Sediment Compatibility for Beach Nourishment in North Carolina

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US Army Corps of Engineers
Wilmington District

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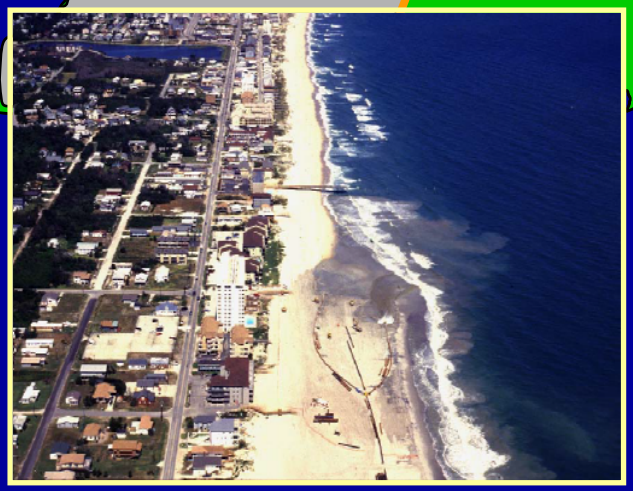


Constructing Shore Protection
Kure Beach, NC

Roanoke
Philpott Dam & Reservoir
J.H. Kerr Dam & Reservoir
VA
NC
Dare County: Bodie Island
Greensboro
Falls Dam & Reservoir
Manteo
W. Kerr Scott Dam & Reservoir
Asheville
Oregon Inlet
Washington
Raleigh
B.E. Jordan Reservoir
Charlotte
Hatteras & Ocracoke
Morehead City
Bogue Banks
N. Topsail /Surf City
Wilmington
Topsail Beach
Wrightsville Beach
SC
Carolina Beach
Kure Beach
Brunswick County Beaches
Atlantic Ocean

Problem/Issue

Atlantic Beach, NC

Pine Knoll Shores Shell Hash
2002

Emerald Isle Carbonate
2003

Oak Island Sea Turtle Habitat
2001

What does "compatible" mean?

- **North Carolina**
  - Sand used for beach nourishment ***shall be compatible*** with existing grain size and type
- **Florida**
  - Borrow from navigation channels $\leq$ 10% fines
  - Borrow from other sources $\leq$ 5% fines
- **USACE**
  - Any borrow material $\leq$ 10% fines
  - Default criteria accepted through coordination with resource agencies

NC State Agencies

- **Division of Coastal Management (DENR)**
  - Coastal Area Management Act (CAMA) of Federal CZM Act
  - Using rules and policies of Coastal Resources Commission
  - Permitting/enforcement, CAMA land use planning, et al.
- **Coastal Resources Commission**
  - Establishes policies for the Coastal Management Program
  - Adopts rules for CAMA
  - Designates Areas of Environmental Concern (AEC)
  - Adopts rules and policies for coastal development within AECs and certifies local land-use plans
- **Science Panel on Coastal Hazards**
  - Technical experts advising DCM
  - Provides CRC with scientific data and recommendations pertaining to coastal topics

Science Panel on Coastal Hazards

- Dr. John Fisher, Chair
  NC State University
- Dr. Margery Overton
  NC State University
- Dr. Orrin Pilkey
  Duke University
- Dr. Stan Riggs
  East Carolina University
- Dr. Bill Cleary
  UNC Wilmington
- Mr. Tom Jarrett
  Consultant (Retired USACE)
- Mr. Steve Benton
  Retired DCM
- Mr. Spencer Rogers
  NC Sea Grant
- Dr. Pete Peterson
  University of North Carolina
- Dr. John Wells
  Virginia Institute of Marine Science
- Dr. Greg Williams
  USACE Wilmington District

Proposed Criteria

1. General Definitions
2. Characterization of Beach to be Nourished
3. Characterization of Borrow Site Material
4. Compatibility of Borrow Site Material to Beach to be Nourished
5. Execution of Nourishment Project
6. Monitoring and Mitigation

