Bogue Banks

Master Beach Nourishment Plan

Carteret County, North Carolina

Shore protection office

Agenda

- Need for Town Concurrence/Approval of Plan
- Project Purpose and Need
- Project Work Plan and Data Collection Program
- Engineering Assessment
- Applicant's Preferred Alternative
- Next Steps/Schedule
- Discussion

Need for Town Concurrence/Approval of Plan

Permitting Agencies Required Interlocal Agreement as Part of Master Plan

- Agencies desired single point of contact for future permitting of individual projects
- Managing the island's shoreline as an entire system is preferred
- Staging and scheduling of projects for individual municipalities will be more predictable
- Combine FEMA maintenance plan and static line into a single uniform nourishment strategy
- Town concurrence/approval of master plan is integral part of interlocal agreement signed by County/Towns

Project Purpose and Need

Project Purpose

- Establish a regional plan facilitating the authorization and scheduling of Bogue Banks' shoreline nourishment/maintenance events
- Provide long-term shoreline stabilization and an equivalent level of protection along Bogue Banks' 25-mile oceanfront/inlet shorelines
- Provide long-term protection to Bogue Banks' tourism industry, state and local infrastructure, and oceanfront or adjacent structures
- Maintain natural resources and associated recreational uses while avoiding and minimizing adverse environmental impacts to the extent feasible

Project Purpose and Need

Project Purpose – (cont'd)

- Consolidate individual Town/County resources for managing the beaches in a more cost & logistically effective way and reduce/eliminate the time and need for individual authorizations

Need for Project

- A need exists to formulate and implement a Bogue Banks regional, long-term, and self-sustaining oceanfront/inlet shoreline protection program which involves consolidating resources from the County and all municipalities on Bogue Banks in the most effective financial and logistical manner.

THE 1990's: Hurricanes, More Hurricanes, And A Time Of Change.

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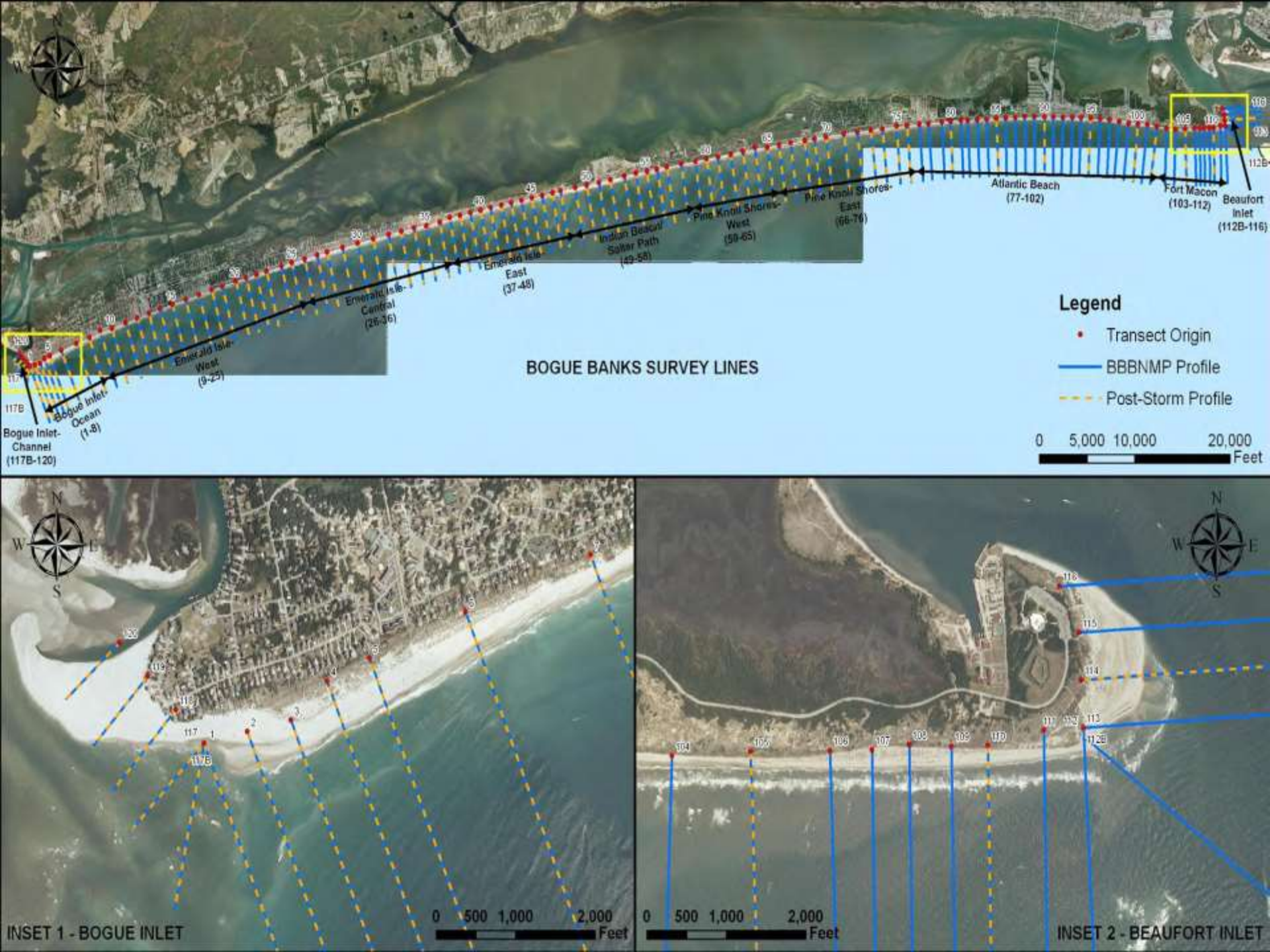
- ✓ ASSESS
- ✓ PLAN
- ✓ PERMIT
- ✓ FUND
- ✓ MONITOR


BOGUE BANKS SURVEY LINES
Legend
Transect Origin
BBBNMP Profile
Post-Storm Profile
0 5,000 10,000 20,000
Feet
Bogue Inlet-Channel (117B-120)
Bogue Inlet-Ocean (1-8)
Emerald Isle-West (9-25)
Emerald Isle-Central (26-36)
Emerald Isle East (37-48)
Indian Beach/ Salter Path (49-58)
Pine Knoll Shores-West (59-65)
Pine Knoll Shores-East (66-76)
Atlantic Beach (77-102)
Fort Macon (103-112)
Beaufort Inlet (112B-116)
INSET 1 - BOGUE INLET
0 500 1,000 2,000
Feet
INSET 2 - BEAUFORT INLET
0 500 1,000 2,000
Feet

THE 1990's: Hurricanes, More Hurricanes, And A Time Of Change.

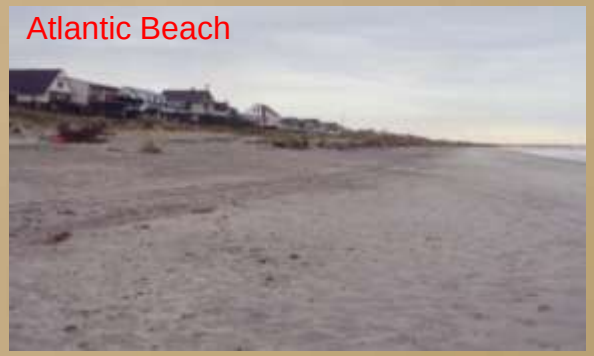

Emerald Isle


Indian Beach

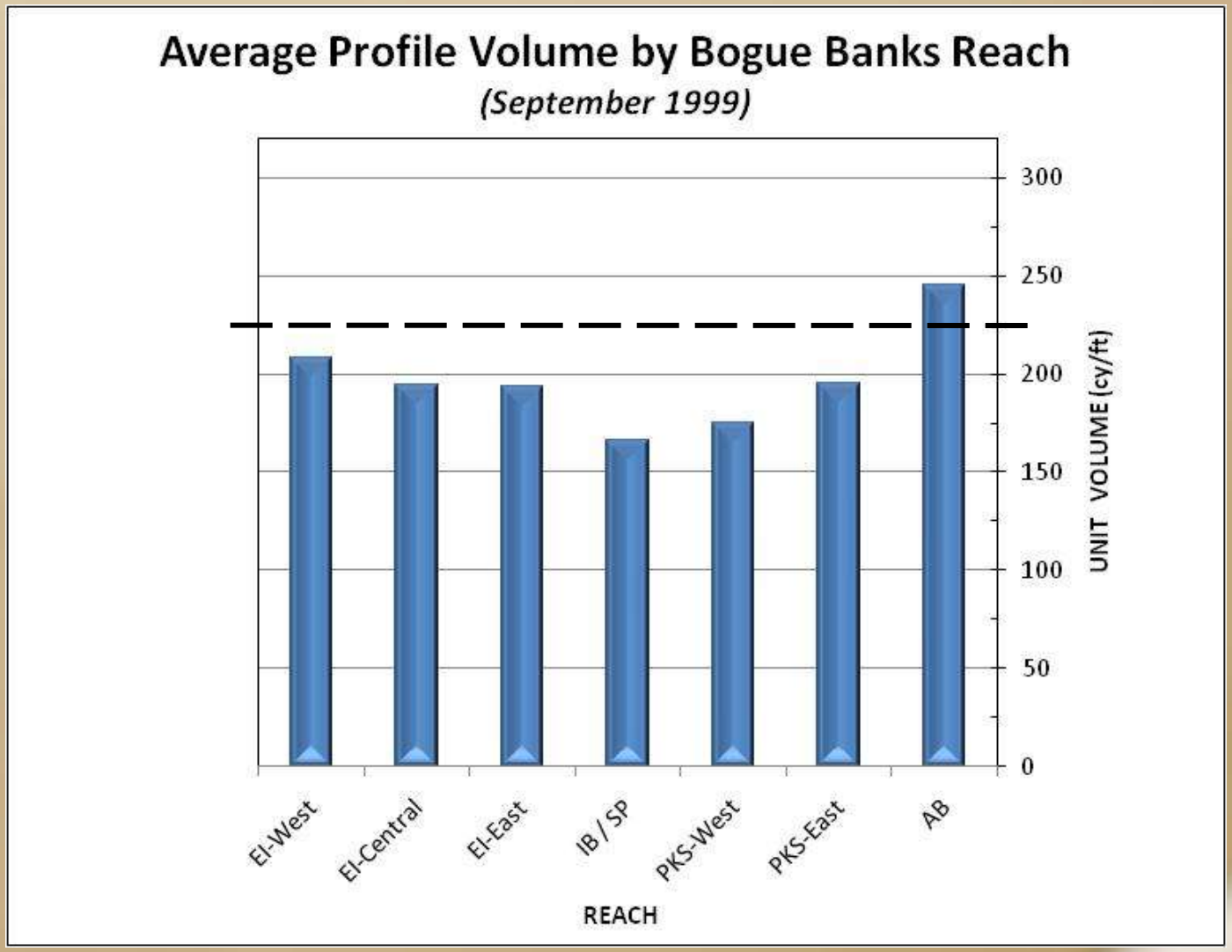

Pine Knoll Shores

VS.


Atlantic Beach


Atlantic Beach

VOLUME vs. SHORELINE



HISTORICAL PROJECTS

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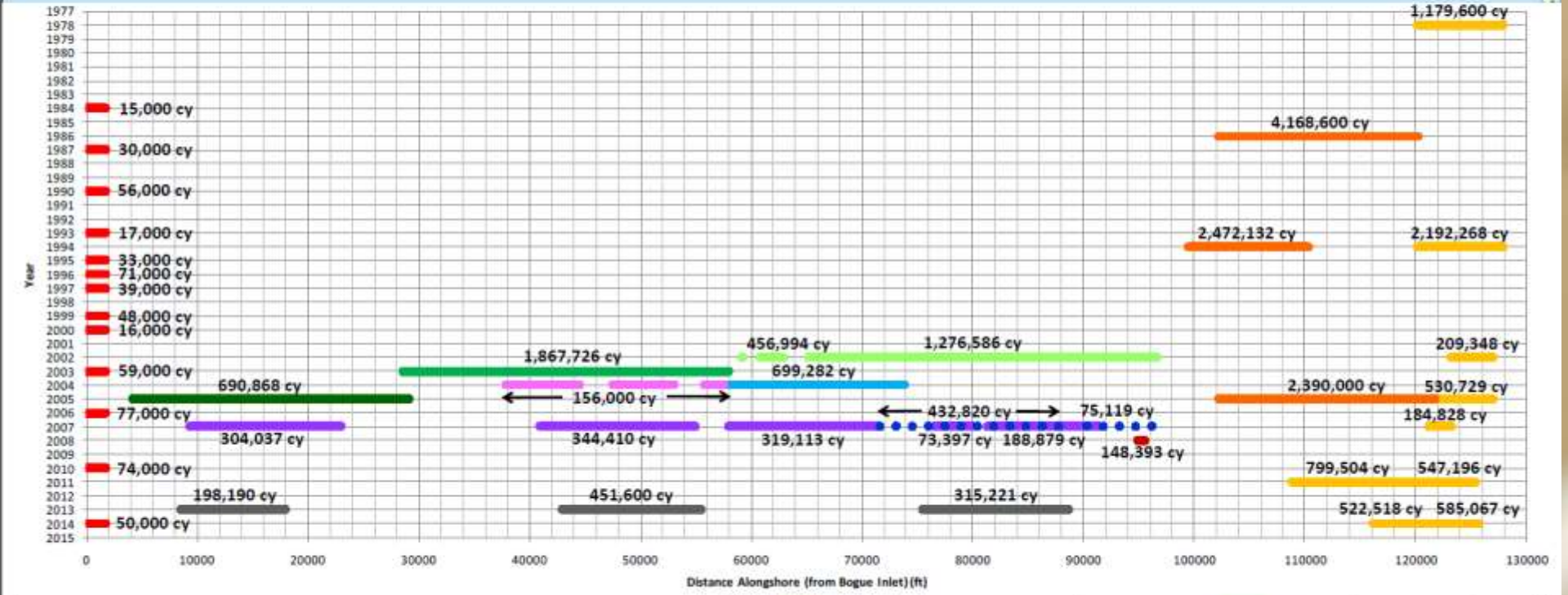

