DEPARTMENT OF THE ARMY
BUFFALO DISTRICT, CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207-3199

REPLY TO
ATTENTION OF

January 9, 2013

Environmental Analysis Team

SUBJECT: Conneaut Harbor, Ashtabula County, Ohio - Request for Section 401 Water Quality Certification for Scheduled 2013 Maintenance Dredging Project

Mr. Scott J. Nally
Director
Ohio Environmental Protection Agency
Division of Surface Water
P.O. Box 1049
Columbus, Ohio 43216-1049
Attn: Ric Queen

Dear Mr. Nally:

Enclosed for your review and comment is the Section 404(a) Public Notice and Section 401 State Water Quality Certification (WQC) application for our scheduled 2013 maintenance dredging project at Conneaut Harbor, Ohio. This project entails the maintenance dredging of authorized Federal navigation channels, and placement of the associated dredged material in the Harbor's authorized open-lake placement area. The Public Notice has been prepared in conformance with U.S. Army Corps of Engineers (USACE) regulation, "Practice and Procedure: Final Rule for Operation and Maintenance of Army Corps of Engineers Civil Works Projects involving the Discharge of Dredged Materials into Waters of the United States or Ocean Waters," 33 Code of Federal Regulations (CFR) 337.1.

The USACE - Buffalo District is requesting Ohio Environmental Protection Agency (OEPA) WQC for the scheduled 2013 maintenance dredging project at Conneaut Harbor, or waiver thereof, under Section 401 of the Clean Water Act.

The following items are contained within this package:

a. Enclosure 1 is the Section 404(a) Public Notice.
b. Enclosure 2 is our Section 401 WQC application.
c. Enclosure 3 is an aerial photograph of Conneaut Harbor.
d. Enclosures 4 and 5 are contract drawings depicting the minimum degradation and preferred alternatives.
e. Enclosure 6 is most recent Tiered Evaluation on channel sediments.

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SUBJECT: Conneaut Harbor, Ashtabula County, Ohio - Request for Section 401 Water Quality Certification for Scheduled 2013 Maintenance Dredging Project

Please note that all associated National Environmental Policy Act (NEPA) documents (Environmental Impact Statements and Environmental Assessments) and Section 404(b)(1) Evaluations have been completed for this maintenance dredging project, and were previously furnished to your office. The majority of the information requested in Item 10 of the WQC application is contained in these documents in further detail.

As you know, we require WQC in order to accept contract bids on this project. The bid opening date has been scheduled for May 15, 2013 and our goal is to secure the WQC by May 1, 2013. Therefore, we ask that you schedule the Public Hearing on this application at your earliest possible convenience. Please advise us regarding the status of this application by January 28, 2013. We appreciate your cooperation in this matter.

Questions pertaining to this matter should be directed to Mr. Eric E. Hannes at (716) 879-4311, by writing to the following address: U.S. Army Corps of Engineers, 1776 Niagara Street, Buffalo, New York, 14207-3199, or by e-mail at: Eric.E.Hannes@usace.army.mil.

Sincerely,

Martin P. Wargo, PWS
Team Leader
Environmental Analysis Team

Enclosures

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US Army Corps of Engineers

Public Notice

Issuing Office: CELRB-PM-EA
Notice No: Conneaut-13

Published: 9 JAN 2013
Expires: 8 FEB 2013

OPERATIONS AND MAINTENANCE
DREDGING AND DREDGED MATERIAL PLACEMENT

CONNEAUT HARBOR

ASHTABULA COUNTY, OHIO

This Public Notice has been prepared and distributed pursuant to Section 404 (a) of the Clean Water Act (33 United States Code (USC) 1344) and 33 Code of Federal Regulations (CFR) 337.1, "Practice and Procedure: Discharge of Dredged Material into Waters of the U.S. or Ocean Waters; Operation and Maintenance; Final Rule" (53 Federal Register, page 14916, 26 April 1988). Its purpose is to specify what dredged/fill materials would be discharged into waters of the United States by implementation of the proposed action, and advise all interested parties of the proposed project and to provide an opportunity to submit comments, or request a public hearing.

The U.S. Army Corps of Engineers (USACE) - Buffalo District anticipates the need to dredge and place material excavated from the Federal navigation channels of Conneaut Harbor, in order to maintain sufficient depth for deep-draft commercial and recreational navigation. Navigation channels included in the harbor project are the Outer Harbor Channel, Inner Harbor Channel, and Municipal Access Channel. The attached map shows the authorized limits and depths of the Federal navigation channels (Figure 1). Up to an additional one foot of material may be dredged from the channels to ensure that the minimum authorized depth is maintained and to account for dredging tolerance. Maintenance dredging of Conneaut Harbor in 2013 will be conducted in areas within the harbor that meet Federal guidelines for open-lake placement. These areas include the Inner Harbor, Outer Harbor, and Municipal Access Channel (Figure 1).

The 2013 dredging operation at Conneaut Harbor is tentatively scheduled to be performed during the period between 1 July and 15 September.

Sediments will be removed from the channel bottom by a mechanical or hydraulic dredge and placed into hoppers aboard ship or scow for transport to the dredged material placement area.

The method of excavation will be determined by the contractor performing the maintenance dredging. In previous years, clamshell bucket and hopper dredges have been used to complete the required work. An estimated total of 150,000 cubic yards of material will be dredged from the Federal navigation channels.

Material in the Conneaut Harbor Federal navigation channels consists primarily of silts and clays, with some fine sands. Conneaut Harbor sediment data was analyzed in fall of 2012 to specifically evaluate its suitability for open-lake placement in accordance with joint U.S. Environmental Protection Agency (USEPA)/USACE protocols contained in the Great Lakes Dredged Material Testing and Evaluation Manual (1998). The material was sampled, tested and evaluated using a tiered approach pursuant to these protocols and guidelines. Based on this Tiered Evaluation, the USACE has determined that the material proposed to be dredged from the Conneaut Harbor Federal navigation channels meets Federal guidelines and is suitable for open-lake placement. Therefore the material dredged from the Conneaut Harbor channels will be placed into the existing, authorized open-lake placement area, which is located four miles from the West Breakwater light, at an azimuth of 314°00' (Figure 2). This site has been used previously by the USACE for the placement of Conneaut Harbor dredged material. Since none of the material proposed for dredging is predominantly coarse-grained (i.e. sand), no material is proposed to be placed at the existing nearshore area.

State Water Quality Certification (WQC) from the Ohio Environmental Protection Agency (OEPA) is required for this action, pursuant to Section 401 of the Clean Water Act. Therefore, a copy of this Public Notice has been provided to OEPA requesting WQC for the associated placement of dredged material at the existing open-lake placement area.

The environmental effects of the dredging operation are documented in the ***Final Environmental Impact Statement (FEIS), Operation and Maintenance, Conneaut Harbor, Ohio (1975); Supplemental Information Report and Section 404(b)(1) Evaluation, Operation and Maintenance, Conneaut Harbor, Ohio (1982 and 2004); and Environmental Assessment (EA)/Finding of No Significant Impact Statement (FONSI) and Section 404(b)(1) Evaluation for Conneaut Harbor, Ohio (1999).*** These documents, and supplemental documentation, have been submitted to USEPA. Copies are available for examination at the Buffalo District office.

There are no listed historic properties or properties determined as being eligible for listing in the National Register of Historic Places that will be affected by this project. By this notice, the National Park Service is advised that currently unknown archaeological, scientific, prehistorical or historical data may be lost or destroyed by the work to be accomplished.

Based on the review of the available environmental data, we have determined that the proposed work will have No Effect on any species proposed or designated by the U.S. Department of the Interior as threatened or endangered, nor will it affect the designated critical habitat of any such species. Therefore, unless additional information indicates otherwise, no further formal consultation pursuant to Section 7 of the Endangered Species Act Amendments of 1978 will be undertaken with the U.S. Fish and Wildlife Service.

This work will be undertaken in a manner consistent, to the maximum extent practicable, with the State of Ohio Coastal Resources Management Program. A Coastal Management Program Federal Consistency Determination has been submitted to the Ohio Department of Natural Resources (ODNR) documenting this determination. Due to the project's proximity to the Pennsylvania State border, this activity has also been evaluated with respect to the Pennsylvania Coastal Resources Management Program. This evaluation has determined that the work will be undertaken in a manner consistent, to the maximum extent practicable, with the Pennsylvania Coastal Resources Management Program. A Coastal Management Program Federal Consistency Determination has been submitted to the Pennsylvania Department of Environmental Protection (PADEP) documenting this determination.

The decision whether to perform dredging has been based on an evaluation of the probable impact, including cumulative impacts of the proposed activity on the public interest. This decision reflects the national concern for both protection and utilization of important resources. The benefit which is reasonably expected to accrue from the proposal has been balanced against its reasonably foreseeable detriments. All factors which may be relevant to the proposal have been considered including the cumulative factors thereof; among those are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife values, flood hazards, floodplain values, land use, navigation, shoreline erosion and accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, considerations of property ownership and, in general, the needs and welfare of the people.

This activity is being coordinated with the following agencies, as well as other appropriate Federal, State and local agencies and organizations:

Ohio Department of Natural Resources
Ohio Environmental Protection Agency
Ohio Historic Preservation Office
Pennsylvania Department of Environmental Protection
U.S. Coast Guard
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Environmental Protection Agency

Any interested parties and/or agencies desiring to express their views concerning the proposed dredging and open-lake placement of dredged material may do so by filing their comments, in writing, no later than 30 days from the date of this notice. Any person who has an interest which may be affected by the proposed dredging and open-lake placement of this dredged material may request a public hearing. The request must be submitted in writing to the undersigned within 30 days of the date of this Public Notice. The request must clearly set forth the interest which may be affected, and the manner in which the interest may be affected, by this activity.

Interested parties are encouraged to contact the USACE - Buffalo District with their comments regarding the proposed dredging of Conneaut Harbor. Please review this Public Notice and send your comments in writing within 30 days to the following e-mail address:

ConneautDredging@usace.army.mil

or via mail to:

U.S. Army Corps of Engineers, Buffalo District
Environmental Analysis Team
1776 Niagara Street
Buffalo, NY 14207-3199
ATTN: Environmental Analysis - Conneaut Dredging

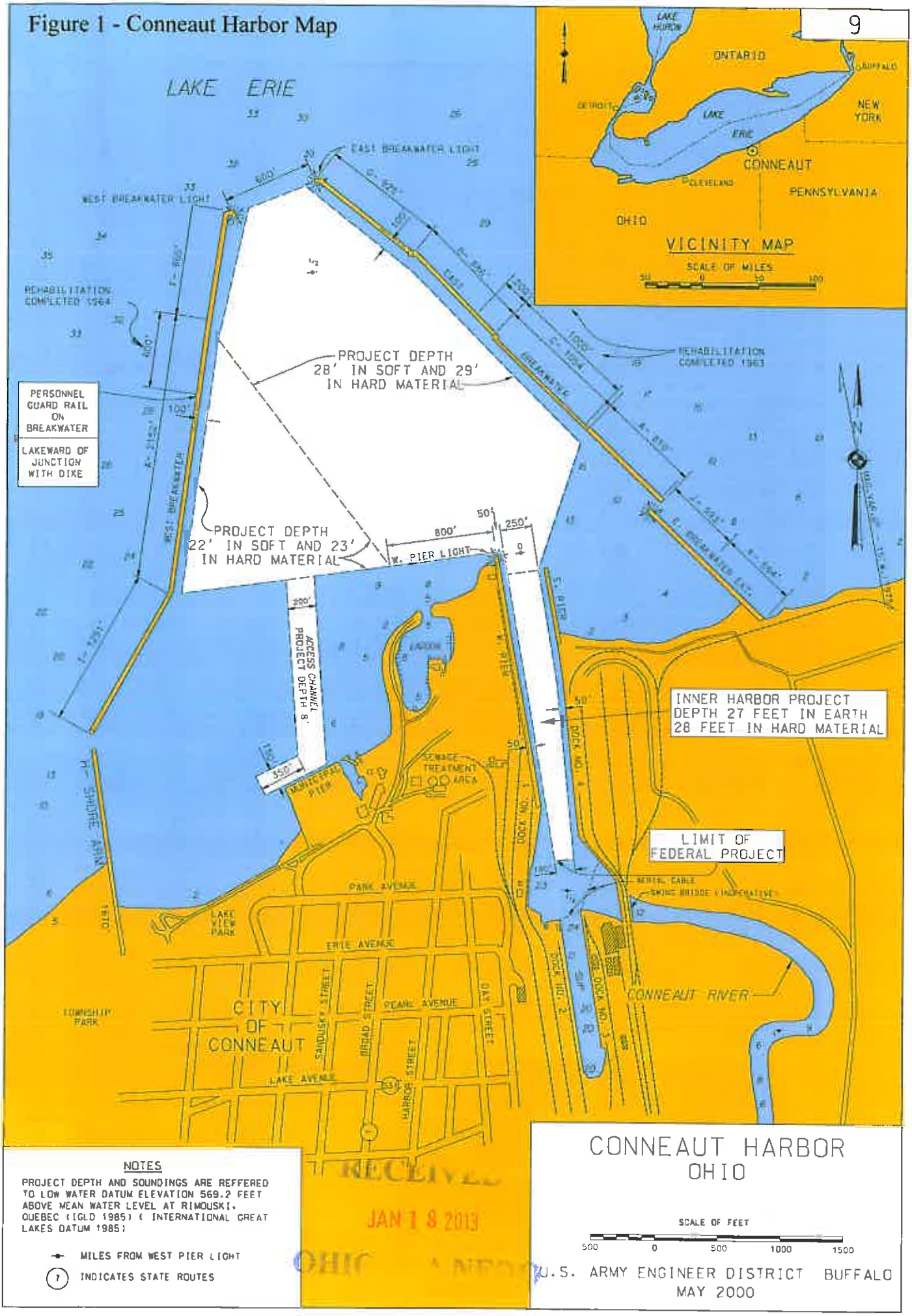
This Public Notice is published in conformance with 33 CFR 337.1. All dredging and dredged material discharge will be performed in conformance with Sections 313 and 404 of the Clean Water Act (33 USC 1323 and 1344, respectively).

Martin P. Wargo, PWS
Supervisory Biologist
Environmental Analysis Team

Attachments

NOTICE TO THE POSTMASTER: It is requested that the above notice be conspicuously displayed for 30 days from the date of issuance.

Figure 1 - Conneaut Harbor Map



NOTES

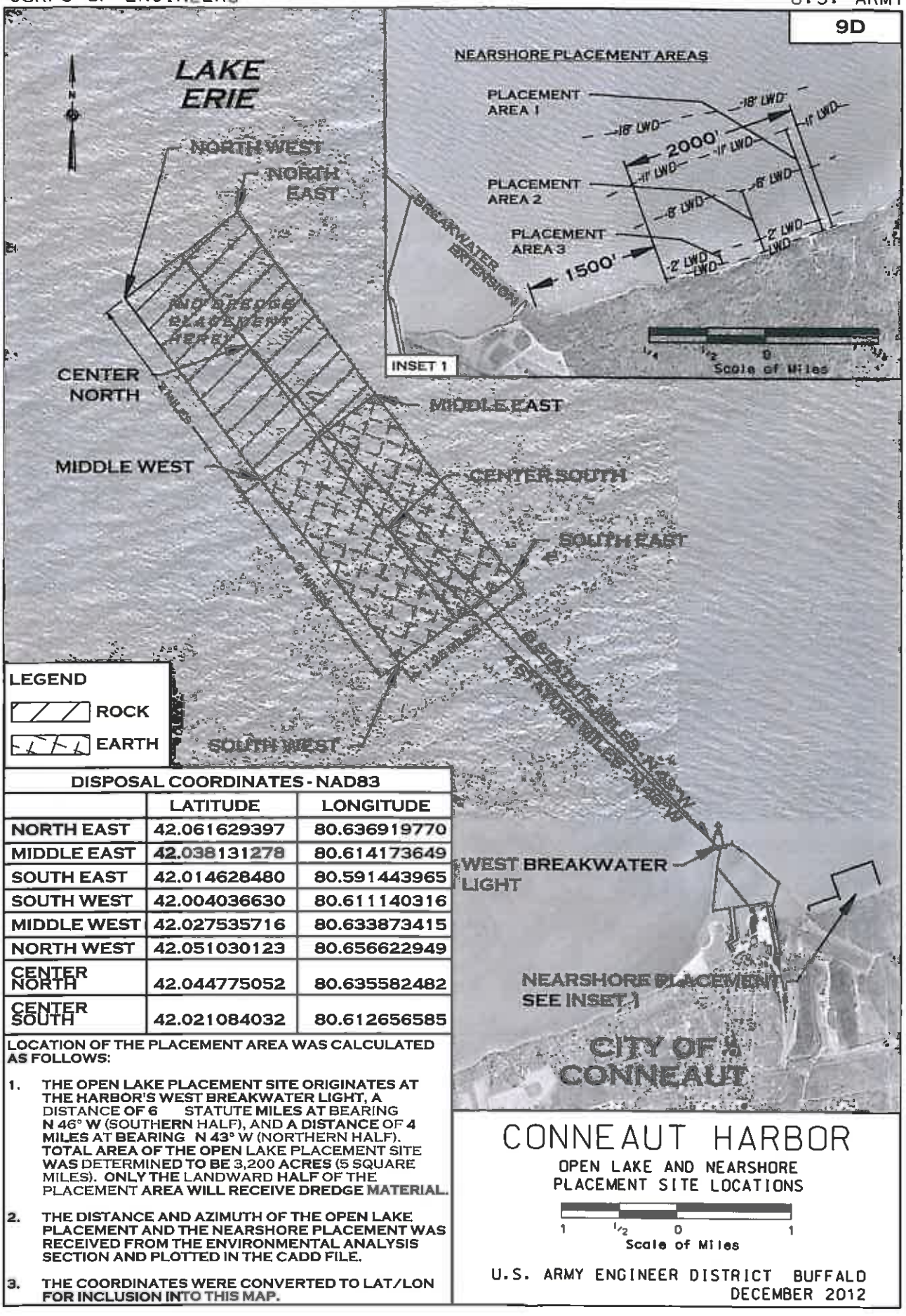
PROJECT DEPTH AND SOUNDINGS ARE REFFERED TO LOW WATER DATUM ELEVATION 569.2 FEET ABOVE MEAN WATER LEVEL AT RIMOUSKI, QUEBEC (IGLD 1985) (INTERNATIONAL GREAT LAKES DATUM 1985)

- MILES FROM WEST PIER LIGHT
- (7) INDICATES STATE ROUTES

CONNEAUT HARBOR
OHIO

SCALE OF FEET
500 0 500 1000 1500

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 2000



DISPOSAL COORDINATES - NAD83		
	LATITUDE	LONGITUDE
NORTH EAST	42.061629397	80.636919770
MIDDLE EAST	42.038131278	80.614173649
SOUTH EAST	42.014628480	80.591443965
SOUTH WEST	42.004036630	80.611140316
MIDDLE WEST	42.027535716	80.633873415
NORTH WEST	42.051030123	80.656622949
CENTER NORTH	42.044775052	80.635582482
CENTER SOUTH	42.021084032	80.612656585

LOCATION OF THE PLACEMENT AREA WAS CALCULATED AS FOLLOWS:

1. THE OPEN LAKE PLACEMENT SITE ORIGINATES AT THE HARBOR'S WEST BREAKWATER LIGHT, A DISTANCE OF 6 STATUTE MILES AT BEARING N 46° W (SOUTHERN HALF), AND A DISTANCE OF 4 MILES AT BEARING N 43° W (NORTHERN HALF). TOTAL AREA OF THE OPEN LAKE PLACEMENT SITE WAS DETERMINED TO BE 3,200 ACRES (5 SQUARE MILES). ONLY THE LANDWARD HALF OF THE PLACEMENT AREA WILL RECEIVE DREDGE MATERIAL.
2. THE DISTANCE AND AZIMUTH OF THE OPEN LAKE PLACEMENT AND THE NEARSHORE PLACEMENT WAS RECEIVED FROM THE ENVIRONMENTAL ANALYSIS SECTION AND PLOTTED IN THE CADD FILE.
3. THE COORDINATES WERE CONVERTED TO LAT/LON FOR INCLUSION INTO THIS MAP.

CONNEAUT HARBOR
OPEN LAKE AND NEARSHORE PLACEMENT SITE LOCATIONS
1 1/2 0 1
Scale of Miles
U.S. ARMY ENGINEER DISTRICT BUFFALO
DECEMBER 2012

Figure 2 - Conneaut Harbor Placement Locations

APPLICATION FOR OHIO EPA SECTION 401 WATER QUALITY CERTIFICATION

Effective October 1, 1996
Revised August, 1998

This application must be completed whenever a proposed activity requires an individual Clean Water Act Section 401 Water Quality Certification (Section 401 certification) from Ohio EPA. A Section 401 certification from the State is required to obtain a federal Clean Water Act Section 404 permit from the U.S. Army Corps Engineers, or any other federal permits or licenses for projects that will result in a discharge of dredged or fill material to any waters of the State. To determine whether you need to submit this application to Ohio EPA, contact the U.S. Army Corps of Engineers District Office with jurisdiction over your project, or other federal agencies reviewing your application for a federal permit to discharge dredged or fill material to waters of the State, or an Ohio EPA Section 401 Coordinator at (614) 644-2001.

The Ohio EPA Section 401 Water Quality Certification Program is authorized by Section 401 of the Clean Water Act (33 U.S.C. 1251) and the Ohio Revised Code Section 6111.03(P). Ohio Administrative Code (OAC) Chapter 3745-32 outlines the application process and criteria for decision by the Director of Ohio EPA. In order for Ohio EPA to issue a Section 401 certification, the project must comply with Ohio's Water Quality Standards (OAC 3745-1) and not potentially result in an adverse long-term or short-term impact on water quality. Included in the Water Quality Standards is the Antidegradation Rule (OAC Rule 3745-1-05), effective October 1, 1996, revised October, 1997 and May, 1998. The Rule includes additional application requirements and public participation procedures. **Because there is a lowering of water quality associated with every project being reviewed for Section 401 certification, every Section 401 certification applicant must provide the information required in Part 10 (pages 3 and 4) of this** application. In addition, applications for projects that will result in discharges of dredged or fill material to wetlands must include a wetland delineation report approved by the Corps of Engineers, a wetland assessment with a proposed assignment of wetland category (ies), official documentation on evaluation of the wetland for threatened or endangered species, and appropriate avoidance, minimization, and mitigation as prescribed in OAC 3745-1-50 to 3745-1-54. Ohio EPA will evaluate the applicant's proposed wetland category assignment and make the final assignment.

Information provided with the application will be used to evaluate the project for certification and is a matter of public record. If the Director determines that the application lacks information necessary to determine whether the applicant has demonstrated the criteria set forth in OAC Rule 3745-32-05(A) and OAC Chapter 3745-1, Ohio EPA will inform the applicant in writing of the additional information that must be submitted. The application will not be accepted until the application is considered complete by the Section 401 Coordinator. An Ohio EPA Section 401 Coordinator will inform you in writing when your application is determined to be complete.

