Assisted Living Shorelines and High Bank Stabilization in Chesapeake Bay

C. Scott Hardaway, Jr.

VIMS

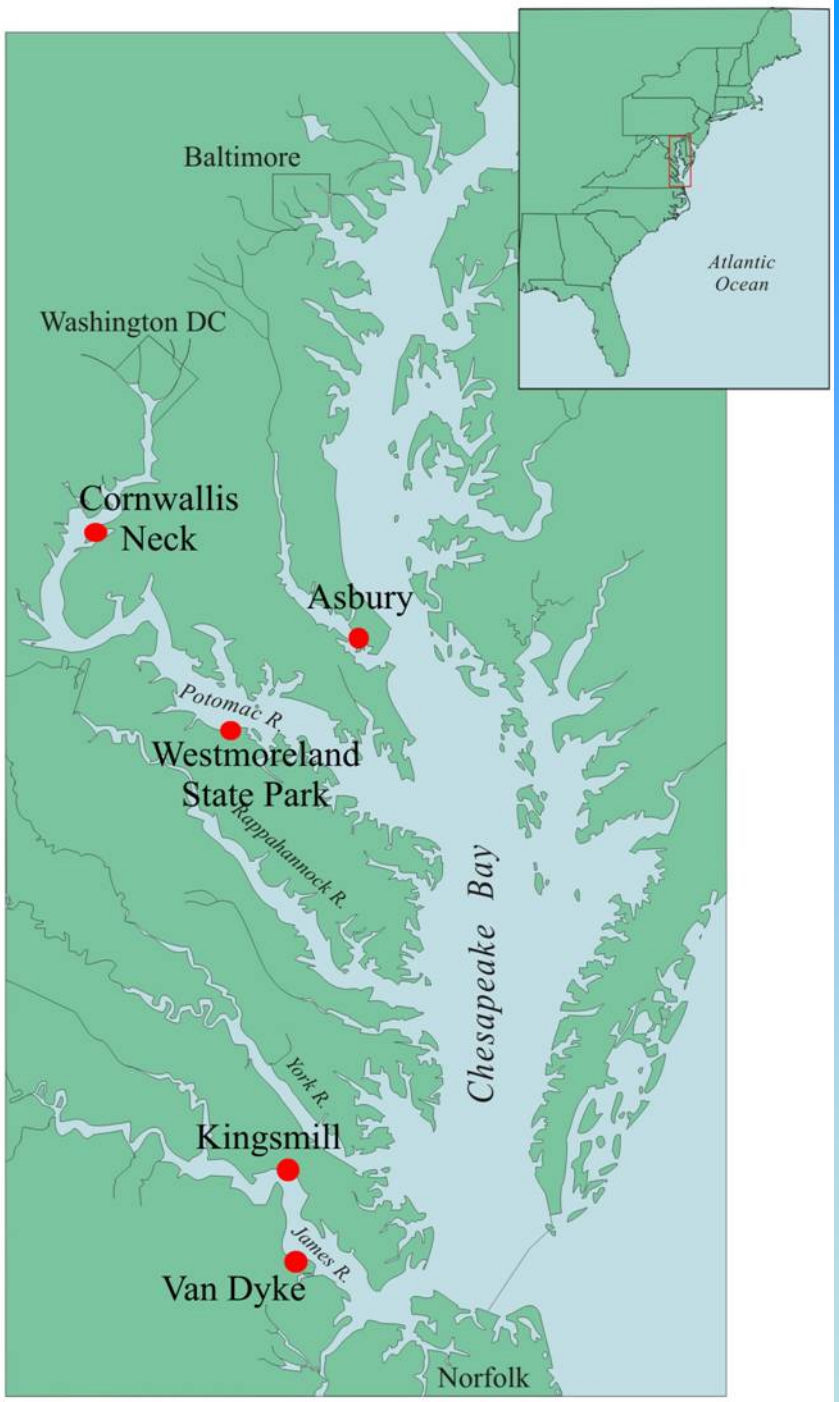
High Bank Erosion Factors

- Bank Geology/composition
- Bank Height
- Fetch exposure/wave climate

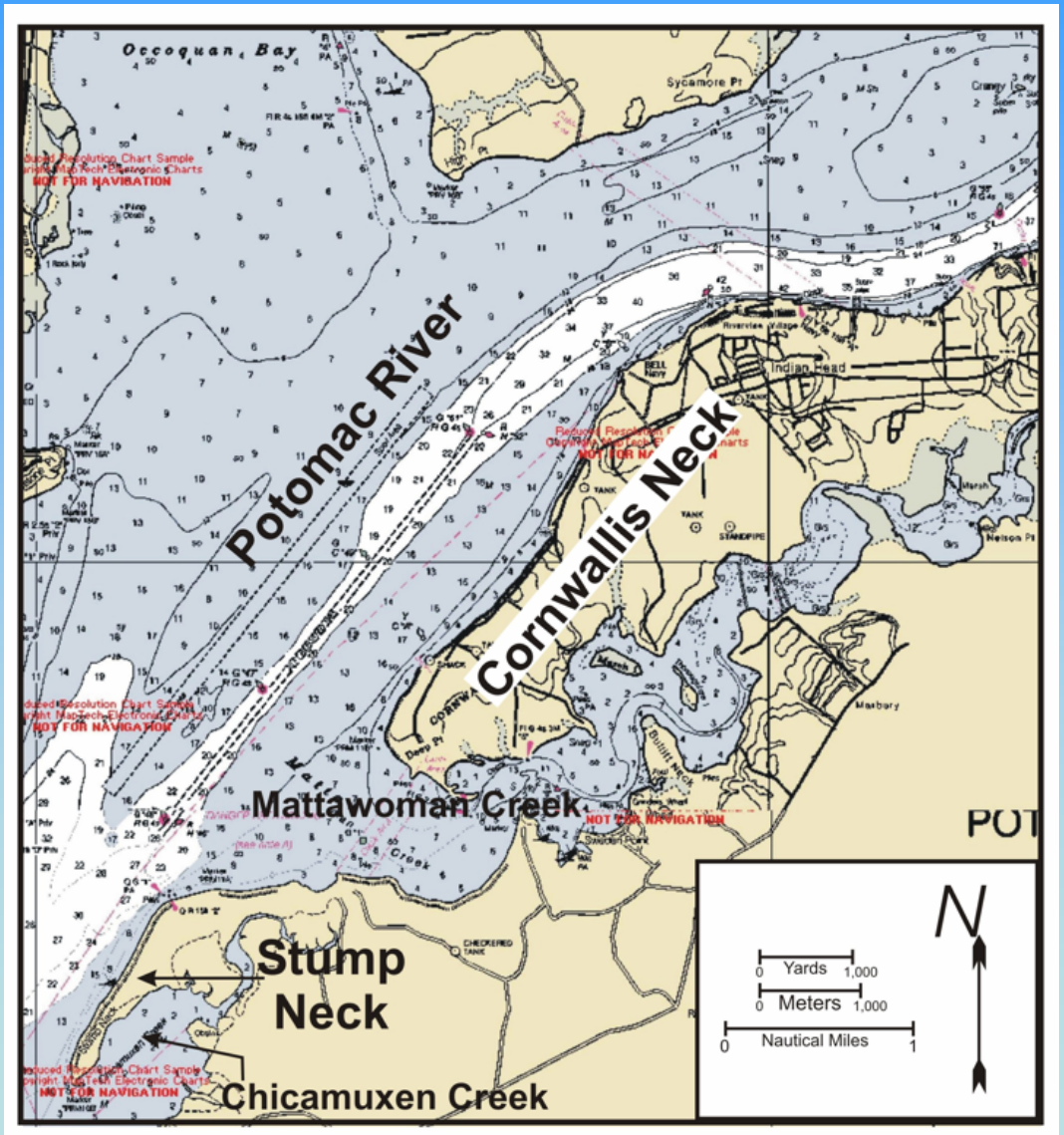
- Bank Toe factors
  - Width and Height of Beach
  - Impinging Wave Climate
- Bank face factors
  - Runoff/groundwater
  - Freeze thaw
  - Sloughing/Slumping

