

Geotechnical Borrow Site Characterization for Preconstruction Engineering and Design, West Onslow Beach and New River Inlet, N.C., Storm Damage Reduction Project, USACE

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U.S. Army Corps of Engineers

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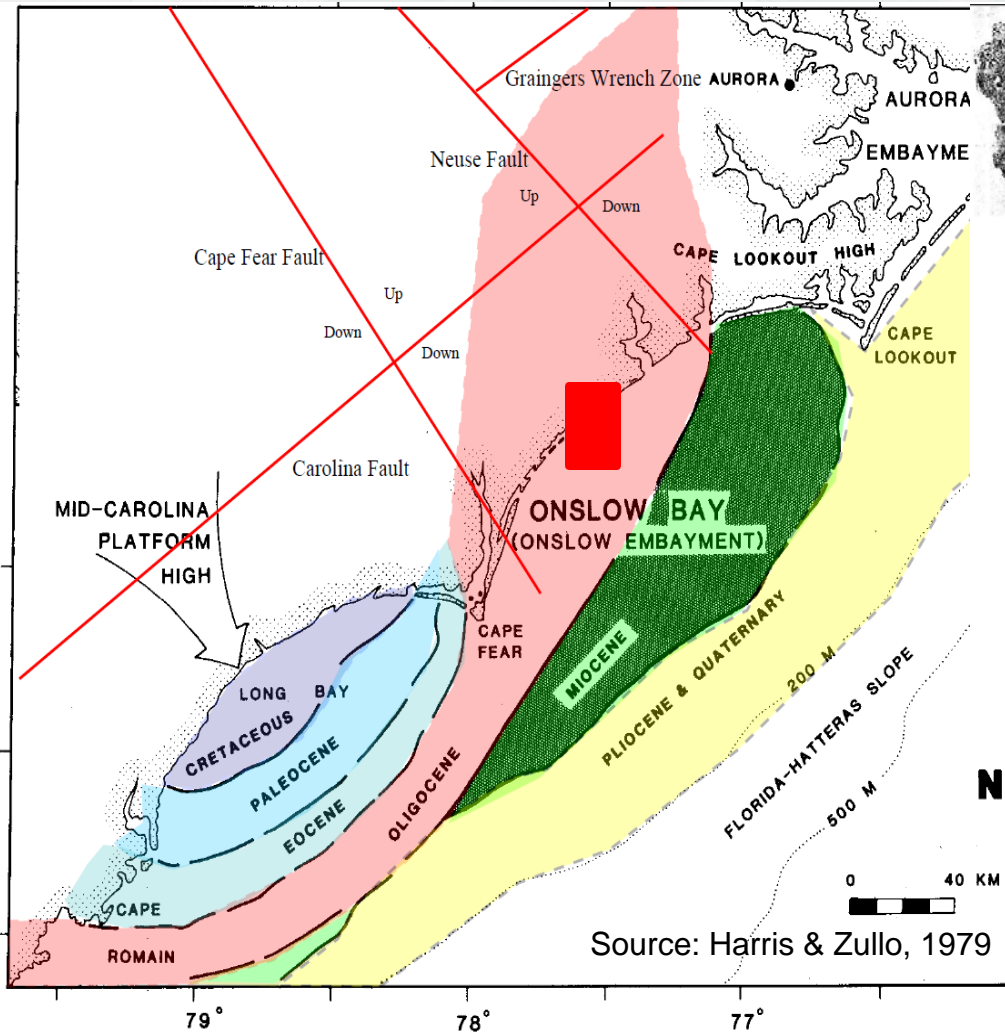


USACE Borrow Site Geotechnical Investigation Timeline

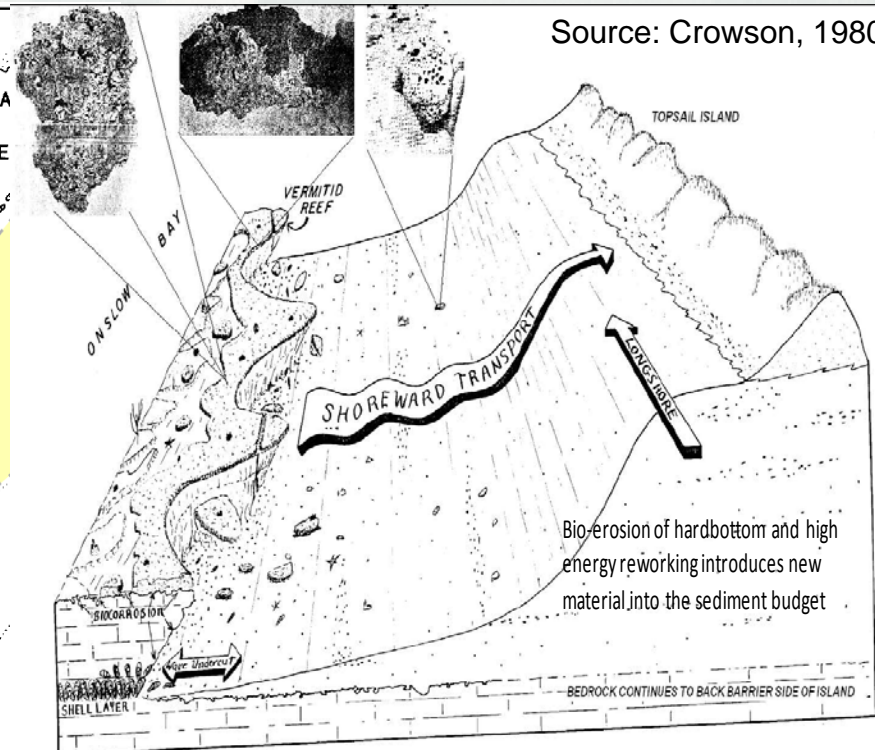
- 2002: Reconnaissance of sand resources: Dr. Cleary, UNCW
- 2003: OSI Geophysical survey (seismic and sidescan sonar)
 - OSI delineates multiple borrow sites along Topsail Island
 - USACE Native Beach Sampling
 - USACE drills 167 vibracores 1.0-6.5 mile offshore along Topsail Island
- 2010 USACE: PED geotechnical investigation in Borrow Area A
 - USACE (2010) 103 vibracores, 1000-foot spacing
 - Sand Compatibility Analysis
- 2011-2012: Additional geophysical survey for final calculation of sand quantities, and plan for initial construction.



