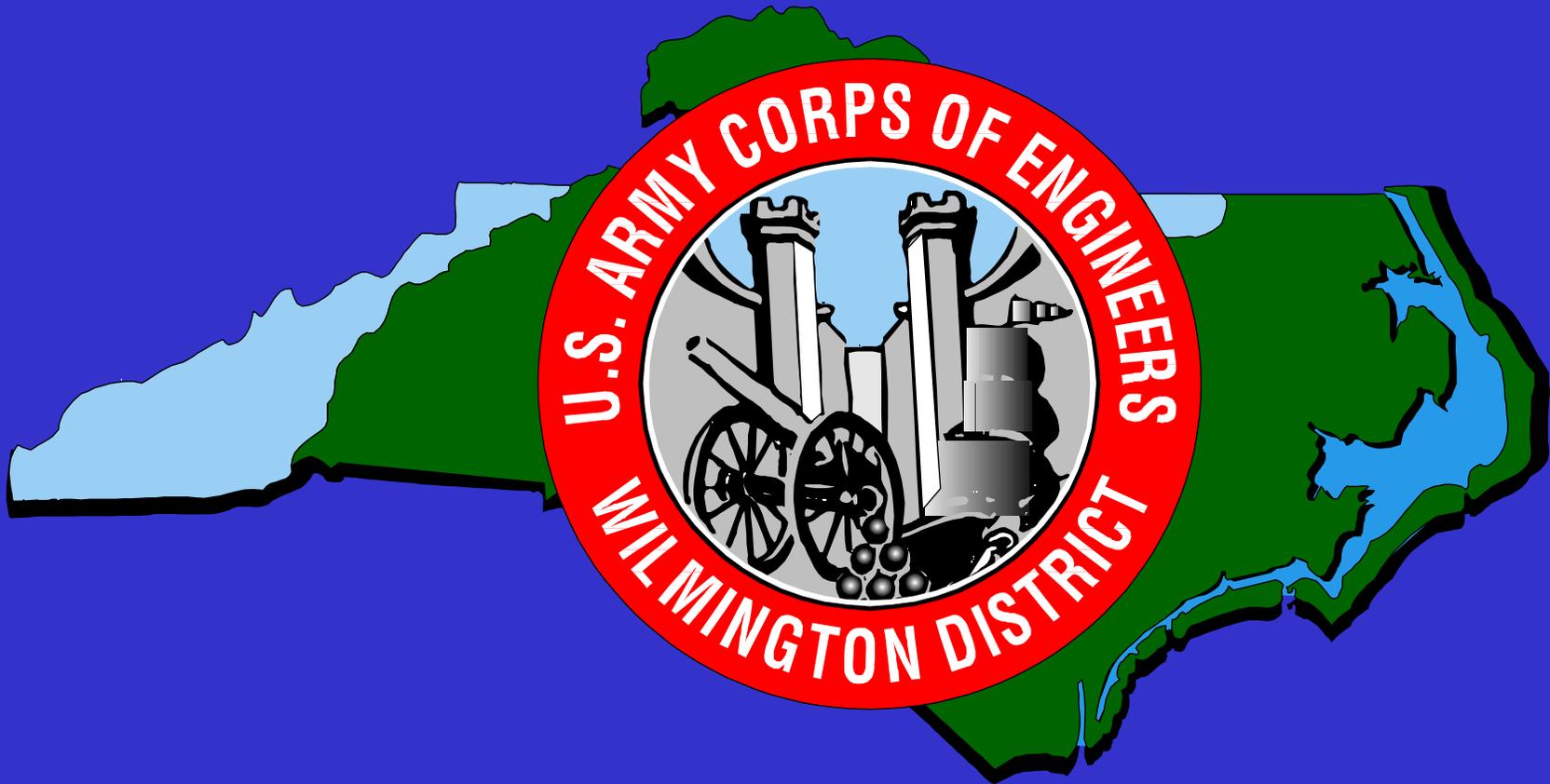
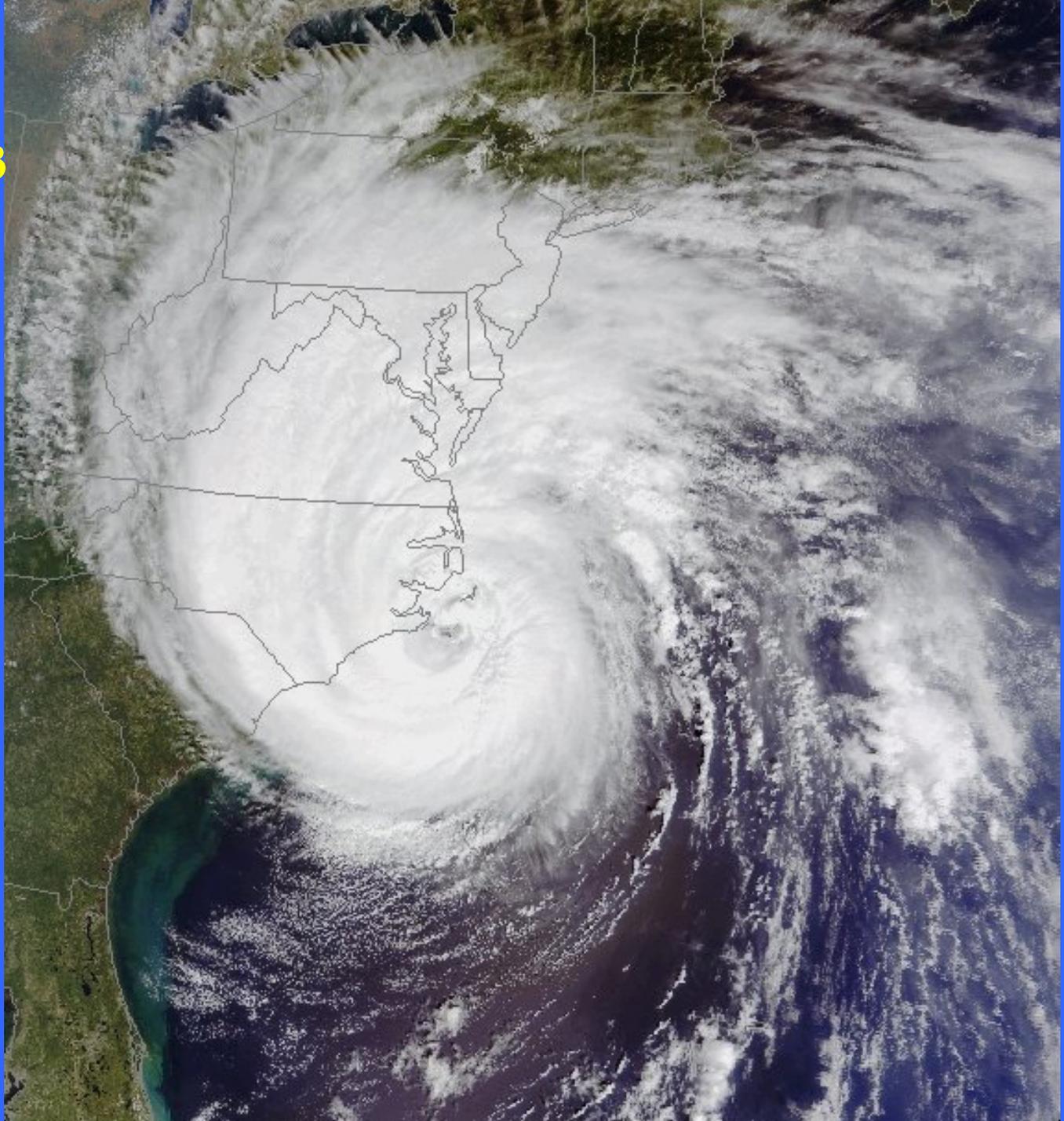


# Hatteras Breach Closure



Mike Wutkowski

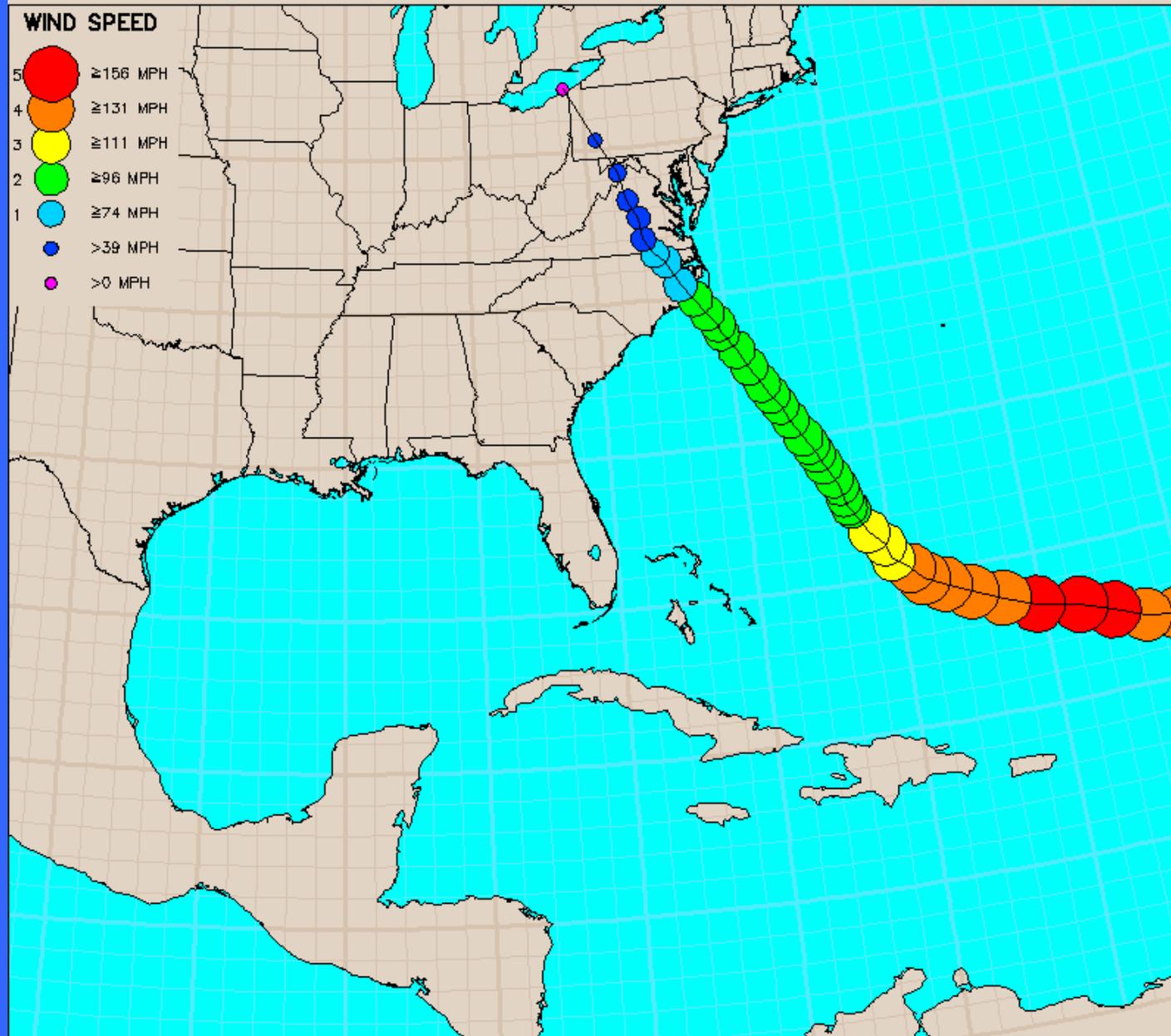
**Hurricane  
Isabel  
18 Sep 2003  
Category 2**



