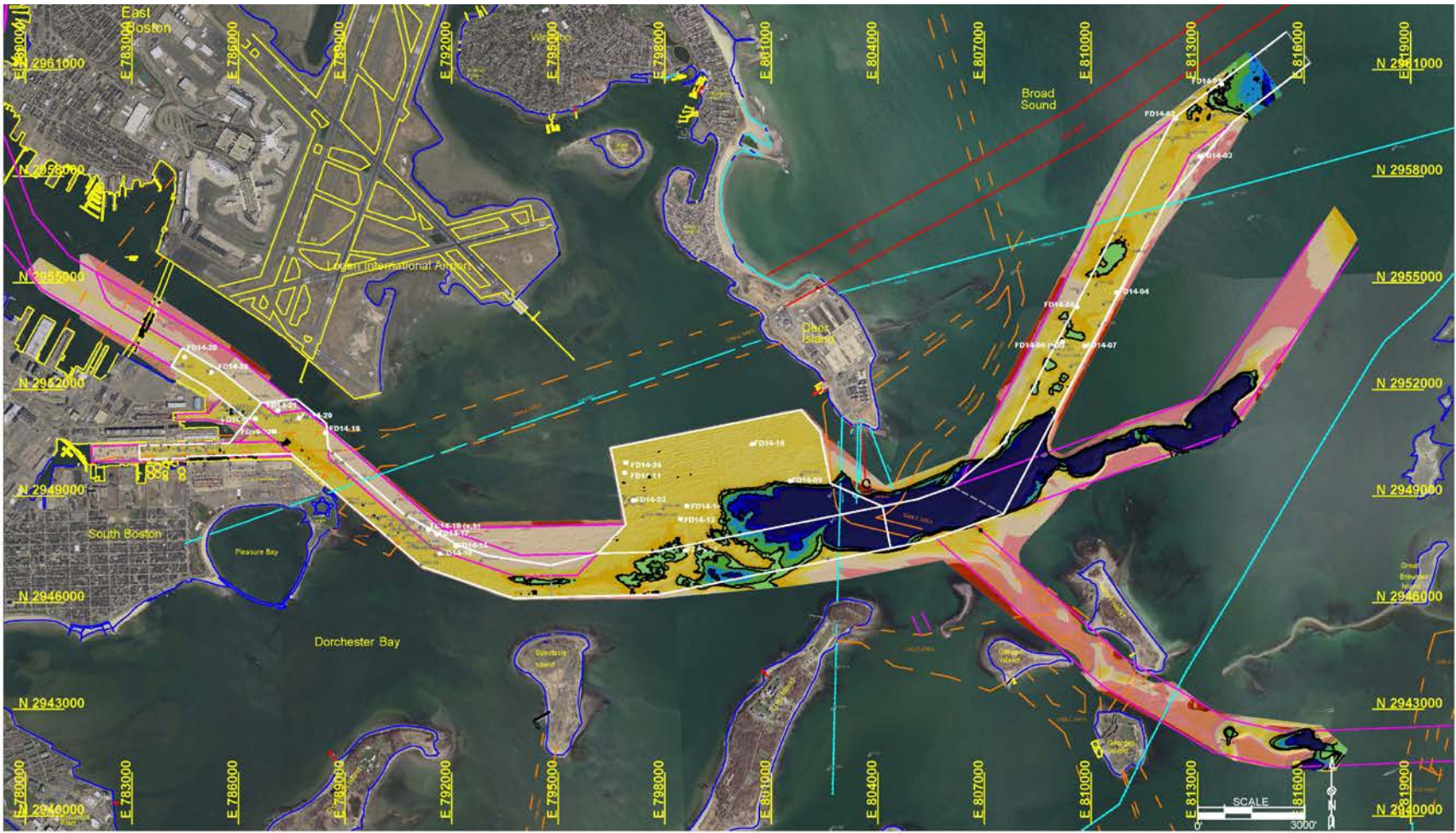


Planimetrics provided by USACE-NAE, New England District

- |   |   |   |  |
|---|---|---|--|
|  Proposed channel          |  Seismic tracklines    |  Cable area            |  Land planimetrics           |
|  e4sciences area divisions |  Sewer area            |  Channel outline, 2010 |  As drilled boring locations |
|   |  Sewer and tunnel area |  Shoreline and dock    |  |