Please submit the following to "Section 401 Supervisor, Ohio EPA/DSW, P.O. Box 1049, Columbus, Ohio 43216-1049:

- Four (4) sets of the completed application form, including the location of the project (preferably on a USGS quadrangle) and 8-1/2 x 11" scaled plan drawings and sections.
- One (1) set of original scaled plan drawings and cross-sections (or good reproducible copies).

(See Application Primer for detailed instructions)

1. The federal permitting agency has determined this project: (check appropriate box and fill in blanks)

   a. [X] requires an individual 404 permit/401 certification- Public Notice # (if known) CONNEAUT-13

   b. [ ] requires a Section 401 certification to be authorized by Nationwide Permit #_____

   c. [ ] requires a modified 404 permit/401 certification for original Public Notice #_____

   d. [ ] requires a federal permit under _____ jurisdiction identified by #_____

   e. [ ] requires a modified federal permit under_____ jurisdiction identified by #_____

2. Application number (to be assigned by Ohio EPA):

3. Name and address of applicant:

Martin P. Wargo
U.S. Army Corps of Engineers, Buffalo District
1776 Niagara Street
Buffalo, NY 14207-3199

Telephone number during business hours:

(_____)_____(Residence)

(716) 879-4116 (Office)

3a. Signature of Applicant: Martin P. Wargo Date: 1/9/13

4. Name, address and title of authorized agent:

Eric E. Hannes
U.S. Army Corps of Engineers, Buffalo District
1776 Niagara Street
Buffalo, NY 14207-3199

Telephone number during business hours:

(_____)_____(Residence)

(716) 879-4311 (Office)

4a. Statement of Authorization: I hereby designate and authorize the above-named agent to act in my behalf in the processing of this permit application, and to furnish, upon request, supplemental information in support of the application.

Signature of Applicant: Martin P. Wargo Date: 1/9/13

5. Location on land where activity exists or is proposed. Indicate coordinates of a fixed reference point at the impact site (if known) and the coordinate system and datum used.

Address:
SEE ATTACHED CONTINUATION SHEET

Street, Road, Route, and Coordinates, or other descriptive location

Watershed	County	Township	City	State	Zip Code

6. Is any portion of the activity for which authorization is sought complete? _____ Yes __X__ No
If answer is "yes," give reasons, month and year activity was completed. Indicate the existing work on the drawings.

7. List all approvals or certifications and denials received from other federal, interstate, state or local agencies for any structures, construction, discharge or other activities described in this application.

Issuing Agency	Type of Approval	Identification No.	Date of Application	Date of Approval	Date of Denial

SEE ATTACHED CONTINUATION SHEET

8. DESCRIPTION OF THE ACTIVITY (fill in information in the following four blocks - 8a, 8b, 8c & 9)

8a. Activity: Describe the Overall Activity:

SEE ATTACHED CONTINUATION SHEET

8b. Purpose: Describe the purpose, need and intended use of the activity:

SEE ATTACHED CONTINUATION SHEET

8c. Discharge of dredged or fill material: Describe type, quantity of dredged material (in cubic yards), and quantity of fill material (in cubic yards). (OAC **3745-1-05(B)(2)(a)**)

SEE ATTACHED CONTINUATION SHEET

9. Waterbody and location of waterbody or upland where activity exists or is proposed, or location in relation to a stream, lake, wetland, wellhead or water intake (if known). Indicate the distance to, and the name of any receiving stream, if appropriate.

SEE ATTACHED CONTINUATION SHEET

10. To address the requirements of the Antidegradation Rule, your application must include a report evaluating the:

- Preferred Design (your project) and Mitigative Techniques
- Minimal Degradation Alternative(s) (scaled-down version(s) of your project) and Mitigative Techniques
- Non-Degradation Alternative(s) (project resulting in avoidance of all waters of the state)

At a minimum, item a) below must be completed for the Preferred Design, the Minimal Degradation Alternative(s), and the Non-Degradation Alternative(s), followed by completion of item b) for each alternative, and so on, until all items have been discussed for each alternative (see Primer for specific instructions). (Application and review requirements appear at **OAC 3745-1-05(B)(2), OAC 3745-1-05(C)(6), OAC 3745-1-05(C)(1) and OAC 3745-1-54**).

10a) Provide a detailed description of any construction work, fill or other structures to occur or to be placed in or near the surface water. Identify all substances to be discharged, including the cubic yardage of dredged or fill material to be discharged to the surface water. **(OAC 3745-1-05(B)(2)(b))**

10b) Describe the magnitude of the proposed lowering of water quality. Include the anticipated impact of the proposed lowering of water quality on aquatic life and wildlife, including threatened and endangered species (include written comments from Ohio Department of Natural Resources and U.S. Fish and Wildlife Service), important commercial or recreational sport fish species, other individual species, and the overall aquatic community structure and function. Include a Corps of Engineers approved wetland delineation. **(OAC 3745-1-05(C)(6)(a, b) and OAC 3745-1-54)**

10c) Include a discussion of the technical feasibility, cost effectiveness, and availability. In addition, the **reliability** of each alternative shall be addressed (including potential recurring operational and maintenance difficulties that could lead to increased surface water degradation.) **(OAC 3745-1-05(C)(6)(h, j-k) and OAC 3745-1-54)**

10d) For regional sewage collection and treatment facilities, include a discussion of the technical feasibility, cost effectiveness and availability, and long-range plans outlined in state or local water quality management planning documents and applicable facility planning documents. **(OAC 3745-1-05(C)(6)(i))**

10e) To the extent that information is available, list and describe any government and/or privately sponsored conservation projects that exist or may have been formed to specifically target improvement of water quality or enhancement of recreational opportunities on the affected water resource. **(OAC** 3745-1-05(B)(2)(g))

10f) Provide an outline of the costs of water pollution controls associated with the proposed activity. This may include the cost of best management practices to be used during construction and operation of the project. **(OAC** 3745-01-05(C)(6)(g))

10g) Describe any impacts on human health and the overall quality and value of the water resource. **(OAC 3745-1-05(C)(6)(c) and OAC** 3745-1-54)

10h) Describe and provide an estimate of the important social and economic benefits to be realized through this project. Include the number and types of jobs created and tax revenues generated and a brief discussion on the condition of the local economy. **(OAC** 3745-1-5(B)(2)(e), **and OAC 3745-1-05(C)(6)(i))**

10i) Describe and provide an estimate of the important social and economic benefits that may be lost as a result of this project. Include the effect on commercial and recreational use of the water resource, including effects of lower water quality on recreation, tourism, aesthetics, or other use and enjoyment by humans. **(OAC 3745-1-05(B)(2)(e,f), and OAC 3745-1-05(C)(6)(e))**

10j) Describe environmental benefits, including water quality, lost and gained as a result of this project. Include the effects on the aquatic life, wildlife, threatened or endangered species. **(OAC** 3745-1-05 **(B)(2)(e,f), OAC 3745-1-05 (C)(6)(b) and OAC 3745-1-54)**

10k) Describe mitigation techniques proposed (except for the Non-Degradation Alternative):

- o Describe proposed Wetland Mitigation (see **OAC 3745-1-54** and Primer)
- o Describe proposed Stream, Lake, Pond Mitigation (see Primer)

11. Application is hereby made for a Section 401 Water Quality Certification. I certify that I am familiar with the information contained in this application and, to the best of my knowledge and belief, such information is true, complete and accurate. I further certify that I possess the authority to undertake the proposed activities or I am acting as the duly authorized agent of the applicant.

Signature of Applicant | Date | Signature of Agent

The application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in Block 3 has been filled out and signed.

Do not send a certification processing fee with this application. The appropriate fee will be assessed when a certification is issued.

401\401appl.898

CONTINUATION SHEET

Application for OEPA Section 401 State Water Quality Certification

CONNEAUT HARBOR MAINTENANCE DREDGING PROJECT

5. The project is located in Conneaut Harbor, Ashtabula County, Ohio. The latitude/longitude of the dredging activity is 41°58'40"N/80°33'16"W. The latitude/longitude of the open-lake placement site is 42°01'15"N/80°36'45"W.

7. Environmental Assessment (EA)/Finding of No Significant Impact (FONSI), Ohio Operation and Maintenance, Littoral and Open Lake Discharge of Dredge Material

< Issuing Agency - U.S. Army Corps of Engineers
< Type of Approval - NEPA Documentation (EA/FONSI)
< Date of Application - April 1999
< Date of Approval - July 1999

Public Notice and Section 404(b)(1) Evaluation for Conneaut Harbor, Ohio Operation and Maintenance, Littoral and Open Lake Discharge of Dredge Material

< Issuing Agency - U.S. Army Corps of Engineers
< Type of Approval - Section 404(b)(1) Evaluation
< Date of Application - April 1999 and April 2004
< Date of Approval - July 1999 and April 2004

8a. The project will entail the maintenance dredging of sediments from the authorized Federal navigation channels of Conneaut Harbor, Ashtabula County, Ohio. The channels will be dredged to authorized depth. Up to an additional one foot of material may be removed to insure the minimum depth and account for to account for dredging tolerance. Conneaut Harbor sediment data was analyzed in the fall of 2012 to specifically evaluate its suitability for open-lake placement in accordance with joint U.S. Environmental Protection Agency (USEPA)/USACE protocols contained in the Great Lakes Dredged Material Testing and Evaluation Manual (1998). The material was sampled, tested and evaluated using a tiered approach pursuant to these protocols and guidelines. Based on this Tiered Evaluation, the USACE has determined that the material proposed to be dredged from the Conneaut Harbor Federal navigation channels meets Federal guidelines and is suitable for open-lake placement. Therefore the material dredged from the Conneaut Harbor channels will be placed into the existing, authorized open-lake placement area, which is located four miles from the West Breakwater light, at an azimuth of 314°00'. This site has been used previously by the USACE for the placement of Conneaut Harbor dredged material. No material is proposed to be placed at the existing nearshore area.

The project is scheduled to occur between 1 July and 15 September in an effort to minimize impacts to local environmental resources, primarily fisheries. A Contractor of the Federal government will accomplish the project. Sediments will be removed from the channel bottom by

a mechanical or hydraulic dredge and placed into hoppers aboard ship or scow for transport to the open-lake placement area. The project is described in further detail in the attached Public Notice.

8b. The purpose of the project is to maintain sufficient water depths for commercial navigation. This project was congressionally authorized by the 1875, 1886, 1888, 1896, 1899, 1902, 1907, 1910, 1916, 1917, 1935, 1937, 1945, 1958, 1960 and 1962 River and Harbor Acts, 1976 and 1986 Water Resources Development Acts, 1985 Supplemental Appropriations Act and 1988 Energy and Water Appropriations Act. Conneaut Harbor is the 81st leading port in the United States and is ranked 19th among Great Lakes Ports with over 3.5M tons of material shipped or received in 2010. Conneaut Harbor is a major shipping and receiving port as well as a harbor of refuge. Commodities shipped or received include coal, iron ore, limestone, lime, ores and minerals. The harbor generates $152M annually in direct revenue while supporting over 1,000 jobs and generating over $56M per year in personal income.

8c. Material in the Conneaut Harbor Federal navigation channels consists primarily of silts and clays, with some fine sands. Approximately 150,000 cubic yards of sediments will be dredged from the harbor in 2013. All of this dredged material will be subsequently placed as described in Item 8a of this application. Additional information on the dredged material can be found in the attached Tiered Evaluation (Enclosure 6).

9. The dredging portion of the project is located in Conneaut Harbor, which is located at the mouth of the Conneaut Creek on Lake Erie. The dredged material placement area is located in Lake Erie, as noted in Item 8a of this application. Conneaut Creek and Lake Erie are the receiving waters for dredging activities, and Lake Erie is the receiving water for dredged material placement activities.

10. Information required under this item is included in the EA and Section 404(b)(1) prepared for the project. The following is a summary of the information contained in these documents that apply to this item of the application:

10a. Descriptions.

(1) *Preferred Design Alternative*: Enclosure 5 shows an approximation of the areas to be dredged under this alternative. This alternative would entail the dredging of an estimated 225,000 cubic yards of dredged material from the harbor, with placement of the dredged material at the existing, authorized open-lake area in Lake Erie. The type of equipment used to complete the maintenance dredging operation would depend on the Contractor performing the work. Dredging would not be performed during Lake Erie storm events. The project would take about 75 to 100 days to complete.

(2) *Non-Degradation Alternative*: This is the "No Action" alternative. No construction or filling of surface waters would occur as a result of this alternative.

(3) *Minimum Degradation Alternative*: Enclosure 4 shows an approximation of the areas to be dredged under this alternative. This alternative would entail the dredging of an estimated

150,000 cubic yards of dredged material from the harbor, with placement of the dredged material at the existing, authorized open-lake area in Lake Erie. The type of equipment used to complete the maintenance dredging operation would depend on the Contractor performing the work. As a mitigative technique, the dredging operation would occur between 1 July and 15 September in order to minimize impacts to local environmental resources, primarily fisheries. In addition, dredging would not be performed during Lake Erie storm events. The project would take about 60 to 90 days to complete.

Note that the Minimum Degradation Alternative estimates dredging 75,000 cubic yards less than the Preferred Design Alternative. It is estimated that dredging activities specified in the Minimum Degradation Alternative will impact an estimated 31 acres, which is 15.5 acres less of channel bottom/habitat than the estimated 46.5 acres that would be impacted under the Preferred Design Alternative with an assumed shoal depth of three feet. Note that the actual shoal thickness cannot be determined until just before the dredging begins. In addition, shoal thickness will vary throughout the harbor and greatly depend on weather conditions. Therefore, the above quantities are merely estimates regarding the acreage of Federal navigation channels to be dredged under either alternative.

10b. Water Quality Impacts.

(1) *Preferred Design Alternative*: The material that would be dredged under this alternative consists of sediments that have deposited in the Federal navigation channels since the last maintenance dredging effort. These types of sediments are homogenous and residually contaminated with pollutants that are ubiquitous throughout the Great Lakes. As such, these sediments are physically and toxicologically similar to those present in the Lake Erie environment. A characterization of this material is contained in the enclosed Tiered Evaluation. This alternative would result in a short-term, negligible lowering of ambient water quality, comparable to that which occurs during Lake Erie storm events. Dredging and dredged material placement activities would result in the excavation, smothering and mortality of benthic macroinvertebrates, and the temporary avoidance of work areas by fish and wildlife species (i.e., mostly waterfowl). Following dredging and dredged material placement activities, the benthic communities would recolonize the impacted areas, and fish and wildlife would return. The dredging area is quite industrialized, so benthic, fish and wildlife use of the water resource is limited; therefore, impacts in this regard would be minor. Dredging would not be performed during Lake Erie storm events. No impacts to threatened or endangered species are anticipated.

The main water quality impacts would be the generation of turbidity and variation of dissolved oxygen levels in the water column.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, no lowering of water quality would result.

(3) *Minimum Degradation Alternative*: This alternative involves a reduction in the volume of dredged material and the associated water quality impacts would be similar to those described for the Preferred Design Alternative.

10c. Feasibility.

(1) *Preferred Design Alternative*: This alternative is technically feasible, as it involves routine maintenance dredging and dredged material placement procedures. Equipment is readily available to accomplish this type of work. The Benefit/Cost (B/C) ratio for this alternative with respect to commercial navigation in the harbor is greater than or equal to 1.0. Costs of this project have ranged from $7.00 to $8.00 per cubic yard of dredged material over the past five years. Although this alternative is the most viable for commercial navigation, recurrent maintenance dredging needs of the Federal navigation channels, as required, would continue to marginally degrade water quality.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, this alternative is technically feasible and available, but would not be cost effective from a commercial navigation standpoint. Under this alternative, the Federal navigation channels would progressively shoal in and impede commercial navigation, which would result in an increased cost of commodities to the local community. Deep-draft commercial navigation in the harbor would become economically nonviable and gradually cease. As described in Section 8b above, this would negatively impact the $152M in annual direct revenue and the over 1,000 jobs that generate over $56M per year in personal income. Losses of between one and two feet of channel depth would result in increased transportation costs of between $297,000 and $1,455,000 annually.

(3) *Minimum Degradation Alternative*: This alternative is technically feasible, as it involves routine maintenance dredging and dredged material placement procedures. Equipment is readily available to accomplish this type of work. The Benefit/Cost (B/C) ratio for this alternative with respect to commercial navigation in the harbor is greater than or equal to 1.0. Costs of this project have ranged from $8.00 to $9.00 per cubic yard of dredged material over the past five years. Although this alternative is the most viable for commercial navigation, recurrent maintenance dredging needs of the Federal navigation channels, as required, would continue to marginally degrade water quality.

10d. Regional Sewage Collection/Treatment Facilities. N/A.

10e. Water Quality Improvement/Recreation Projects. No information, to our knowledge, is available.

10f. Water Pollution Control Costs.

(1) *Preferred Design Alternative*: Not dredging during storm events constitutes "blow days," which cost about $10,000 to $20,000 per day of lost work. The decision not to dredge based on weather conditions would be due to safety concerns.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, no costs result from water pollution controls.

(3) *Minimum Degradation Alternative*: The costs of adhering to the environmental window for this alternative would be significant. The moderately restrictive environmental window under

this alternative raises the cost of this alternative about 10-20 percent per cubic yard. In addition, not dredging during storm events constitutes "blow days," which cost about $10,000 to $20,000 per day of lost work.

10g. Human Health Impacts.

(1) *Preferred Design Alternative*: The human health impacts associated with this alternative would be indiscernible. The generation of turbidity and reduced dissolved oxygen in the water column would be the primary effects associated with the dredging and dredged material placement activities. The dredging area is within an industrialized water resource committed to commercial navigation. This alternative would result in short-term, minimal impacts to the quality and value of the receiving waters.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, no effects to human health would occur.

(3) *Minimum Degradation Alternative*: This alternative involves a reduction in the volume of dredged material and the associated human health impacts would be similar to those described for the Preferred Design Alternative.

10h. Social/Economic Benefits Gained.

(1) *Preferred Design Alternative*: This alternative would restore navigable depths in the harbor channels for commercial vessel traffic. A large industrial base depends on the harbor to receive commercial goods and ship them off-site for a reasonable cost. This would have a substantial positive impact on the local economy by providing jobs that support these commodities, as well as by maintaining a competitive price level on commercial goods. The harbor supports over 1,000 jobs and generates over $56M per year in personal income. This industrial base generates substantial tax revenues for local governments. Construction of the project itself would support about 10-20 blue-collar jobs in the dredging industry for a period of about 3-4 months. In addition, social and economic benefits associated with recreational navigation would accrue with project construction.

(2) *Non-Degradation Alternative*: This alternative would involve the cessation of maintenance of harbor Federal navigation channels. However, benefits would accrue to recreational navigation until the channels shoal into a degree at which they would no longer be usable for shallow-draft vessels. Recreational benefits in this regard would include primarily those associated with local marinas and the leisure craft they support.

(3) *Minimum Degradation Alternative*: This alternative involves a reduction in the volume of dredged material and the associated social/economic benefits gained would be similar to those described for the Preferred Design Alternative.

10i. Social/Economic Benefits Lost.

(1) *Preferred Design Alternative*: Lowered water quality associated with this alternative, such

as turbidity and reduced dissolved oxygen levels in the water column, would be aesthetically displeasing and may not be attractive to recreational boaters in the area. Recreational fishing activities in the harbor may be temporarily negatively affected by the lowering of water quality. Except for commercial industries such as restaurants and other riparian retail establishments, the lowering of water quality would have minimal negative effects on commercial activities.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, no lowering of water quality would occur. Therefore, negative effects on the recreational use of the harbor would not occur. However, substantial effects on commercial (and eventually recreational) navigation and associated industries would occur as a result of this alternative. The overall value of the harbor as a water resource to commercial navigation would progressively deteriorate to a point at which deep-draft commercial vessels would no longer be able to navigate the harbor due to inadequate depths. The large industrial base that depends on the harbor to transport commodities would no longer be able to do so cost-effectively. The harbor would no longer be a viable alternative for the transportation of goods. This would have a substantial negative impact on the local economy and on the over 1,000 jobs that support these commodities. The harbor would no longer effect competitive price levels on local commercial goods. Since the industrial base on the harbor would likely close down, all tax revenues in this regard would be lost. The lack of project construction itself would result in the loss of about 10-12 blue-collar jobs in the dredging industry for a period of about 3-4 months.

(3) *Minimum Degradation Alternative*: This alternative involves a reduction in the volume of dredged material and the associated social/economic benefits lost would be similar to those described for the Preferred Design Alternative.

10j. Environmental Benefits Lost/Gained.

(1) *Preferred Design Alternative*: This alternative would result in a short-term reduction of water quality in the receiving waters. Dredging and dredged material placement activities would result in the excavation, smothering and mortality of benthic macroinvertebrates, and the temporary avoidance of work areas by fish and wildlife species (i.e., mostly waterfowl). The dredging area is quite industrialized, so benthic fish and wildlife use of the water resource is limited; therefore, impacts in this regard would be minor. Following dredging and dredged material placement activities, the benthic communities are expected to recolonize the impacted areas, and fish and wildlife would return. No effects to endangered or threatened species would occur.

(2) *Non-Degradation Alternative*: Since this alternative involves no construction or filling of surface waters, associated environmental benefits would include no degradation of water quality in receiving waters, and no physical disturbances to benthos, or fish and wildlife. No effects to endangered or threatened species would occur.

(3) *Minimum Degradation Alternative*: This alternative involves a reduction in the volume of dredged material and the associated environmental benefits lost/gained would be similar to those described for the Preferred Design Alternative.

10k. Mitigative Techniques.

(1) *Preferred Design Alternative*: Dredging will not be performed during Lake Erie storm events. Care would be employed throughout the course of the dredging and material placement operations to avoid the creation of unnecessary turbidity that may degrade water quality or adversely affect aquatic life outside the project area.

(2) *Non-Degradation Alternative*: N/A.

(3) *Minimum Degradation Alternative*: Dredging in Conneaut Harbor will be scheduled to occur between 1 July and 15 September to minimize any potential impacts to local environmental resources, primarily fisheries. Dredging will not be performed during Lake Erie storm events. Care would be employed throughout the course of the dredging and material placement operations to avoid the creation of unnecessary turbidity that may degrade water quality or adversely affect aquatic life outside the project area.

