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MAINTENANCE DREDGING OF THE FEDERAL NAVIGATION CHANNELS IN THE --ETC(U)
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SUMMARY

MAINTENANCE DREDGING OF THE FEDERAL NAVIGATION CHANNELS ST. CLAIR RIVER, MICHIGAN

( ) DRAFT ENVIRONMENTAL STATEMENT (X) FINAL ENVIRONMENTAL STATEMENT

RESPONSIBLE OFFICE: U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231
Telephone: (313) 226-6752

1. NAME OF ACTION: (X) ADMINISTRATIVE ( ) LEGISLATIVE

2. DESCRIPTION OF ACTION: The proposed action is to perform maintenance dredging of the St. Clair River when required to remove shoaling. Average annual volume removed is approximately 130,000 cubic yards consisting primarily of gravel, sand, and silt. The material removed will be disposed of in deep water or placed on selected onshore sites. All materials scheduled for removal from the St. Clair River have been classified by the U.S. Environmental Protection Agency as suitable for unrestricted open water disposal. Most maintenance operations are accomplished by hopper dredge, but a derrickboat utilizing a bucket dredge removes channel obstructions if rock rather than sand or silt must be removed. The open water disposal sites used by the hopper dredge are located in the deep water of Lake Huron several miles north of the Blue Water Bridge and during 1976 in deep water of the North Channel adjacent to Point Au Chenes. The use of the North Channel disposal area will be discontinued after the 1976 work season. In subsequent years sediments removed from the lower reaches of the river will be stockpiled at an onshore site furnished by the Michigan Department of Natural Resources for future project uses in the maintenance and further development of the St. Clair Flats Wildlife Area.

3. A. ENVIRONMENTAL IMPACT: The proposed continuance of maintenance dredging operations would sustain a deep water channel throughout the length of the St. Clair River. Maintenance dredging of the Federal Navigation Channels would restore authorized project depths enabling cargo vessels to utilize maximum draft loads with subsequent economic benefit. The resuspension of sediments associated with the removal and open water disposal operations would have negative influences of varying degree upon the adjacent aquatic environment.

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B. ADVERSE ENVIRONMENTAL IMPACT: Maintenance dredging of sand and silt will cause short-term adverse environmental effects in both the area being dredged and the open water disposal sites. The primary effect of the operations will be a temporary increase in turbidity and the associated short-term degradation in water quality both in the dredged channel and at the open water disposal sites. Benthic organisms and rooted aquatic plants that have colonized the area to be dredged will be destroyed. Benthic populations in the disposal areas will be smothered. The aquatic biota may also experience long-term effects. Due to annual dredging and disposal, the species composition may never reach a true balance, and maximum sustained population diversity may never be reached. The impact on onshore disposal areas will be minimal since selection of such sites will be based on their condition of providing negligible loss to the natural environment.

4. ALTERNATIVES CONSIDERED:

A. Alternative of No Action.

B. Alternative of Mechanical Dredging.

C. Dredging to a Lesser Depth.

D. Alternative Disposal Methods.

5. COMMENTS RECEIVED:

Federal Agencies
U.S. Department of the Interior
U.S. Environmental Protection Agency
U.S. Department of Commerce - Assistant Secretary for Science and Technology
U.S. Department of Agriculture - Soil Conservation Service
U.S. Department of Agriculture - Forest Service
Advisory Council on Historic Preservation
Department of Housing and Urban Development

State Agencies
Michigan Department of Natural Resources
Michigan Department of State Highways and Transportation
Michigan Department of State

Local Agencies/Public Utilities
City of Detroit - City Engineering Department
Detroit Metro Water Department
Detroit Edison Company

Comments were also requested from all organizations and citizens shown to be interested in the project.

6. DRAFT STATEMENT TO CEQ: 20 August 1975.
FINAL STATEMENT TO CEQ: 15 July 1976.

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MAINTENANCE DREDGING OF THE
FEDERAL NAVIGATION CHANNELS
ST. CLAIR RIVER, MICHIGAN

1. PROJECT DESCRIPTION

A. Scope of Work

1.01 The U.S. Army Corps of Engineers proposes to perform maintenance dredging of the Federal Navigation Channels in the St. Clair River when required to remove shoaling. The material removed will be disposed in deep open water of Lake Huron and the St. Clair River or placed ashore at selected sites. All materials scheduled for removal from the St. Clair River are from stretches classified by the U.S. Environmental Protection Agency (EPA) as being suitable for unrestricted open water disposal.

1.02 The annual removal of shoaling of these navigation channels is essential to the safe navigation of domestic and foreign deep-draft vessels sailing between Lake St. Clair and Lake Huron. U.S. waterborne commerce on the St. Clair River for the period 1965 through 1974 averaged 107 million tons of cargo per year.

1.03 The Federal project consists of a navigation channel extending from the 30 foot contour of Lake Huron through the St. Clair River to Algonac, thence through the South Channel adjacent to Harsens Island into Lake St. Clair (Figure 1). Dredging in the Canadian waters of the Cut Off Channel is not accomplished by the United States Government, and is not a part of the dredging under consideration here. The material removed consists mostly of sand and silt. Average annual volume of material removed is about 130,000 cubic yards. Maintenance is usually accomplished by a Corps of Engineers hopper dredge during summer and autumn and by a Corps of Engineers derrickboat with a bucket dredge during spring and summer. See Chart No. 1A for controlling depth in each reach of the river.

1.04 The normal open water disposal sites used by the hopper dredge are located in deep water of Lake Huron several miles north of the Blue Water Bridge and for the remainder of 1976 in deep water of the North Channel adjacent to Point Au Chenes (see Figures 2 and 9). In future years dredged materials removed from the lower reaches of the river will be stockpiled at an onshore site on Harsens Island (Figure 8, Site No. 1) recommended by the Michigan Department of Natural Resources (MDNR). It is planned to make use of these materials in public project works at the St. Clair Flats Wildlife Area. The material removed by derrickboat is small in volume and consists primarily of scattered obstructions of hard material. The latter will be disposed of in deep water outside

and adjacent to the selection of the channel from which it was removed, or placed ashore at upland sites. Such onshore sites will be limited to those properties that have been granted prior Federal and State permits for such activity. This restriction will insure that such areas and proposed action have been given suitable review and are in compliance with the National Environmental Policy Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, Endangered Species Act, Coastal Zone Management Act, Marine Protection, Research and Sanctuary Act, and the Federal Water Pollution Control Acts.

B. Authority

1.05 The existing project was authorized by the Rivers and Harbors Acts of July 13, 1892, July 3, 1930, March 2, 1945, July 24, 1946 and March 21, 1956. This provides for channels through the St. Clair River which at low water datum are suitable for vessels drawing 35.5 feet; the project also provides for compensating works, consisting of a number (estimated at 31) of submerged rock sills, with crests 31 feet below datum and improvement of North Channel Outlet - 100' wide and 10' deep for recreational craft. The existing project is complete except for construction of the submerged rock sills and dredging the North Channel Outlet. Initiation of field investigations and detailed design studies have been deferred on these segments of the project authorization.

C. Federal Costs

1.06 As of 31 Dec. 1975, cumulative new work expenditures on the existing project were $19,213,246 and cumulative maintenance expenditures on the existing project were $5,246,804, for a total cost of $24,460,050.

2. ENVIRONMENTAL SETTING OF THE PROJECT AREA

A. General

2.01 The St. Clair River, a section of the Great Lakes connecting channels, is 40 miles long and flows in a southerly direction from Lake Huron into Lake St. Clair. The river forms the boundary between Ontario, Canada on the east and St. Clair County, Michigan, on the west.

2.02 The river is divided into two characteristic sections - a swift-flowing 28-mile long upper section, and a slower moving 12-mile long delta. Flow in the half-mile wide watercourse is interrupted between the headwaters and the delta only by two small islands (Stag and Fawn Islands) and one shoal. Within the delta the river subdivides into three channels - the North, Middle, and South Channels. A portion of the South Channel has been improved to form the St. Clair Cutoff, the dredged navigation channel which leads into Lake St. Clair.

2.03 The normal difference in water level between Port Huron, at the head of the St. Clair River, and Lake St. Clair is about 5 feet. The shipping channels provide a depth of 27.5 feet for downbound and upbound traffic through the river, and a single deep channel at the St. Clair Cutoff Channel. The river conveys an average of 179,000 cfs of water from Lake Huron to Lake St. Clair. The St. Clair River near its upper end has a velocity of about 5 m.p.h. through the narrow section, extending from about 1,000 feet above to 200 or 300 feet below the Blue Water Bridge at Port Huron, and a velocity of approximately 2 m.p.h. through the Cut-Off Canal entering Lake St. Clair. At intermediate points, the velocity varies irregularly between these limits. Banks of the river are clay and sand and usually quite steep.

2.04 Relief in the St. Clair's upper reaches is greater than in the lower; present high water levels, in fact, threaten to inundate the low banks found in these latter reaches. The County's highest point (890 feet) is in the northwest section. Large flat and low areas (575 to 600 foot elevation) are found in the southern portion of the County. The delta area, where the St. Clair River enters Lake St. Clair, 15,000 acres of marshland exist, including portions of Dickinson and Harsen's Islands.

2.05 The lightly-forested lands adjoining the river are characterized by oak-hickory and maple-beech-birch forest climaxes. Dairy farming and cash-crop farming are the predominant agricultural activities in the upland areas that are not urbanized.

B. Demography

2.06 Population of St. Clair County is now estimated at 125,500 persons. This represents at 17% increase over 1960 census figures. In spite of this increase in population, the change in percent of population living in urban places within St. Clair County has declined in the interim from 1950-1970 from 54% to 46%. It is the rural character of the growth which distinguishes St. Clair from the remaining counties in southeast Michigan. The county's rural areas areas are rapidly developing, with much of the growth occurring on the shoreline of the St. Clair River. The growth occurring along the river indicates that this portion of the waterway will eventually take on an urban character. The largest urban areas now on the U.S. side of the river are Port Huron and Marysville with populations of 35,794 and 5,610 persons, respectively. On the Canadian side a large population concentration is located at Sarnia, with over 57,000 persons. The largest other Ontario towns along the St. Clair River are Corunna (population 2,429) and Port Lambton (population 688).

2.07 Two Indian reserves (Canadian) have frontage on the St. Clair-Detroit system; one of these is found just south of Sarnia, and has about one-half mile of river frontage; the other is located on Walpole Island, in the St. Clair delta. As of December 1972, the population of the Walpole Island Indian Band was 1,649. On this number, 1,247 were domiciled on the reserve, with 402 living elsewhere. The reserve includes approximately 39,741 acres of land on Walpole Island itself, with several hundred acres of water.

2.08 If the St. Clair-Detroit Rivers system today constitutes a major corridor for waterborne traffic, and therefore a central axis of settlement, it should not be surprising that such has been the case since man first began to settle in southeast Michigan and southwest Ontario. According to evidence at the Holcombe site complex, located along an ancient glacial lake in Macomb County (inland), men first arrived in the St. Clair-Detroit region around 9000 B.C. Archaeological sites dating from the Archaic period (roughly from 8000-1500 B.C.) are found in the area. Woodland period remains are also in evidence; these date from the first millenium B.C.

2.09 In addition to prehistoric relics, there are many historical sites of importance. Historical development dating from the European contact period is evident throughout the region. The pattern of historic settlement attests to the geographic and economic importance of the littoral sector of this passage and of the riverine systems dissecting it. The known settlements in the study area - including both those of an historic and prehistoric nature - occupy several sectors of the region extending southward from Port Huron. Several aboriginal sites are found in the neighborhood of Port Huron; however, it seems that little development took place along the St. Clair River, since few sites have been discovered between Port Huron and Algonac. This is no doubt due in part to a lack of excavation in the region; however, it is probably also representative of a situation in which settlement was sparse. The shores of the St. Clair, which has a powerful current within these upper reaches, would probably not have been an attractive site for settlement in comparison to the lands surrounding the slower-moving waters of the delta. There is in fact a cluster of sites in the delta area, although even here settlement does not seem to have been dense. Note Figure No. 7, page A-16.

C. Waterborne Commerce

2.10 The St. Clair River is an important water transportation route. Table 1 indicates the freight traffic for the last ten years of record.

TABLE NO. 1

COMPARATIVE STATEMENT OF TRAFFIC

Year	Traffic of Ports Tons	Through Traffic Tons	Total Tons
1965*	5,329,390	101,686,333	107,015,723
1966*	5,521,260	108,407,386	113,928,646
1967*	5,416,199	95,608,260	101,024,459
1968*	5,654,167	101,482,613	107,136,780
1969*	6,129,208	103,144,802	109,274,010

TABLE NO. 1 (Cont)

COMPARATIVE STATEMENT OF TRAFFIC

Year	Traffic of Ports Tons	Through Traffic Tons	Total Tons
1970*	5,919,012	103,303,685	109,222,697
1971*	5,688,999	97,203,129	102,892,128
1972*	5,600,885	100,863,737	106,464,622
1973*	4,572,884	114,336,877	118,909,761
1974*	4,211,684	97,233,746	101,445,430

Section included: Entire length of St. Clair River and Black River up to Washington Avenue in Port Huron. Controlling Depths: 27 to 30 feet in St. Clair River at Port Huron and 20 feet in Black River. Navigation Dates: March 1 to December 30.

*Includes United States Commerce Only

2.11 In 1973 the main commodities carried upbound from the lower Great Lakes via this waterway are coal and lignite (15.3 million tons), iron ore concentrates (3.3 million tons), and finished iron and steel products (1.4 million tons); main products moving downbound are iron ore (57.6 million tons), limestone (17.9 million tons), grain (13.0 million tons), and building cement (1.2 million tons). By far, the major portion of freight traffic generated in ports along the St. Clair River are incoming shipments of limestone at Port Huron, coal and lignite at Marysville and St. Clair - large fossil-fueled electric generating plants are at these locations - and limestone at Marine City. Tables 2 through 5 indicate the comparative statement of traffic for these ports over the last ten years of record.

TABLE NO. 2

Commercial Vessel Traffic at Port Huron, Michigan 1965-1974

Year	Tons	Year	Tons
1965	940,004	1970	1,091,390
1966	990,049	1971	886,739
1967	824,165	1972	857,217
1968	1,349,382	1973	364,264
1969	1,173,057	1974	308,098

TABLE NO. 3

Commercial Vessel Traffic at Marysville, Michigan 1965-1974

Year	Tons	Year	Tons
1965	508,546	1970	537,803
1966	577,318	1971	678,524
1967	647,732	1972	633,656
1968	673,905	1973	606,591
1969	654,749	1974	577,663

TABLE NO. 4

Commercial Vessel Traffic at St. Clair, Michigan 1965-1975

Year	Tons	Year	Tons
1965	3,698,891	1970	3,997,186
1966	3,834,612	1971	3,994,987
1967	3,755,094	1972	3,950,487
1968	3,488,126	1973	3,338,058
1969	4,146,656	1974	3,075,056

TABLE NO. 5

Commercial Vessel Traffic at Marine City, Michigan 1965-1974

Year	Tons	Year	Tons
1965	122,837	1970	103,008
1966	114,760	1971	113,772
1967	161,902	1972	159,510
1968	135,070	1973	252,704
1969	143,355	1974	232,521

D. Recreation

2.12 As might be expected in a region of such dense population, threaded by a major watercourse, water-oriented sports are popular. In this area having such extensive contact between water and land, one finds numerous parks, boat landings, and water-access points. Some of these are listed in Table 6.