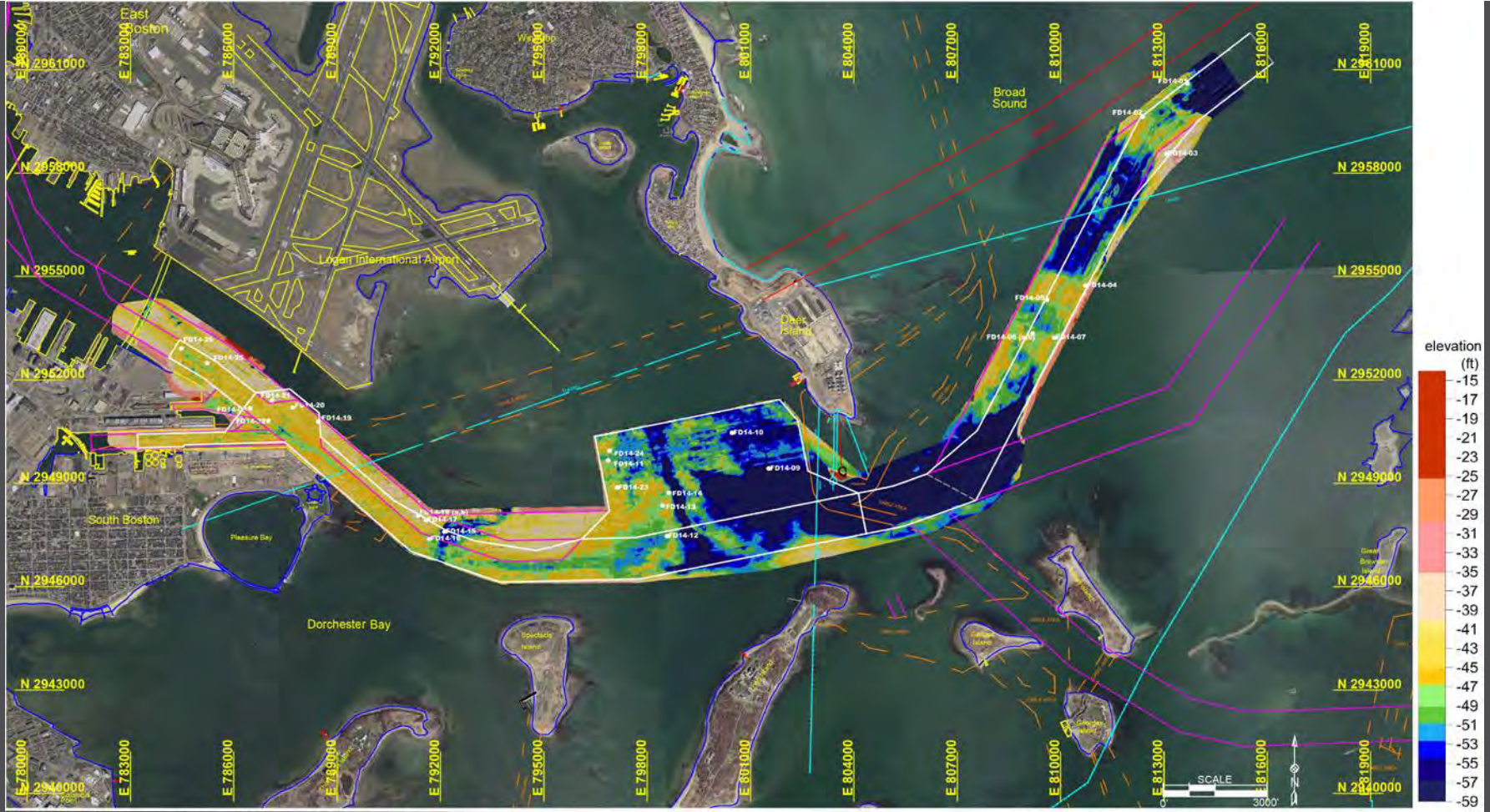
Massachusetts Mainland State Plane Feet Coordinate System  
 North American Datum of 1983 (NAD83)  
 Vertical datum: MLLW (NAVD 1988)  
 2013 Orthophotos: USGS and Massachusetts