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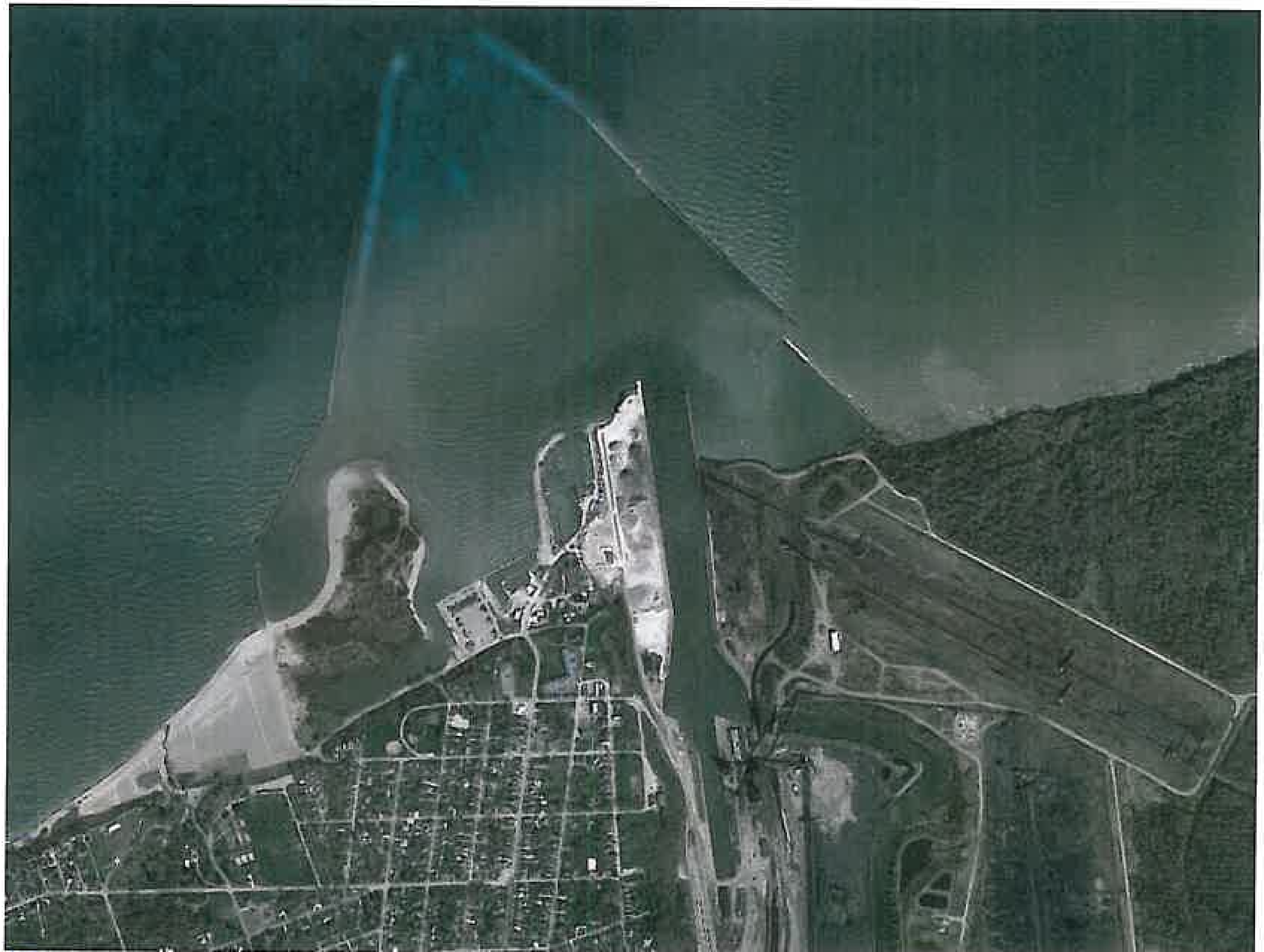

Enclosure 3

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MINIMUM DEGRADATION ALTERNATIVE
(DREDGE 31 ACRES, LOCATIONS AND EXTENTS WILL BE ADJUSTED BASED ON ACTUAL SHOALING LOCATIONS AND DEPTHS)

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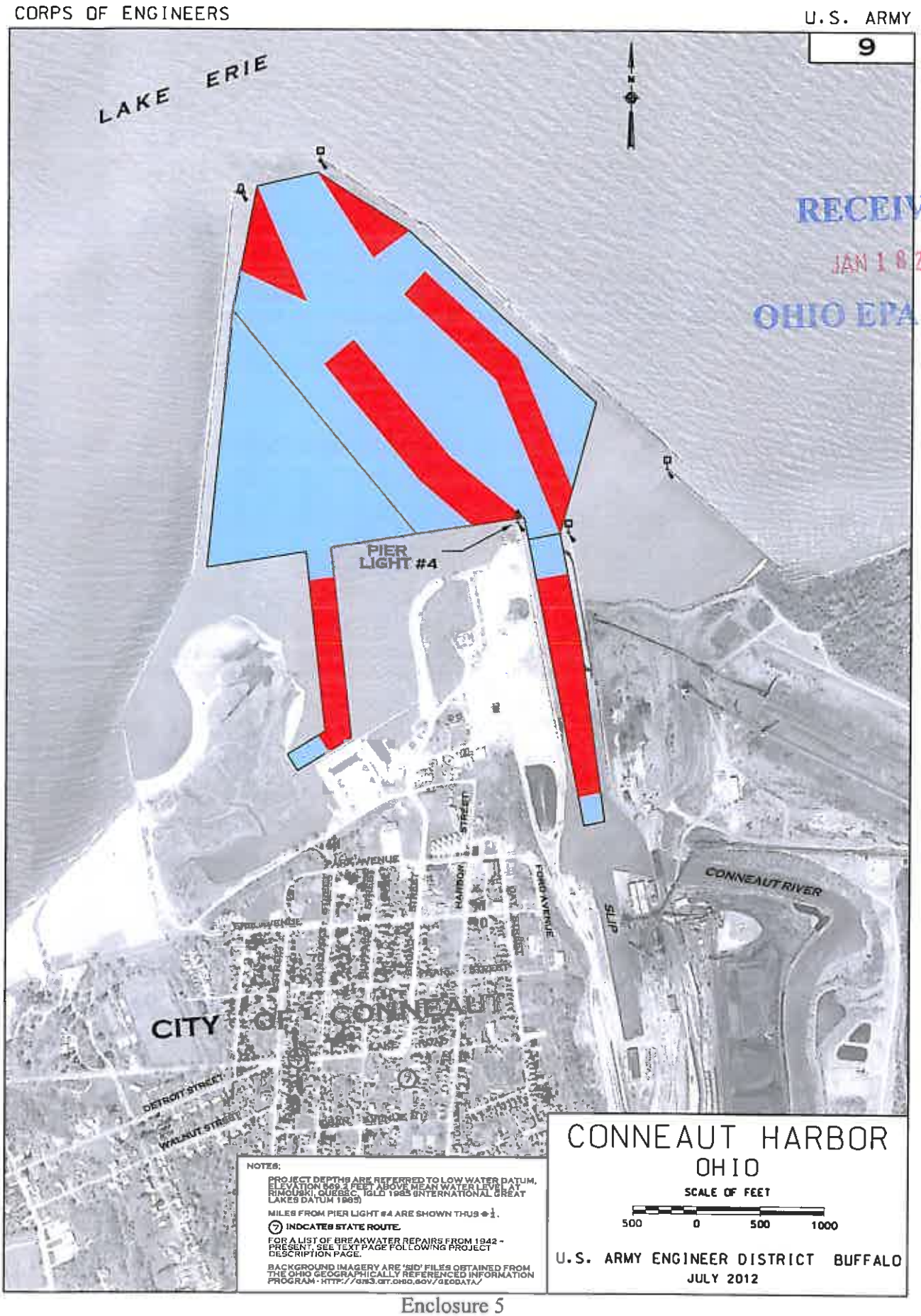
PREFERRED DESIGN ALTERNATIVE
(DREDGE 46.5 ACRES, LOCATIONS AND EXTENTS WILL BE ADJUSTED BASED ON ACTUAL SHOALING LOCATIONS AND DEPTHS [redacted])



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US Army Corps of Engineers
Buffalo District

EVALUATION OF CONNEAUT HARBOR FEDERAL NAVIGATION CHANNEL SEDIMENTS WITH RESPECT TO THEIR SUITABILITY FOR OPEN-LAKE PLACEMENT

I. Introduction.

This Tiered Evaluation on Conneaut Harbor Federal navigation channel sediments has been performed in accordance with guidelines contained in the 1998 U.S. Environmental Protection Agency (USEPA)/U.S. Army Corps of Engineers (USACE) Great Lakes Dredged Material Testing and Evaluation Manual (USEPA/USACE 1998). It is based on harbor and lake area sediment data collected in 2003 (Engineering and Environment, Inc. [EEI] 2003), 2007 (EEI 2007) and 2012 (RTI Laboratories [RTI] 2012).

II. Sediment Quality Assessment.

Background and Potential Sources of Sediment Contamination

Traditional contaminants in Conneaut Harbor Federal navigation channel sediments include heavy metals, polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and pesticides. The major source of bottom sediments in the harbor includes sediments from Conneaut Creek and littoral drift over and through the breakwaters protecting the Outer Harbor. Major sources of pollution to bottom sediments in the harbor include: (1) non-point source agricultural runoff (i.e., phosphorus, nitrogen and pesticides); (2) urban storm water runoff (i.e., heavy metals, oil and PAHs), resulting from commercial and residential development; (3) municipal and effluent industrial point source discharges; (4) combined sewer overflows (CSOs) (i.e., oil, sediment and bacteria); (5) sanitary sewer overflows; and (6) chemical leachate from waste disposal sites.

Evaluation Based on Existing Sediment Data

In 2003, 12 surface grab samples were collected from the Federal navigation channels of Conneaut Harbor (sites CH-1 through CH-12) (Figure 1), four from the open-lake reference area (sites CL-2, CL-3, CL-5 and CL-6) and two from the open-lake placement area (sites CD-1 and CD-2) (Figure 2). A composite sample of the four open-lake reference area sediments (CL-comp) and of the two open-lake placement area sediments (CD-comp) was also collected. All sediment samples were subjected to physical analyses including bulk particle size, and analyzed for the following: inorganics including heavy metals, cyanide, ammonia, phosphorus, nitrogen, TOC and chemical

oxygen demand (COD); and organics including PAHs, PCBs and pesticides (EEI 2003). A standard elutriate test (SET) for the same inorganic and organic contaminants was applied to all of the Federal navigation channel sediment samples.

In 2007, 12 surface grab samples were collected from the Federal navigation channels of Conneaut Harbor (Sites COH-1 through COH-12) (Figure 3), four from the open-lake reference area (Sites COL-1 through COL-4) and two from the open-lake placement area (Sites COD-1 and COD-2) (Figure 4). All sediment samples were subjected to physical analyses including bulk particle size, and analyzed for the following: inorganics including heavy metals, cyanide, ammonia, phosphorus, nitrogen, TOC and chemical oxygen demand (COD); and organics including PAHs, PCBs and pesticides (EEI 2007). A SET for the same inorganic and organic contaminants was applied to all of the Federal navigation channel sediment samples.

In 2012, 12 surface grab samples were collected from the Federal navigation channels of Conneaut Harbor (Sites COH-1 through COH-12) (Figure 5), four from the open-lake reference area (Sites COL-1 through COL-4) and four from the open-lake placement area (Sites COD-1 through COD-4) (Figure 6). All sediment samples were subjected to physical analyses including bulk particle size, and analyzed for the following: inorganics including heavy metals, oil and grease, cyanide, ammonia nitrogen, phosphorus, total kjeldahl nitrogen (TKN) and TOC; and organics including PAHs, PCBs and pesticides (RTI 2012). A SET for the same inorganic and organic contaminants was applied to all of the Federal navigation channel sediment samples.

This evaluation is based on data generated from the 2003, 2007 and 2012 sediment sampling and analyses efforts, and is summarized as follows:

a. <u>2003 Sediment Data (EEI 2003)</u>. The sediment sampling sites for this sediment sampling/analysis effort are shown in Figures 1 and 2.

1. *Bulk sediment analyses.*

(a) **Physical testing:** Table 1 presents the results of the sieve analyses performed on the sediment samples. The majority of the harbor material was comprised of between 80.8% (Site CH-6) and 95.2% (Site CH-9) silts and clays, with the remainder sands. Three of the harbor sites (CH-8, CH-11 and CH-12), however, were comprised primarily of sands, ranging from 57.2% (CH-8) to 92.8% (CH-11), with the remainder silts and clays. All four open-lake reference area sediment samples were comprised predominantly of sands (70.7% to 87.8%), with some silts and clays. Sediments at the open-lake placement area were comprised of between 41% and (CD-2) and 75.6% silts and clays (CD-1), with some sands.

Table 2 presents the results of the TOC analyses. TOC concentrations in the harbor sediments ranged from 5,990 mg/kg at site CH-11 to 24,100 mg/kg at site CH-1. In open-lake reference area sediments, TOC concentrations ranged from 4,070 mg/kg

at site CL-3 to 10,400 mg/kg at site CL-5. In open-lake placement area sediments, TOC concentrations ranged from 9,280 mg/kg at site CD-2 to 14,000 mg/kg at site CD-1.

(b) **Chemical testing:** Both open-lake reference and placement area sediments were used to represent the lake environs. As such, contaminant concentrations in the harbor channel sediment samples were compared to these areas to determine if they significantly exceeded lake sediment concentrations.

(1) Inorganic analyses

•Heavy metals— Table 3 presents the results of the metals analyses on the sediment samples. Fourteen metals were tested during the 2003 sampling effort. Of these, antimony, cadmium, copper, lead, mercury, selenium, silver, thallium and zinc were either undetected or measured at concentrations that were below those found in the open-lake reference and placement area sediments. The other metals, including arsenic, barium, beryllium, chromium, cobalt, nickel, and vanadium were measured at concentrations that exceeded that of either the reference and/or placement area. In most cases these exceedances were negligible. However, barium (Sites CH-1 – CH-4) was found in concentrations nearly twice those of the reference (52.6 mg/kg) or placement (49.5 mg/kg) area sediments, with a maximum concentration of 87.7 mg/kg at site CH-2. This concentration is not of toxicological significance and is below the Erie/Ontario lake plain sediment reference value of 190 mg/kg (Ohio EPA 2003). Beryllium concentrations in the harbor sediments (maximum concentration of 0.95 mg/kg at site CH-1) are not considered to be toxicologically significant and were comparable to the Erie/Ontario lake plain sediment reference value of 0.8 mg/kg (Ohio EPA 2003).

(2) Organic analyses

•PAHs—Table 4 presents the results of these analyses. Total PAH concentrations in the harbor sediment samples ranged from 0.10 mg/kg to 1.25 mg/kg. Open-lake reference and placement area sediments total PAH levels ranged from 0.06 mg/kg to 0.55 mg/kg, and 0.59 mg/kg to 1.03 mg/kg, respectively. Total PAH concentrations in the harbor sediments are low and very similar to those at of the open-lake placement area, but nearly double those of the open-lake reference area.

In order to ascertain whether total PAHs would bioaccumulate from the harbor sediment samples at levels higher relative to those at the open-lake reference/placement areas, a Tier 2 theoretical bioaccumulation potential (TBP) model was employed. TBP is an equilibrium theory-based algorithm used to predict the potential bioaccumulation of neutral, organic compounds, such as PAHs, in sediments (McFarland 1984). This model is expressed as:

$$TBP = BSAF\ (L)\ (C_s/TOC)$$

Where:

TBP = Predicted whole body tissue concentration of the neutral organic compound (mg/kg wet weight)
BSAF = Biota-sediment accumulation factor
L = Concentration of lipid in target animals (mg/kg wet weight)
C_s = Concentration of neutral organic compound in sediment (mg/kg dry weight)
TOC = Total organic carbon concentration in sediment (mg/kg dry weight)

The target animal used in this case is an oligochaete worm. In this model, a 1% lipid content in oligochaete worms, an average that is characteristically representative (e.g., Ankley *et al.* 1992, Pickard *et al.* 2001), a BSAF of 1.0 (Pickard *et al.* 2006) and TOC data from Table 2 were used. The total PAH TBP predictions are shown in Table 4. The TBP for total PAHs at sites CH-3 through CH-9 and CH-12 (range 0.56 mg/kg to 1.00 mg/kg) was higher than that of the open-lake reference area (0.53 mg/kg) sediments. However, only sites CH-5 (0.86 mg/kg), CH-8 (0.97 mg/kg), and CH-12 (1.00 mg/kg) were higher than the TBP of the open-lake placement area (0.74 mg/kg).

Toxicity is the best biological measurement endpoint for PAHs. The toxicological risk to benthic macroinvertebrates associated with complex mixtures of PAHs can be estimated using hydrocarbon narcosis and equilibrium partitioning (EqP) models (USEPA 2003). This approach assumes that the risk of PAH mixtures to benthic organisms is attributable to the number of PAH toxic units that are freely dissolved in sediment pore water, and is used to calculate EqP Sediment Benchmark Toxic Units, Final Chronic Value ($\sum ESBTU_{FCV}$) (USEPA 2003). The presence of TOC acts to sequester PAHs in the sediment phase, thus lowering the amount of PAHs available in the water phase. $ESTBU_{FCV}$s are calculated as follows:

$$ESBTU_{FCV} = \frac{C/f_{OC}}{C_{OC,PAHi,FCVi}}$$

Where:
$C_{OC,PAHi,FCVi}$ = Final chronic value (FCV) concentration in sediment ($\mu g/g_{OC}$) (see USEPA 2003)
C = Concentration of PAH compound in sediment (µg/g dry weight)
f_{OC} = Decimal fraction of TOC in sediment ($\mu g/g_{OC}$ dry weight)

Freshwater sediment containing $\sum ESBTU_{FCV} < 1.0$ of a mixture of 34 or more PAH compounds are acceptable for the protection of aquatic organisms. Conversely, $\sum ESBTU_{FCV} > 1.0$ suggest that sensitive benthic organisms may be affected by the PAH mixture. USACE guidelines emphasize acute toxicity tests for dredged material evaluations. Therefore, an acute-chronic ratio (ACR) of 4.16 was applied to $C_{OC,\ PAHi}$ to calculate a $\sum ESBTU_{FAVi}$. This ACR is a geometric mean of PAH-specific mean ACRs for *Daphnia, Paratanytarsus, Pimephales, Oncorhynchus, Americamysis* and

Cyprinodon (USEPA 2003). For PAH mixtures in the harbor sediments, an uncertainty factor of 11.5 with a confidence level of 95% was applied to the $\sum ESBTU_{FCV}$ because the analyses covered only the 16 USEPA priority pollutant PAH compounds (USEPA 2003). Table 4a shows the results of the calculations. Across all sites, the harbor sediments generated $\sum ESBTU_{FCV}$ values below 1.0 (range 0.07 to 0.37), indicating that the PAH mixtures have a very low potential to cause acute toxicity to benthic invertebrates. Based on this information, total PAHs were not identified as a COC.

•PCBs—Table 5 presents the results of these analyses. PCBs were measured as Aroclor mixtures. Total PCB concentrations were determined by summing the three Aroclor mixtures detected across all of the sediment samples, including Aroclors 1248, 1254 and 1260. Total PCBs in the harbor sediment samples ranged from 7.07 µg/kg at site CH-9 to 42.4 µg/kg at site CH-5. Total PCB levels in sediments at Sites CH-5, CH-7 (26.6 µg/kg) and CH-8 (19.7 µg/kg) were elevated relative to those at the open-lake reference (18.2 µg/kg) and placement (18.8 µg/kg) areas.

In order to ascertain whether total PCBs would bioaccumulate from the CH-5, CH-7 and CH-8 sediment samples at levels higher relative to those at the open-lake reference/placement areas, the Tier 2 TBP model was employed, as described above, however in this case a BSAF of 1.58 for total PCBs was used (Pickard, unpublished data).

The total PCB TBP predictions are summarized in Table 5. The TBP for total PCBs at sites CH-7 (0.025 mg/kg) and CH-8 (0.027 mg/kg) were comparable to the open-lake reference (0.028 mg/kg) and placement (0.032 mg/kg) areas. For site CH-5 (0.048 mg/kg), the TBP for total PCBs was higher relative to the open-lake reference and placement areas. However, a level of 0.048 mg/kg is low and not of significant toxicological concern. Therefore, based on this TBP prediction, total PCBs were not identified as a COC.

•Pesticides—Table 6 presents the results of these analyses. Most pesticides in the harbor sediments samples were non-detectable. The only exceptions to this were low levels of 4,4'-dichlorodiphenyltrichloroethane (DDT) (4.21 µg/kg at site CH-10) and one of its metabolites/breakdown products 4,4'-dichlorodiphenyldichloroethylene (DDE) (2.38 µg/kg and 1.8 µg/kg at sites CH-3 and CH-12, respectively). However, the concentrations measured in the harbor sediments were lower than those measured in the open-lake reference area sediments which were 4.73 µg/kg for 4,4'-DDT and 3.29 µg/kg for 4,4' DDE, and comparable to those in the open-lake placement area (4.06 µg/kg and 1.39 µg/kg, respectively).

2. *Elutriate testing*—Tables 7 through 10 present the results of the SET performed on the sediment samples. The results show low releases of some metals and PAHs from the harbor sediment samples (Tables 7 and 8, respectively). No releases of PCB compounds were indicated at or above MDLs ranging from 0.05 µg/L

to 0.08 µg/L (Table 9). Low pesticide releases from sediments were indicated at several of the harbor sites (Table 10).

b. 2007 Sediment Data (EEI 2007). The sediment sampling sites for this data set are shown in Figures 3 and 4.

1. *Bulk sediment analyses.*

(a) **Physical testing:** Table 11 presents the results of the sieve and TOC analyses performed on the sediment samples. All of the harbor material was comprised of between 63.3% (Site COH-11) and 95% (Sites COH-1 and 3) silts and clays, with the remainder sands. Three of the four open-lake reference area sediment samples were comprised predominantly of fine sands (63.2% to 75.9%), with the remainder silts and clays. The fourth sample (COL-3) was nearly evenly split between silt/clay and fine sand (54.2% and 45.8%, respectively). The open-lake placement area sites were predominated by fine sands (77.4% and 98.6%), with the remainder silts and clays. It should be noted that nearly all of the sand content for each of the samples (harbor, reference and placement area samples) was classified as fine sand with a sieve size of 0.075-0.425 mm, as compared to the silt sieve size of 0.005-0.075mm. It is very difficult to visually discern a difference between silt and fine sand, and therefore sediments with this particle size distribution would not typically be well suited for nearshore placement (littoral nourishment) activities.

Average TOC concentrations in the harbor sediments ranged from 5,260 mg/kg at site COH-8 to 17,200 mg/kg at site COH-3. In the open-lake reference area, TOC sediment concentrations ranged from 5,890 mg/kg at site COL-2 to 13,100 mg/kg at site COL-3. In the open-lake placement area, TOC concentrations were 2,000 mg/kg and 7,510 mg/kg at sites COD-1 and COD-2, respectively.

(b) **Chemical testing:** As in the evaluation of the 2003 data set, both open-lake reference and placement area sediments were used to represent the lake environs. As such, contaminant concentrations in the harbor sediment samples were compared to these areas to determine if they significantly exceeded lake sediment concentrations.

(1) Inorganic analyses

•General Chemistry—Table 12 presents the results of the general chemistry analyses on the sediment samples. Oil and grease, ammonia, nitrogen and chemical oxygen demand (COD) were detected in the harbor sediments at concentrations higher than those found in the open-lake placement area, but less than or comparable to those found in the reference area. None of these concentrations are of toxicological concern. Cyanide and phosphorus concentrations were either undetected or measured at levels below those found in the reference and placement area sediments.

•Heavy metals—Table 13 presents the results of the metals analyses on the sediment samples. With the exception of cadmium, which was not detected at any of the harbor sites, all of the metals were detected in the harbor sediments at concentrations that exceeded those found in the open-lake placement and/or reference area. However, the concentrations measured in the harbor sediments were not of significant toxicological concern and were comparable or less than their respective Erie/Ontario lake plain sediment reference value (Ohio EPA 2003). Therefore, none of the metals were identified as contaminants of COCs.