Bogue Banks Beach Nourishment Projects 1978-2014

- Bogue Inlet AIWW Crossing Disposal
- AIWW Tangent B Disposal
- MCH Inner Harbor Maintenance Dredge Disposal
- Brandt Island Pump-Out
- Bogue Banks Restoration - Phase I
- Bogue Banks Restoration - Phase II
- Bogue Banks Restoration - Phase III
- Section 933 - Phase I
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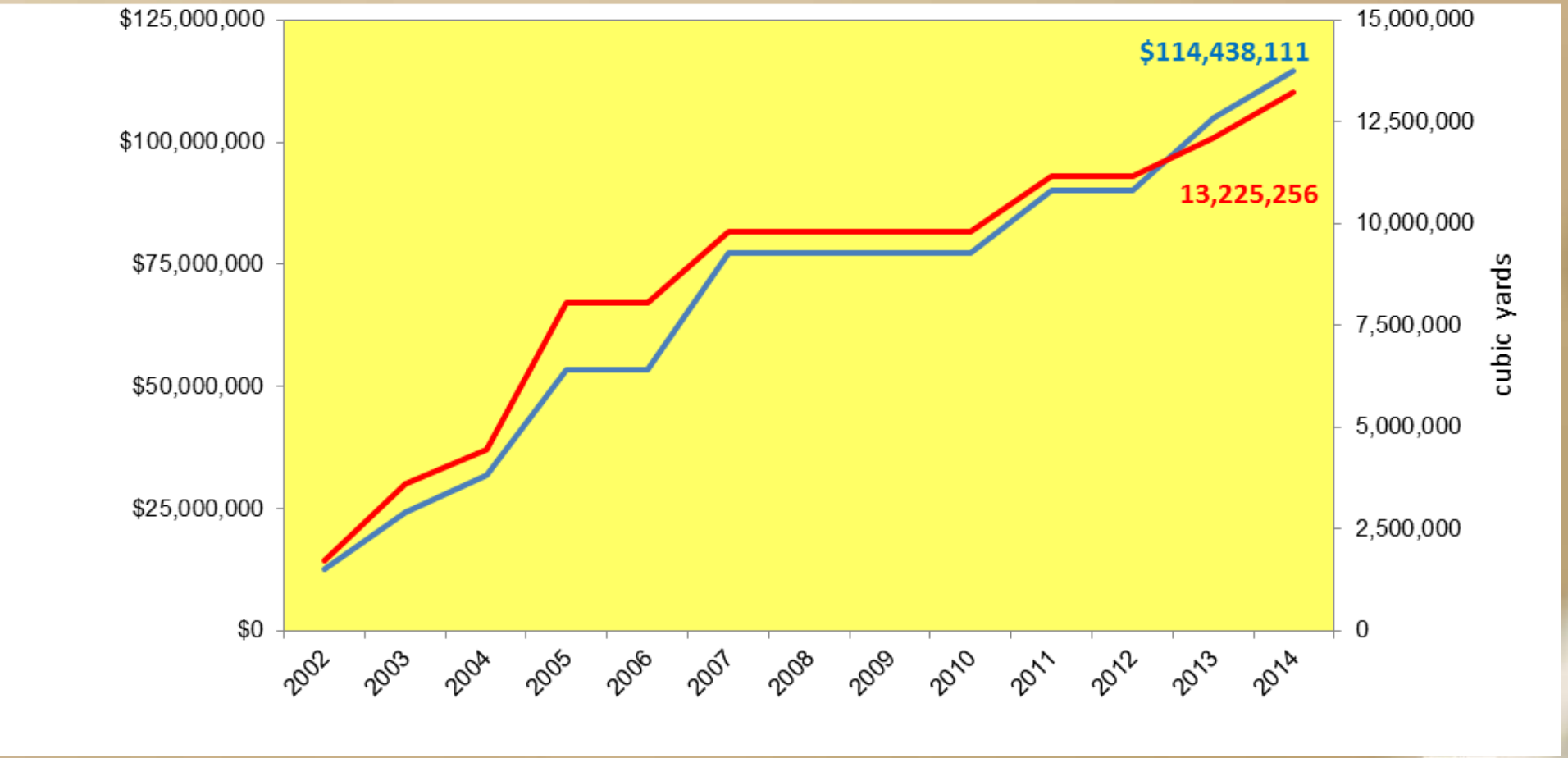
- FEMA Post-Isabel Restoration
- FEMA Post-Ophelia Restoration
- Post-Irene Restoration

Cumulative Costs and Volume



Cumulative Costs and Volume

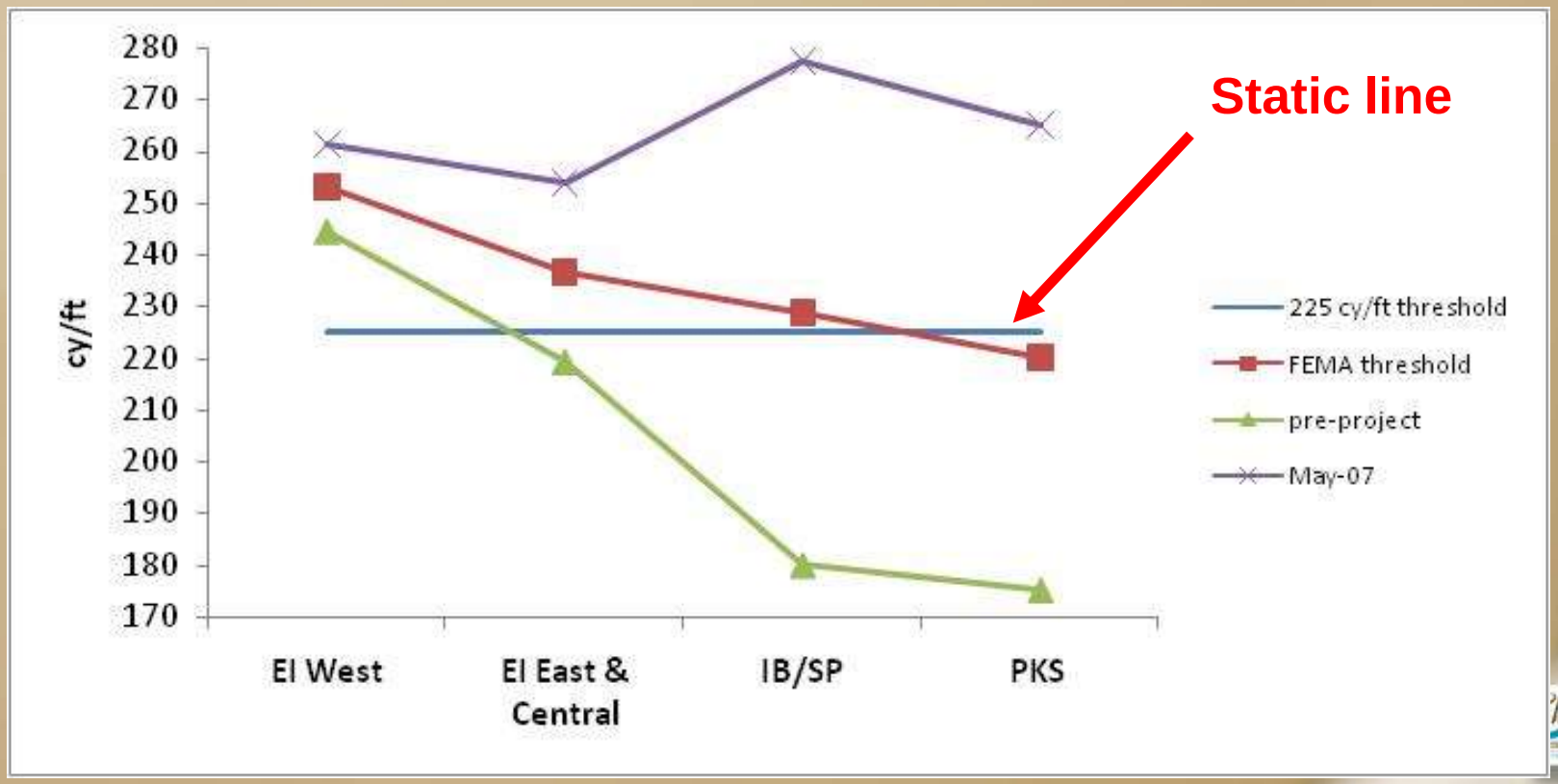
Project	Local ($)	State ($)	Federal ($)	Total ($)	cubic yards
Phase I ('01-'02)	$11,700,000	$900,000	$0	$12,600,000	1,733,580
Phase II ('03)	$11,800,000	$0	$0	$11,800,000	1,867,726
Phase III ('05)	$7,100,000	$3,800,000	$0	$10,900,000	690,868
933 Phase I ('04)	$400,000	$1,200,000	$3,800,000	$5,400,000	699,282
Pump-Out ('04-'05)	$0	$1,000,000	$9,600,000	$10,600,000	2,920,729
933 Phase II ('07)	$678,000	$2,000,000	$7,600,000	$10,278,000	507,939
Harbor ('10-'11)	$0	$0	$12,762,429	$12,762,429	1,346,700
Harbor ('14)	$0	$0	$9,415,774	$9,415,774	1,107,585
Isabel ('04)	$0	$0	$1,956,175	$1,956,175	156,000
Ophelia ('07)	$0	$0	$13,773,768	$13,773,768	1,229,836
Irene ('13)	$7,875,810	$0	$7,076,155	$14,951,965	965,011
TOTALS	**$39,553,810**	**$8,900,000**	**$65,984,301**	**$114,438,111**	**13,225,256**
%	**35%**	**8%**	**58%**	**100%**	

Cumulative Costs and Volume

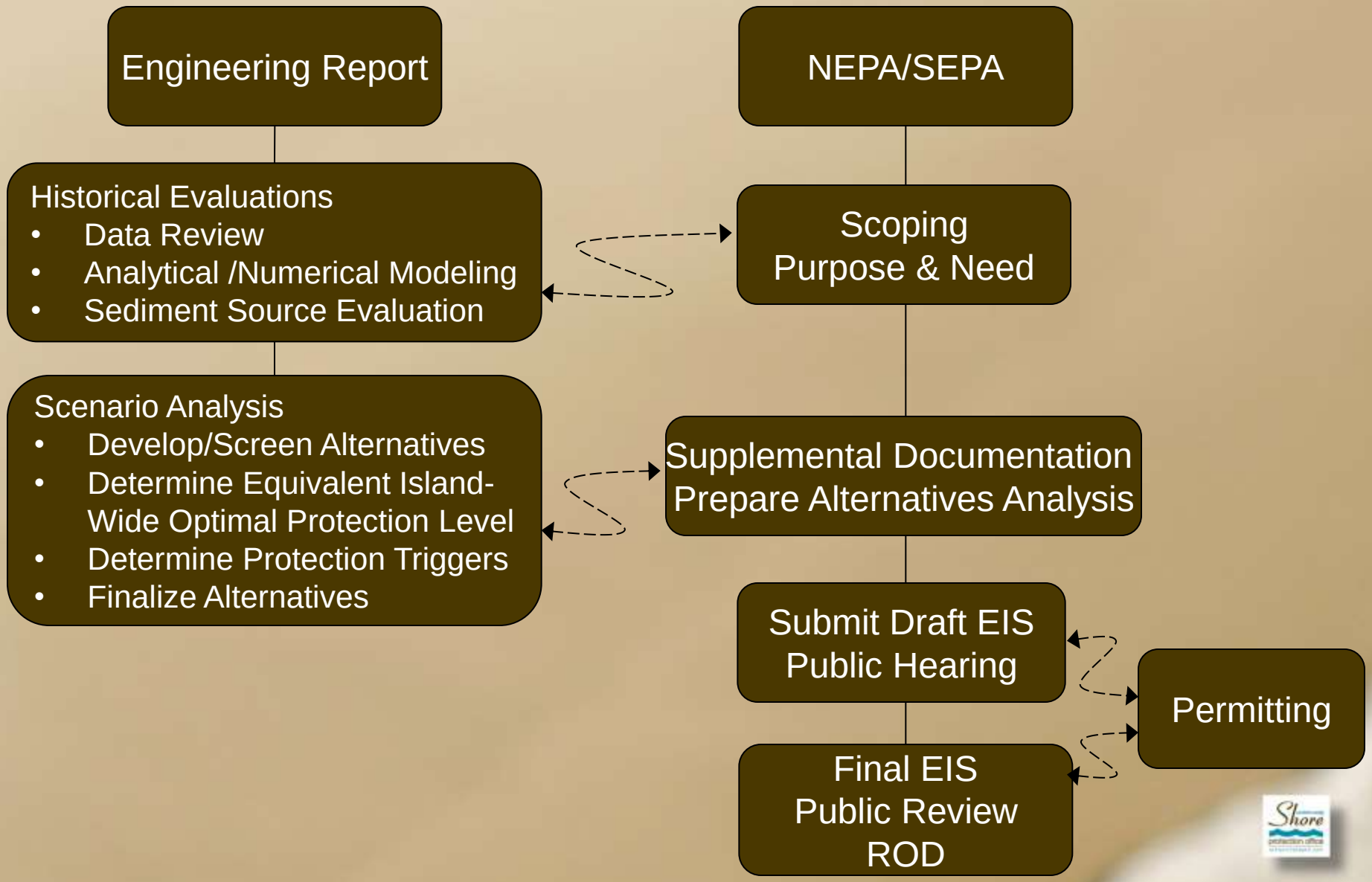
Project	County ($)	Pine Knoll Shores	Indian Beach	Emerald Isle	State ($)	Federal ($)	Total ($)	cubic yards
Phase I ('01-'02)	$0	$8,307,000	$3,393,000	$0	$900,000	$0	$12,600,000	1,733,580
Phase II ('03)	$0	$0	$0	$11,800,000	$0	$0	$11,800,000	1,867,726
Phase III ('05)	$0	$0	$0	$7,100,000	$3,800,000	$0	$10,900,000	690,868
933 Phase I ('04)	$0	$66,542	$333,458	$0	$1,200,000	$3,800,000	$5,400,000	699,282
Pump-Out ('04-'05)	$0	$0	$0	$0	$1,000,000	$9,600,000	$10,600,000	2,920,729
933 Phase II ('07)	$0	$678,000	$0	$0	$2,000,000	$7,600,000	$10,278,000	507,939
Harbor ('10-'11)	$0	$0	$0	$0	$0	$12,762,429	$12,762,429	1,346,700
Harbor ('14)	$0	$0	$0	$0	$0	$9,415,774	$9,415,774	1,107,585
Isabel ('04)	$0	$0	$0	$0	$0	$1,956,175	$1,956,175	156,000
Ophelia ('07)	$0	$0	$0	$0	$0	$13,773,768	$13,773,768	1,229,836
Irene ('13)	$5,920,405	$511,798	$0	$1,443,607	$0	$7,076,155	$14,951,965	965,011
TOTALS	**$5,920,405**	**$9,563,340**	**$3,726,458**	**$20,343,607**	**$8,900,000**	**$65,984,301**	**$114,438,111**	**13,225,256**
%	**5%**	**8%**	**3%**	**18%**	**8%**	**58%**	**100%**	

LOOKING BACK

- We've used the volumetric approach with the 225 cy/ft trigger.
- FEMA is 50% of the nourishment fill.
- And…there's the 30-year Static Line Exception Plan trigger.