Planimetrics provided by USACE-NAE, New England District		Channel outline, 2010	As drilled boring locations	Massachusetts Mainland State Plane Feet Coordinate System North American Datum of 1983 (NAD83) Vertical datum: MLLW (NAVD 1988) 2013 Orthophotos: USGS and Massachusetts
Proposed channel	Sewer area	Shoreline and dock	Historic boring locations	
e4sciences area divisions	Sewer and tunnel area	Land planimetrics	-47ft, -49ft, -53ft contours	
	Cable area			





Planimetrics provided by USACE-NAE, New England District			As drilled boring locations	Massachusetts Mainland State Plane Feet Coordinate System North American Datum of 1983 (NAD83) Vertical datum: MLLW (NAVD 1988) 2013 Orthophotos: USGS and Massachusetts
— Proposed channel	— Sewer area	— Channel outline, 2010		
— e4sciences area divisions	— Sewer and tunnel area	— Shoreline and dock		
	— Cable area	— Land planimetrics		

West

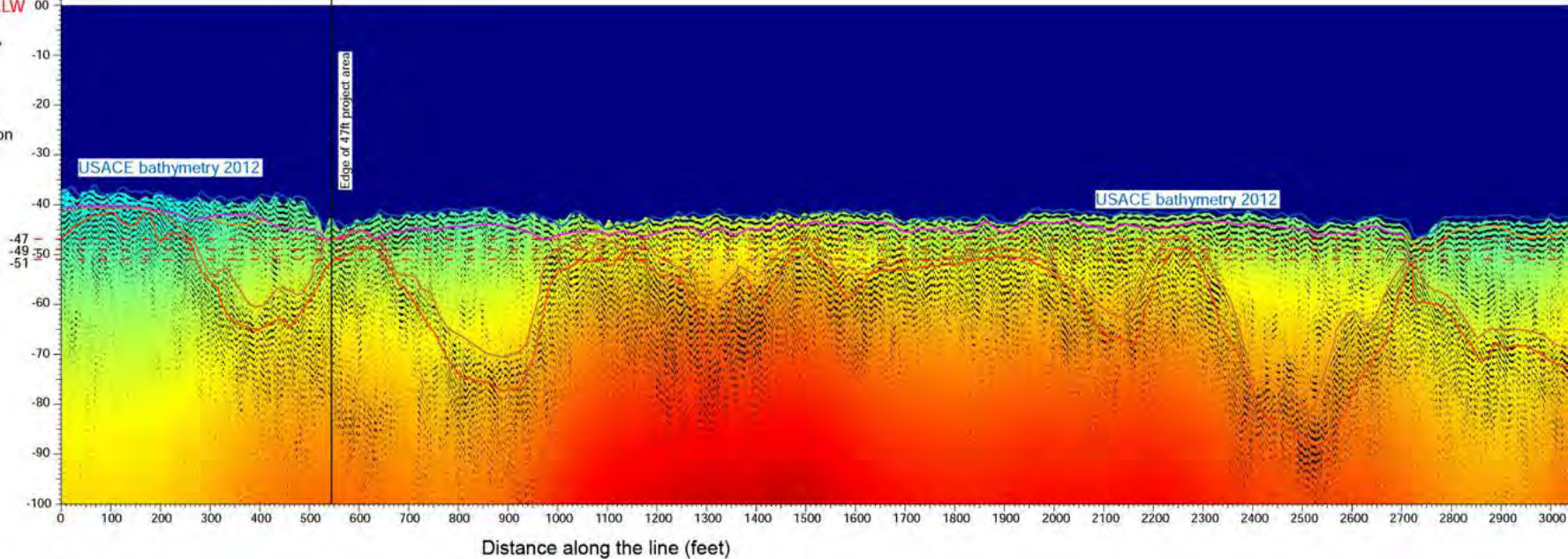
20141210\_01100

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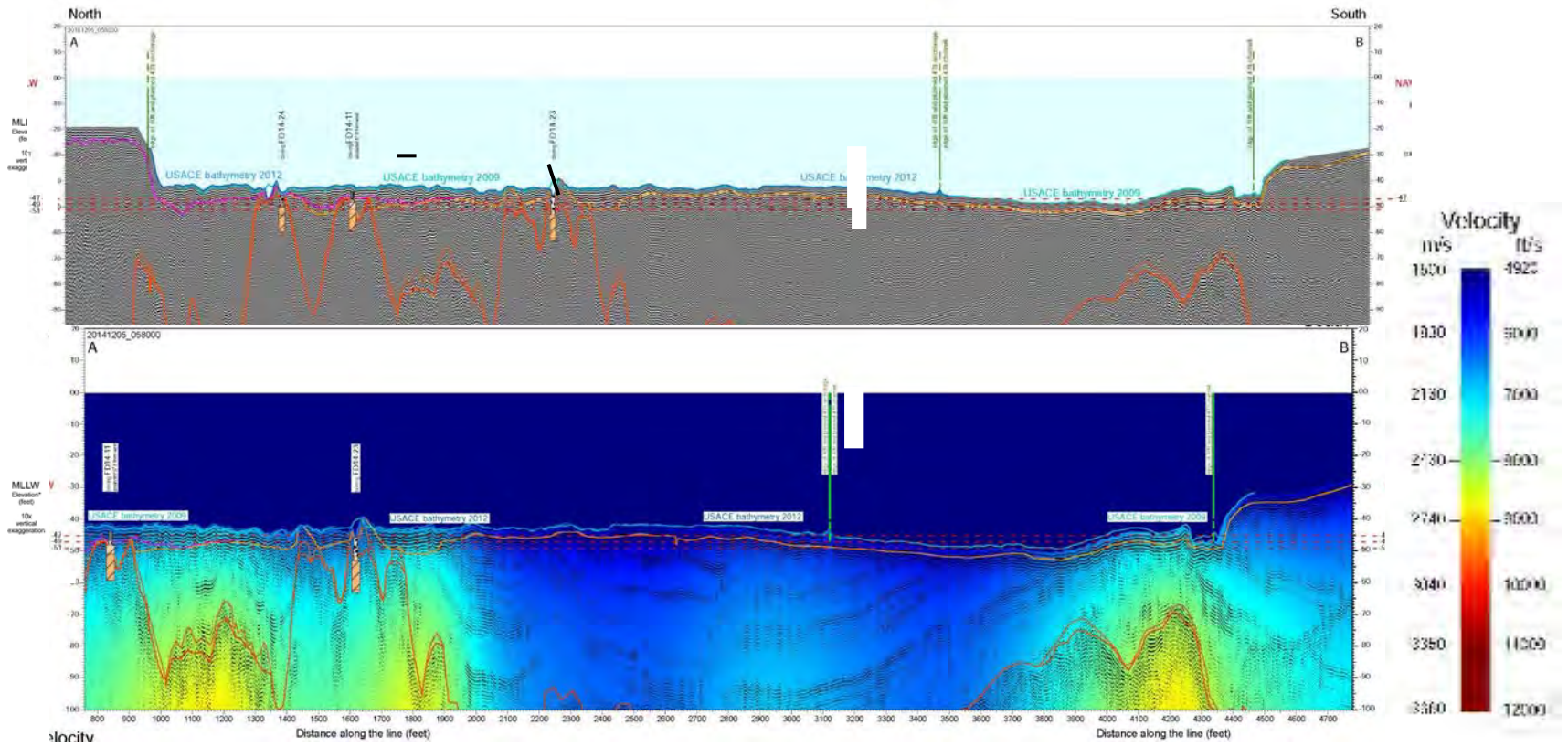
NAVD88 MLLW

Elevation\*  
(feet)