NASA

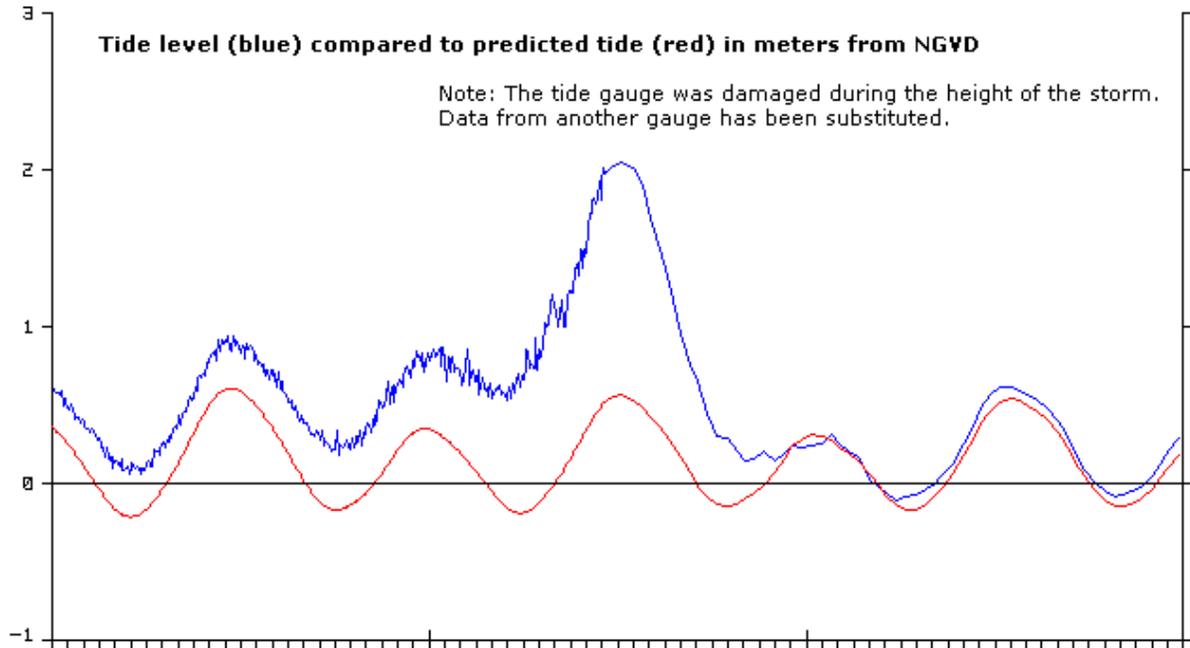
# Hurricane Isabel

13:00 Sat September 6, 2003 to 15:00 Fri September 19, 2003 UTC

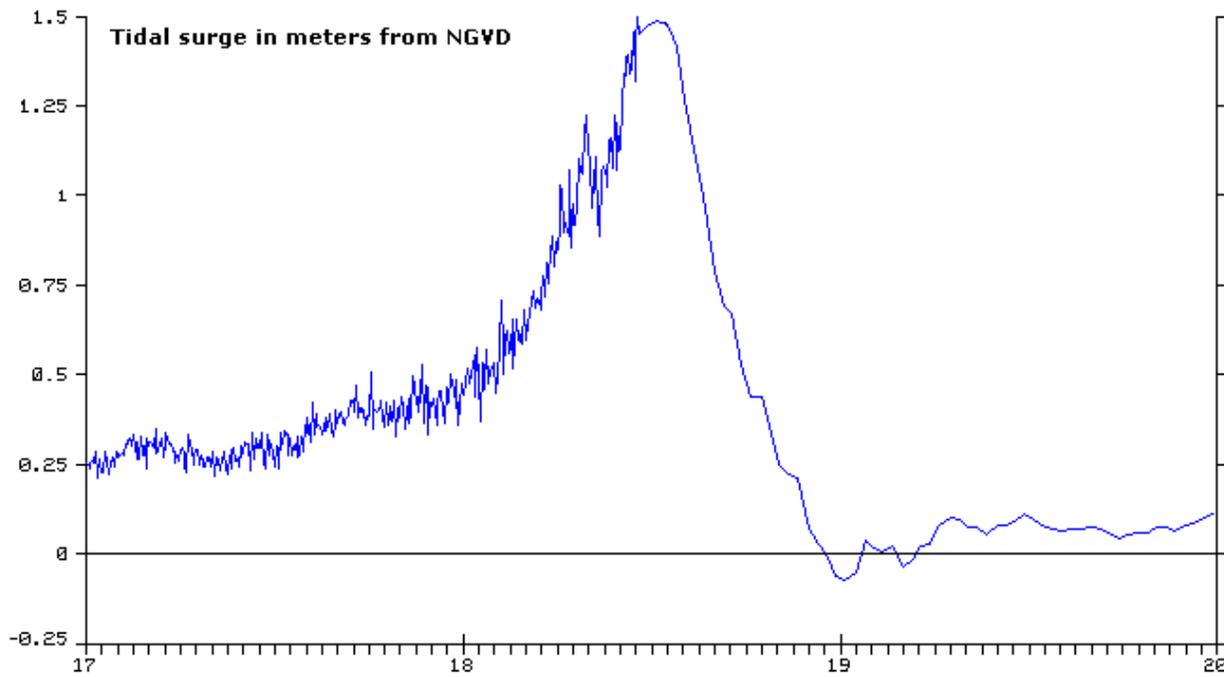


**Tide level (blue) compared to predicted tide (red) in meters from NGVD**

Note: The tide gauge was damaged during the height of the storm.  
Data from another gauge has been substituted.

