Delaware River Main Channel Deepening Project

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Additional References

Philadelphia District. 2000. *Maintenance Dredging w/Options for Deepening, Delaware River Philadelphia to the Sea, PA, NJ, and DE, Construction Solicitations and Specification*. IFB DACW61-00-B-0012, 9 May 2000.

Philadelphia District. 1997. *Port Mahon, Delaware Interim Feasibility Study, Final feasibility Report and Environmental Impact Statement*. September, 1997.

Philadelphia District. 1997. *Delaware River Main Channel Deepening Project, Supplemental Environmental Impact Statement,* July, 1997.

Philadelphia District. 1996. *Broadkill Beach, Delaware Interim Feasibility Study, Final Feasibility Report and Environmental Impact Statement.* September, 1996.

Philadelphia District. 1996. *Rehoboth Beach/Dewey Beach, Delaware Interim Feasibility Study, Final Feasibility report and Environmental Impact Statement.* June, 1996.

Philadelphia District. 1992. *The Delaware River Comprehensive Navigation Study, Main Channel Deepening Final Interim Feasibility Study and Environmental Impact Statement,* February, 1992.

U S Fish and Wildlife Service. 1995. *Planning Aid Report, comprehensive Navigation Study, Main Channel Deepening Project, Delaware River From Philadelphia to the Sea, Beneficial Use of Dredged Material.* August 1995.

Water Quality Scopes of Work:

1. Confined Disposal Facility Water Quality Monitoring, Reedy Point North and /or South.
2. Reedy Point North and/or South confined Disposal Facility Chemical Analysis of Dredged Material.
3. Water quality Monitoring at the Point of Dredging, Three Channel Locations Within State of Delaware Waters.
4. Water Quality Monitoring, Economic Loading of Hopper Dredges.

Delaware River Main Channel deepening Project, Oyster Monitoring Study in Delaware Bay, SCOPE OF WORK FOR YEAR ONE (Presconstruction).

Comments on the Responses to the Final *Delaware River Main Channel Deepening Project, Supplemental Environmental Impact Statement*, July, 1997.

Correspondence between DNREC and the Corps since the completion of the SEIS (July, 1997).

Delaware River Hopper Dredging Studies

Proposed New and Modified Buoy Locations

Engineering Drawings:

1. Maintenance Dredging with Options for Deepening: Delaware River Philadelphia to the Sea, PA, NJ, and DE.
2. Reedy Point Disposal Areas, New Castle County, DE.
3. Artificial Island Disposal Area, Cumberland County, New Jersey and New Castle County, Delaware.
4. Kilcohook Disposal Area, Salem County, New Jersey and New Castle County, Delaware.
5. Port Mahon Ecosystem Restoration and Protection Project, Kent County, Delaware.
6. Beachfill, Broadkill Beach, Sussex County, Delaware.
7. Dune and Beachfill, Rehoboth and Dewey Beaches, Sussex County, Delaware.

Black and Veatch Waste Science, Inc. 1996. *Results of Berthing Area Vibracore Sampling along the Delaware River from Beckett Street Terminal in Camden, NJ to Sun Oil Refinery in Marcus Hook, PA.* Final Report prepared for the U.S. Army Corps of Engineers, Philadelphia District, February 1996.

Photographs

JOINT APPLICATION FORM

For Subaqueous Lands, Wetlands, Marina and 401 Water Quality Certification Projects

State of Delaware
Department of Natural Resources
and Environmental Control
Division of Water Resources
Wetlands and Subaqueous Lands Section

DELAWARE
DIVISION OF WATER RESOURCES
Clean Water - for Today and Tomorrow

DELAWARE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL

Revised April 20. 1999

APPLICATION FOR APPROVAL OF A SUBAQUEOUS LANDS, MARINA, AND/OR WETLANDS PROJECTS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

* Complete each section of this application as thoroughly and accurately as possible. Incomplete or inaccurate applications will be returned.

* Depending upon the nature of the project, some appendices now require professional expertise to be properly completed. A consultants list is available by calling (302) 739-4691.

* Proof of ownership or permitted land use agreement is mandatory and must be submitted at time of application.

* For Tax Parcel Information:

New Castle County	395-5400
Kent County	736-2010
Sussex County	855-7878

* While completing this application, please refer to the definitions and explanations provided in the Joint Permit Application Form Reference Guide or Guidance Document for Boat Docking Facilities and Wetlands Walkways, as appropriate.

* All applications must be accompanied by plan drawings which show the location and design details of the proposed work. For specific requirements and typical drawings, refer to the explanation section and typical plans section of the Joint Application Form Reference Guide or Guidance Document for Boat Docking Facilities and Wetland Walkways, as appropriate. 8 1/2" x 11" black and white drawings (to scale) are required for every application. Full construction plans may also be submitted for additional clarification on major projects.

* Fee schedules are provided as an insert to this application. Application fees are non-refundable regardless of the permit decision or application status.

* After completing the basic information section, complete the appropriate "type of project" appendix for your project. Please refer to the Joint Application Form Reference Guide if you need help.

* All applications must be completed in ink. Submit <u>three (3)</u> complete copies of the application and drawings to :

Department of Natural Resources and Environmental Control
Division of Water Resources
Wetlands and Subaqueous
Lands Section
89 Kings Highway
Dover, DE 19901

* No construction may begin at the project site before written approval has been received for this work.

* Subaqueous Lands <u>Leases</u> are not considered valid until they have been recorded in the Recorder of Deeds Office for the appropriate county and evidence of lease recordation has been submitted to the above address.

TYPE OF PROJECT

List of Appendices

(Delaware River Main Channel Deepening Project)

Please complete the Basic Application Form (pages 4 through 8) for all projects. Please check below only the appendices which apply to your project, complete the appropriate appendices and attach them to the Basic Application Form. (Please see definitions and explanations section of the Joint Application Form Reference Guide for further help.)

Applications must have the following applicable appendix completed upon submittal. Return only those appendices which apply to your project. Incomplete applications will be returned.

A._____Boat Docking Facilities (1-4 slips)

B._____Boat Ramps

C._____Road Crossings

D._____Channel Modifications or Impoundment Structures (Dams)

E._____Utility Crossings

F. x Intake or Outfall Structures

G._____Bulkheads

H. x Fill

I. x Rip-Rap

J._____ Vegetative Stabilization

K. x Groins, Jetties, or Breakwaters

L._____Construction in State Wetlands (Type I)

M. x Construction in State Wetlands(Type II)

N._____Preliminary Marina Screening Checklist (See * below)

O._____Marina (See * below)

P._____Stormwater Management

Q. x Ponds and Impoundments (Other than for Stormwater Management)

R._____ Dredging/Maintenance
_____ Hydraulic _____Mechanical

S. x New Dredging
x Hydraulic x Mechanical**

***Please see following section on Marinas for a description of the requirements.**
**** This includes rock blasting on the Delaware/Pennsylvania border.**
Reminder: After completing the basic application and the appendices which apply to this project, turn to the sample drawings in the Joint Application Form Reference Guide and prepare your application drawings.

BASIC APPLICATION FORM

ATTACH ADDITIONAL 8 1/2" X 11" SHEETS OF PAPER AS NEEDED

1. **Applicant's (Property Owner) Name and complete address:**
US Army Corps of Engineers
Philadelphia District
100 Penn Square East
Philadelphia, PA 19107

Telephone Number
Home ( ): _____
Work (215): 656-6554

2. **Name of Leaseholder (if applicable) of land where project is contemplated and complete address:** _____

Telephone Number
Home ( ): _____
Work ( ): _____

3. **Authorized agent's name and complete address (if applicable):** John Brady

Telephone Number
Home ( ): _____
Work (215): 656-6554

(Complete agent authorization section at the bottom of page 8)

4. **Is this project**

_____ **New?** _____ **Repair/Replacement?**

__x__ **Both? If "Both", please explain:** Deepening existing Federal Navigation Channel

_____ **Supplemental Approval for an existing lease or permit?**

5. **Provide a brief description of the project:**

The project encompasses the Delaware River Estuary from Philadelphia, Pennsylvania and Camden, New Jersey to the mouth of Delaware Bay. The project borders the Commonwealth of Pennsylvania, and the States of New Jersey and Delaware. The project modifies the existing Delaware River Federal Navigation channel from 40 to 45 feet at Mean Low Water with an allowable dredging overdepth of one foot following the existing channel alignment from Delaware Bay to Philadelphia Harbor, Pennsylvania and Beckett Street Terminal, Camden, New Jersey (Refer to the attached Fact Sheet and Corps reports (FEIS dated February 1992 and SEIS dated July 1997) for more detail description).

A. _x_ **Dredging** **D.**_____ **Dock(s)**

Total Estimated Volume: 18.97 million cubic yards. **Total Number: _____**

B. _x_ Filling **E. _____ Pier(s)/Walkways**

Total Volume: 18.97 million* cubic yards. **Total Number: _____**

C. _x_ Shore Erosion Control
Total Length: __**_**

F. ____ Other
Total Dimensions:

The existing 40-foot deep, 105 mile long, 400 to 1000 feet wide, Federal Navigation Channel would be deepened to 45 feet, including widening 12 bends, and an anchorage deepening at Marcus Hook, Pennsylvania. The dimensions of Kelly Island Wetland Restoration Site and the Beach Placement Sites are listed in the appropriate appendices.

*Approximately 2.4 million cubic yards of fill will be placed at Kelly Island Wetland Restoration Site. Approximately 2.4 million cubic yards of fill will be placed at selected State of Delaware beaches. The potential beach sites and volume of fill that would be placed at each site, if selected, is listed below:

Port Mahon, Delaware : 306,000 cubic yards
Rehoboth/Dewey Beach, Delaware: 1,440,000 cubic yards
Broadkill Beach, Delaware: 1,305,000 cubic yards

** The total length depends on which beaches are selected for sand placement. See Appendix F for each beach placement site and for Kelly Island Wetland Restoration which is 5,000 ft of shore erosion control. Potential shore erosion control for potential beach sites are listed below:

Port Mahon: 5,200 linear feet
Rehoboth/Dewey Beach: 13,500 linear feet
Broadkill Beach: 14,600 linear feet

6. Primary purpose of the project:

_____ Shore Erosion Control
_____ Utility Installation
_____ Create Waterfowl Habitat
_____ Temporary Construction
_____ Beach Nourishment/Fill
_____ Residential Commercial Development
_____ Erosion/Sediment Control
_____ Stormwater Management
_____ Fill
_____ Culvert
_____ Dam
_____ Road
_x_ Improve Navigable Access
_____ Improve Fish Habitat
_____ Stream Channelization
_____ Maintenance/Repair

_____ **Small Pond**
_____ **Marina**
_____ **Bridge**
_____ **Vessel Berthing/Launching**
_____ **Other**

7. **Have you discussed this project with any representative of Local, State, or Federal regulatory agency? __x__ Yes _____ No**
If yes, complete the information below.

This project has had extensive coordination through the NEPA review process. *The Delaware River Comprehensive Navigation Study, Main Channel Deepening Final Interim Feasibility Report*, including the *Final Environmental Impact Statement (EIS) completed in February 1992* was filed with the US Environmental Protection Agency. This document was subsequently supplemented in July 1997 with the *Delaware Main Channel Deepening Project Supplemental Environmental Impact Statement (SEIS)*. These documents were coordinated with Federal regulatory agencies including the US Environmental Protection Agency (USEPA), National Marine Fisheries Service (NMFS), US Fish and Wildlife Service, and New Jersey (NJDEP), Pennsylvania (PADEP) and State of Delaware (DNREC), including Delaware Coastal Management Program and the Wetlands and Aquatic Protection Section of the Delaware Division of Water Resources, regulatory agencies. Local agencies, environmental groups and individuals were also sent these documents. In addition, a public hearing was held in May 1998. A meeting was held between the Corps of Engineers and State of Delaware Department of Natural Resources and Environmental Control Division of Soil and Water Conservation (DNREC) on 27 September 2000 to discuss technical aspects of the project.

In addition, a meeting was held between the Corps of Engineers, DNREC and other agencies on 1 November 2000 to discuss the project design and monitoring of Kelly Island wetland restoration project. Pertinent handouts from that meeting are attached. Below are meetings held since the publication of the SEIS (July 1997):

Meetings after July 1997: Meetings with the State of Delaware and other agencies are listed below.

Representative	Agency	Date
John Hughes, Sara Cooksey Laura Herr Tim Goodger Paul Daily, Frank Smith	DNREC, Soil and Water DNREC, Wetlands NMFS FWS, Bombey Hook NWR	5 April 2000
Sara Cooksey, William Moyer, Robert Henry, Jeff Tinsman, Roy Miller and other DNREC personnel	DNREC Coastal Management Program, Wetlands, Fish and Wildlife	27 Sept. 2000
David Carter, Susan Love, Robert Henry, Anthony Pratt Frank Smith, Oscar Reed Tim Goodger	DNREC Coastal Management Program DNREC Soil and Water FWS, Bombey Hook NWR NMFS	1 Nov. 2000

Name of Representative: See Section 7.0 of the EIS and Table 15-1 of SEIS. Numerous officials were contacted from each agency.

Name of Agency: See Section 7.0 of the EIS and Table 15-1 of SEIS. Numerous officials were contacted from Federal, State and local agencies
Date: See above. In addition, numerous meetings and informal discussions were held.

8. **Have you applied for, or obtained a permit from any Local, State, or Federal agency for any portion of this project described in this application?***
____ **Yes** __x__ **No**

* The Corps applied for a Coastal Zone Management Consistency Statement from DNREC, Division of Soil and Water on 20 December 1996. On 1 May 1997, DNREC provided Coastal Zone Management Consistency. As discussed in #7 above, this project has been, and continues to be, coordinated with numerous State and Federal regulatory agencies including DNREC, NJDEP, PADEP, the USEPA (Regions II and III), the US Fish and Wildlife Service and the National Marine Fisheries Service.