Geologic Setting



Source: Harris & Zullo, 1979

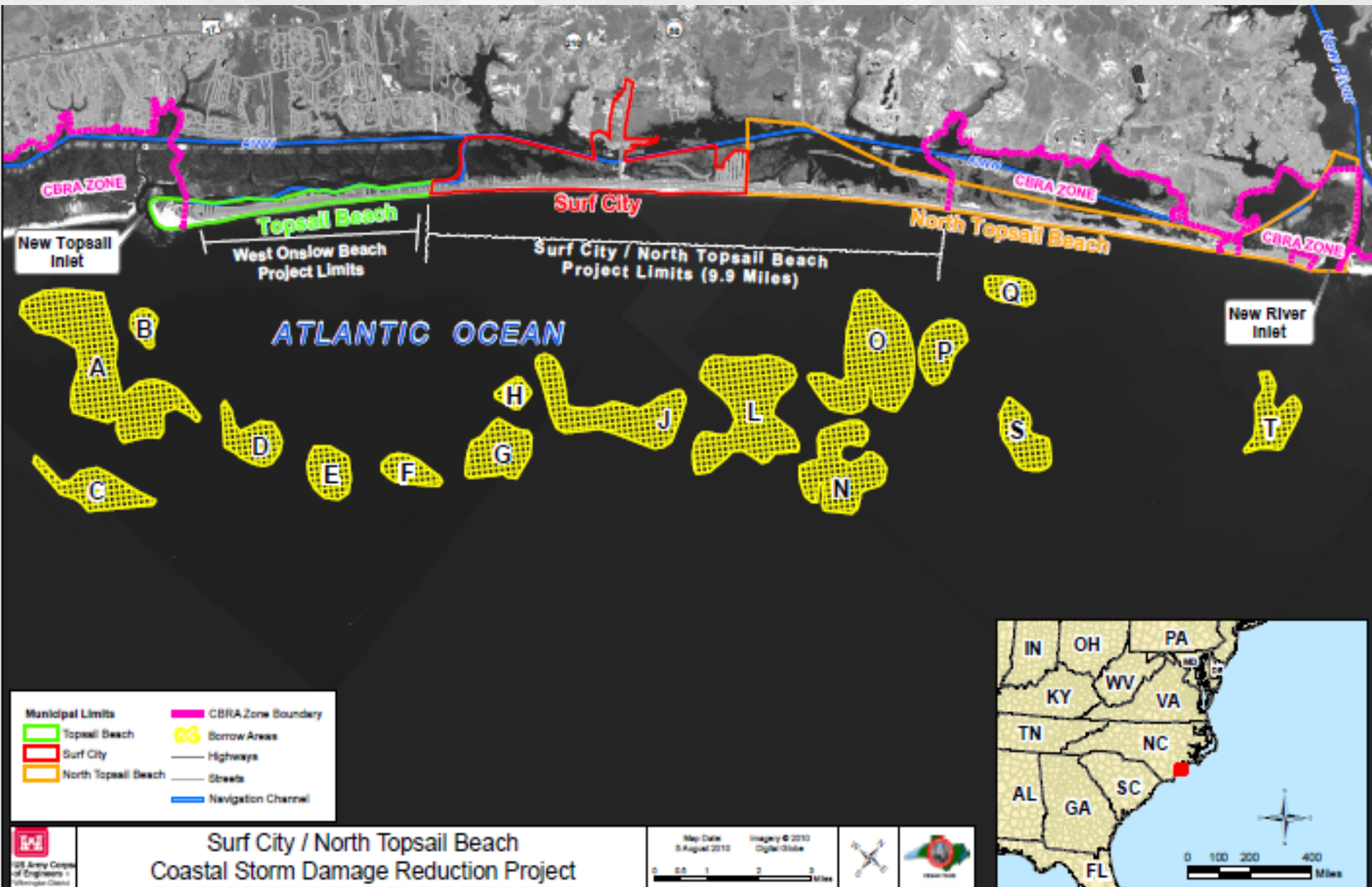


Source: Crowson, 1980



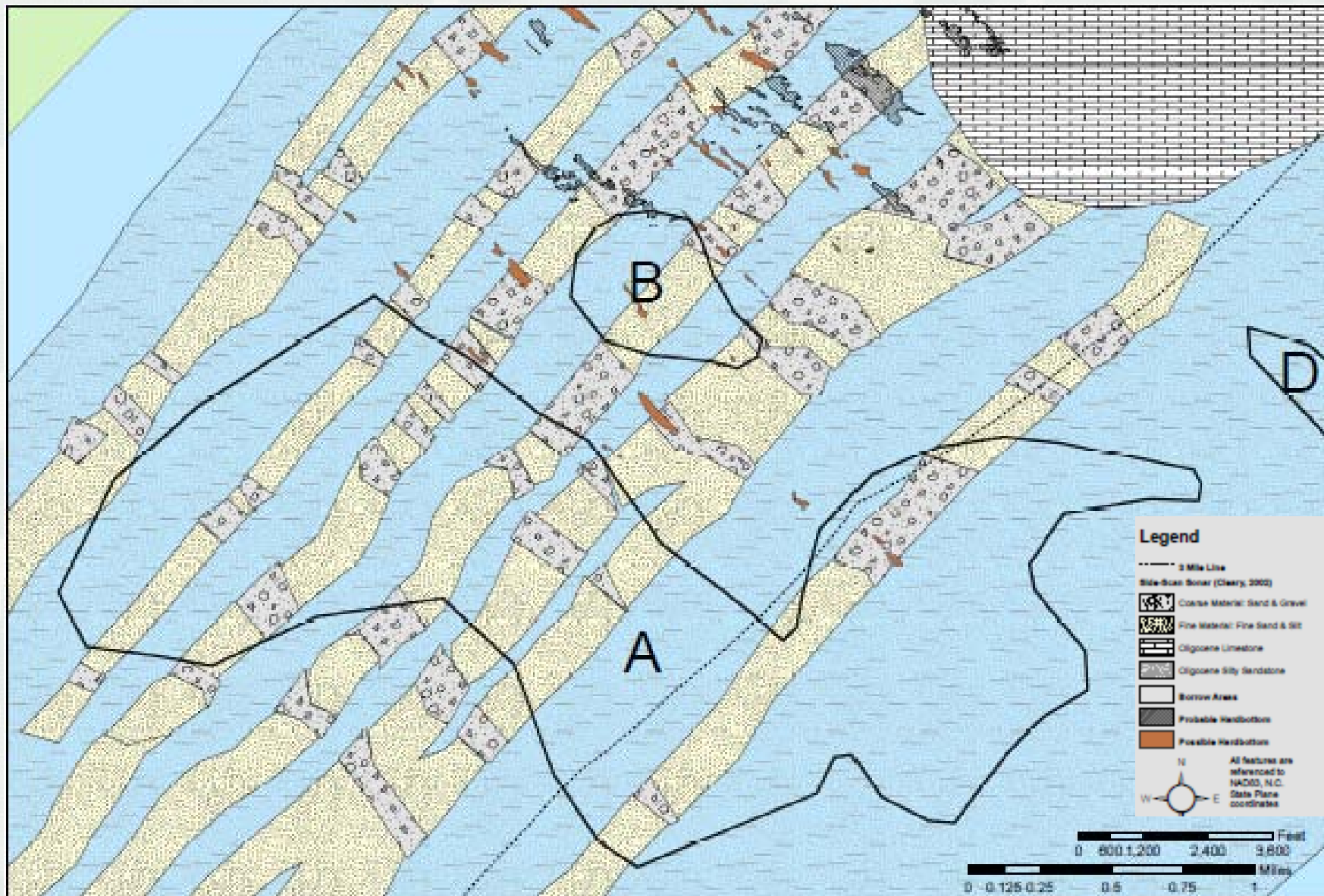