10x  
vertical  
exaggeration



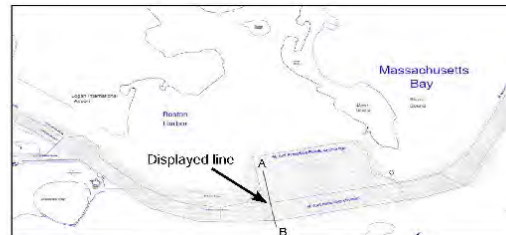


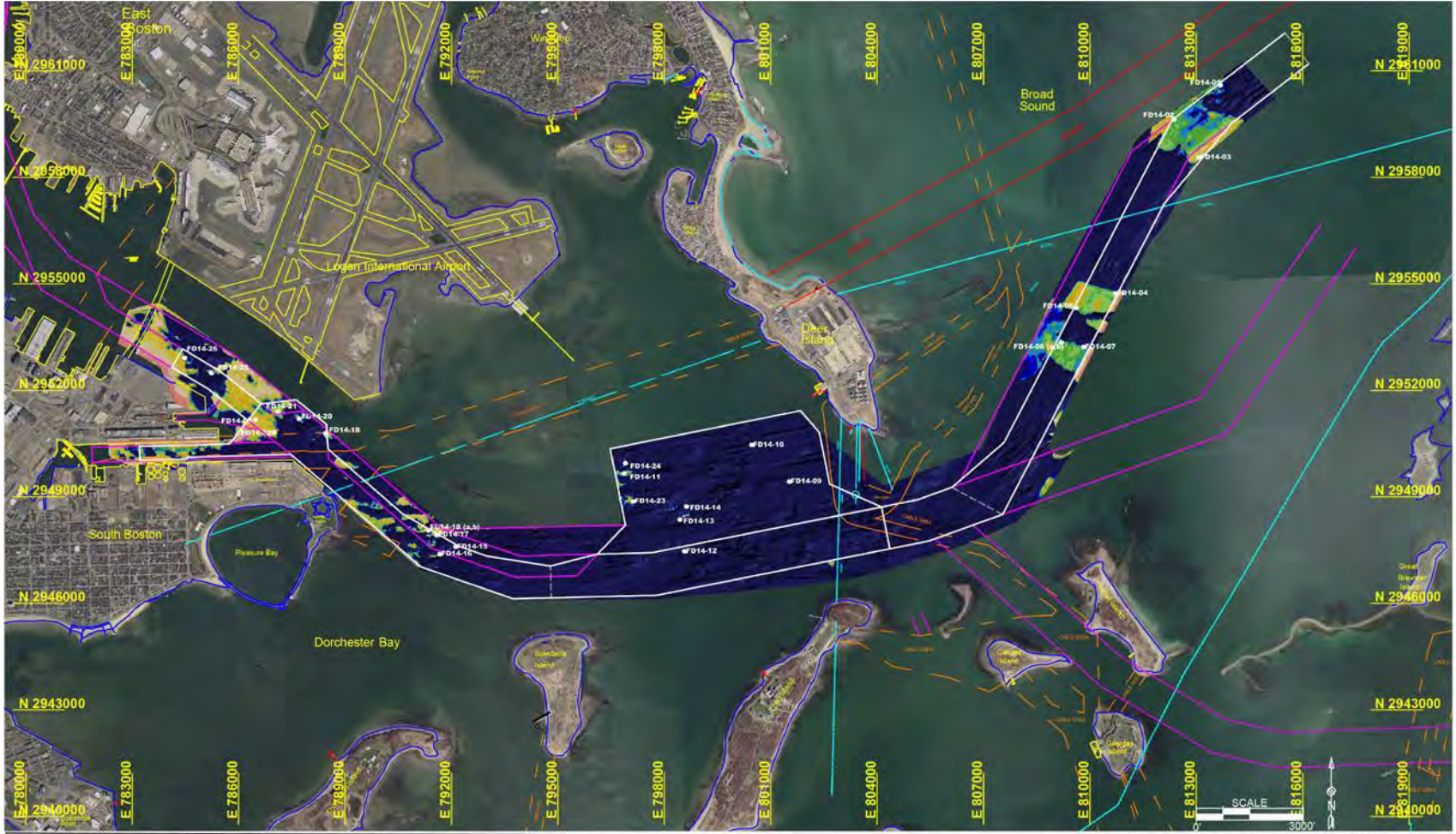


**KEY**

- Improvement Dredge Depth
- Bottom of Black Silt
- Top of Pleistocene
- Top of Till and Rock
- Top of Rock (Cambridge Argillite)
- USACE bathymetry 2014
- USACE bathymetry 2012
- USACE bathymetry 2009