If yes, provide the following:
Agency:_____
Type of Action/Permit:_____
ID No:_____
Application/Issue Date: _____

9. **Project Location:**___ Refer to attached Fact Sheet.
Site address of Location: N/A
_____
_____
County/City: New Castle, Kent and Sussex counties.
Directions from nearest intersection of two state roads: N/A
Name of the waterbody at the project location: Delaware Bay
Is it a tributary of any other water body? __x__ **Yes** _____ **No**
If yes, which waterbody? Atlantic Ocean

The waterbody at the project location is: (check one on line A & one on line B)

A. x Natural _____ Man-made _____ Uncertain
B. x Tidal _____ Non-tidal _____ Uncertain

10. **Current land use: _____Agriculture ____ Marsh/Swamp _____ Meadow _____ Wooded Developed, Beach**

The area to be dredged is the existing Federal navigation channel of the Delaware River and Bay. The Federal navigation channel is regulated by the Corps of Engineers and the US Coast Guard. The upland disposal areas at Reedy Point North and South, Killcohook, and Artificial Island are established Federally owned confined upland disposal areas that have been used for many years for this purpose. Kelly Island Wetland restoration area is an eroding wetland/shallow water area that is part of the Bombay Hook National Wildlife Refuge and is used for wildlife conservation. The proposed beach placement sites are presently eroding beaches in the State of Delaware.

Present zoning is: _____Agriculture ___x__Commercial
___x__Residential ___x___Other

The Federal Navigation Channel is not zoned, but is regulated by the Corps of Engineers and the US Coast Guard.

11. **a. List the name and complete address of the owners of the contiguous neighboring lands on <u>all</u> sides of the property. (Attach sheets as needed).**

Federal Navigation Channel: N/A
Kelly Island Wetland Restoration: US Fish and Wildlife Service, Bombay Hook National Wildlife Refuge, RD 1, Box 147, Smyrna, DE 19977

Beach Placement Sites: Combination of private, and public ownership. List of owners will be obtained during the acquisition of temporary easements for placement of sand at the specific beach site (s).

***For marina projects or projects that include activities or construction in wetlands,* list the name and complete address of the owners, as listed with the County Board of Assessment, of neighboring lands within 1,000 feet of the project (including those across the waterway if within the 1,000 foot radius) and any claimants of such ownership rights that are known to the applicant, with their last known addresses.**

Kelly Island Wetland Restoration:

1. State of Delaware
   Dover, DE 19903

2. Delaware Chapter of the Nature Conservancy
Attn: Mr. Jack Zankel
260 Chapman Road, 201-D
Newark, DE 19713

3. Port Mahon Oyster Company
P.O. Box 365
Little Creek, DE 19961

4. John Pleasanton
RD #3, Box 304
Dover, DE 19901

5. Delaware Storage and Pipeline Company
Box 313
Dover, DE 19903

6. US Fish and Wildlife Service
Bombay Hook National Wildlife Refuge
RD 1, Box 147
Smyrna, DE 19977

Port Mahon: Same as for Kelly Island Wetland Restoration with the following addition:

US Coast Guard , Marine Safety Office
1 Washington Avenue
Philadelphia, Pennsylvania 19147-4395

Other Beach Placement Sites: This information will be obtained during the acquisition of temporary easements for placement of sand at the specific beach site (s).

12. Will any public benefit be derived from the project? __x__ Yes __No_____ Uncertain If yes, explain below See page 2-83 of the FEIS for economic benefits. Corps project benefits focus on the contribution to the nation and the resulting increases in the net value of the national output of goods and services. This project will benefit the nation as well as the region, including the State of Delaware. Also, refer to the attached Fact Sheet.

13. Has any work commenced or has any portion of the project for which you are seeking a permit been completed? ____ Yes __x_ No If yes, give details below. State when work was completed and who performed the work. Please indicate on attached drawings what is proposed.

14. Proposed Start Date: Spring/Summer, 2001

15. **Contractor's Name and Complete Address:** Not selected at this time. Contractor will be selected once Corps solicits bids for the work to be accomplished. This will happen once the project cooperation agreement (construction agreement) is signed with the sponsor.

Telephone Number:_____

PLEASE COMPLETE AND ATTACH ALL APPROPRIATE DRAWINGS AND APPENDICES TO THIS SECTION. INCLUDE A COPY OF THE PROPERTY DEED AND SURVEY TO SHOW ALL PROPERTY BOUNDARIES AND DIMENSIONS. Tax maps and lists of property owners will be supplied when the temporary easements are acquired for placement of sand material at the specific beach site (s).

APPLICANT SIGNATURE &/OR AGENT AUTHORIZATION

* **All applicants must sign this page. Complete the Agent Authorization Section only if applicable.**

I certify that the information on this form and the attached plans is true and accurate to the best of my knowledge.

I understand that DNREC may request information in addition to that set forth herein and may be deemed appropriate in considering this application.

I grant permission to the authorized DNREC representative(s) to enter upon the premises for inspection purposes during working hours.

I will abide by the conditions of this approval if issued.

Robert L. Callegari — 1/18/01

Applicant Signature **Date**

Applicant Name (Printed/Typed) Robert L. Callegari

Agent Authorization Section

*** If you elect to complete this section, all future correspondence may be signed by the duly authorized agent. In addition, the agent will become the primary point of contact for all correspondence from the Department.**

I, Robert L. Callegari **, hereby designate and authorize**
Name of applicant
John T. Brady **to act on my behalf in the processing**
Name of Agent
of this application and to furnish any information that is requested.

R L Callegari — 1/18/01

Applicant Signature **Date**

John T. Brady — January 18, 2001

Agent Signature **Date**

Revised 3/1/96

Company Name Philadelphia District

U.S. Army Corps of Engineers

APPLICANT BACKGROUND INFORMATION

Pursuant to 7 Del. C., Chapter 79, the following information must be submitted along with any commercial subaqueous lands permit application. "Commercial" is defined as any activity undertaken for profit for which a fee will be charged, directly or indirectly, or which results in the generation of revenue. Please use the N/A abbreviation for any items that are not applicable to your application.

PROVIDING ALL THE INFORMATION REQUESTED IN THIS FORM SATISFIES THE REQUIREMENTS OF 7 DEL, C., CH. 79 UNLESS THE DEPARTMENT OF NATURAL RESOURCES AND ENVIRONMENTAL CONTROL OR THE DEPARTMENT OF JUSTICE DETERMINES THAT ADDITIONAL SUBMISSIONS ARE NECESSARY. FAILURE TO PROVIDE THE INFORMATION REQUESTED OR PROVIDING ERRONEOUS INFORMATION IS GROUNDS FOR DENYING OR REVOKING AN ENVIRONMENTAL PERMIT, AND FOR CIVIL OR CRIMINAL PENALTIES.

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1. * Attach a complete list of all current members of the Board of Directors, all current corporate officers, all persons owning more than 20 percent of the applicant's stock or other resources, all subsidiary companies, all parent companies, all companies with which the applicant's company shares two or more members of the Board of Directors. N/A

2. * Attach a description of any felony or other criminal conviction of any person or company identified in response to Question 1 where the conviction resulted in a fine greater than $1,000 or a sentence longer than seven days, regardless of whether any portion of such fine or sentence was suspended. N/A

3. Have any of the following been issued to any person or entity specified in response to Question Number 1 or any violation of any environmental statute, regulation, permit, license, approval, or order, regardless of the state in which it occurred, during the five years prior to the date of the application:

Notice of Violation	**(yes or no)** No
Administrative Penalties	**(yes or no)** No
Criminal Citation	**(yes or no)** No
Arrests	**(yes or no)** No
Convictions	**(yes or no)** No
Criminal Penalties	**(yes or no)** No

4. If you answered "Yes" to any of the items in Question 3, attach a description of the incidents or events leading to the issuance of each enforcement action, the disposition of each action, and any actions that have been taken to correct the violations that led to such enforcement action. N/A

5. * Attach copies of any and all settlements of the environmental claims associated with actions identified in response to Question 3 above, whether or not such settlements were based on agreements where the applicant did not admit liability for the action. N/A

I do hereby swear that I have read the above questions and have provided all of the information requested and that all of the information provided is true and accurate.

1/18/01
Date

Signature - Applicant or Corporate Agent

Name: Robert L. Callegari

Company Name: US Army Corps of Engineers

Address: 100 Penn Square East

Philadelphia, PA 19107-3390

Phone: 215-656-6540

*** NOTE: The applicant may claim that some or all of the information presented in response to Questions, 1, 2, and 5 is confidential if such information is not already available to the public. An applicant wishing to make such a claim should write, preferably in red ink "claimed confidential information" at each point in the response where such confidentiality is claimed, and provide an explanation of why the release of such information would constitute an invasion of personal privacy or would seriously affect the applicant's business or competitive situation.**

U.S. Army Corps of Engineers, Philadelphia District

JANUARY 2001

DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

(PROJECT FACT SHEET)

LOCATION

The project encompasses the Delaware River Estuary from Philadelphia, Pennsylvania and Camden, New Jersey to the mouth of Delaware Bay **(FIGURE 1)** and borders the Commonwealth of Pennsylvania, and the States of New Jersey and Delaware.

EXISTING FEDERAL PROJECT

The existing Delaware River (40-foot navigation channel), Philadelphia to the Sea Project **(FIGURE 2)** was adopted in 1910 and modified in 1930, 1935, 1938, 1954, and 1958. The project extends from Allegheny Avenue in Philadelphia to deep water in Delaware Bay **(FIGURES 2A and 2B)**. The channel widths range from 400 feet in Philadelphia Harbor to 1,000 feet in Delaware Bay. There are 19 anchorages on the Delaware River. The project includes 12 training dikes to reduce shoaling in the channel and anchorages to minimize dredging and disposal costs. The maintenance channel dredging and disposal of dredged material is a Federal responsibility.

The Federal government has the responsibility for providing the necessary disposal facilities and embankments for material dredged. Currently, the material is disposed at confined upland disposal facilities (National Park, New Jersey, Oldmans, New Jersey, Pedricktown North, New Jersey Pedricktown South, New Jersey, Penns Neck, New Jersey, Killcohook, New Jersey/Delaware with Areas 2 and 3 located in Delaware and Artificial Island, New Jersey/Delaware with Area 1 located in Delaware). In addition, material from the Delaware Bay portion of the project is disposed at an existing approved subaqueous site (Buoy 10) located in New Jersey.

NEED FOR THE DEEPENING THE EXISTING FEDERAL PROJECT

Today, the Delaware River Ports are the largest freshwater port complex in the world and the fifth largest port complex in the United States.

The Delaware River Ports are the last major East Coast ports complex to consider improving their channel. The Ports of New York, New York; Baltimore, Maryland; Norfolk, Virginia; Savannah,

Georgia; and Wilmington, North Carolina have channel depths ranging from 42 to 50 feet.

The oil refineries, general cargo terminals and other bulk cargo facilities along the Delaware River handle more than 70 million tons of cargo annually. This sector of the regional economy directly generates $3.5 billion dollars in revenues, more than $1 billion in wages, $150 million in state and local taxes and more than 30,000 jobs.

The existing Delaware River Federal Navigation project, which provides for a 40-foot channel, restricts efficient movement of both present and future tankers, dry bulk carriers, and container vessels. These conditions result in significant light loading and lightering costs, vessels delays, and exclusion of some of the larger and more efficient world fleet vessels from visiting the Delaware River ports. Deepening the Delaware River main channel from 40 to 45 feet is essential to guarantee the future competitiveness of the Delaware River Ports.

DEEPENING PROJECT AUTHORIZATION

The Delaware River Main Stem and Channel Deepening Project, Pennsylvania, New Jersey, and Delaware, was authorized by Public Law 102-580, Section 101(6) of the Water Resources Development Act of 1992. The Bi-State Delaware River Port Authority is the non-Federal sponsor for this project.

DEEPENING PROJECT

DESCRIPTION. The project as shown on **FIGURE 3** provides for modifying the existing Delaware River Federal Navigation channel (Philadelphia to Sea Project) from 40 to 45 feet at Mean Low Water with a required dredging overdepth of one foot, following the existing channel alignment from Delaware Bay to Philadelphia Harbor, Pennsylvania and Beckett Street Terminal, Camden, New Jersey. The channel side slopes are 3 horizontal to 1 vertical. The project also includes deepening of an existing Federal access channel at a 45-foot depth to Beckett Street Terminal, Camden, New Jersey.

The channel width (same as the existing 40-foot project) is 400 feet in Philadelphia Harbor (length of 2.5 miles); 800 feet from the Philadelphia Navy Yard to Bombay Hook (length of 55.7 miles); and 1,000 feet from Bombay Hook to the mouth of Delaware Bay (length of 44.3 miles). Typical cross-sections of these channel widths are shown on **FIGURES 4 and 5**. The project includes 12 bend widenings at various ranges as listed below as well as provision of a two-space anchorage to a depth of 45 feet at Marcus Hook, Pennsylvania. The existing turning basin adjacent to the former Philadelphia Naval Shipyard will not be deepened as part of the 45 foot project. Also, included as part of the Federal project is the relocation and addition of buoys at the 12 modified channel bends. A plan view of the proposed channel bends and Marcus Hook Anchorage are displayed on **FIGURES 6-12.**

CHANNEL BEND MODIFICATIONS. The following channel bends will be modified.