2.13 Boating is an especially popular form of recreation in the region; fishing, cruising, and water-skiing lead to a very high concentration of pleasure craft in season. A feature of the St. Clair River is the high number of small fixed piers per shoreline mile. During 1971, over one-fifth of the total small-boat launchings in the entire State of Michigan (eighty-three counties) took place in the ten-county area of southeast Michigan - most of these launchings taking place on the St. Clair-Detroit Rivers system (Michigan Recreational Boating Sutdy, 1971).

TABLE NO. 6

PARKS AND WILDLIFE AREAS

Name of Site	Location*	Annual Usage	Acreage and/or Description
St. Clair Flats Wildlife Area	St. Clair River delta	150,000 (1963)	6,614. Set amidst a 15,000-acre marsh.
Algonac State Park	St. Clair River	236,170 (Average 1967-72)	981. Frontage of 3,400 feet; major public access for fishing and boating on St. Clair River.
Tashmoo Park	St. Clair River (Harsens Island)	-	-
Marine City Park	St. Clair River	-	-
St. Clair Park	St. Clair River	-	5.2
Marysville Park	St. Clair River	-	30.0
South Park	St. Clair River	-	-
Keifer Park	St. Clair River	-	7.8
Pine Grove Park	St. Clair River	-	13.2
Bluewater Bridge Park	St. Clair River	-	12.0

*U.S. side of river

2.14 The St. Clair Parkway Commission maintains several small parcels of land along the Ontario side of the St. Clair River, pleasant spots for picnicking and sightseeing; a park is maintained in Mitchell Bay as well, with additional facilities for boating, camping and swimming. Current holdings are listed in the following table (Table 7).

TABLE NO. 7

ONTARIO PARKS ADMINISTERED BY
ST. CLAIR PARKWAY COMMISSION

Name of Park	Acreage	Frontage in Feet
Sarnia Centennial	38.0	1,600
Guthrie	5.0	2,460
Mooretown Centennial	1.0	355
Willow	4.0	500
Seager	1.0	650
Cathcart	24.0	1,200
Lambton-Cundick	32.0	335
Reagan	0.1	2,000
Port Lambton	0.5	528
Brander	35.0	1,448
Mitchell Bay: Marine Park	48.0) 72.0	
Dover Twp. Park	24.0)	1,200
TOTAL	212.6	12,276

2.15 Within the St. Clair River system, the waters of both Canada and the United States supply a rich harvest to sport fishermen. The waterway is, in fact, one of the most popular sport fisheries in the Great Lakes Basin, despite the reputation which portions of it receive for contamination of various sorts. Important sport fishes taken within the system include salmon, yellow perch, walleye, smallmouth bass, panfish, and muskellunge. The Thames River, entering Lake St. Clair at its southeast corner, provides a spawning area for large numbers of walleye, perhaps in fact for the majority of walleye caught in the St. Clair River and lower Lake Huron. Major movements of these and other fishes take place between Lake St. Clair and Lakes Erie and Huron.

2.16 The St. Clair Flats Area (the delta of the St. Clair River), including marshes and surrounding bay waters, is approximately 21,000 acres in extent, and includes some 50 miles of shore frontage. The area is considered by some to have a great deal of recreational potential. Public Act No. 326, §§ 2-2h(1913) Mich. Pub. Laws, MCLA § 322.402-402-h, MSA § 13.702-702(8) states that the Department of Conservation (now the Michigan Department of Natural Resources) can make and enforce any regulations it deems necessary for the preservation of the St. Clair Flats Area (18,000 acres) for the public use of navigation, hunting and fishing. The surrounding waters are heavily fished from boats. Since there seems to be little enforcement either of building codes or of health codes in the area, it is feared that future recreational development will be haphazard.

E. Wildlife

2.17 The St. Clair River supports a considerable sport fishery. What is known of the fish population of the river has been obtained from fishermen by creel census, from fish-kill observations, from reports of fish collected from trash racks at power plants, and from migration studies of a few species. There is little information concerning distribution and abundance of low-value and forage fish, and no reported data for the occurrence or spatial and temporal distributions of fish eggs and larvae in the river.

2.18 Waterfowl hunting and upland game hunting are also popular pursuits during the autumn. By far the most abundant game is waterfowl. The reason for the presence in the waterway of huge populations of waterfowl at certain times of the year is the availability of food in the shallow waters which so abound in the region. Such shallows are found throughout the bays of Lake St. Clair. Southern St. Clair County and southeastern Macomb County, because of abundance of food and nesting areas, support sizeable resident waterfowl populations in addition to the migrant flocks. Locally breeding birds include mallard, black duck, teal, and coot. The species of waterfowl sustaining the greatest hunting pressure in Michigan are mallard and scaup. Fully 37 percent of the scaup harvest, for example, in Michigan occurs in St. Clair, Macomb, Wayne, and Monroe Counties. When hunting is permitted on canvasbacks and redheads, Michigan is a major U.S. harvest area. St. Clair, and Macomb Counties alone account for 46 percent of the harvest of canvasbacks in Michigan, and 30 percent of the harvest of redheads.

2.19 The region encompassing southeastern Michigan and southwest Ontario, including Harsens and Dickinson Islands, supports a variety of forms of animal life; among these are populations of game birds, big game animals, small furbearers, and others. Beginning with the shore area itself, the most widespread animal is the muskrat. In the vicinity of Walpole Island alone, over 50,000 muskrats are taken annually. Mink, beaver, and otter are also present in swamp areas. Further inland, larger furbearers, such as raccoon and fox, are found.

2.20 Both foxes and wolves are encountered in such numbers in Ontario that county Governments see fit to bounty them. Even so, there has been of late an upward trend in the number of wolves in most Ontario counties (Ontario Ministry of Natural Resources, District Annual Reports).

2.21 Deer production in southeastern Michigan is not as great as in the northern areas, but deer are nevertheless found here. Foxes are hunted and squirrel, rabbit, and grouse are more or less abundant. Pheasant and quail are hunted as well. In Ontario, the counties of Essex, Kent, and Lambton have much the same upland game population as does southeastern Michigan. Ruffed grouse and Hungarian partridge are abundant as well. Two endangered or threatened species may occur in the project area. They are the longjaw cisco (Coregonus alpenae) and the Indiana bat (Myotis sodalis). For a listing of wildlife found in the area, please see Appendix A, Table 14.

F. Water Quality

2.22 Installations responsible for wasteloading into the St. Clair River include power plants (thermal wastes), sewage treatment plants (STP), and industrial outfalls. There are four power plants sited on the St. Clair River, one of these is Canadian. All introduce heated water into the river system. There are nine waste outfalls on the St. Clair River which contribute loads of solid and liquid waste (See Figure 3).

2.23 Sewage treatment on this river system ranges from secondary at best, to the discharge of raw sewage at worst. Intermediate-capacity plants give primary treatment; some communities utilize septic tanks. In Canada, plants giving only primary treatment nevertheless have phosphate-removal capabilities. Many communities along the riverbank have sewage disposal problems, but communities such as those found on the islands within Clay Township (St. Clair delta area) have problems involving both sewage disposal and water supply. A potable water supply is available to the mainland portion of the township from the City of Algonac system, which draws from the St. Clair River near the head of the delta. However, problems of engineering and attendant costs have posed special problems to the residents of the islands. Drinking water must be carried from the mainland by island residents and visitors, since the shallow wells, fouled by the St. Clair River, are considered a health hazard. Clay Township, mainland and islands, gives no treatment to its sewage. Even septic tanks are said to be ineffective due to saturated soil conditions, and the river eventually receives a large amount of the community's untreated wastes. A facilities plan under an EPA planning grant has been submitted by St. Clair County (Algonac, Ira and Clay Townships) for improved sewage collection and treatment. Follow up grants are currently being processed.

2.24 Sewage wasteloading is, however, only part of the burden inflicted on the St. Clair River system. This area has a special reputation for being the source of mercury contamination in the lower Great Lakes, as well as for introducing quantities of oil into the water. At least four heavy industrial plants are located on the U.S. side of the St. Clair River and eleven on the Canadian side. The U.S. plants engage in the manufacture of paper products, in metal plating, and in salt processing. Canada's installations are largely petrochemical in nature; some engage in salt processing. A large agricultural products plant is found on the Ontario shore, south of Courtright. Industrial wasteloading of the St. Clair is augmented by the contribution of tributary streams such as the Black, Pine, and Belle Rivers on the U.S. side, and Talford, Baby and Clay Creeks on the Canadian shore (See Figure 3). These problems bear a certain relationship to shipping: oil spills are a possible by-product of commercial navigation, and mercury contamination was involved in the decision for cessation of dredging in certain navigation channels.

2.25 Despite the wasteloadings previously described, there are 15 water intake cribs situated in the St. Clair River. Many of these are for intake of potable water; some are for cooling of condensers in power stations; others are for industrial use. In 1971, 70 percent of the population of St. Clair County drew its water from the St. Clair River or Lake St. Clair.

2.26 Recent physico-chemical data for the St. Clair River indicate the water is generally of excellent quality, although some degradation is known to occur in very localized areas where tributaries join the river. The river has a low turbidity and dissolved solids content, and dissolved oxygen remains at or near saturation levels. Temperatures of the St. Clair River range from about 32°F in the winter months to about 75°F in August. Bacterial counts for the river are generally low.

2.27 Water treatment plants within the St. Clair River system are those at Port Huron, with a capacity of 30 million USGPD, and Marine City, having a capacity of 1.5 million USGPD. Marysville has a plant designed to handle 7.5 million USGPD and is beginning construction of a second plant of similar capacity. The City of St. Clair presently operates a plant having a capacity of 1.5 million USGPD; this city, too, is about to begin construction of a new facility, one capable of treating 5.5 million USGPD. The plant is expected to be operative by 1975. Intakes serving Algonac and East China Township can handle 1.8 million and 1.0 million USGPD, respectively. Ira Township has a facility which can treat 0.6 million USGPD; the intake is located in Anchor Bay, in Lake St. Clair. New Baltimore also draws potable water from Anchor Bay, with an intake capacity of 1.5 million USGPD.

2.28 On the Ontario side of the St. Clair River, Sarnia's water filtration plant processes 12 to 14 million USGPD during the winter and has a capacity of 48 million USGPD. The Ontario Ministry of the Environment presently has a water treatment plant under construction at Point Edward,

near the head of the St. Clair, with intakes to be located in Lake Huron. The plant is designed for a flow capacity of about 146 million USGPD. The area to be served by the plant extends in a strip along the St. Clair reaching from Point Edward 26 miles south to Port Lambton, and about 6 miles northward from Point Edward along the Lake Huron shore.

G. Sediments Aquatic Biota

2.29 The U.S. Environmental Protection Agency has conducted bottom sediment sample analyses from the St. Clair River in 1970, 1973, 1974, and 1975. Eight locations were sampled in 1970 and the bottom sediments were classified as unpolluted at that time. Two tributaries of the St. Clair, the Black and Pine Rivers, were also sampled and classified polluted. The report compiled from the analyses of samples from eight locations in 1973 (3 stations) and 1974 (5 stations) classified the St. Clair River as polluted since the analyses of bottom sediments at river mile 37.0 indicated "high" concentrations of cobalt, and sediments collected at river mile 17.5 showed higher zinc, cadmium, and manganese concentrations than possessed by sediments at the other sample stations. No sampling was accomplished in the tributaries during the latter years. The results of these samplings and analyses are shown in Tables 8-13 and Figures 4-6, in Appendix A. EPA resampled the St. Clair River on 5 October 1975 to delineate the river sediments' classification. Results of this survey (Appendix A - Attachment 1) indicated the sediments scheduled for removal are suitable for unrestricted open lake disposal.

2.30 The phytoplankton of the St. Clair River is dominated by diatoms. It generally exhibits a seasonal concentration maxima in the spring and reflects essentially the same characteristics as that of Lake Huron phytoplankton. Species richness increases from the upper St. Clair River to its downstream area and the greatest richness occurred along the U.S. shore. Due to physical factors, there is little potential to develop into a nuisance phytoplankton population.

2.31 Information concerning zooplankton of the St. Clair River is sparse and insufficient to make any generalizations concerning population densities, temporal or spatial distributions, or species diversity.

2.32 Results of a recent study (1974) have indicated that the benthic macroinvertebrate assemblage of the St. Clair River is strikingly homogeneous. Only one genus was collected at upstream stations; the North American prosobranch Goniobasis sp. (snail). The stations at a downstream location were also dominated by this genus although Trichoptera (caddisflies) were documented as well. The general clay, coarse-sand, and gravel substrate of the river bottom supports only meager numbers of benthic macroinvertebrates. However, productive benthic communities do develop in areas of silt and detritus deposition. These communities are generally predominated by tubificid oligochaetes, gastropods, and midge larvae.

2.33 The biota of aquatic ecosystems is controlled by the physical and chemical environment as well as biological interrelationships. Bottom fauna vary according to natural characteristics of a body of water, such as depth, temperature, and type of sediment. The St. Clair River has an undiversified macroinvertebrate community consisting of organisms indigenous to, and adapted for, rapidly flowing water with hard underlying substrates.

3. RELATIONSHIP OF THE ACTION TO LAND USE PLANS

3.01 The proposed maintenance dredging of portions of the St. Clair River navigation channels will not alter, impede or adversely affect land use plans for the St. Clair River regional area or the immediate project area. No conflicts with the objectives and specific terms of existing or proposed Federal, State or local land use plans, policies or controls have been identified in relation to the proposed work.

4. THE PROBABLE IMPACT OF THE PROPOSED ACTION ON THE ENVIRONMENT

A. Physical Impacts

4.01 Water Quality. Implementation of the proposed action could result in the following impacts: (a) an increase in water turbidity due to the suspension of bottom sediments caused by dredging and disposal operation; (b) the release and relocation of nutrients now lying in the river and lake bottom sediments due to the disturbance of these materials by the dredging work; and (c) the re-suspension of organic substances, chemicals and other high oxygen demanding substances reduces the amount of dissolved oxygen in the water.

4.02 A portion of the existing silt and clay bottom sediments would be put into suspension due to the project's dredging and disposal operation. It is also possible that dredging would release some amounts of other nutrients, such as organic nitrogen and ammonia, now lying in the river bottom sediments. However, overall nutrient levels should not be increased by this dredging. The movement of the current and large volume of water down these channels should effect a dilution of nutrients rather than a settling of nutrients to the river bottom. Much of the river flow is concentrated in the shipping channels, and any suspended solids would be carried great distances and dispersed over a wide area as the river flow spreads out into Lake St. Clair.

4.03 Total solids should be higher downstream because of the presence of suspended dredged material. A recent monitoring test conducted for a private dredging project in a location between Marine City and St. Clair, Michigan, at approximately river mile 21, indicated a rise in the suspended solids level of 0.7 ppm or 8.6 percent. Bottom material in the test site was gray clay with a light covering of gravel or ash.

4.04 Based upon the sediment sample analyses conducted by the U.S. EPA in the St. Clair River, the adverse effects of the proposed maintenance work appear to be minimal.

4.05 Erosion Effects. The maintenance dredging work does not directly affect shoreline erosion problems. Much of the current problem in areas along the waterway is the result of persistent high water levels inundating the low-lying shores. Ship passages - whether commercial vessels or recreational craft - cause more erosion during high water levels than during normal or low water levels, but are not solely responsible for such erosion. Vessel speed and resultant wake is directly related to the severity of shore erosion, particularly where the shoreline is near the navigation channel.