Source: S. Rier

Topsail Project Site Map



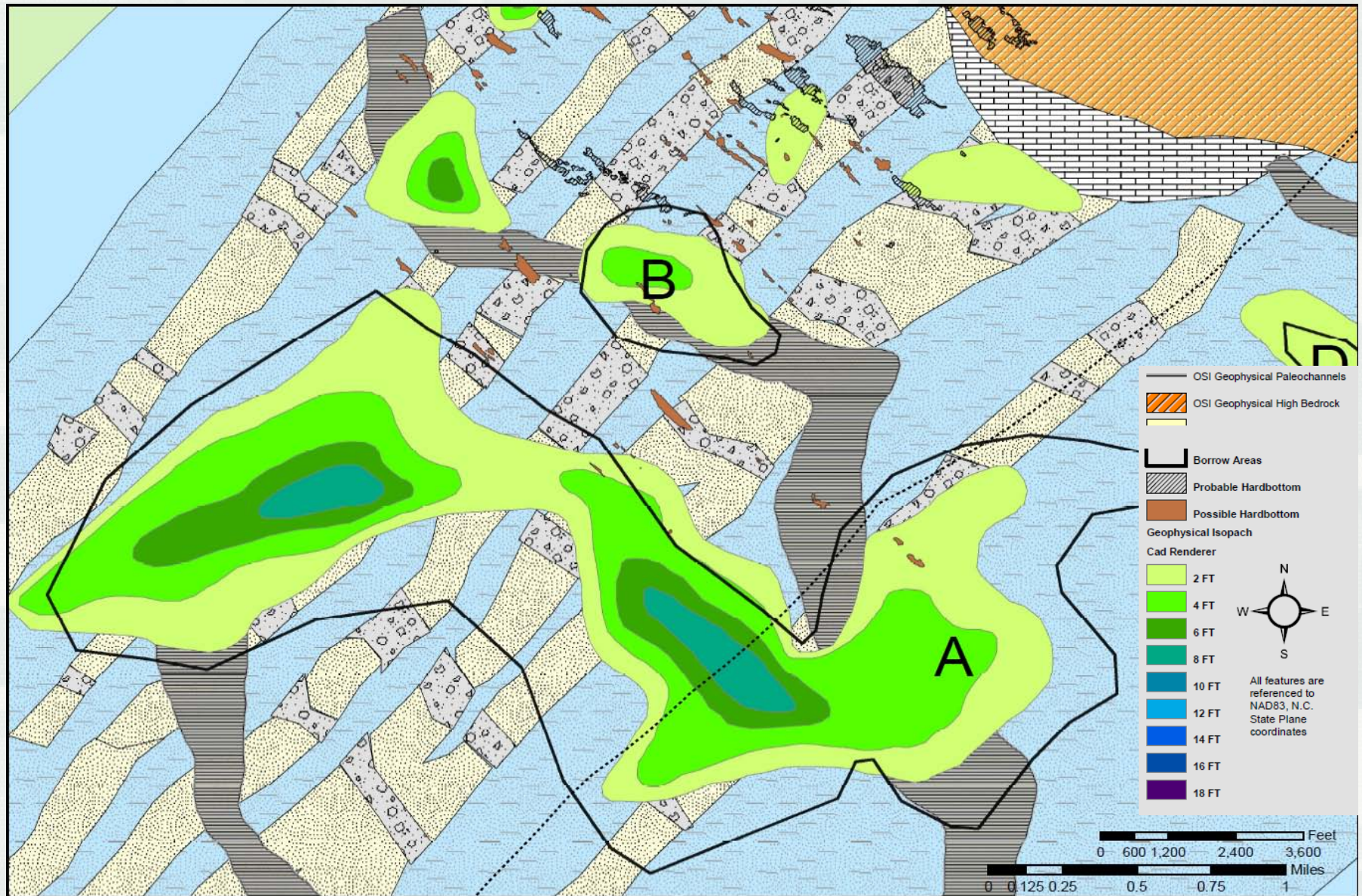
Sand Resource Reconnaissance

(Cleary, 2002)