1. MIAH MAULL-CROSS LEDGE: 200-foot width increase at the apex of the West Side of

the bend over a distance of 4000 feet both north of and south of the apex. (**BW1** - channel station 405 + 043);

2. LISTON-BAKER: Maximum width increase on the east edge of 250 feet, over a distance of 4,500 feet south of the apex, and extending 3,900 feet north from the apex (**BW2** - channel station 275 + 057);

3. BAKER-REEDY ISLAND: 100-foot width increase at the west edge apex of the bend over a distance of 3500 feet both north of and south of the apex (**BW3** - channel station 265 + 035);

4. REEDY ISLAND-NEW CASTLE: Maximum widening of 400 feet at the west apex of the bend, tapering to zero over a distance of 3,200 feet south of the apex and to zero over a distance of 4,000 feet north of the apex (**BW4** - channel station 238 + 982);

5. NEW CASTLE-BULKHEAD BAR AND BULKHEAD BAR-DEEPWATER: The west edge of Bulkhead Bar range is extended by 300 feet to the south and 300 feet to the north; the widening tapers to zero at a distance of approximately 3,000 feet south of the south end of Bulkhead Bar and 3,000 feet north of the north end of Bulkhead bar (**BW5** - channel station 212 + 592 and 209 + 201);

6. DEEPWATER-CHERRY ISLAND: A maximum channel widening of 375 feet is required at the western apex of the bend. The widening tapers to zero at a distance of about 2,000 feet both north and south of the apex (**BW6** - channel station 186 + 331);

7. **BELLEVUE-MARCUS HOOK:** The east apex of the bend requires a 150 foot widening over existing conditions, along a total length of approximately 4,000 feet (**BW7** - channel station 141 + 459);

8. CHESTER-EDDYSTONE: The southwest apex of the bend requires a maximum 225 foot widening, with a transition to zero at the northeast end of Eddystone range, over a linear distance of approximately 6,000 feet (**BW8** - channel station 104 + 545);

9. EDDYSTONE-TINICUM: The northeast apex of this bend requires a 200 foot widening, with a transition to zero at a distance of about 1,200 feet northeast and southwest of the bend apex (**BW9** - channel station 97 + 983);

10. TINICUM-BILLINGSPORT: The North Channel edge of Billingsport was widened by 200 feet. At the northern apex of the Tinicum-Billingsport bend, this results in a maximum widening of approximately 400 feet, with a transition to zero at a distance of about 2,000 feet west of the apex (**BW10** - channel station 79 + 567);

11. BILLINGSPORT-MIFFLIN: The south apex of the bend was widened a maximum of 200 feet to the south, and transitioned to zero at a distance of approximately 3,000 feet northeast of the apex (**BW11** - channel station 72 + 574);

12. EAGLE POINT-HORSESHOE BEND: The northwest edge of Horseshoe Bend required a maximum widening of 490 feet to the north. The widening transitions to zero at a distance of approximately 4,000 lineal feet west of the west end of Horseshoe Bend, and at a distance of 1,500 lineal feet north of the north end of the bend (**BW12** - channel station 44 + 820 to 41 + 217).

INITIAL CHANNEL DREDGING. For the initial deepening, material would be dredged and placed by hydraulic and hopper dredges in confined upland disposal facilities in the Delaware River portion of the project area and for beneficial uses in Delaware Bay. In addition, 229,000 cubic yards of rock would be removed in the vicinity of Marcus Hook, Pennsylvania (See **FIGURE 13)**. The initial dredging quantities are distributed among the project reaches as follows:

Reach AA	1,430,000 cubic yards
Reach A	3,316,000 cubic yards
Reach B	8,624,000 cubic yards
Reach C	4,465,000 cubic yards*
Reach D	5,789,000 cubic yards
Reach E	9,264,000 cubic yards**

*** Based on recent surveys quantity decreased to 2,865,000 cubic yards**
****Based on recent surveys quantity decreased to 7,323,000 cubic yards**

Dredging equipment is described in Sections 3.1.2.3 and 10.4.2.1 of the Corps' Supplemental Environmental Impact Statement (SEIS) dated July 1997. The channel dredging project will use hydraulic hopper and pipeline dredges. See Section 3.0 of the SEIS (July 1997). Since the preparation of the July 1997 SEIS some of the Kelly Island Wetland Restoration project features have been refined and the sand stockpile placement sites (Broadkill, Delaware and Slaughter, Delaware) have been replaced with direct placement of sand to State of Delaware beaches.

ROCK BLASTING. Approximately 229,000 cubic yards of bedrock from the Delaware River near Marcus Hook, Pennsylvania would be removed to deepen the navigation channel to a depth of 47-ft mean low water. Approximately 70,000 cubic yards, covering 18 acres, will be removed by blasting, with the remainder (159,000 cubic yards) being removed by mechanical methods. The areas of blasting are shown on **FIGURE 13,** and a typical cross section is shown in **FIGURE 14**. Within the State of Delaware 22,200 cubic yards of rock will be blasted. In order to remove the rock by blasting, holes drilled into the rock are packed with explosive to direct the force of the blast into the rock. The depth and placement of the holes and the size of the charges control the amount of rock that is broken. This would be conducted by repeatedly drilling, blasting, and excavating relatively small areas until the required amount and area of bedrock is removed. An alternate to the drilling and blasting technique is the use of shaped charges, which are placed on the bottom and accomplish the same thing as drilling and blasting in a lesser amount of time. The method chosen will meet all appropriate environmental parameters.

MAINTENANCE DREDGING. The required maintenance dredging of the 45-foot channel will increase to 6,007,000 cubic yards per year (cy/yr) from the current 4,888,000 cy/yr for the 40-foot channel for a net increase of 1,119,000 cy/yr.

DISPOSAL PLAN.

1. DELAWARE RIVER. The initial dredging material from the river portion of the project (Reaches AA-D) will be disposed at nine existing Federal upland confined disposal facilities (National Park, New Jersey, Oldmans, New Jersey, Pedricktown North, New Jersey Pedricktown South, New Jersey, Penns Neck, New Jersey, Killcohook, New Jersey/Delaware with Areas 2 and 3 located in Delaware, Artificial Island, New Jersey/Delaware with Area 1 located in Delaware, and Reedy Point North, Delaware and Reedy Point South, Delaware) and to three new confined upland sites identified as Raccoon Island, 15D and 15G located in the State of New Jersey. Refer to **FIGURE 3.** The dredged material consists of silt, rock, clay, sand, and gravel. The three new upland sites will be acquired by the project sponsor, the Delaware River Port Authority. Reedy Point North and South confined upland disposal facilities will only be used for disposal of dredged material from initial dredging. The maintenance quantities will be placed at seven existing Federal confined upland disposal facilities (National Park, Oldmans, Pedricktown North, Pedricktown South, Penns Neck, Killcohook, and Artificial Island) and at the three new confined upland disposal facilities, to be acquired by the project sponsor, Delaware River Port Authority.

2. DELAWARE BAY. The initial dredged material from Delaware Bay (Reach E), comprised primarily of sand, will be used for wetland restoration areas at Egg Island Point, New Jersey and Kelly Island, Delaware and for beach nourishment and environmental restoration within the State of Delaware. Refer to **FIGURE 3.** Both the wetland restorations and beach placement will help control the severe erosion that is occurring at many areas along the Delaware Bay shoreline in the State of Delaware.

CONSTRUCTION. Construction involves four elements: the preparation of confined upland disposal facilities to receive dredged material, dredging of the channel, construction of two wetland restoration sites, and beach sand placement.

Reaches AA, A, B, and C will be dredged by hydraulic dredge and pumped into confined upland disposal areas as designated for the project. See **FIGURE 3** for locations of confined upland disposal areas. Rock will be removed using one of the aforementioned techniques; blasted material will be removed from the channel using a bucket dredge. Material will be transported by barges to Fort Mifflin, Pennsylvania where it will be disposed at the existing Federally owned confined upland disposal facility. Dredged material from Reaches AA and A will be disposed in National Park and Raccoon Island. Reach B materials will be disposed at Raccoon Island, 15D, 15G, Pedricktown North and South, and Oldmans. Reach C materials will be disposed at Killcohook and Penns Neck with some of the initial quantity from Reach C slated for Reedy Point North disposal area. Due to the long pumping distances, Reach D will be dredged by hopper dredges assisted by mooring barges pumping into the confined upland sites at Artificial Island and Reedy Point South. In Reach E, hopper dredges assisted by mooring barges with booster pumps will be used to pump excavated material to two wetland restoration sites (Kelly Island, Delaware and Egg Island Point, New Jersey) and beaches within the State of Delaware.

All operation and maintenance dredged quantities would be placed into the three proposed

confined upland areas in addition to the existing Federal sites which include National Park, Pedricktown North and South, Oldmans, Penns Neck, Killcohook Areas 1, 2, and 3, and Artificial Island Areas 1, 2, and 3. Maintenance material from Reach E will be disposed at an existing approved subaqueous site (Buoy 10), located in New Jersey.

Initial construction is scheduled to be completed in a period of 4 to 6 years, subject to appropriation of Federal funding by Congress. Work has been subdivided into various construction contracts. The contracts are divided into four categories: confined upland disposal facilities construction contracts; wetland restoration contracts; beach sand placement contracts; and channel dredging contracts with placement of dredged material to confined upland disposal facilities.

In the initial construction year, dredging will be performed in Reach C. Plans and specifications for this dredging are included. Similar type of plans and specifications will be developed for dredging contracts in Reaches AA, A, B, D and E.

For the new confined upland disposal facilities, work consists of site clearing, raising or building dikes, installing wick drains, constructing access roads, and constructing sluices. All disposal preparation work will be done prior to initial dredging.

PROJECT OPERATION. The Philadelphia District, Corps of Engineers would maintain the Federal channel and anchorage in accordance with the project dimensions. Maintenance of navigation aids would continue to be the responsibility of the US Coast Guard.

ACCESS ROADS. Access roads are not required for the dredging work, as all work will be accomplished by floating plant. Existing access roads are available at the existing confined disposal facilities. New access roads will be needed for the new proposed confined upland disposal facilities. The work at the beneficial use sites will be accomplished by floating plant and using equipment transported by floating plant.

RELOCATIONS. At the proposed modified bends, navigation aids will be relocated and for some bends additional buoys will be required.

REAL ESTATE REQUIREMENTS. The real estate required for the proposed project involves the acquisition of three new upland disposal areas (Raccoon Island, 15D, and 15G). This consists of the fee acquisition of privately owned land in New Jersey. In addition, temporary easements would need to be obtained for beach sand placement sites.

DEEPENING PROJECT ACTIVITIES WITHIN STATE OF DELAWARE

DELAWARE RIVER.

CHANNEL DREDGING. Channel dredging would commence within Reach B, 3,015,000 cubic yards, including 22,200 cubic yards of rock to be blasted, - Starting at Marcus Hook Range

(Station 127+000) continuing in Reaches C (2,846,000 cubic yards), and Reach D (5,789,000 cubic yards). Dredged material would be placed in designated confined upland disposal facilities as discussed earlier.

DELAWARE BAY.

The Corps of Engineers and the State of Delaware have embarked on a program to stabilize and restore the environment in the Delaware Bay. This program entails beneficial use of dredged material from the proposed deepening of the Delaware River Federal Navigation Channel. The material (7,323,000 cubic yards) from the Delaware Bay deepening **(Reach E)** primarily consists of clean sand. The material to be excavated in the Delaware Bay portion of the project will be used for beneficial use purposes such as wetland restoration/protection at Kelly Island, Port Mahon, Delaware and placement of sand on State of Delaware beaches.

1. KELLY ISLAND WETLAND RESTORATION. The main purpose of this project **(FIGURE 3)** is to stem the continued erosion estimated at 20 feet per year for Kelly Island and at the same time restore wetlands and provide horseshoe crab spawning habitat using dredged material about 2.4 million cubic yards from deepening of the Delaware River Main Channel. Restoring this environmentally sensitive area has been a high priority to State of Delaware. A plan has been developed with the assistance of the Federal and State resource agencies to restore 60 acres of intertidal habitat and provide over 5,000 linear feet of sandy beach.

2. SAND PLACEMENT-BEACHES. Sand placement sites where the Corps has completed an environmental assessment or environmental impact statement will be considered. The placement of sand material will provide storm damage protection, thereby preventing potential damages to adjacent communities and environmental restoration and protection of severely eroding tidal wetlands and beaches along the shore of Delaware Bay. The placement sites include Port Mahon, Broadkill Beach, and Dewey/Rehoboth Beaches. Corps of Engineers reports for these sites have been completed and are attached.

ENVIRONMENTAL CONSIDERATIONS. As part of the Corps studies, an evaluation of environmental impacts associated with the Delaware River deepening project was conducted. At the end of the feasibility study phase, the Delaware River Comprehensive Navigation Study Main Channel Deepening Interim Feasibility Report and Environmental Impact Statement was completed in February 1992 and the Record of Decision was filed in December 1992.

In 1992, the next study phase, Preconstruction, Engineering, and Design (PED) was initiated. As part of the PED study, additional supplementary environmental analyses, as recorded in the December 1992 Record of Decision for the Final Environmental Impact Statement, were performed. As a result of these studies, a Draft Supplemental Environmental Impact Statement (DSEIS) was prepared in December 1996 and was circulated to Federal and State resource agencies and to the public for comments. Responses to comments on the DSEIS were prepared and incorporated into the Final Supplemental Environmental Impact Statement (FSEIS). The FSEIS was filed with the U. S. Environmental Protection Agency in July 1997 and was made available to Federal and State resource agencies and the public for review and comment. A public

hearing was held in May 1998. The record of Decision was signed in December 1998. Copies of both the FEIS dated February 1992 and SEIS dated July 1997 are attached. In addition, monitoring of confined upland disposal facilities at Reedy Point and at the point of dredging will be undertaken. Scopes of work for these efforts are attached. Monitoring of oyster resources and sea turtles will also be done and numerous environmental windows will be followed to protect sensitive resources. See attached tables of environmental windows.

ECONOMIC ANALYSIS PROCESS

Standard Corps procedures were followed which measured the beneficial contribution to the National Economic Development (NED) Account that will result from deepening the Delaware River shipping channel. Regional benefits were not included in the benefit-cost ratio for the project. The feasibility study economic analysis was reviewed and approved by the Corps headquarters, the Office of the Assistant Secretary of the Army for Civil Works, and Office of Management and Budget prior to authorization for construction by Congress in the Water Resources Development Act of 1992. Subsequently, the final project design (Preconstruction Engineering and Design) included an updated economic analysis that was reviewed and approved by Corps headquarters.

For the Delaware River Main Channel Deepening Project, NED benefits were assessed using a standard discount process as dictated by Corps regulations. The present worth of the stream of transportation savings to be accrued over the 50-year project life were estimated and expressed on an average annual basis. On the NED cost side of the equation, project construction costs were annualized by applying the standard interest and amortization factor. Other NED costs to be incurred over the 50-year project life were assessed in present worth terms, using the same discounting process as for benefits. The ultimate result is expressed in terms of average annual NED benefits and NED costs (which are directly comparable in present worth terms) to determine project justification (benefit-cost ratio). For the Delaware River Main Channel Deepening Project a benefit-cost ratio of 1.4 was computed. The benefit-cost ratio provides $1.40 in NED benefits for every $1 in NED costs for the project.

PROJECT BENEFITS.

1. DIRECT BENEFITS. The improved channel will have a significant impact in allowing more efficient vessel loading, reducing the lightering requirements of crude oil tankers in the lower Delaware Bay, and attracting larger, more efficient container and dry bulk vessels. No change in the size of tankers using the Delaware River is expected. It is estimated that the proposed deepening will result in annual transportation savings of $40.1 million to the NED account.