4.06 Littoral Drift Effects. Accretion and erosion along points of the river shoreline are natural phenomena. Improvements to navigation channels have created artificially steep banks in many reaches of the river. The dredging and disposal operations would release some materials into the waterway contributing to the load being moved naturally. However, since the disposal operations will be in deep water or upland area sites, there is little prospect of influencing littoral processes to any discernible degree.

4.07 Effects on Flood Stages. There would be no measurable influence on water level stages from the dredging operation. Any increase in channel capacity realized from material removal would be negated by the subsequent disposal of these dredgings in other sections of the waterway.

4.08 Other. Removal of shoals and other obstructions would eliminate the potential for current diversion.

B. Biotic Impacts

4.09 Impacts from Dredging. Physical alteration of the sediment-water interface in the dredging area will have several immediate impacts: bottom dwelling organisms will be either decimated or displaced; sediments will be resuspended resulting in a reduction of transparency; metals and nutrients in the sediments may be released into the environment; organic material will be reintroduced and will oxidize, possibly reducing the oxygen level.

4.10 During dredging operations, the nutrients are reintroduced into solution or suspension from anaerobic sediments. These additional nutrients would be available for aquatic plant growth until oxidation of the reduced nutrient forms occurred, thus removing the nutrients by natural chelation or incorporation into organic matter.

4.11 Reintroduction of micro-toxic heavy metals like calcium and iron from sediments is being studied for the Corps' Waterway Experiment Station by the University of Southern California. The amount released into solution through dredging action has been reported as too insignificant to be harmful to aquatic life. Preliminary data involving reintroduction of macro-toxic heavy metals like zinc and mercury is inconclusive.

4.12 A negative impact of concern is the turbidity attributed to the overflow from the hopper dredge as sediments are stirred up from the dredging operation. This problem is directly related to the composition of the sediments. Turbidity in the channel is a natural phenomenon. Winds stir the waves during stormy weather and rains carry sediments lakeward from tributaries. Turbidity caused by dredging is related to sediment composition, the amount of work done and weather conditions.

4.13 Increased turbidity tends to restrict light penetration that is necessary for photosynthesis for organisms and for aquatic flora. Resuspended organics tend to reduce the oxygen demand. Correspondingly, increases in solids, chemical (COD) and biochemical (BOD) demand, total phosphorus, metals and possible grease and oil would be expected to occur in the immediate dredge area.

4.14 In the unpolluted river areas, the dredging operations would be removing the non-polluted sediment capable of providing habitat for aquatic fauna and flora. Removal of the existing bottom habitats for benthc macro-invertebrate communities will also result from dredging. Adjacent benthic communities can be expected to be subjected to smothering from sedimentation which accumulates. Recolonization of these areas would generally be dependent on the species' nature and mobility of organisms inhabiting the affected areas and the subsequent type of substrate.

4.15 Researchers have shown that fish can and do avoid areas of adverse turbidity. Temporary displacement of fish populations can occur during dredging operations. The suspension of sediments could disrupt any spawning grounds that may exist in the immediate areas though this is not expected to be a major problem.

4.16 Impacts from Disposal. Impacts of upland disposal of the sediments dredged from the St. Clair River navigation channel are considered minimal. The onshore site chosen by the MDNR for the storage and subsequent reuse of hopper dredged materials would occupy State-owned lands which are part of the managed St. Clair Flats Wildlife Area. The MDNR feels this currently unutilized area of some 25 to 30 acres is expendable to serve storage needs for materials that will be readily available to repair and construct the diking system used to control the water levels in the remainder of the 6,615 acre developed wildlife area. The dredged materials will also be used in the development of other facilities for public use in the State-managed area, e.g. berms to allow public shore fishing and supplemental parking facilities. The existing habitats now occupying the storage site would be changed. The placement of dredgings would replace the present vegetation which consists of sedge grasses (Cyperaceae), forbs, and shrubs of buttonbush (Cephalanthus occidentalis) and red-osier dogwood (Cornus stolonifera), and scattered stands of tree growth, primarily cottonwood (Populus deltoides), occasional maples (Acer saccharinum and rubrum) and white ash (Fraxinus americana). Animal life consisting primarily of rodents

like mice (Peromyscus leucopus), woodchuck (Marmota monax); small mammals like cottontail rabbits (Cylvilagus floridanus) and foxes (Vulpes fulva); game birds like pheasant (Phasianus colchicus) and ducks (Anatinae) would be destroyed or displaced to adjacent similar areas.

4.17 Impacts of other onshore disposals of the materials dredged by derrickbarge operations are generally limited to 200 cubic yards or less per site. Wildlife and natural vegetation on these areas has been previously lost to erosion or replaced by human habitation. Such areas are normally located behind constructed bulkheads on properties that have received prior Federal and State permits for this work as required under P.L. 92-500, Federal Water Pollution Control Act. These permits are issued only after a public notice of the proposed work is distributed to Federal, State, and local agencies, as well as concerned citizens for review and comment.

4.18 Open water disposal of unpolluted sediments has been the common Corps' policy due to economic considerations and the lack of identified long-term effects on water quality from such action. Any adverse impacts on water quality would be confined to the immediate work area, should be minimal in degree, and of little consequence to the prevailing water conditions. The U.S. EPA has stated that those materials removed from the Federal navigation channel maintained by the Corps are suitable for unrestricted open-lake disposal (EPA letter of 24 March 1976, page A-19).

4.19 All organisms that burrow through the mud, attach themselves to solid surfaces, or crawl on the bottom are part of the benthic community. The density and species depend upon the bottom type (sand, gravel, silt, etc.), amount of organic food source, water depth, and degree of organic enrichment. Studies conducted in the lower reaches of the St. Marys River by the Great Lakes Fishery Laboratories, U.S. Fish and Wildlife Service, to monitor the impacts of channel modifications (blasting, dredging, and disposal) on the macrobenthos of the area indicated no noticeable effect on the benthic community of the river in those areas. The macrobenthos in the lower St. Marys River remained abundant and diverse. The maintenance dredging work to be accomplished in the St. Clair River will not be as concentrated as that performed in the St. Marys River but rather is scattered over the length of the river wherever shoaling has occurred. Consequently, it is expected that the impact on the benthic and plankton communities in the St. Clair River should be even less discernible than the effects revealed in the St. Marys monitoring study. According to experts from the U.S. Fish and Wildlife Service, recolonization can occur quickly at both the dredged areas and the disposal sites. Although benthic organisms will recolonize, the species diversity could be reduced. Due to the dredging and disposal, the species composition may never reach a true balance, and maximum sustained population density may never be achieved.

4.20 There may be short-term effects on the fish population and aquatic food chain due to the stirring of the water in the immediate work areas. Spawning runs of popular sport fish, such as walleye, occur from March into May, and should not be affected by the limited dredging operations conducted by the derrickbarge at that time.

4.21 Conclusions. Many areas in the St. Clair River are popular sport fishing and waterfowl hunting grounds, but the dredging operation should have minimal adverse impact on these activities. This is best evidenced by the fact that such maintenance work has been proceeding for many years without impeding the growth of recreational activities. In fact, subsequent events have shown that the reefs and shoals formed from the disposal of such dredged materials have enhanced fish habitat and stimulated fishing activity for sport and commercial interests. Overall, the impacts from maintenance dredging and disposal operations have little influence in determining the population characteristics of the aquatic and terrestrial biota inhabiting the St. Clair River System. The environmentally critical condition throughout the St. Clair River would seem to be flow velocity, and not pollution, posed on the observed benthic macrofauna. Species collected are intolerant to mildly tolerant to pollutant additions or presence.

4.22 The 26 September 1975 Federal Register publicized listing of endangered and threatened wildlife lists two species of animals that may live in the vicinity of the Federal navigation channels. These are the longjaw cisco (Coregonus alpenae) and the Indiana bat (Myotis sodalis). The longjaw cisco is reported to occupy portions of Lakes Michigan, Huron, and Erie. Since the St. Clair River serves as a connecting channel between Lake Erie and Lake Huron, this species could possibly be found in the project area. However, this is unlikely as this fish normally inhabits the moderately deep waters of the lakes. Spawning takes place in deep water in November, so the maintenance project would have little effect on species activity.[4] The indiana bat is a terrestrial mammal and maintenance operations in the water pose no threat. The proposed land disposal sites should not impact on this bat species either as their normal habitat would be in riparian stands of mature forests. Proposed disposal sites would occupy open lands with no more than brush vegetation.

C. Social Impacts

4.23 Aesthetics. Three aesthetic impacts can be identified: (a) the onshore disposal areas would be visually unattractive and the periodic placement of dredged material would impede the establishment of vegetative cover; (b) the removal and disposal operations would create localized and temporary turbid water conditions; and (c) the increased noise and activity associated with the maintenance work would cause additional disturbance to the local area.

4.24 Maintenance dredging, however, has been an ongoing periodic operation in this waterway ever since the navigation channels were established by the Rivers and Harbors Act of 1892. Most of the project work occurs at some distance from shoreline areas and is little noticed except by fellow mariners.

4.25 Historical and Cultural Values. Deep-draft navigation on the Great Lakes and Connecting Channels has established a colorful history and has developed a cultural pattern unique to its own activity. Most neighbors of the waterway have chosen this location to be a part of that environment.

4.26 The National Register of Historic Places includes four properties located in St. Clair County. Three of the structures are homes or buildings located in river-front communities but not in areas influenced by the maintenance work. The fourth property is the St. Clair River Tunnel, running beneath the river between Port Huron, Michigan, and Sarnia, Ontario. This tunnel serves as a railroad transportation route. Although the tunnel runs under the navigation channel, safe and sufficient overhead is provided between the channel bottom and tunnel ceiling. There are several other sites listed for St. Clair County in Michigan's State Register of Historic Places. None of these will be affected by the project. There are no prehistoric/historic archaeological sites identified for the county in the State of Michigan's Historic Preservation Plan (Vol. II, 1975).

4.27 Use Patterns. The proposed activity will not infringe upon current uses or users of the waterway. Although the river channels have been developed for the benefit of waterborne commerce over the past 83 years, the area still retains much of its recreation-oriented environment. The St. Clair River remains a popular attraction for the fishermen, hunter, boater and sight-seeing tourists.

4.28 Economic Effects. The St. Clair River system is a link in the channels connecting the transportation routes of the lower Great Lakes with those of the upper Great Lakes. The economic effects of not dredging could be quite adverse. If the cargo carrying vessels were forced to lighten their loads because of decreased channel project depths, transportation costs would increase and be passed onto the consumer. Large volumes of such basic materials as iron ore, limestone, coal, and grain pass through this waterway. Unit price increases for items such as these would have national as well as regional import.

4.29 Public Interests. Maintenance of this waterway for the safe passage of deep-draft vessels is clearly in the public interest. As indicated in 4.28, a large segment of the nation's waterborne commerce moves through the St. Clair Waterway at relatively low ton per mile costs and fuel consumption.

4.30 The St. Clair River is an international waterway. Much of the channel lies in Canadian waters, but is maintained by the Army Corps of Engineers as the result of international agreements.

4.31 Cumulative Effects. A major adverse impact on the local, regional, and national economy would result if the channels of the St. Clair River system were allowed to become unsuitable for deep-draft navigation. Foregoing maintenance operations in these areas would jeopardize the safe movement of waterborne commerce through these areas, endangering not only the vessels but also the men onboard. The timely removal of obstructions from the navigation channels would reduce the probability of ship groundings and the potential threat of a pollution incident.

4.32 Even though maintenance dredging activities are and have been an ongoing feature of the river scene before the turn of this century, the appeal of the area for recreational activity remains strong. Because this type of maintenance dredging and disposal work affects a relatively small part of the overall river system, areas of this waterway still remain a viable habitat for fish, waterfowl, and the recreational boater. The degradation of the system's water and sediment quality during recent years can be largely attributed to the discharge of municipal and industrial wastes.

5. PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

5.01 The destruction and disturbance of benthic communities in the areas to be dredged is inevitable. Benthic organisms and rooted aquatic plants that have colonized the areas since the last maintenance operations will be removed by the proposed work. There will also be some local disturbances to benthos in areas adjacent to the dredging operations. These areas may experience benthic smothering as a result of resuspended sediments. Physical removal of the bottom substrate and local increases in turbidity will also result in slight depressions of dissolved oxygen concentrations during dredging operations as oxydizable materials are released from the bottom sediments. Such dissolved oxygen depressions will be minimal and should not create ecological concern due to their localized and short-lived nature. Disposal operations will also create instances of increased turbidity and depressed dissolved oxygen concentrations.

5.02 The use of the proposed upland site on Harsen's Island and selected shoreline properties for dredge disposal purposes would create changes to the vegetation, animal-life, and visual aesthetics in those areas. As described previously in this text, the areas involved are relatively small in extent and such impacts are not considered of significance to the ecological system.

6. ALTERNATIVES TO THE PROJECT

A. No Maintenance Dredging

6.01 This alternative would suspend maintenance dredging of the navigation channel in the St. Clair River resulting in a build-up of bottom sediments. This build-up would necessitate a reduction in vessel draft, lowering the total tonnage of both upbound and downbound waterborne commerce. We estimate that the St. Clair River navigation channel would reach a depth of 15 feet in a period of 12 years at that area in the river that historically shoaled the fastest (upstream of Russel Island). It is considered that commercial navigation would effectively cease at a controlling depth of 15 feet below Low Water Datum (IGLD, 1955). Costs of waterborne transport would rise due to inefficient use of vessels,

with increased costs passed on ultimately to the consumer. Additionally, the operation of vessels would be hazardous when navigating to avoid shoals.

B. Alternative of Mechanical Dredging

6.02 At the present time, maintenance operations on the St. Clair River are accomplished primarily by a Government owned hopper dredge. In some instances, a derrickboat is utilized to remove large or cumbersome obstructions or extremely hard benthic material. Maintenance dredging could be accomplished using a mechanical type dredge rather than the proposed hopper dredge. Mechanical dredges use either a bucket or dipper to remove bottom material in grabs and deposit the dredgings into attending barges.

6.03 Mechanical dredging obstructs navigation with attending barges, tugs and auxillary equipment. This method of dredging would introduce an increased safety hazard to navigation in the channels.

6.04 Sediment disturbance and resuspension is greatly increased by mechanical dredging. Mechanical dredging would also require increased dredging time and result in a higher cost per cubic yard of dredged material. Hopper dredges are specifically designed to provide increased efficiency and subsequent lower costs for dredging operations.

C. Dredging to a Lesser Depth

6.05 Dredging to any depth less than the maximum controlling depth authorized would create severe restrictions for vessels using the waterway. Not being able to load to the maximum possible drafts would necessitate increasing the number of vessel passages to transport equal quantities, thereby raising the costs of commodities transported; these costs would ultimately be passed on to consumers.

D. Alternative Disposal Methods

Water Disposal

6.06 The Lake Huron open-water dumping area, located about 3-1/4 miles north of the head of the St. Clair River and 1/2 mile west of the navigation route into the lake, had been used by the Corps for many years (Figure 2). Water depths in the area were 18-20 feet below Low Water Datum (IGLD, 1955). This location provided a readily accessible disposal site with reasonable running times for the dredge when operating in the upper reaches of the St. Clair River. The MDNR has pointed out that this dumping area has become good fishing grounds which seasonally attract many fishermen and should not be disturbed. The MDNR objected to the continued use of this disposal area.