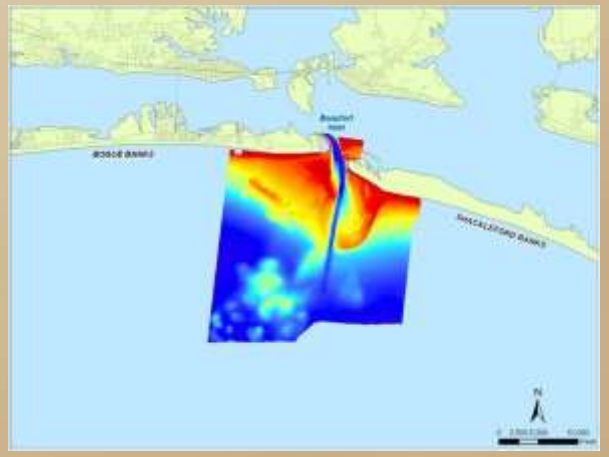
Project Work Plan

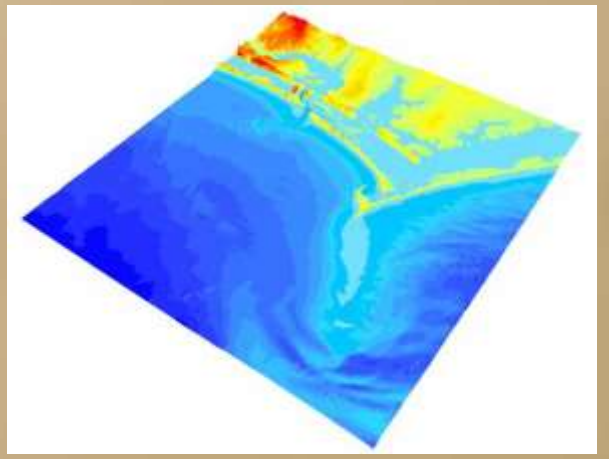


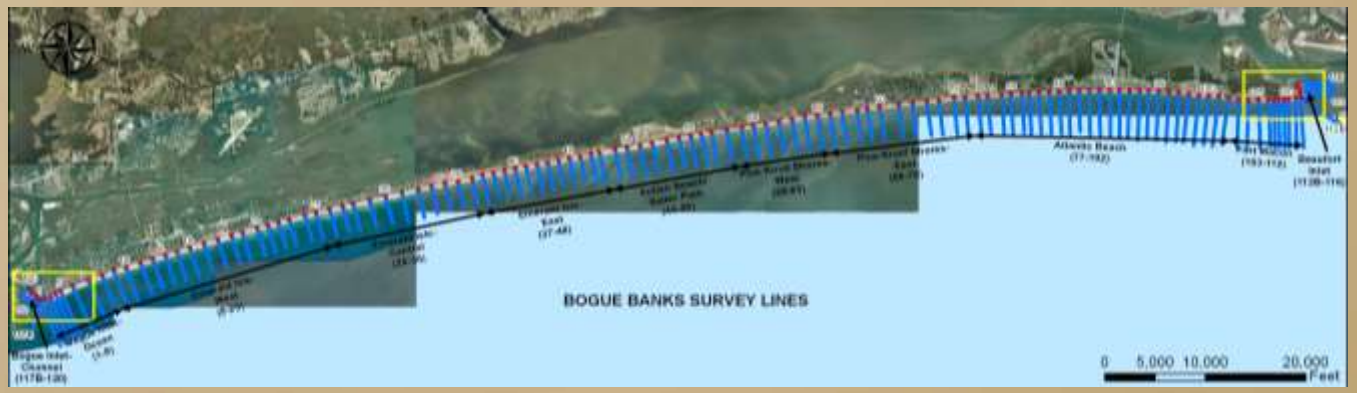
Data Collection and Review

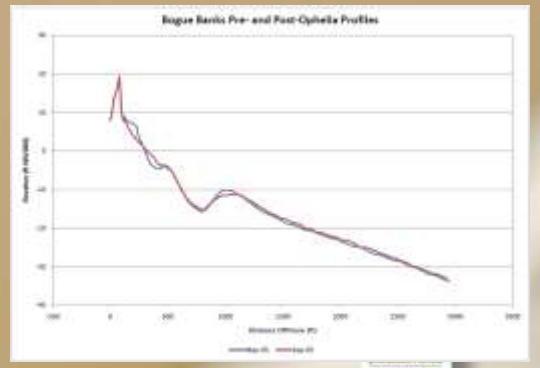
RICH DATASET – Especially Over Last Decade

- Three declared events – Isabel, Ophelia and Irene
- Trends are affected by management interventions

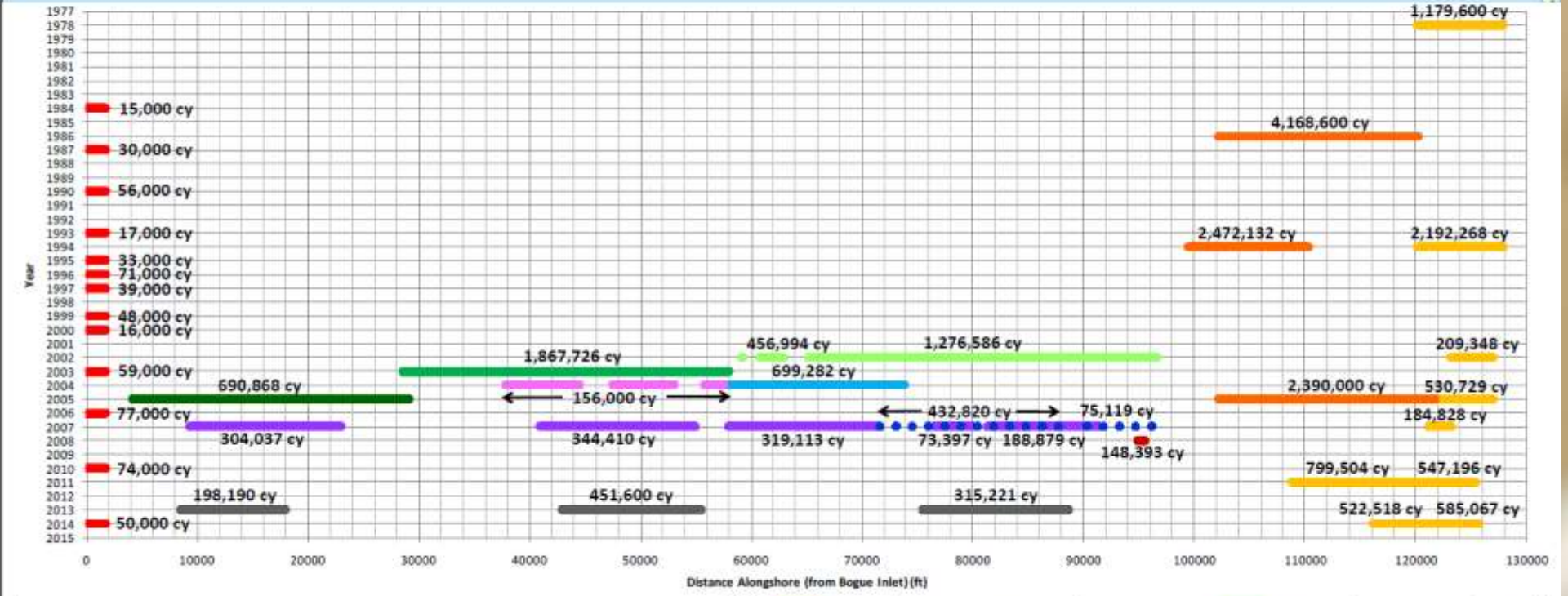








Data Collection and Review



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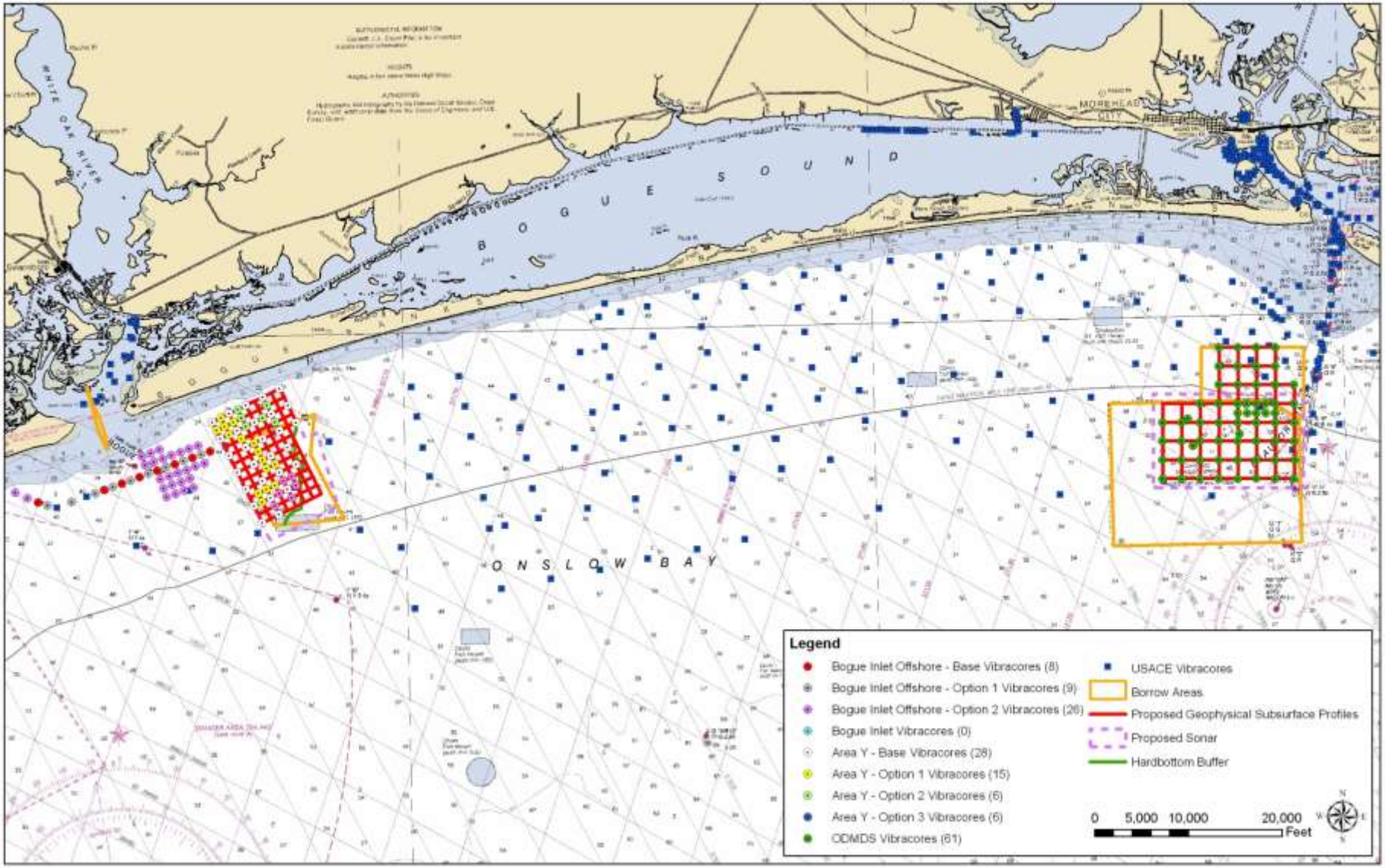
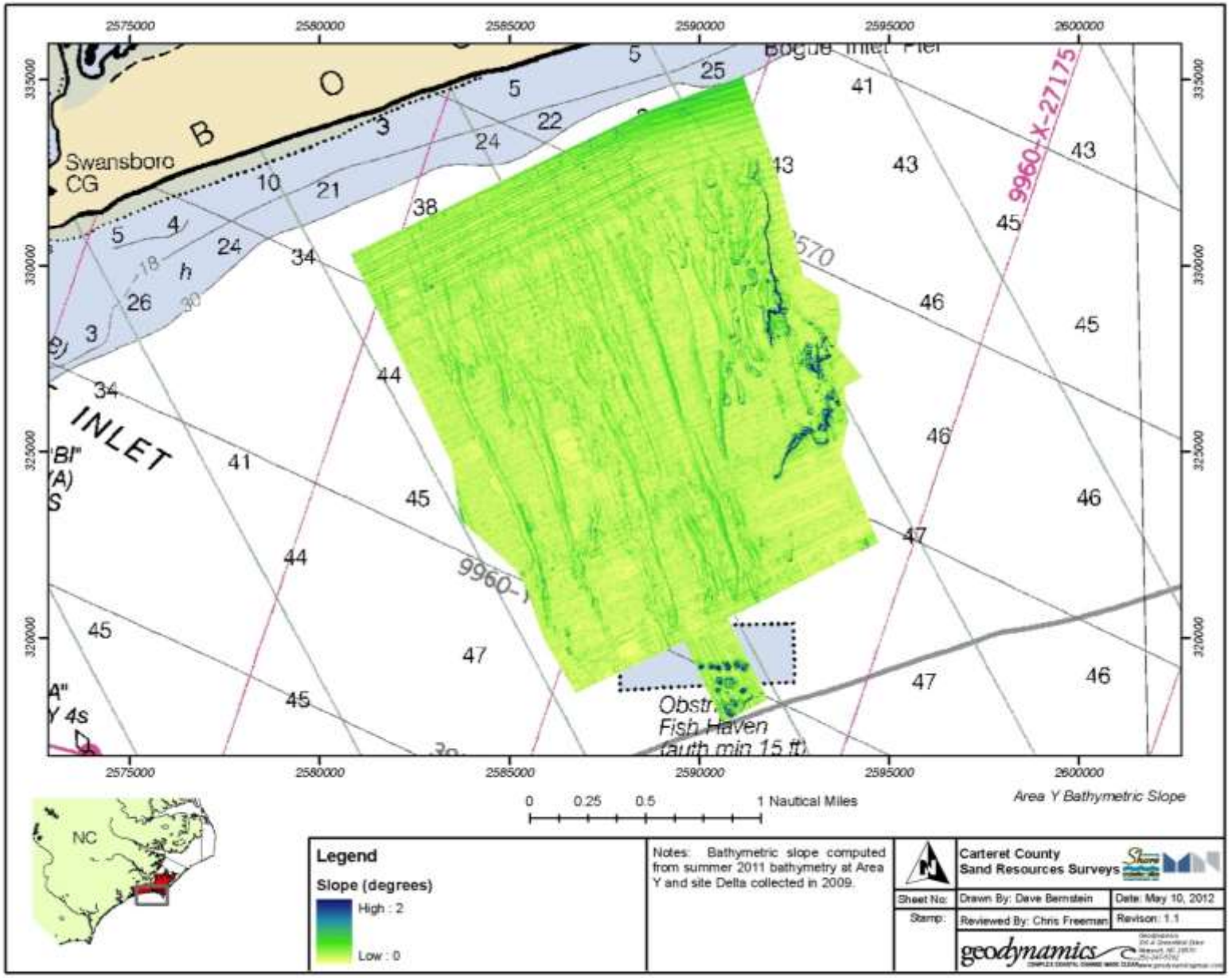
Preliminary Project Study Area