The benefit analysis applied the same level of tonnage for both the 45-foot channel depth and 40-foot current channel depth. The analysis did not claim that the deepened channel would induce more tonnage through the Delaware River Ports.

2. OIL SPILL REDUCTION. The tankers that currently lighter at Big Stone Beach Anchorage and are destined for the refineries will be helped by the channel deepening. With the 45-foot channel, 15% of these tankers have sailing drafts that would not require lightering at Big Stone

Beach Anchorage. These tankers would be able to navigate directly upriver and unload their entire cargoes at the dock facilities of the refineries. Any potential for oil spillage during a lightering operation would be completely eliminated for these tankers.

Also, the largest tankers, with sailing drafts currently up to 55 feet coming into Big Stone Beach Anchorage, State of Delaware, would also be positively impacted by the channel deepening. The 45-foot channel will reduce the total barrels required to be lightered in the environmentally sensitive lower bay by a magnitude of 40%. The larger tankers, while still being required to lighter, will be lightering much less total crude oil. This will reduce the potential of oil spillage by reducing tanker time at the anchorage and reducing the total hookups needed with the lightering barge fleet.

3. INDIRECT BENEFITS. Regional economic impacts will be realized during the construction of the project and once the project is in operation. These regional benefits were not included in the calculation of the project's benefit-cost ratio. These impacts are summarized as follows:

A. ECONOMIC IMPACTS DURING CONSTRUCTION.

- 1,600 jobs
- $200 million in wages
- $400 million in revenue impacts
- $25 million in State, Local Taxes
- $60 million in Federal Taxes

The State of Delaware will accrue the following positive indirect benefits from the construction of the channel-deepening project (using a nationally linked input-output economic model of the region developed by the University of Delaware):

- 300 jobs **(1)**
- $31 Million in wages **(2)**
- $60 Million in total revenues filtered into the State's economy **(3)**
- $4 Million in state and local tax receipts**(4)**
- $9 Million in federal tax receipts **(5)**

(1) During the four-year period of project construction, 300 jobs will be supported. These jobs will be forthcoming from the dredging industry and firms, which supply goods, and services for construction.

(2) Over the 4-year period, $31 million will be paid in wages to individuals employed during project construction.

(3) Over the 4-year period, $60 million will be filtered into the State's economy as wage earners purchase goods and, services. The projected wages will be spent in the local communities and would benefit a substantial number of people and businesses.

(4) Over the 4-year period, $4 million will be generated from state and local income taxes and

sales tax.

(5) Over the 4-year period, $9 million will be generated in federal income taxes.

B. ENHANCE CLIMATE FOR ECONOMIC GROWTH AT PORT OF WILMINGTON

The deepening project will make the entire tri-state port system more competitive in the world market. As a result, the already strong growth being exhibited by the Port of Wilmington can only be enhanced. Direct benefits were not computed for the Port of Wilmington as part of the Delaware River Deepening Project because of the less than 40-foot depth of the Christina River channel. However, if the Christina River channel is deepened to 40 feet or if the Port of Wilmington ultimately shifts some facilities, such as its container operation, directly onto the Delaware River (with direct access to the 45 foot channel), this would have a positive benefit by attracting cargo and larger vessels resulting in increased jobs, wages, output, and tax receipts.

C. ENVIRONMENTAL BENEFITS WITHIN THE STATE OF DELAWARE

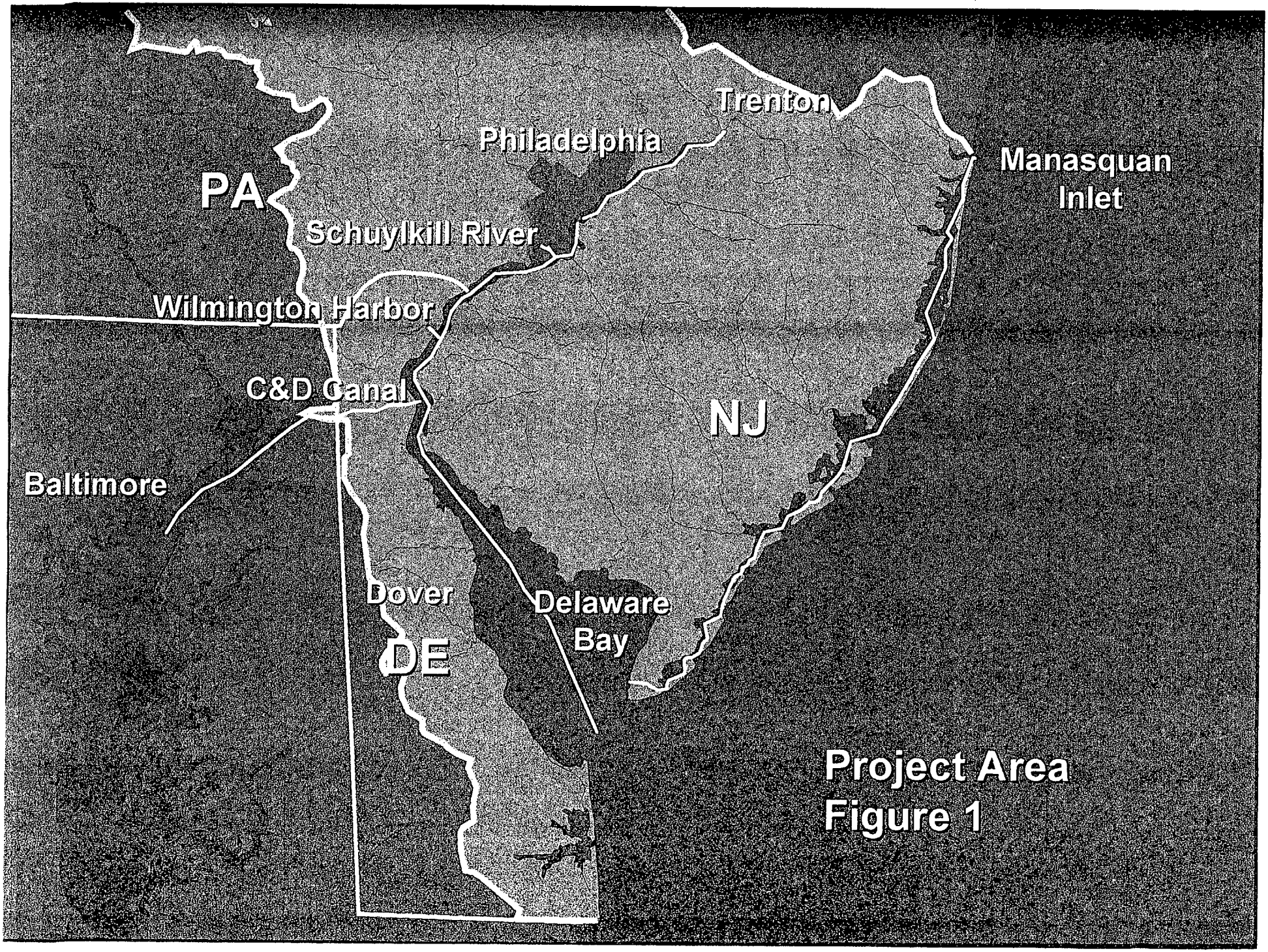
KELLY ISLAND WETLAND RESTORATION. This beneficial use of dredged material will restore 60 acres of tidal wetland and protect approximately 5,000 feet of eroding tidal wetlands. The 5,000 foot long sand berm that will contain the dredged material will provide habitat for spawning horseshoe crabs and migratory shorebirds such as sanderlings, red knots, and ruddy turnstones. The restored wetland and tidal creek channels will provide habitat for long-legged wading birds, summer and winter flounder, and migratory shorebirds such as dowitchers, dunlins, and semipalmated sandpipers.

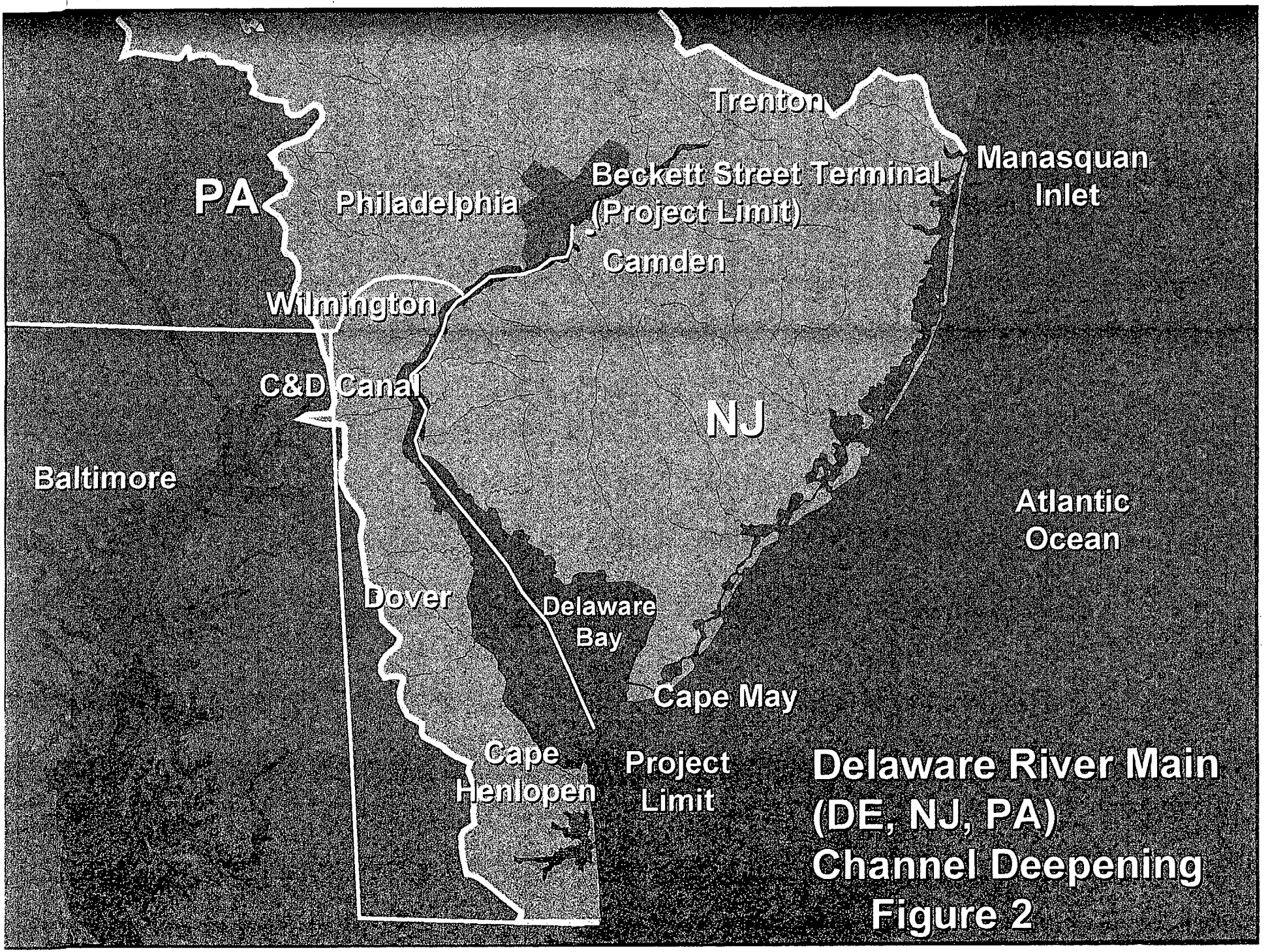
BEACH SAND PLACEMENT. Many beaches and tidal wetlands along the Delaware Bay shore are severely eroding. Dredged material will be placed at Port Mahon to restore the eroding beaches, protect the tidal wetlands that are behind the beaches and enhance horseshoe crab and migratory bird habitat. In the other sites, where the locations adjacent to the beach have been developed, the beach placement will protect property from storm damage.

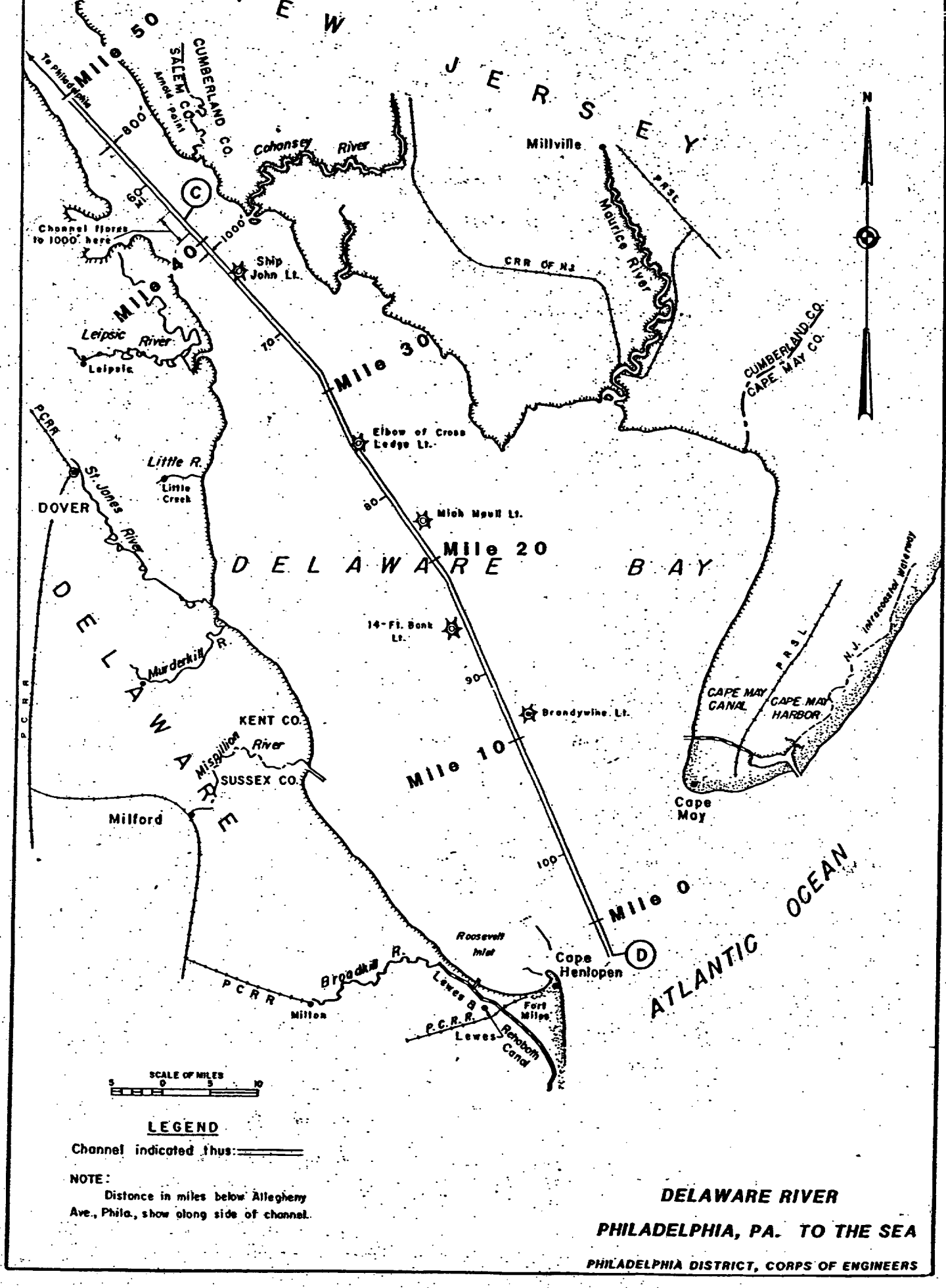
DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