6.07 The MDNR recommended that a disposal area approximately 4-1/2 miles into the lake and located between the navigation channel and the International Boundary be used (Figure 9, page A-18). Water depths in this area would be more than 30 feet below Low Water Datum. This alternative has been adopted as a project proposal.

6.08 The disposal of all unpolluted dredged material from the St. Clair River into open-water areas of Lake Huron. Such action would require the dredge to travel as much as 40 miles enroute to the dumping grounds and would increase the present dredge-disposal cycle time seven-fold for the maintenance operation in the lower reaches of the project area. This plan would raise present costs from approximately $70,000 to $490,000. Due to the relatively large economic costs and the questionable benefits derived from this alternative, it was not considered further.

6.09 The North Channel of the St. Clair River off Point Au Chenes, has been used in past years for the disposal of dredged materials removed from reaches adjacent to the delta area of the St. Clair River. Water depths at this disposal area are 80 to 90 feet. The MDNR has described this area as important sturgeon grounds and has also stocked the area with a large complement of brown trout during the past year. The MDNR strongly opposes continued use of the area for disposal purposes, but recognizing the unresolved need to locate disposal grounds within a reasonable distance of the work area, the MDNR has agreed to the utilization of this deep-water disposal area during the 1976 season only. In the interim the Corps will endeavor to establish long-term onshore sites with the cooperation of the MDNR.

Land Disposal

6.10 Materials removed from the St. Clair River during maintenance dredging could be deposited on upland sites such as abandoned quarries or sand and gravel pits. Other onshore sites could include public and private properties that find the dredged material a useful source as fill material to restore river-side lands lost to erosion. Another possibility is to stockpile the dredgings that are primarily sand and gravel for future use in the construction and maintenance of public works facilities and projects. This material would not be useful for agricultural purposes due to its relatively low nutrient content.

6.11 Land disposal could be accomplished either by truck transport or by pumping dredgings via a pipeline from the hopper dredge or transporting scow to the disposal site. However, the cost of using maintenance dredgings for fill purposes is, in most cases, a prohibitive factor. In addition to normal dredging expenses, the scow or dredge unit must transport the dredged material to a site in close proximity to the fill area. Unless the material can be discharged directly from the containing vessel to the disposal site, a pipeline system with auxiliary pumps must be installed between the docking site and fill area. Costs for construction of this system increase markedly with any increase in pumping distance. Costs of transshipping the materials by truck are similarly prohibitive.

6.12 The geomorphology of the terrain bordering the St. Clair River has not lent itself to the development of stone quarries or aggregate pits within practicable distances. The unavailability of such potential sites within the limits of economic feasibility precludes further consideration of this alternative.

6.13 The use of selected properties adjacent to the waterway for the placement of limited amounts of dredged material has been a part of the project operation in the past. Upon request of property owners or local government entities materials removed from the navigation channel by the derrickbarge were placed on those lands to combat shoreline erosion and preserve the property from further degradation. Amounts of material involved by this action were generally less than 200 cubic yards, except in 1975 when 2,500 cubic yards of dredgings removed by hopper dredge were contributed to a shoreline park being developed as part of urban renewal for the City of Algonac. In the future, in order to abide by the directives of Executive Order 11593 that Federal agencies assure that their plans and programs contribute to the preservation and enhancement of non-Federally owned sites, structures, and objects of historical, archaeological, or architectural significance, the use of onshore disposal for such purposes will be limited to only those properties, whether private or public, that have been granted prior Federal and State permits for such proposed activity. This restriction will insure that such areas and proposed action have been given suitable review by concerned government agencies and the public and are in compliance with the National Environmental Policy Act, Fish and Wildlife Coordination Act, National Historic Preservation Act, Endangered Species Act, Marine Protection, Research and Sanctuary Act, and the Federal Water Pollution Control Acts. If the need for an archaeological or historical survey is determined as a result of this review, no disposal action will be permitted until such survey(s) is accomplished.

6.14 The primary proposed land disposal plan is to stockpile those dredgings removed from the lower reaches of the project on land provided by the State of Michigan, Department of Natural Resources (Figure No. 8, page A-17). The MDNR has provided an unutilized area in the St. Clair Flats Wildlife Area for the storage of hopper dredged materials. This site is less than 1/2 mile from the shoreline of the Middle Channel of the river delta; therefore, the hopper dredge has the capability to dock and pump the materials onto the site without the need for excessive lengths of pipeline or auxiliary pump stations. The materials stockpiled in this manner will be readily available for use in the repair and construction of the diking system used to control the water levels in the managed wildlife area and for the development of other public-use facilities.

Confined Disposal Facilities

6.15 The sediments to be dredged from the shoals formed in the St. Clair River navigation channels have been classified by the U.S. Environmental Protection Agency (EPA) as suitable for open water disposal. The Corps of Engineers is not authorized or funded to construct diked disposal areas for the containment of unpolluted dredged materials removed during channel maintenance operations. The need for this method of disposal is not demonstrated by virture of EPA's classification, and therefore, this alternative was given no further consideration.

7. RELATIONSHIPS BETWEEN SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

7.01 Annual maintenance dredging of the St. Clair River navigation channel allows commerce to continue throughout the entire Great Lakes system. The continuance of shipping within the system insures the satisfaction of both short-term immediate needs such as maximum draft and long-term needs in the form of continued access between the upper and lower lakes. Maintenance dredging has been continuing in Lake St. Clair and the St. Clair River since the late 1800's. Curtailment could create serious repercussions to the long range economic and cultural development of many Great Lakes ports, not only in the United States but Canada as well.

7.02 Maintenance dredging will affect localized areas of the channel only temporarily resulting in a short-term disruption of the bottom associated biological community. Reestablishment of this community is expected to occur in a short period after dredging operations cease, as the result of the inherent ability of ecological systems to withstand minor disturbances.

7.03 The use of dredged materials to restore and protect eroding shorelines represents a positive, short-term, functional use of this resource. This action serves to enhance the human environment through the protection of property and to protect the natural environment by inhibiting the loss of upland soils to erosion. The proposed use of dredged materials in the formation and repair of the dikes controlling water levels in the wildlife area contributes to the habitat preservation required for long-term waterfowl propagation and improves the quality of recreation for the public.

8. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES WHICH ARE INVOLVED IN THE ACTION

8.01 The actual removal of sediments from the navigation channel will create no irreversible commitments of resources other than the economic outlay expended to complete the project. Maintenance dredging will periodically alter the bottom environment of existing Federal Navigation Channels. This process is not considered irreversible as cessation of maintenance dredging would result in an eventual return of existing Federal Navigation Channels to their natural conditions. The fact that maintenance dredging is a reoccurring item provides proof that the conditions being altered will again establish at a later time.

8.02 A number of benthic and bottom-associated organisms will be destroyed. Although benthic organisms will recolonize, the species diversity could be reduced. Due to dredging and disposal operations, the species composition may never reach a true balance, and maximum sustained population density may never be achieved (personal communication, U.S. Fish and Wildlife Service, Ann Arbor, Michigan).

9. COORDINATION AND COMMENTS AND RESPONSE

A. Public Participation

9.01 A Public Notice, dated 12 February 1975, regarding maintenance dredging in the St. Clair River was issued by the Corps' Detroit District Office. Copies of this notice were sent to the Environmental Protection Agency, the Department of the Interior, the Coast Guard, the State of Michigan, the Department of Commerce, St. Clair County, the City of Port Huron, the City of Marysville, the City of Marine City, the City of Algonac, and other Federal, State and local agencies, as well as to known interested groups and individuals. The proposed dredging is being reviewed under the following laws: Federal Water Pollution Control Act of 1972, the National Environmental Policy Act of 1969, the Fish and Wildlife Act of 1956, the Marine Protection Research and Sanctuaries Act of 1972, the Endangered Species Act of 1973, as well as the various Congressional Acts authorizing construction and maintenance of the Federal project.

9.02 Responses to this notice were received from the National Marine Fisheries Service; the National Park Service; U.S. Coast Guard; U.S. Environmental Protection Agency (EPA); and the Michigan Department of Natural Resources, Hydrological Survey Division. The EPA advised that: reaches of the river not previously sampled or classified by EPA should not be assumed unpolluted and such areas should be sampled and classified prior to maintenance dredging (previous reports received from the EPA classified

bottom sediments of the St. Clair River as unpolluted - 1970 test results - and as polluted - 1973-74 test results - and as suitable for unrestricted open lake disposal - 1975 test results); spoil should not be placed upon wetlands or shallow water inlets along the St. Clair River; water treatment plants served by the river should be kept informed of dredging activities so appropriate treatment adjustments can be made; maintenance operations should be timed to prevent interference with fish spawning and migrations in the waterway; precautions should be taken to mitigate adverse effects on benthos, nursery and feeding grounds when disposing of material. The other agencies had no objections to the proposed action. The lack of any other response to the Public Notice is taken to mean that there is no further objection to the dredging operations or to the proposed sites for the disposal of dredged material.

9.03 Subsequently, a Statement of Finding was issued on 15 April 1975. The District Engineer determined that it was in the overall public interest to continue the annual maintenance dredging of the St. Clair River during 1975 concurrent with the preparation of an Environmental Impact Statement for the proposed work. The decision not to hold a public hearing was also made at that time, since no requests for a hearing were received. As of 1 January 1976, maintenance dredging operations that may have a significant impact on the human environment are prohibited without an environmental statement being on file at CEQ for thirty days prior to the proposed action.

B. Government Agencies

9.04 Thirteen government agencies, Federal, State and City, furnished comments on the Draft EIS. Most concern was centered around the locations of the areas where dredged materials would be deposited. An expanded discussion of these areas is presented in the Final EIS and in the following Comment/Response section. The U.S. Environmental Protection Agency sited a "lack of objection" to the project but did state the belief that additional information was required to fully evaluate the project's total environmental impact. The Final EIS contains expanded discriptions and data, to the extent available, which should aid the environmental evaluations.

9.05 In order to resolve the objections of the MDNR to the disposal sites proposed in the Draft EIS, i.e., the North Channel of the St. Clair River off Point Au Chenes and the open water dumping grounds in Lake Huron, the Corps had discussions with MDNR representatives on May 3 and 13, 1976. The following determinations were made as a result of these meetings: (1) The MDNR withdrew its objection to the deposition of dredge materials in the North Channel for the remainder of 1976; (2) Dredgings from subsequent years will be placed ashore on Harsen's Island in a storage area of the State's St. Clair Flats Wildlife Area. This

material will be recycled by MDNR for maintenance and construction work in the Wildlife Area; (3) Dredgings removed from the upper reaches of the St. Clair River will be deposited in the deeper-water area of Lake Huron as recommended by MDNR.

C. Citizen Groups

9.06 The proposal to continue maintenance operations in the St. Clair River Federal navigation channels was well publicized by circulation of the Public Notice and Draft EIS to local and national civic groups, environmental organizations, conservation clubs, area news media and to interested citizens. Two letters were received in reply to the Draft EIS from this element; one from a private citizen, and another from the public utility providing this area with electrical power. No objections to the proposed action were expressed by these correspondents. No comments were received from any of these sources in response to the prior Public Notices.

D. Comments and Response

9.07 The Draft Environmental Statement was sent to the following agencies and groups requesting their review and comments:

Federal Agencies

*U.S. Department of the Interior
*U.S. Environmental Protection Agency
*U.S. Department of Commerce
*U.S. Department of Agriculture
*Advisory Council on Historic Preservation
U.S. Department of Transportation
U.S. Department of Health, Education and Welfare
*U.S. Department of Housing and Urban Development

State Agencies

*Michigan Department of Natural Resources
*Michigan Department of State (State Historic Preservation Officer)
*Michigan Department of State Highways and Transportation
Executive Office of the Govenor
Advisory Council for Environmental Quality

Canadian

Ministry of Transport, Ontario, Canada

Local Agencies

Southeast Michigan Council of Governments
City of Marine City, Michigan
Clay Township, St. Clair County, Michigan
City of Marysville, Michigan
Ira Township, St. Clair Co., Michigan
City of Algonac, Michigan
Board of County Road Commissioners, St. Clair Co.
Township of East China, St. Clair Co., Michigan
City of Port Huron, Michigan
*City of Detroit, Michigan
Port Huron Maritime Commission
St. Clair County Board of Supervisors
Board Office, Fort Gratiot Township, St. Clair Co.
Burtchville Township, St. Clair Co.

Environmental - Civic Groups

Clay Township Association
Marine City Chamber of Commerce
Historical Society of Michigan
Eastern Michigan Advisory Council
Water Resources Congress
National Audubon Society
Izaak Walton League
Sierra Club
Michigan Student Environmental Conference, Inc.
League of Women Voters
Michigan United Conservation Clubs
Conference on Michigan Archaeology
Michigan Natural Areas Council
Citizens Council for Land Use Research & Education

*Individual Citizens and Business Concerns

50 in total - 2 responses received.

*Indicates that comments were received from that agency, group, or element.

9.08 Comments received from respondents to the DEIS are listed in the following comment and response section. Copies of the original correspondence are included with this statement as Appendix B.

9.09 Public information copies of this Final Environmental Statement will be furnished to appropriate Federal, State and local clearinghouses as well as concerned citizens and conservation/environmental groups. Copies are available to interested individuals upon request from U.S. Army Engineer District, Detroit, P.O. Box 1027, Detroit, Michigan 48231, ATTN: Environmental Resources Branch.

U.S. Department of the Interior, Office of the Secretary - North Central Region

1. Comment:

The presence of aboriginal sites in the St. Clair Flats area is recognized on page 8 of the statement. As both the cut-off channel and the north channel cross these flats and maintenance dredging material may be placed on upland sites, the statement should address the possiblity that such material may adversely impact presently unknown cultural resources. In order to fulfill the intent of Executive Order 11593, Protection and Enhancement of the Cultural Environment, the Corps of Engineers should have all areas affected surveyed by a professional archeologist. Any sites discovered should be evaluated for inclusion of the National Register of Historic Places.

Response:

Disposal on upland areas will be limited to properties whose owners request fill material - to re-establish eroded shorelines. Such onshore disposal will be limited to those properties that have been granted prior Federal and/or State permits for such activity as required by P.L. 92-500, Section 404, the Federal Water Pollution Control Act. This restriction will insure that such areas and the proposed action have been given suitable review under the provisions of the National Environmental Policy Act, the Fish and Wildlife Coordination Act, the National Historic Preservation Act, Endangered Species Act, and the Coastal Zone Management Act, as well as P.L. 92-500. Figure No. 7, page A-16, illustrates the known settlements in the study area - including both those of an historic and prehistoric nature. As pointed out in paragraph 2.09, it seems that little development took place along the St. Clair River south of Port Huron since few sites have been discovered between Port Huron and Algonac.[3]

2. Comment:

We recommend that the environmental impact statement include language to the effect that the sponsoring agency has checked the National Register of Historic Places and, in consultation with the State Historic Preservation Officer, determined that no properties listed on, nominated to, or eligible for the National Register would be affected by the proposal.

Response:

Historical sites included in the National Register and their relation to the proposed maintenance activities have been addressed in paragraph 4.26 of the Final EIS. The Draft EIS was coordinated with the Director of the Michigan History Division and the State Historic Preservation Officer. She concluded that the proposed work will have no effect on cultural resources. A copy of her letter is contained in Attachment B.