(2) Organic analyses

•PAHs—Table 14 presents the results of these analyses. Total PAH concentrations in the harbor sediment samples ranged from 0.37 mg/kg to 0.61 mg/kg, which were lower than those measured in the sediments in 2003 (Table 4). At the open-lake reference and placement areas, total PAH sediment levels ranged from 0.05 mg/kg to 0.37 mg/kg, and 0.02 mg/kg and 0.31 mg/kg, respectively. Except for sites COH-8, 9, 11 and 12, total PAH concentrations in the harbor sediments were very comparable to those at both of the open-lake areas.

In order to ascertain whether total PAHs would bioaccumulate from harbor sediment samples COH-8, 9, 11 and 12 at levels higher relative to those at the open-lake reference/placement areas, a Tier 2 TBP model was employed, as described in the 2003 evaluation above. The total PAH TBP predictions are shown in Table 14. The TBP for total PAHs at sites COH-8, 11 and 12 was higher relative to either the open-lake reference or placement area, or both.

Therefore, the toxicological risk of the PAH mixtures at Sites COH-8, COH-11 and COH-12 to benthic macroinvertebrates was estimated using hydrocarbon narcosis and EqP models (USEPA 2003), as described in the 2003 evaluation above. Table 14a shows the results of these calculations. Across all sites, the harbor sediments generated $\sum ESBTU_{FCV}$ values below 1.0 (range 0.01 to 0.37), indicating that the PAH mixtures have a very low potential to incur acute toxicity to benthic invertebrates. Therefore, total PAHs were not identified a COC.

•PCBs—Table 15 presents the results of these analyses. PCBs were measured as Aroclor mixtures. Total PCB concentrations were determined by summing the three Aroclor mixtures detected across all of the sediment samples, including Aroclors 1248, 1254 and 1260. Total PCB concentrations in the harbor sediments ranged from 0.03 to 0.43 mg/kg. Total PCB concentrations in the open-lake reference and placement area sediments ranged from 0.03 to 0.12 mg/kg, to 0.06 to 0.12 mg/kg, respectively. Sites COH-4 (0.22 mg/kg) and COH-8 (0.43 mg/kg) had concentrations of total PCBs in sediments that significantly exceeded those at both of the open-lake areas.

In order to ascertain whether total PCBs would bioaccumulate from the COH-4 and COH-8 sediment samples at levels higher relative to those at the open-lake reference/placement areas, a Tier 2 TBP model was employed, as described above.

The total PCB TBP predictions are summarized in Table 15. The TBP for total PCBs at site COH-4 (0.25 mg/kg) was less than that of the open-lake placement area (0.94 mg/kg) and comparable to that of the open-lake reference area (0.24 mg/kg). The TBP for total PCBs at site COH-8 (1.29 mg/kg) was elevated in comparison to both the open-lake reference and placement areas. Based on this TBP prediction, total PCBs were identified as a COC at this site. However, it was apparent during a review of the location of the sampling sites that this sample was taken from an area outside of the Federal navigation channel, and thus this sample represents material that would not be dredged during maintenance activities. It is recommended that efforts are made during the next sediment sampling effort to collect sediments from this vicinity that are within the Federal navigation channel.

•Pesticides—Table 16 presents the results of these analyses. No pesticides were detected in any of the samples at MDLs ranging from 13.1 µg/kg to 921 µg/kg.

2. *Elutriate testing*—Tables 17 through 21 present the results of the SET performed on the sediment samples. The results show low releases of some of the general chemistry parameters and metals from the harbor sediment samples (Tables 17 and 18). Low releases of four PAH compounds were evidenced from sediments at site COH-7 (Table 19). No releases of PCBs were shown at or above MDLs ranging from 0.0343 µg/L to 0.0358 µg/L (Table 20). No pesticide releases from the sediments were detectable at MDLs ranging from 0.0053 µg/L to 0.181 µg/L (Table 21).

c. <u>2012 Sediment Data (RTI 2012)</u>. The sediment sampling sites for this data set are shown in Figures 5 and 6.

1. *Bulk sediment analyses.*

(a) **Physical testing:** Table 22 presents the results of the sieve and hydrometer analyses performed on the sediment samples. All of the harbor material was comprised of between 58.3% (Site COH-1) and 84.8% (Sites COH-11) silts and clays, with the remainder sand and gravel. All four open-lake reference area sediment samples were comprised predominantly of silt and clay (75% to 83.2%), with the remainder sand and gravel. The open-lake placement area sites were also predominated by silt and clay (68.4% to 78.4%), with the remainder sand and gravel.

(b) **Chemical testing:** As in the evaluation of the previous data sets, both open-lake reference and placement area sediments were used to represent the lake environs. As such, contaminant concentrations in the harbor sediment samples

were compared to these areas to determine if they significantly exceeded lake sediment concentrations.

(1) Inorganic analyses

•General Chemistry—Table 23 presents the results of the general chemistry/inorganic analyses on the sediment samples. Oil and grease, ammonia nitrogen, TKN and total phosphorus were detected in the harbor sediments at concentrations higher than those found in the open-lake placement and reference areas. None of these concentrations are of toxicological concern. Cyanide was undetected in all of the lake and harbor sediments. Therefore, none of the inorganic compounds were identified as contaminants of COCs.

Average TOC concentrations in the harbor sediments ranged from 5,300 mg/kg at site COH-11 to 11,000 mg/kg at sites COH-2 and COH-3. In the open-lake reference area, TOC sediment concentrations ranged from 2,500 mg/kg at site COL-4 to 4,400 mg/kg at site COL-2. In the open-lake placement area, TOC concentrations ranged from 4,400 mg/kg at site COD-1 to 11,000 mg/kg at site COD-3.

•Heavy metals—Table 24 presents the results of the metals analyses on the sediment samples. Nearly all of the metals were detected in the harbor sediments at concentrations that exceeded those found in the open-lake placement and/or reference area. However, the concentrations measured in the harbor sediments were not of significant toxicological concern and were comparable or less than their respective Erie/Ontario lake plain sediment reference value (Ohio EPA 2003) and threshold effect concentrations (TECs) (MacDonald 2000). Therefore, none of the metals were identified as contaminants of COCs.

(2) Organic analyses

•PAHs—Table 25 presents the results of these analyses. Total PAH concentrations in the harbor sediment samples ranged from 0.81 mg/kg (COH-2) to 3.7 mg/kg (COH-12). At the open-lake reference and placement areas, total PAH sediment levels ranged from 0.24 mg/kg to 2.3 mg/kg, and 0.65 mg/kg and 2.3 mg/kg, respectively. Except for sites COH-10 and 12, total PAH concentrations in the harbor sediments were substantially less than those at both of the open-lake areas.

The toxicological risk of the PAH mixtures at Sites COH-10 and COH-12 to benthic macroinvertebrates was estimated using hydrocarbon narcosis and EqP models (USEPA 2003), as described in the 2003 evaluation above. Table 25a shows the results of these calculations. The harbor sediments at COH-10 and 12 generated $\sum ESBTU_{FCV}$ values below 1.0 (0.37 to 0.43, respectively), indicating that the PAH mixtures have a very low potential to incur acute toxicity to benthic invertebrates. Therefore, total PAHs were not identified a COC.

•PCBs—Table 26 presents the results of these analyses.

PCBs were measured as Aroclor mixtures. Only one Aroclor mixture, Aroclor-1254, was detected in the sediment samples. Total PCB concentrations were therefore determined by using the total Aroclor-1254 concentration at each site where it was detected. Total detected PCB concentrations in the harbor sediments ranged from 0.022 to 0.045 mg/kg. Total PCB concentrations in the open-lake reference and placement area sediments ranged from 0.014 to 0.029 mg/kg, to 0.02 to 0.072 mg/kg, respectively. Sites COH-6 (0.031 mg/kg), COH-7 (0.035 mg/kg), COH-10 (0.034 mg/kg), and COH-12 (0.045 mg/kg) had concentrations of total PCBs in sediments that exceeded those at the open-lake reference area, all were below those in the open-lake placement area.

In order to ascertain whether total PCBs would bioaccumulate from the COH-6, 7, 10 and 12 sediment samples at levels higher relative to those at the open-lake reference/placement areas, a Tier 2 TBP model was employed, as described above. The total PCB TBP predictions are summarized in Table 26. The TBP for total PCBs at each of the effected harbor sites were less than that of the open-lake reference and placement areas. Based on this TBP prediction, total PCBs were eliminated as a potential COC.

•Pesticides—Table 27 presents the results of these analyses. 4,4-DDE, delta-BHC and dieldrin were detected at several harbor sampling locations. However, all of the detected concentrations were less than or comparable to those detected in the open-lake reference and placement area sediments. Therefore, pesticides were not identified a COC.

2. *Elutriate testing*—Tables 28 through 32 present the results of the SET performed on the sediment samples. The results minor releases of some of the inorganic compound parameters and metals from the harbor sediment samples (Tables 28 and 29). All of the releases are well below applicable Outside Mixing Zone Maximum (OMZM) Ohio State Water Quality standards (SWQS). No releases of PAH or PCBs compounds were evidenced from elutriate samples (Table 30 and 31). Minor pesticide releases values were evidenced for delta-BHC, gamma-Chlordane and heptachlor (Table 32). However, all of these detections were at concentrations below the laboratory reporting limit and there are no corresponding SWQS for these compounds.

d. Final COC List. Based on the 2007 data, total PCBs were determined to be a COC in sediments at site COH-8 in the west Outer Harbor. However, as discussed above, this sample location was located outside of the Federal navigation channel and sediment collected in 2012 within the navigation channel in the vicinity of this sample showed that concentrations found in this area to below those found in the lake environs.

e. Quality Assurance (QA)/Quality Control (QC) Documentation. QA/QC information and records on the data contained in this evaluation are available in EEI (2003 and 2007) and RTI (2012).

Conclusion

This evaluation has determined that:

a. All sediments dredged from the Conneaut Harbor Federal navigation channels meet Federal guidelines for open-lake placement.

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Table 1. Particle size analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2003).

Particle Size Distribution (%)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	CL-2	CL-3	CL-5	CL-6	CD-1	CD-2	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Silt	12.9	11.7	15.6	18.7	60.5	31.0	61.1	71.8	73.9	65.8	70.2	74.4	64.5	35.9	74.6	71.0	6.7	33.9
Clay	8.7	0.5	13.7	7.9	15.1	10.0	21.6	16.2	21.0	18.1	16.4	6.4	20.8	6.9	20.6	20.7	0.5	6.2
Sand	78.4	87.8	70.7	73.4	24.4	59.0	17.3	12.0	5.1	16.1	13.4	19.2	14.7	57.2	4.8	8.3	92.8	59.9
Specific Gravity	2.70	2.70	2.69	2.69	2.71	2.68	2.62	2.62	2.66	2.66	2.67	2.69	2.68	2.70	2.72	2.71	2.71	2.71

Table 2: Bulk total organic carbon (TOC) analyses on Conneaut Harbor Federal navigation channel sediments (from EEI, 2003).

TOC - mg/kg (ppm)	Reference Area Sites					Placement Area Sites			Harbor Area Sites											
	CL-2	CL-3	CL-5	CL-6	CL-comp	CD-1	CD-2	CD-comp	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Total Organic Carbon - 1	7,560	4,410	11,900	6,300	9,520	13,800	10,100	10,800	22,900	19,900	15,700	19,300	13,800	16,500	16,500	11,300	16,800	21,000	6,830	10,600
Total Organic Carbon - 2	6,290	4,080	8,230	5,240	7,530	15,500	8,080	12,700	22,800	16,500	17,700	23,400	15,600	16,100	15,800	14,300	15,000	19,300	5,980	11,600
Total Organic Carbon - 3	7,010	3,990	12,100	5,020	7,260	11,200	8,640	14,500	24,400	22,900	15,200	19,200	13,400	15,800	16,700	11,000	14,500	21,200	5,550	10,400
Total Organic Carbon - 4	6,690	3,780	9,470	5,380	8,340	15,300	10,300	15,000	26,400	20,700	19,200	17,200	12,700	14,200	18,600	10,200	13,500	18,300	5,620	9,700
Total Organic Carbon	6,890	4,070	10,400	5,480	8,160	14,000	9,280	13,200	24,100	20,000	16,900	19,800	13,900	15,600	16,900	11,700	14,900	20,000	5,990	10,600

Note: Results are reported as dry weight.

Table 3: Bulk metals analyses on Conneaut Harbor Federal navigation channel sediments (from EEI, 2003).

Metal - mg/kg (ppm)	Reference Area Sites					Placement Area Sites			Harbor Area Sites										
	CL-2	CL-3	CL-5	CL-6	CL-comp	CD-1	CD-2	CD-comp	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Antimony	<0.319	<0.304	<0.408	<0.285	<0.324	<0.34	<0.328	<0.328	<0.47	<0.479	<0.474	<0.412	<0.429	<0.383	<0.413	<0.321	<0.419	<0.425	<0.302	<0.334
Arsenic	3.27	13.1	5.94	4.8	7.52	8.12	6.05	9.11	9.52	9.19	9.43	9.82	9.5	9.09	12	9.35	10.9	10.6	6.78	10.3
Barium	31	52.6	48.2	29.2	36.6	44.3	39.3	49.5	85.1	87.7	84.1	73.8	63	45	62.5	39.4	64.2	59.6	29.9	41.6
Beryllium	0.512	0.558	0.749	0.481	0.546	0.601	0.546	0.645	0.954	0.93	0.934	0.853	0.789	0.649	0.872	0.506	0.851	0.8	0.333	0.465
Cadmium	0.185	0.839	1.14	<0.04	0.358	<0.048	0.117	0.069	<0.066	<0.068	<0.067	<0.058	<0.6	<0.054	<0.058	<0.045	0.121	<0.06	<0.043	<0.047
Chromium	14.9	19.2	30.9	10.3	17.3	15	15	17	22.9	22.4	22.9	21.2	21.4	17.2	23.3	12.6	23.3	21.6	7.21	11
Cobalt	6.1	6.92	8.36	0.656	6.68	8.66	7.73	9.48	12.4	11.7	11.9	11.5	10.7	8.8	11.9	7.05	11.7	10.7	5.4	7.23
Copper	11.7	17.3	24.9	7.86	13	23.6	17.7	24.1	24.8	23.2	22.8	26.8	27.1	27.9	29.9	19.9	31.2	30.3	12.9	21.9
Lead	15.6	29.2	35.1	9.86	20	16.5	16.3	18	22.4	20.9	20.8	19.7	18.9	16.8	19.4	13.4	21.4	20.5	8.87	15.1
Mercury	0.046	0.058	0.125	0.01	0.061	0.06	0.04	0.054	0.031	0.104	0.035	0.036	0.041	0.037	0.04	0.022	0.045	0.042	0.01	0.025
Nickel	16.4	24.4	27	16.1	19.6	21.9	20.2	24.3	29.6	28.6	29.4	28.7	27.5	23.6	31.1	18.5	30.6	28.5	13.1	17.8
Selenium	<0.465	<1.11	<0.595	<0.416	<0.472	<0.496	0.673	<0.478	<0.685	<0.698	<0.691	<0.6	<0.625	<0.558	<0.602	0.805	0.666	<0.619	0.672	<0.486
Silver	0.179	0.373	0.375	0.128	0.237	0.098	0.147	0.133	0.285	0.183	0.241	0.083	0.06	0.12	0.198	0.038	0.122	0.138	<0.031	<0.34
Thallium	0.21	0.223	0.302	0.147	0.185	0.532	0.225	0.273	0.252	0.287	0.26	0.318	0.289	0.292	0.31	0.2	0.344	0.332	0.133	0.184
Vanadium	18.1	20	23.9	17.7	18.7	16.1	16.9	18.6	24.8	24.5	24.3	23.5	23.3	20.8	25.2	16.3	26.2	24.8	9.88	14.1
Zinc	83.5	109	178	46.4	102	80.4	83.8	92.5	98.7	96.3	97.2	103	101	91.5	106	76.5	113	108	49.8	72.6

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 4: Bulk polycyclic aromatic hydrocarbon (PAH) and theoretic bioaccumulation potential (TBP) analyses on Conneaut Harbor Federal navigation channel sediments (from EEI, 2003).

PAH - ug/kg (ppb)	Reference Area Sites					Placement Area Sites			Harbor Area Sites										
	CL-2	CL-3	CL-5	CL-6	CL-comp	CD-1	CD-2	CD-comp	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
1-Methylnaphthalene	<2.45	<2.43	<3.08	<2.26	<2.59	<2.56	<2.55	<2.63	<3.43	<3.56	<3.67	<3.16	<3.07	<2.91	<3.08	<3.34	<3.22	<2.6	<2.47	<2.57
2-Methylnaphthalene	*8.98*	<2.14	<2.71	*4.23*	*6.95*	<2.26	<2.25	<2.31	<3.03	<3.14	<3.23	<2.79	<2.71	<2.57	<2.72	<2.94	<2.84	<2.29	*9.72*	<2.27
Acenaphthene	<9.66	<9.55	<12.1	<8.88	<10.2	<10.1	<10.0	<10.3	<13.5	<14.0	<14.4	<12.4	<12.1	<11.5	<12.1	<13.1	<12.7	<10.2	<9.72	<10.1
Acenaphthylene	<1.08	*16.5*	*6.64*	*1.09*	<1.14	<1.13	*7.89*	<1.15	<1.51	<1.56	<1.61	<1.39	<1.35	<1.28	<1.35	<1.46	<1.41	<1.14	<1.08	*10.7*
Anthracene	<6.03	<5.96	<7.56	<5.55	<6.37	<6.3	<6.26	<6.45	<8.43	<8.75	<9.0	<7.77	<7.54	<7.15	<7.57	<8.19	<7.92	<6.39	<6.07	<6.32
Benzo(a)anthracene	16.2	20.8	41.5	4.13	18.2	83.8	43.8	58.8	92.7	<0.964	<0.991	71.7	75.6	77.1	74.4	87.2	81.3	<0.704	11.5	<0.696
Benzo(a) pyrene	<2.17	<2.14	90	<1.99	<2.29	129	84.7	<2.32	153	110	139	119	138	<2.57	125	171	2.85	97.6	2.18	96.4
Benzo(b) fluoranthene	<0.741	<0.733	<0.93	<0.682	56.7	<0.775	<0.77	<0.793	225	173	241	185	206	216	<0.93	<1.01	<0.974	143	<0.746	146
Benzo(ghi) perylene	<1.06	<1.05	<1.33	<0.977	<1.12	<1.11	<1.1	<1.14	<1.49	<1.54	<1.59	<1.37	<1.33	<1.26	<1.33	<1.44	<1.4	<1.13	<1.07	<1.11
Benzo(k) fluoranthene	10.5	9.06	28.3	<0.857	14.8	50.2	26.8	43.8	64	46.3	63.7	49.9	54.6	66.1	60.3	82.8	70.7	44.5	<0.938	45.7
Chrysene	21.2	25.3	50.7	<0.774	21.2	106	56.6	68.9	104	89.6	105	89.8	93.2	91.1	84.2	110	91.7	71.3	<0.847	100
Dibenzo(a,h) anthracene	<1.52	<1.5	<1.9	<1.4	<1.6	<1.59	<1.58	<1.62	<2.12	<2.2	<2.27	<1.96	<1.9	<1.8	<1.9	<2.06	<1.99	<1.61	<1.53	<1.59
Fluoranthene	35.7	36.9	88.2	7.41	34.1	199	108	137	258	173	185	169	180	183	163	201	192	132	27.1	200
Fluorene	<8.97	<8.87	<11.3	<8.25	<9.49	34	*13.5*	27.9	<12.5	*22.9*	<13.4	*25.6*	*19.8*	*25*	*25.9*	*22.8*	33.6	*17.9*	<9.03	30.4
Indeno(1,2,3-cd) pyrene	<1.28	<1.26	46.3	<1.17	25.7	38.6	46.2	52.2	55.2	50.7	69.6	71.2	68.3	65.3	62.8	74.7	72.4	53.7	<1.29	46.1
Naphthalene	<1.28	<1.27	<1.61	*3.77*	*4.98*	<1.34	*7.3*	<1.37	*20.5*	<1.86	41.3	<1.66	<1.61	<1.52	<1.61	<1.75	<1.69	<1.36	<1.29	<1.35
Phenanthrene	*17.3*	*20.2*	50.3	<0.906	*19.2*	145	55.9	103	167	108	117	118	126	139	122	129	149	94.8	*22.3*	176
Pyrene	44.1	45.5	113	12.3	44.5	232	122	174	251	189	249	211	210	222	201	227	243	150	<1.36	191
Total PAHs	178.79	206.59	551.87	59.14	271.39	1039.95	590.40	690.74	1174.53	993.37	1253.86	1136.75	1197.33	1111.68	945.39	1134.51	964.63	877.33	98.05	1063.47
TOC (mg/kg)	6,890	4,070	10,400	5,480	8,160	14,000	9,280	13,200	24,100	20,000	16,900	19,800	13,900	15,600	16,900	11,700	14,900	20,000	5,990	10,600
TBP (mg/kg)	0.259	0.508	0.531	0.108	0.333	0.743	0.636	0.523	0.487	0.497	0.742	0.574	0.861	0.713	0.559	0.970	0.647	0.414	0.164	1.003

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 4a: Acute equilibrium partitioning-based sediment benchmark toxic units (ESBTUs) for PAH compound concentrations in Conneaut Harbor Federal navigation channel sediment samples (USEPA 2003; based on data from EEI 2003).