FIGURES

U. S. Army Corps of Engineers, Philadelphia District


Trenton
Philadelphia
Manasquan
Inlet
PA
Schuylkill River
Wilmington Harbor
C&D Canal
NJ
Baltimore
Dover
Delaware
Bay
DE
Project Area
Figure 1


Trenton
Manasquan Inlet
PA
Philadelphia
Beckett Street Terminal (Project Limit)
Camden
Wilmington
C&D Canal
NJ
Baltimore
Atlantic Ocean
Dover
Delaware Bay
Cape May
Cape Henlopen
Project Limit
Delaware River Main (DE, NJ, PA) Channel Deepening
Figure 2



LEGEND

Channel indicated thus: ═══

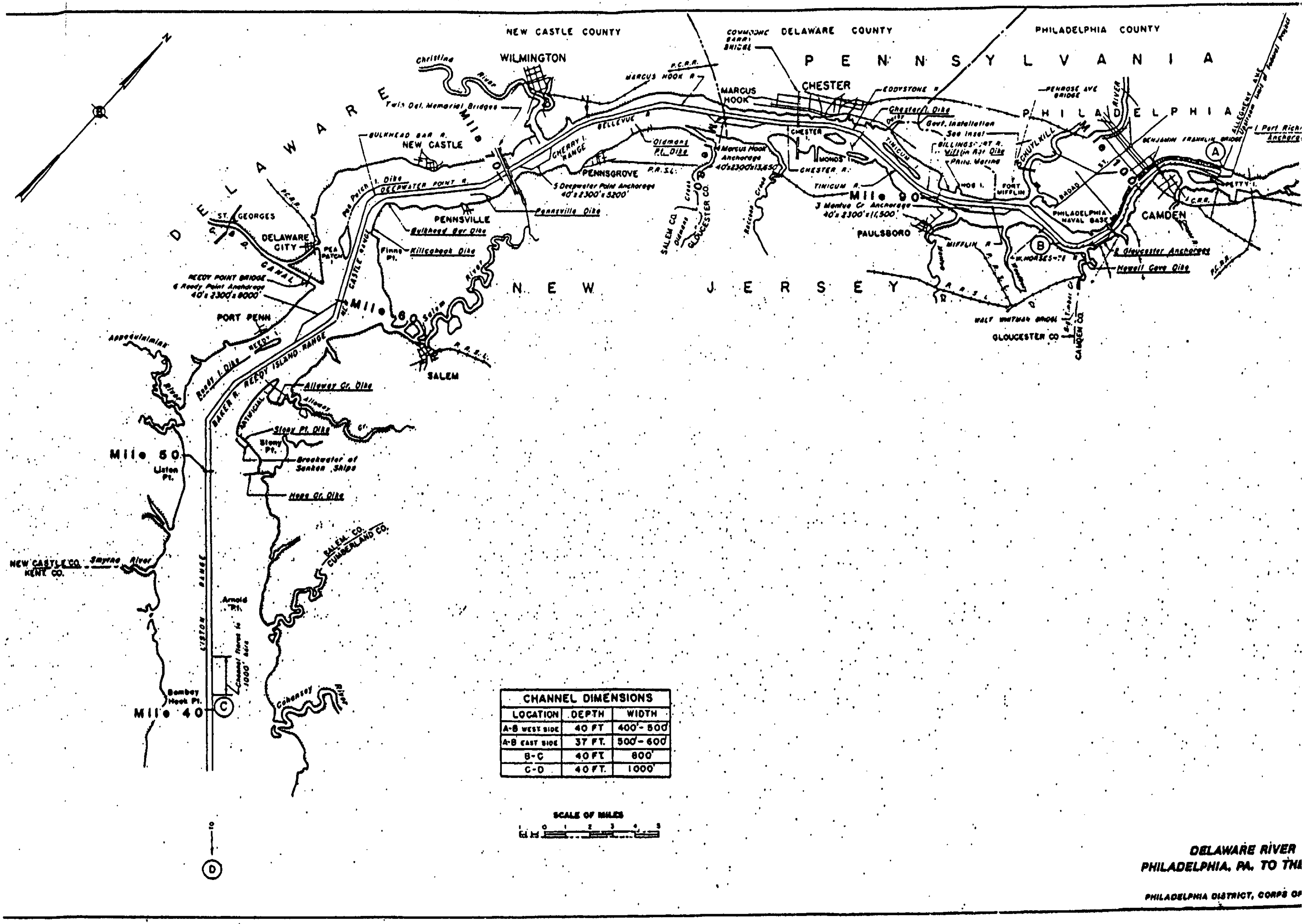
NOTE:
Distance in miles below Allegheny Ave., Phila., show along side of channel.

DELAWARE RIVER

PHILADELPHIA, PA. TO THE SEA

PHILADELPHIA DISTRICT, CORPS OF ENGINEERS

FIGURE 2A



CHANNEL DIMENSIONS		
LOCATION	DEPTH	WIDTH
A-B WEST SIDE	40 FT	400'- 500'
A-B EAST SIDE	37 FT.	500'- 600'
B-C	40 FT	800'
C-D	40 FT.	1000'

DELAWARE RIVER
PHILADELPHIA, PA. TO THE

PHILADELPHIA DISTRICT, CORPS OF

FIGURE 2B

PENNSYLVANIA

NEW JERSEY

DELAWARE

BUCKS COUNTY

MONTGOMERY COUNTY

CHESTER COUNTY

DELAWARE COUNTY

BURLINGTON COUNTY

CAMDEN COUNTY

GLOUCESTER COUNTY

NEW CASTLE COUNTY

SALEM COUNTY

ATLANTIC COUNTY

CUMBERLAND COUNTY

CAPE MAY COUNTY

SUSSEX COUNTY

Trenton

Philadelphia

Schuylkill River

Ranoocas Creek

Camden

Beckett Street Terminal

Philadelphia Naval Base

National Park

Marcus Hook Anchorage

BW12

BW11

BW10

BW9

BW8

BW7

BW6

BW5

BW4

BW3

BW2

BW1

Raccoon Island

15D

15G

Pedricktown North

Pedricktown South

Oldmans

Wilmington

Salem River

Penns Neck

Killcohook

Pea Patch Island

Reedy Point North

Reedy Point South

Artificial Island

Salem

Chesapeake Bay

Chesapeake & Delaware Canal

Smyrna

Bombay Hook

Kelly Island

Dover

Port Mahon

Egg Island Point

Kitts Hummock

Cohansey River

Vineland

Maurice River

Stone Harbor

Mispillion River

Mispillion Inlet

Buoy 10

Cape May Point

Cape May - Lewes Ferry

Broadkill Beach

Lewes

Cape Henlopen

Dewey & Rehoboth Beaches

LEGEND

- 0 DRBC River Miles
- 100 Channel Stationing
- Bend Widening Location (BW)
- Existing Disposal Areas
- Proposed Upland Disposal Areas
- Main Channel
- Channel Reaches
- State Boundaries
- County Boundaries
- Water Features
- Ferry

NOTES:

1. Colors in channel coincide with disposal locations.

SCALE IN MILES

7 0 7

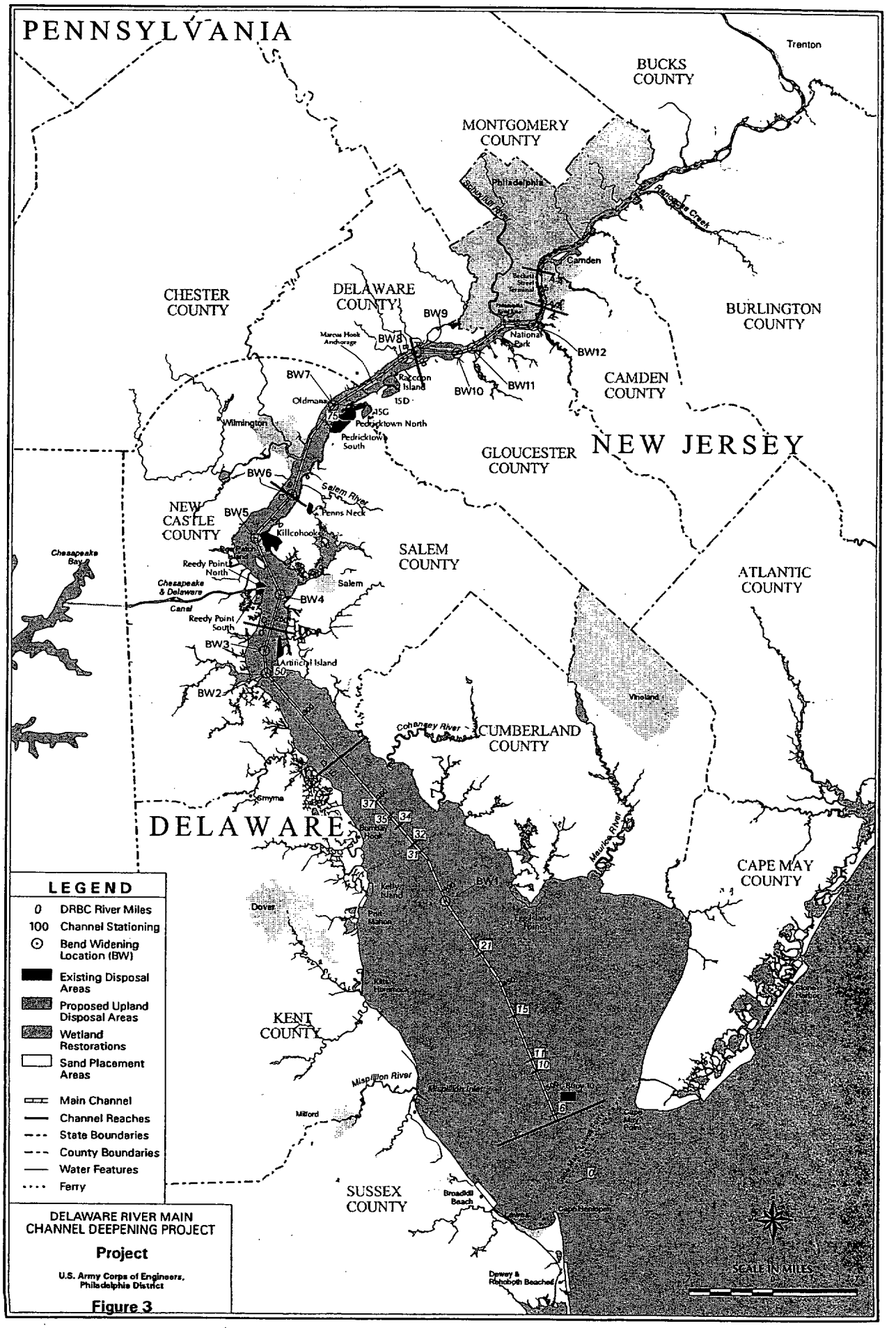
1" = 7 Miles

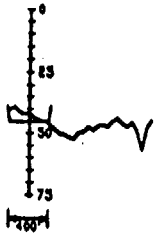
DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

Project

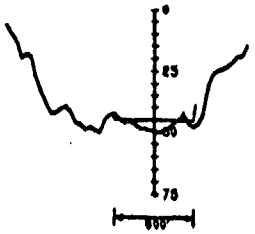
U.S. Army Corps of Engineers, Philadelphia District

Figure 3


PENNSYLVANIA
Trenton
BUCKS COUNTY
MONTGOMERY COUNTY
Philadelphia
Delaware River
Pennsauken Creek
Camden
CHESTER COUNTY
DELAWARE COUNTY
BW9
BW8
BW12
BURLINGTON COUNTY
Marcus Hook Anchorage
National Park
BW7
Raccoon Island
BW10
BW11
CAMDEN COUNTY
Oldmans
15D
15G
Wilmington
Pedricktown North
Pedricktown South
GLOUCESTER COUNTY
NEW JERSEY
BW6
Salem River
NEW CASTLE COUNTY
BW5
Penns Neck
Killcohook
SALEM COUNTY
Chesapeake Bay
Reedy Point North
Chesapeake & Delaware Canal
Salem
ATLANTIC COUNTY
BW4
Reedy Point South
BW3
Artificial Island
BW2
Vineland
Cohansey River
CUMBERLAND COUNTY
Smyrna
DELAWARE
Maurice River
CAPE MAY COUNTY
BW1
Dover
Port Mahon
KENT COUNTY
Mispillion River
Milford
SUSSEX COUNTY
Broadkill Beach
Dewey & Rehoboth Beaches
SCALE IN MILES
LEGEND
0 DRBC River Miles
100 Channel Stationing
Bend Widening Location (BW)
Existing Disposal Areas
Proposed Upland Disposal Areas
Wetland Restorations
Sand Placement Areas
Main Channel
Channel Reaches
State Boundaries
County Boundaries
Water Features
Ferry
DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT
Project
U.S. Army Corps of Engineers, Philadelphia District
Figure 3