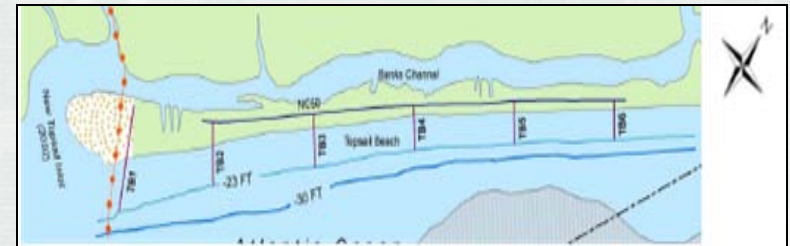
Geophysical Survey

(OSI, 2003)

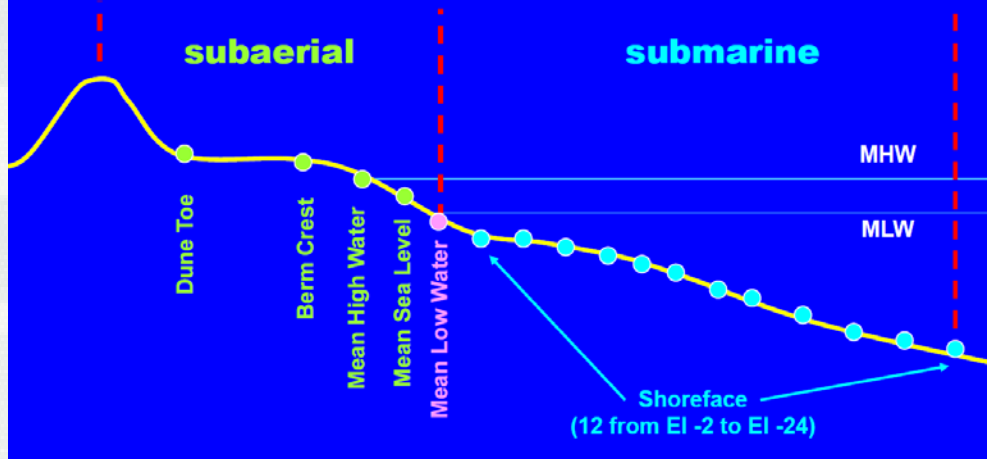


Native Beach Composite Data

- Performed in 2003
- Samples were collected at approximately 5,000-foot intervals along the study area



USACE Beach Sampling Protocol



Sample Area	Mean (phi)	Std Dev (phi)	% Silt (<#230)	% Shell
TB-1	2.24	0.57	0.9	9
TB-2	2.17	0.75	1.0	14
TB-3	2.23	0.59	0.8	12
TB-4	2.04	0.87	1.0	15
TB-5	2.15	0.75	1.7	14
TB-6	2.22	0.67	1.6	11

Topsail Beach Composite Data

Mean **2.18**

Std Dev **0.70**

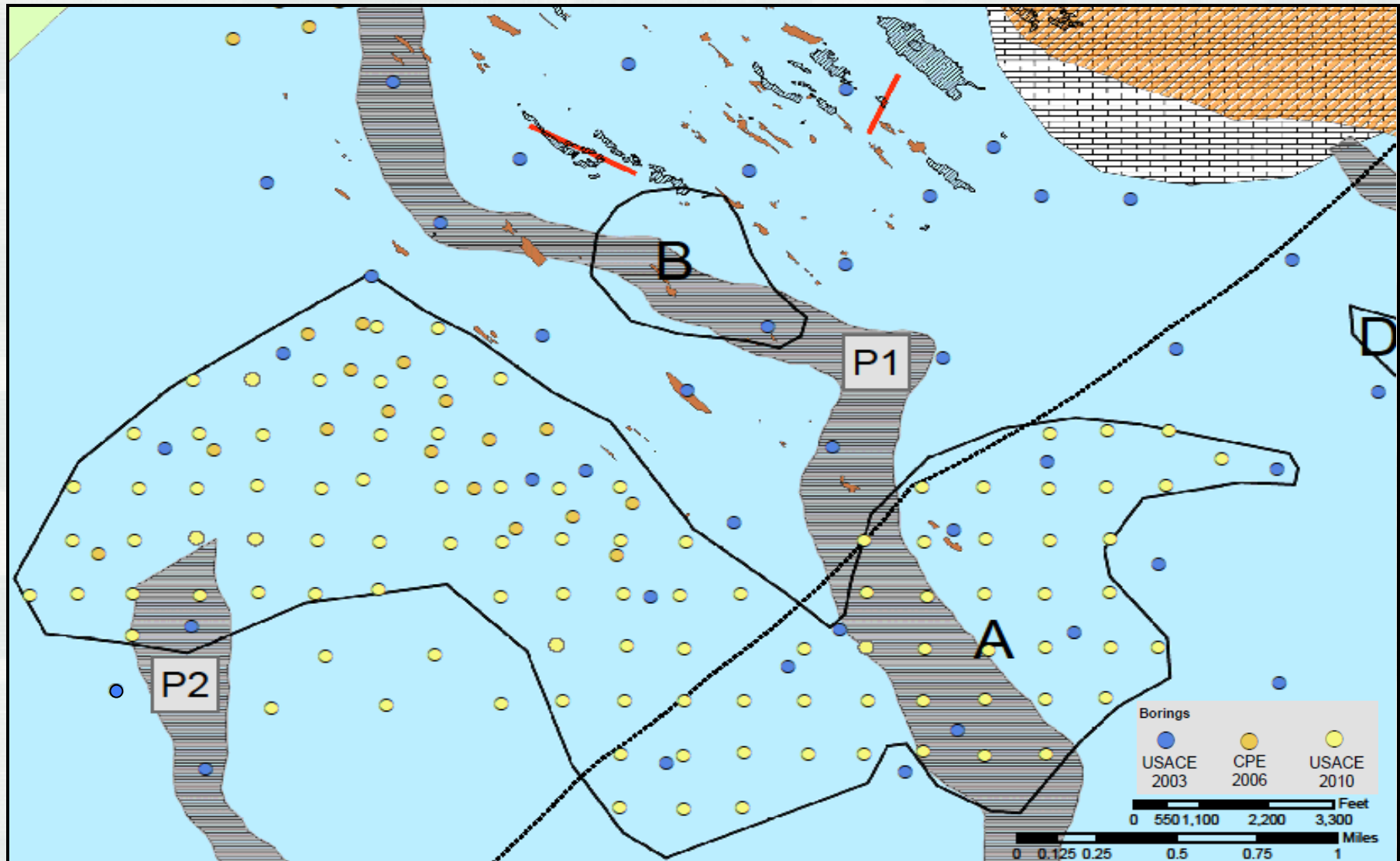
% Silt **1.2**

% Shell **12**



“Borrow Area A” Site Layout

Preconstruction, Engineering & Design Phase



Vibracoring Aboard the *D/B Snell*

- USACE, Wilmington
- Shallow Draft ~ 4-foot
- Max Depth 45-50 foot
- Hydraulic 60-foot crane
- Twin Detroit diesel
- 8-man Crew Quarters
- 10 or 20-foot continuous
- Digital Penetrometer
- Survey-grade, GPS
- Hypack Navigation
- 20-years experience
- 10-18 Vibracore/Day