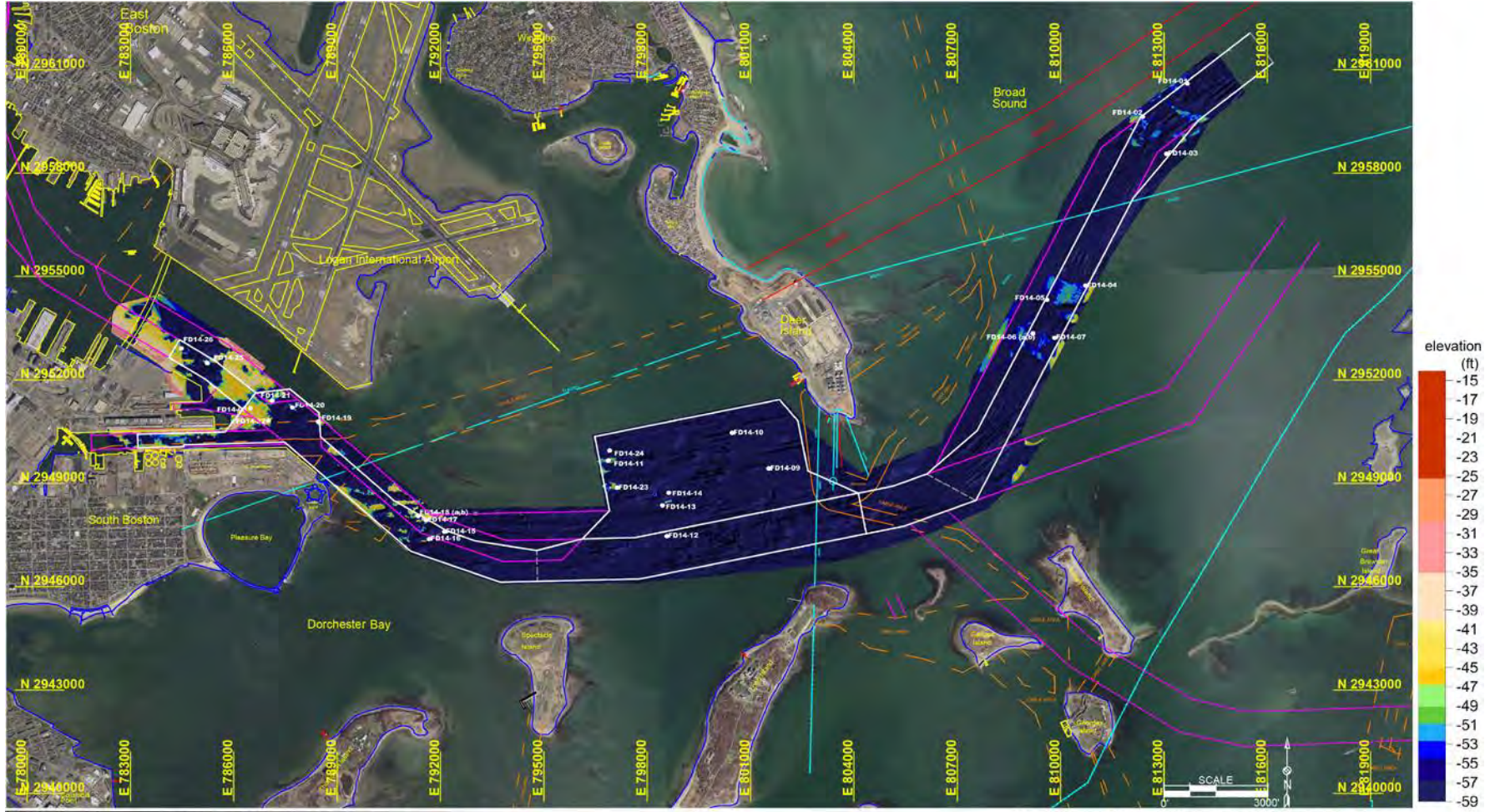
\*Note: Elevation below mudline is approximate. No sediments were sampled. Elevations are from modeled acoustic velocities for regional sediments in the area.





Planimetrics provided by USACE-NAE, New England District  
 Proposed channel  
 e4sciences area divisions  
 Channel outline, 2010  
 Sewer area  
 Sewer and tunnel area  
 Cable area  
 Shoreline and dock  
 Land planimetrics  
 As drilled boring locations  
 Massachusetts Mainland State Plane Feet Coordinate System  
 North American Datum of 1983 (NAD83)  
 Vertical datum: MLLW (NAVD 1988)  
 2013 Orthophotos: USGS and Massachusetts