Sta 33+000 (21 Apr 93)



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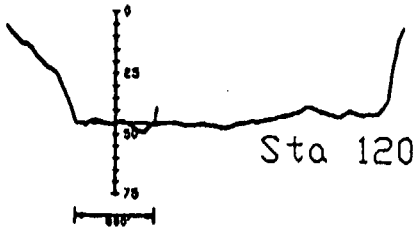

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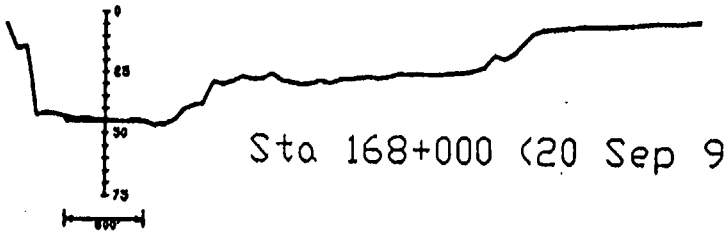

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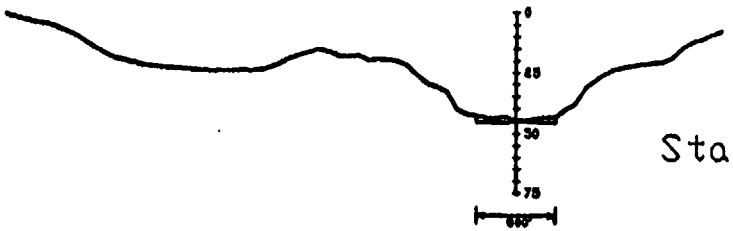


Sta 200+000 (25 Jun 92)

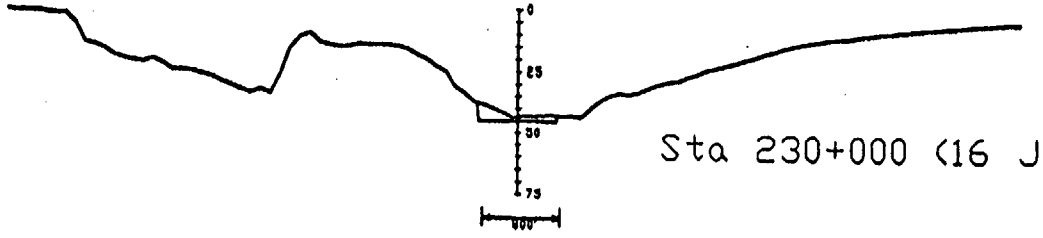
Horizontal: 1"=2000'
Vertical: 1"=80'

DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

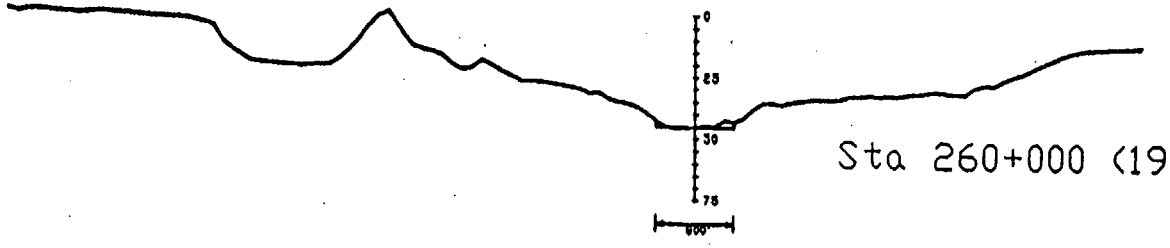
Representative Cross Sections
Sta 33+000 to Sta 200+000

U.S. Army Corps of Engineers,
Philadelphia District

Figure 4

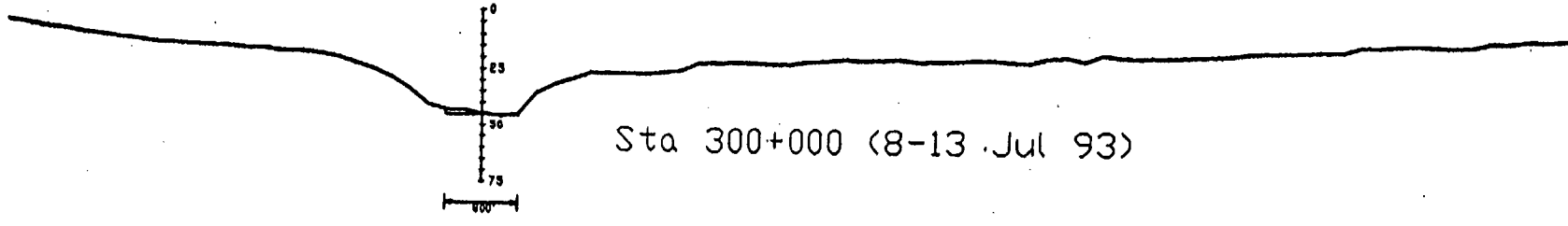


Sta 230+000 (16 Jul 93)

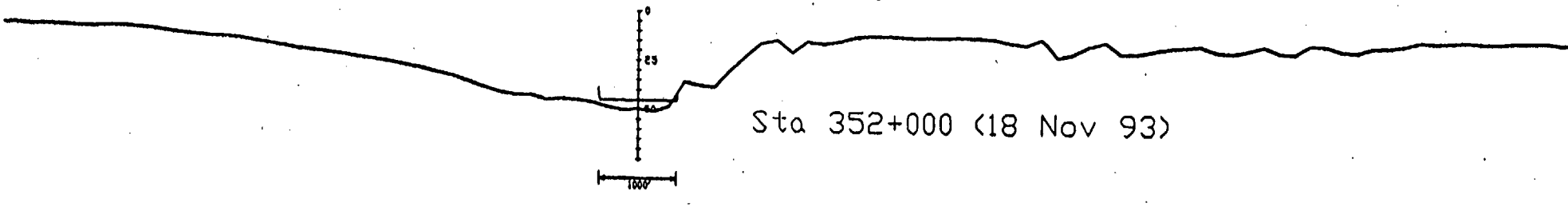


Sta 260+000 (19 Jul 93)

Horizontal: 1"=2000'
Vertical: 1"=80'



Sta 300+000 (8-13 Jul 93)



Sta 352+000 (18 Nov 93)

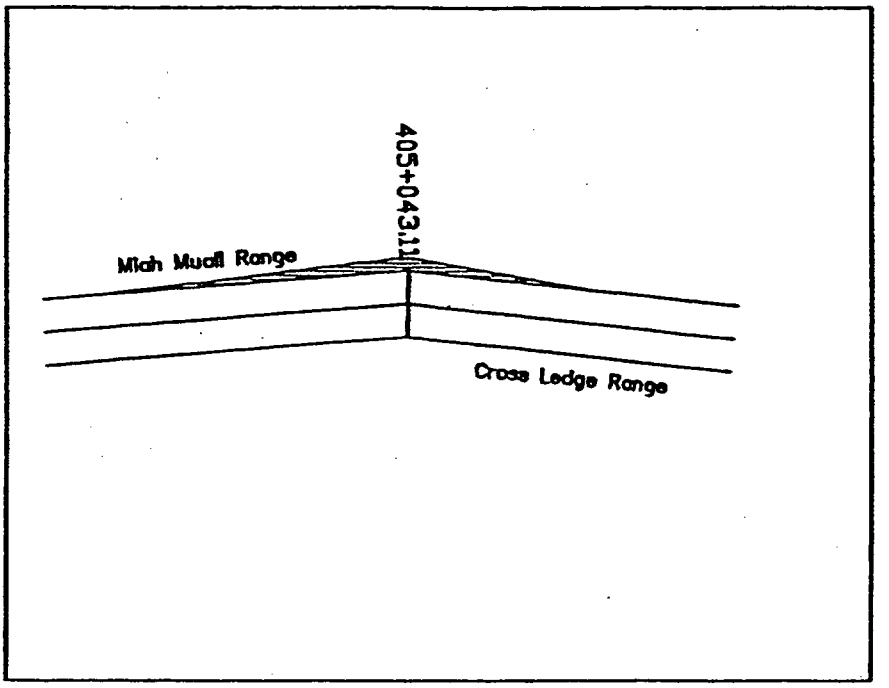
DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Representative Cross Sections
Sta 200+000 to Sta 352+000

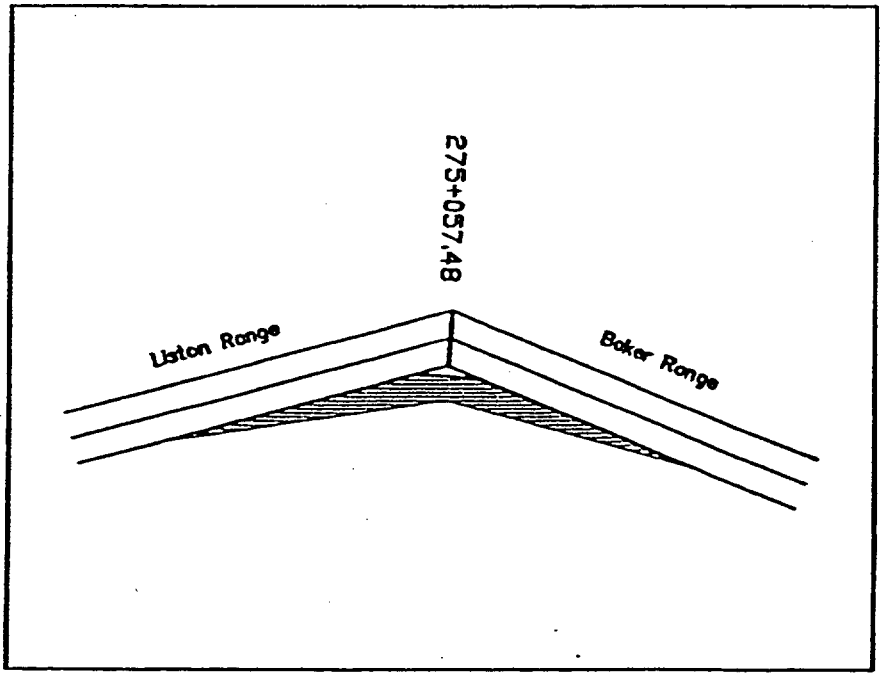
U.S. Army Corps of Engineers,
Philadelphia District

Figure 5.

MIAH MUALL–CROSS LEDGE (BW1)



LISTON–BAKER (BW2)



— Bend Widening

SCALE: 1"=3000'

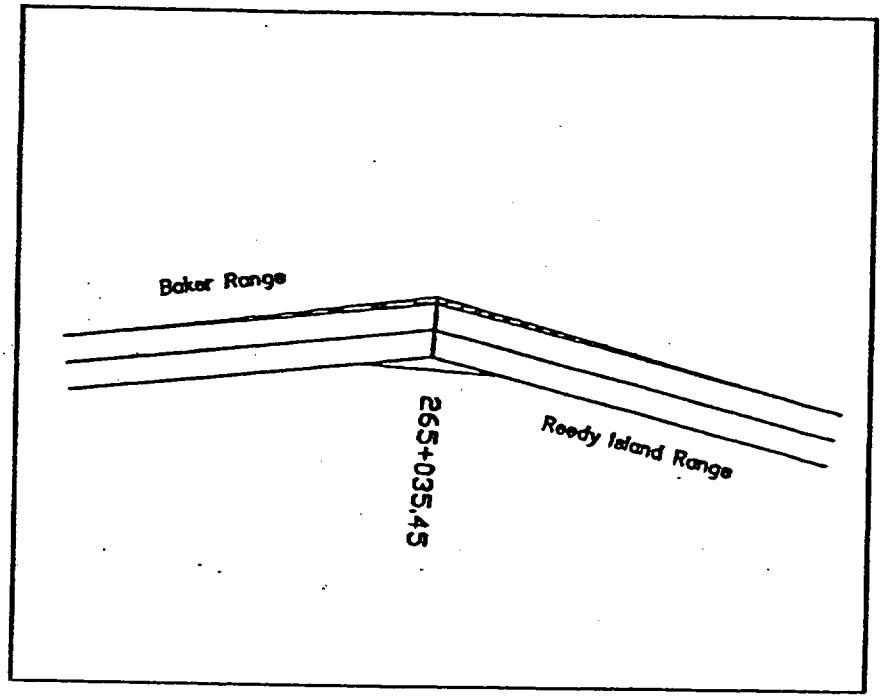
DELAVARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
Miah Muall-Cross Ledge
Liston-Baker

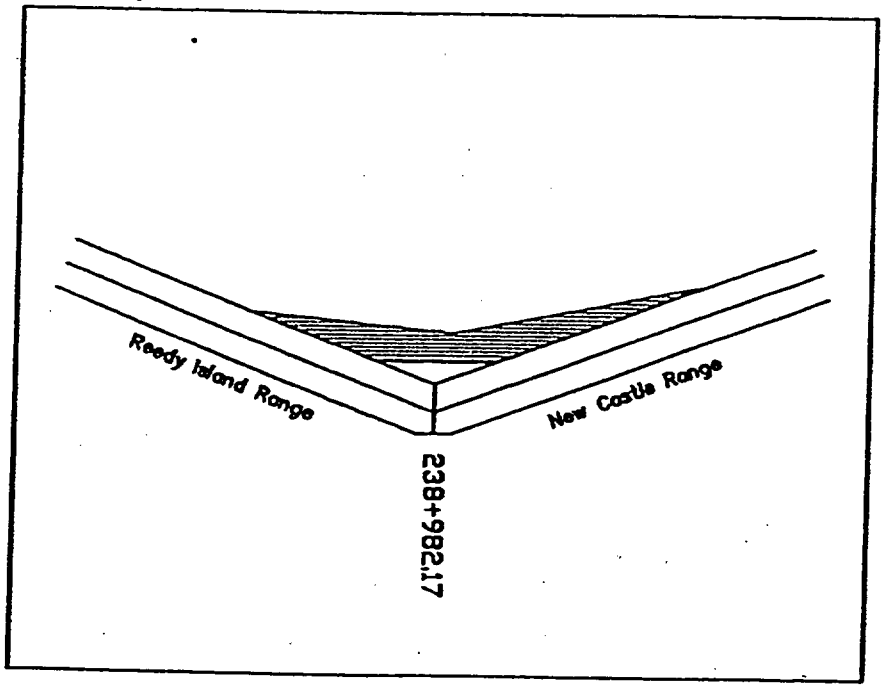
U.S. Army Corps of Engineers,
Philadelphia District