Shoreline Sites

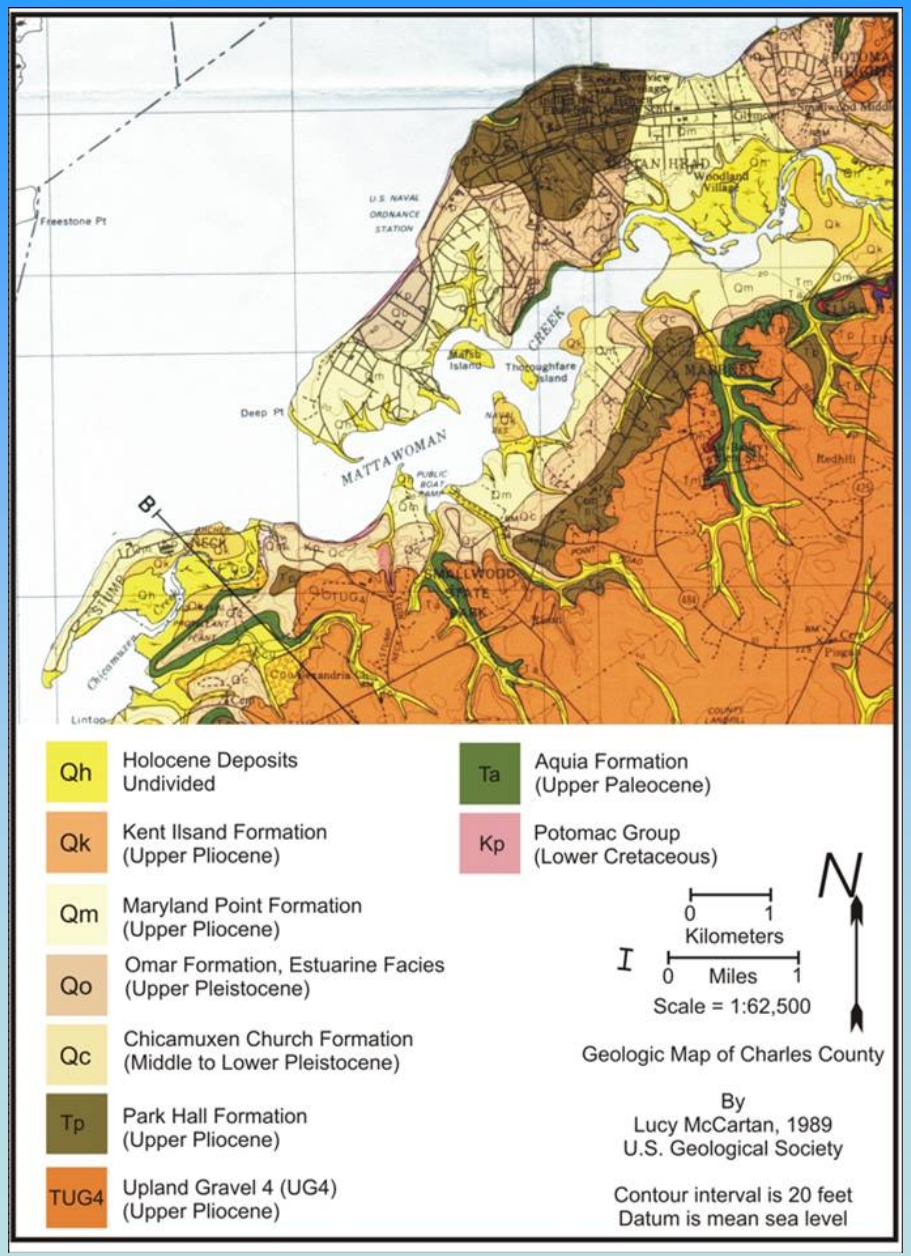
- Cornwallis Neck, MD: Bank heights 50 to 100 ft. Longest Fetch: NW- 6 miles. Installed 2008
- Van Dyke on the James: Bank ht 65 ft. Fetch: NNW- 12 miles. Installed 1997.
- Asbury on the Patuxent: Bank Ht 60 ft. Fetch: NW-9 miles. Installed 1994.
- Kingsmill on the James: Bank ht 75 ft. Fetch : S-12 miles. Installed 1998
- Westmoreland State Park, Potomac River: Bank Ht 150 ft. Fetch: E-10 miles. Design phase.


Baltimore
Washington DC
Cornwallis
Neck
Asbury
Potomac R.
Westmoreland
State Park
Rappahannock R.
Chesapeake Bay
York R.
Kingsmill
James R.
Van Dyke
Norfolk
Atlantic
Ocean

Management Plan Study Area



Geology and Slope Dynamics



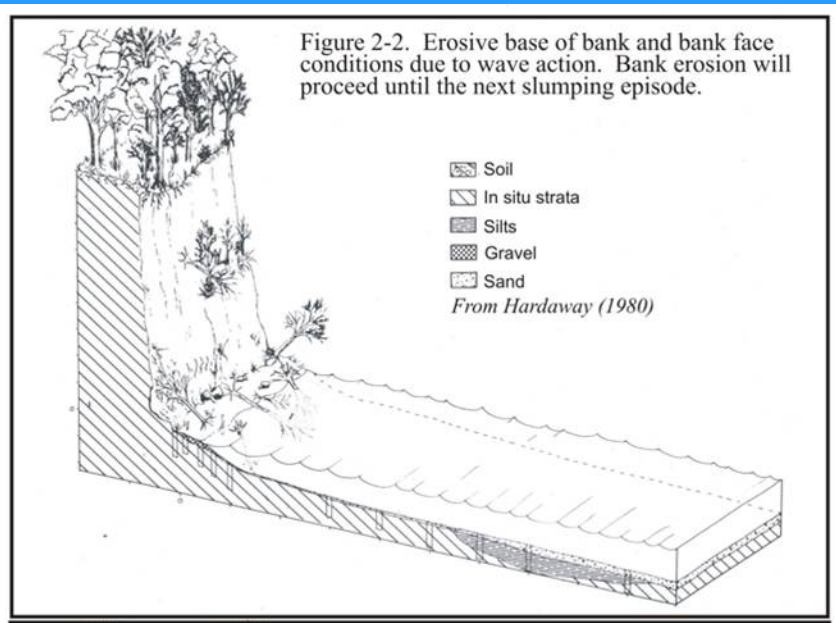


Figure 2-2. Erosive base of bank and bank face conditions due to wave action. Bank erosion will proceed until the next slumping episode.