Field Program Development



Geophysical Imaging

Results - Bathymetry



AREA Y

- Hardbottoms
- Shore-perp features

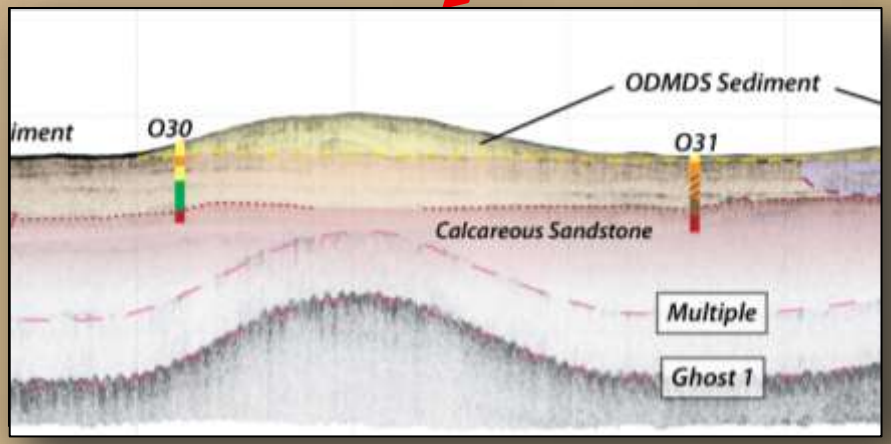
Subsurface Profiles

Methodology

RV CAPRICORN

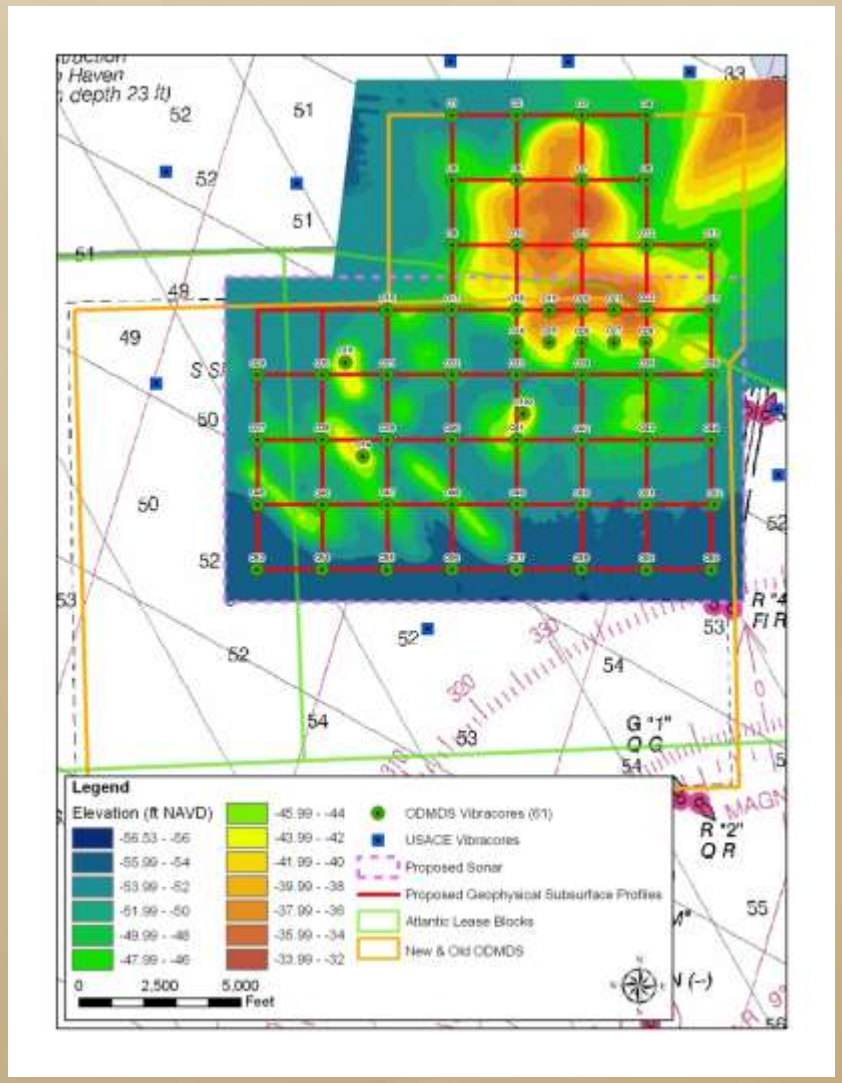
CHIRP SUB-BOTTOM PROFILER

- EdgeTech sb512i
- 0.7-12 kHz CHIRP signal
- Survey at 2-4 kts



Field Program Development

Vibracore Plan



Potential Borrow Areas: Summary

Area	Section	Navigation	Volume (cy)	Mean Grain Size (mm)	Fines (%)	CaCO3 (%)	Overfill Factor	Rank
Native Beach	CSE 2001 Composite	-	-	0.3	< 1	≤ 20	-	-
Old ODMDS	Old ODMDS 1	No	13,138,307	0.3	0.53	13.6	1.25	A
	Old ODMDS 2	No	1,098,108	0.32	0.2	13.6	1.25	A
Current ODMDS	Current ODMDS 1	No	3,268,601	0.3	0.52	13.3	1.25	A
	O-192 Mound	No	785,270	0.36	0.13	19.6	1.25	A
	O-14/O47 Mound	No	566,028	0.38	0.23	19.8	1.2	A
	O-15 Mound	No	355,920	0.24	0.07	10.1	1.6	B
	O-35 Mound	No	499,491	0.3	0.31	15.2	1.3	B
	O-46 Mound	No	493,564	0.4	0.37	18.2	1.25	B
	O-48 Mound	No	468,740	0.2	5.91	7.8	2.25	C
	Remaining Mounds	No	320,000	-	-	-	-	C
Area Y	Y-80 Mound	No	1,079,853	0.23	2.37	1.5	2.5	C
	Y-120 Mound	No	379,675	0.4	2.04	1.5	1.3	C

Non-Renewable Use Volume Totals

Area	Total Volume (cy)
Sand Mines	1,380,700
AIWW Disposal Areas	1,288,800
Offshore Sources	22,453,557
TOTAL	**25,123,057**

Potential Borrow Areas: Summary

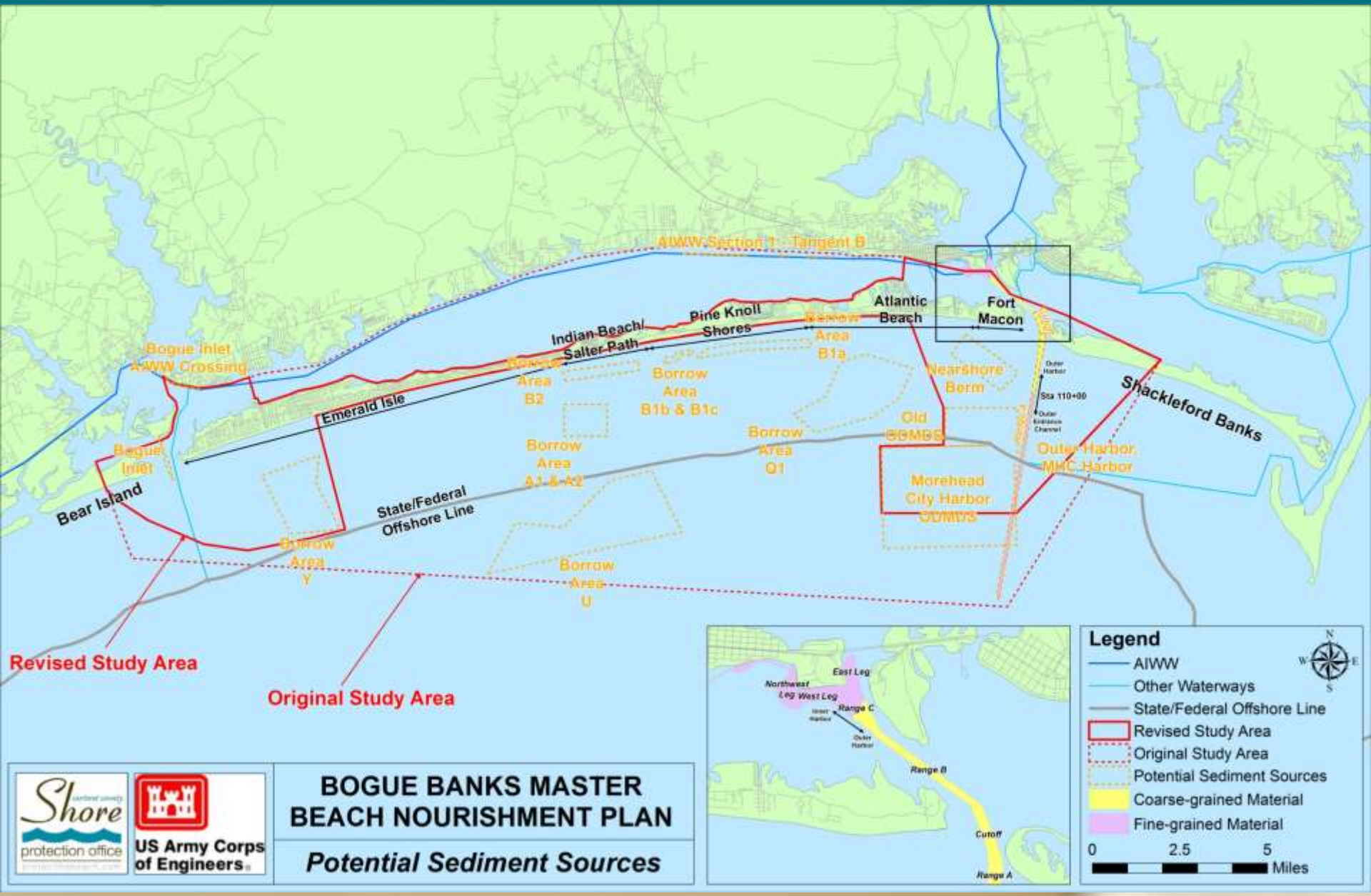
Renewable Use Volume Totals

Area	Section	Volume	Dredging Frequency	50 yr Total
MHC Outer Harbor	Cutoff+Range A to STA 110	400,000 cy (assumed)	1 years	20,000,000
Bogue Inlet	Inlet Relocation	850,000 cy	10 years	4,250,000
	AIWW Crossing	44,000 cy	2.5 years	880,000
			Totals:	**25,130,000**

Total Volume Available

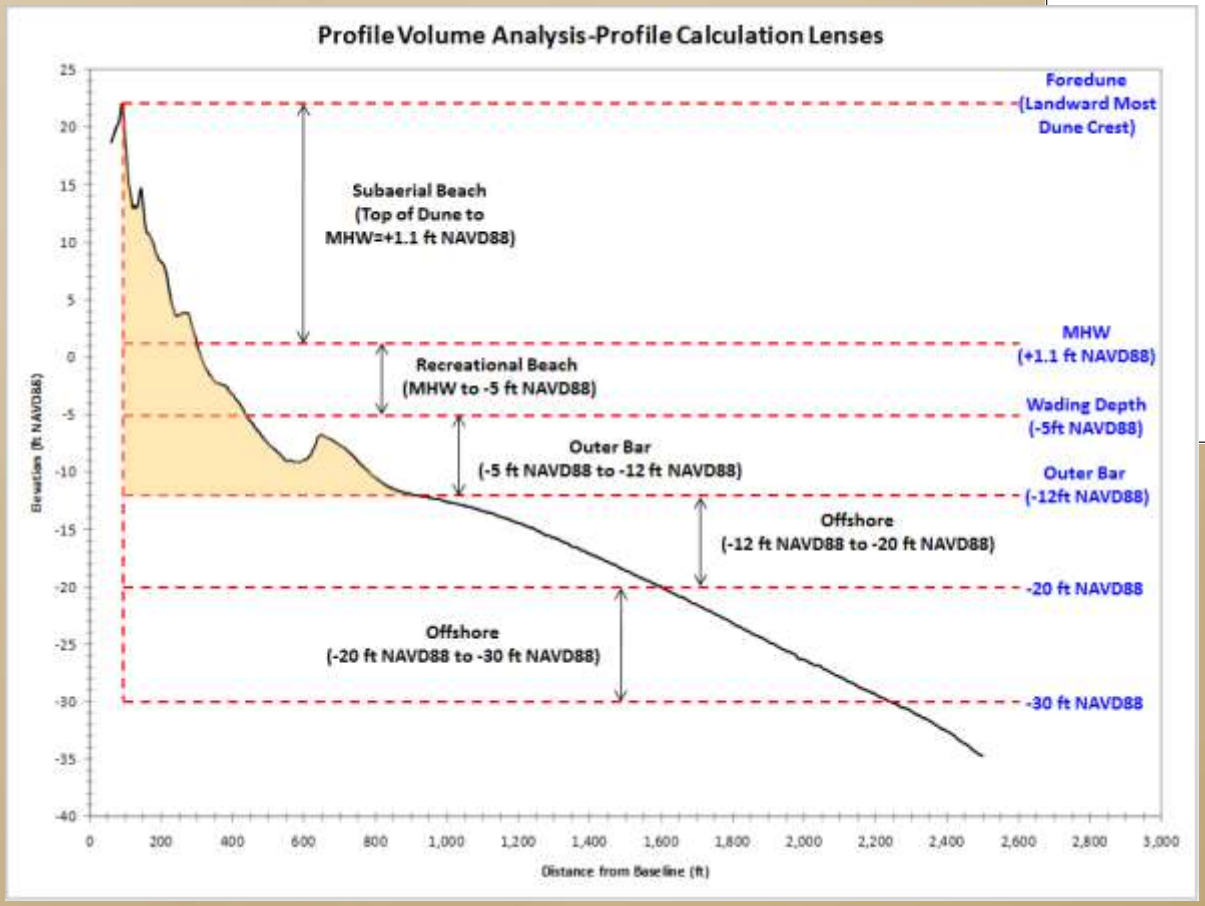
Source	50-Yr Total Volume (cy)
Renewable	25,130,000
Non-Renewable	25,123,057
TOTAL	**50,253,057**