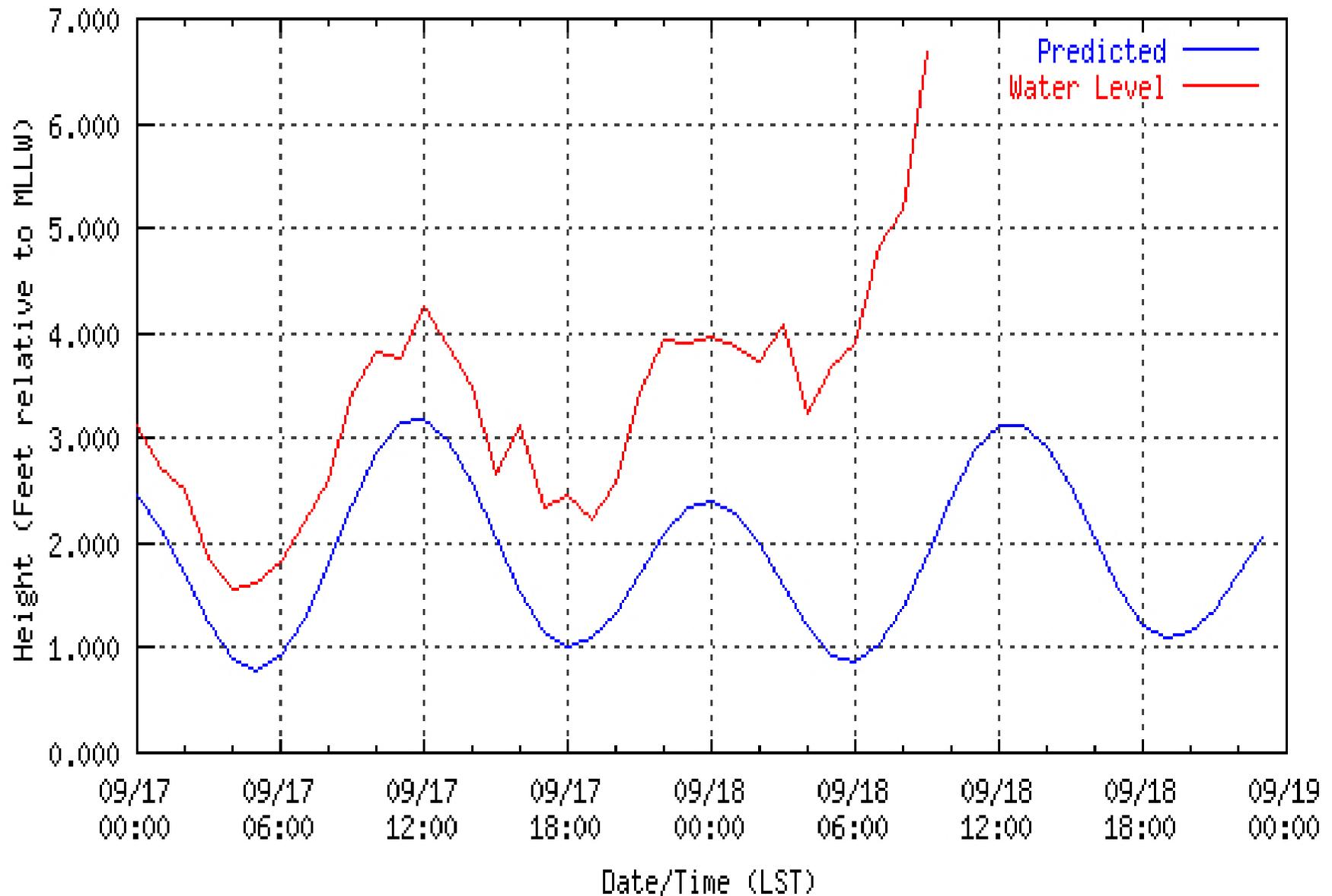


**Tidal surge in meters from NGVD**

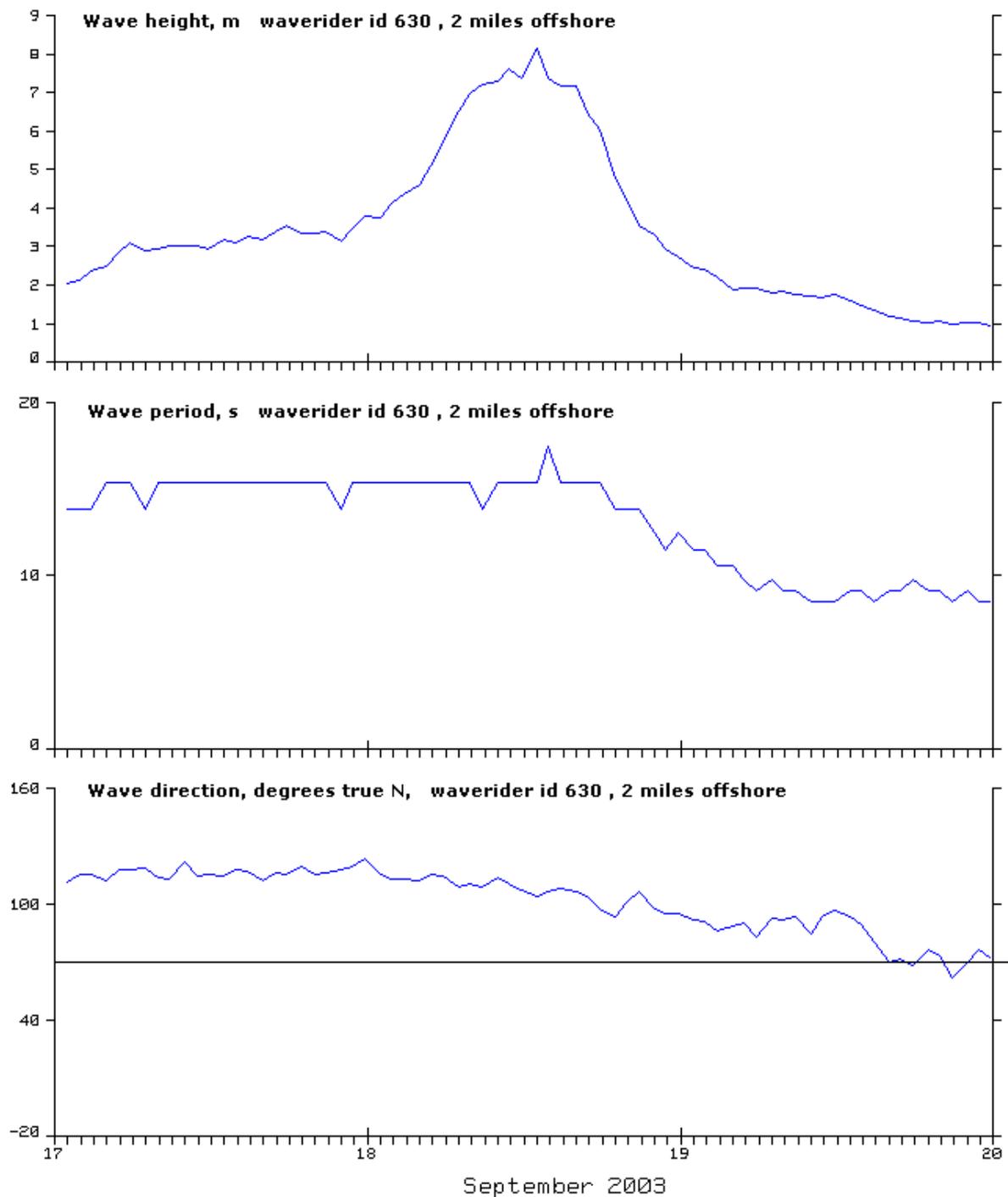


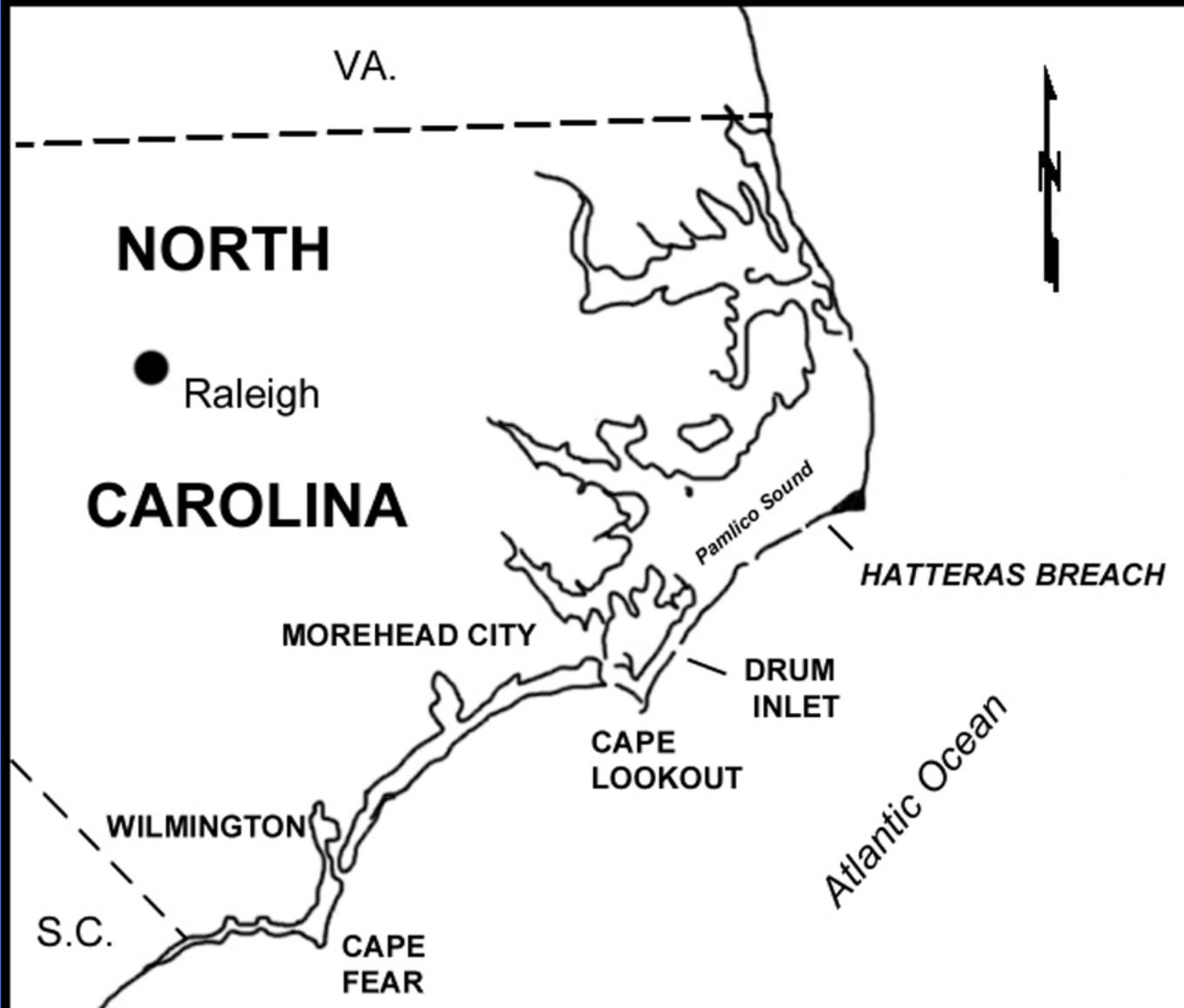
September 2003

NOAA/NOS/CO-OPS  
Verified Hourly Height Water Level Plot  
8654400 CAPE HATTERAS FISHING PIER , NC  
from 09/17/2003 - 09/18/2003