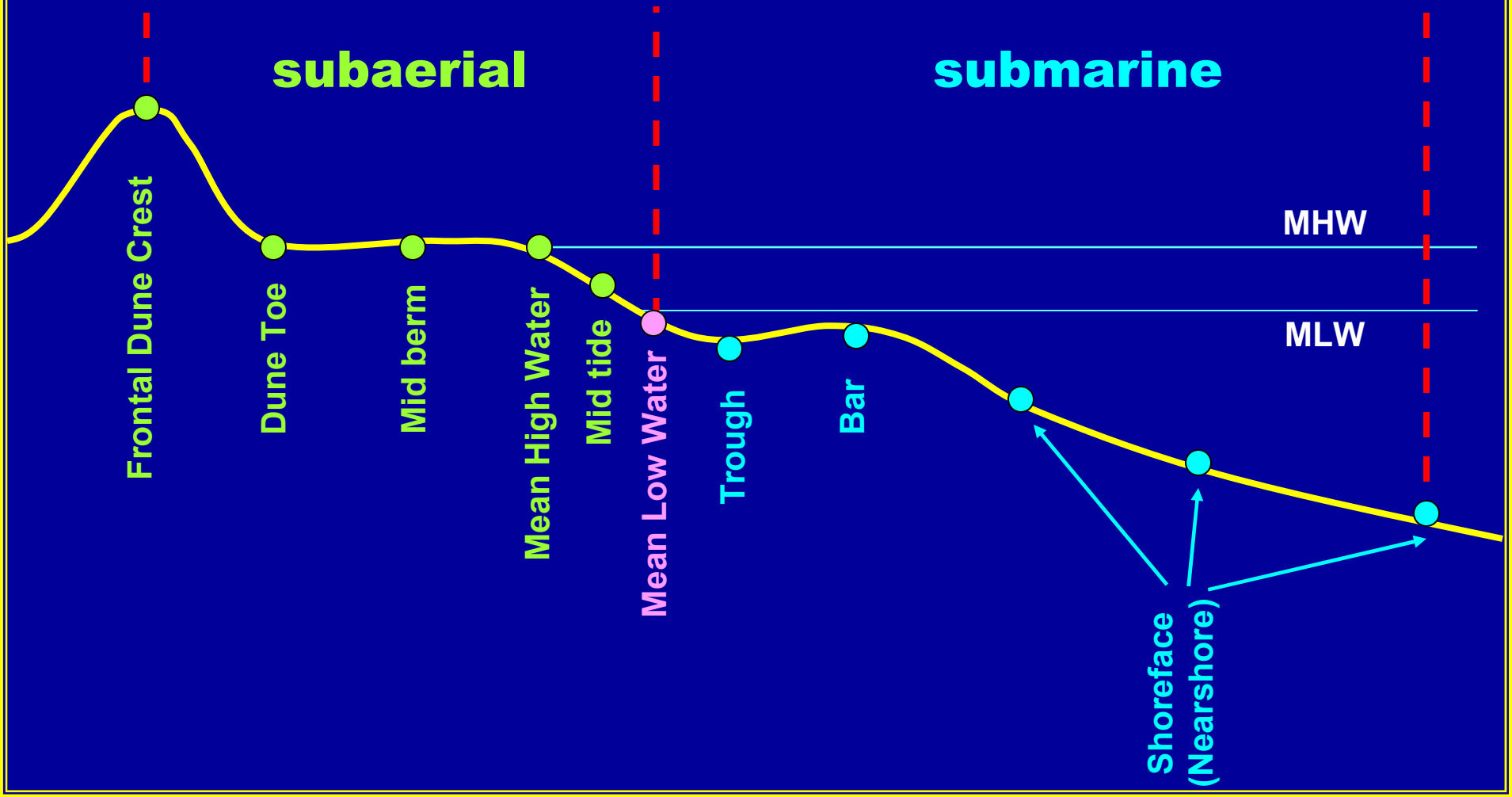
Definitions

- Beach nourishment
- Borrow area
- Sand resource
- Sand reserve
- Compatibility
- Sediment
- Grain size