PAH - ug/kg (ppb)	$C_{sc,PAH,FAVI}$ (ug/g)*	CH-3	$ESBTU_{FAVI}$	CH-4	$ESBTU_{FAVI}$	CH-5	$ESBTU_{FAVI}$	CH-6	$ESBTU_{FAVI}$	CH-7	$ESBTU_{FAVI}$	CH-8	$ESBTU_{FAVI}$	CH-9	$ESBTU_{FAVI}$	CH-12	$ESBTU_{FAVI}$
Acenaphthene	2043	<14.4	0.00042	<12.4	0.00031	<12.1	0.00043	<11.5	0.00036	<12.1	0.00035	<13.1	0.00055	<12.7	0.00042	<10.1	0.00047
Acenaphthylene	1880	<1.61	0.00005	<1.39	0.00004	<1.35	0.00005	<1.28	0.00004	<1.35	0.00004	<1.46	0.00007	<1.41	0.00005	***10.7***	0.00054
Anthracene	2471	<9.0	0.00022	<7.77	0.00016	<7.54	0.00022	<7.15	0.00019	<7.57	0.00018	<8.19	0.00028	<7.92	0.00022	<6.32	0.00024
Benzo(a)anthracene	3499	<0.991	0.00002	**71.7**	0.00103	**75.6**	0.00155	**77.1**	0.00141	**74.4**	0.00126	**87.2**	0.00213	**81.3**	0.00156	<0.696	0.00002
Benzo(a) pyrene	4014	**139**	0.00205	**119**	0.00150	**138**	0.00247	<2.57	0.00004	**125**	0.00184	**171**	0.00364	**2.85**	0.00005	**96.4**	0.00227
Benzo(b) fluoranthene	4073	**241**	0.00350	**185**	0.00229	**206**	0.00364	**216**	0.00340	<0.93	0.00001	<1.01	0.00002	<0.974	0.00002	**146**	0.00338
Benzo(ghi) perylene	4555	<1.59	0.00002	<1.37	0.00002	<1.33	0.00002	<1.26	0.00002	<1.33	0.00002	<1.44	0.00003	<1.4	0.00002	<1.11	0.00002
Benzo(k) fluoranthene	4081	**63.7**	0.00092	**49.9**	0.00062	**54.6**	0.00096	**66.1**	0.00104	**60.3**	0.00087	**82.8**	0.00173	**70.7**	0.00116	**45.7**	0.00106
Chrysene	3511	**105**	0.00177	**89.8**	0.00129	**93.2**	0.00191	**91.1**	0.00166	**84.2**	0.00142	**110**	0.00268	**91.7**	0.00175	**100**	0.00269
Dibenzo(a,h) anthracene	4672	<2.27	0.00003	<1.96	0.00002	<1.9	0.00003	<1.8	0.00002	<1.9	0.00002	<2.06	0.00004	<1.99	0.00003	<1.59	0.00003
Fluoranthene	2941	**185**	0.00372	**169**	0.00290	**180**	0.00440	**183**	0.00399	**163**	0.00328	**201**	0.00584	**192**	0.00438	**200**	0.00642
Fluorene	2238	<13.4	0.00035	***25.6***	0.00058	***19.8***	0.00064	***25***	0.00072	***25.9***	0.00068	***22.8***	0.00087	**33.6**	0.00101	**30.4**	0.00128
Indeno(1,2,3-cd) pyrene	4638	**69.6**	0.00089	**71.2**	0.00078	**68.3**	0.00106	**65.3**	0.00090	**62.8**	0.00080	**74.7**	0.00138	**72.4**	0.00105	**46.1**	0.00094
Naphthalene	1602	**41.3**	0.00153	<1.66	0.00005	<1.61	0.00007	<1.52	0.00006	<1.61	0.00006	<1.75	0.00009	<1.69	0.00007	<1.35	0.00008
Phenanthrene	2479	**117**	0.00279	**118**	0.00240	**126**	0.00366	**139**	0.00359	**122**	0.00291	**129**	0.00445	**149**	0.00403	**176**	0.00670
Pyrene	2900	**249**	0.00508	**211**	0.00367	**210**	0.00521	**222**	0.00491	**201**	0.00410	**227**	0.00669	**243**	0.00562	**191**	0.00621
Total PAHs		**1253.86**		**1136.75**		**1197.33**		**1111.68**		**945.39**		**1134.51**		**964.63**		**1063.47**	
TOC (mg/kg)		**16,900**		**19,800**		**13,900**		**15,600**		**16,900**		**11,700**		**14,900**		**10,600**	
$\sum ESBTU_{FAV,3A}$**			**0.26859**		**0.20310**		**0.30272**		**0.25710**		**0.20541**		**0.35060**		**0.24651**		**0.37185**

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

* Based on an ACR of 4.16 (USEPA 2003)

** Includes sum of $ESBTU_{FAV}$ values multiplied by an uncertainty factor of 11.5, which is a conservative value for PAHs at 95% confidence interval (USEPA, 2003)

Table 5: Bulk polychlorinated biphenyl (PCB) and TBP analyses on Conneaut Harbor Federal navigation channel sediments (from EEI, 2003).

Aroclor - ug/kg (ppb)	Reference Area Sites					Placement Area Sites			Harbor Area Sites											
	CL-2	CL-3	CL-5	CL-6	CL-comp.	CD-1	CD-2	CD-comp	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Aroclor-1016	<1.42	<1.4	<1.78	<1.31	<1.48	<1.48	<1.47	<1.54	<2.05	<2.11	<2.09	<1.88	<1.83	<1.73	<1.87	<1.48	<1.86	<1.84	<1.41	<1.47
Aroclor-1221	<4.0	<3.96	<5.02	<3.68	<4.18	<4.18	<4.16	<4.35	<5.77	<5.95	<5.88	<5.31	<5.17	<4.89	<5.28	<4.17	<5.25	<5.18	<3.97	<4.14
Aroclor-1232	<2.36	<2.34	<2.97	<2.18	<2.47	<2.47	<3.46	<2.57	<3.41	<3.52	<3.48	<3.14	<3.05	<2.89	<3.12	<2.46	<3.1	<3.06	<2.35	<2.45
Aroclor-1242	<2.36	<2.34	<2.97	<2.18	<2.47	<2.47	<2.46	<2.57	<3.41	<3.52	<3.48	<3.14	<3.05	<2.89	<3.12	<2.46	<3.1	<3.06	<2.35	<2.45
Aroclor-1248	6.5	*3.7*	11.5	<1.31	8.4	*4.4*	<1.47	*7.8*	<2.05	<2.11	<2.09	<1.88	39.6	*4.68*	23.8	17.5	*4.28*	<1.84	<1.41	<1.47
Aroclor-1254	<0.709	<0.701	<0.89	<0.653	<0.741	<0.742	11.4	<0.772	<1.02	<1.06	<1.04	<0.941	<0.916	<0.867	<0.936	<0.739	<0.931	<0.918	<0.704	<0.734
Aroclor-1260	*1.9*	<1.4	*5.8*	<1.31	*3.6*	<1.48	6	*2.7*	<2.05	<2.11	<2.09	<1.88	<1.83	<1.73	<1.87	<1.48	<1.86	<1.84	<1.41	<1.47
Total PCBs	9.11	5.40	18.19	3.27	12.74	6.62	18.87	11.27	5.12	5.28	5.22	4.70	42.35	7.28	26.61	19.72	7.07	4.60	3.52	3.67
TOC (mg/kg)	6,890	4,070	10,400	5,480	8,160	14,000	9,280	13,200	24,100	20,000	16,900	19,800	13,900	15,600	16,900	11,700	14,900	20,000	5,990	10,600
TBP (mg/kg)	0.021	0.021	0.026	0.009	0.025	0.007	0.032	0.013	0.003	0.004	0.005	0.004	0.048	0.007	0.025	0.027	0.007	0.004	0.009	0.005

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 6: Bulk pesticide analyses on Conneaut Harbor Federal navigation channel sediments (from EEI, 2003).

Pesticide - ug/kg (ppb)	Reference Area Sites					Placement Area Sites			Harbor Area Sites											
	CL-2	CL-3	CL-5	CL-6	CL-comp	CD-1	CD-2	CD-comp	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
4,4-DDD	*1.57*	<1.47	*4.78*	<0.546	<1.56	<1.56	<1.55	<1.62	<2.15	<2.22	<2.19	<1.98	<1.92	<1.82	<1.96	<1.55	<1.96	<1.93	<1.48	<1.54
4,4-DDE	<1.28	<1.26	*3.29*	<0.47	<3.56	<1.33	<1.33	<1.39	<1.84	<1.9	*2.38*	<1.69	<1.65	<1.56	<1.68	<1.33	<1.68	<1.65	<1.27	*1.8*
4,4-DDT	*4.5*	*4.73*	<3.38	<0.992	<8.37	*2.92*	*4.06*	<2.93	<3.89	<4.01	<3.96	<3.58	<3.48	<3.29	<3.56	<2.81	<3.54	*4.21*	<2.67	<2.79
Aldrin	<1.22	<1.2	<1.53	<0.448	<1.27	<1.27	<1.26	<1.32	<1.76	<1.81	<1.79	<1.62	<1.57	<1.49	<1.61	<1.27	<1.6	<1.58	<1.21	<1.26
Chlordane-Technical	<47.2	<46.6	<59.2	<17.4	<49.2	<49.3	<49.0	<51.3	<68.1	<70.2	<69.4	<62.6	<60.9	<57.7	<62.2	<49.2	<61.9	<61.0	<46.8	<48.8
Dieldrin	<1.22	<1.2	<1.53	<0.448	<1.27	<1.27	<1.26	<1.32	<1.76	<1.81	<1.79	<1.62	<1.57	<1.49	<1.61	<1.27	<1.6	<1.58	<1.21	<1.26
Endosulfan I	<0.569	<0.562	<0.714	<0.209	<0.594	<0.594	<0.591	<0.619	<0.821	<0.846	<0.836	<0.755	<0.735	<0.695	<0.75	<0.593	<0.747	<0.736	<0.564	<0.589
Endosulfan II	<1.1	<1.08	<1.38	<0.404	<1.15	<1.15	<1.14	<1.19	<1.58	<1.63	<1.61	<1.46	<1.42	<1.34	<1.45	<1.14	<1.44	<1.42	<1.09	<1.14
Endosulfan Sulfate	<1.3	<1.29	<1.63	<0.479	<1.36	<1.36	<1.35	<1.41	<1.88	<1.94	<1.91	<1.73	<1.68	<1.59	<1.72	<1.36	<1.71	<1.68	<1.29	<1.35
Endrin	<1.43	<1.41	<1.8	<0.526	<1.49	<1.5	<1.49	<1.56	<2.06	<2.13	<2.1	<1.9	<1.85	<1.75	<1.89	<1.49	<1.88	<1.85	<1.42	<1.48
Endrin Aldehyde	<1.43	<1.41	<1.8	<0.526	<1.49	<1.5	<1.49	<1.56	<2.06	<2.13	<2.1	<1.9	<1.85	<1.75	<1.89	<1.49	<1.88	<1.85	<1.42	<1.48
Endrin Ketone	<1.54	<1.52	<1.93	<0.566	<1.6	<1.61	<1.6	<1.67	<2.22	<2.29	<2.26	<2.04	<1.99	<1.88	<2.03	<1.6	<2.02	<1.99	<1.52	<1.59
Heptachlor	<0.752	<0.744	<0.944	<0.277	<0.785	<0.786	<0.781	<0.818	<1.09	<1.12	<1.11	<0.998	<0.971	<0.919	<0.992	<0.784	<0.987	<0.973	<0.746	<0.778
Heptachlor Epoxide	<0.637	<0.63	<0.8	<0.234	<0.665	<0.666	<0.662	<0.693	<0.92	<0.948	<0.937	<0.846	<0.823	<0.779	<0.84	<0.664	<0.837	<0.825	<0.632	<0.66
Methoxychlor	<9.51	<9.4	<11.9	<3.5	<9.92	<9.94	<9.87	<10.3	<13.7	<14.1	<14.0	<12.6	<12.3	<11.6	<12.5	<9.91	<12.5	<12.3	<9.43	<9.84
Toxaphene	<88.7	<87.7	<111.0	<32.6	<92.6	<92.7	<92.1	<96.4	<128.0	<132.0	<130.0	<118.0	<115.0	<108.0	<117.0	<92.4	<116.0	<115.0	<88.0	<91.8
Alpha-BHC	<0.819	<0.81	<1.03	<0.301	<0.855	<0.856	<0.851	<0.891	<1.18	<1.22	<1.2	<1.09	<1.06	<1.0	<1.08	<0.854	<1.08	<1.06	<0.813	<0.848
Beta-BHC	<0.673	<0.665	<0.844	<0.248	<0.702	<0.703	<0.699	<0.732	<0.971	<1.0	<0.989	<0.893	<0.869	<0.822	<0.887	<0.701	<0.883	<0.87	<0.667	<0.696
Delta-BHC	<0.673	<0.665	<0.844	<0.248	<0.702	<0.703	<0.699	<0.732	<0.971	<1.0	<0.989	<0.893	<0.869	<0.822	<0.887	<0.701	<0.883	<0.87	<0.667	<0.696
Gamma-BHC (Lindane)	<0.59	<0.583	<7.41	<0.217	<0.616	<0.617	<0.613	<0.642	<0.851	<0.878	<0.867	<0.783	<0.762	<0.721	<0.778	<0.615	<0.775	<0.763	<0.585	<0.611

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 7: Elutriate metals analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI, 2003).

Metal - mg/L (ppm)	Harbor Area Sites											
	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Antimony	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**0.2**	**1**
Arsenic	**15**	**15**	**14**	**11**	**11**	**8**	**9**	**9**	**8**	**7**	**3**	**8**
Barium	**131**	**136**	**136**	**122**	**113**	**71**	**100**	**98**	**88**	**87**	**44**	**81**
Beryllium	**0.5**	**1**	**0.5**	**1**	**0.4**	**0.2**	**0.3**	**0.2**	**0.1**	**0.1**	**0.2**	**0.2**
Cadmium	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.1**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**
Chromium	**11**	**12**	**11**	**14**	**9**	**5**	**8**	**5**	**3**	**4**	**4**	**2**
Cobalt	**6**	**6**	**6**	**6**	**4**	**2**	**3**	**2**	**2**	**2**	**2**	**2**
Copper	**16**	**17**	**16**	**16**	**11**	**6**	**10**	**6**	**5**	**6**	**5**	**6**
Lead	**16**	**16**	**15**	**15**	**9**	**4**	**8**	**5**	**4**	**4**	**3**	**3**
Mercury	**0.5**	**0.01**	**0.04**	**0.04**	<0.03	<0.03	**0.4**	**0.04**	**0.04**	<0.03	<0.03	<0.03
Nickel	**13**	**14**	**13**	**14**	**10**	**6**	**9**	**6**	**5**	**6**	**5**	**6**
Selenium	**2**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**1**
Silver	**0.05**	**0.05**	**0.05**	**0.07**	**0.05**	**0.02**	**0.04**	**0.03**	**0.01**	**0.02**	<0.01	<0.01
Thallium	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**	**0.02**	**0.1**	**0.06**	**0.04**	**0.04**	0.06	0.02
Vanadium	**16**	**17**	**17**	**18**	**11**	**5**	**11**	**6**	**4**	**5**	**6**	**4**
Zinc	**52**	**64**	**49**	**59**	**44**	**25**	**34**	**27**	**16**	**23**	**17**	**15**

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 8: Elutriate PAH analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI, 2003).

PAH - ug/L (ppb)	Harbor Area Sites											
	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
1-Methylnapthalene	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296	<0.296
2-Methylnapthalene	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161
Acenaphthene	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153	<0.153
Acenaphthylene	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154	<0.154
Anthracene	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196	<0.196
Benzo(a)anthracene	***0.027***	<0.019	***0.027***	***0.036***	***0.026***	***0.022***	***0.025***	<0.019	<0.019	<0.019	<0.019	<0.019
Benzo(a)pyrene	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Benzo(b)fluoranthene	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019
Benzo(ghi)perylene	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018	<0.018
Benzo(k)fluoranthene	<0.013	***0.025***	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013	<0.013
Chrysene	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019
Dibenzo(a,h) anthracene	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022	<0.022
Fluoranthene	***0.103***	***0.036***	***0.062***	***0.073***	***0.062***	***0.059***	***0.052***	***0.036***	***0.034***	<0.015	<0.015	***0.054***
Fluorene	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Indeno(1,2,3-cd)pyrene	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027
Naphthalene	<0.053	<0.027	<0.043	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161	<0.161
Phenanthrene	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198	<0.198
Pyrene	<0.02	<0.02	<0.02	***0.064***	***0.042***	<0.02	***0.04***	<0.02	***0.022***	***0.024***	<0.02	***0.039***

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 9: Elutriate PCB analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI, 2003).

PCB - ug/L (ppb)	Harbor Area Sites											
	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
Aroclor-1016	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1221	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083
Aroclor-1232	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1242	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Aroclor-1248	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1254	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aroclor-1260	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 10: Elutriate pesticide analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI, 2003).

Pesticide - ug/L (ppb)	Harbor Area Sites											
	CH-1	CH-2	CH-3	CH-4	CH-5	CH-6	CH-7	CH-8	CH-9	CH-10	CH-11	CH-12
4,4-DDD	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
4,4-DDE	***0.008***	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
4,4-DDT	<0.011	***0.028***	<0.011	<0.011	***0.02***	***0.013***	<0.011	***0.015***	***0.013***	**0.041**	<0.011	<0.011
Aldrin	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Chlordane-Technical	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155	<0.155
Dieldrin	***0.011***	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Endosulfan I	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Endosulfan II	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012	<0.012
Endosulfan Sulfate	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Endrin	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Endrin Aldehyde	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Endrin Ketone	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Heptachlor Epoxide	***0.011***	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Methoxychlor	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028	<0.028
Toxaphene	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105	<0.105
Alpha-BHC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Beta-BHC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Delta-BHC	***0.011***	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Gamma-BHC (Lindane)	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 11. Particle size analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

Particle Size Distribution (%)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Clay	11.4	11.1	21.7	17.8	0.5	6.8	23.8	18.3	21.5	19.9	17.6	13.0	21.5	18.8	21.2	19.7	10.0	21.2
Silt	15.8	13.0	32.5	19.0	0.9	15.8	71.2	67.1	73.5	74.6	72.3	75.5	67.2	53.3	73.6	71.4	53.3	67.6
Fine Sand	70.1	70.1	43.0	52.2	89.7	72.8	4.9	14.2	4.9	5.4	10.0	11.2	9.9	27.1	5.1	8.6	36.5	10.7
Medulm Sand	2.5	5.2	2.4	10.5	8.5	3.7	0.1	0.4	0.1	0.1	0.1	0.3	0.9	0.8	0.1	0.2	0.2	0.4
Coarse Sand	0.2	0.6	0.4	0.5	0.4	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.1	0.0	0.1
Fine Gravel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coarse Gravel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cobbles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Specific Gravity	2.71	2.73	2.66	2.69	2.72	2.68	2.69	2.69	2.67	2.70	2.70	2.71	2.71	2.73	2.69	2.72	2.71	2.72
TOC (mg/kg)	6,040	5,890	13,100	10,500	2,000	7,510	16,300	13,800	17,200	14,000	9,740	7,680	7,650	5,260	9,150	7,060	8,190	8,190

Table 12: Bulk general chemistry analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

Parameter - mg/kg (ppm)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Oil and Grease	<350	<360	<680	1,000	410	<330	<430	<430	<430	<420	<400	<400	560	<350	<430	<400	<490	1,400
Nitrogen, Ammonia	10.3	11.8	147	31.3	4.20	15.1	67.7	69.4	94.7	48.6	69.7	57.1	59.1	23.4	71.4	62.0	43.3	51.5
Phosphorus, Total as P	293	262	589	301	175	320	155	278	228	274	314	265	191	175	271	234	309	274
Nitrogen, Total Kjeldahl	455	417	2,320	1,070	66.0	522	1,400	1,550	1,740	1,480	1,460	1,400	1,250	777	1,710	1,300	1,270	1,250
Chemical Oxygen Demand (COD)	20,000	21,000	49,000	41,000	8,000	21,000	44,000	49,000	41,000	44,000	43,000	39,000	36,000	27,000	45,000	41,000	30,000	43,000
Cyanide, Total	<0.07	<0.07	<0.13	<0.08	<0.06	<0.06	<0.08	<0.08	<0.09	<0.08	<0.07	<0.08	<0.08	<0.07	<0.08	<0.07	<0.09	<0.08

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 13: Bulk metals analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

Metal - mg/kg (ppm)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aluminum	4,840	4,020	7,440	5,050	1,770	3,690	8,720	9,540	10,900	8,450	8,210	3,800	7,870	4,400	4,660	7,820	5,170	5,850
Antimony	1.10	<0.44	<0.85	0.780	<0.4	<0.46	<0.58	1.20	1.10	<0.53	1.80	<0.5	0.930	<0.45	<0.56	0.950	<0.48	0.560
Arsenic	6.60	5.60	14.2	7.58	5.60	6.80	9.80	11.9	12.4	10.1	13.3	8.20	11.4	6.60	8.00	14.5	12.9	11.2
Barium	23.5	20.0	57.0	34.2	11.3	18.0	43.7	48.0	61.5	43.7	37.9	18.4	35.7	25.4	21.7	48.6	25.9	28.5
Beryllium	0.320	0.290	0.560	0.390	0.150	0.250	0.480	0.520	0.570	0.460	0.440	0.230	0.420	0.270	0.290	0.430	0.300	0.330
Cadmium	0.280	0.350	1.00	1.20	<0.13	0.180	<0.19	<0.18	<0.17	<0.17	<0.17	<0.16	<0.17	<0.15	<0.18	<0.17	<0.16	<0.17
Calcium	5,040	4,060	6,080	4,390	3,660	4,830	2,720	5,220	3,140	3,880	9,320	7,840	6,550	5,530	5,920	11,300	14,600	9,390
Chromium	12.2	11.1	21.4	20.2	3.70	8.10	12.5	14.0	15.4	12.3	12.8	6.30	12.0	7.20	7.70	12.8	9.2	9.60
Cobalt	6.80	5.40	8.30	6.00	3.20	5.40	9.10	10.4	11.4	9.00	9.50	4.80	8.70	5.10	5.70	9.30	7.20	7.50
Copper	11.6	9.58	26.6	18.4	1.90	7.50	16.0	18.4	19.5	16.7	19.4	12.7	17.7	9.30	12.7	21.7	19.5	18.3
Iron	16,800	13,500	19,300	12,900	8,980	12,400	20,100	23,500	24,800	20,200	22,500	12,200	20,600	12,300	13,400	22,700	18,000	17,700
Lead	16.3	13.8	30.0	26.7	5.60	10.4	13.4	16.7	17.0	13.8	14.4	7.50	13.1	7.70	8.80	14.8	12.0	12.2
Magnesium	4,010	3,350	4,920	3,540	2,140	3,470	3,820	4,460	4,800	4,120	5,540	3,630	5,040	3,280	3,410	6,250	5,220	4,910
Manganese	194	181	633	205	132	193	249	280	403	260	331	182	312	172	207	379	312	311
Molybdenum	0.400	<0.28	0.820	0.600	<0.26	0.360	0.570	0.580	0.76	0.540	0.89	0.680	0.750	0.500	0.570	1.20	1.20	0.940
Nickel	15.7	13.3	24.2	20.1	6.50	12.4	19.5	22.2	24.1	19.5	21.1	10.8	19.3	11.5	12.8	21.0	15.9	16.4
Potassium	596	528	1,140	750	217	438	760	798	872	758	772	472	750	505	555	819	592	677
Selenium	0.730	<0.7	<1.4	<0.91	0.670	<0.75	1.30	<0.88	1.90	1.20	1.60	<0.8	<0.84	<0.73	<0.91	1.50	1.70	1.10
Silver	<0.14	<0.14	0.480	0.320	<0.13	<0.15	<0.19	<0.18	<0.17	<0.17	0.190	<0.16	0.210	<0.15	<0.18	0.230	0.180	0.210
Sodium	52.1	43.8	73.4	49.2	28.8	36.7	50.8	57.7	126	50.0	56.6	43.0	55.5	39.7	44.8	66.8	60.8	55.7
Thallium	0.800	<0.7	<1.4	1.10	0.680	<0.75	<0.93	0.880	<0.85	<0.86	<0.86	0.880	<0.84	<0.73	0.950	0.940	<0.78	<0.87
Vanadium	14.2	10.8	16.3	11.5	6.80	8.50	11.8	<13.4	15.0	11.8	12.6	6.50	11.4	7.80	7.50	12.9	9.50	9.60
Zinc	80.8	70.5	114	96.4	33.0	57.1	64.2	75.6	79.8	63.9	75.5	39.5	67.7	43.0	45.1	73.9	65.0	58.3
Mercury	0.0473	0.0487	0.259	0.100	0.00550	0.0297	0.0326	0.0265	0.0238	0.0213	0.0225	0.0229	0.0269	0.0256	0.0342	0.0283	0.0331	0.0337