**Largest waves ever recorded at the FRF. Significant Wave Height of 26.6 ft in 55 ft of water.**



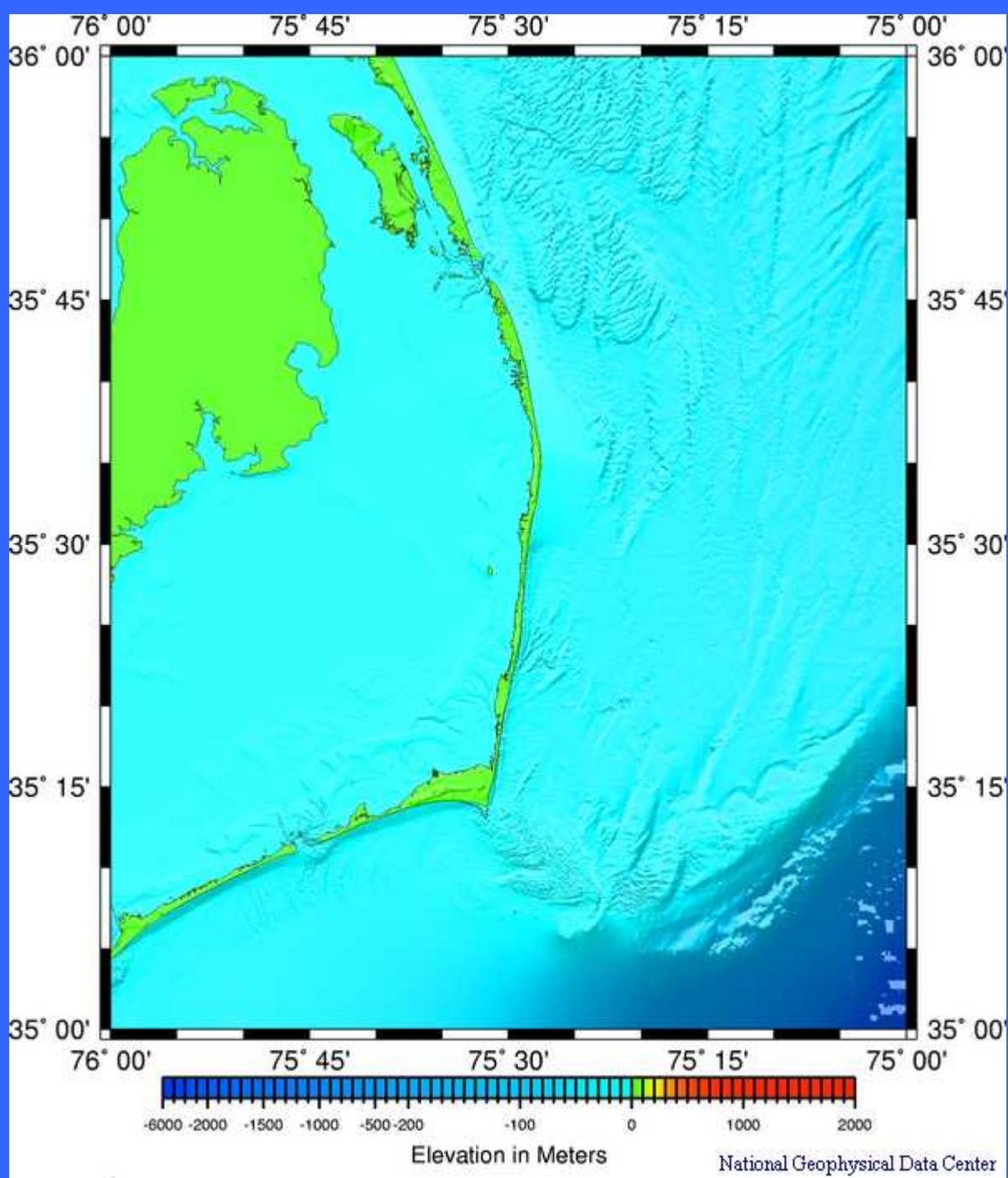


## VICINITY MAP

0 50 100



SCALE IN MILES









# Hurricane Isabel Damage Assessment

1998

19 Sept 2003

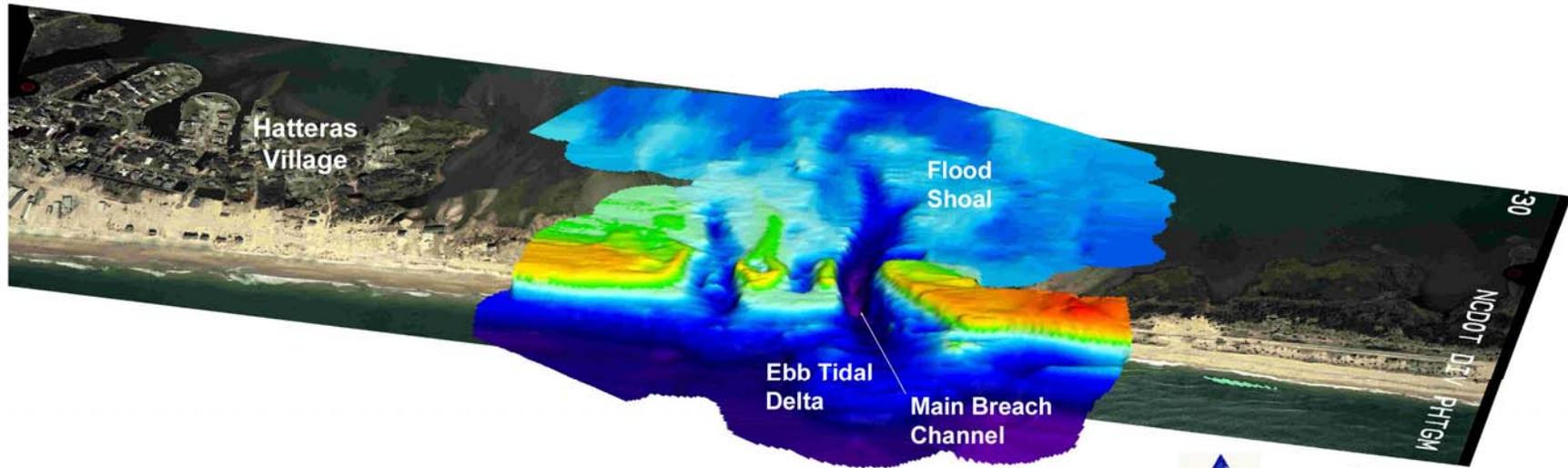
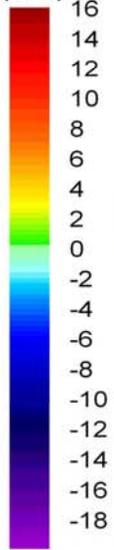


**Cape Hatteras National Seashore, North of Hatteras Village, NC.**

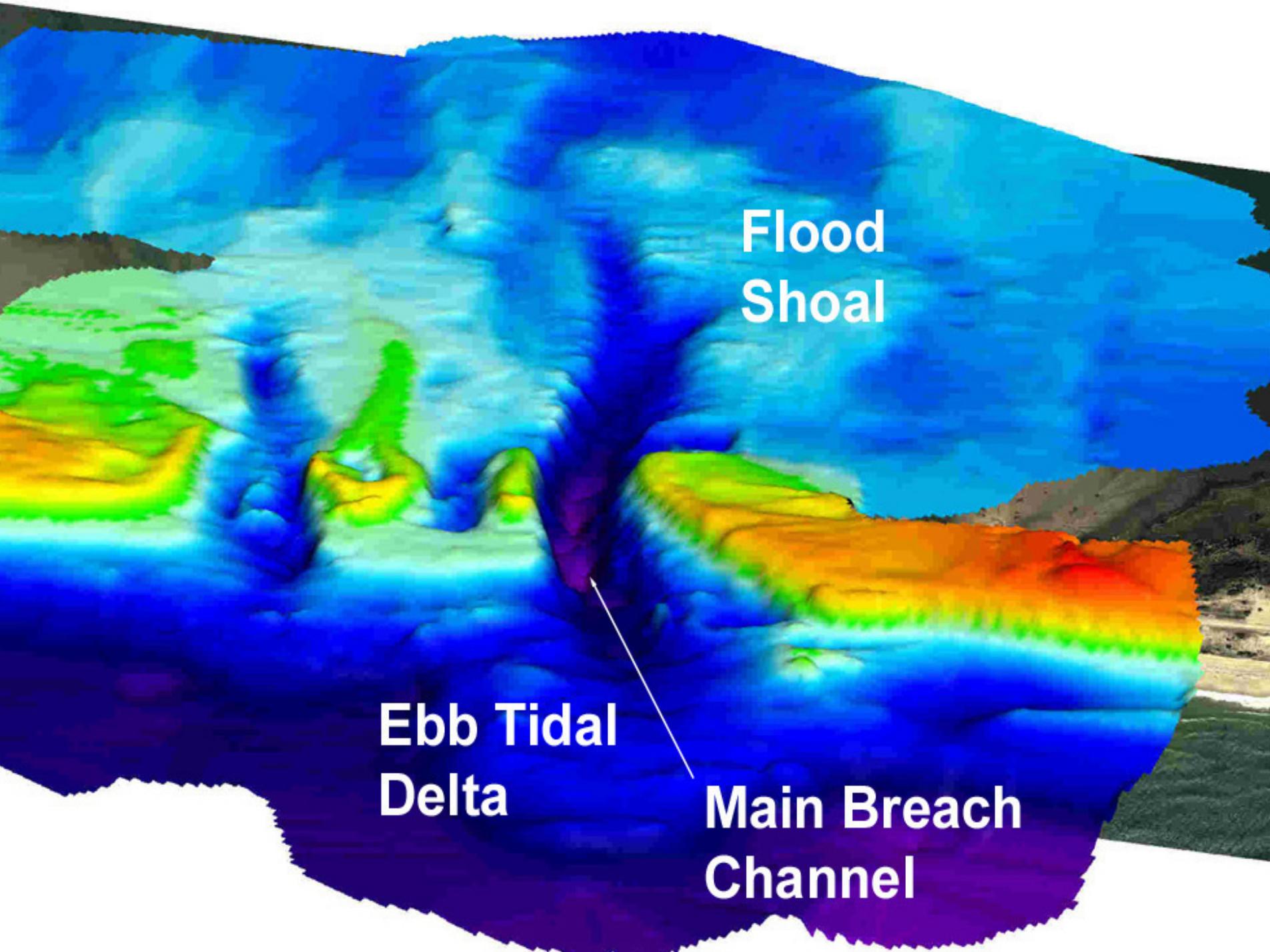
# John Dugan Aret'e



Elevation/  
Depth  
(feet)