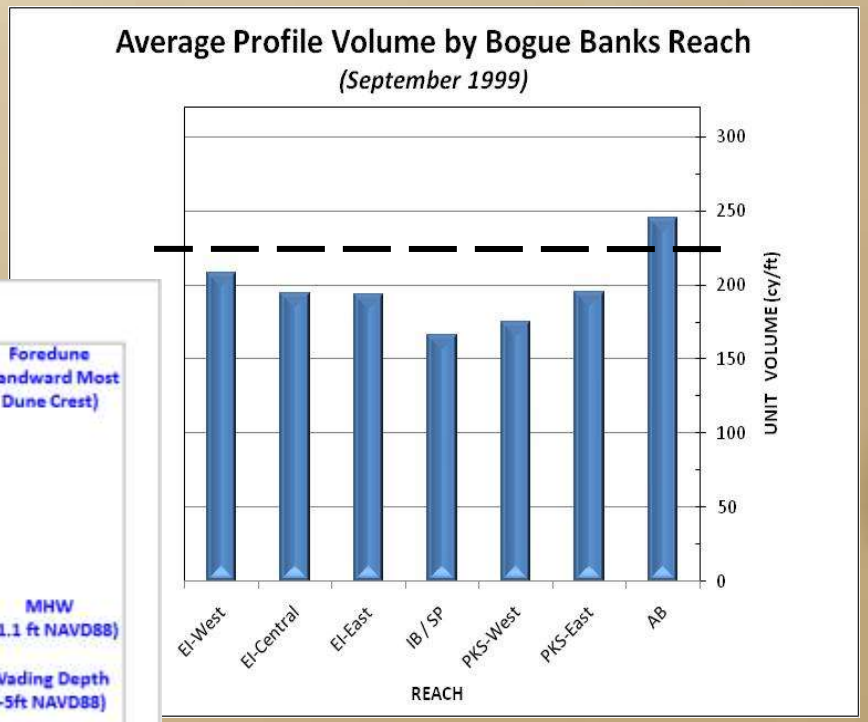
Revised Study Area



Analytical/Empirical Assessment to Determine Volume Need

KEY TERMS - Profile (Volume) Change

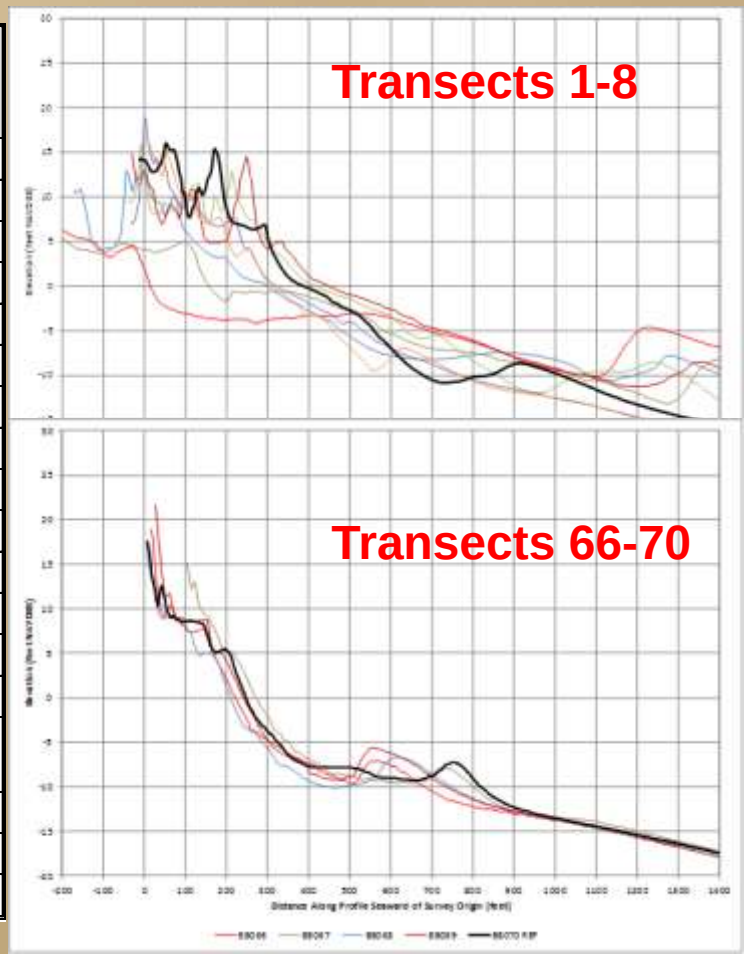




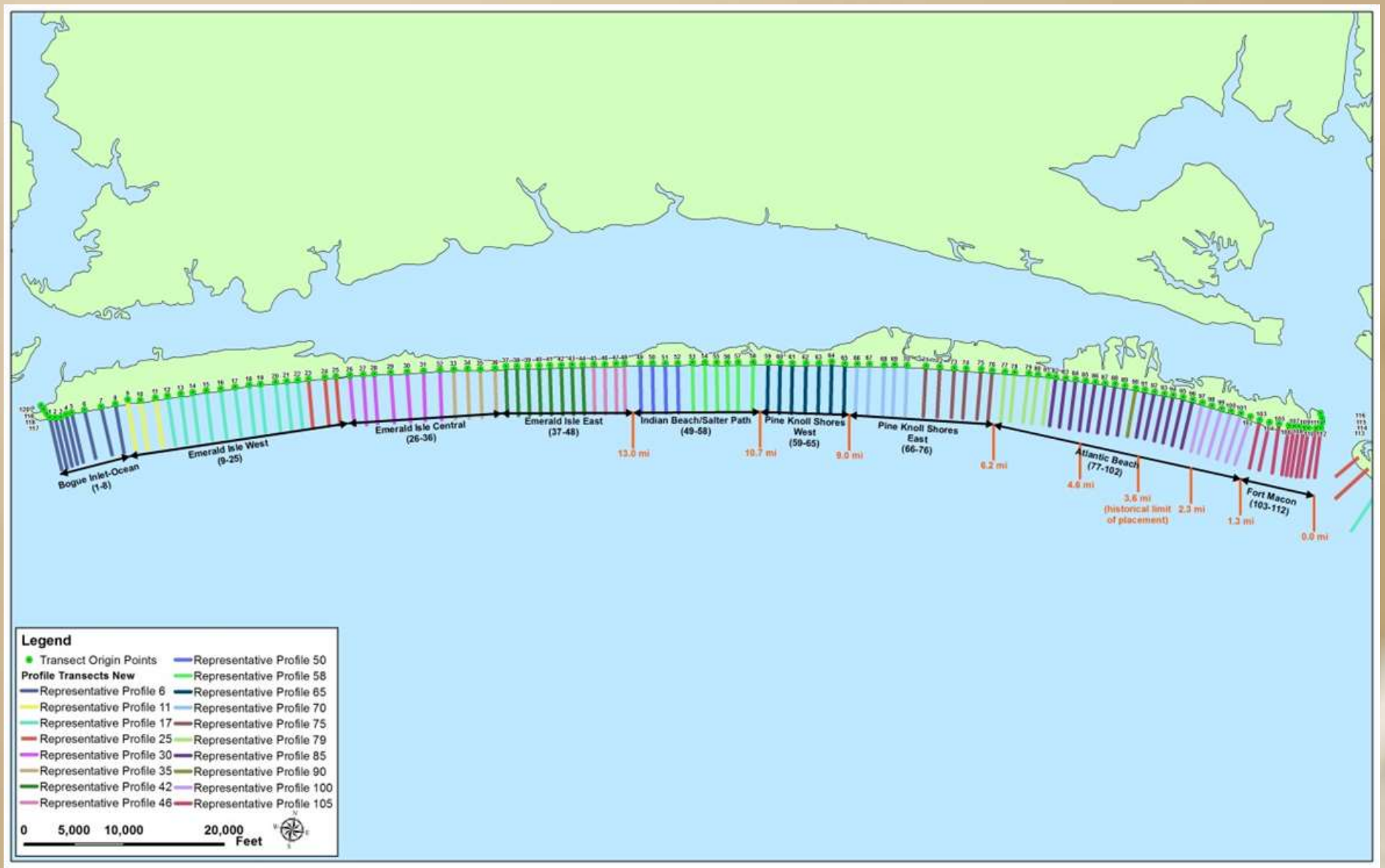
Study Reaches

- Reviewed Transects and Selected Similar Profiles and Grouped Together Based on Dune/Berms Shape, and Height to Determine Reaches

Reach	Bogue Banks Transects	Length (feet NAVD88)	Representative Transect
Bogue Inlet – Ocean (1-8)	1 through 8	7,432	6
Emerald Isle – West (9-25)	9 through 11	4,056	11
	12 through 22	14,283	17
	23 through 25	4,005	25
Emerald Isle – Central (26-36)	26 through 32	10,428	30
	33 through 36	5,374	35
Emerald Isle – East (37-48)	37 through 44	8,814	42
	45 through 48	4,406	46
Indian Beach – Salter Path (49-58)	49 through 52	5,275	50
	53 through 58	7,575	58
Pine Knoll Shores – West (59-65)	59 through 65	9,063	65
Pine Knoll Shores – East (66-76)	66 through 70	6,564	70
	71 through 76	8,251	75
Atlantic Beach (77-102)	77 through 81	5,388	79
	82 through 89 & 91 through 96	13,771	85
	90	1,006	90
	97 through 102	6,011	100
Fort Macon State Park (103-112)	103 through 112	6,691	105



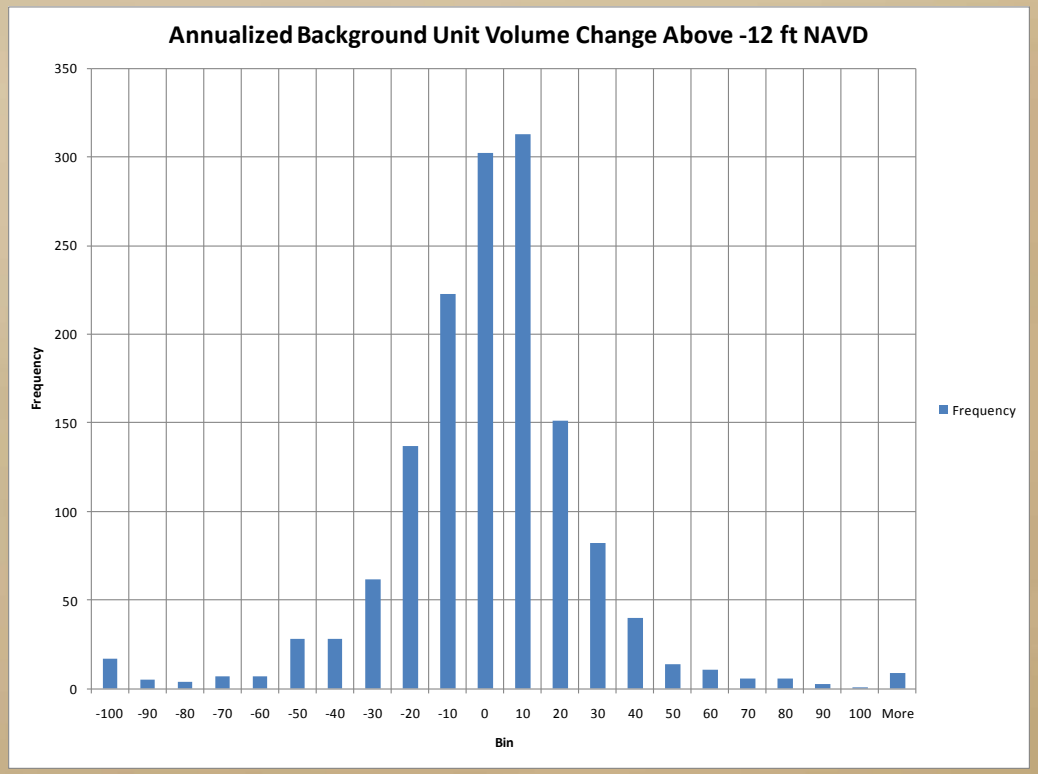
Study Reaches

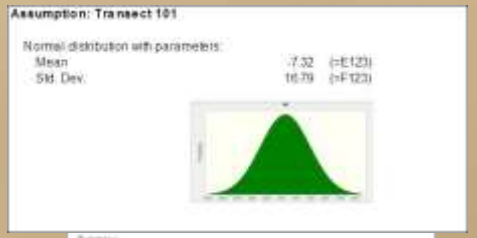


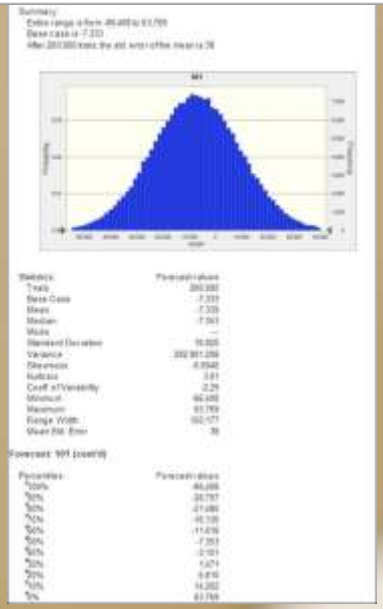
Crystal Ball Analyses

- Ran Crystal Ball Models with Reach Breakdowns for All Studied Elevations (+1.1', -5', -12', -16', -20', -30') For All Data (1999-2012)

- Normal Distribution was Valid Assumption Based on Data







Crystal Ball Analyses

- Final Estimates Use 50% Exceedance (All Loss) – for Accretional Reaches Select 1st Loss % (55-70%)

	Reach Length (ft)	USACE Annual Renourishment (cy)	USACE Annual Renourishment Density (cy/ft)		-12 ft Annual Loss 50% (All Loss)(cy)	-12 ft Annual Loss Density 50% (All Loss) (cy/ft)
Bogue Inlet (1-8)	7,432	-19,228	-2.6		-39,468	-5.3
Emerald Isle West - West (9-11)	4,056	-24,225	-6.0		-5,384	-1.3
Emerald Isle West - Central (12-22)	14,283	-16,233	-1.1		-4,768	-0.3
Emerald Isle West - East (23-25)	4,005	-295	-0.1		-1,566	-0.4
Emerald Isle Central - West (26-32)	10,428	-5,245	-0.5		-14,093	-1.4
Emerald Isle Central - East (33-36)	5,374	-2,133	-0.4		-10,890	-2.0
Emerald Isle East - West (37-44)	8,814	-22,025	-2.5		-40,472	-4.6
Emerald Isle East - East (45-48)	4,406	-8,410	-1.9		-23,272	-5.3
Indian Beach/Salter Path - West (49-52)	5,275	-18,144	-3.4		-54,380	-10.3
Indian Beach/Salter Path - East (53-58)	7,575	-23,753	-3.1		-8,187	-1.1
Pine Knoll Shores - West (59-65)	9,063	-31,057	-3.4		-13,726	-1.5
Pine Knoll Shores - East - West (66-70)	6,564	-19,056	-2.9		-24,709	-3.8
Pine Knoll Shores East - East (71-76)	8,251	-31,562	-3.8		-46,360	-5.6
Atlantic Beach - West (77-81)	5,388	-26,533	-4.9		-5,881	-1.1
Atlantic Beach - Central (82-89, 91-96)	13,771	-52,361	-3.8		-96,718	-7.0
Atlantic Beach - Circle (90)	1,006	-4,280	-4.3		-12,948	-12.9
Atlantic Beach - East (97-102)	6,011	-51,707	-8.6		-49,398	-8.2
TOTAL ANNUAL VOLUME CHANGE	**121,702**	**-356,247**	**-2.9**		**-452,220**	**-3.7**
50-yr Nourishment Need	**121,702**	**-17,812,350**			**-22,611,000**	