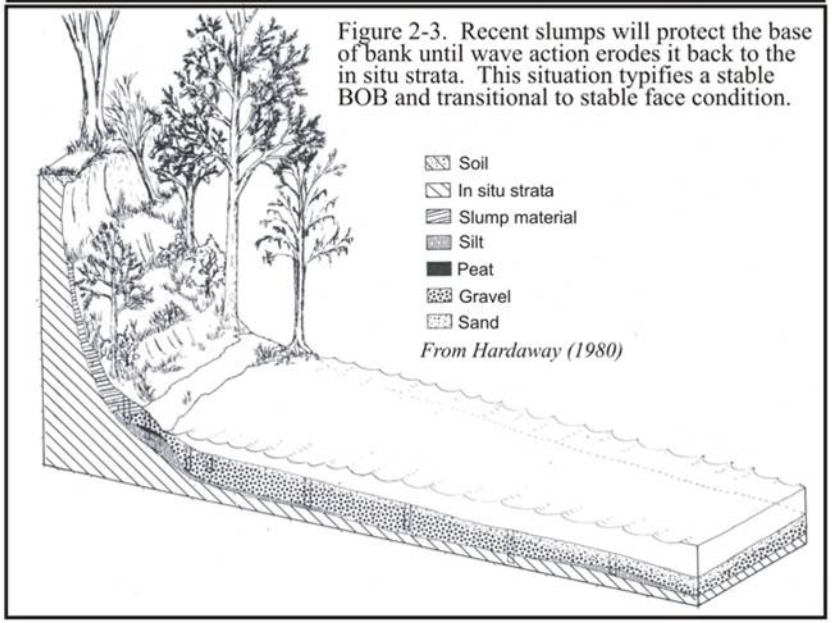


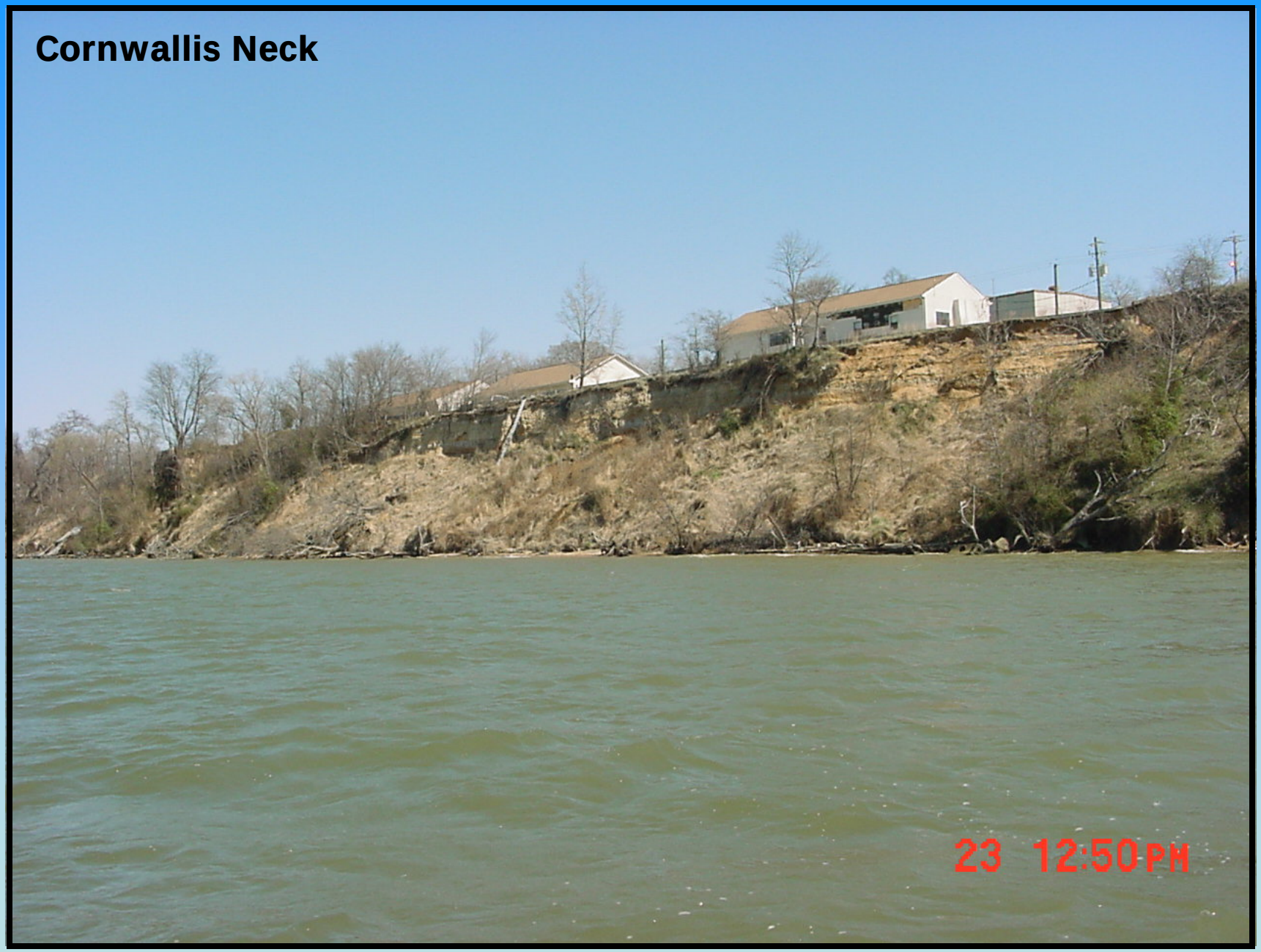
Figure 2-3. Recent slumps will protect the base of bank until wave action erodes it back to the in situ strata. This situation typifies a stable BOB and transitional to stable face condition.