U.S. Environmental Protection Agency, Region V - Chicago, Illinois

1. Comment:

In general, the EIS adequately describes the project. However, in order to evaluate the project's environmental impacts, additional information is required on the "upland" shore disposal sites mentioned. The location of these sites should be specified and illustrated on a map or aerial photo exihibit. Furthermore, a detailed description of the environmental setting of each of these sites should be presented with a discussion of its past and present use, if any.

Response:

Please refer to paragraphs 1.04, 4.16, 4.17, 6.13 and 6.14 for discussions on onshore sites. The location of private property sites is not known in advance but such areas would be subject to an environmental assessment during the permit application review period.

2. Comment:

We commented on a Public Notice for this project on March 25, 1975 and requested that dredge spoil not be placed upon wetlands or shallow water areas along St. Clair River or in St. Clair Lake. Every effort should be made to preserve and protect the river and delta wetlands in the project area.

Response:

No wetland areas will be filled in relation to these maintenance operations.

3. Comment:

Our July 19, 1974 letter to your office indicated that the bottom sediments in the St. Clair River Federal Navigation Channel at river miles 17.5 and 37.0 are polluted. Since the sampling coverage in these two areas was poor, and no delineation was made of the polluted zone, we resampled this river on September 29, 1975. This sampling chedule was noted in our September 11, 1975 letter to Brigadier General Moore. As soon as the results of this survey are available, we will reevaluate the existing pollutional classification of the river. Where bottom sediments are determined polluted, delineation of the polluted zones will be provided. The EIS should discuss the history of mercury - contaminated sediments in the St. Clair River.

Response:

The 1975 EPA sampling results have been received and are included in Appendix A, Attachment No. 1. Mercury contamination and other sources of pollution have been discussed in paragraph 2.24 of the Final EIS.

4. Comment:

With regard to sewage treatment in St. Clair County (Algonac, Ira and Clay Townships) a facilities plan under an EPA planning grant has been submitted by St. Clair County for improved sewage collection and treatment. Follow-up grants are currently being processed.

Response:

This information has been added to update the discussion presented in paragraph 2.23 of the Final EIS.

5. Comment:

In accordance with EPA procedures, we have rated this project as LO (lack of objection) and have classified the EIS as Category 2 (additional information is required to fully evaluate the project's total environmental impact). The date and classification of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on other agency's projects.

Response:

Additional information included in the Final EIS provides a clearer presentation of the project's total environmental impact.

U.S. Department of Commerce
Assistant Secretary for Science and Technology

1. Comment:

The draft environmental impact statement describes a navigation channel extending the length of the St. Clair River, but does not indicate whether all or segments of the channel will be dredged. U.S. Environmental Protection Agency analyses of bottom sediments (Page 19, paragraph 2; Table 8, page A-5; and Table 13, page A-11) leads them to conclude that the bottom sediments are polluted. Until specific reaches are determined to be unpolluted, the EPA observations should preclude any maintenance dredging.

Response:

Depth soundings of the navigation channel are made before dredging commences to delineate the shoaled areas that must be removed. Dredging occurs only on those sections of the navigation channel that are shoaled.

The most recent publication, EPA-660/3-74029 dated December 1974, classifies the St. Clair River as unpolluted. Utilizing 1973 data and the seven bulk sediment criteria with established limits, only zinc, marginally, exceeded the U.S. EPA recommended limits at Station 17.5. On 5 October 1975, the U.S. EPA resampled the river to delineate the status of the river sediments. Results of the survey indicated the sediments proposed for removal are suitable for unrestricted open-lake disposal.

2. Comment:

Use of the projected disposal site in Lake Huron will not isolate spoil as implied but can create problems. Water depth at the site is 12 to 18 feet; this is shallow enough that relatively minor wave action and littoral drift will disperse sediments in Lake Huron and move the sediment back into the river through resuspension and traction.

Response:

The majority of materials dredged in the upper portions of the St. Clair River do not originate from Lake Huron. Large portions originate from tributaries to the River, a notable example being the large volume of materials dredged from the areas near the mouth of the Black River at Port Huron.

With regard to the disposal site, dredged materials deposited at this location do not move. The contours visible on navigation charts are a result of past disposal operations. Disposal will also take place in waters 18 feet or deeper. This is necessary because the hopper dredge draws 13 feet when loaded and requires a 5 foot safety margin when dumping. However, a new, deeper water disposal area has been selected at the behest of the MDNR.

3. Comment:

The rationale on Page 21, paragraph 1, of the Draft EIS, ignores the total problem of suspended material by dismissing it once this material has left the river. A primary control on suspended sediment transport is the stream velocity. The marked decrease at the head of Lake St. Clair will cause a substantial part of the load to drop out of suspension rather than to diffuse widely through the lake. Significance of this problem relates to the degree of pollution of the material put into suspension.

Response:

Undoubtedly, a portion of existing silt and clay will be put into suspension during dredging operations. The idea that this paragraph is conveying is that most of the suspended materials will be transported downstream via the navigation channel, because current velocities in it are higher than along the shallower shoreline areas. More suspended materials would tend to settle in the area of the navigation channel at the head of Lake St. Clair, rather than to be dispersed evenly throughout the entire delta region. Pollutant levels at the head of the lake would not be anticipated to increase significantly because of dredging, in that only unpolluted materials are being dredged upstream. Additionally, the movement of current and the large volume of water should effect a dilution of nutrients, rather than result in their concentration.

4. Comment:

On page 23, (Effect on terrestrial biota) planned disposal sites are not identified. These should be known before operations so that site specific impacts can be looked at. We hope that the Corps of Engineers will work with the State Dredge Spoil Disposal Committee in determining sites.

Response:

Materials dredged by the hopper dredge in the lower portions of the St. Clair River were deposited shoreward of a large bulkhead presently being constructed by the City of Algonac. The bulkhead is part of the City's urban renewal program. The City had expressed the desire to have the materials deposited at this location. A new onshore site has been furnished through the cooperation of the Michigan DNR. This site on Harsen's Island should accommodate hopper dredgings for several years.

Derrickboat operations generally are directed towards the removal of minor shoaling that has occurred between scheduled hopper dredge visits. Shoaling is usually relatively minor and its removal by hopper dredge would not be economically justified. Annual volume of materials removed by derrickboat varies between 1,000 and 2,000 cubic yards. These materials, usually composed of sand and gravel, were routinely placed on private property at the owner's request. Volumes of materials placed at any one location generally does not exceed 200 cubic yards. Please refer to Comment/Response No. 1, U.S. Department of the Interior, for description of new limitations to this method of disposal.

5. Comment:

Removal of shoals from the river will restore the navigation channel to project dimensions. River water will return to project levels. Disposal of the spoil in other parts of the river will cause minor, not measurable, raise of water levels. The net effect on water levels from dredging and spoil disposal will be of a minor raise over the project levels.

Response:

As stated above, materials derived from maintenance operations during 1975 are anticipated to be placed on selected upland areas. Ongoing maintenance operations are not anticipated to result in long-term perceptible changes in river levels or flows.

U.S. Department of Agriculture - Soil Conservation Service

1. Comment:

Throughout the Statement it is insinuated that the major portion of the dredged material will be disposed of in deep water and the deep water disposal sites have been identified in the Statement. However, it is noted that a portion of the dredged material is to be placed ashore at upland sites. The Statement does not indicate the extent of the upland disposal, neither the yardage to be disposed of nor the land area to be used for the upland disposal. The Statement also does not indicate the proposed location of the upland disposal areas nor effect on land use of the upland disposal. It would seem desirable to expand the Statement to cover these items.

Response:

See Comment/Response Number 4, U.S. Department of Commerce, and the expanded Section 4 in the Final EIS. Average volumes for onshore disposal will range between 25,000 and 30,000 cubic yards.

2. Comment:

It is stated, "The periodic placement of dredged material would impede the establishment of vegetative cover." It would seem desirable to state that re-establishment of vegetative cover is part of the project.

Response:

In this case, materials deposited on upland areas are commonly placed beyond bulkhead structures. Corps of Engineers guidelines for the issuance of permits for such structures mandate that they be constructed

to be impermeable. In this way, backfill materials will not leach to the adjacent waterway. Individual property owners are responsible for the re-establishment of vegetation or other stabilizing measures for the fill materials.

U.S. Department of Agriculture - Forest Service

1. Comment:

We believe that impacts of the above project on land vegetation will be minor. Perhaps shrubs and trees could be used to improve aesthetic appearances of diked disposal sites.

Response:

Please refer to Comment/Response #2, U.S. Department of Agriculture, Soil Conservation Service. Diked disposal sites are not a requisite of this maintenance program since materials are unpolluted.

Advisory Council on Historic Preservation, Washington, D.C.

1. Comment:

The Council has determined that while you have discussed the historical and archaeological aspects related to the proposed undertaking, the Council needs additional information concerning compliance with Section 800.4(a) of the Council's procedures. Under this Section, the Corps is responsible for identifying properties located within the area of the undertaking's potential environmental impact that are included in or eligible for inclusion in the National Register of Historic Places. The final environmental statement on this project should be revised to reflect compliance with this section in regard to eligible National Register properties.

Response:

It is not anticipated that there would be any undisturbed historical or cultural resources in the area of the project's potential environmental impact. The navigation channel has been dredged annually since the late 1800's. It is unlikely that anything of archaeological importance would remain in the channel areas. Upland spoil disposal with regard to archaeological considerations is addressed in Comment/Response #1, U.S. Department of the Interior.

2. Comment:

To insure a comprehensive review of cultural resources, the Advisory Council suggests that the final environmental statement contain

evidence of contact with the Michigan State Historic Preservation Officer and that a copy of his comments concerning the effects of the undertaking upon these resources be included in the final statement.

Response:

The Draft EIS was coordinated with the State Historic Preservation Officer and she stated that the proposed project would have no effect on cultural resources. A copy of her reply is contained in Attachment B.

Department of Housing and Urban Development - Detroit Area Office

1. Comment:

The subject Draft EIS has been reviewed and no objections to the proposed action are warranted.

Response:

Comment noted.

2. Comment:

From a planning perspective relative to proposed or existing residential use, the onshore landfills should be adequately identified.

Response:

Please see Comment Response Number 4, U.S. Department of Commerce, and Comment Response No. 1, U.S. Department of the Interior.

3. Comment:

Any negative impacts insofar as amenities of residential use that may be reduced or depreciated in valuation would be an important consideration in the environmental clearance of a project proposed for HUD participation.

Response:

Filling behind properly constructed bulkheads would not be expected to reduce or depreciate property value. In the majority of cases, bulkheads and the restoration of eroded properties serve to enhance shoreline property values.

State of Michigan - Department of Natural Resources

1. Comment:

We have reviewed the draft environmental impact statement on the proposed Maintenance Dredging of Federal Navigational Channels in the St. Clair River. We find the statement basically adequate in the description of the project and much of the associated environmental impacts.

Response:

Comment noted.

2. Comment:

Our major concern is in regard to the disposal sites for the dredged materials. We strongly object to the proposed disposal site located in the North Channel adjacent to Point AuChenes (Figure 2). These are important sturgeon grounds and a large complement of brown trout (20,000 this past year) are stocked in this area. We are therefore absolutely opposed to any dumping of dredge spoils in the north channel.

Response:

Soft unpolluted material dredged by hopper from the southerly reaches of the St. Clair River has generally been deposited in a 90-foot deep hole in the North Channel near Point AuChenes. The velocity there is such that soundings indicate that the material deposited in the hole is very quickly removed and conveyed downstream. The practice of utilizing this disposal site was temporarily discontinued, and the material was placed at an upland site in the City of Algonac. Discussions were initiated with the Michigan Department of Natural Resources with respect to the environmental implications of use of the open water site, in order to determine whether or not sturgeon or trout fisheries would be adversely affected. The determinations as a result of the meetings are discussed in the Final EIS, paragraph 9.05.

3. Comment:

With reference to the disposal area identified in Lake Huron 3-1/4 miles north of the Blue Water Bridge, we would prefer that the spoil be deposited in deeper water to the north, a mile further out, in about 40 feet of water near the U.S.-Canadian boundary. The 15 to 20-foot depths in the designated area are walleye, perch, and catfish grounds which seasonally attract many fishermen and should not be disturbed. It would also appear that materials deposited at the designated site in depths of 20 feet or less and within 1/2-mile of the navigation channel, would be moved back into the channel to the south during a northeaster.

Response:

The deep water disposal site in Lake Huron will be relocated as requested by the MDNR. It is our opinion, however, that the fishing grounds now attracting fishermen were established by the creation of a reef type structure from past disposal of dredged materials.

During a northeaster, sediments would probably be driven towards the west and could have the final destiny of augmenting the littoral load along the western shoreline of Lake Huron. Maintenance operations of the channel east of the disposal area are carried out on a very infrequent basis, indicating that relatively small amounts re-enter the navigation channel.

4. Comment:

It is also stated that the dredged materials may be placed on shore at selected upland sites. The location of these sites is not given. They should be identified and described in the statement. Where are these sites?

Response:

Please refer to paragraphs 1.04, 4.16, 4.17, 6.13 and 6.14.

5. Comment:

We are also concerned over the distribution of fines during the dredging process due to the history of mercury useage and disposal into the St. Clair River channel. While the data presented in Tables 9 and 10 would indicate that the presence of mercury in the sediments is within the standard, we remain concerned about the dispersion of mercury and other heavy metals (i.e. zinc) which can be widely spread by the strong currents over the bottom of the channel and Lake St. Clair downstream and can subsequently enter the food chain. We reiterate our comments provided in the response to the draft environmental impact statement on the maintenance dredging of navigation channels (downstream) in Lake St. Clair (our letter Sept. 5, 1975). Has the Corps conducted any research on methods of clarifying overflow waters during dredging activities?

Response:

The redistribution of heavy metals during dredging operations in the St. Clair River has not been thoroughly investigated. A study done for the EPA (Water Quality Investigation of the Detroit and St. Clair Rivers, Encotech Corp., August 1974) indicates that the St. Clair River does show enrichment in certain sedimentary constituents (e.g. COD, TKN,

total phosphorus, chromium, zinc, manganese, and iron) as it descends from Lake Huron. In most instances, this increase is relatively small. Sediments at the mouth of the St. Clair River had relatively low concentrations of heavy metals except for mercury concentrations which were excessive. In 1975 the Detroit District initiated a program to monitor hopper dredge overflows during the dredging work in Lake St. Clair. These initial data are insufficient to base determinations but the program is continuing. It should be pointed out that materials dredged in the river are more sandy and gravelly, the river current is at its lowest velocity at or near the bottom where the dredging disturbance occurs, and, therefore, should not disseminate as widely as the finer silt and clay sediments found in the lake.

In the mid-1960's the Corps conducted a study on dredging and water quality problems in the Great Lakes under the management of the Buffalo District. Investigations of methods to clarify overflow waters were undertaken during this study with no practicable solutions forth coming. Please refer to the reference: Corps of Engineers, Buffalo District (1969), Dredging and Water Quality Problems in the Great Lakes, 12 Volume Technical Report.

The Corps of Engineers through its Dredged Material Research Program being conducted by the Waterways Experiment Station at Vicksburg, Mississippi, is researching methods of clarifying overflow waters. Task 5A, Dredged Material Densification, has for its objective the development and testing of promising techniques for dewatering or densifying dredged materials using mechanical, biological, and/or chemical techniques prior to, during, and after placement in containment areas. Several other objectives are being pursued in the fields of Turbidity Prediction and Control Research (Task 6C) under the auspices of this extensive investigative program. Some of the studies under this unit include the determination of the nature and degree of turbidity generated by current dredge practice and predicting the turbidity-generation potential of sediments to be dredged.