**AVAILABLE FOR
INTER-AGENCY WORK; (USGS)**

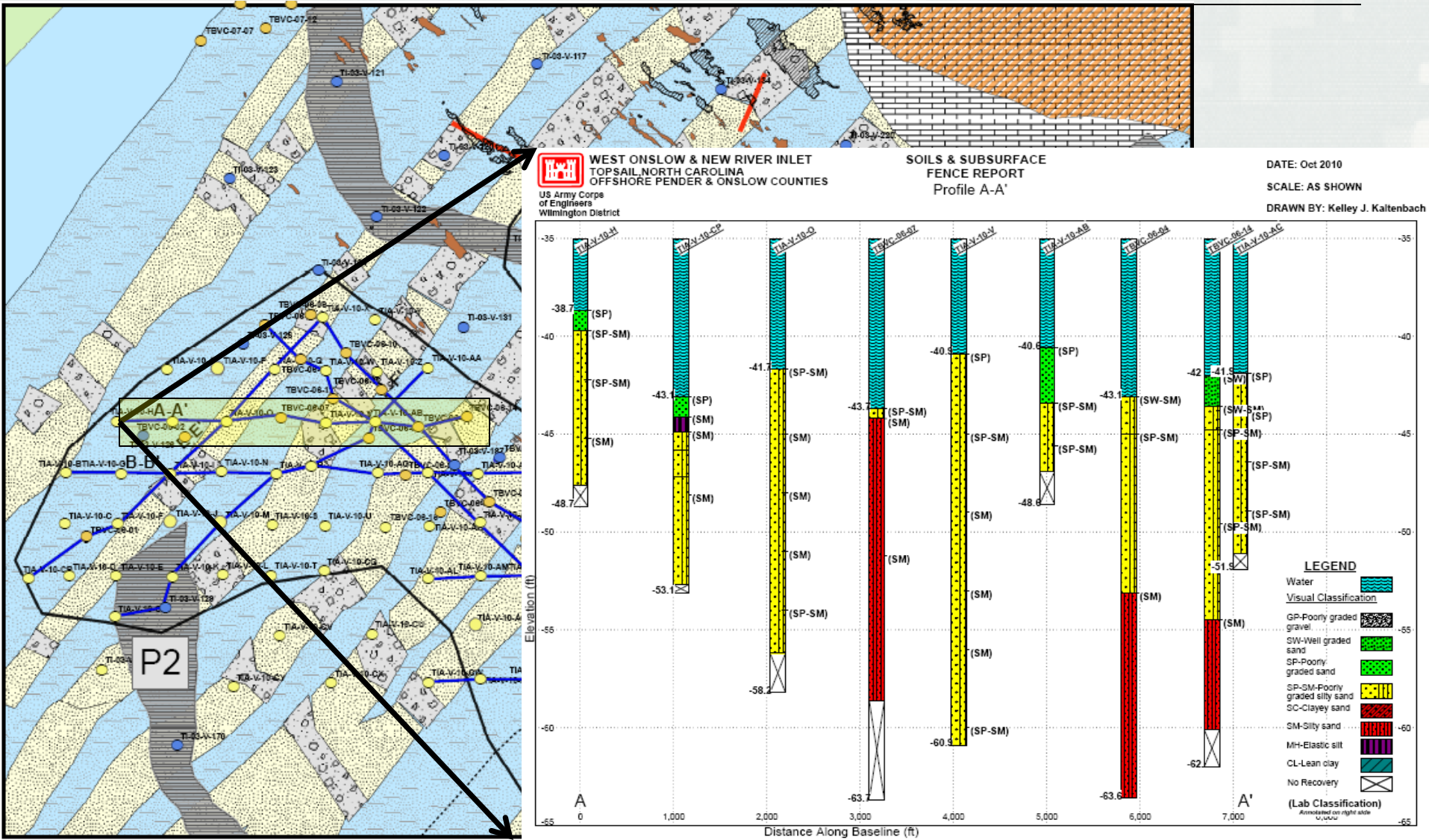


Boring Logs and Laboratory Sample Processing

- 103 Vibracores were drilled, tidal correction applied, field logged by an engineering geologist and visually classified IAW USCS.
- 437 soil samples selected and laboratory tested IAW ASTM D422.
 - *(16 sieves, visual classification and shell estimation for each sample)*
- Field logs & lab data input into gINT
- Beach compatibility analysis was performed using the laboratory data (engineer).

[illegible]