Cornwallis Neck, MD
Bank Height

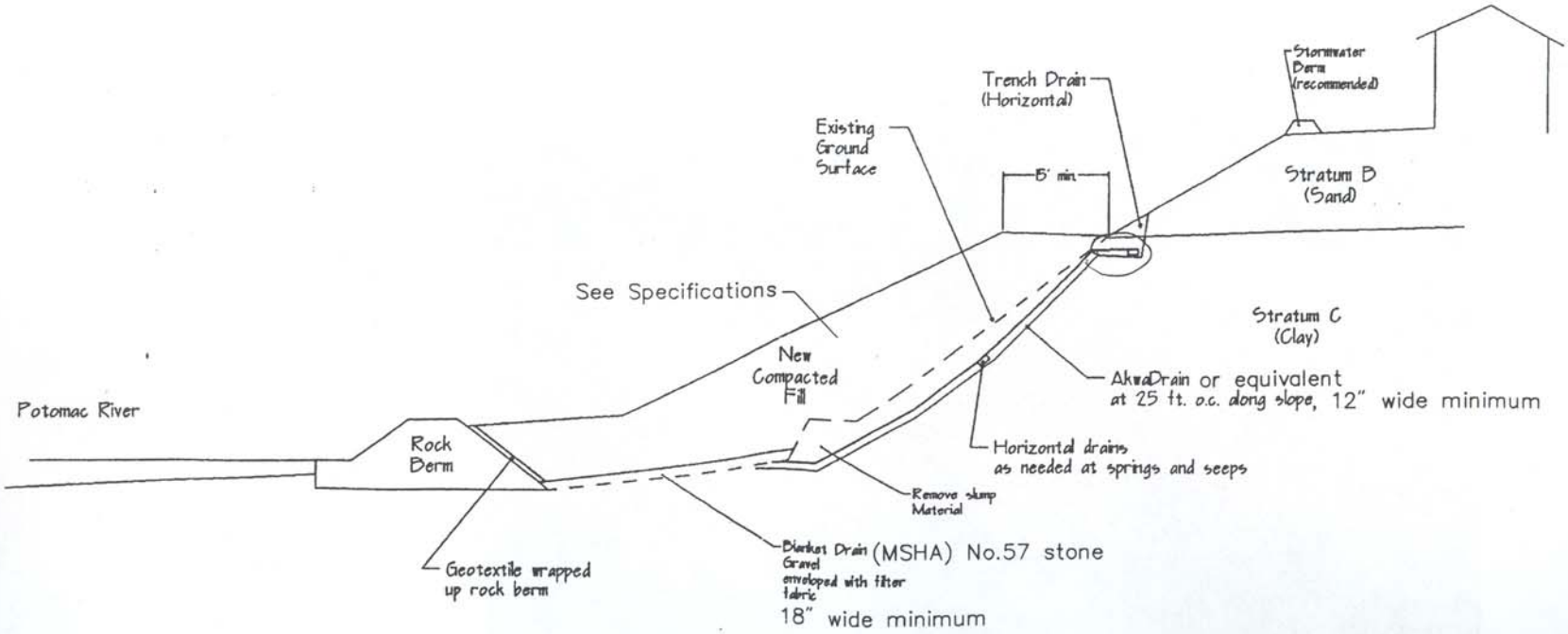

Cornwallis Neck
23 12:55 PM


Cornwallis Neck
23 1:10PM

Cornwallis Neck



BANK FACE DEWATERING SYSTEM

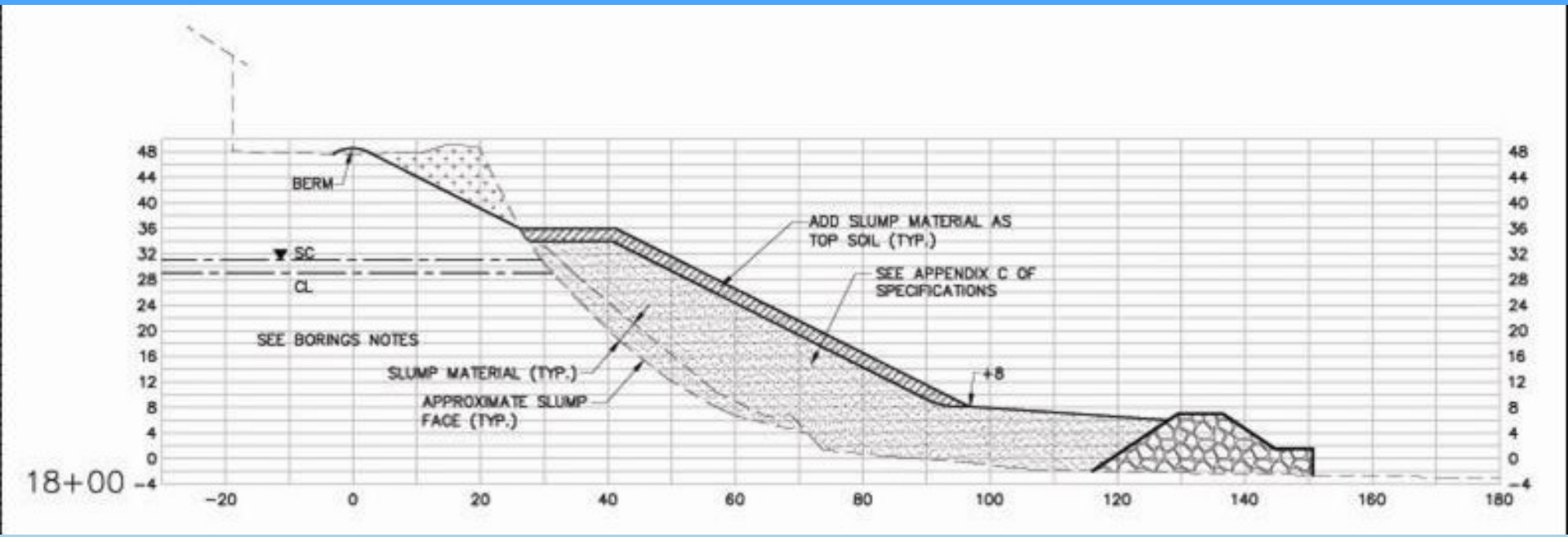


Schematic Section Through Slope

Indian Head NSWC, Slope Section 17+00 to 22+00, Indian Head, Maryland

D. W. KOZERA, INC. PROFESSIONAL ENGINEERS & GEOLOGISTS	CONTRACT NO: 03123.D	FIGURE NO:
	SCALE: NONE	DATE: 9-29-04 Rev 12-7-04

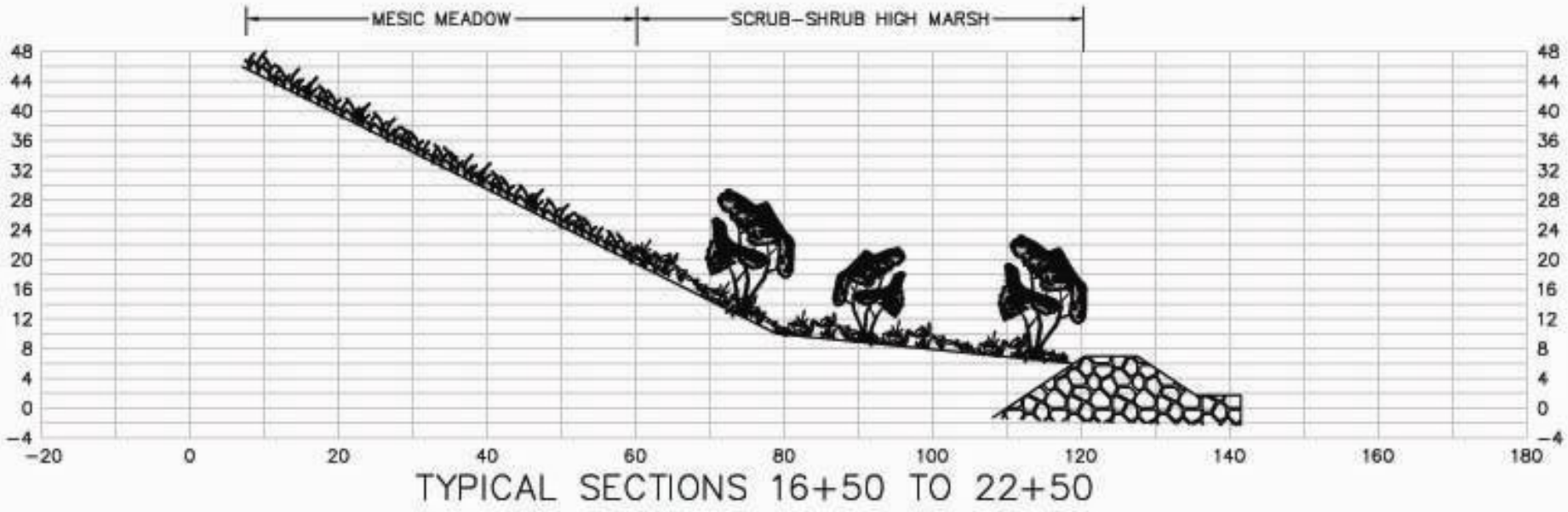
High Sill/Breakwater with Gravel Fill, lateral and Vertical Drains