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 14: Bulk PAH and TBP analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

PAH - ug/kg (ppb)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Acenaphthene	*3.00*	*2.03*	<1.29	*0.852*	*0.647*	4.69	<0.82	*1.21*	*3.30*	<0.739	*3.30*	*2.61*	*1.31*	4.23	*3.84*	*1.30*	4.71	9.25
Acenaphthylene	*3.59*	8.19	<1.75	*2.55*	<0.75	*2.61*	<1.12	*2.44*	*2.28*	<1.01	*2.76*	*2.81*	*1.55*	5.57	*4.12*	*2.24*	5.68	6.18
Anthracene	5.93	9.04	<3.33	*3.40*	<1.44	8.78	<2.13	8.88	7.13	<1.92	8.49	7.03	*2.88*	34.6	10.4	*4.61*	56.1	14.3
Benzo(a)anthracene	18.6	38.3	<1.68	15.3	*1.91*	27.7	*3.37*	25.0	20.7	*3.98*	28.1	21.7	8.95	41.8	36.1	15.6	51.4	35.3
Benzo(a) pyrene	17.6	28.7	*5.22*	12.0	*1.25*	22.4	*2.49*	20.0	17.8	*3.32*	22.6	18.2	7.81	36.6	29.0	12.3	42.0	26.6
Benzo(b) fluoranthene	26.8	38.6	*7.93*	15.3	*2.46*	35.1	*4.13*	30.2	27.8	5.31	32.9	26.1	12.3	57.4	43.0	17.1	62.7	37.4
Benzo(ghi) perylene	11.3	16.3	*4.14*	7.19	<1.21	12.9	*2.09*	11.4	11.4	*2.42*	12.0	12.2	*5.10*	22.7	18.1	6.28	24.1	14.4
Benzo(k) fluoranthene	8.75	13.7	*3.01*	6.58	*1.08*	11.7	*1.60*	9.02	8.06	*1.90*	9.88	7.83	*4.49*	17.2	13.3	8.97	19.4	14.8
Chrysene	8.63	28.7	<1.9	<1.24	<0.82	26.1	<1.21	8.25	*1.71*	<1.09	10.6	5.06	<1.16	56.8	22.0	<1.13	64.2	*27.4*
Dibenzo(a,h) anthracene	<1.42	*1.63*	<3.06	<2.0	<1.32	*3.29*	<1.96	<1.61	<1.79	<1.76	<1.71	<1.66	<1.86	*2.36*	*1.88*	<1.82	*2.31*	3.39
Fluoranthene	35.1	61.0	*8.05*	20.8	5.11	50.7	7.12	38.2	38.8	8.12	49.7	41.1	17.2	80.6	62.2	29.5	89.5	79.1
Fluorene	*2.88*	*2.45*	*1.53*	*1.46*	*0.675*	6.72	*1.28*	*3.21*	*4.19*	*1.18*	*4.37*	*3.44*	*2.01*	9.71	5.37	*2.94*	10.8	11.1
Indeno(1,2,3-cd) pyrene	9.50	13.7	*3.21*	6.05	<1.15	11.3	*2.30*	10.1	9.76	*2.14*	10.7	9.98	*4.32*	19.3	16.1	*5.19*	20.9	11.3
1-Methylnaphthalene	*2.16*	*2.08*	<1.23	*0.841*	*0.573*	5.59	*2.25*	4.97	*3.98*	*2.01*	*3.99*	*2.68*	*2.93*	7.78	5.36	*4.68*	*4.10*	*4.16*
2-Methylnaphthalene	*2.53*	*2.50*	*1.71*	*1.27*	*0.529*	5.23	*3.20*	6.69	*4.85*	*2.66*	*4.98*	*3.46*	*3.58*	9.35	6.21	*4.41*	6.10	*3.78*
Naphthalene	*3.84*	4.23	*2.5*	*2.59*	*0.645*	5.47	*2.70*	4.92	5.62	*1.95*	*4.20*	*3.20*	*2.68*	7.43	6.17	*4.78*	5.77	*4.00*
Phenanthrene	13.2	22.8	*4.56*	8.31	*2.13*	32.6	*4.70*	16.6	27.9	5.32	29.8	24.8	10.8	44.2	34.7	17.2	56.0	44.1
Pyrene	37.4	84.2	<1.08	10.3	<0.47	51.9	<0.69	33.5	27.8	<0.62	43.8	36.5	*0.835*	89.7	61.5	15.9	91.4	84.1
Total PAHs	207.54	373.57	54.24	115.92	23.07	313.96	39.71	224.54	216.04	42.78	274.91	224.22	85.26	530.20	367.28	146.86	606.97	422.72
TOC (mg/kg)	6,040	5,890	13,100	10,500	2,000	7,510	16,300	13,800	17,200	14,000	9,740	7,680	7,650	5,260	9,150	7,060	8,190	8,190
TBP (mg/kg)	0.344	0.634	0.041	0.110	0.115	0.418	0.024	0.163	0.126	0.031	0.282	0.292	0.111	1.008	0.402	0.208	0.741	0.516

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

Table 14a: Acute equilibrium partitioning-based sediment benchmark toxic units (ESBTUs) for PAH compound concentrations in Conneaut Harbor Federal navigation channel sediment samples (USEPA 2003; based on data from EEI 2007).

PAH - ug/kg (ppb)	$C_{oc,PAHi,FAVi}$ (µg/g)*	COH-8	$ESBTU_{FAVi}$	COH-9	$ESBTU_{FAVi}$	COH-11	$ESBTU_{FAVi}$	COH-12	$ESBTU_{FAVi}$
Acenaphthene	2043	**4.23**	0.00039	***3.84***	0.00021	**4.71**	0.00028	**9.25**	0.00055
Acenaphthylene	1880	**5.57**	0.00056	***4.12***	0.00024	**5.68**	0.00037	**6.18**	0.00040
Anthracene	2471	**34.6**	0.00266	**10.4**	0.00046	**56.1**	0.00277	**14.3**	0.00071
Benzo(a)anthracene	3499	**41.8**	0.00227	**36.1**	0.00113	**51.4**	0.00179	**35.3**	0.00123
Benzo(a) pyrene	4014	**36.6**	0.00173	**29.0**	0.00079	**42.0**	0.00128	**26.6**	0.00081
Benzo(b) fluoranthene	4073	**57.4**	0.00268	**43.0**	0.00115	**62.7**	0.00188	**37.4**	0.00112
Benzo(ghi) perylene	4555	**22.7**	0.00095	**18.1**	0.00043	**24.1**	0.00065	**14.4**	0.00039
Benzo(k) fluoranthene	4081	**17.2**	0.00080	**13.3**	0.00036	**19.4**	0.00058	**14.8**	0.00044
Chrysene	3511	**56.8**	0.00308	**22.0**	0.00068	**64.2**	0.00223	***27.4***	0.00095
Dibenzo(a,h) anthracene	4672	***2.36***	0.00010	***1.88***	0.00004	***2.31***	0.00006	**3.39**	0.00009
Fluoranthene	2941	**80.6**	0.00521	**62.2**	0.00231	**89.5**	0.00372	**79.1**	0.00328
Fluorene	2238	**9.71**	0.00082	**5.37**	0.00026	**10.8**	0.00059	**11.1**	0.00061
Indeno(1,2,3-cd) pyrene	4638	**19.3**	0.00079	**16.1**	0.00038	**20.9**	0.00055	**11.3**	0.00030
Naphthalene	1602	**7.43**	0.00088	**6.17**	0.00042	**5.77**	0.00044	***4.00***	0.00030
Phenanthrene	2479	**44.2**	0.00339	**34.7**	0.00153	**56.0**	0.00276	**44.1**	0.00217
Pyrene	2900	**89.7**	0.00588	**61.5**	0.00232	**91.4**	0.00385	**84.1**	0.00354
Total PAHs		**530.20**		**367.78**		**606.97**		**422.72**	
TOC (mg/kg)		**5,260**		**9,150**		**8,190**		**8,190**	
$\sum ESBTU_{FAV,34}$**			**0.37031**		**0.14624**		**0.27363**		**0.19433**

Note: Results are reported as dry weight. **Positive detections are presented in bold.**

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in bold italics are estimated values, detected above MDL but below reporting limit (J).

* Based on an ACR of 4.16 (USEPA 2003)

** Includes sum of $ESBTU_{FAVi}$ values multiplied by an uncertainty factor of 11.5, which is a conservative value for PAHs at 95% confidence interval

Table 15: Bulk PCB and TBP analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

Aroclor - ug/kg (ppb)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aroclor-1016	<9.56	<9.55	<18.5	<12.1	<8.74	<10.1	<12.3	<12.0	<11.9	<11.9	<11.5	<11.0	<11.0	<9.95	<12.5	<11.3	<10.9	<11.8
Aroclor-1221	<9.56	<9.55	<18.5	<12.1	<8.74	<10.1	<12.3	<12.0	<11.9	<11.9	<11.5	<11.0	<11.0	<9.95	<12.5	<11.3	<10.9	<11.8
Aroclor-1232	<9.56	<9.55	<18.5	<12.1	<8.74	<10.1	<12.3	<12.0	<11.9	<11.9	<11.5	<11.0	<11.0	<9.95	<12.5	<11.3	<10.9	<11.8
Aroclor-1242	<9.56	<9.55	<18.5	<12.1	<8.74	<10.1	<12.3	<12.0	<11.9	<11.9	<11.5	<11.0	<11.0	<9.95	<12.5	<11.3	<10.9	<11.8
Aroclor-1248	<9.56	30.6	*52.5*	56.9	47.2	*22.1*	<12.3	<12.0	<11.9	201	<11.5	<11.0	*16.3*	402	*22.3*	*22.0*	<10.9	*26.5*
Aroclor-1254	*14.3*	39.9	*46.0*	*32.8*	50.7	*28.5*	<12.3	<12.0	<11.9	<11.9	<11.5	*12.1*	*13.0*	<9.95	*13.6*	*15.6*	*14.1*	*14.8*
Aroclor-1260	<9.56	*17.6*	*24.2*	*15.9*	*20.9*	*13.1*	<12.3	<12.0	<11.9	<11.9	<11.5	<11.0	<11.0	*18.2*	<12.5	<11.3	<10.9	<11.8
Total PCBs	33.42	88.10	122.70	105.60	118.80	63.70	36.90	36.00	35.70	224.80	34.50	34.10	40.30	430.15	48.40	48.90	35.90	53.10
TOC (mg/kg)	6,040	5,890	13,100	10,500	2,000	7,510	16,300	13,800	17,200	14,000	9,740	7,680	7,650	5,260	9,150	7,060	8,190	8,190
TBP (mg/kg)	0.087	0.236	0.148	0.159	0.939	0.134	0.036	0.041	0.033	0.254	0.056	0.070	0.083	1.292	0.084	0.109	0.069	0.102

Note: Results are reported as dry weight. Positive detections are presented in bold.
< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).
Results in italics are estimated values, detected below quantitation limits (J).

Table 16: Bulk pesticide analyses on Conneaut Harbor Federal navigation channel sediments (from EEI 2007).

Pesticide - ug/kg (ppb)	Reference Area Sites				Placement Area Sites		Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Alpha-BHC	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Gamma-BHC (Lindane)	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Beta-BHC	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Delta-BHC	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Heptachlor	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Aldrin	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Heptachlor Epoxide	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
Endosulfan I	<14.4	<14.5	<27.7	<18.6	<13.3	<15.3	<18.9	<17.9	<17.5	<18.1	<17.1	<16.8	<16.5	<15.2	<19.2	<16.9	<16.2	<17.7
4,4-DDE	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Dieldrin	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Endrin	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
4,4-DDD	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Endosulfan II	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Endrin Aldehyde	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
4,4-DDT	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Endosulfan Sulfate	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Methoxychlor	<144	<145	<277	<186	<133	<153	<189	<179	<175	<181	<171	<168	<165	<152	<192	<169	<162	<177
Endrin Ketone	<28.8	<29.0	<55.3	<37.2	<26.6	<30.6	<37.8	<35.7	<34.9	<36.1	<34.2	<33.6	<33.1	<30.4	<38.5	<33.9	<32.5	<35.3
Chlordane-Technical	<144	<145	<277	<186	<133	<153	<189	<179	<175	<181	<171	<168	<165	<152	<192	<169	<162	<177
Toxaphene	<480	<483	<921	<619	<442	<510	<630	<595	<582	<601	<569	<560	<551	<506	<641	<564	<541	<588

Note: Results are reported as dry weight.

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 17: Elutriate general chemisty analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI 2007).

Parameter - mg/L (ppm)	Harbor Area Sites											
	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Cyanide, Total	<0.0015	<0.0015	*0.00247*	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015	<0.0015
Nitrogen, Ammonia	0.787	0.819	1.49	0.735	3.04	0.932	0.572	0.232	1.55	1.34	4.75	0.649
Phosphorus, Total as P	*0.039*	*0.038*	*0.032*	*0.33*	*0.03*	*0.029*	0.109	*0.0380*	*0.041*	*0.034*	*0.029*	*0.029*
Nitrogen, Total Kjeldahl	1.04	1.04	1.80	1.00	2.88	0.17	1.15	0.456	1.88	1.92	4.78	0.924
Oil and Grease	<1.52	<1.53	<1.48	<1.54	*1.55*	*1.53*	*1.56*	<1.40	*1.6*	*1.81*	*1.79*	<1.47

Note: Results are reported as dry weight.

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in italics are estimated values, detected below quantitation limits (J).

Table 18: Elutriate metals analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI 2007).

Metal - mg/L (ppm)	Harbor Area Sites											
	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Mercury	0.0011	0.0007	0.0014	0.0127	0.00059	0.0025	0.0031	0.0021	0.00073	0.00085	0.0005	0.0014
Aluminum	10.6	10.8	13.9	83.4	13.4	11.9	2730	21.6	8.10	17.8	<5.0	7.50
Antimony	0.570	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Arsenic	3.60	2.50	4.70	4.30	5.20	4.40	3.20	2.50	5.70	3.60	6.70	3.50
Barium	35.8	31.60	46.7	42.9	42.8	43.7	45.3	32.4	49.2	49.8	72.6	43.5
Beryllium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.140	<0.1	<0.1	<0.1	<0.1	<0.1
Cadmium	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11	<0.11
Calcium	31900	32200	31800	30300	30100	32600	31500	32200	30300	32800	33400	30700
Chromium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	3.20	<1.0	<1.0	<1.0	<1.0	<1.0
Cobalt	0.370	0.270	1.00	1.20	0.400	0.580	1.40	0.760	0.560	0.480	0.590	0.400
Copper	0.660	0.790	0.580	0.650	0.550	0.620	3.50	0.620	0.460	0.600	0.410	0.580
Iron	124	185	141	230	147	136	3530	124	128	325	149	125
Lead	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	2.80	<0.5	<0.5	<0.5	<0.5	<0.5
Magnesium	8700	8240	8640	7900	7700	8030	8560	8660	7630	8080	7220	8620
Manganese	339	253	405	379	475	245	231	76.6	667	622	964	340
Molybdenum	1.60	1.50	1.80	1.50	1.30	1.50	1.60	1.70	1.40	1.50	1.50	1.50
Nickel	1.50	1.50	1.70	1.80	1.70	1.90	4.40	1.50	2.00	2.00	2.80	1.90
Potassium	1520	1620	1740	1520	1700	1520	2140	1450	1540	1510	1900	1540
Selenium	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Sodium	12500	12100	14400	13300	9900	11500	11100	11100	10400	12400	11500	12100
Thallium	0.540	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Vanadium	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0
Zinc	<2.6	<2.6	<2.6	<2.6	<2.6	4.90	14.1	<2.6	3.20	3.10	<2.6	<2.6

Note: Results are reported as dry weight.
< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 19: Elutriate PAH analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI 2007).

PAH - ug/L (ppb)	Harbor Area Sites											
	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Acenaphthene	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133
Pyrene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	***0.0293***	<0.017	<0.017	<0.017	<0.017	<0.017
Naphthalene	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133
Acenaphthylene	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133
Fluorene	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133
Phenanthrene	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133	<0.133
Anthracene	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138	<0.138
Fluoranthene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(a)anthracene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Chrysene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(b)fluoranthene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	**0.0557**	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(k)fluoranthene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(a)pyrene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	***0.0274***	<0.017	<0.017	<0.017	<0.017	<0.017
Indeno(1,2,3-cd)pyrene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	***0.0302***	<0.017	<0.017	<0.017	<0.017	<0.017
Dibenzo(a,h) anthracene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	***0.0236***	<0.017	<0.017	<0.017	<0.017	<0.017
Benzo(ghi)perylene	<0.017	<0.017	<0.017	<0.017	<0.017	<0.017	***0.0221***	<0.017	<0.017	<0.017	<0.017	<0.017

Note: Results are reported as dry weight. Positive detections are presented in bold.

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Results in italics are estimated values, detected below quantitation limits (J).

Table 20: Elutriate PCB analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI 2007).

PCB - ug/L (ppb)	Harbor Area Sites											
	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aroclor-1016	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1221	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1232	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1242	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1248	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1254	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-1260	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351
Aroclor-Total	<0.0343	<0.0351	<0.0351	<0.0343	<0.0343	<0.0351	<0.0358	<0.0358	<0.0351	<0.0351	<0.0351	<0.0351

Note: Results are reported as dry weight.

< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 21: Elutriate pesticide analyses on Conneaut Harbor Federal Navigation channel sediments (from EEI 2007).

Pesticide - ug/L (ppb)	Harbor Area Sites											
	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Alpha-BHC	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Gamma-BHC (Lindane)	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Beta-BHC	<0.0091	<0.0089	<0.0089	<0.0091	<0.0089	<0.0091	<0.0089	<0.0094	<0.0102	<0.0099	<0.0094	<0.0091
Delta-BHC	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Heptachlor	<0.007	<0.0069	<0.0069	<0.007	<0.0069	<0.007	<0.0069	<0.0056	<0.006	<0.0077	<0.0056	<0.007
Aldrin	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0073	<0.0079	<0.0059	<0.0073	<0.0054
Heptachlor Epoxide	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Gamma-Chlorodane	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Alpha- Chlorodane	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Endosulfan I	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
4,4-DDE	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Dieldrin	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Endrin	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
4,4-DDD	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Endosulfan II	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Endrin Aldehyde	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
4,4-DDT	<0.0108	<0.0105	<0.0105	<0.0108	<0.0105	<0.0108	<0.0105	<0.0111	<0.012	<0.0118	<0.0111	<0.0108
Endosulfan Sulfate	<0.0054	<0.0053	<0.0053	<0.0054	<0.0053	<0.0054	<0.0053	<0.0056	<0.006	<0.0059	<0.0056	<0.0054
Methoxychlor	<0.0538	<0.0526	<0.0526	<0.0538	<0.0526	<0.0538	<0.0526	<0.0556	<0.0602	<0.0558	<0.0556	<0.0538
Endrin Ketone	<0.0135	<0.0132	<0.0132	<0.0135	<0.0132	<0.0135	<0.0132	<0.0139	<0.0151	<0.0148	<0.0139	<0.0135
Chlordane-Technical	<0.0823	<0.0805	<0.0805	<0.0823	<0.0805	<0.0823	<0.0805	<0.085	<0.0922	<0.09	<0.085	<0.0823
Toxaphene	<0.161	<0.158	<0.158	<0.161	<0.158	<0.161	<0.158	<0.167	<0.181	<0.0176	<0.167	<0.161

Note: Results are reported as dry weight.
< = Indicates the compound was analyzed for but not detected at or above the method detection limit (MDL).

Table 22. Particle size analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012).