Probability	Storm Loss above -12 ft NAVD (cy)	Storm Loss above -16 ft NAVD (cy)
85%	-1,644,909	-1,847,667
84%	-1,636,034	-1,839,681
80%	-1,602,871	-1,809,816
75%	-1,567,196	-1,776,197
70%	-1,534,995	-1,747,197
65%	-1,506,039	-1,719,307
60%	-1,477,667	-1,693,397
55%	-1,450,894	-1,668,206
50%	-1,424,153	-1,644,355

- **Total 50 yr need = 22.6 Mcy (Background) + 22.4 to 27.2 Mcy (Storm) = <u>45.0 – 49.8 Mcy</u>**

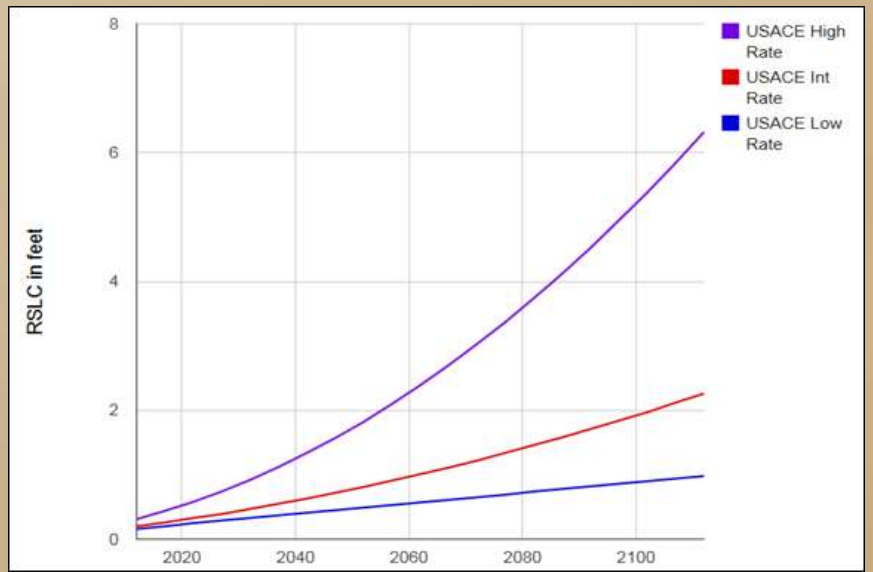
Sea Level Change Effects

- **Total 50 yr need with Potential Sea Level Change = <u>46.8 – 51.6 Mcy</u>**

- Previous PRT Guidance – Use Intermediate Rate from USACE Guidance

- Add Elevation to Entire Profile

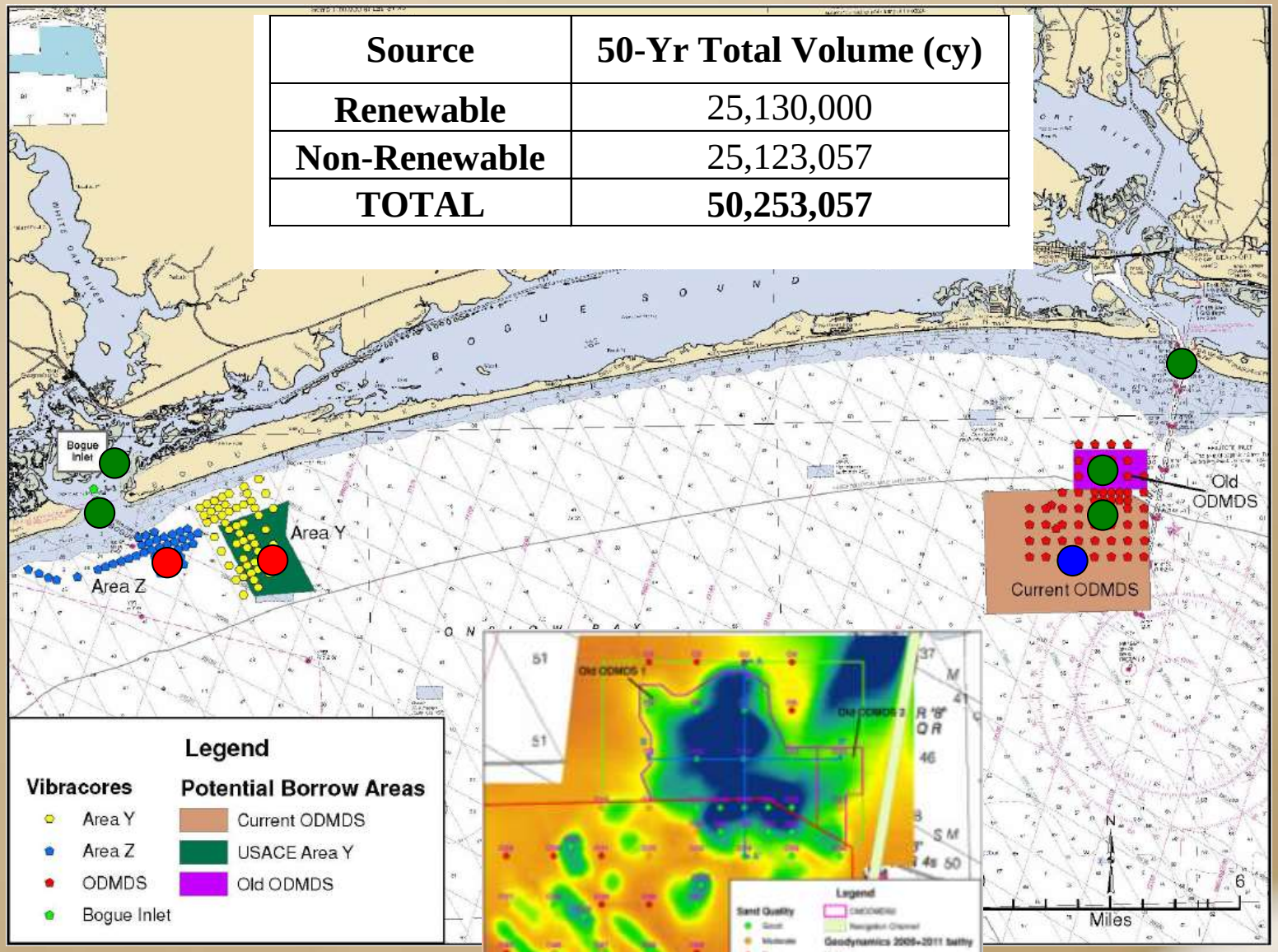
Project Time-Frame	Relative Sea-Level Change Scenario		
	Low (feet)	Intermediate (feet)	High (feet)
Year 2022 (10 years)	0.25	0.33	0.58
Year 2037 (25 years)	0.37	0.55	1.12
Year 2062 (50 years)	0.57	1.01	2.39
Year 2087 (75 years)	0.78	1.58	4.12
Year 2112 (100 years)	0.98	2.26	6.32



Low SLC: +0.57 feet	Intermediate SLC: +1.01 feet	High SLC: +2.39 feet
1,030,000 cubic yards	1,825,000 cubic yards	4,300,000 cubic yards

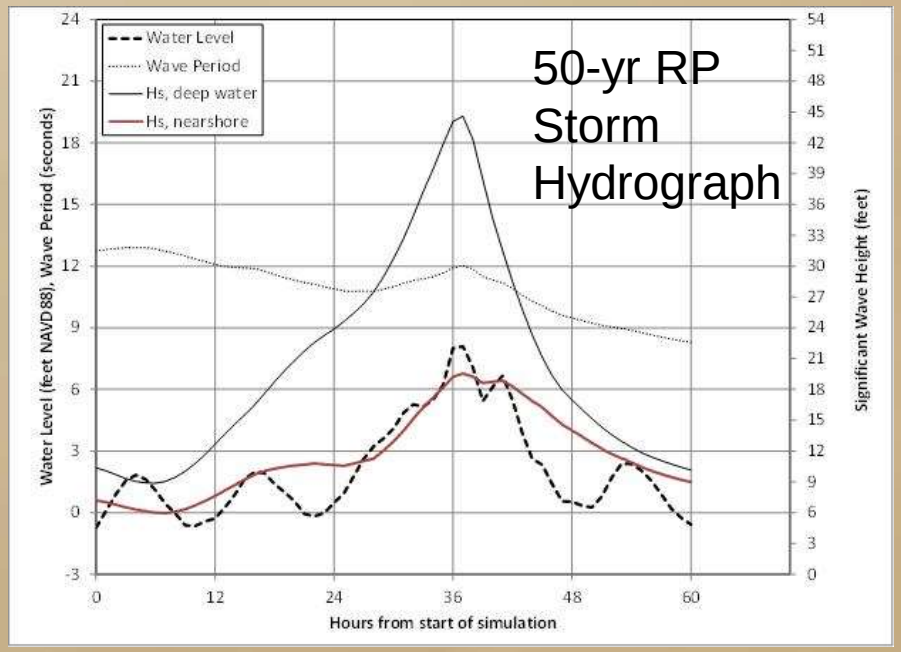
Potential Borrow Areas: Summary

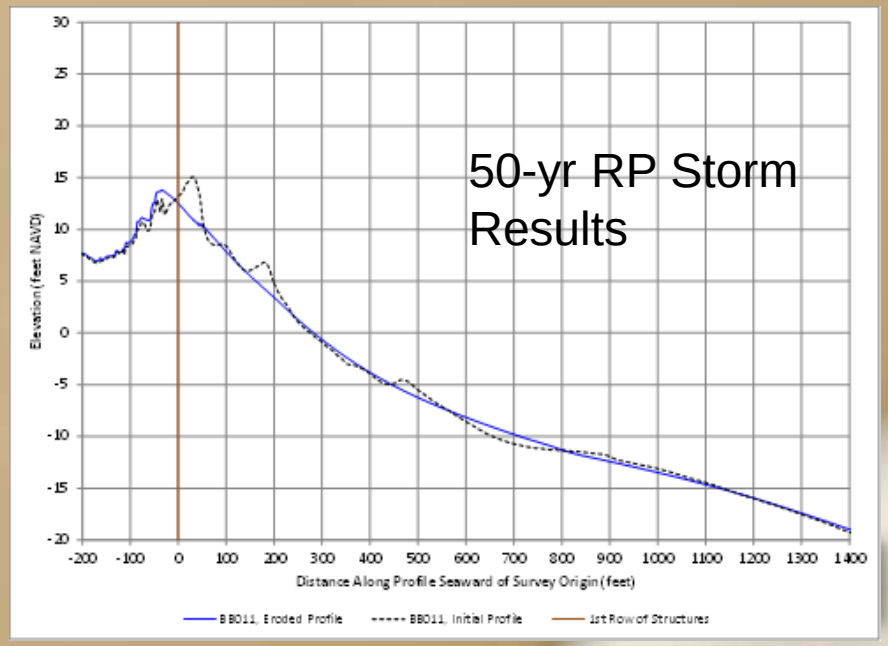
Source	50-Yr Total Volume (cy)
Renewable	25,130,000
Non-Renewable	25,123,057
TOTAL	**50,253,057**



Level of Protection (LoP) Determination

- Synthetic Storms Developed for 10, 25, 50 and 100 yr RP
- Hurricane Fran Estimated to Be Between 20 - 25 yr Event
- SBEACH Runs Made at Representative Profiles (2011)
- Level of Protection Determination – 1st Row of Structures





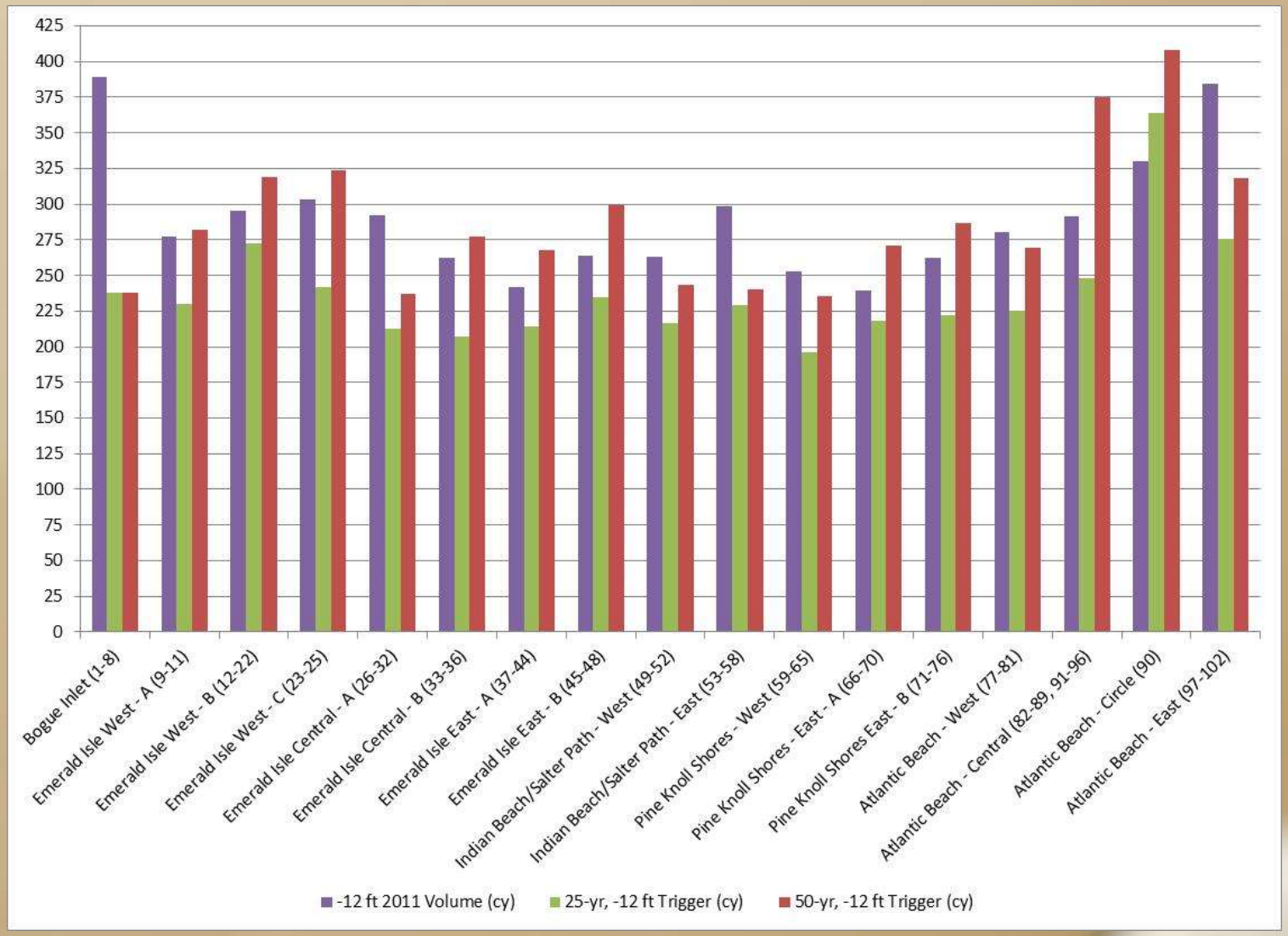
Level of Protection Determination

- Good for 25-yr RP Currently – 2011 Profile
- Would Take Some Dune/Berm Building in EI-West/Central/East, and AB to Get to 50-yr Level of Protection