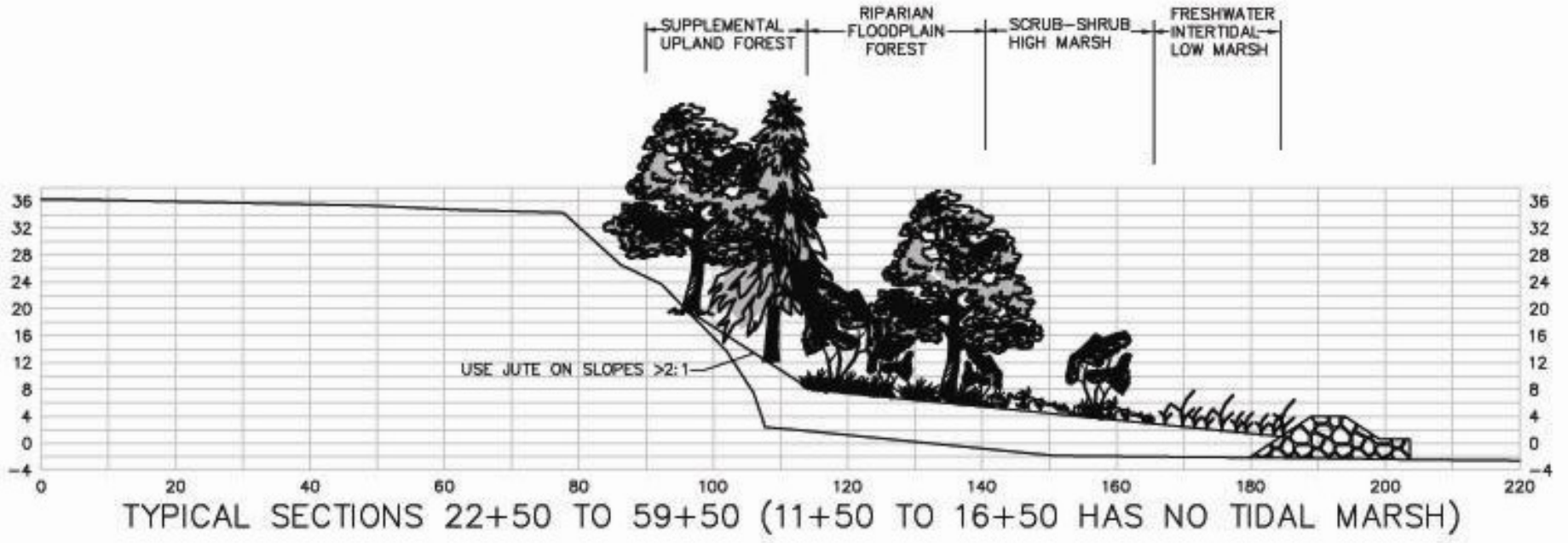

Cornwallis Neck
JUN 26 2008

Cornwallis Neck

Breakwater Vegetation Scheme



Sill Vegetation Scheme

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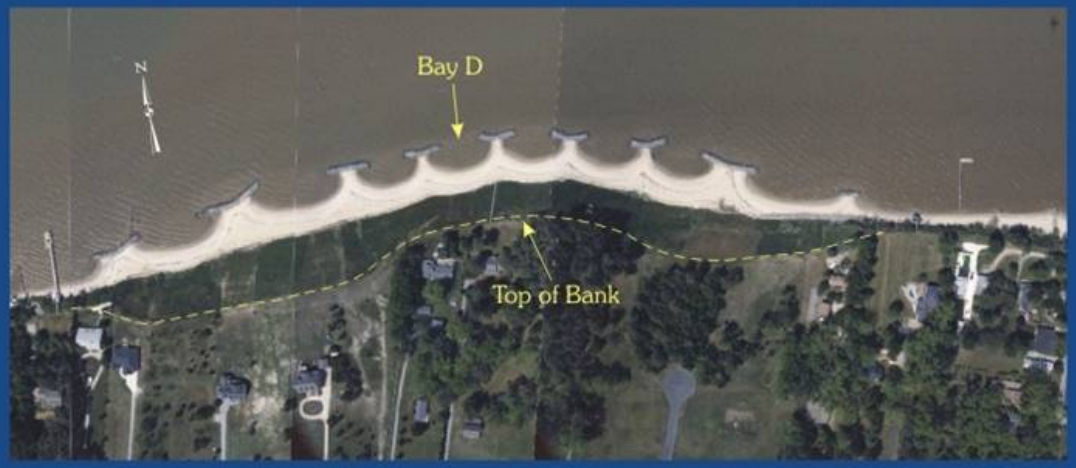
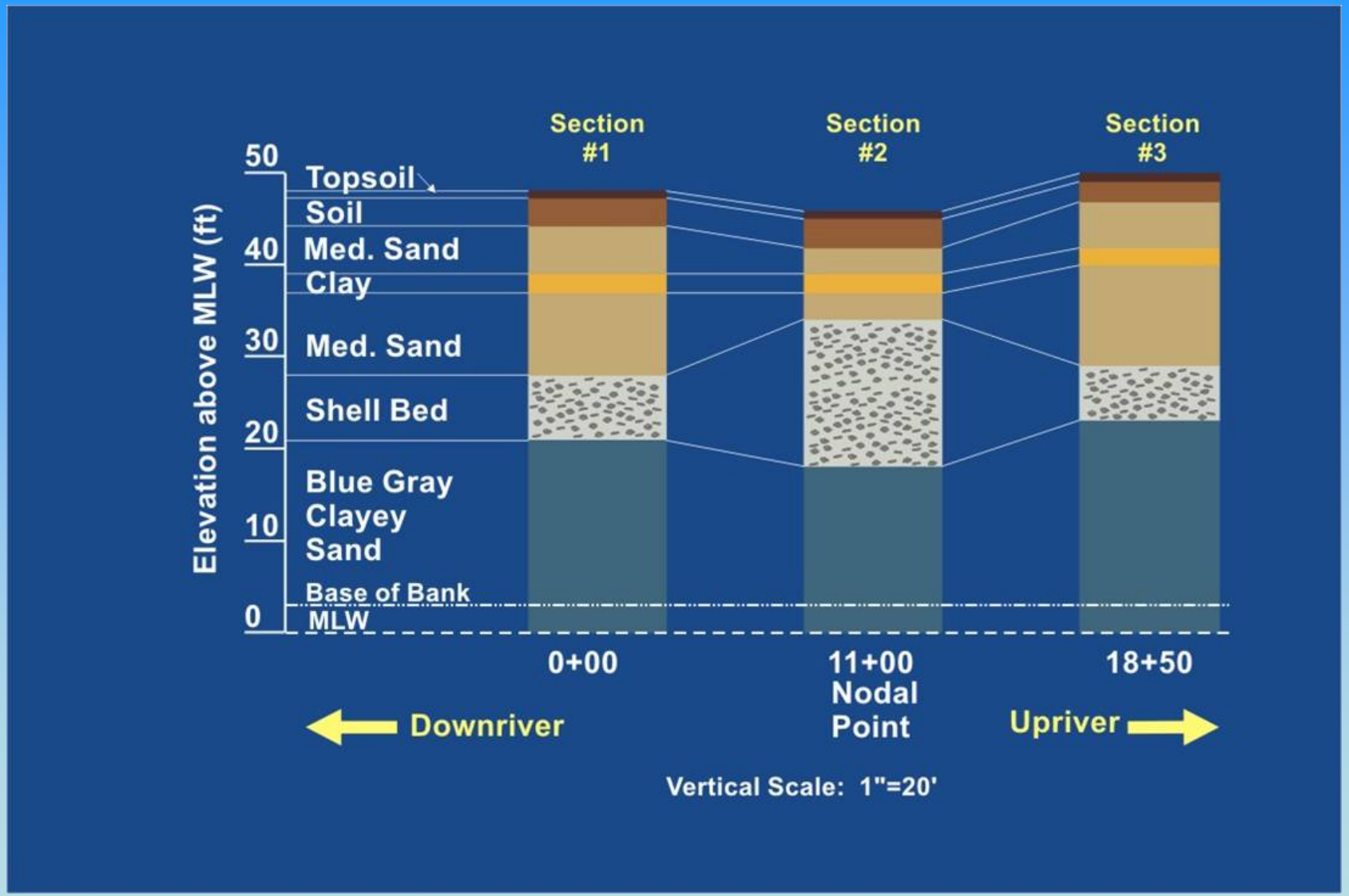
VanDyke Project
Pre-Construction
1994