Particle Size Distribution (%)	Reference Area Sites				Placement Area Sites				Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COD-3	COD-4	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Clay	9.1	5.4	2.0	1.0	5.5	6.7	7.6	2.5	17.3	11.2	10.3	11.7	13.7	14.9	11.9	11.7	11.9	7.8	3.1	8.5
Silt	65.9	67.8	78.7	82.2	65.2	71.7	60.8	68.3	41.0	49.9	53.2	54.5	58.1	57.4	52.4	52.2	52.4	57.8	81.7	55.4
Fine Sand	8.7	13.4	12.7	11.1	13.3	11.2	4.6	20.1	1.4	2.4	3.2	2.0	0.8	2.3	1.3	4.9	0.3	1.5	14.9	2.8
Medium Sand	0.4	0.2	0.9	4.0	2.7	0.7	0.5	0.6	0.5	0.4	0.4	0.1	0.3	0.1	0.2	0.2	0.0	0.1	0.0	0.3
Coarse Sand	15.0	11.8	5.7	1.5	12.8	9.2	25.1	7.5	36.9	33.4	30.2	31.7	27.1	25.3	33.8	31.0	35.4	32.8	0.3	33.0
Fine Gravel	0.9	1.4	0.0	0.2	0.5	0.5	1.4	1.0	2.9	2.7	2.7	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0
Coarse Gravel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cobbles	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Fines (Silt and Clay)	75.0	73.2	80.7	83.2	70.7	78.4	68.4	70.8	58.3	61.1	63.5	66.2	71.8	72.3	64.3	63.9	64.3	65.6	84.8	63.9
Total Sand and Gravel	25.0	26.8	19.3	16.8	29.3	21.6	31.6	29.2	41.7	38.9	36.5	33.8	28.2	27.7	35.7	36.1	35.7	34.4	15.2	36.1

Table 23: Bulk inorganic analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012)

Inorganic Parameter - mg/kg (ppm)	Reference Area Sites				Placement Area Sites				Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COD-3	COD-4	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Oil and Grease, Total	310	140 U	240	130 U	190	130 U	150 U	140 U	170 U	170 U	150 U	140 U	200 U	140 U	140 U	140 U	160 U	150 U	130 U	360
Nitrogen, Ammonia	44	44	47	19 U	78	44	110	39	290	150	200	160	290	110	120	100	130	120	49	130
Phosphorus, Total (as P)	60	58	66	23	170	71	170	84	170	180	190	160	160	170	200	170	190	190	100	200
Nitrogen, Total Kjeldahl	450	570	380	270	880	350	1,000	570	1,800	1,500	1,500	1,600	2,200	1,200	1,200	980	1,500	1,200	510	1,600
Cyanide, Total	1.4 U	1.4 U	1.3 U	1.1 U	1.6 U	1.4 U	1.5 U	1.4 U	1.9 U	1.7 U	1.7 U	1.7 U	1.8 U	1.5 U	1.6 U	1.5 U	1.8 U	1.7 U	1.3 U	1.8 U
Total Organic Carbon	3,900	4,400	2,900	2,500 J	4,400	5,400	11,000	3,900	10,000	11,000	11,000	10,000	9,200	9,500	7,600	6,700	6,400	7,000	5,300	8,800

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated

Table 24: Bulk metals analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012)

Metal - mg/kg (ppm)	Reference Area Sites				Placement Area Sites				Harbor Area Sites											
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COD-3	COD-4	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aluminum	6,400	6,900	4,800	4,200	6,100	5,200	10,000	6,300	15,000	13,000	15,000	14,000	14,000	12,000	13,000	13,000	14,000	12,000	6,100	14,000
Arsenic	4.6	6.2	12	12	7.9	6	9.6	6.2	10	9.2	9.7	11	14	12	12	11	14	12	10	14
Barium	32	39	37	28	43	27	58	29	77	68	72	72	66	52	58	59	69	55	32	64
Beryllium	0.39	0.37	0.41	0.28 J	0.45	0.3 J	0.6	0.33 J	0.75	0.64	0.7	0.72	0.8	0.63	0.54	0.58	0.62	0.62	0.34 J	0.69
Cadmium	0.57	0.69	0.95	0.33	1.6	0.61	0.58	1.1	0.59	0.58	0.64	0.63	0.74	0.59	0.57	0.67	0.66	0.66	0.46	0.81
Calcium	6,200	5,700	5,900	6,000	6,400	7,000	4,600	6,700	4,000	5,300	6,100	9,300	20,000	15,000	12,000	15,000	13,000	13,000	22,000	21,000
Chromium	14	15	14	8.3	24	13	17	18	22	20	22	22	23	19	20	21	23	20	10	22
Cobalt	8.1	9.3	7.8	6.4	8.5	7.4	13	7.4	14	13	14	14	15	13	13	13	16	13	8.5	15
Copper	12	16	12	5	21	15	22	14	24	24	26	28	33	29	28	28	32	29	20	38
Iron	20,000	22,000	21,000	17,000	19,000	17,000	27,000	19,000	33,000	32,000	36,000	35,000	38,000	33,000	34,000	35,000	38,000	34,000	21,000	38,000
Lead	17	25	24	15	33	16	30	24	21	21	24	23	24	21	21	22	24	21	13	26
Magnesium	3,900	4,200	2,800	2,200	3,900	3,700	4,200	4,000	5,100	4,900	5,500	6,100	7,500	7,200	6,800	6,700	7,400	6,800	4,900	7,400
Manganese	280	300	370	300	290	250	400	310	520	440	500	500	590	490	520	530	590	500	390	660
Nickel	20	23	22	15	27	19	28	20	31	30	33	33	37	30	31	32	37	32	20	36
Potassium	1,000	1,200	790	710	1,400	890	1,300	920	2,100	1,900	2,100	1,900	2,300	1,900	1,900	1,800	2,200	1,900	1,000	2,200
Selenium	0.39 J	0.56 J	0.52 J	0.38 J	0.73 J	0.44 J	0.67 J	0.56 J	0.67 J	0.85 J	0.82 J	0.75 J	1 J	0.57 J	0.75 J	0.68 J	0.78 J	0.7 J	0.37 J	0.92 J
Sodium	100	100	94	100	89	100	120	99	86 J	91 J	130	95 J	120 J	100 J	100 J	110	110	99	120	120
Thallium	0.16 J	0.21 J	0.14 J	0.12 J	0.23 J	0.14 J	0.19 J	0.17 J	0.28 J	0.26 J	0.26 J	0.28 J	0.34 J	0.28 J	0.27 J	0.28 J	0.34 J	0.29 J	0.16 J	0.36 J
Vanadium	14	16	15	9.4	18	13	16	12	22	20	21	21	24	20	20	20	23	20	12	23
Zinc	84	110	96	72	120	79	100	130	110	99	110	110	120	100	100	110	120	110	86	120
Antimony	0.18 J	0.26	0.21 J	0.12 J	0.28	0.14 J	0.1 J	0.15 J	0.23 J	0.12 J	0.12 J	0.12 J	0.15 J	0.13 J	0.11 J	0.1 J	0.15 J	0.18 J	0.13 J	0.18 J
Silver	0.12 J	0.14	0.13 J	0.039 J	0.24	0.096 J	0.073 J	0 15	0.11 J	0.089 J	0.089 J	0.082 J	0 11 J	0.12 J	0.091 J	0.086 J	0.11 J	0.12 J	0.073 J	0.12 J
Mercury	0.03	0.061	0 039	0.0068 J	0.082	0.028	0.042	0 047	0 025	0.028	0.032	0.03	0 022 J	0 019	0.027	0.03	0 032	0.029	0.012	0.037

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

Table 25: Bulk polycyclic aromatic hydrocarbon (PAH) analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012)

PAH - µg/kg (ppb)	Reference Area Sites								Placement Area Sites								Harbor Area Sites																			
	COH-1		COH-2		COH-3		COH-4		COD-1		COD-2		COD-3		COD-4		COH-1		COH-2		COH-3		COH-4		COH-5		COH-6		COH-7		COH-8		COH-9		COH-10		COH-11		COH-12	
2-Methylnaphthalene	11	U	15	J	12	U	10	U	22	J	11	U	100	J	13	J	20	J	14	U	17	J	17	J	17	U	13	J	44	J	22	J	27	J	29	J	11	U	38	J
Acenaphthene	10	U	37	J	11	U	9	U	20	J	9.3	U	27	J	11	J	14	U	12	U	12	U	13	U	15	U	11	U	15	J	11	U	13	U	19	J	9.6	U	35	J
Acenaphthylene	23	J	51	J	10	U	8.7	U	16	J	9.7	U	17	J	14	J	13	U	12	U	16	J	12	U	14	U	14	J	13	J	13	J	14	J	18	J	9.2	U	27	J
Anthracene	31	J	74	J	12	J	9.9	U	37	J	11	J	58	J	31	J	21	J	18	J	28	J	35	J	66	J	49	Jm	42	J	36	J	44	Jm	78	Jm	20	J	87	J
Benzo(a)anthracene	130	J	160	J	37	J	13	U	110	J	44	J	150	J	74	J	68	J	57	J	74	J	90	J	87	Jm	120	Jm	110	Jm	90	Jm	98	Jm	160	Jm	49	J	260	J
Benzo(a) pyrene	140	J	270		47	J	12	U	150	J	51	J	170	J	110	J	100	J	64	J	84	J	99	J	100	J	120	J	120	J	99	J	110	J	190	J	47	J	290	J
Benzo(b) fluoranthene	170	Jm	270	m	88	Jm	11	U	200	Jm	59	Jm	220	Jm	150	Jm	130	Jm	80	Jm	110	Jm	130	Jm	140	Jm	170	Jm	160	Jm	150	Jm	160	Jm	260	m	69	Jm	370	m
Benzo(g,h,i) perylene	110	J	150	J	34	J	14	U	150	J	49	J	100	Jm	80	J	62	J	30	J	32	J	40	J	43	J	48	J	110	J	49	J	41	J	70	J	15	U	240	J
Benzo(k) fluoranthene	57	Jm	130	Jm	230	U	21	U	76	Jm	26	Jm	74	Jm	51	Jm	51	Jm	35	Jm	37	Jm	55	Jm	51	Jm	63	Jm	47	Jm	47	Jm	69	Jm	95	Jm	23	Jm	150	Jm
Chrysene	170	J	210	J	58	J	11	U	160	J	60	J	190	J	120	Jm	93	J	70	J	90	J	120	J	110	J	150	J	160	J	130	J	130	J	210	J	70	J	360	
Dibenzo(a,h) anthracene	36	U	37	U	38	U	32	U	43	U	35	U	40	U	36	U	48	U	44	U	42	U	45	U	54	U	41	U	42	U	40	U	47	U	43	U	34	U	50	U
Fluoranthene	250		340		90	J	26	J	180	J	100	J	350		150	J	180	J	140	J	180	J	250	J	230	J	310		250	J	270		270	J	490		160	J	550	
Fluorene	13	U	20	J	13	U	11	U	21	J	12	U	47	J	14	J	17	U	16	U	15	U	17	J	19	U	18	J	27	J	21	J	24	J	37	J	13	J	56	J
Indeno(1,2,3-cd) pyrene	88	J	130	J	31	J	10	U	130	J	36	J	94	Jm	80	J	70	J	30	J	32	J	43	J	45	J	53	J	94	J	49	J	48	J	77	J	15	J	190	J
Naphthalene	14	J	35	J	10	J	7.8	U	37	J	8.5	U	63	J	27	J	12	U	11	U	10	U	11	U	13	U	9.9	U	29	J	15	J	16	J	21	J	8.3	U	29	J
Phenanthrene	85	J	110	J	34	J	11	U	110	J	35	J	240		70	J	90	J	68	J	91	J	130	J	130	Jm	150	J	160	J	140	J	160	J	270		90	J	310	
Pyrene	330		300	m	81	J	28	J	260	J	92	J	340		210	J	130	J	110	J	130	J	180	J	170	J	240	J	240	J	210	J	210	J	370		120	J	620	
Total PAHs	1,668		2,339		814		246		1,731		649		2,280		1,251		1,119		811		1,000		1,287		1,304		1,581		1,663		1,392		1,481		2,437		763		3,662	

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

m = Manual integration used to determine area response

Table 25a: Acute equilibrium partitioning-based sediment benchmark toxic units (ESBTUs) for pyrogenic PAH compound concentrations in Conneaut Harbor Federal navigation channel sediment samples (USEPA 2003; based on data from RTI, 2012)

PAH - µg/kg (ppb)	$C_{oc,PAH,FAVI}$ (µg/g)*	COH-10	$ESBTU_{FAVI}$	COH-12	$ESBTU_{FAVI}$
Acenaphthene	2043	19	0.0013	35	0.0019
Acenaphthylene	1880	18	0.0014	27	0.0016
Anthracene	2471	78	0.0045	87	0.0040
Benzo(a)anthracene	3499	160	0.0065	260	0.0084
Benzo(a) pyrene	4014	190	0.0068	290	0.0082
Benzo(b) fluoranthene	4073	260	0.0091	370	0.0103
Benzo(g,h,i) perylene	4555	70	0.0022	240	0.0060
Benzo(k) fluoranthene	4081	95	0.0033	150	0.0042
Chrysene	3511	210	0.0085	360	0.0117
Dibenzo(a,h) anthracene	4672	43	0.0013	50	0.0012
Fluoranthene	2941	490	0.0238	550	0.0213
Fluorene	2238	37	0.0024	56	0.0028
Indeno(1,2,3-cd) pyrene	4638	77	0.0024	190	0.0047
Naphthalene	1602	21	0.0019	29	0.0021
Phenanthrene	2479	270	0.0156	310	0.0142
Pyrene	2900	370	0.0182	620	0.0243
Total PAHs		2,408		3,624	
Total Organic Carbon - mg/kg		7,000		8,800	
$\sum ESBTU_{FAV,34}$**			0.3713		0.4315

Note: Results are reported as dry weight. **Po**

* Based on an ACR of 4.16 (USEPA 2003)

** Includes sum of $ESBTU_{FAVI}$ values multiplied by an uncertainty factor of 3.4, which is a conservative value for pyrogenic PAHs at 95% confidence interval (USEPA, 2003)

Table 26: Bulk polychlorinated biphenyl (PCB) analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012)

PCB - µg/kg (ppb)	Reference Area Sites				Placement Area Sites				Harbor Area Sites												
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COD-3	COD-4	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aroclor-1016	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1221	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1232	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1242	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1248	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1254	14 J	29 J	27 J	41 U	71 J	23 J	20 J	58 J	62 U	57 U	53 U	56 U	66 U	31 J	35 J	26 J	26 J	34 J	22 J	45 J
Aroclor-1260	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Aroclor-1262	45 U	47 U	48 U	41 U	55 U	44 U	50 U	46 U	62 U	57 U	53 U	56 U	66 U	52 U	53 U	51 U	58 U	53 U	43 U	63 U
Total Organic Carbon		4,400			4,400									9,500	7,600			7,000		8,800
Theoretic Bioaccumulation Potential (TBP)		0.104			0.258									0.051	0.073			0.077		0.081

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

Table 27: Bulk pesticide analyses on Conneaut Harbor Federal navigation channel sediments (RTI, 2012)

Pesticide - ug/kg (ppb)	Reference Area Sites				Placement Area Sites				Harbor Area Sites													
	COL-1	COL-2	COL-3	COL-4	COD-1	COD-2	COD-3	COD-4	COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
4,4-DDD	2.3 U	2.4 U	2.5 U	2.1 U	2.1 J	0.73 J	2.6 U	2.2 J	3.2 U	2.9 U	2.7 U	2.9 U	3.4 U	2.7 U	2.7 U	2.6 U	3.0 U	2.7 U	2.2 U	3.2 U
4,4-DDE	1.1 U	1.2 U	0.64 Jm	1.0 U	1.9	0.64 J	1.1 J	1.5	1.1 J	1.0 Jm	1.1 J	0.99 J	1.0 J	0.79 J	1.0 J	1.0 Jm	1.1 J	1.0 J	0.62 J	1.1 J
4,4-DDT	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Aldrin	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
alpha-BHC	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
alpha-Chlordane	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
beta-BHC	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
delta-BHC	1.1 U	1.2 U	0.6 J	1.2	1.2 Jm	0.51 Jm	1.2 U	0.6 Jm	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	0.96 Jm	1.3 U	1.1 Jm	0.85 J	1.4	1.1	1.9
Dieldrin	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	0.88 J	1.6 U
Endosulfan I	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Endosulfan II	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Endosulfan sulfate	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	0.81 J	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Endrin	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Endrin aldehyde	1.1 U	1.2 U	1.2 U	1.0 U	0.94 J	1.1 U	1.2 U	1.5	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Endrin ketone	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
gamma-BHC (Lindane)	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
gamma-Chlordane	1.1 U	0.59 J	0.72 J	1.0 U	1.9	0.59 J	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Heptachlor	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Heptachlor epoxide	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U
Methoxychlor	1.1 U	1.2 U	1.2 U	1.0 U	1.4 U	1.1 U	1.2 U	1.2 U	1.6 U	1.4 U	1.3 U	1.4 U	1.7 U	1.3 U	1.3 U	1.3 U	1.5 U	1.3 U	1.1 U	1.6 U

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

m = Manual integration used to determine area response.

Table 28: Site water and elutriate inorganics analyses on Conneaut Harbor Federal Navigation channel sediments (RTI, 2012)

Inorganic Parameter - mg/L (ppm)	Lake Site Water	Harbor Area Sites											
		COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Oil and Grease	2.5 U	**1.3 J**	**3.7 J**	**3.6 J**	**2.2 J**	**1.1 J**	2.5 U	2.5 U	**1.0 J**	2.5 U	2.5 U	**3.0 J**	2.5 U
Nitrogen, Ammonia	**0.067 J**	**5.3**	**2.7**	**2.3**	**1.8**	**7.8**	**0.66**	**2.5**	**2.4**	**4.3**	**2.5**	**0.77**	**2.1**
Phosphorus, Total as P	0.008 U	**0.0088 J**	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Nitrogen, Total Kjeldahl	**0.9**	**5.6**	**3.3**	**2.8**	**2.3**	**6.7**	**2.4**	**3.2**	**2.5**	**3.3**	**3.1**	**1.6**	**1.6**
Cyanide, Total	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

Table 29: Site water and elutriate metals analyses on Conneaut Harbor Federal Navigation channel sediments (RTI, 2012)

Metal - mg/L (ppm)	Lake Site Water	Harbor Area Sites											
		COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aluminum	0.0075 J	0.34	0.039 J	0.015 J	0.01 J	0.0093 J	0.0081 J	0.098	0.027 J	0.018 J	0.042 J	0.039 J	0.011 J
Arsenic	0.00074 J	0.015	0.0096	0.0027	0.0033	0.0068	0.0026	0.0078	0.0054	0.0083	0.0064	0.0023	0.0048
Barium	0.023 J	0.36	0.29	0.23	0.23	0.35	0.23	0.33	0.26	0.32	0.31	0.2	0.24
Beryllium	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Cadmium	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Calcium	31	34	36	34	33	43	34	32	32	37	31	36	31
Chromium	0.00068 J	0.00096 J	0.00056 J	0.00083 J	0.00082 J	0.00082 J	0.00072 J	0.00067 J	0.00062 J	0.0006 J	0.0006 J	0.0009 J	0.00058 J
Cobalt	0.0005 U	0.00082 J	0.0004 J	0.0002 J	0.00022 J	0.00084 J	0.0002 J	0.00049 J	0.00042 J	0.0006 J	0.00042 J	0.00012 J	0.00031 J
Copper	0.0016 J	0.002 J	0.0012 J	0.002 J	0.00096 J	0.0014 J	0.001 J	0.00098 J	0.00096 J	0.001 J	0.00086 J	0.0025 J	0.0018 J
Iron	0.12 U	3.6	1	0.076 J	0.077 J	0.42	0.12 U	0.47	0.12 U	0.16 J	0.5	0.098 J	0.12 U
Lead	0.0005 U	0.0011	0.0005 J	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00026 J	0.0005 U	0.0005 U	0.0012	0.0015	0.0005 U
Magnesium	8.6	7.8	8.7	8.8	8.1	9.3	8.1	6.8	6.4	7.7	6.7	8.2	6.7
Manganese	0.012	1.8	0.84	0.29	0.48	1.3	0.41	1.1	0.86	1.5	1.1	0.14	0.6
Nickel	0.0013 J	0.0024 J	0.0018 J	0.0014 J	0.0015 J	0.0037 J	0.0017 J	0.0019 J	0.0018 J	0.0022 J	0.0019 J	0.0018 J	0.0017 J
Potassium	1.4	3.0	2.3	2.1	1.9	3.4	2.2	2.3	2.1	2.8	2.1	2.0	2.0
Selenium	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U	0.0025 U
Sodium	9.5	13	13	14	11	121	11	12	11	12	12	12	11
Thallium	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.00088 J
Vanadium	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Zinc	0.013 J	0.16	0.11	0.057	0.062	0.13	0.046 J	0.084	0.048 J	0.089	0.094	0.05	0.056
Antimony	0.00067 J	0.00066 J	0.0011 J	0.0005 U	0.0005 U	0.0011 J	0.0006 J	0.00074 J	0.0012 J	0.00099 J	0.0008 J	0.011 J	0.001 J
Silver	0.0005 U	0.00022 J	0.00026 J	0.00023 J	0.0005 U	0.00025 J	0.0005 U	0.0005 U	0.0005 U	0.00019 J	0.0005 U	0.0005 U	0.0005 U
Mercury	0.0001 U	0.000049 J	0.000049 J	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.000029 J	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

Table 30: Site water and elutriate polycyclic aromatic hydrocarbon (PAH) analyses on Conneaut Harbor Federal Navigation channel sediments (RTI, 2012)

PAH - ug/L (ppb)	Lake Site Water	Harbor Area Sites											
		COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
2-Methylnaphthalene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Acenaphthene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Acenaphthylene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Anthracene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Benzo(a)anthracene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Benzo(a) pyrene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Benzo(b) fluoranthene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Benzo(g,h,i) perylene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Benzo(k) fluoranthene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Chrysene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Dibenzo(a,h) anthracene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Fluoranthene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Fluorene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Indeno(1,2,3-cd) pyrene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Naphthalene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Phenanthrene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U
Pyrene	0.51 U	0.53 U	0.51 U	0.5 U	0.5 U	0.51 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.52 U	0.53 U

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

Table 31: Site water and elutriate polchlorinated bipheynl (PCB) analyses on Conneaut Harbor Federal Navigation channel sediments (RTI, 2012)

PCB - µg/L (ppb)	Lake Site Water	Harbor Area Sites											
		COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
Aroclor-1016	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1221	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1232	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1242	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1248	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1254	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1260	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Aroclor-1262	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

Table 32: Site water and elutriate pesticide analyses on Conneat Harbor Federal Navigation channel sediments (RTI, 2012)

Pesticide - ug/L (ppb)	Lake Site Water	Harbor Area Sites											
		COH-1	COH-2	COH-3	COH-4	COH-5	COH-6	COH-7	COH-8	COH-9	COH-10	COH-11	COH-12
4,4-DDD	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
4,4-DDE	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
4,4-DDT	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Aldrin	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
alpha-BHC	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
alpha-Chlordane	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Beta-BHC	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Chlordane, total	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
delta-BHC	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	**0.0044 J**	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Dieldrin	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endosulfan I	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endosulfan II	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endosulfan sulfate	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endrin	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endrin aldehyde	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Endrin ketone	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
gamma-BHC (Lindane)	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
gamma-Chlordane	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	**0.023**	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Heptachlor	0.0041 U	0.0043 U	**0.0059 J**	0.004 U	**0.0028 Jm**	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	**0.0053 J**	0.0043 U
Heptachlor epoxide	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Methoxychlor	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U
Toxaphene	0.0041 U	0.0043 U	0.004 U	0.004 U	0.004 U	0.004 U	0.0042 U	0.0041 U	0.0042 U	0.004 U	0.0042 U	0.004 U	0.0043 U

Note: Results are reported as dry weight. Positive detections are presented in bold.

U = Indicates the compound was analyzed for but not detected at or above the reporting limit (RL).

J = Indicates values below the RL but greater than the established method detection limit (MDL). There is greater uncertainty associated with these results and data should be considered as estimated.

m = Manual integration used to determine area response.

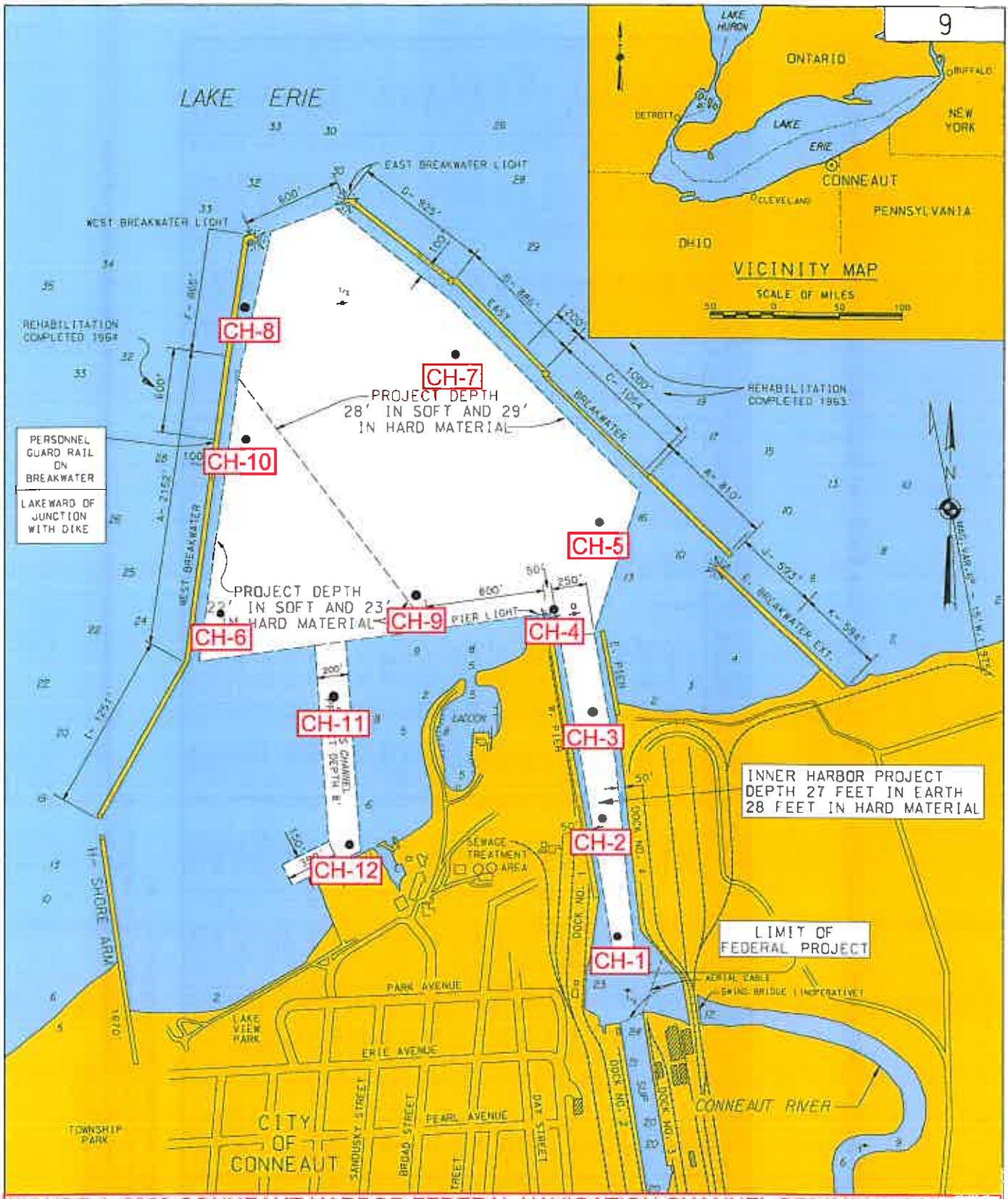

FIGURE 1: 2003 CONNEAUT HARBOR FEDERAL NAVIGATION CHANNEL SEDIMENT SAMPLE LOCATIONS.