Reach	Bogue Banks Transect	Initial Volume (cy/ft)	25-year RP Level of Protection	50-year RP Level of Protection	100-year RP Level of Protection
Bogue Inlet – Ocean	6	254	No Impact	No Impact	Minor Overtopping
Emerald Isle – West	11	282	No Impact	No Impact	Threatened
	17	319	No Impact	No Impact	Undermined
	25	323	No Impact	Minor Overtopping	Threatened
Emerald Isle – Central	30	266	No Impact	No Impact	No Impact
	35	277	No Impact	No Impact	Undermined
Emerald Isle – East	42	268	No Impact	No Impact	Major Overtopping
	46	299	No Impact	No Impact	Undermined
Indian Beach – Salter Path	50	290	No Impact	No Impact	No Impact
	58	267	No Impact	No Impact	No Impact
Pine Knoll Shores – West	65	235	No Impact	Minor Overtopping	Undermined
Pine Knoll Shores – East	70	271	No Impact	Minor Overtopping	Major Overtopping
	75	276	No Impact	Minor Overtopping	Major Overtopping
Atlantic Beach	79	269	No Impact	Minor Overtopping	Undermined
	85	375	No Impact	No Impact	Major Overtopping
	90	408	No Impact	Threatened	Threatened
	100	495	No Impact	No Impact	No Impact
Fort Macon State Park	105	365	n/a	n/a	n/a

Level of Protection Determination

- 50-yr RP Event LoP is Attainable BUT Likely Not Sustainable



Level of Protection Determination

- Develop Preliminary Management Reaches

Reach	Reach Length (ft)	50-yr, -12 ft Trigger (cy)	25-yr, -12 ft Trigger (cy)	Adjusted 25-yr, -12 ft Trigger (cy)	Preliminary -12 ft Trigger (cy)	-12 ft 2011 Volume (cy)
Bogue Inlet (1-8)	7,432	238	103	238	235	389
Emerald Isle West - A (9-11)	4,056	282	230	230		277
Emerald Isle West - B (12-22)	14,283	319	272	272	266	295
Emerald Isle West - C (23-25)	4,005	323	242	242		303
Emerald Isle Central - A (26-32)	10,428	237	213	213	211	292
Emerald Isle Central - B (33-36)	5,374	277	207	207		262
Emerald Isle East - A (37-44)	8,814	268	214	214	221	242
Emerald Isle East - B (45-48)	4,406	299	235	235		264
Indian Beach/Salter Path - West (49-52)	5,275	243	216	216	224	263
Indian Beach/Salter Path - East (53-58)	7,575	241	229	229		298
Pine Knoll Shores - West (59-65)	9,063	235	196	196	211	253
Pine Knoll Shores - East - A (66-70)	6,564	271	218	218		240
Pine Knoll Shores East - B (71-76)	8,251	287	222	222		262
Atlantic Beach - West (77-81)	5,388	269	225	225	254	281
Atlantic Beach - Central (82-89, 91-96)	13,771	375	248	248		291
Atlantic Beach - Circle (90)	1,006	408	364	364		330
Atlantic Beach - East (97-102)	6,011	318	276	276		384
TOTAL	**121,702**					
AVERAGE		**288**	**230**	**238**	**233**	**290**
					Weighted	

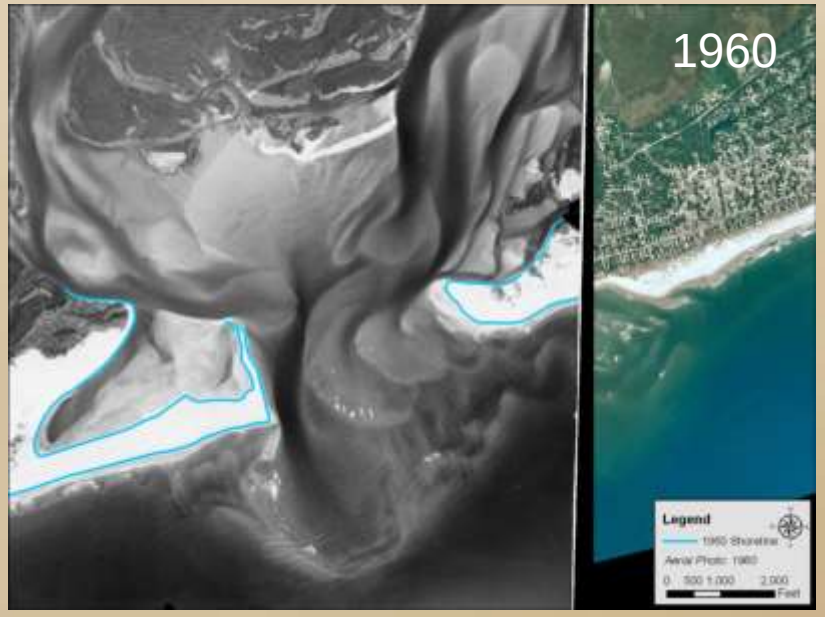
- Select 25-yr Event for Final LoP and Maintenance
- If Quiet Years Ensue – Can Always Work to 50-yr LoP

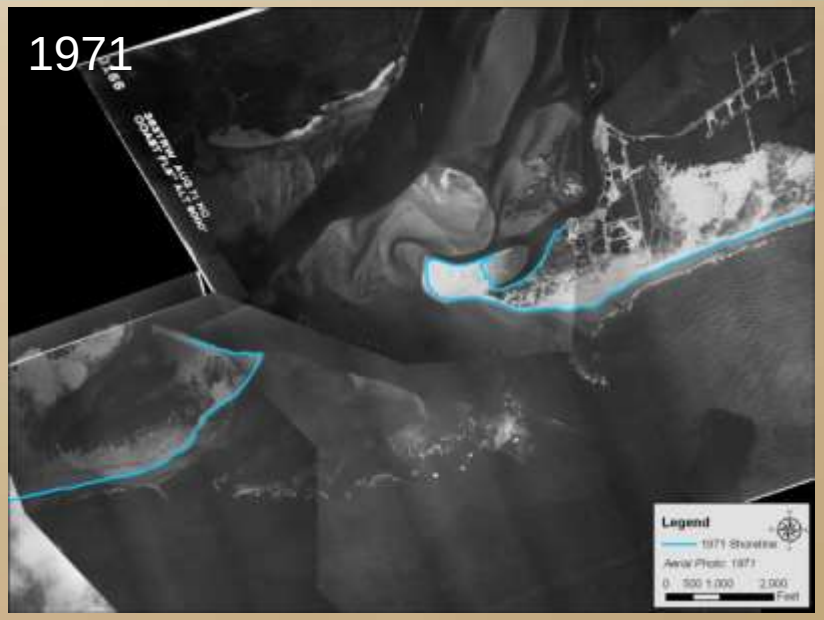
Bogue Inlet

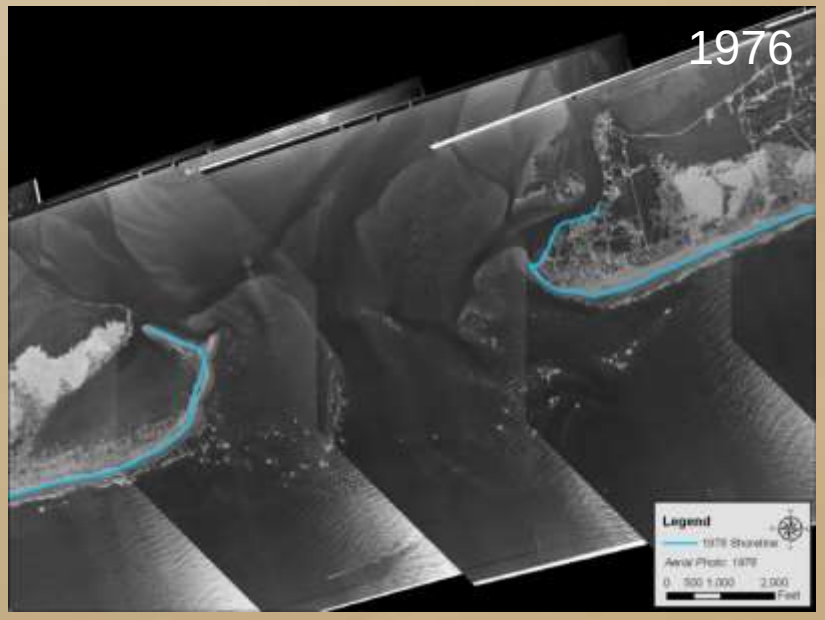
- Primary Purpose for Inlet Relocation Is Infrastructure Protection – “Safe Box” Set to Keep Channel From Threatening Either Shoulder