6. Comment:

Additionally, we would urge that a larger number of sediment samples be taken by the EPA in future years along this navigation channel. This is important to make certain that the levels of mercury and other heavy metals remain well within the EPA guidelines and to insure that any chemical containment problem with be quickly detected and corrected.

Response:

In their letter of 10 October 1975 responding to the Draft EIS on the proposed maintenance dredging, EPA indicated that they had resampled the St. Clair River. From the results of this sampling EPA concluded that sediments to be removed from the channel are suitable for unrestricted open-lake disposal. Attachment 1, Appendix A.

7. Comment:

It is stated on page 3 of the Draft EIS that the derrickboat is scheduled for maintenance operations June 5 to August 30, 1975. We assume the year cited is an error, and will be corrected in the final statement.

Response:

The date was correct. The Corps of Engineers, in pursuing attempts to maintain the Nation's waterways and comply with applicable laws, has developed a management program for Environmental Impact Statements on projects in an Operation and Maintenance status. This was necessary because of an instantanious backlog of EIS's for ongoing projects which occurred with the passage of NEPA. Among other items, the program provides that no dredging would commence after 1 October 1974 unless an environmental assessment has been prepared. The program also provides that no dredging will be initiated after 1 January 1976 without a Final Environmental Statement onfile with CEQ for 30 days, if the assessment concludes that an EIS is required. In the interim, those instances where a determination is made that overriding public interest requires the dredging to proceed before the required EIS can be prepared, an appropriate determination and finding would be prepared in lieu of an EIS in accordance with the requirements of the Federal dredging regulation. Preparation of the EIS would continue concurrently. The management program was approved by CEQ and noticed in the Federal Register, Vol. 39, page 22635, July 22, 1974. The Public Notice of 12 February 1975 implements this regulation.

8. Comment:

Mention should be made whether the dredging will begin in the upper most reach of the area to be dredged and proceed downstream. This would seem desirable to minimize re-deposition of disturbed materials back into the channel.

Response:

The order in which shoals are dredged is determined by considerations of convenience and availability of dredging equipment. Given the volume of flow of the river and the small ratio of the material to be dredged relative to the magnitude of material normally carried in suspension by the river, the redeposition of disturbed fine materials on downstream shoals is not significant enough to bear importantly on the order in which shoals are removed.

9. Comment:

On page 20 of the Draft EIS (Environmental Impact), this section does not adequately describe how dredging will affect various species of fish--their reproduction, migration, feeding and living. This aspect should be thoroughly covered in the final environmental impact statement.

Response:

Environmental impacts of dredging are discussed in paragraphs 4.09 through 4.15.

10. Comment:

We agree that the dredging does not directly affect shoreline erosion problems. However, the large ships that use the deepened channel do cause some degree of erosion damage. This should be mentioned in the statement.

Response:

Mr. Ralph Rogerson, a resident of Harsons Island, made this same observation in his letter responding to the Draft EIS. He noted that vessel speeds and their wake were related to amounts of shoreline erosion, particularly recreational-type cruiser craft. The Corps of Engineers has no jurisdiction over vessel speeds, either commercial or recreational. This is the responsibility of the U.S. Coast Guard.

11. Comment:

Finally, P.A. 326 of 1913 states that approximately 18,000 acres of the St. Clair Flats are dedicated to the paramount use for public hunting and fishing. Information contained in paragraph 1 on page 14 of the Draft EIS seems contrary to this Act. We suggest this be clarified or corrected in the final statement.

Response:

This paragraph describes the present usage of the St. Clair flats area and is not meant to challenge P.A. 326 of 1913. However, this information has been added to the Final EIS, paragraph 2.16.

Michigan Department of State - Michigan History Division

1. Comment:

Dr. Lawrence Finfer, Environmental Review Coordinator and Dr. Martha M. Bigelow, State Historic Preservation Officer and Director, Michigan History Division have reviewed the proposal for maintenance dredging of the St. Clair River. They conclude that this project will have no effect on cultural resources.

Response:

Your response is noted and has been included in the formulation of the EIS.

State of Michigan - Department of State Highways and Transportation

1. Comment:

The Environmental Liaison Section has reviewed the Draft Environmental Statement and believes the need for this project (maintenance of the waterway for safe passage of National and International waterborne commerce) is obvious and clearly defined in the Statement.

Response:

Your comments are noted and have been considered in the formulation of the EIS.

2. Comment:

There is an inconsistency between the statement on page 1 which indicates "all materials scheduled for removal from the St. Clair River are from stretches classified as being clean and suitable for open water disposal." However, on page 30, the statement indicates the Environmental Protection Agency's testing in 1973-74 showed bottom sediments are polluted and non-tested sediments should not be assumed non-polluted and such areas should be sampled and classified prior to maintenance dredging.

Response:

Please refer to EPA's 1975 test results included in Appendix A.

3. Comment:

The Statement notes that "removed material will be disposed in deep open water areas, or placed ashore at upland sites." Although the location of deep water disposal sites are clearly shown in Figure No. 2, the upland sites are not. Since upland disposal could have a very severe adverse environmental impact due to the high water table of upland sites adjacent to the river, it is suggested if such upland sites are used that their locations be shown.

Response:

The primary "upland" disposal site is the parcel of land offered by MDNR which is located within the boundaries of the St. Clair Flats Wildlife Area. See Figure 8. Secondary sites for onshore disposal would be limited to properties that have been permitted under Section 404, P.L. 92-500 as explained in paragraphs 1.04 and 4.16. These unpolluted materials would serve to restore eroded shores.

4. Comment:

On page 1, it is indicated that this maintenance operation will be performed "in 1975 and subsequent years thereafter as required to remove shoals." This statement seems to suggest that this Environmental Statement is of the "class action" variety and additional Statements will not be prepared for subsequent years. Although this procedure would be acceptable if such things as the condition of bottom sediments do not change, the Environmental Protection Agency's test results show bottom conditions can and often do change. Therefore, it is suggested that a clarification be made of whether additional Statements will be prepared for subsequent dredging and, if so, under what conditions.

Response:

This Statement will be up-dated on an "as needed" basis. One basis upon which the Statement could be up-dated is the change of sediment quality or the locations of disposal areas.

City of Detroit - City Engineering Department

1. Comment:

There is no apparent conflict between Detroit City Engineering Department interests and the proposed operations.

Response:

Your response is noted and has been included in the formulation of the EIS.

Detroit Metro Water Department

1. Comment:

We are concerned about the temporary decrease in water quality during the annual dredging of 130,000 cubic yards of sediments as reported in the September 5, 1975, Federal Register.

Response:

As noted, water quality can temporarily decrease during dredging operations. The decrease in water quality is related to sediment composition, size of the area being dredged and the length of time that the dredge operates. May (1973) compiled data on three dredging operations and determined that suspended solids concentrations did not exceed background levels beyond a few hundred feet of the dredge.

Your office also requested a copy of the Draft EIS on the St. Clair River Maintenance Dredging and a copy was sent to your department.

Since no further comments were received from your department regarding the Maintenance Dredging and since no comments concerning adverse water quality were received to the DEIS on Lake St. Clair where the Detroit Metro Water Department water intake is located, it is assumed that your concern about degraded water quality has been answered satisfactorily by the information contained in the Draft EIS.

Detroit Edison Company - Detroit, Michigan

1. Comment:

The Detroit Edison Company has reviewed the above referred Draft Environmental Statement, and believes the work, as proposed, to be in the best interests of Edison and our customers and residents of southeastern Michigan.

Response:

Your response is noted and has been considered in the formulation of the EIS.

Ralph Rogerson - Harsens Island, Michigan

1. Comment:

Reviewed the Draft EIS and found all aspects both pro and con have been covered, giving the reader a clear view of both sides of the question of whether or not to dredge the shoals of the St. Clair River.

2. Comment:

Mr. Rogerson stated that he was familar with the area and the shoals should be removed to aid in holding down costs of comodities transported by commercial vessels.

3. Comment:

Mr. Rogerson stated that the present channel depths should not be deepened, as during low water times, they now suck out the water from the adjoining canals and when the water returns, a great deal of sand returns filling up the canals.

Response:

Maintenance dredging operations described in the Environmental Statement are directed to restoring the depths presently authorized by

Congress. Any increase in depth would require new authorizations from Congress. Present dredging is not anticipated to affect water levels in adjoining canals or the river proper. Please refer to Comment/ Response No. 6, U.S. Department of Commerce.

4. Comment:

Mr. Rogerson addressed the Extended Navigation Season by stating that when the Coast Guard helped ice-bound ships last winter his dock was squeezed aside, damaging pilings and dumping a portion into the river.

Response:

Activities and their environmental impacts and proposed solutions related to the Extended Navigation Season Demonstration Program are discussed in the Fiscal Year 1976 Extended Navigation Season Demonstration Program Final EIS. A copy has been forwarded to Mr. Rogerson which outlines this coming year's activities.

5. Comment:

Mr. Rogerson expressed concern that stiffer controls should be leveled on vessel speeds, particularly during high water levels. He stated that at normal speeds freighters do very little damage, but stricter controls should be put on recreational craft speed.

Response:

The Corps of Engineers determines allowable speed limits but authority to enforce these controls lies with the U.S. Coast Guard. Complaints of this nature should be addressed to that unit of government.

6. Comment:

It is my observation that the dredged materials, when dumped into the river, quickly sink to the bottom. Do the freighters, as they have fairly deep drafts, drag these materials along with them?

Response:

Movement of materials along the river bottom is caused by many factors, including prop wash from the deeper-draft vessels, velocity of the current and the amounts of loose materials.

7. Comment:

Commented on construction procedures used by contractors when opening a canal. Also stated that pile driving operations have no significant impact on fish life.

Response:

Minimal pile driving operations are planned in conjunction with the St. Clair River maintenance operations. Two pile clusters will be needed in the Middle Channel to dock the hopper dredge for material disposal into the MDNR's Harsens Island site. Canals constructed adjacent to navigable waterways of the United States require permits from the Corps of Engineers. Construction procedures contained therein must be adhered to.

8. Comment:

Stated that everyone must consider all aspects of wildlife, fish, etc., and protect and conserve them, but it is also true that people also must be considered and allowed to protect their properties.

Response:

The Corps endeavors to follow a program that considers and evaluates both economic considerations and the impacts on the natural environment.

REFERENCES

1. Water Quality Investigation of the Detroit & St. Clair Rivers; Encotech Corp., Ann Arbor, Mich., for Environmental Protection Agency; August 1974.

2. Belle River Power Generating Facilities, Environmental Report; Commonwealth Asso., Inc., Jackson, Mich., for Detroit Edison; April 1974.

3. System Study to Extend Navigation Season on St. Clair-Detroit River Systems, Appendix B; Acres American, Inc., Buffalo, N.Y., for U.S. Army Corps of Engineers, Detroit District; August 1974.

4. Project Map, St. Clair River, Michigan; Condition of Improvement, 30 June 1973; Detroit District Corps of Engineers.

5. Bottom Sediment Sample Analysis, Michigan Navigation Channels; U.S. Environmental Protection Agency, 1970, 1973.

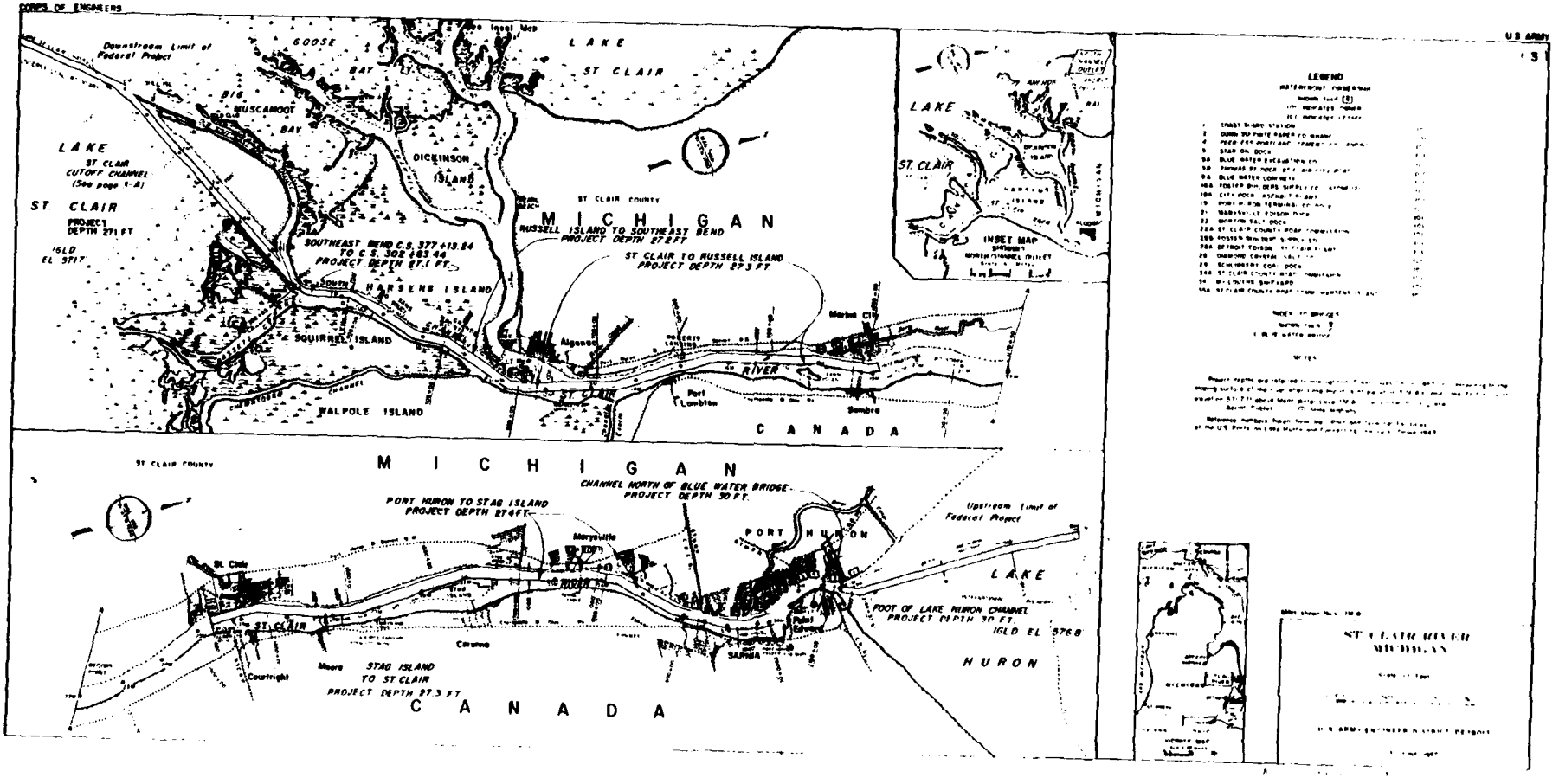
6. Plumb, R. H. and Lee, G. F., 1974; Literature Review on Research Study for the Development of Dredged Material Disposal Criteria, U.S. Army Waterways Experiment Station, Technical Report, D-74-1.