VanDyke Project
Two Years After
Construction
1999

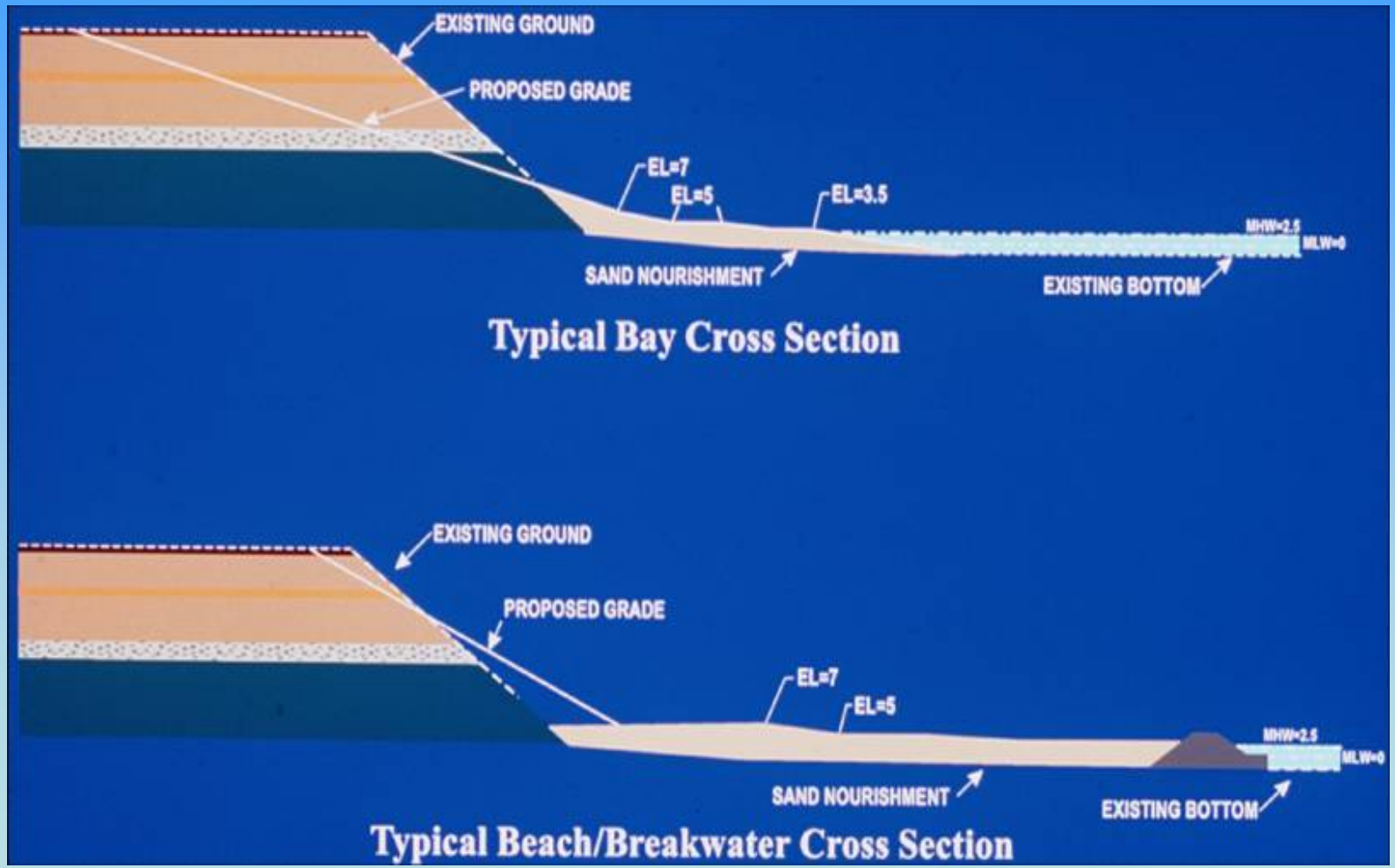



Section #1
Section #2
Section #3
Elevation above MLW (ft)
50
40
30
20
10
0
Topsoil
Soil
Med. Sand
Clay
Med. Sand
Shell Bed
Blue Gray Clayey Sand
Base of Bank
MLW
0+00
11+00
Nodal Point
18+50
Downriver
Upriver
Vertical Scale: 1"=20'


Van Dyke

Shore Protection

Typical breakwater and bay cross-sections.



Van Dyke

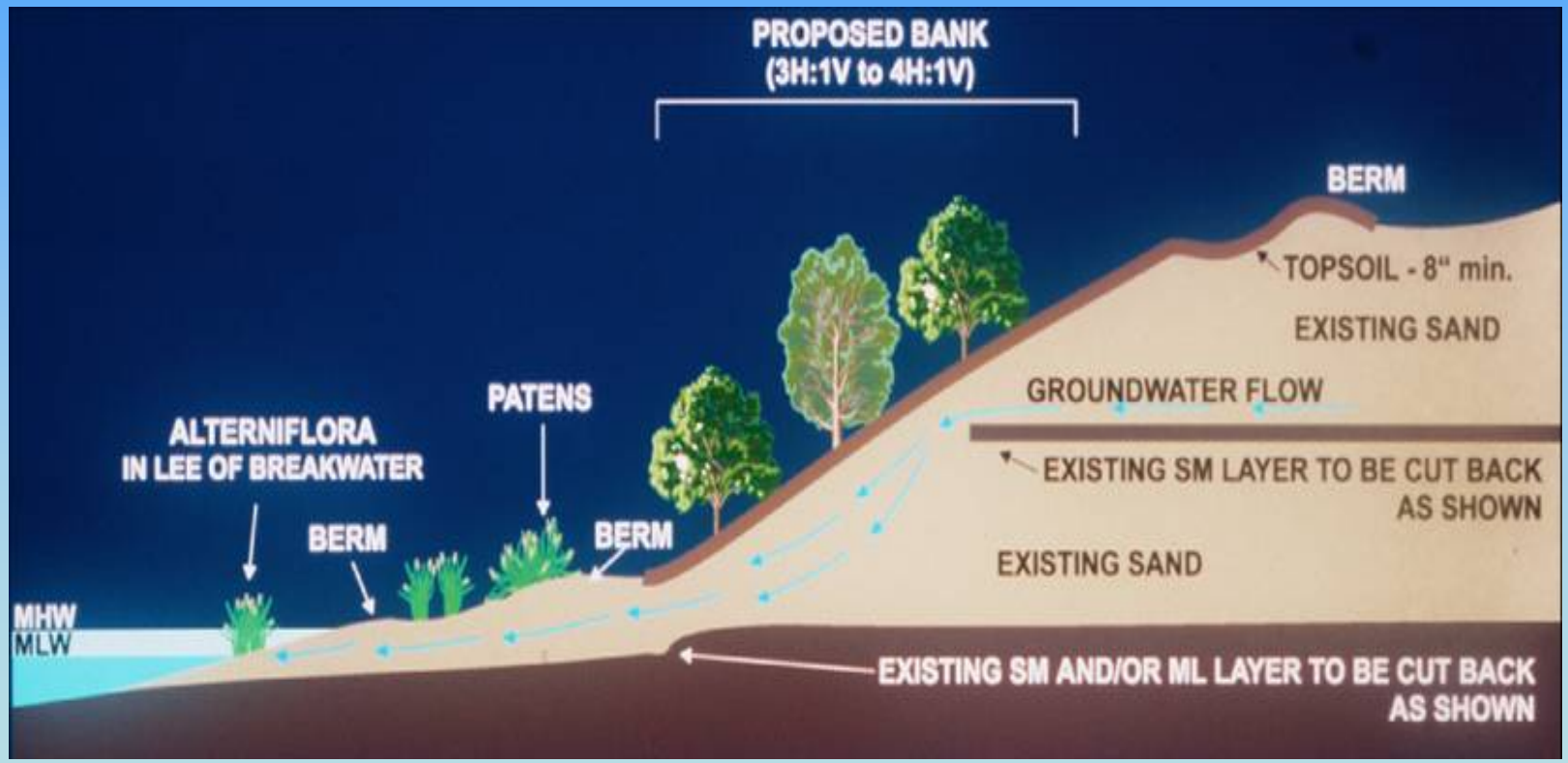
Little impact to the breakwaters and beach. The banks were eroded in areas with steep bank slopes in several embayments.

