Delaware Inland Bays
and Indian River Inlet
USACE Involvement Since 1935

Jeff Gebert
USACE Philadelphia District
19 September 2013
What we will cover . . .

• USACE authorities
  Navigation & shore protection
• What we know about IRI and bays
• Ongoing USACE work
  Projects
  Studies
• CAC questions
USACE Study Region . . . Your backyards

Indian River Inlet

Little Assawoman Bay

Indian River Bay

Rehoboth Bay

Indian River Inlet

North
USACE authorities
Navigation & shore protection

- What we know about IRI and bays
- Ongoing USACE work
  Projects
  Studies
- CAC questions
Indian River Inlet, 1931
1935 USACE Survey
REPORT OF THE DISTRICT ENGINEER

SYLLABUS

District engineer recommends improvement of Indian River Inlet, Del., by jetting and dredging to afford 12-foot navigation and to restore sea-food industry in Indian River and Rehoboth Bays through increased salinity, at an estimated cost of $415,500 for new work ($408,000 through Engineer Department plus $7,500 through Lighthouse Service) and $10,500 annually for maintenance ($10,000 through Engineer Department plus $500 through Lighthouse Service), provided local interests furnish a cash contribution of $160,000, all lands required for right-of-way and disposal areas, and agree through proper local authority to construct an adequate movable-span highway bridge across the inlet.

WAR DEPARTMENT:

UNITED STATES ENGINEER OFFICE,
Philadelphia, Pa., February 26, 1937.

Subject: Survey report on Indian River and Indian River Inlet.
To: The Division Engineer, North Atlantic Division, New York, N. Y.

AUTHORITY

1. This review report is submitted in compliance with instructions from the Chief of Engineers dated March 2, 1935, and endorsed by the division engineer under date of March 6, 1935; also with instructions from the division engineer of August 21, 1935, and with further instructions from the division engineer of October 27, 1936, transmitting recommendations made in letter of the Board of Engineers for Rivers and Harbors to the Chief of Engineers dated October 23, 1936, pursuant to the following resolution of the Committee on Rivers and Harbors:

1774—37—3
DELAWARE COAST, BEACH EROSION CONTROL AND HURRICANE PROTECTION

LETTER
FROM
THE SECRETARY OF THE ARMY
TRANSMITTING

A LETTER FROM THE CHIEF OF ENGINEERS, DEPARTMENT OF THE ARMY, DATED MAY 13, 1968, SUBMITTING A REPORT, TOGETHER WITH ACCOMPANYING PAPERS AND AN ILLUSTRATION, ON A REVIEW OF THE REPORT ON DELAWARE COAST, BEACH EROSION CONTROL AND HURRICANE PROTECTION, REQUESTED BY A RESOLUTION OF THE COMMITTEE ON PUBLIC WORKS, UNITED STATES SENATE, ADOPTED JANUARY 7, 1963

PRESENTED BY MR. RANDOLPH

JULY 2, 1968.—Referred to the Committee on Public Works and ordered to be printed with an illustration
Indian River Inlet - Sand Bypassing Project
Initiated January 1990

- Discharge Pipeline Crosses Bridge
- Pump House
- North Beach Discharge
- Crane and Eductor
• USACE authorities
  Navigation & shore protection

• What we know about IRI and bays

• Ongoing USACE work
  Projects
  Studies

• CAC questions
**Bays**
- Surface area: 29 sq mi.
- Upland DA: 250 sq mi.

**Inlet Tidal Prism**
- $x10^8$ cu ft
- 1948: 4
- 1975: 10
- 1983: 20 - 33
- 1986: 13 - 15
- 2004: 10 - 22

**Ocean Mn**
- 4.0 ft

**Bay Mn**
- ~1.8 ft
- ~2.8 ft

**Inlet Mn**
- ~3.3 ft

**Inlet Width**
- 500 feet
Mean Range ~ 3.3 feet
Mean Range ~ 1.8 feet
Mean Range ~ 2.8 feet
Mean Range ~ 1.0 feet
Mean Range ~ 1.1 feet
Hurricane Sandy - October 2012
Wind Vector Time Series at NDBC 44009 and 44065

44065 Wind Vectors: Max = 56 MPH (from east)
44009 Wind Vectors: Max = 53 MPH (from west)

Period of max wind speeds
Mean Sea Level Trend
8557380 Lewes, Delaware

Lewes, DE 3.20 +/- 0.28 mm/yr

The mean sea level trend is 3.20 millimeters/year with a 95% confidence interval of +/- 0.28 mm/yr based on monthly mean sea level data from 1919 to 2006 which is equivalent to a change of 1.05 feet in 100 years.