7. Hutchinson, G. E., 1957; A Treatise on Limnology.

8. Environmental Protection Agency, 1971; The Effects of Dredging on Water Quality, Office of Water Programs, Region X, Seattle, excerpted in "World Dredging and Marine Construction."

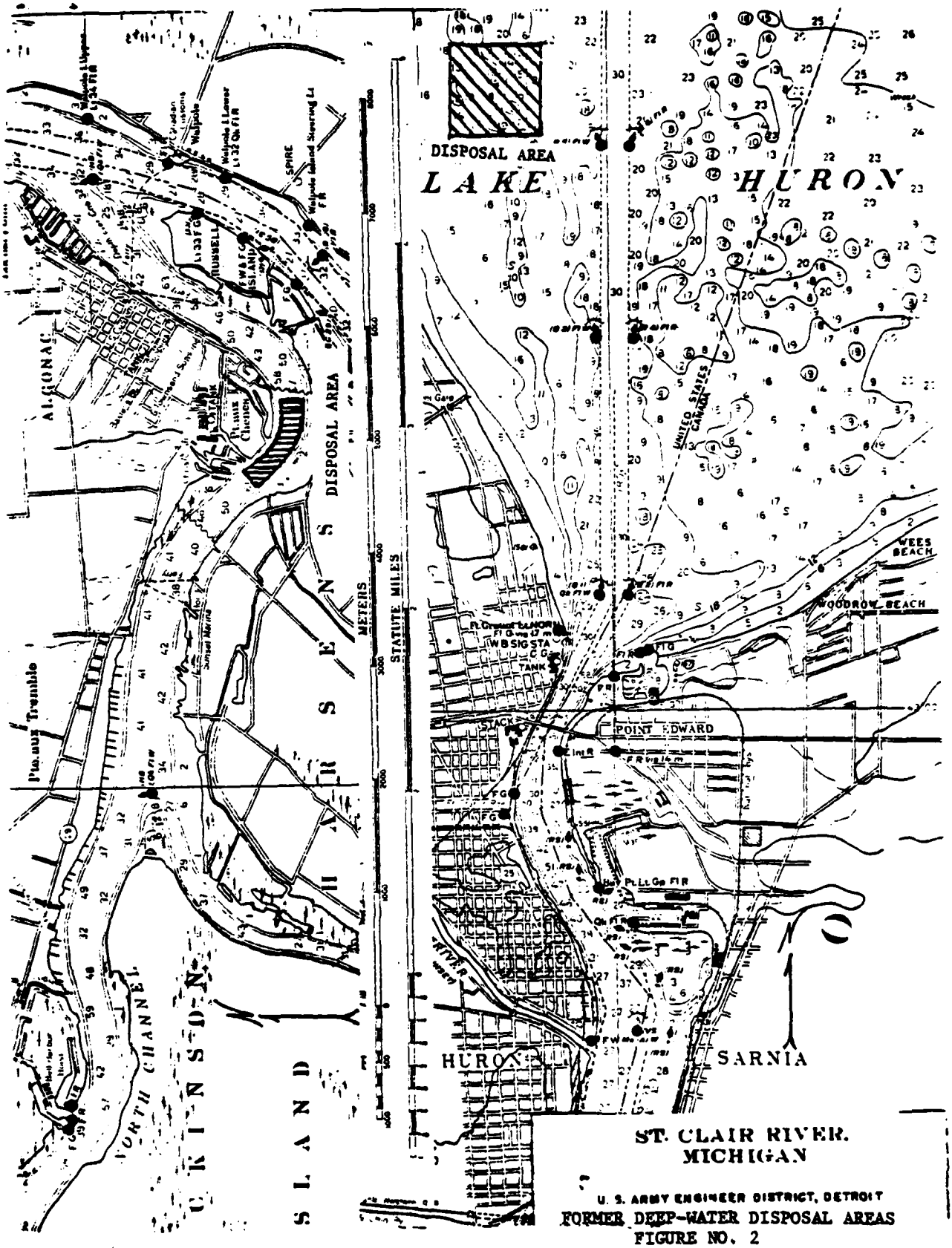
APPENDIX A

FIGURES & TABLES


CORPS OF ENGINEERS
Downstream Limit of Federal Project
GOOSE BAY
LAKE ST CLAIR
BIG MUSCAMOOT BAY
DICKINSON ISLAND
LAKE ST CLAIR CUTOFF CHANNEL (See page 1-8)
ST CLAIR PROJECT DEPTH 27.1 FT
IGLD EL 5717
SOUTHEAST BEND C.S. 377+13.84 TO C.S. 382+83.44 PROJECT DEPTH 27.1 FT.
ST CLAIR COUNTY
MICHIGAN
RUSSELL ISLAND TO SOUTHEAST BEND PROJECT DEPTH 27.8 FT.
ST CLAIR TO RUSSELL ISLAND PROJECT DEPTH 27.3 FT.
HARSENS ISLAND
SQUIRREL ISLAND
WALPOLE ISLAND
Algonac
Marine City
Port Lambton
Sombra
CANADA
INSET MAP
LAKE ST CLAIR
ST CLAIR COUNTY
MICHIGAN
CHANNEL NORTH OF BLUE WATER BRIDGE PROJECT DEPTH 30 FT.
PORT HURON TO STAG ISLAND PROJECT DEPTH 27.4 FT.
Marysville
PORT HURON
Upstream Limit of Federal Project
St Clair
ST CLAIR
Courtright
Moore
Corunna
STAG ISLAND TO ST CLAIR PROJECT DEPTH 27.3 FT.
SARNIA
LAKE HURON
FOOT OF LAKE HURON CHANNEL PROJECT DEPTH 30 FT. IGLD EL 576.8
CANADA
US ARMY
LEGEND
ST CLAIR RIVER MICHIGAN

No. 1A — PROJECT

NAME OF CHANNEL	LENGTH	UP OR DOWN BOUND	WIDTH	DEPTH	IGLD 1955	ADOPTED
Foot of Lake Huron	26,500'	both	800'	30.0'	576.8-576.5	1956
Channel North of Blue Water Bridge	4,100'	both	800'	30.0'	576.4-576.1	1956
Port Huron to Stag Island	38,000'	both	1,000' and 1,400'	27.4'	576.1-574.9	1956
Stag Island to St. Clair (Including widening at upper and lower ends of Stag Island)	37,600'	both	900' and 1,000'	27.3'	574.9-573.8	1956
St. Clair to Russell Island	77,000'	both	1,000'	27.3'	573.8-572.4	1956
Russell Island to Southeast Bend	20,600'	both	700' 1,000'	27.2'	572.4-572.1	1956
Southeast Bend C.S. 324/00 to C.S. 250/00	7,400'	both	700'	27.1'	572.1-572.0	1956
Southeast Bend Cut-off Channel	30,300'	both	700'	27.1'	572.0-571.7	1956
North Channel Outlet	8,000'	small craft	100'	10.0'	571.7	1946


DISPOSAL AREA
LAKE HURON
DISPOSAL AREA
ALGONAC
ST. CLAIR RIVER
METERS
STATUTE MILES
WEES BEACH
WOODROW BEACH
POINT EDWARD
SARNIA
HURON
NORTH CHANNEL
ST. CLAIR RIVER
MICHIGAN
U. S. ARMY ENGINEER DISTRICT, DETROIT
FORMER DEEP-WATER DISPOSAL AREAS
FIGURE NO. 2

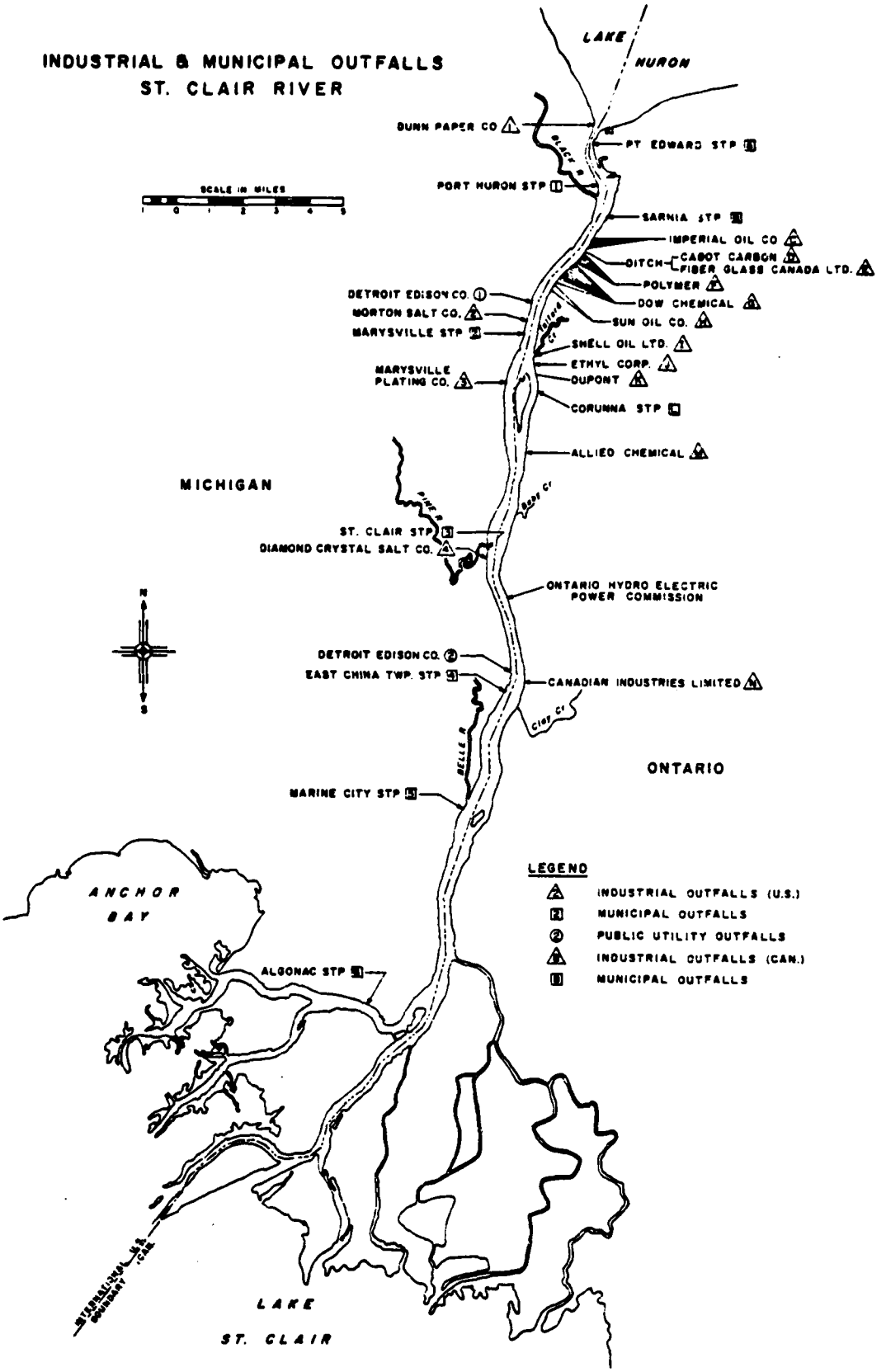

INDUSTRIAL & MUNICIPAL OUTFALLS
ST. CLAIR RIVER
LAKE HURON
DUNN PAPER CO
PT EDWARD STP
BLACK R
PORT HURON STP
SCALE IN MILES
SARNIA STP
IMPERIAL OIL CO
DITCH
CABOT CARBON
FIBER GLASS CANADA LTD.
POLYMER
DETROIT EDISON CO.
DOW CHEMICAL
MORTON SALT CO.
SUN OIL CO.
MARYSVILLE STP
BLACK CR
SHELL OIL LTD.
ETHYL CORP.
MARYSVILLE PLATING CO.
DUPONT
CORUNNA STP
ALLIED CHEMICAL
MICHIGAN
PINE R
BEAR CR
ST. CLAIR STP
DIAMOND CRYSTAL SALT CO.
ONTARIO HYDRO ELECTRIC POWER COMMISSION
N
S
DETROIT EDISON CO.
EAST CHINA TWP. STP
CANADIAN INDUSTRIES LIMITED
CLAY CR
BELLE R
ONTARIO
MARINE CITY STP
LEGEND
INDUSTRIAL OUTFALLS (U.S.)
MUNICIPAL OUTFALLS
PUBLIC UTILITY OUTFALLS
INDUSTRIAL OUTFALLS (CAN.)
MUNICIPAL OUTFALLS
ANCHOR BAY
ALGONAC STP
INTERNATIONAL BOUNDARY
LAKE ST. CLAIR

Figure No. 3

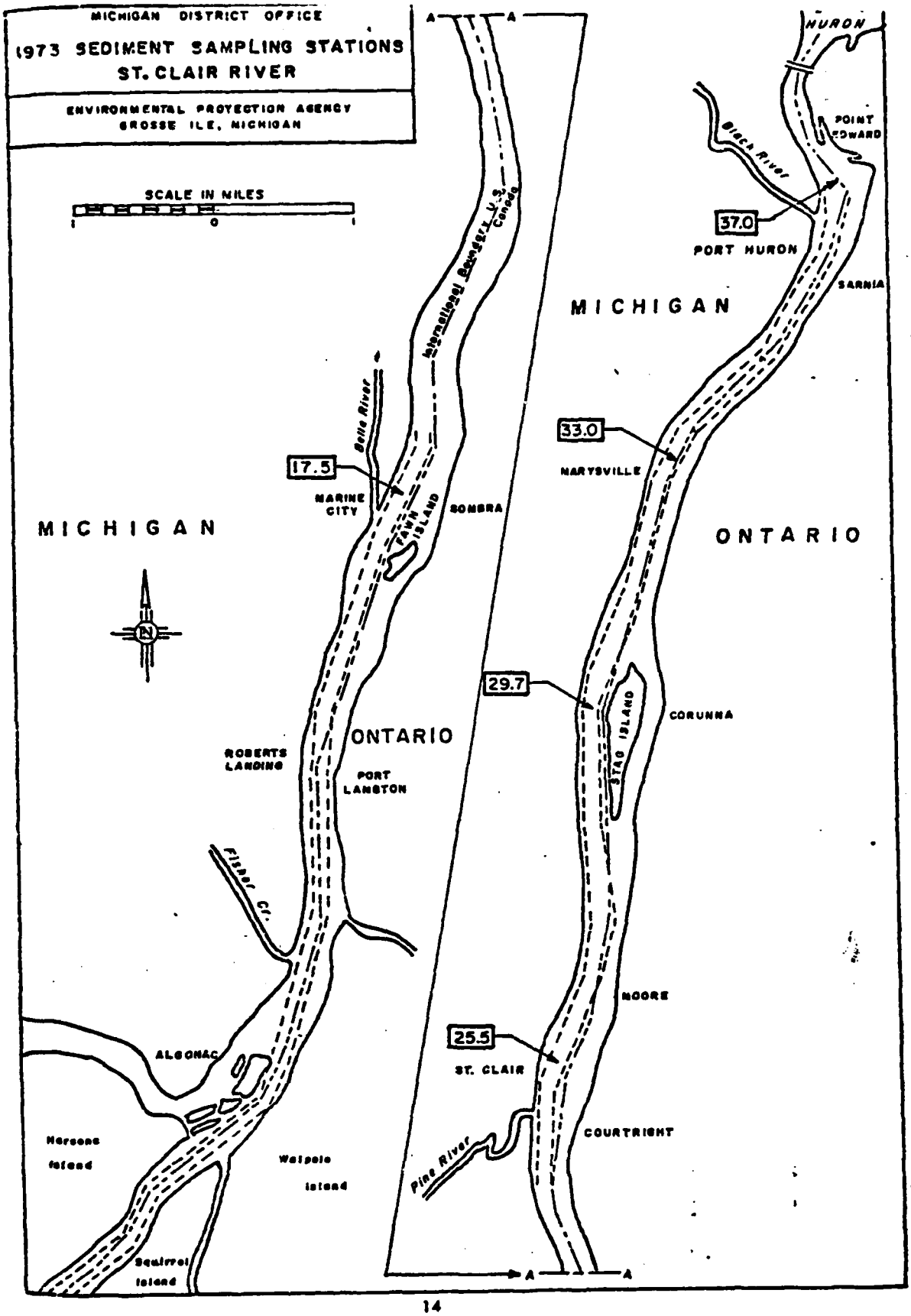

MICHIGAN DISTRICT OFFICE
1973 SEDIMENT SAMPLING STATIONS
ST. CLAIR RIVER
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN
SCALE IN MILES
1 0 1
A A
International Boundary U.S. Canada
Belle River
17.5
MARINE CITY
FAWN ISLAND
SOMBRA
MICHIGAN
ONTARIO
ROBERTS LANDING
PORT LAMBTON
FISHER CR.
ALGONAC
Harsens Island
Walpole Island
Squirrel Island
HURON
POINT EDWARD
Black River
37.0
PORT HURON
SARNIA
MICHIGAN
33.0
MARYSVILLE
ONTARIO
29.7
STAG ISLAND
CORUNNA
MOORE
25.5
ST. CLAIR
COURTRIGHT
Pine River
A A
N