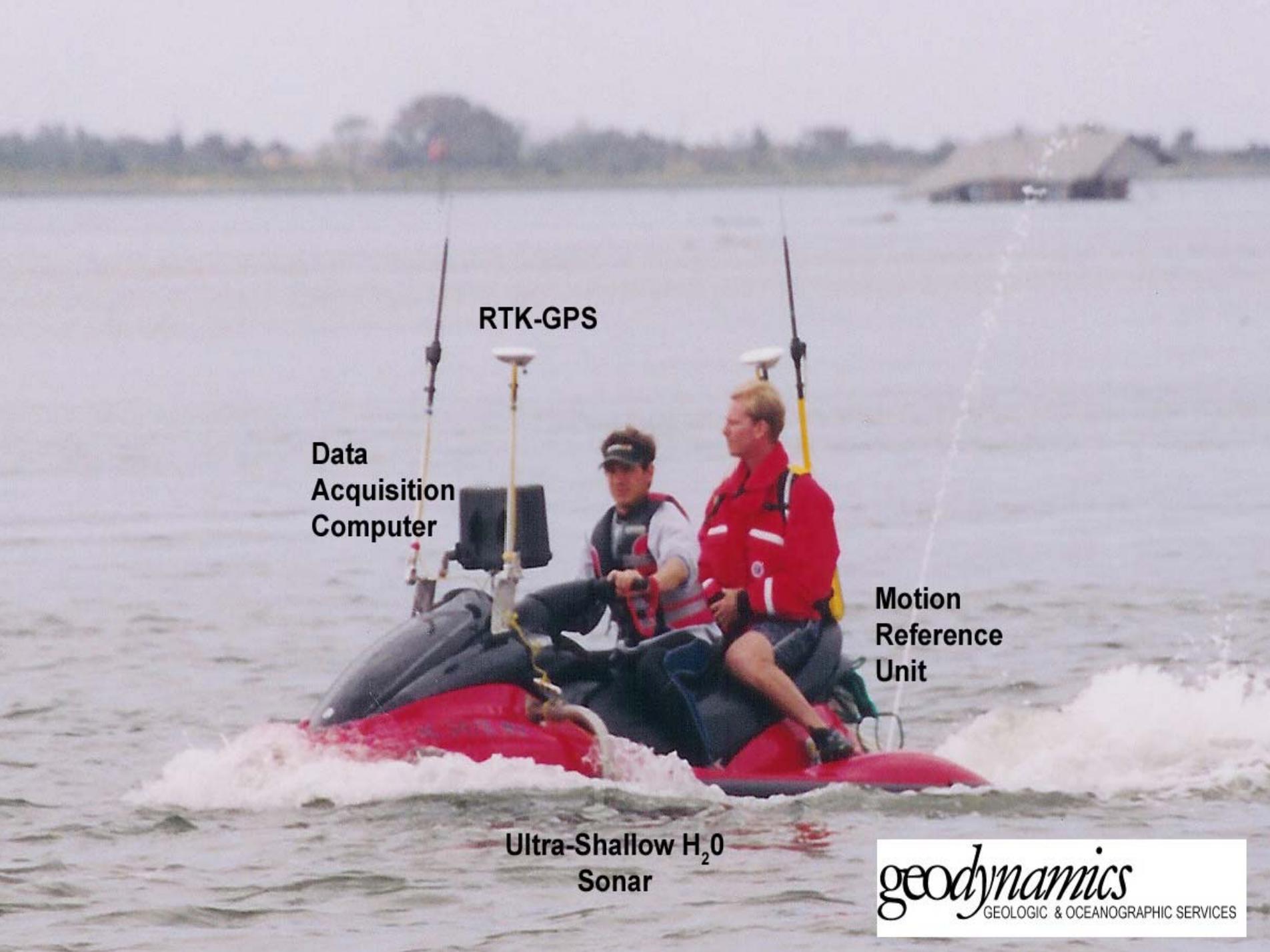
*geodynamics*  
GEOLOGIC & OCEANOGRAPHIC SERVICES



**Flood  
Shoal**

**Ebb Tidal  
Delta**

**Main Breach  
Channel**



RTK-GPS

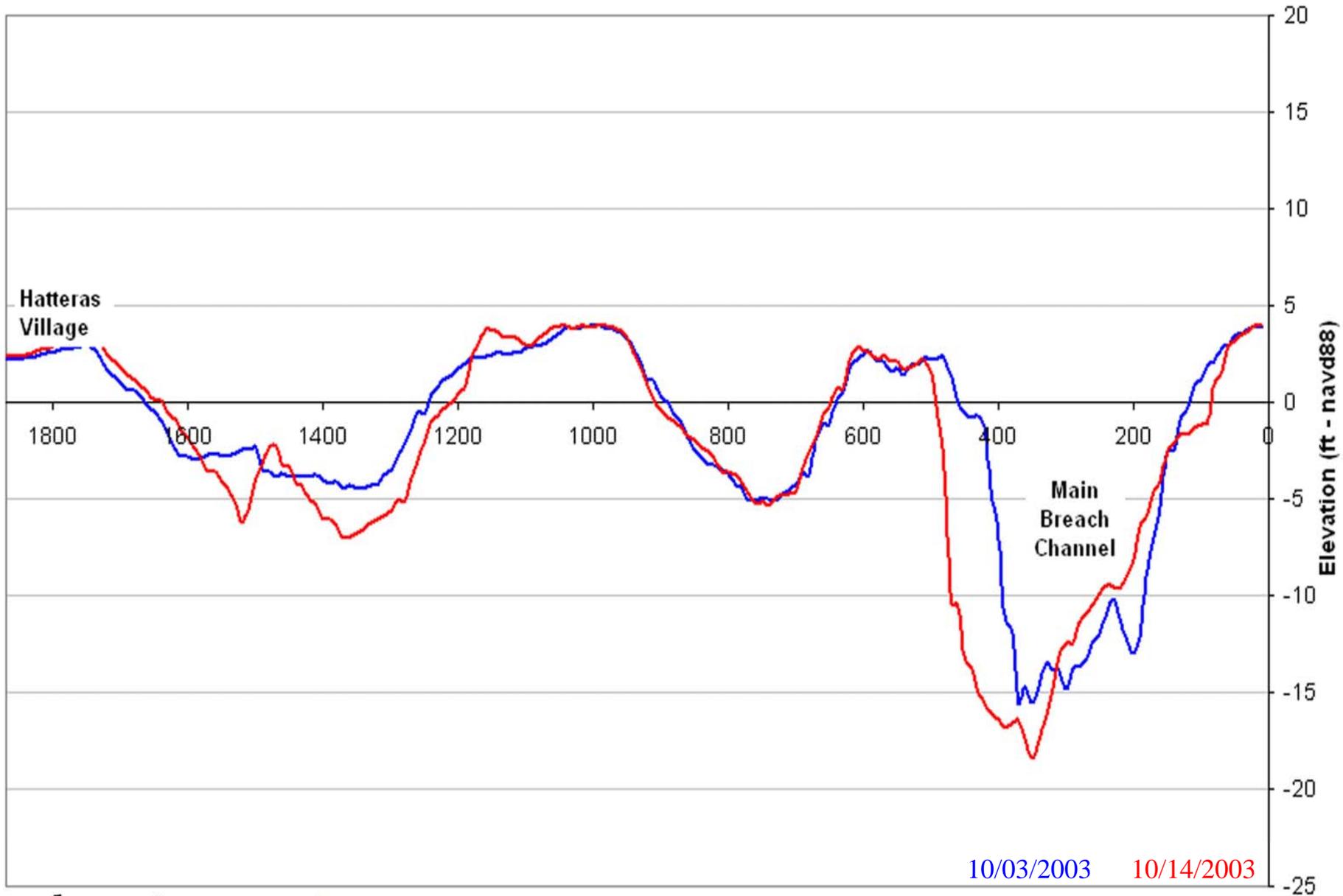
Data  
Acquisition  
Computer

Motion  
Reference  
Unit

Ultra-Shallow H<sub>2</sub>O  
Sonar

*geodynamics*  
GEOLOGIC & OCEANOGRAPHIC SERVICES

# Hatteras Breach Cross Section



10/03/2003 10/14/2003

Distance Along Profile (ft)