Source: NOAA
2004 Hydro Survey
View to West
• USACE authorities
  Navigation & shore protection
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Hurricane Sandy Restoration

Roosevelt Inlet/ Lewes Beach
10,000 CY

Rehoboth Beach & Dewey Beach
270,000 CY

Indian River Inlet - Sand Bypass Plant
380,000 CY

Bethany Beach/South Bethany
310,000 CY

Fenwick Island
260,000 CY
Pennsylvania Avenue, Bethany Beach, DE
Flood Reduction Study

• 2009-Study initiated
  – Resident survey, economic analysis, and review of previous studies
• 2012-FSCA signed, $60K Fed and $60K non-Fed funds received
  - storm water runoff model was completed, potential structure locations identified outside of Town
• 2012- Hurricane Sandy
  - Town was flooded for days and for longer than adjacent communities
• 2013-Received $80K of Sandy funds
• 2013-Back bay tidal flooding model is being completed, PDT site visit on 7 August
Pennsylvania Avenue, Bethany Beach, DE
Next Steps

• Complete first phase
  - Preliminary alternatives, model alternatives, meet with Town and DNREC
• Resume plan formulation
  - Define existing conditions
  - Determine future without project conditions
  - Formulate Alternative Plans
  - Evaluate Alternative Plans
  - ATR
• Draft Feasibility Report Submittal- March 2014
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QUESTION 1: What actions would the Corps recommend to mitigate flooding in the Inland Bays, which regularly occurs during typical storm events and is well documented at USGS water level monitoring stations? Is reduction of the Inlet’s cross-sectional area by reduction of its ever increasing self-scouring depth an option?
One potential solution . . .
QUESTION 2: Assuming that modification of the inlet is necessary to effectively mitigate flooding in the Inland Bays, what procedure must be followed to request the ACOE to take such action?
DNREC or CIB could respond to the draft Delaware Inland and Delaware Bay recon level analysis with a letter of interest requesting a feasibility study of modifying the Federal navigation project at IRI for storm damage mitigation. See the attached map of vulnerable areas from DNREC that includes 8 locations around the Inland Bays possibly affected by Sandy.
QUESTION 3: To the best of our knowledge, the Inland Bays’ Tidal Prism Graph has not been updated since 1989. What procedure must be followed to have the ACOE update this graph?
Source: 2011 State of the Bays Report
QUESTION 4: Will the Corps’ recent study of NJ bays flooding extended to the DE bays?
North Atlantic Coast Comprehensive Study - NACCS
Reconnaissance-Level Analyses

Determine if there is a Federal (USACE) interest in a cost-shared feasibility study in the interest of providing potential projects in Delaware Inland Bays and Delaware Bay Shoreline.

Coastal flood risk management measures could include: structural, non-structural, natural, nature-based, and policy and programmatic measures or a combination of them, if a feasibility study is initiated.
NACCS/RLA

Next Steps

Fall 2013 – Draft RLA (October 2013)
FY 2014 – sign letters of intent with local sponsor;
   Project Management Plan for Feasibility Phase
FY 2015 – Feasibility phase IF:
   ► Federal interest is determined during Recon
   ► Non-federal sponsor is identified
   ► Federal funding is available
QUESTION 5: In 2004 it was reported that the ACOE had developed a hydrodynamic flow model for the Inland Bays to include both the Assawoman Canal and Little Assawoman Bay (as part of the TMDL pollution abatement initiative). Also at about the same time, DNREC’s Division of Water Resources reportedly had a contract with “Entrix” to develop a hydrodynamic flow model for Little Assawoman Bay under the state’s TMDL program. Are these or similar hydrologic computer models currently available that might be beneficial in evaluating Inland Bays flooding?
INTRODUCTION

This report presents results of the first phase of a numerical modeling study of Indian River Inlet, Delaware. The scope of the study is to analyze inlet processes that control scour, structure stability, ebb and flood shoal change, and tidal exchange between the Atlantic Ocean and Rehoboth and Indian River Bays. The objectives of the study are to: (1) identify causative factors that have produced persistent scour in several areas of the inlet and led to structural instability, (2) understand the function of the inlet in controlling sediment transport patterns, and its influence on the regional sediment budget, and (3) apply the information gained from the first two objectives to develop and evaluate design alternatives to minimize scour and stabilize inlet structures, maintain navigation, improve sediment management at the inlet, and enhance water quality in the bays. The first phase of the work presented herein focuses on inlet circulation modeling including: data collection, model grid development, evaluation of ocean and bay water level modeling stations, model calibration, and preliminary assessment of alternatives. The second phase of proposed work will include: detailed assessment of alternatives (impacts on inlet circulation, sediment transport patterns and backbay water levels), environmental studies, selection of a recommended plan, and development of plans and specifications for the recommended plan. The third proposed phase is construction of the recommended plan.
December 2004 Measurements

Figure 1: Indian River Inlet survey area
Discussion, Q&A
Pre-bypassing - 1988
Indian River Inlet - Sand Bypassing Components

- Discharge Pipeline Crosses Bridge
- Pump House
- North Beach Discharge
- Crane and Eductor
Bathymetry
1935
Bathymetry
1962
October 2003
Ebb jet deflection to south
DE Inland Bays - Tides
10 August - 10 September 2013