Beach Characterization

- Sediment sampling to geological and engineering standards capturing 3-D spatial variability of sediment characteristics
- Minimum of 3 evenly spaced (not exceeding 5,000 ft), shore-perpendicular transects
- Sampling locations to follow morphology – half of total samples taken landward of MLW, half seaward of MLW and one at MLW
- Average grain size, fine grained fraction (<0.0625 mm) and coarse grained fraction (>4.76 mm) calculated by simple arithmetic mean of all samples collected
- For prior nourished beaches use best available data
- Beach sediment characterization fixed for future

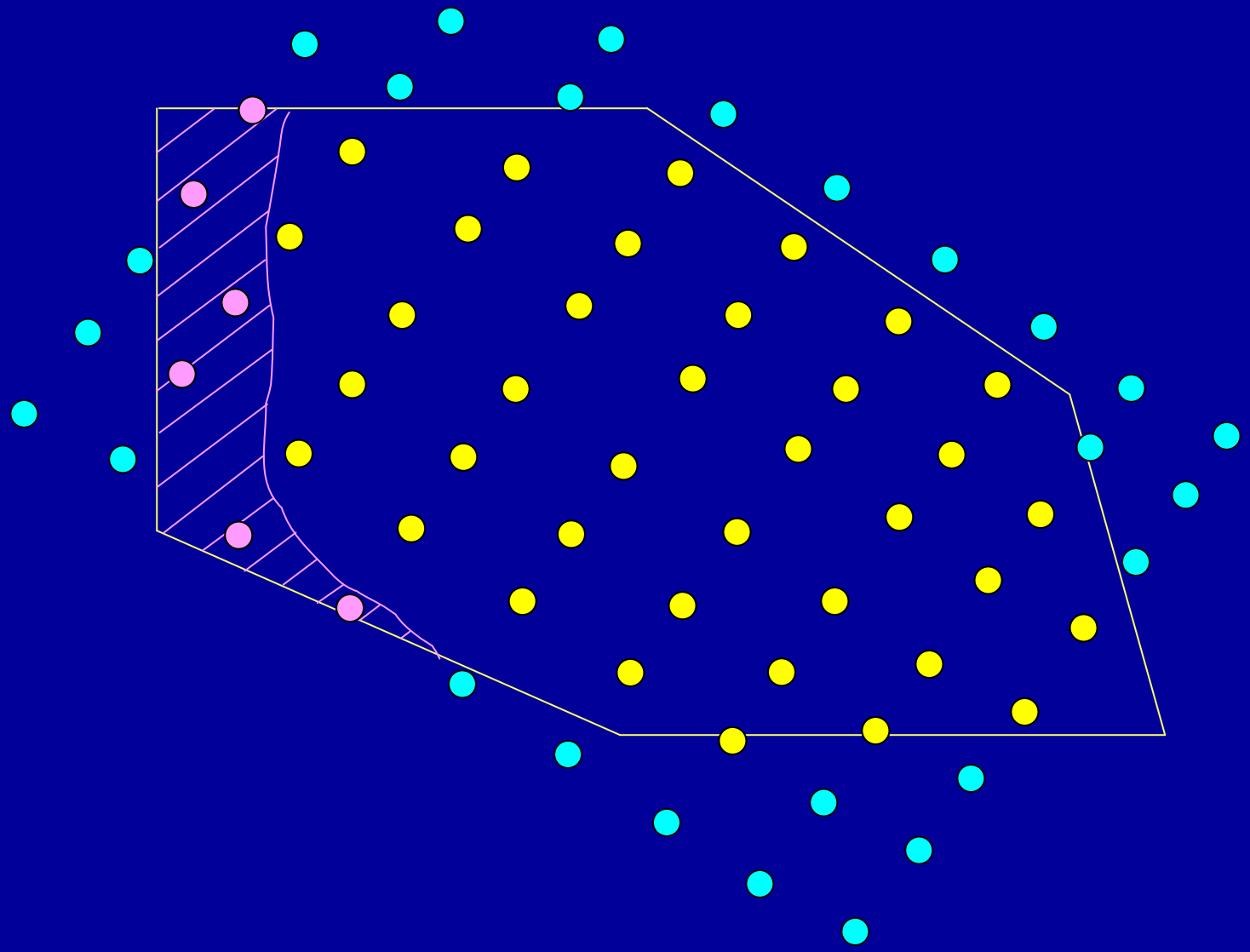
Sampling Protocol for beach



Borrow Site Characterization

- Use appropriate acoustic and/or equivalent remotely sensed bathymetric and subsurface survey techniques
- Sampling methodology shall use a core barrel of no less than 3 inches (76.2 mm) in diameter
- No characterization and sampling required from a regularly maintained navigation channel*
- Fine- (<0.0625 mm) and coarse-(>4.76 mm) grained fraction determined by a simple arithmetic mean of all samples collected