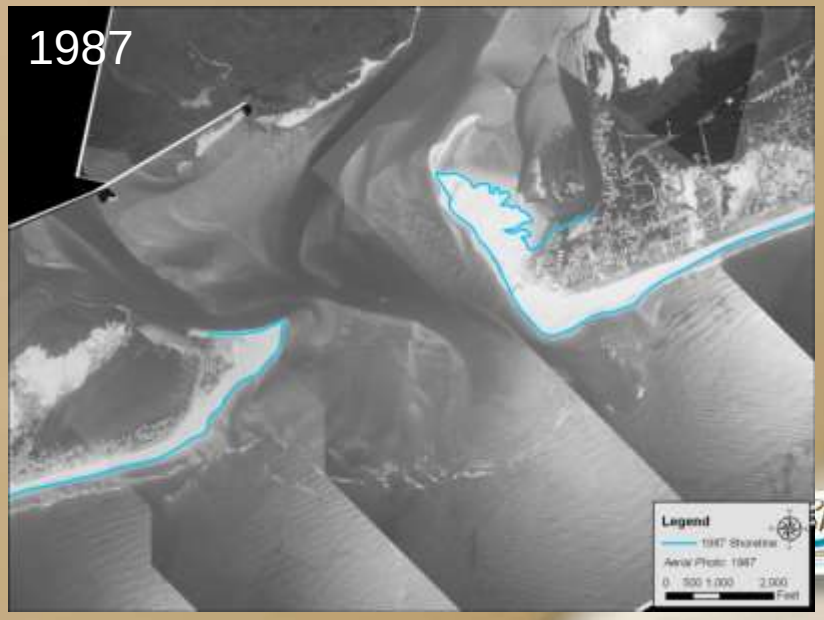
Carteret County SPO, 2004

Bogue Inlet – Historical Aerials & Shorelines

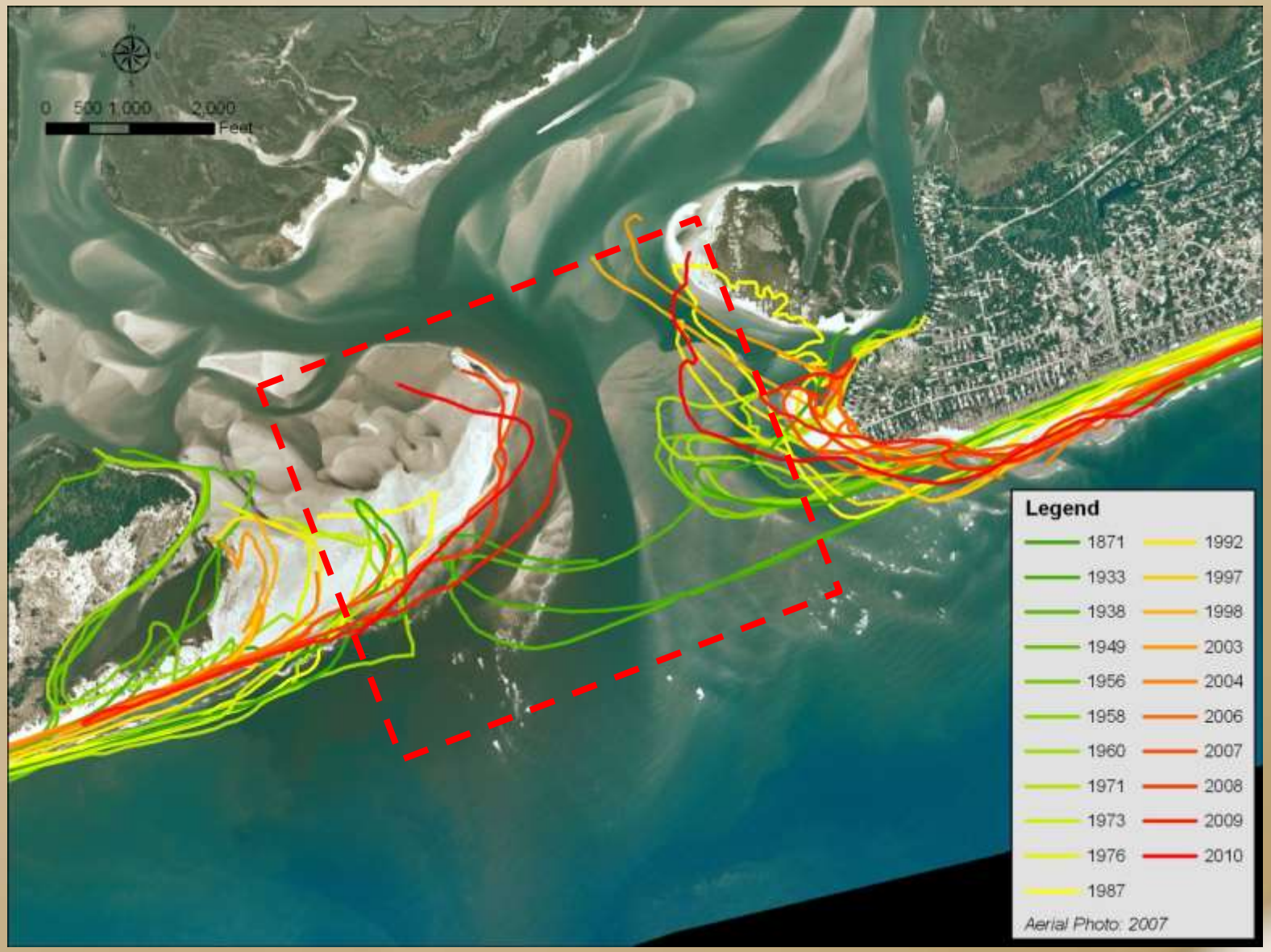




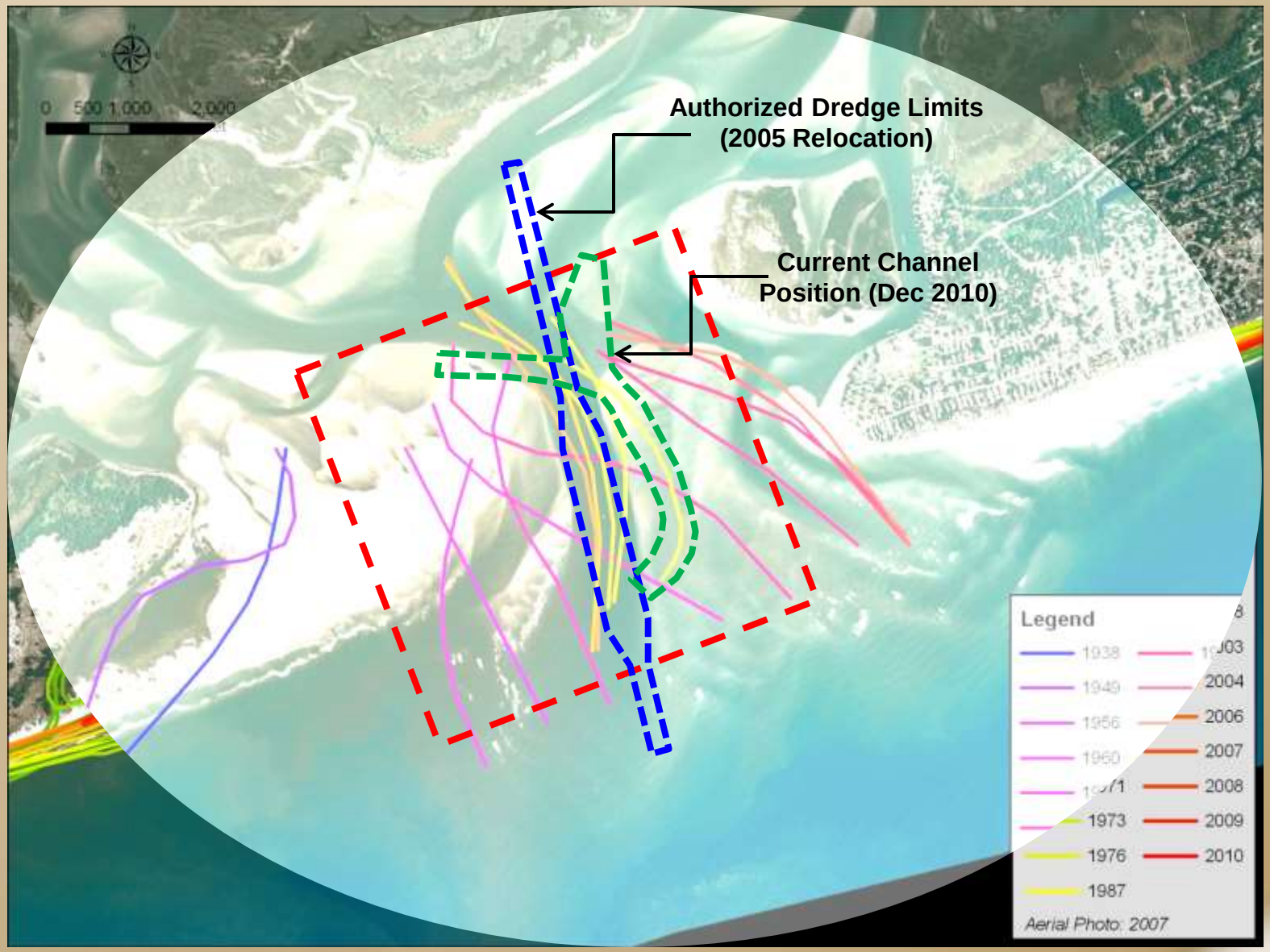




Bogue Inlet – Proposed Channel Position Range

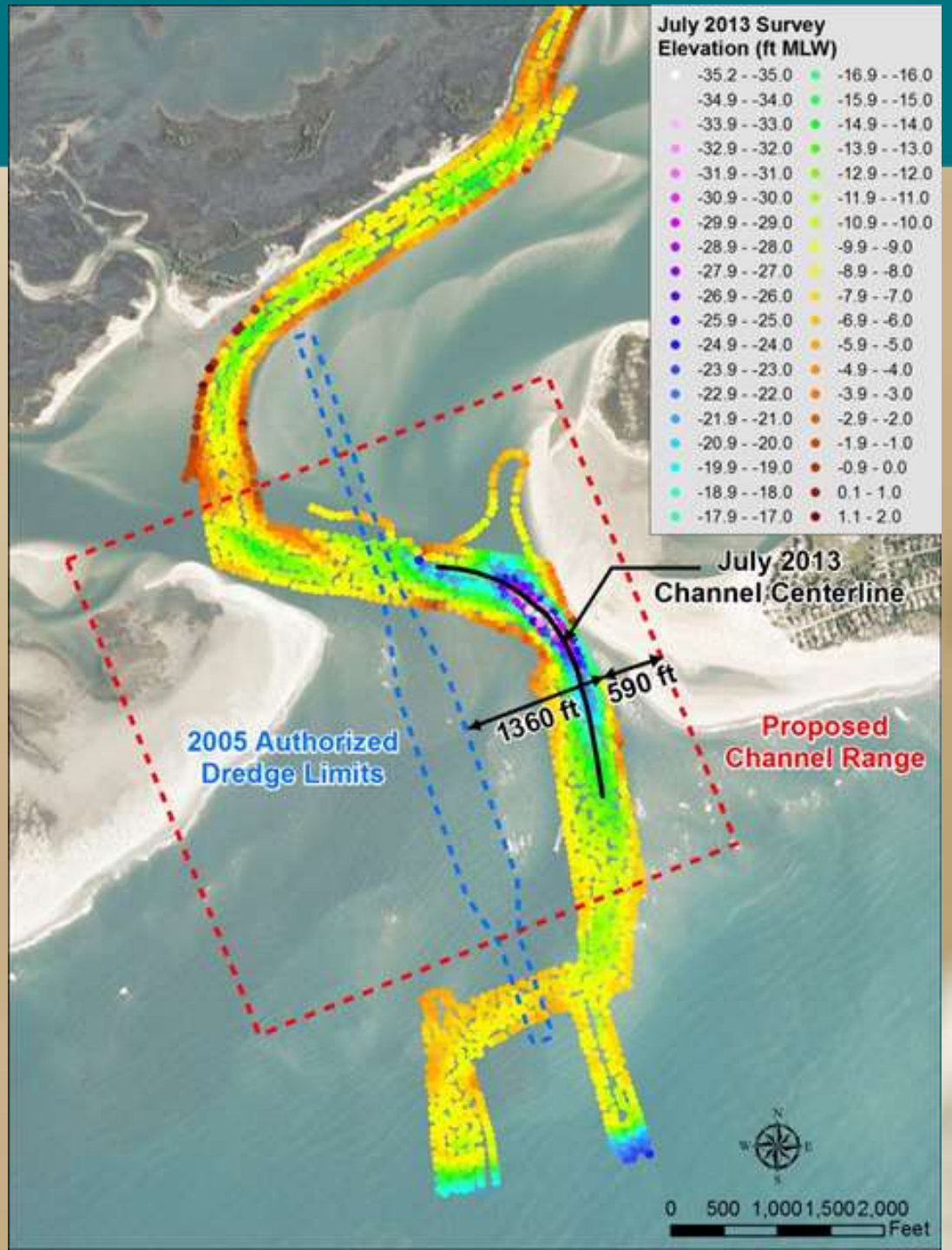


Bogue Inlet – Proposed Channel Position Range



Bogue Inlet

- Based on Current Patterns – 5-10 More Years Before Next Relocation Needed



Applicant's Preferred Alternative

Potential Alternatives

- Alternative #1 - No Action (Status Quo)
- Alternative #2 - No Action (Relocation/Abandonment)
- Alternative #3 – USACE SAW 50-yr Project
- Alternative #4 – Beach Renourishment Only
  - Upland Sources Only
  - AIWW Sources Only
  - Offshore Sources Only
  - Offshore/AIWW/Upland Sources
- Alternative #5 – Beach Renourishment and Inlet Management
  - Non-Structural Inlet Management
  - Structural Inlet Management
  - Hybrid Approach

Applicant's Preferred Alternative

Beach Nourishment with Non-Structural Inlet Management Meets The Project Need

- **Total 50 yr need = 22.6 Mcy (Background) + 22.4 to 27.2 Mcy (Storm) = 45.0 – 49.8 Mcy**
- **Total 50 yr need with Potential Sea Level Change = 46.8 – 51.6 Mcy**

Area	Section	Volume	Dredging Frequency	50 yr Total
MHC Outer Harbor	Cutoff+Range A to STA 110	400,000 cy (assumed)	1 years	20,000,000
Bogue Inlet	Inlet Relocation	850,000 cy	10 years	4,250,000
	AIWW Crossing	44,000 cy	2.5 years	880,000
			Totals:	**25,130,000**

Area	Total Volume (cy)
Sand Mines	1,380,700
AIWW Disposal Areas	1,288,800
Offshore Sources	22,453,557
TOTAL	**25,123,057**

Source	50-Yr Total Volume (cy)
Renewable	25,130,000
Non-Renewable	25,123,057
TOTAL	**50,253,057**

Applicant's Preferred Alternative

- Based on 2011 Volumes @ -12 ft and Average Loss Rates Appears that Beach Can Go 5 – 8 Years Before Next Nourishment Projects Are Needed In Critical Areas – Longer for Others – Remember Storm Effects in Higher %

Reach	Reach Length (ft)	Management Reach Length (ft)	Preliminary -12 ft Trigger (cy)	-12 ft 2011 Volume (cy)	Years to 25 yr Trigger 50%	Years to 25 yr Trigger 55%	Years to 25 yr Trigger 60%	Years to 25 yr Trigger 65%	Years to 25 yr Trigger 70%	Years to 25 yr Trigger 75%	Years to 25 yr Trigger 85%
Bogue Inlet (1-8)	7,432	11,488	235	349	29	18	13	10	8	7	5
Emerald Isle West - A (9-11)	4,056										
Emerald Isle West - B (12-22)	14,283	18,288	266	297	90	90	90	49	19	11	6
Emerald Isle West - C (23-25)	4,005										
Emerald Isle Central - A (26-32)	10,428	15,802	211	282	45	36	22	16	12	10	7
Emerald Isle Central - B (33-36)	5,374										
Emerald Isle East - A (37-44)	8,814	13,220	221	250	6	5	4	3	3	2	2
Emerald Isle East - B (45-48)	4,406										
Indian Beach/Salter Path - West (49-52)	5,275	12,850	224	284	12	10	8	7	6	5	4
Indian Beach/Salter Path - East (53-58)	7,575										
Pine Knoll Shores - West (59-65)	9,063	23,878	211	253	12	9	7	6	5	4	3
Pine Knoll Shores - East - A (66-70)	6,564										
Pine Knoll Shores East - B (71-76)	8,251										
Atlantic Beach - West (77-81)	5,388	26,176	254	312	9	8	7	6	5	5	4
Atlantic Beach - Central (82-89, 91-96)	13,771										
Atlantic Beach - Circle (90)	1,006										
Atlantic Beach - East (97-102)	6,011										
TOTAL	**121,702**	**121,702**									
AVERAGE			**233**	**288**	**29**	**25**	**22**	**14**	**8**	**6**	**4**
			weighted	weighted							

Applicant's Preferred Alternative

- Reaches Require Nourishment at 3, 6, and 9 yr Cycles – Feeder Beach/Accretional Areas – Cycles Based on Expected Project Nourishment Density – (25 – 50 cy/ft) & Loss Rates

Applicant's Preferred Alternative

- Reaches Require Nourishment at 3, 6, and 9 yr Cycles – Feeder Beach/Accretional Areas

Year	Reach Nourishment Volume (cy)	Nourishment Project
2019	686,067	3
2022	1,839,351	6
2025	967,920	9
2028	1,839,351	6
2031	686,067	3
2034	2,121,204	6,9
2037	686,067	3
2040	1,839,351	6
2043	967,920	9
2046	1,839,351	6
2049	686,067	3
2052	2,121,204	6,9
2055	686,067	3
2058	1,839,351	6
2061	967,920	9
2064	1,839,351	6
Total	21,612,609	

Applicant's Preferred Alternative

Again, It Is VERY IMPORTANT To Note That The Results Are Based Upon Average Erosion Rates Across The Island.

Storm Effects And Other Factors Will Control the Specific Timing and Locations of the Individual Nourishment Actions Completed as Part of the MBNP.

The MBNP Will Seek to Nourish Areas As They Reach The 25-yr LoP As Well As In Response To Future Storms Which Of Course Cannot Be Predicted.

We Expect the Permit Will Ask for Approval for Placement of up to 3 Mcy (Background and Storm) Every 3 Years But Expect Actual Placement Will Be Less – Similar to 2000's

Applicant's Preferred Alternative

- Dredging/Placement Unit Costs Developed from Past Projects – Rates Include Mob/Demob

- Emerald Isle – Combination of Pipeline and Hopper - $12 - $18/ cy – AVG. = **$15/cy**

- Indian Beach /Salter Path – All Hopper - **$13/cy**

- Pine Knoll Shores – All Hopper - **$12.25/cy**

- Atlantic Beach – Combination of Hopper and Pipeline - $11.50 cy – USACE Project Good To Circle – 60% - Prorated Unit Rate for Entire Volume = **$4/cy**

Applicant's Preferred Alternative

- Preferred Plan = Current Funding Levels Close at 33/67 Split
  County Has $7 M in Reserve

				25% Town/75% County Cost Share				33% Town/67% County Cost Share		
Town	Annual Volume Loss (cy)	% of Total Annual Volume Loss	Avg. Placement Unit Cost Per Town	Annual Town Cost ($)	Annual County Cost ($)	% of Total Annual County Cost	Annually Generated Taxes for Beach Nourishment	Annual Town Cost ($)	Annual County Cost ($)	% of Total Annual County Cost
Emerald Isle	139,913	31%	$15.00	$524,674	$1,574,021	46%	$675,000	$692,569	$1,406,126	46%
Indian Beach/Salter Path	62,567	14%	$13.00	$203,343	$610,028	18%	$282,406	$268,412	$544,959	18%
Pine Knoll Shores	84,795	19%	$12.25	$259,685	$779,054	23%	$316,500	$342,784	$695,955	23%
Atlantic Beach	164,945	36%	$4.00	$164,945	$494,835	14%	TBD	$217,727	$442,053	14%
TOTAL	452,220				$3,457,938				$3,089,093	
					Avg. Annual County Tax Generated Over Next 6 Years = $2,440,664					

Applicant's Preferred Alternative

- Preferred Plan = Current Funding Levels Close at 33/67 Split
- Annual Total Cost = $4.61 M * 50 yr = **$230.5 M**
- Annual Total Revenue = $3.93 M * 50 yr = **$196.6 M**
- **If Everything Escalates at Same Rate = <u>85% Funded</u> Overall (*Assumes Atlantic Beach Starts Generating Taxes)**
- **If Atlantic Beach Declines to Participate = <u>94% Funded</u>**

Next Steps/Schedule

- PRT Meeting – **Oct 2013**
- Engineering Report QA/QC & Finalization – **Feb 2014**
- Draft EIS – **Summer/Fall 2014**
- Final EIS – **Winter/Spring 2015**
- Permits – **Summer/Fall 2015**

Overall Discussion