NOTES

PROJECT DEPTH AND SOUNDINGS ARE REFFERED TO LOW WATER DATUM ELEVATION 569.2 FEET ABOVE MEAN WATER LEVEL AT RIMOUSKI. QUEBEC (IGLD 1985) (INTERNATIONAL GREAT LAKES DATUM 1985)

MILES FROM WEST PIER LIGHT

(7) INDICATES STATE ROUTES

CONNEAUT HARBOR
OHIO

SCALE OF FEET

500 0 500 1000 1500

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 2000

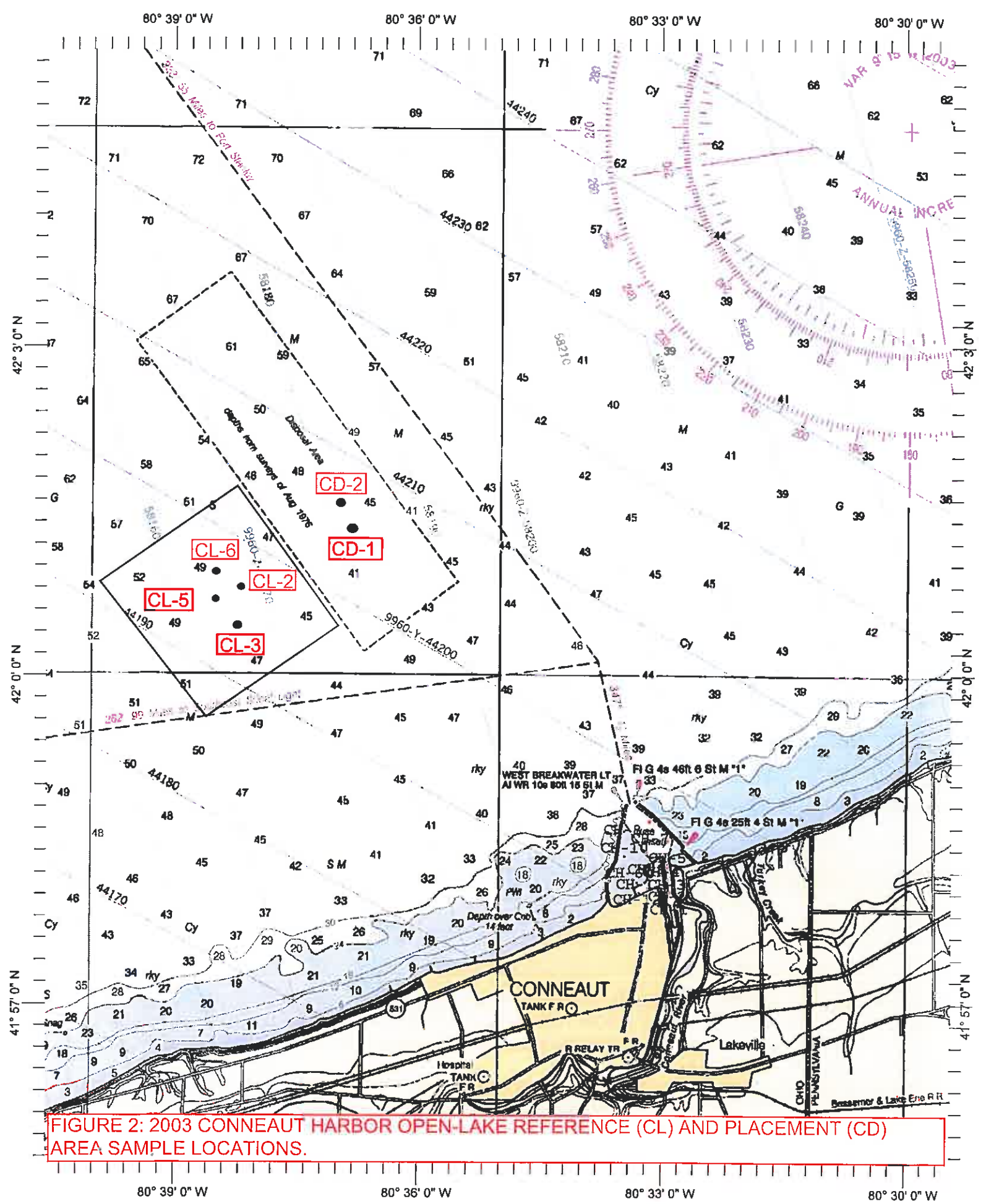

FIGURE 2: 2003 CONNEAUT HARBOR OPEN-LAKE REFERENCE (CL) AND PLACEMENT (CD) AREA SAMPLE LOCATIONS.

Chart Name: SIXTEENMILE CREEK TO CONNEAUT
Chart ID: 14824_1
Top Left: 42° 5' 42" N 80° 40' 34" W
Bottom Right: 41° 55' 32" N 80° 29' 25" W

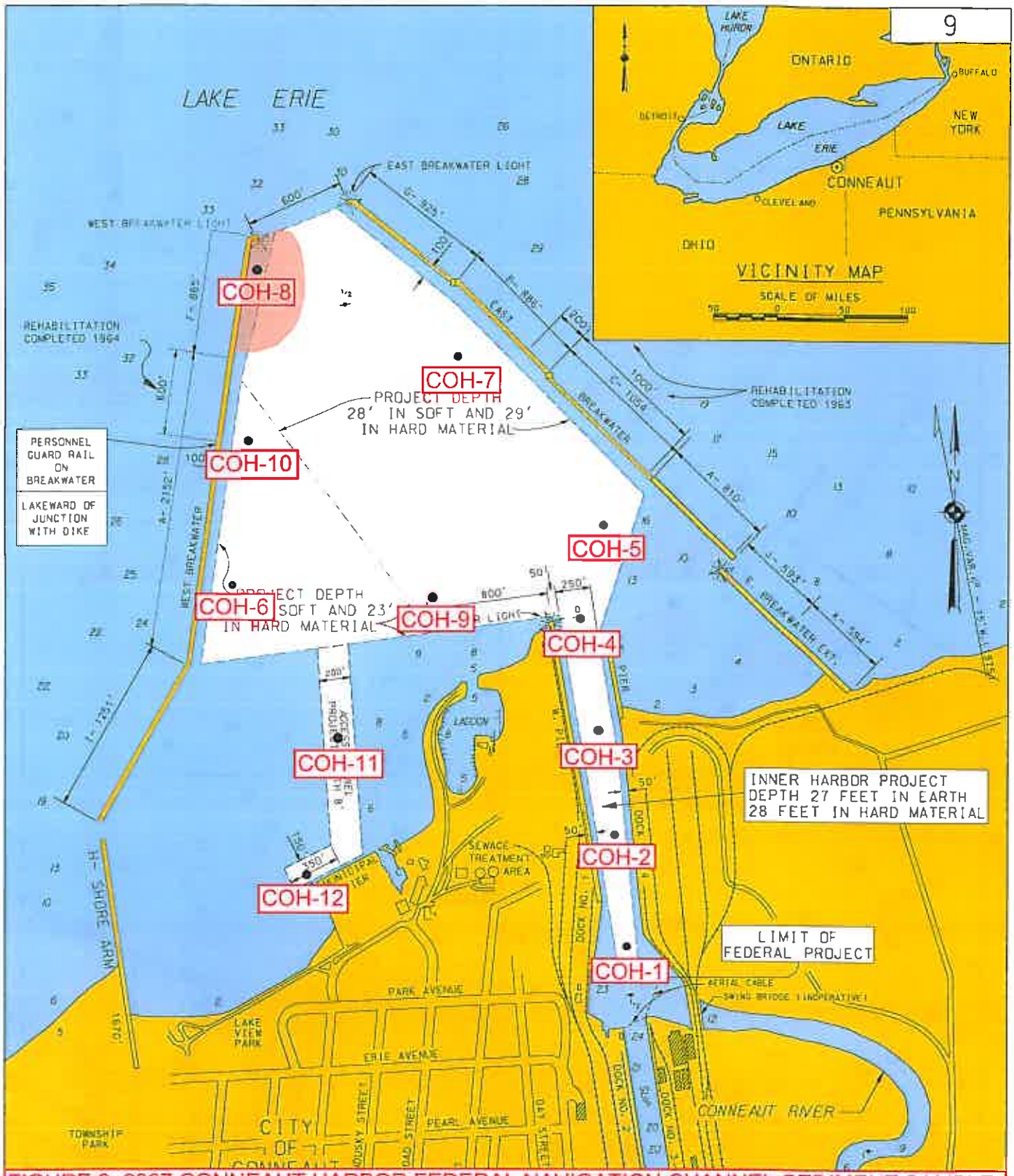

FIGURE 3: 2007 CONNEAUT HARBOR FEDERAL NAVIGATION CHANNEL SEDIMENT SAMPLE LOCATIONS. (AREA SHADED IN RED INDICATES PORTION THAT IS NOT SUITABLE FOR OPEN-LAKE PLACEMENT)

NOTES

PROJECT DEPTH AND SOUNDINGS ARE REFFERED TO LOW WATER DATUM ELEVATION 569.2 FEET ABOVE MEAN WATER LEVEL AT RIMOUSKI, QUEBEC (IGLD 1985) (INTERNATIONAL GREAT LAKES DATUM 1985)

→ MILES FROM WEST PIER LIGHT

(7) INDICATES STATE ROUTES

CONNEAUT HARBOR
OHIO

SCALE OF FEET

500 0 500 1000 1500

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 2000

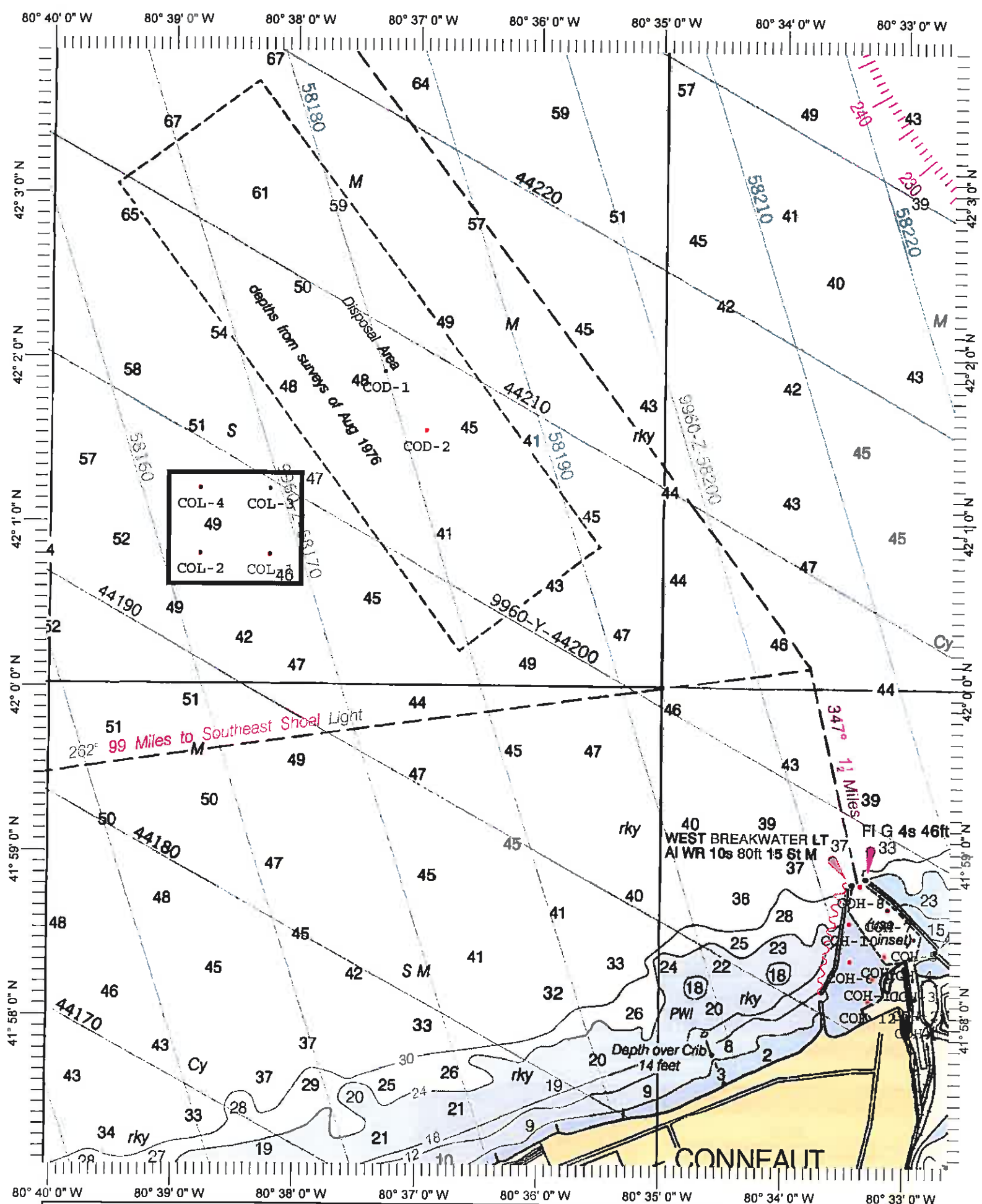

FIGURE 4: 2007 Conneaut Harbor Open-Lake Reference (COL) and Disposal (COD) Area Sampling Locations.

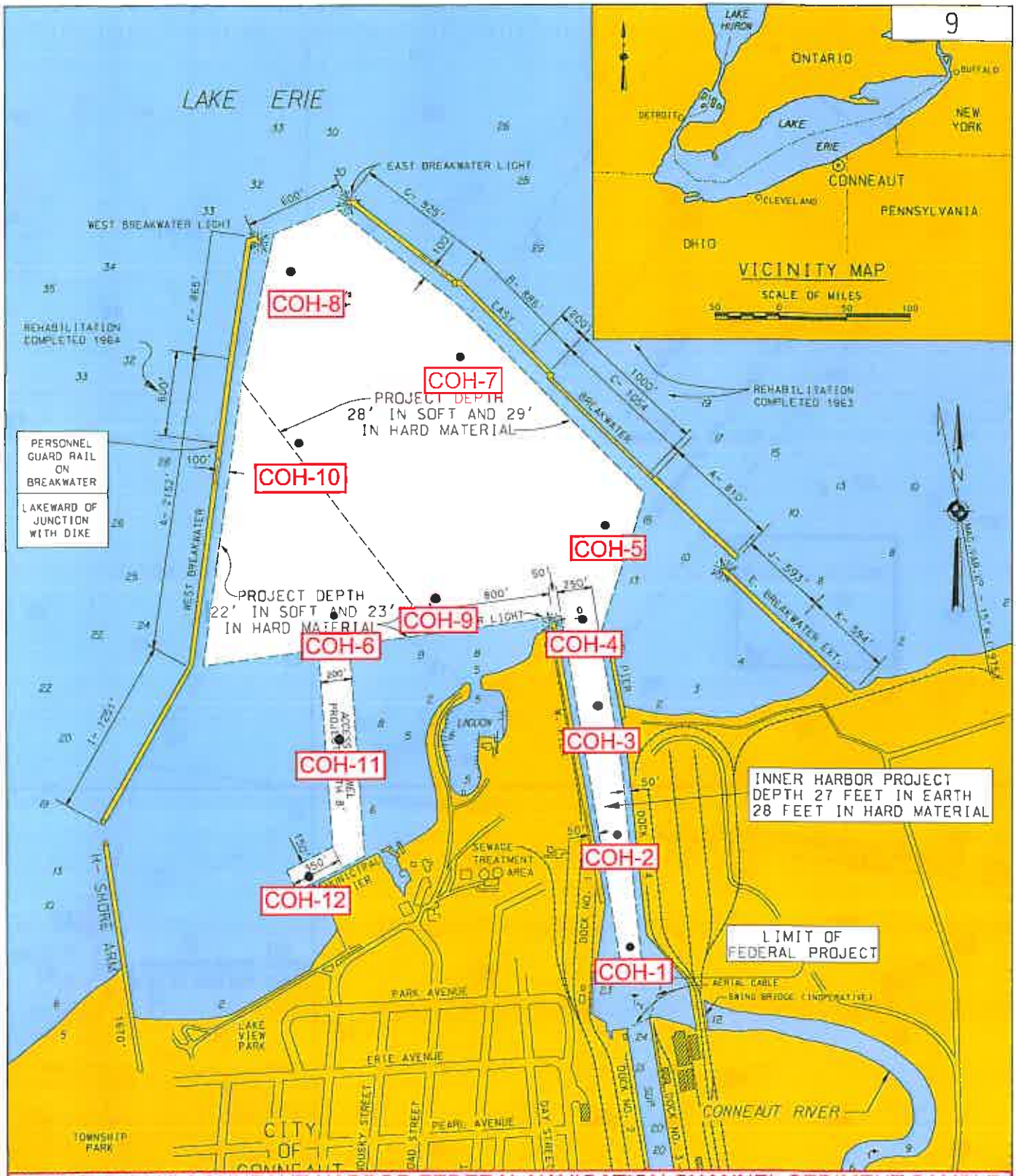

FIGURE 5: 2012 CONNEAUT HARBOR FEDERAL NAVIGATION CHANNEL SEDIMENT SAMPLE LOCATIONS.

NOTES

PROJECT DEPTH AND SOUNDINGS ARE REFFERED TO LOW WATER DATUM ELEVATION 569.2 FEET ABOVE MEAN WATER LEVEL AT RIMOUSKI. QUEBEC (IGLD 1985) (INTERNATIONAL GREAT LAKES DATUM 1985)

MILES FROM WEST PIER LIGHT

(7) INDICATES STATE ROUTES

CONNEAUT HARBOR
OHIO

SCALE OF FEET
500 0 500 1000 1500

U.S. ARMY ENGINEER DISTRICT BUFFALO
MAY 2000

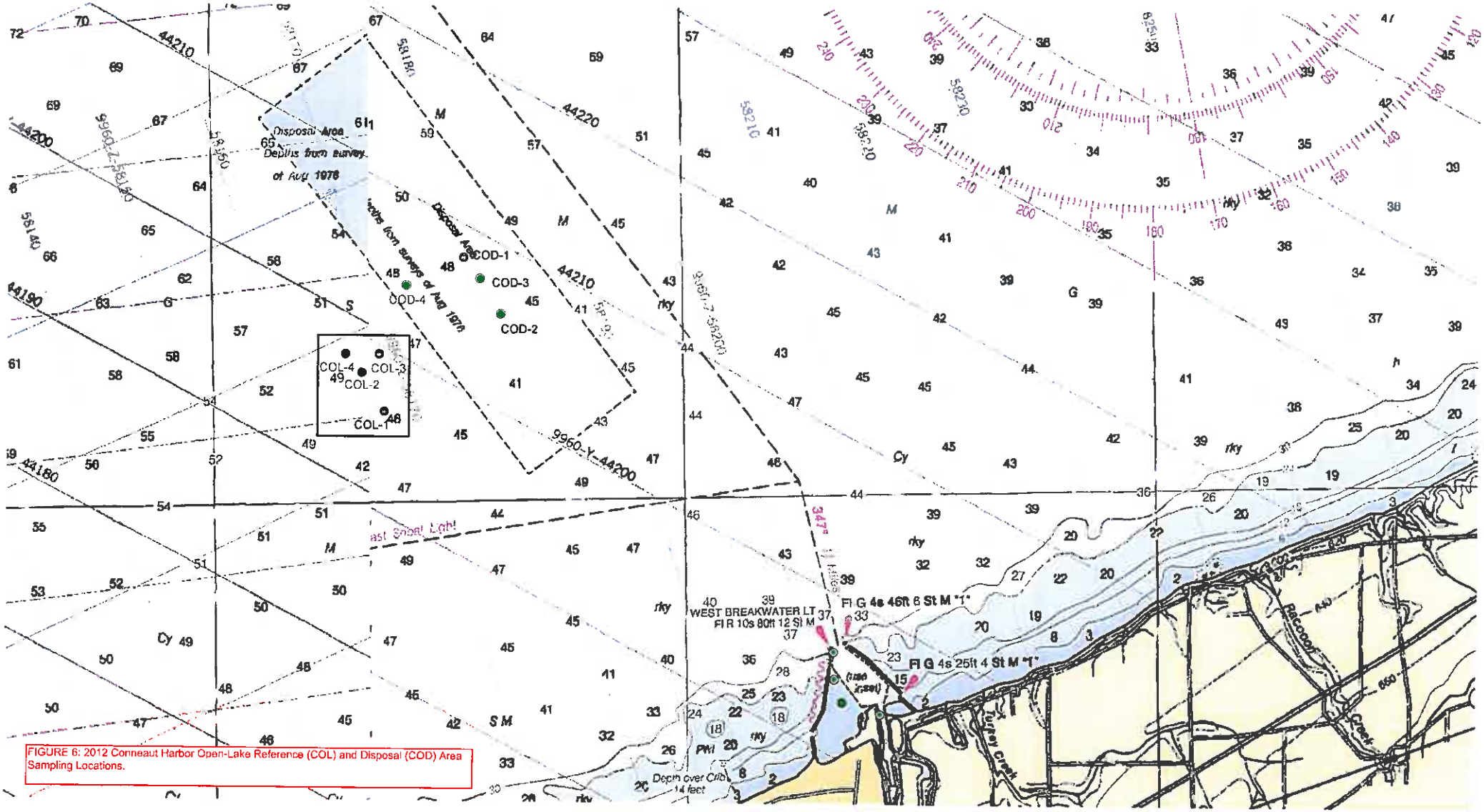

FIGURE 6: 2012 Conneaut Harbor Open-Lake Reference (COL) and Disposal (COD) Area Sampling Locations.

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