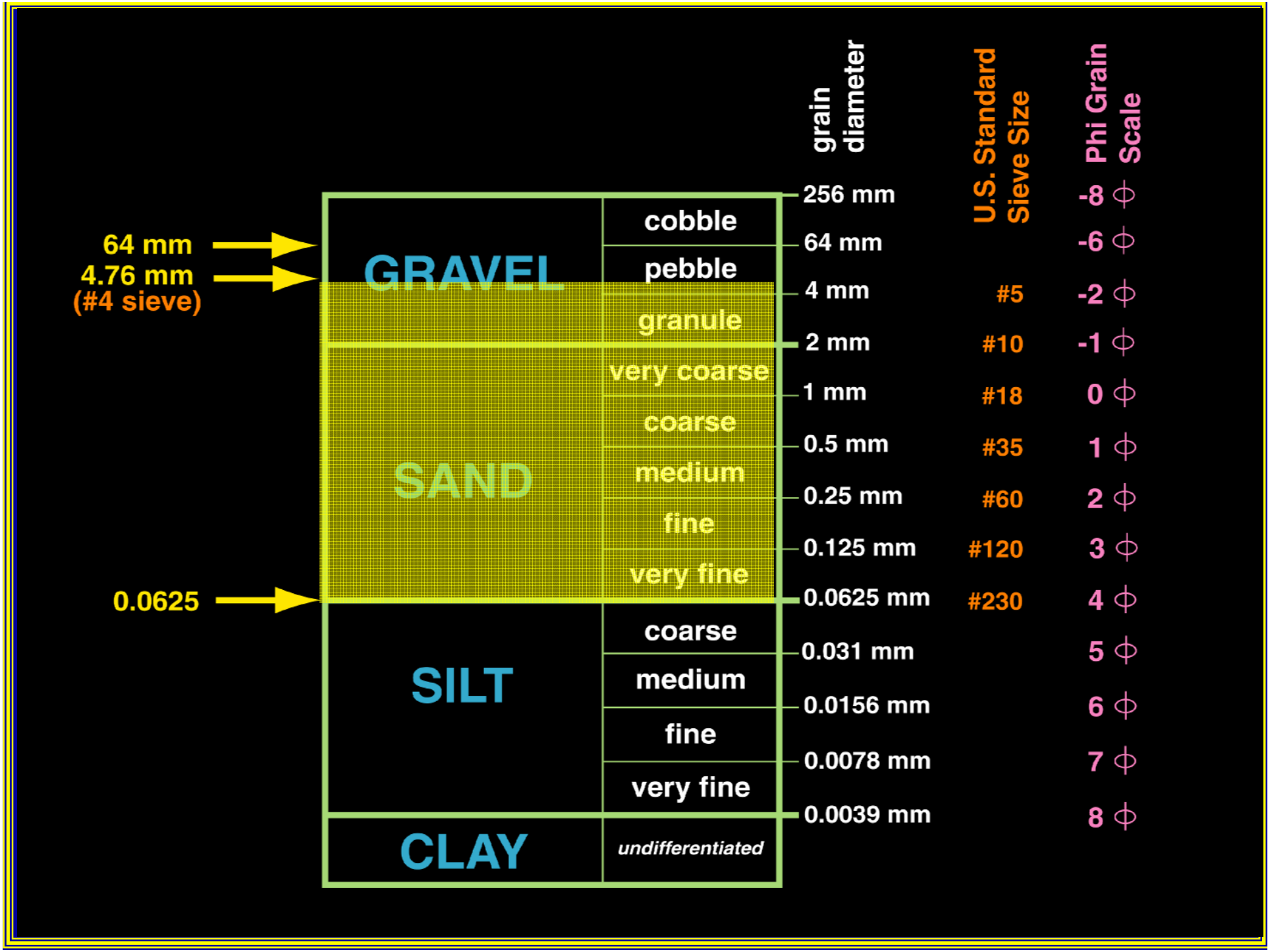
Borrow site sampling



Compatibility—Size

- **The average percentage by weight of the *fine-grained* fraction (<0.0625 mm) of borrow material shall not exceed average percentage by weight of native beach fines plus 5%**
  - ***e.g., 6% native plus 5% = 11% threshold***

- **The average percentage by weight of the *coarse-grained* fraction (>4.76 mm) of borrow material shall not exceed average percentage by weight of native beach coarse material plus 4%**
  - ***e.g., 6% native plus 4% = 10% threshold***


grain diameter
U.S. Standard Sieve Size
Phi Grain Scale
64 mm
4.76 mm
(#4 sieve)
0.0625
GRAVEL
SAND
SILT
CLAY
cobble
pebble
granule
very coarse
coarse
medium
fine
very fine
coarse
medium
fine
very fine
undifferentiated
256 mm
64 mm
4 mm
2 mm
1 mm
0.5 mm
0.25 mm
0.125 mm
0.0625 mm
0.031 mm
0.0156 mm
0.0078 mm
0.0039 mm
#5
#10
#18
#35
#60
#120
#230
-8 ϕ
-6 ϕ
-2 ϕ
-1 ϕ
0 ϕ
1 ϕ
2 ϕ
3 ϕ
4 ϕ
5 ϕ
6 ϕ
7 ϕ
8 ϕ

Compatibility—Mineralogy

- **Composite mineralogy shall be similar, specifically carbonate content that shall not exceed 40% over the average percentage by weight of the native beach.** ***(This topic warrants further investigation.)***
  - ***e.g., 25% CO_3 on native beach plus 40% = 65% threshold***

- **Sandy sediment from navigation channel maintenance shall not exceed 10% percentage by weight of fine-grained material (<0.0265 mm) regardless of native beach content**