gINT Boring Log Database & Fence Reports



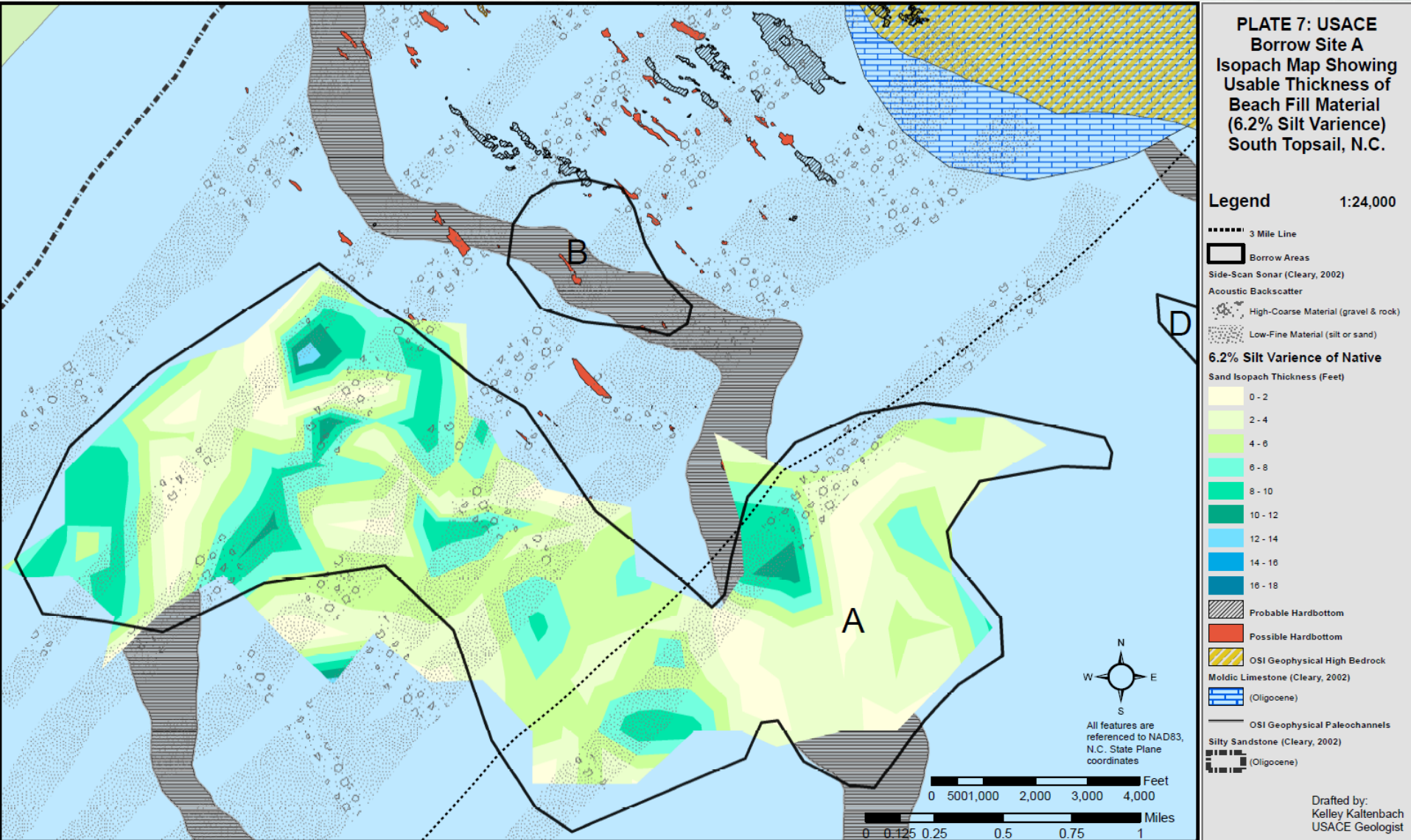
Comparison of the Native Beach & Borrow Area A Characteristics

Data	Native Beach	Borrow site A		
		6.2 % Silt	6.5 % Silt	Under 10 % Silt
Mean (phi)	2.18	2.45	2.52	2.61
Std Dev (phi)	0.70	0.71	0.66	0.60
% Silt (<#230)	1.2	6.2	6.5	7.5
% Shell	12	8	7	6

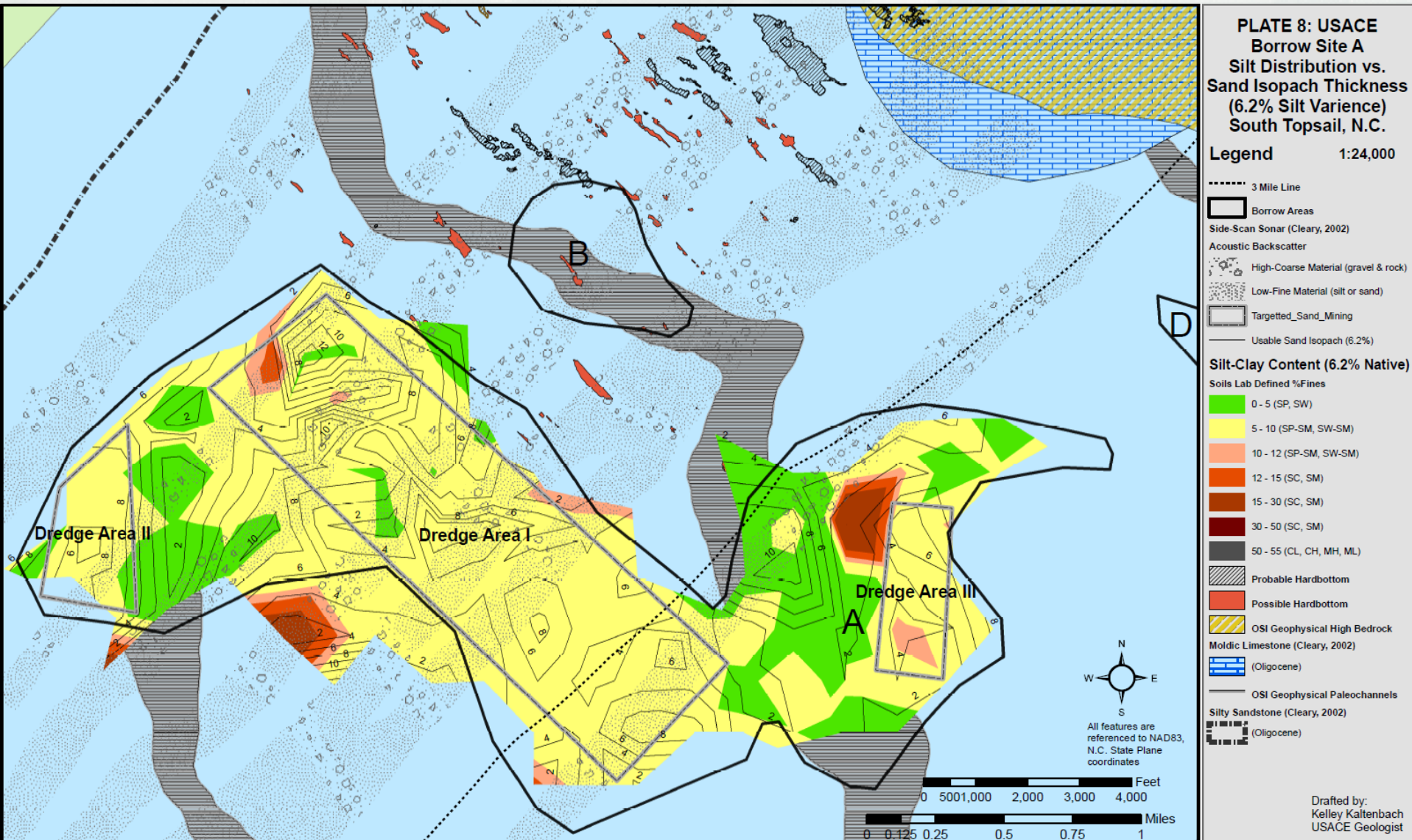
*Phi is a logarithmic unit used to measure grain sizes for sand, grit, and gravel. The 0 point of the scale is a grain size of 1 millimeter, and each increase of 1 in the phi number corresponds to a decrease in grain size by a factor of 1/2.