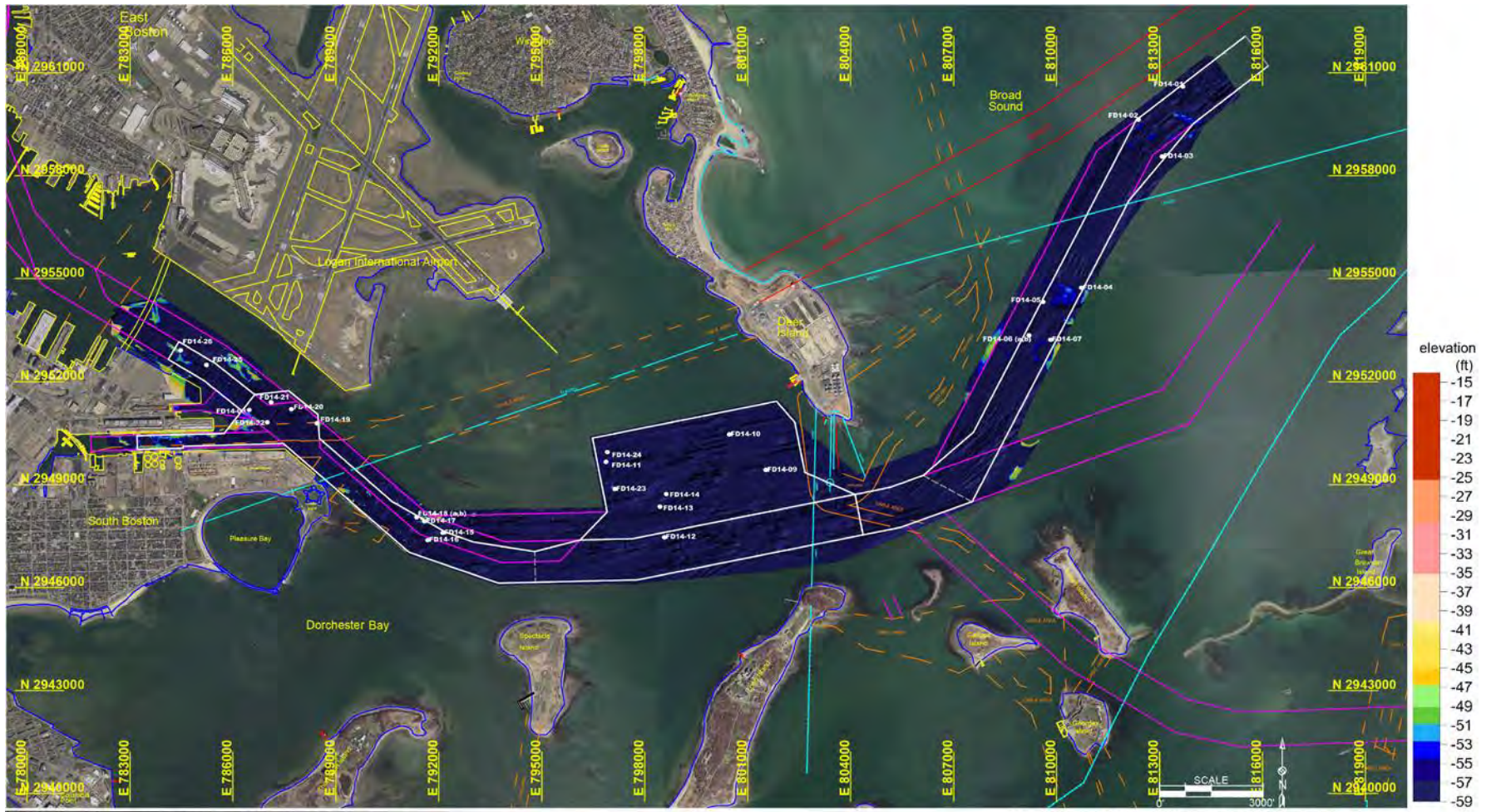
Planimetrics provided by USACE-NAE, New England District

Proposed channel	Sewer area	Channel outline, 2010
e4sciences area divisions	Sewer and tunnel area	Shoreline and dock
Cable area	Land planimetrics	

As drilled boring locations

Massachusetts Mainland State Plane Feet Coordinate System  
 North American Datum of 1983 (NAD83)  
 Vertical datum: MLLW (NAVD 1988)  
 2013 Orthophotos: USGS and Massachusetts





Planimetrics provided by USACE-NAE, New England District			Massachusetts Mainland State Plane Feet Coordinate System
Proposed channel	Sewer area	Channel outline, 2010	North American Datum of 1983 (NAD83)
e4sciences area divisions	Sewer and tunnel area	Shoreline and dock	Vertical datum: MLLW (NAVD 1988)
Cable area	Land planimetrics	As drilled boring locations	2013 Orthophotos: USGS and Massachusetts



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