Project Execution

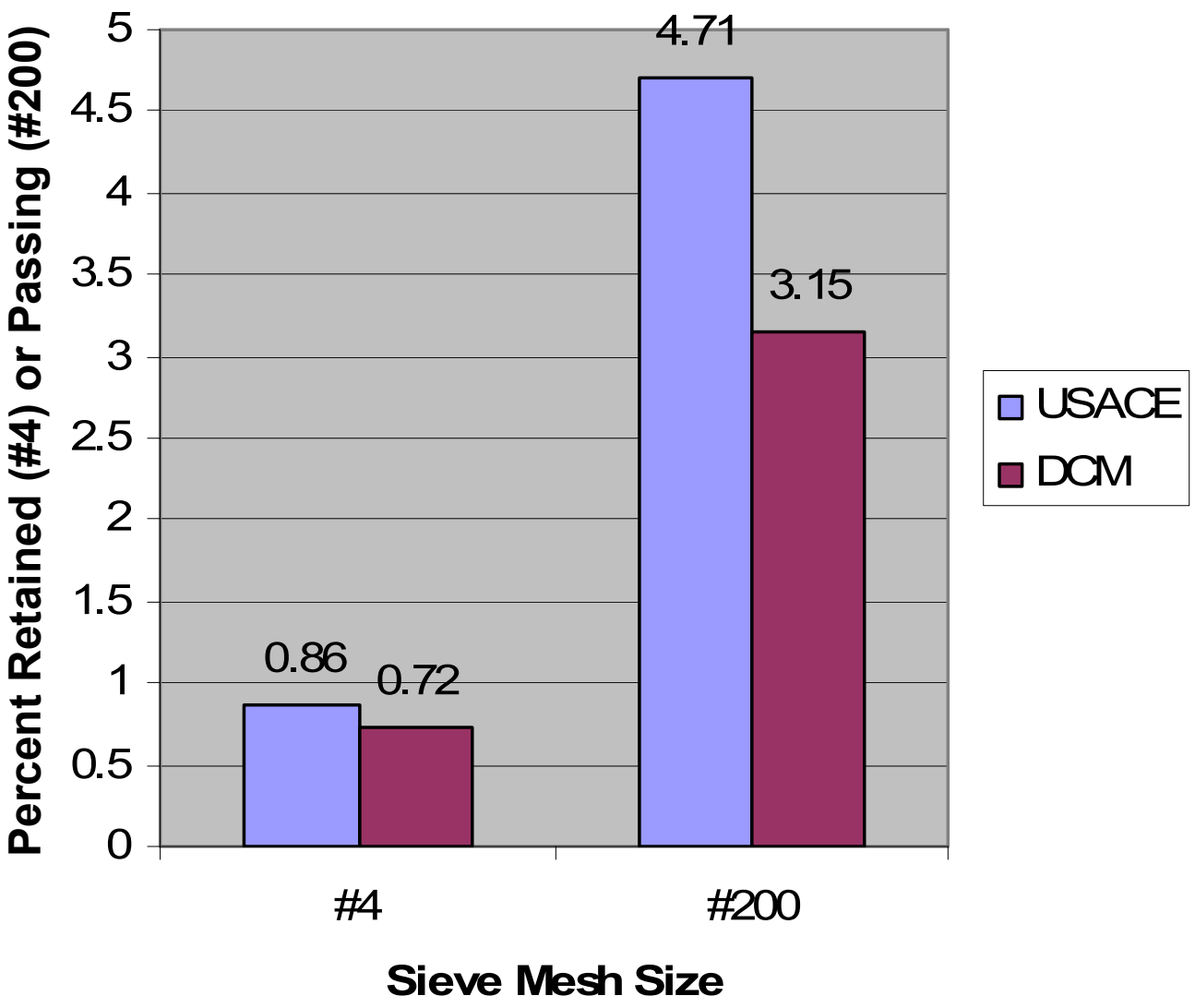
- Be consistent with the Submerged Lands Mining Rules
- Not alter wave refraction patterns resulting in adverse impacts to adjacent shoreline(s)
- Not alter inlet hydrology resulting in increased erosion or an adverse impact ecosystems or habitat
- Be done in a manner consistent with State policy regarding habitat protection
- Not contain foreign material (construction debris, toxic material, etc.)

Monitoring & Mitigation

- Material placement shall not violate water quality standards
- Exceedingly coarse material (>64 mm) greater than pre-nourished values shall be removed in an environmentally sound manner
- Biological and physical monitoring data shall be used to design biological and ecological mitigation where impacts are sufficient to require it
- Goal of scientific monitoring to better understand biological and physical response to beach nourishment and decrease adverse impact(s)

Implementation Process

- Review formal recommendations from CRC Science Panel on Coastal Hazards
- New scientific data?
- Stakeholder input
- Analysis of how recommendations and draft rules will affect the “real world”