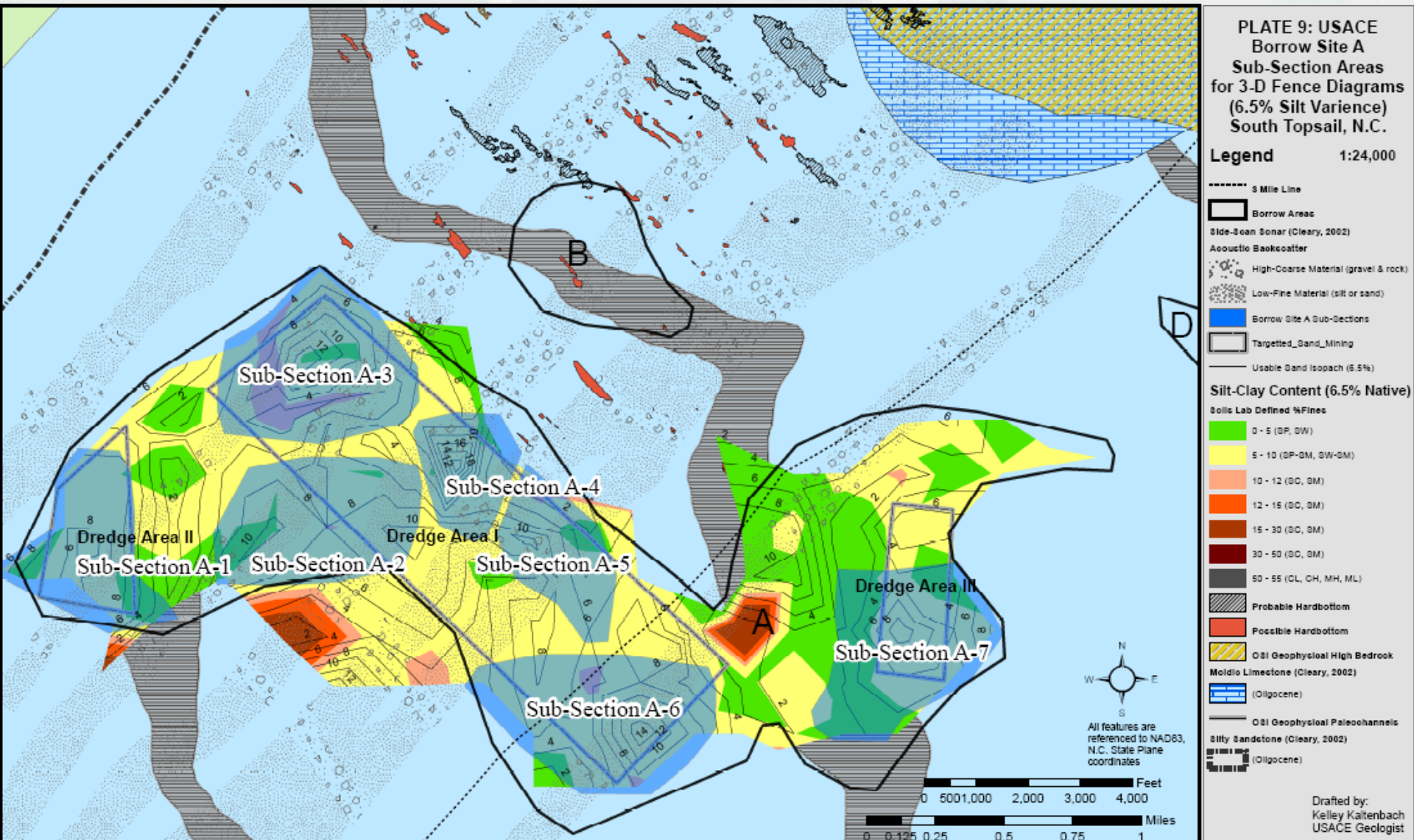
Sand Resource Isopach



Sand Isopach vs. Silt Distribution



3-D Analysis Borrow Site Isopach



3-D Fence Report (gINT)