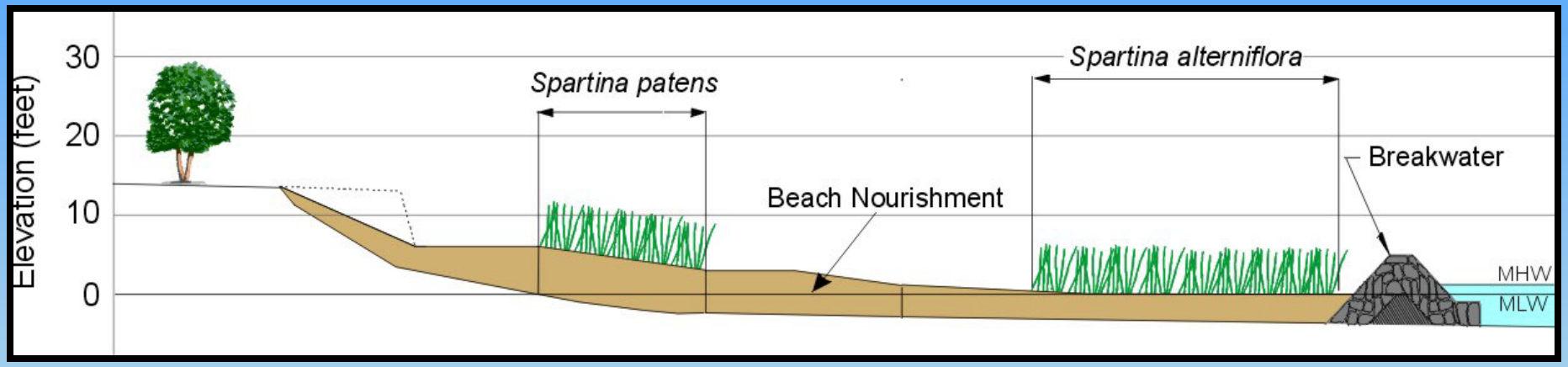
Shore Protection

Asbury project located in a coastal embayment with a unidirectional wind/wave climate demonstrating shore planforms resulting from annual and storm waves which approach from the same quadrant.

Shore Protection

Typical cross-section of a project with a high, upland bank.

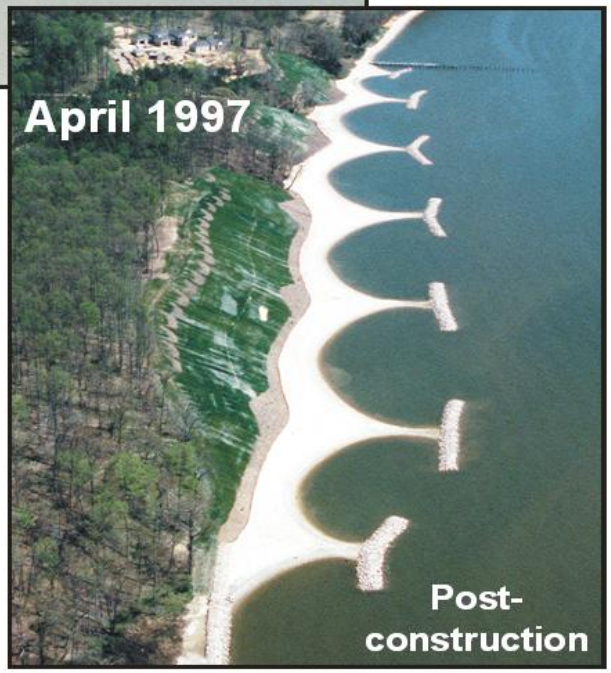


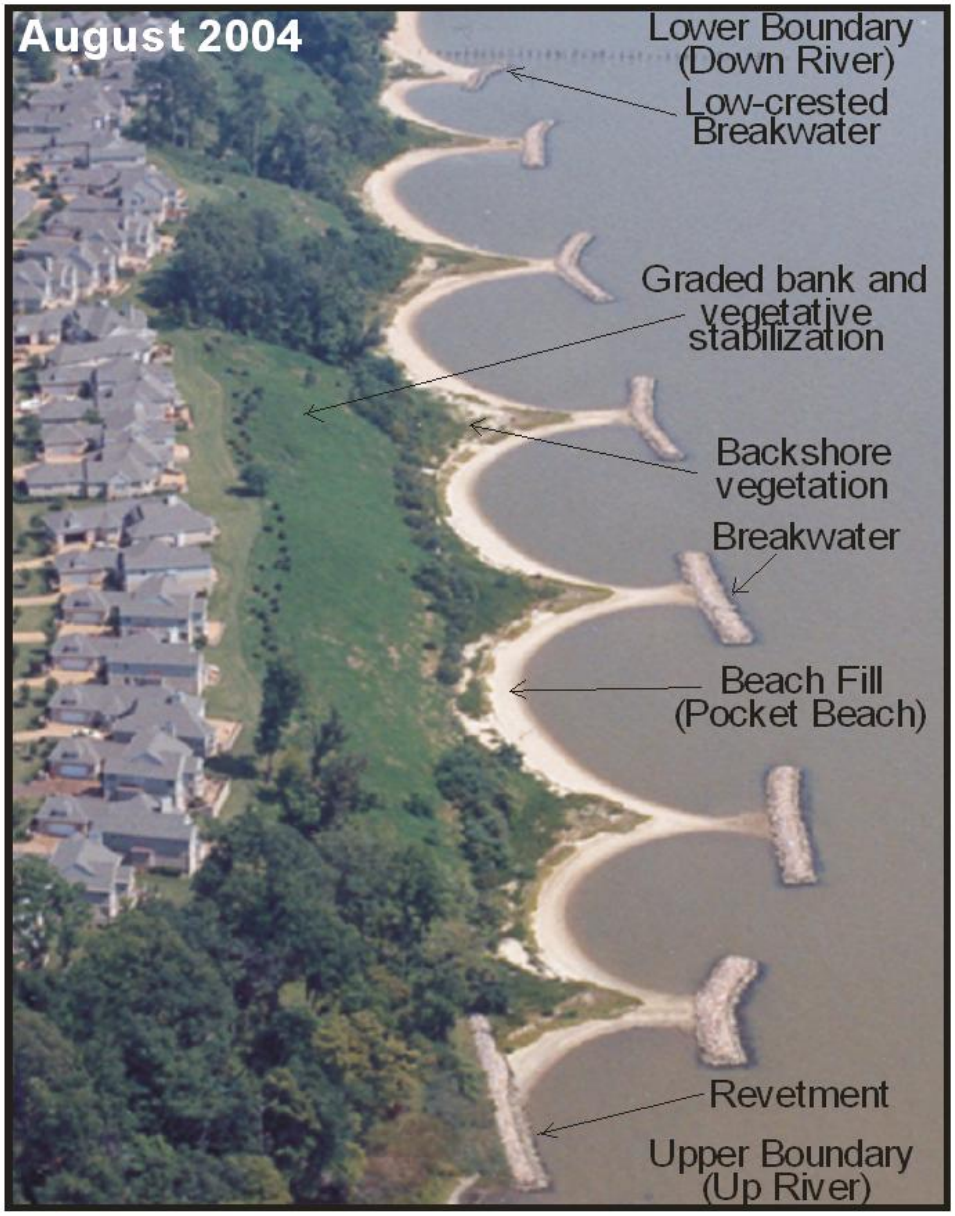

Elevation (feet)
30
20
10
0
Spartina patens
Spartina alterniflora
Beach Nourishment
Breakwater
MHW
MLW