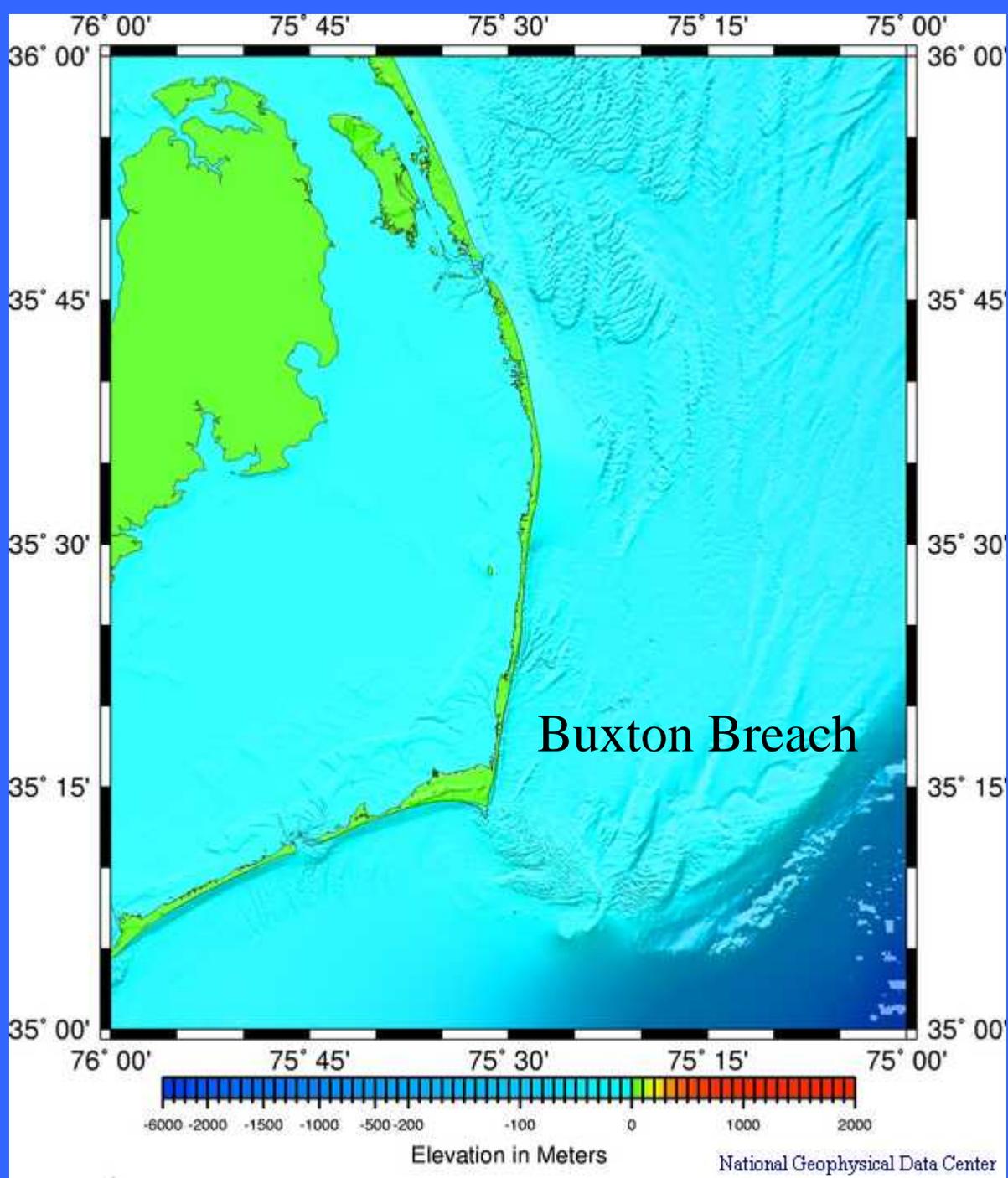
Survey1 Survey2

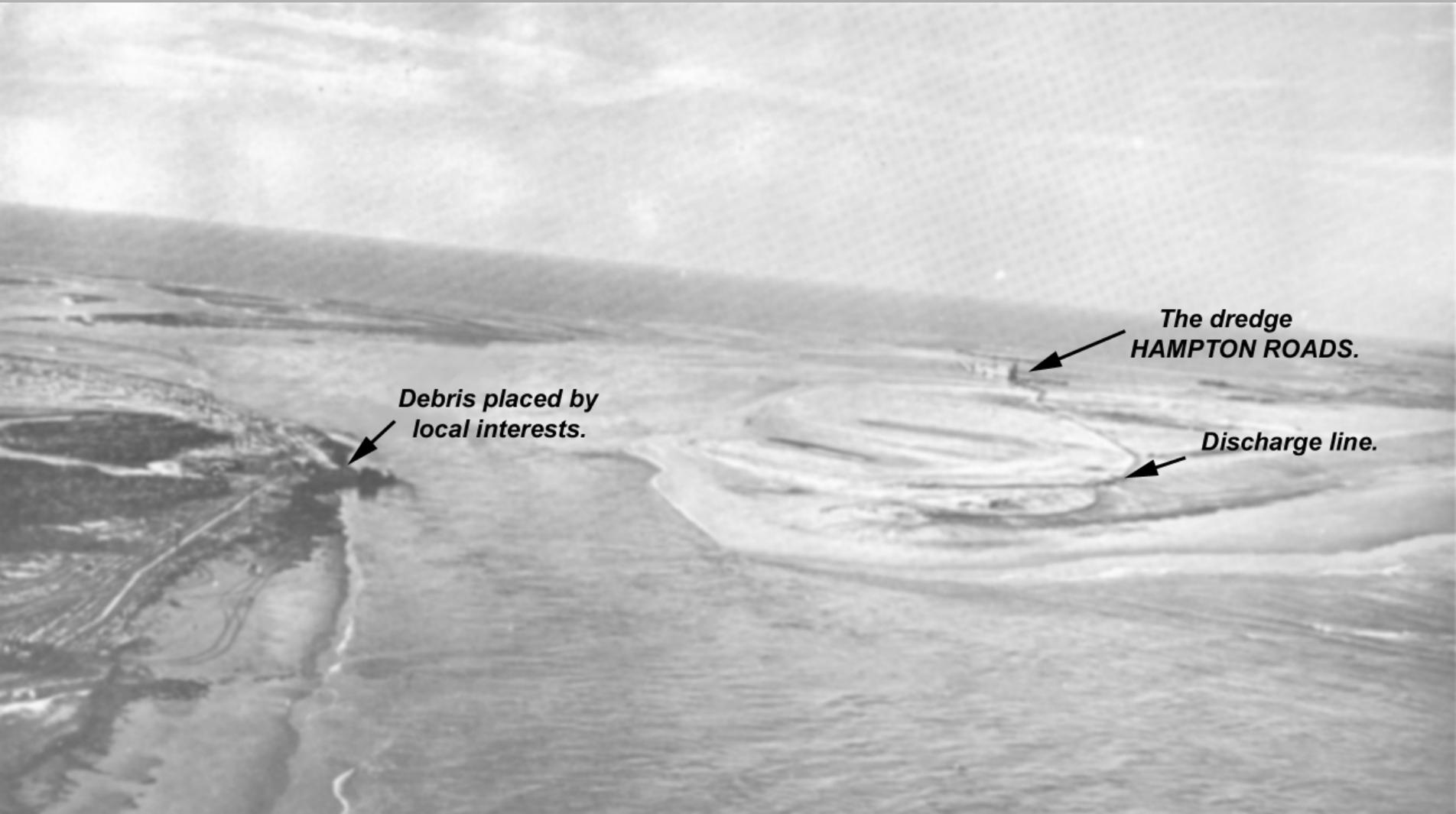
**Max surface current speed ~ 7.0 fps.**



# Piles Constructed in the 1933 Breach







*Debris placed by  
local interests.*

*The dredge  
HAMPTON ROADS.*

*Discharge line.*

**Buxton Breach**  
1,650 ft wide  
12 feet deep

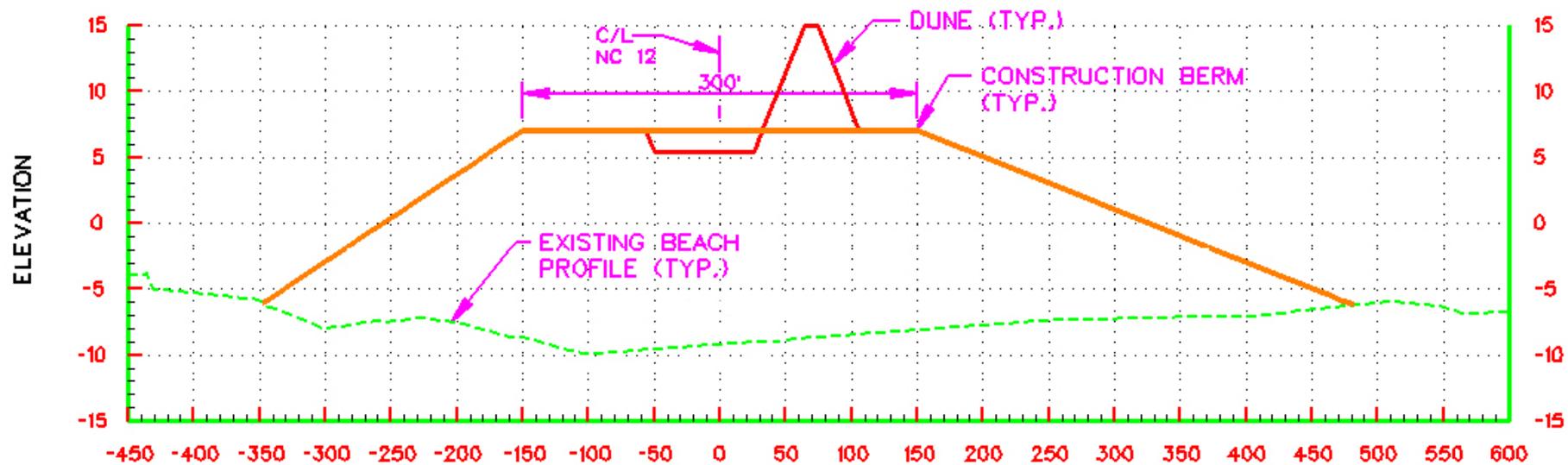
Two 16 inch dredged  
1,160 hp, 1,600 hp