Figure 6

BAKER–REEDY ISLAND (BW3)



REEDY ISLAND–NEW CASTLE (BW4)



— Bend Widening

SCALE: 1"=3000'

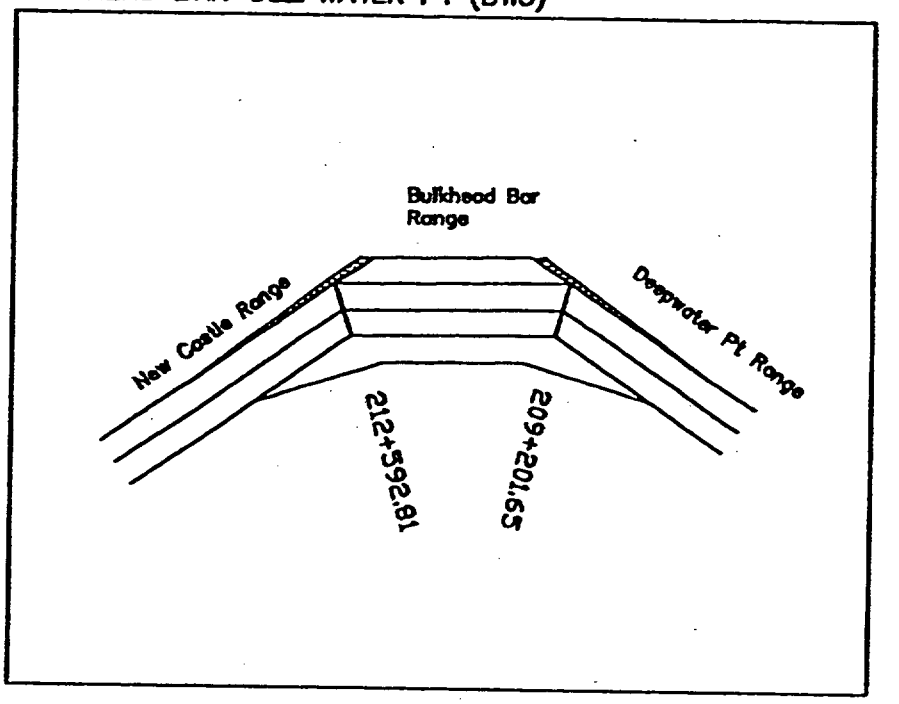
DELAVARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
Baker–Reedy Island
Reedy Island–New Castle

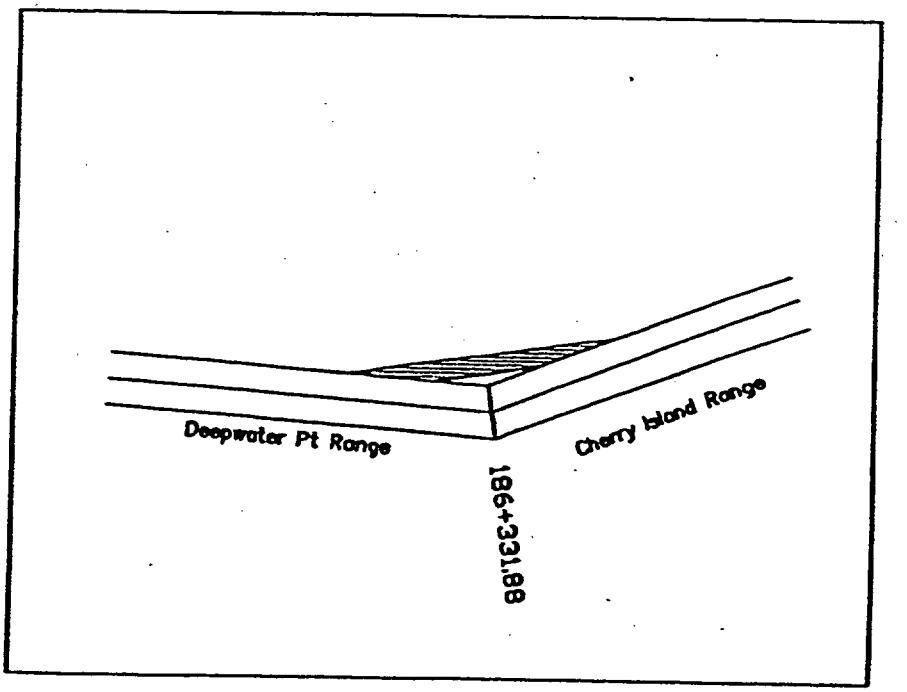
U.S. Army Corps of Engineers,
Philadelphia District

Figure 7

NEW CASTLE–BULKHEAD BAR AND
BULKHEAD BAR–DEEPWATER PT (BW5)



DEEPWATER PT–CHERRY ISLAND (BW6)



— Bend Widening

SCALE: 1"=3000'

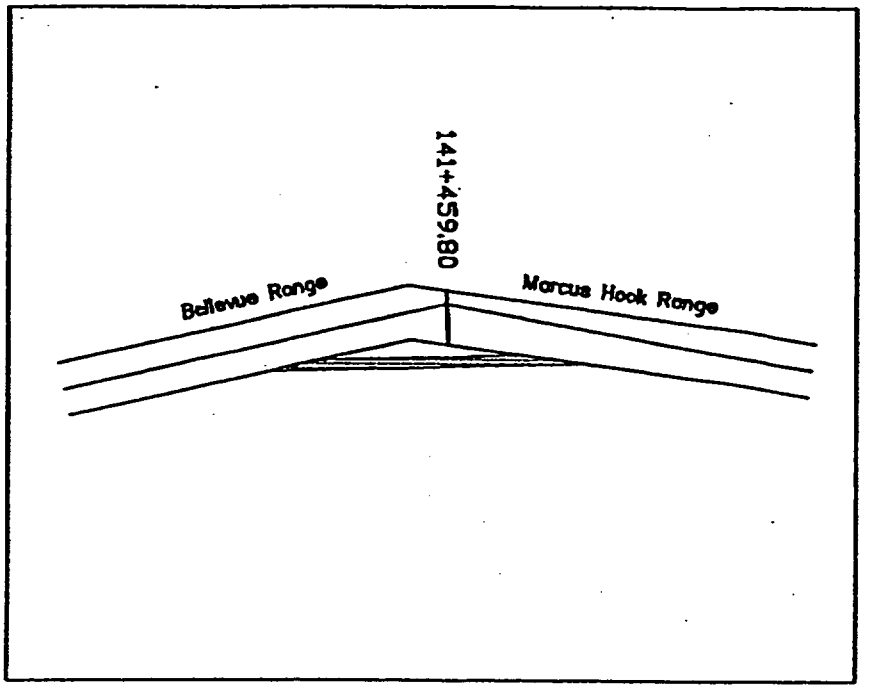
DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
New Castle–Bulkhead Bar–Deepwater Pt
Deepwater Pt–Cherry Island

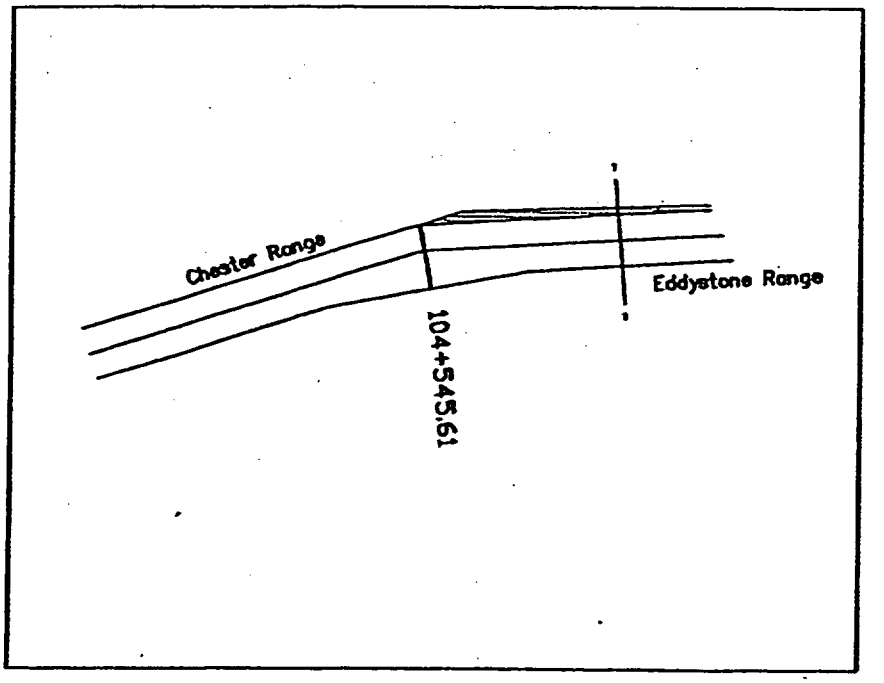
U.S. Army Corps of Engineers
Philadelphia District

Figure 8

BELLEVUE–MARCUS HOOK (BW7)



CHESTER–EDDYSTONE (BW8)



— Bend Widening

SCALE: 1"=3000'

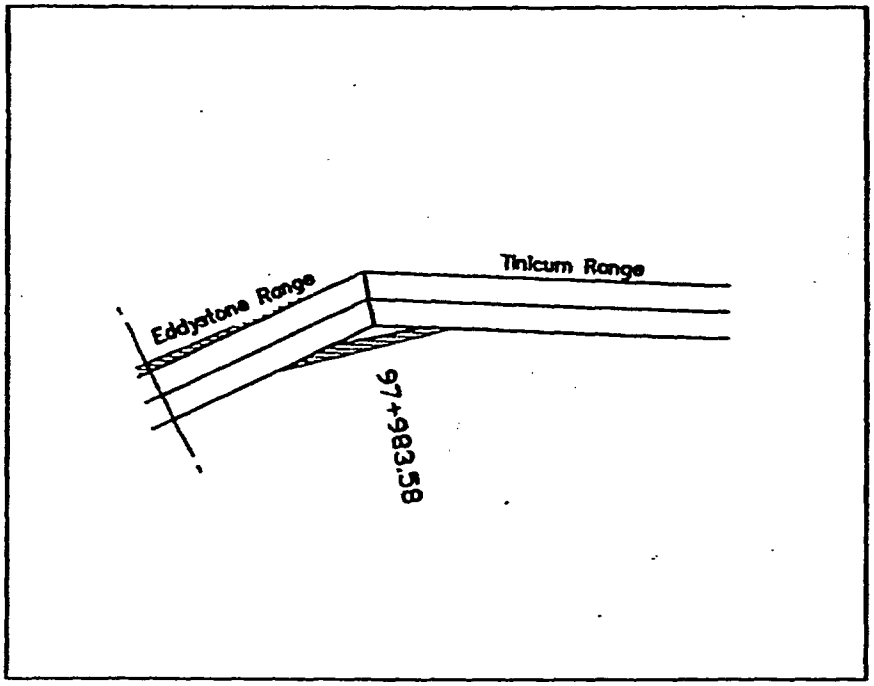
DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
Bellevue-Marcus Hook
Chester-Eddystone

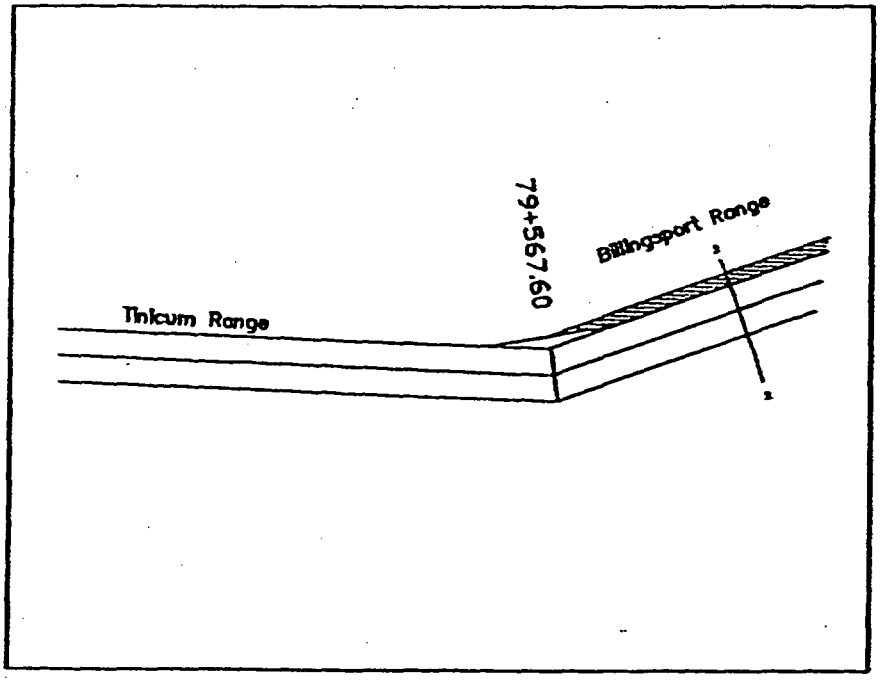
U.S. Army Corps of Engineers,
Philadelphia District

Figure 9

EDDYSTONE–TINICUM (BW9)



TINICUM–BILLINGSPORT (BW10)



— Bend Widening

SCALE: 1"=3000'