Shore Protection

Asbury site before the project (November 1994), after the project (October 1998), and in August 2000.

Kingsmill on the James






Kingsmill


Kingsmill


Kingsmill
AUG 21 2003


Kingsmill
AUG 21 2003


Kingsmill
AUG 21 2003

Westmoreland State Park

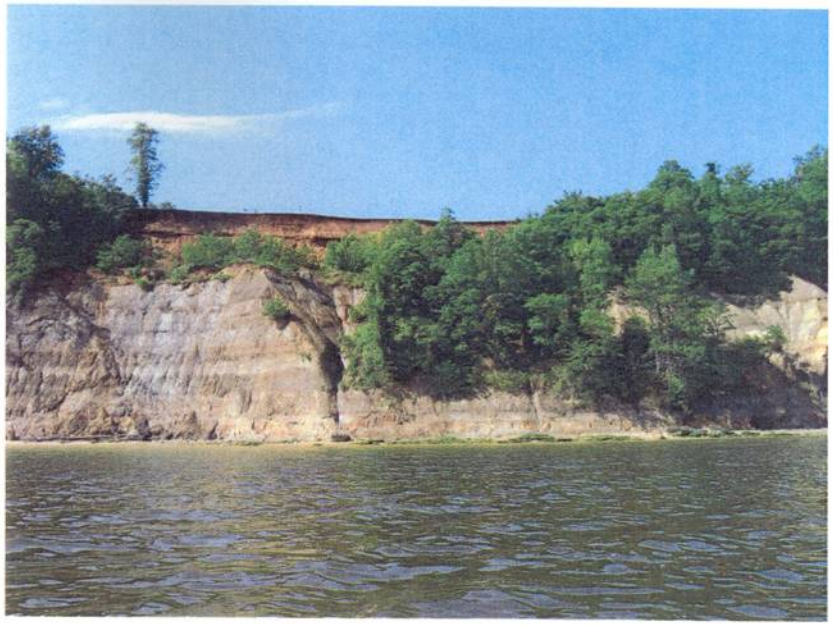


Photo No. 1: View of Horsehead Cliffs

Photo No. 2: Upper Sand Portion of the Bluff


Westmoreland
State Park
JUN 5 2008

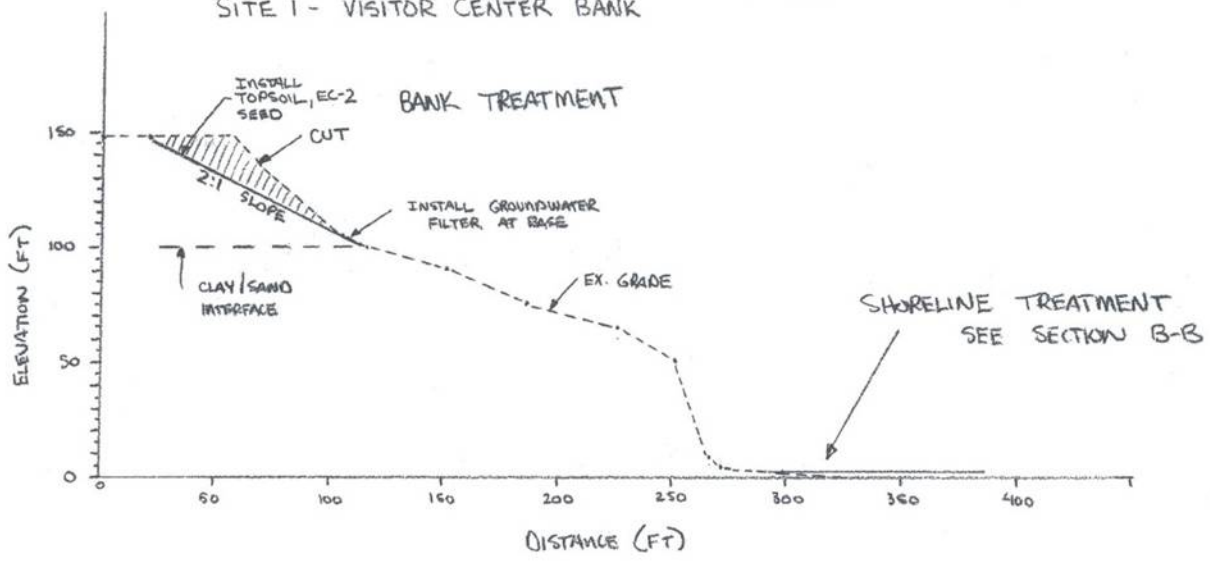

Westmoreland
State Park
JUN 5 2008

WESTMORELAND

SECTION A-A

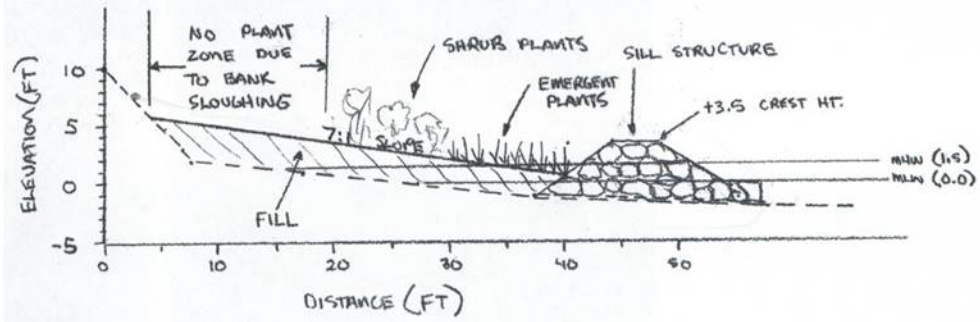
1" = 50

SITE 1 - VISITOR CENTER BANK



SECTION B-B

1" = 10'



Summary of Bank Modifications and Type of “Living Shoreline” Application.

- Cornwallis Neck: Blanket drain/bank grading with continuous breakwater and semi-continuous sill with fresh water wetlands and riparian buffer. Non graded bank expected to continue sloughing onto planted terrace of sill system.
- Van Dyke: Bank grading to use bank sands for breakwater system.
- Asbury: Bank grading to use banks sands for breakwater system. Mature vegetation of wetlands and uplands vegetation on bank.
- Kingsmill: Bank grading, bank sands partially unsuitable and had to be moved offsite. Borrow sand required for full filling of breakwater system. System planted with grasses and trees have come in.
- Westmoreland State Park: Design phase. Bank grading along top strata with small revetment to address groundwater and wide sill system along the base. Continued slumping expected.