9,000 cyds/day each  
1 dredge 55 days  
2 dredges 3 days

588,000 cyds  
At closure







40+00





PAMLICO SOUND



BORROW AREA

BREACH AREA

PIPELINE ROUTE

34,000 ft

HATTERAS INLET

ATLANTIC OCEAN



PLAN VIEW SHOWING THE BORROW AREA, THE PIPELINE ROUTE AND THE BREACH AREA

# *Illinois*

11,300 HP

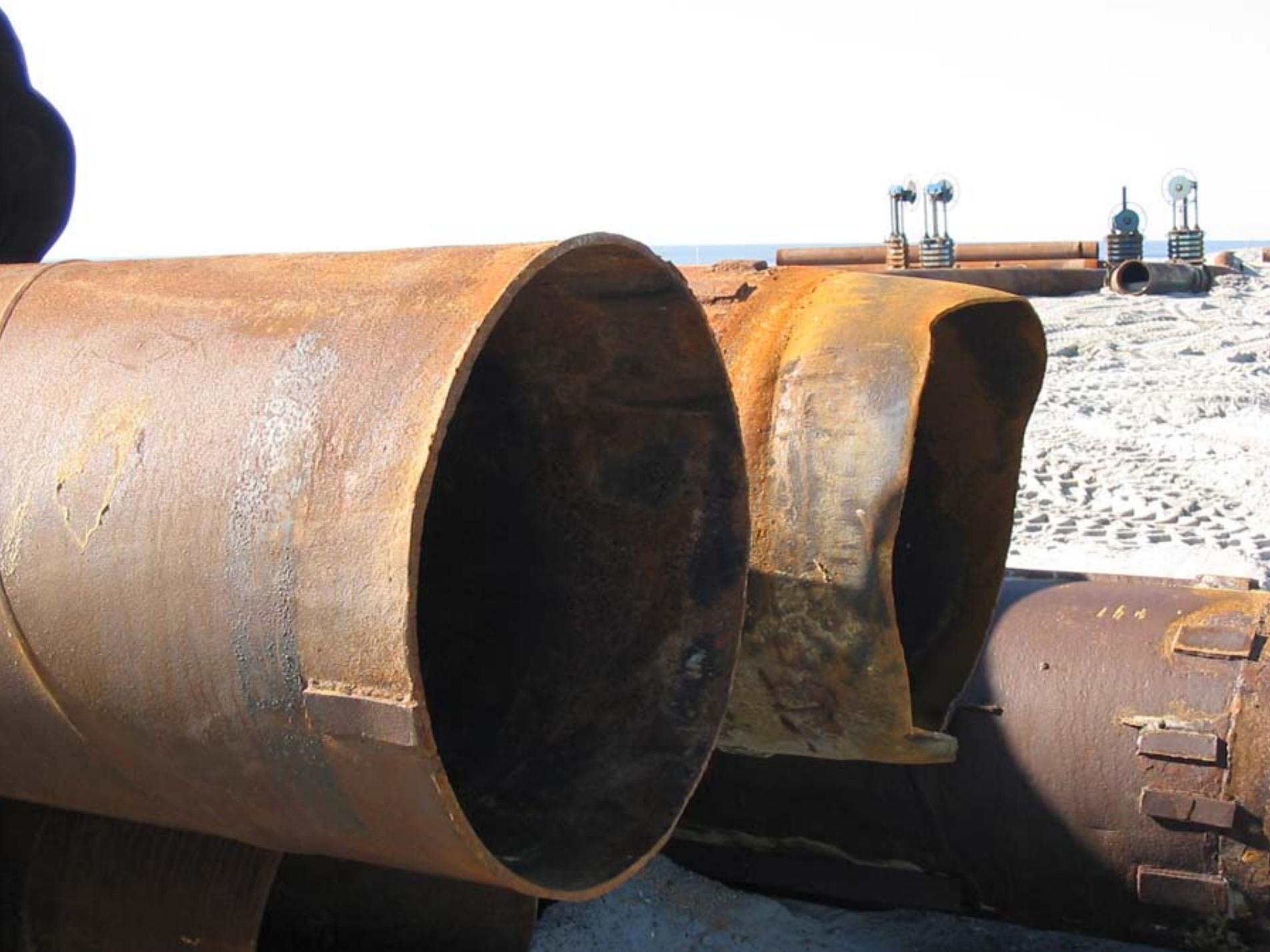
30 inch



7,200 HP  
Booster

























Started 17 October 2003  
15 days, 15 hrs/day, 22,000 cyds/day, 41,000 cyds/day max



NOV 3 2003



**coarse sand**

**1/2-1.0mm**



**medium sand**

**1/4-1/2mm**















Drew C. Wilson Photos

The Virginia-Pilot



11/01 15 day of pumping.