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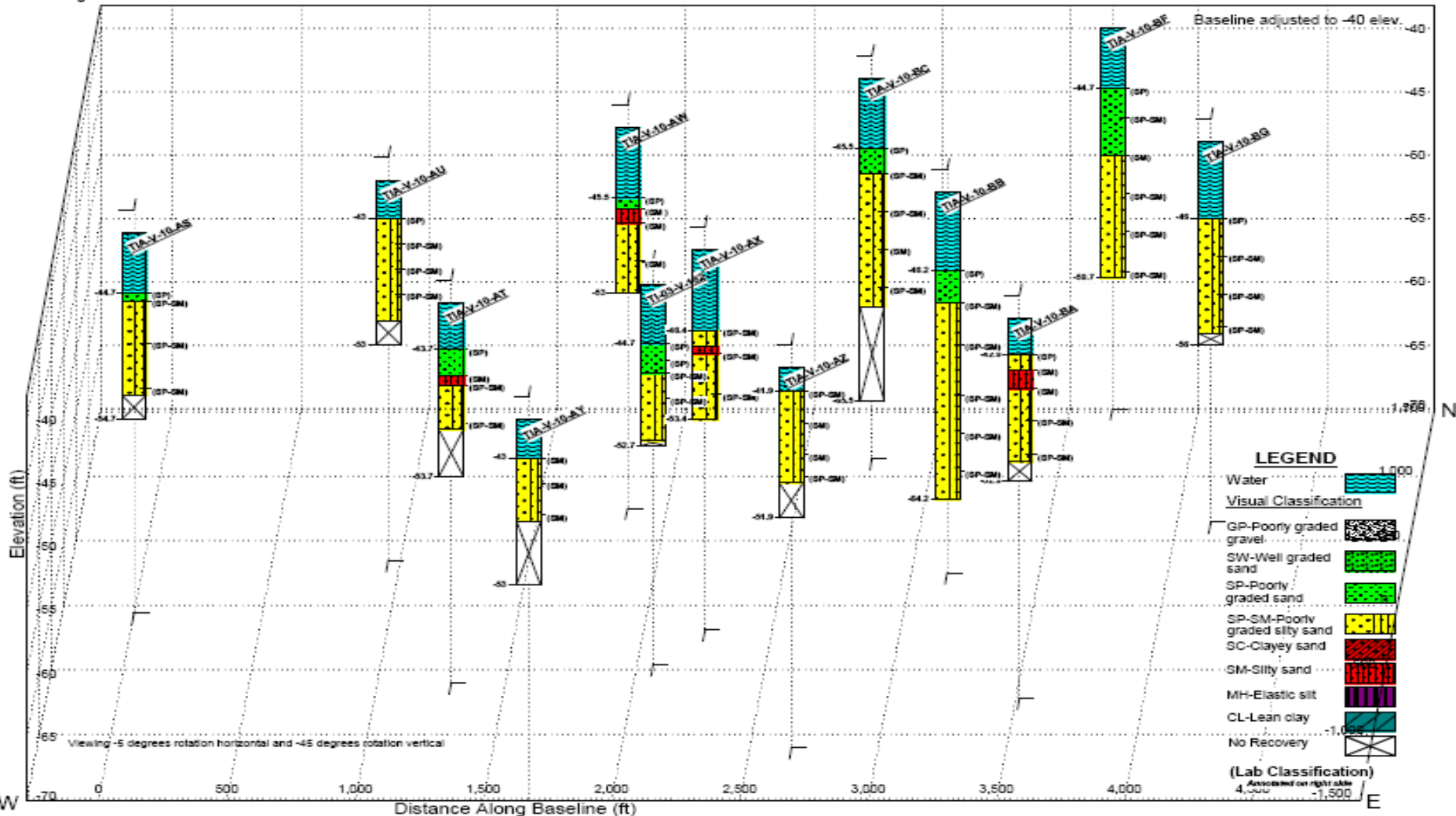
WEST ONSLOW & NEW RIVER INLET
TOPSAIL, NORTH CAROLINA
OFFSHORE PENDER & ONSLOW COUNTIES

SOILS & SUBSURFACE FENCE REPORT Sub-Section A-6

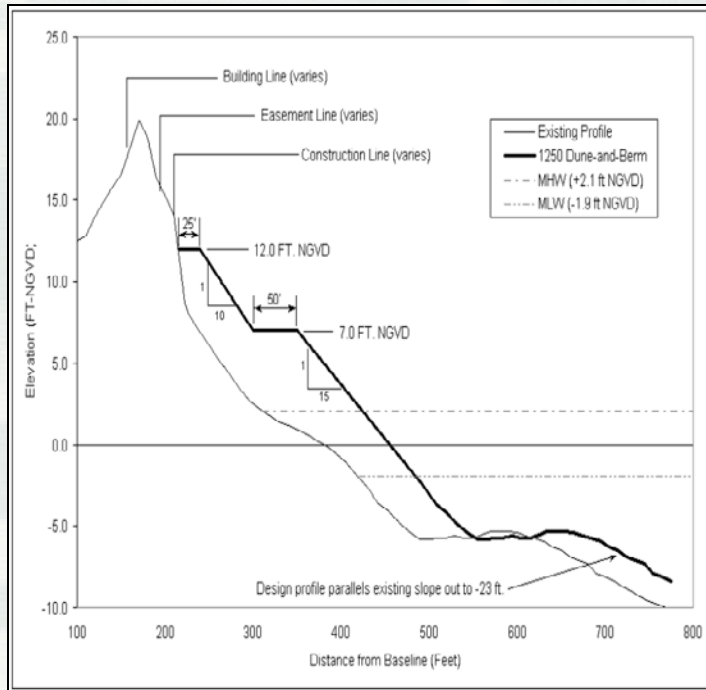
DATE: Nov 2010

SCALE: AS SHOWN

DRAWN BY: Kelley J. Kaltenbach



Material Quantities for Overfill Ratio



Locally preferred berm and dune

Composite % silt	Over- fill ratio*	Initial construction (CY)	Renourish- ment** (CY per cycle)	Total material needed (CY)
1.2	1.00	2,387,000	690,000	10,667,000
6.2	1.31	3,126,970	903,900	13,973,770
6.5	1.39	3,317,930	959,100	14,827,130
Under 10	1.50	3,580,500	1,035,000	16,000,500

* Adjusted Equilibrium Profile Method

** Assumes most of the renourishment material will come from Borrow site A or another borrow with a similar overfill ratio.

Note: Quantities are based on the amounts determined during the Feasibility Phase and are reported in the GRR.



Work for FY11

- Perform hydrographic and side-scan surveys.
 - Acquire survey-grade seafloor bathymetry to quantify usable material in Borrow Site A
- Develop optimal dredge plan for site development.
- Future Work dependent upon funding.



Questions?

My Thanks to the following people:

- Erin Williams (co-author)
- Mitch Hall, PG, Geotech Chief
- Greg Williams, PE, Ph.D., Chief, Engineering Branch , H&H
- Jan Brodmerkle, PE, Project MGR



- Crew of *D/B Snell*
- Naomi Hazelet
- Geotechnical Staff, USACE Wilmington District
- Brad Worley, PG
- My wife Jenny and lil' E.C.