COARSE LIMITS

USACE = none

DCM = native + 4%

= 4.72%

Florida = 5%

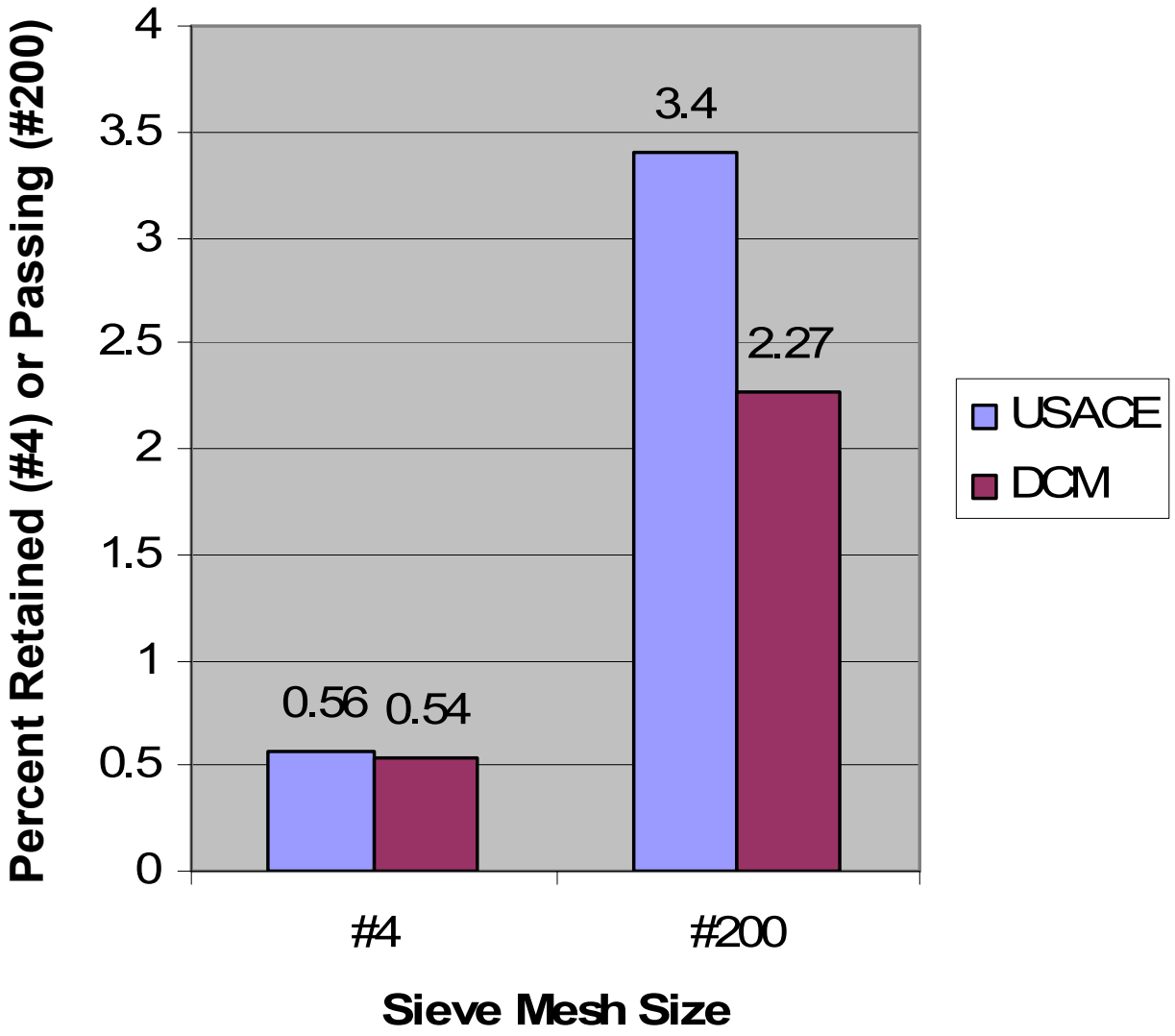
FINE LIMITS

USACE = 10%

DCM = native + 5%

= 8.15%

Florida = 5%



COARSE LIMITS

USACE = none

DCM = native + 4%
= 4.54%

Florida = 5%

FINE LIMITS

USACE = 10%

DCM = native + 5%
= 7.27%

Florida = 5%

Conclusions

- Impacts of these criteria (or some variation) is not yet known
  - DCM staff goal is little/no impact to beach nourishment
  - DCM goal is to be as compatible with USACE as possible
- White paper is being prepared by DCM
- Final DCM recommendations to go to CRC this fall


Questions?

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