11/1/03 9:30 am



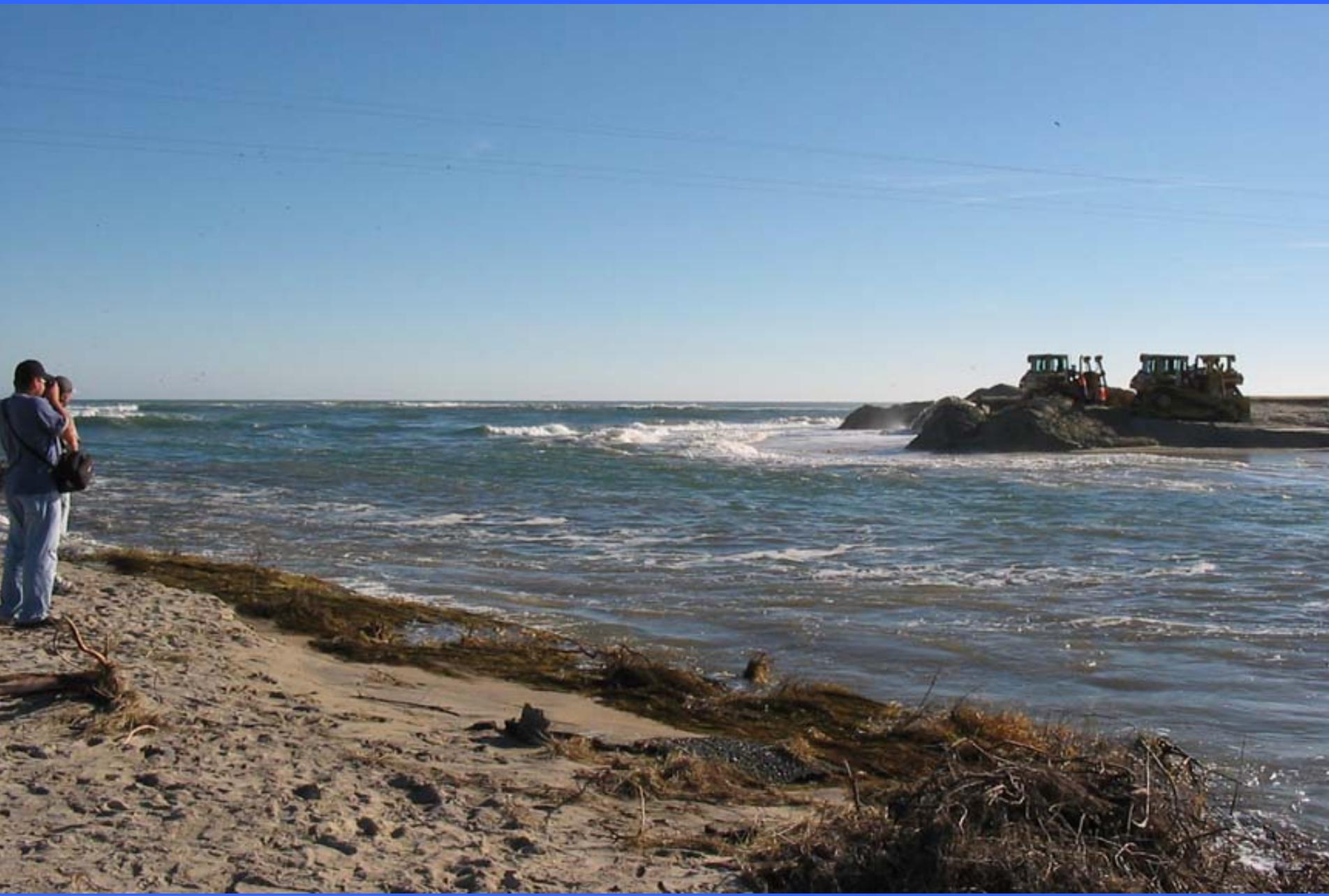


1 November 2003 9:30 am



11/1/03 11:00 am





1 November 2003 4:00pm



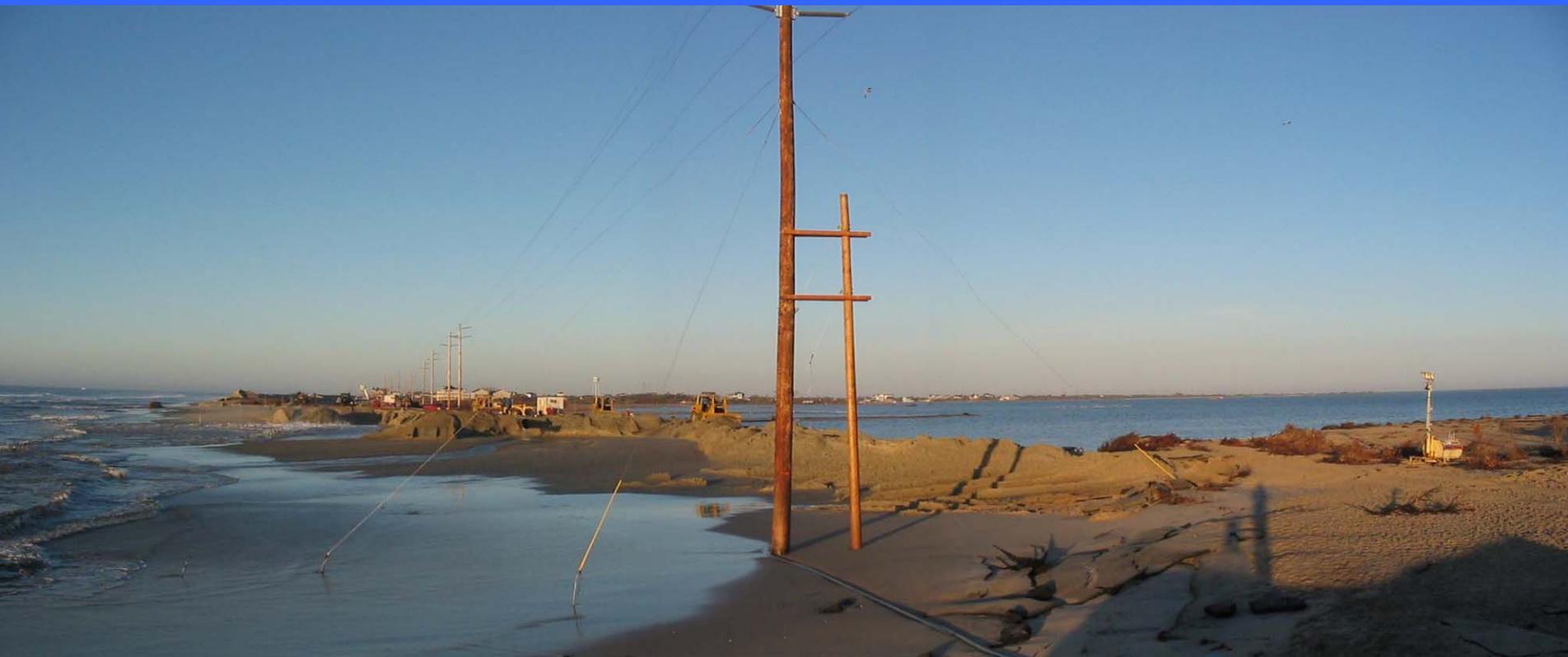






1 November 2003

8:40 pm



300,000 cubic yards dredged at closure

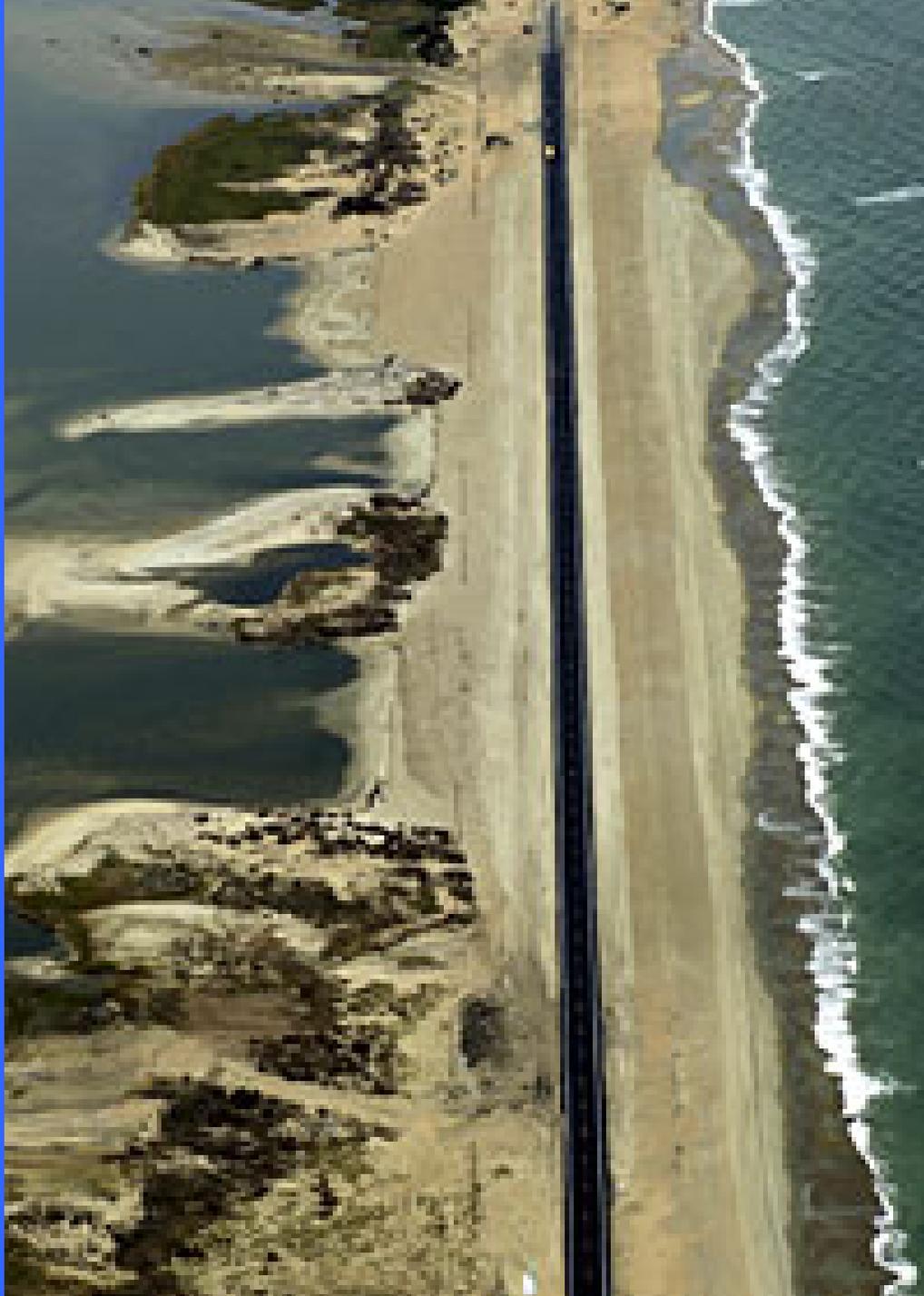




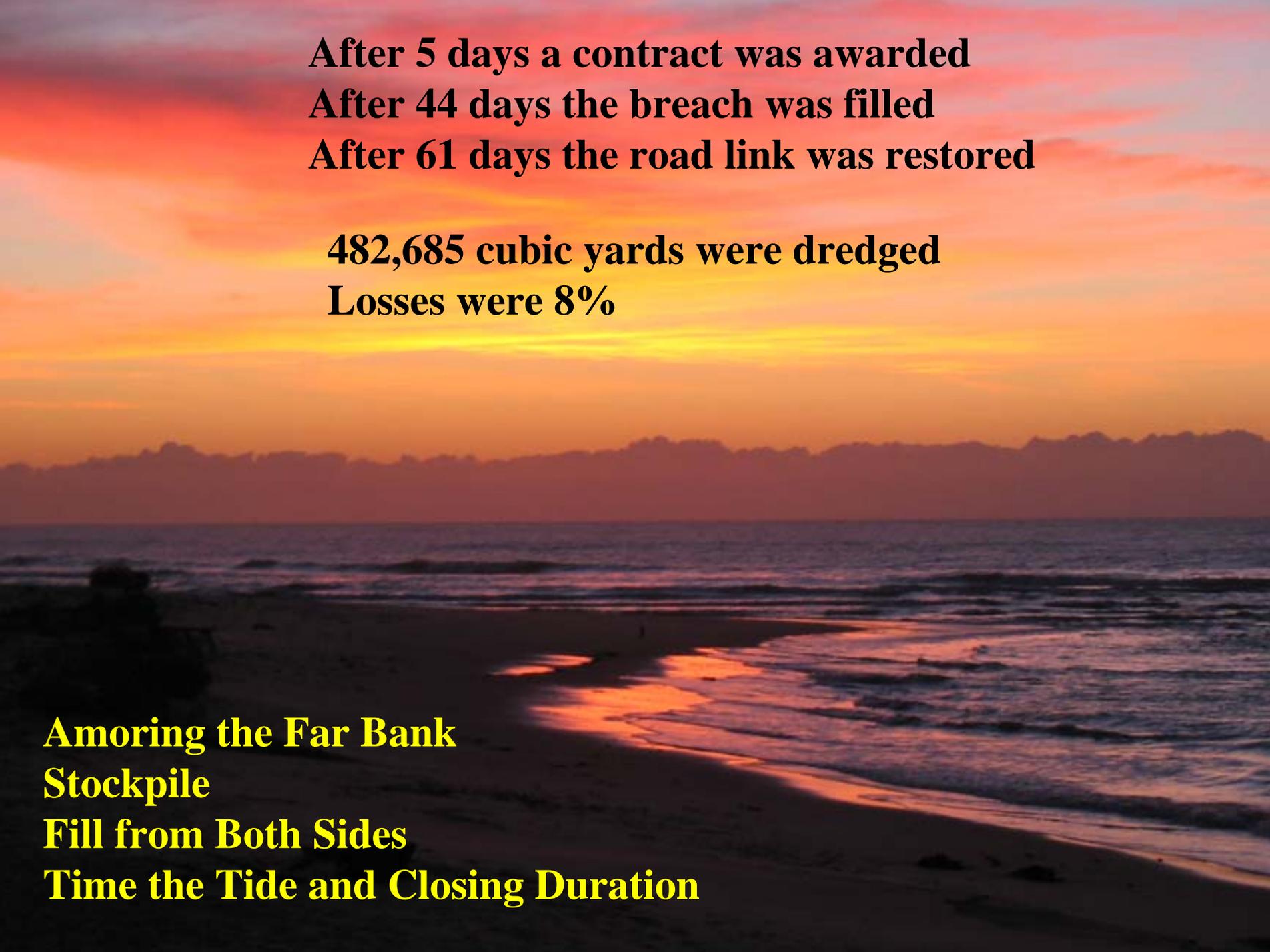
Drew C. Wilson Photos

The Virginia-Pilot





11/18/03



**After 5 days a contract was awarded**  
**After 44 days the breach was filled**  
**After 61 days the road link was restored**

**482,685 cubic yards were dredged**  
**Losses were 8%**

**Amoring the Far Bank**  
**Stockpile**  
**Fill from Both Sides**  
**Time the Tide and Closing Duration**