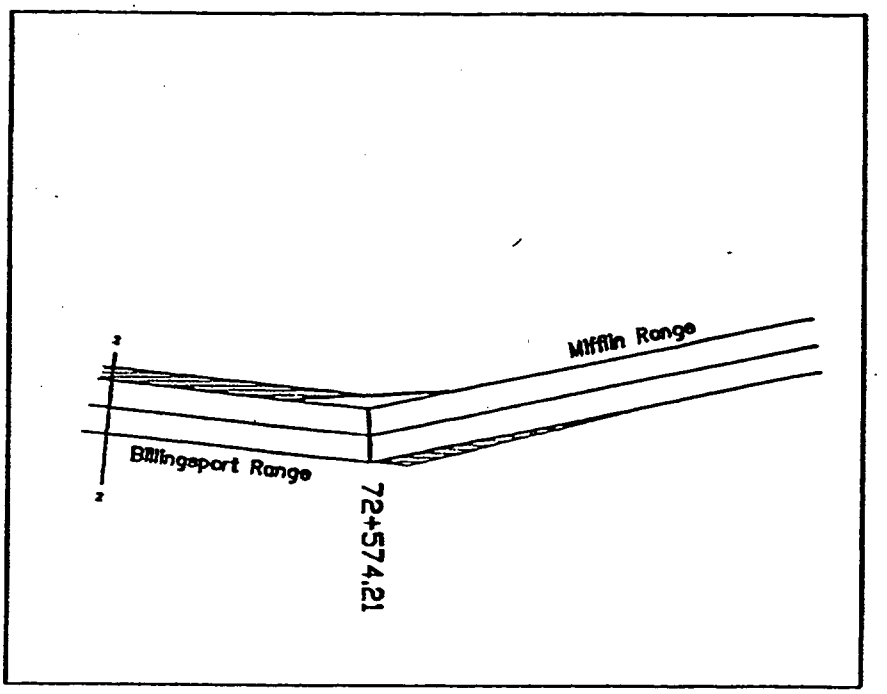
DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
Eddystone-Tinicum
Tinicum-Billingsport

U.S. Army Corps of Engineers,
Philadelphia District

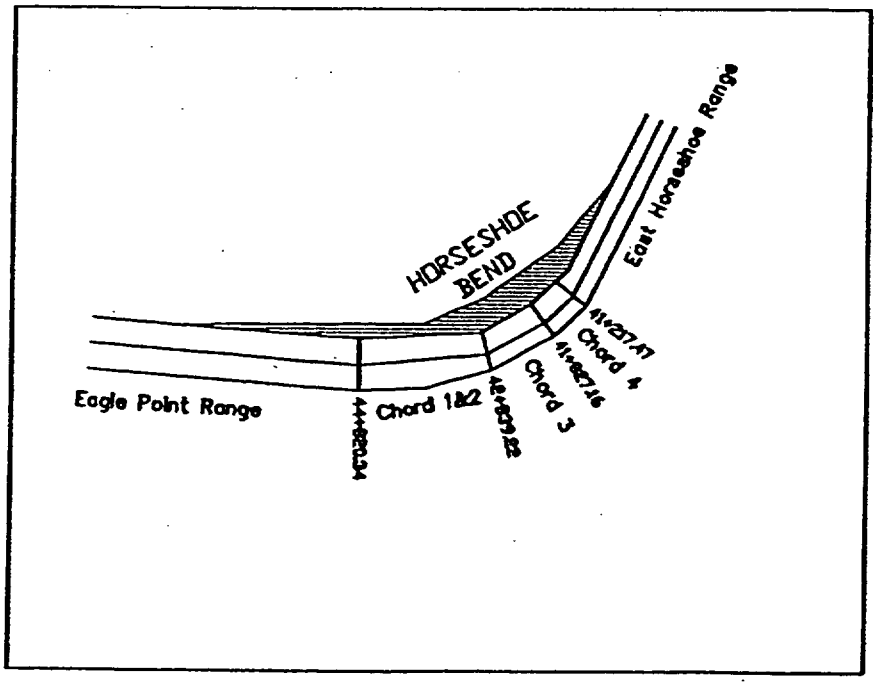
Figure 10

BILLINGSPORT–MIFFLIN (BW11)



HORSESHOE BEND (BW12)

(EAGLE POINT–CHORDS 1, 2, 3 & 4–EAST HORSESHOE)



— Bend Widening

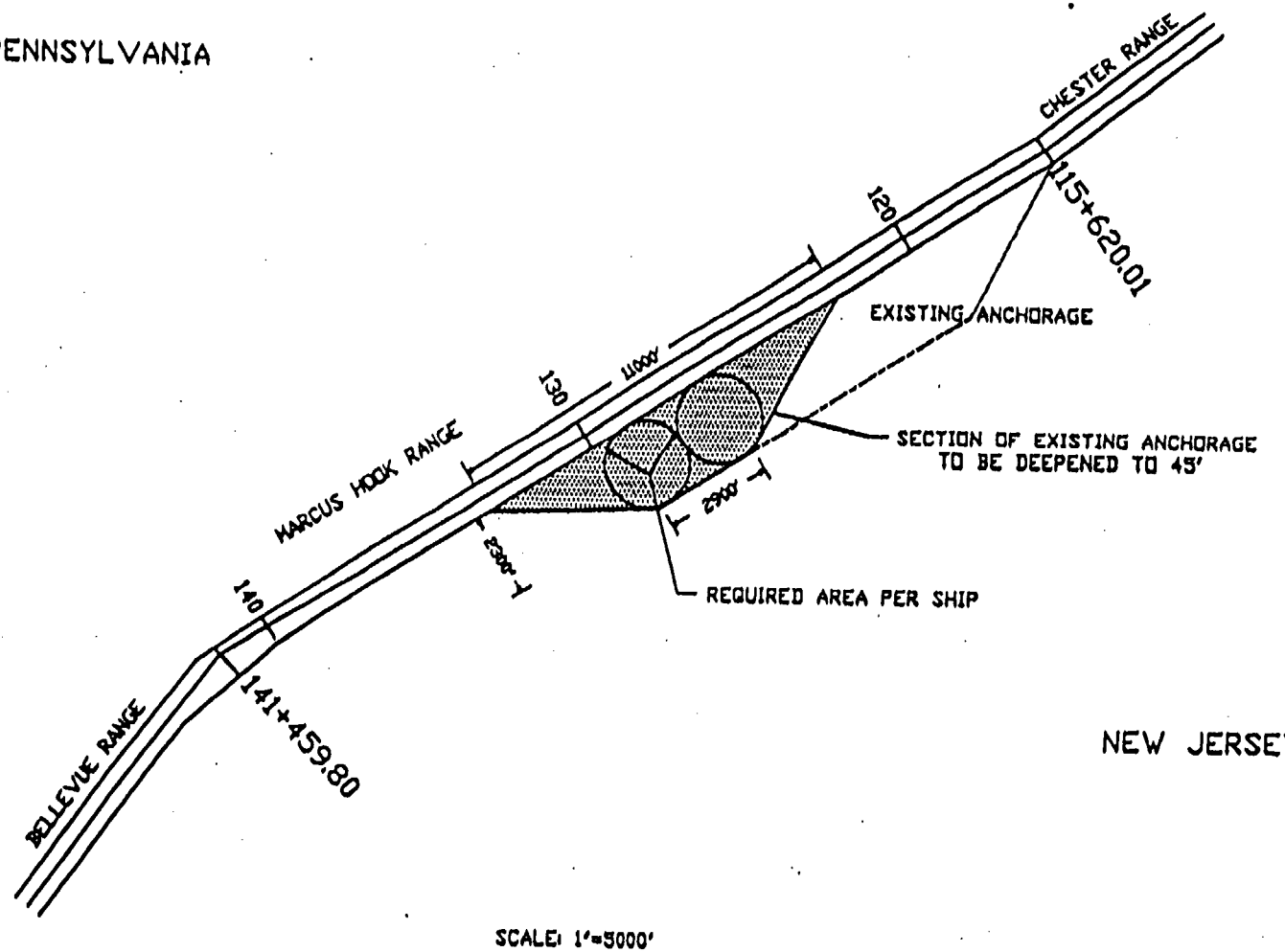
SCALE: 1"=3000'

DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Bend Widenings:
Billingsport-Mifflin
Horseshoe Bend

U.S. Army Corps of Engineers,
Philadelphia District

Figure 11

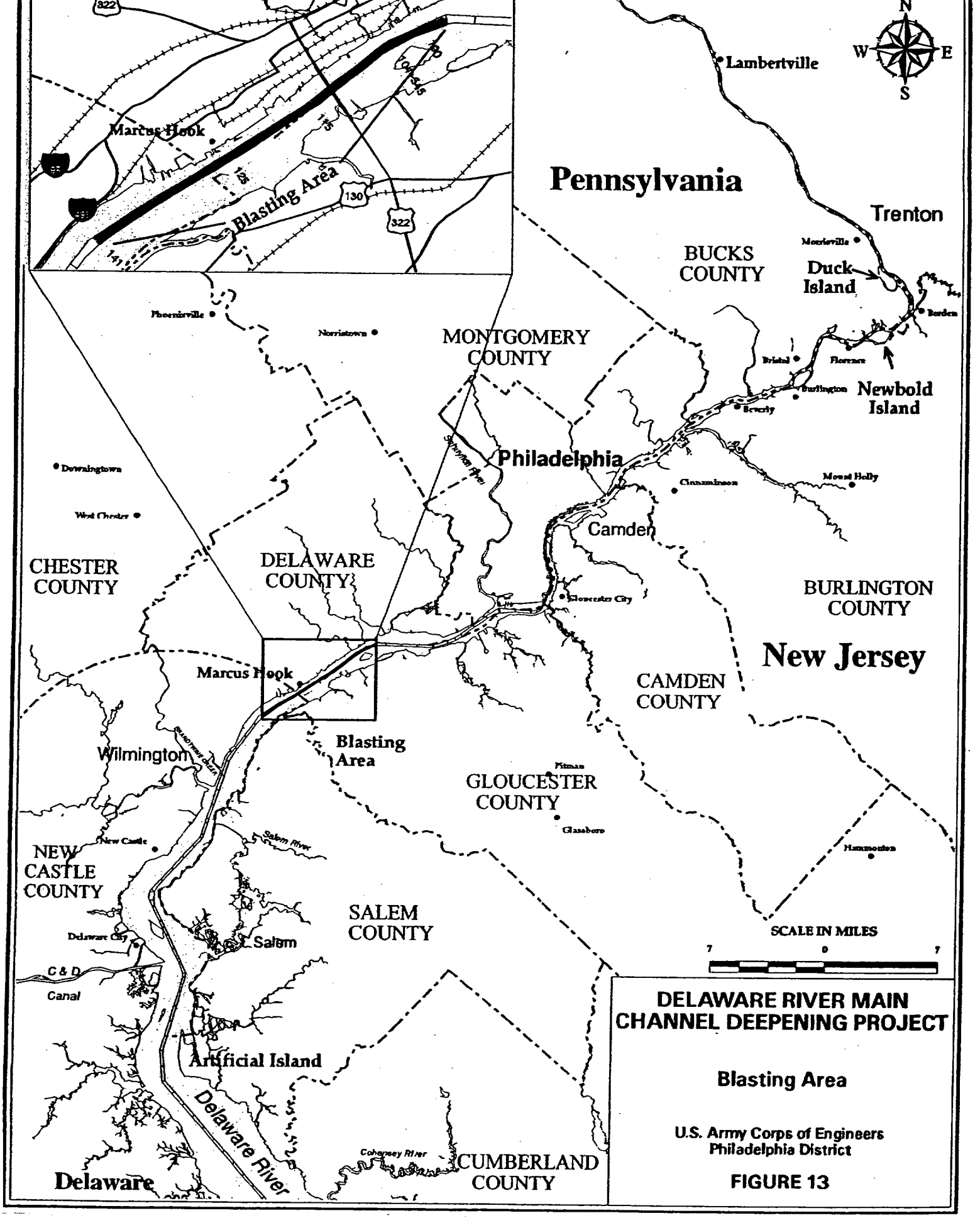


DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

Marcus Hook Anchorage

U.S. Army Corps of Engineers,
Philadelphia District

Figure 12

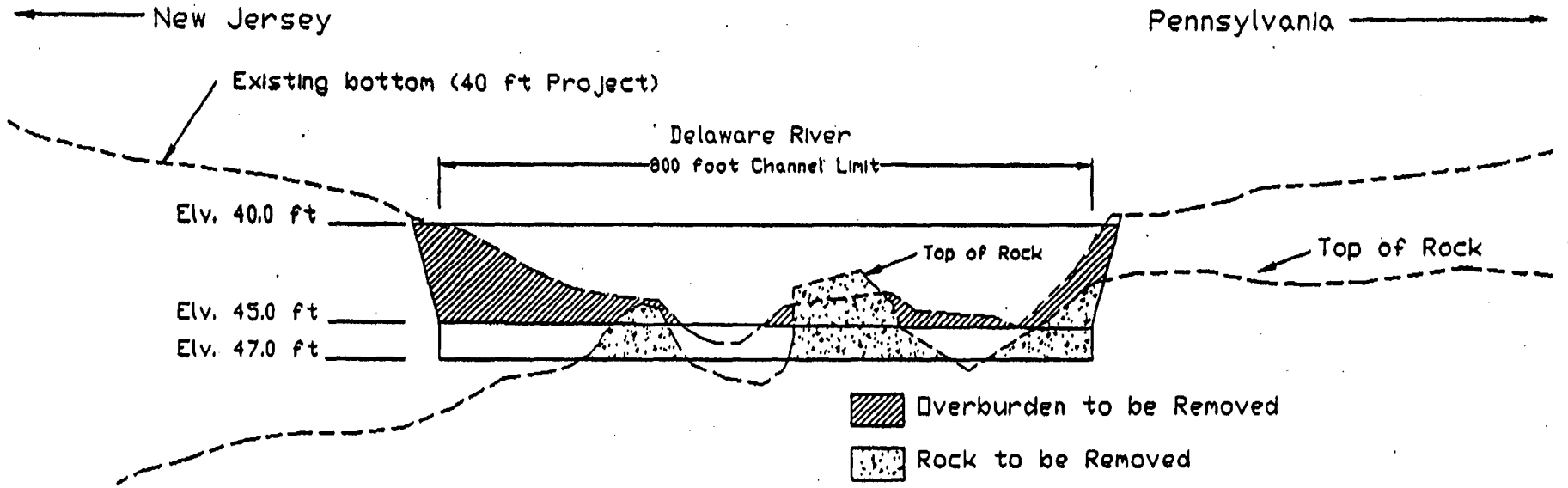


DELAWARE RIVER MAIN CHANNEL DEEPENING PROJECT

Blasting Area

U.S. Army Corps of Engineers
Philadelphia District

FIGURE 13



NOT TO SCALE

NOTE: Drawing is exaggerated in the vertical direction

DELAWARE RIVER
MAIN CHANNEL DEEPENING PROJECT

ROCK EXCAVATION

EXAMPLE CROSS SECTION

U.S. Army Corps of Engineers,
Philadelphia District

Figure 14