Figure No. 4

FIGURE 22

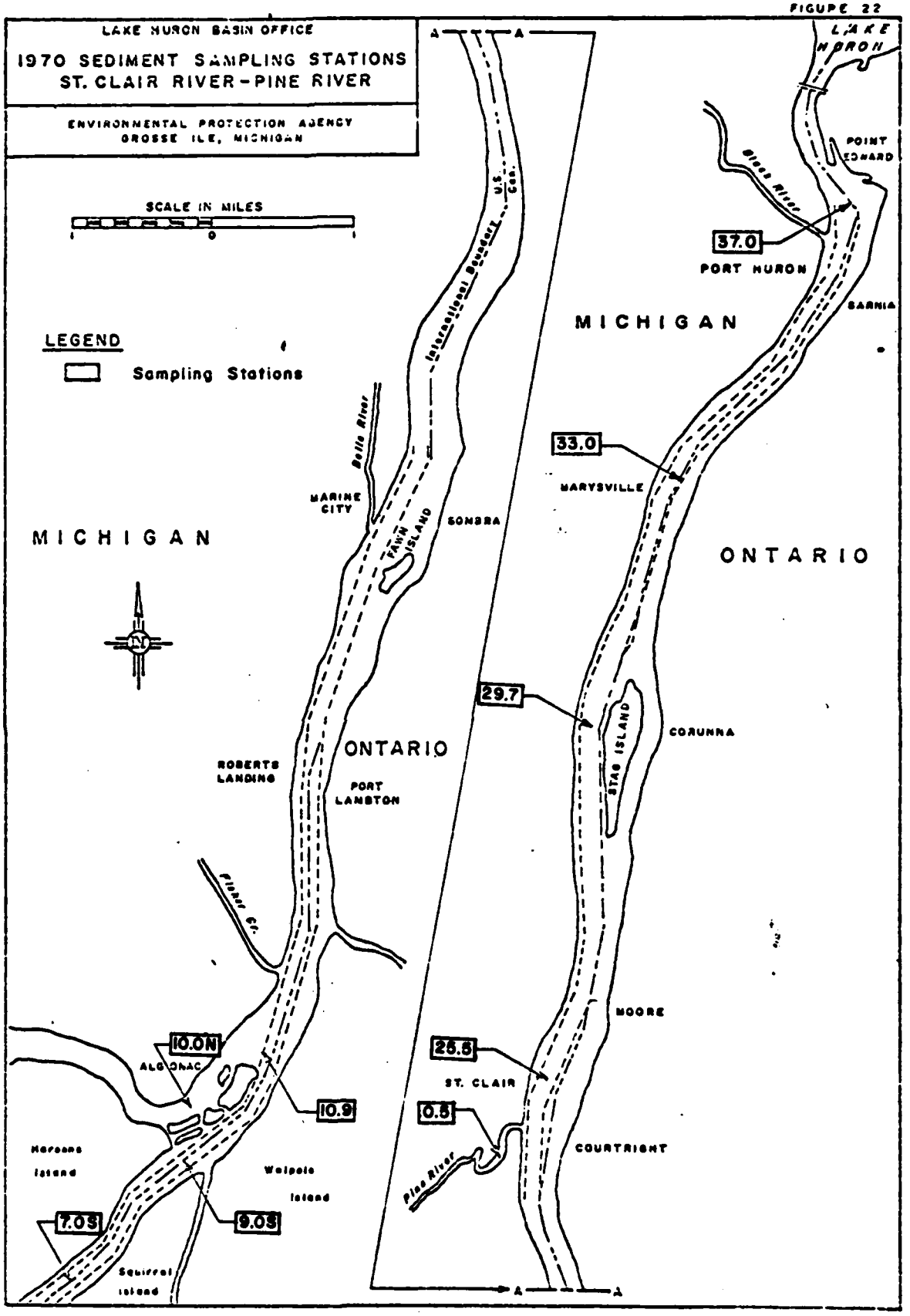


Figure No. 5

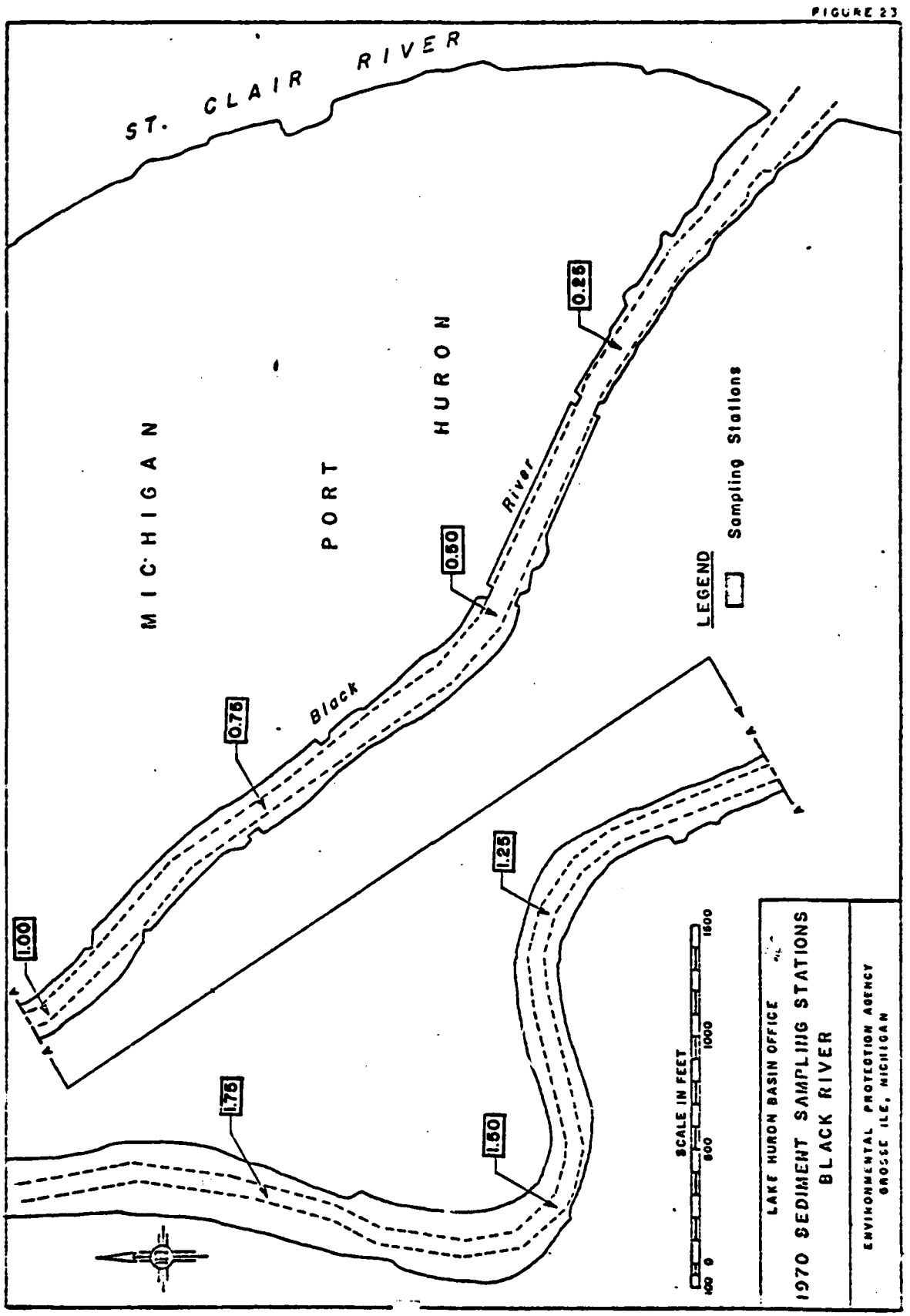


FIGURE 23
ST. CLAIR RIVER
MICHIGAN
PORT HURON
Black River
0.26
0.50
0.75
1.00
1.25
1.50
1.75
LEGEND
Sampling Stations
SCALE IN FEET
400 0 800 1000 1600
LAKE HURON BASIN OFFICE
1970 SEDIMENT SAMPLING STATIONS
BLACK RIVER
ENVIRONMENTAL PROTECTION AGENCY
GROSSE ILE, MICHIGAN

Figure No. 6

TABLE 8

Bottom Sediment Sample Analysis
St. Clair River
April 25, 1973

MODO-EPA

Station No.	Depth (ft.)	Lab. No.	Sediment Description				Temp. °C
			Color	Odor	Oil	Percent Composition	
37.0	33	17001	brown	-	no	Sand-100	5.0
25.5	20	17004	gray-brown	-	no	Sand-80, ooze-20	5.0
17.5	20	17005	gray-brown	-	no	Clay-50, Sand-40, Gravel-10	5.0
*37.0	24	4699	brown	-	no	Sand-90, Silt-10	0.5
*33.0	24	4700	brown	-	no	Pebbles-50, Sand-40, Clay-10	0.5
*29.7	39	4701	gray	-	no	Clay-98, Sand-2	1.0
*25.5	6	4702	brown-yellow	-	no	Sand-50, Silt-50	0.5
*17.5	15	4703	brown-yellow	-	no	Sand-50, Silt-50	1.0

*Sampled 3/19/74

Summary of Sediment Quality

Location	No. of Samples	No. of Analyses	Pollution Status*	General Quality & Remarks
*St. Clair River	3	51	P	High zinc, cadmium and manganese concentrations at station 17.5 and high concentration of cobalt at station 37.0

TABLE 9

Bottom Sediment Sample Analysis
St. Clair River

MODO-EPA

Station No.	Solids (percent) Total	Solids (percent) Tot. Vol.	COD (mg/kg) Wet B	COD (mg/kg) Dry B	Phenol (mg/kg) Wet B	Phenol (mg/kg) Dry B	Tot. Kjeldahl Nitrogen (mg/kg) Wet B	Tot. Kjeldahl Nitrogen (mg/kg) Dry B	Total Phos. (mg/kg) Wet B	Total Phos. (mg/kg) Dry B	Oil & Grease (mg/kg) Wet B	Oil & Grease (mg/kg) Dry B
37.0	84.6	0.8		8625		0.20		213		111		5
25.5	78.3	1.1		12465		.1		309		117		83
17.5	71.7	3.1		31315		0.24		675		226		551

Station No.	Arsenic (mg/kg) Wet B	Arsenic (mg/kg) Dry B	Cadmium (mg/kg) Wet B	Cadmium (mg/kg) Dry B	Total Chromium (mg/kg) Wet B	Total Chromium (mg/kg) Dry B	Cobalt (mg/kg) Wet B	Cobalt (mg/kg) Dry B	Copper (mg/kg) Wet B	Copper (mg/kg) Dry B	Manganese (mg/kg) Wet B	Manganese (mg/kg) Dry B
37.0		1.79		13		12		80		8		131
25.5		2.1		19		.2		18		18		116
17.5		4.1		22		4		17		32		240

Station No.	Total Iron (mg/kg) Wet B	Total Iron (mg/kg) Dry B	Lead (mg/kg) Wet B	Lead (mg/kg) Dry B	Nickel (mg/kg) Wet B	Nickel (mg/kg) Dry B	Zinc (mg/kg) Wet B	Zinc (mg/kg) Dry B	Mercury (mg/kg) Wet B	Mercury (mg/kg) Dry B
37.0		2727		0.4		7		34		
25.5		3006		11		15		49		
17.5		5004		10		19		67		
Concentration Limits		30000		50				50		
*37.0									0.1	0.2
*33.0									0.1	0.2
*29.7									0.1	0.2
*25.5									0.1	0.2
*17.5									0.2	0.3
*Concentration Limits										1.0

*Sampled 3/19/74

TABLE 10

Bottom Sediment Sample Analysis
Michigan Navigation Channels - 1970

FWOA-LHBO

St. Clair River

Station No.	Date	Depth (ft.)	Sediment Description				% Passing No. 10 Mesh Screen
			Color	Odor*	Oil	Percent Composition	
37.0	5/18	24	sandy	Df	no	sand-100	98
33.0	5/18	30	sandy	Df	no	pebbles-80, sand-10, stone-10	
25.5	5/18	5	sandy	Df	no	sand-100	98
29.7	5/18	30	sandy	none	no	stones-100	
10.0N	6/8		sandy	none	no	sand-90, clay-10	99.2
10.9	6/8		sandy	none	no	sand-40, clay-40, silt-9, pebbles-10, stone-1	90.3
9.0S	6/8		sandy	none	no	sand-99, clay-1	98.8
7.0S	6/8		sandy	none	no	sand-94, gravel-5, pebbles-1	88.4

Station No.	Date	Depth (ft.)	Solids (percent)		Mercury (mg/kg)		Oil & Grease (mg/kg)		Total Iron (mg/kg)		Total Phosphorus (mg/kg)	
			Total	Tot. Vol.	Wet B	Dry B	Wet B	Dry B	Wet B	Dry B	Wet B	Dry B
37.0	5/18	24	79.5	.9	.8	1.0	180	230	42	53	170	210
33.0	5/18	30	90.3	1.1	.2	.2	160	180	60	66	150	170
25.5	5/18	5	76.8	.8	.2	.3	180	230	32	42	120	160
10.0N	6/8		80.6	2.0	.2	.2	160	200	8,700	11,000	140	170
10.9	6/8		78.3	3.0	.4	.5	200	260	10,000	13,000	160	200
9.0S	6/8		81.9	1.8	.5	.6	220	270	4,600	5,600	79	96
7.0S	6/8		82.1	.8	.4	.5	220	270	3,700	4,500	70	85

TABLE 10 (cont'd)

Bottom Sediment Sample Analysis
Michigan Navigation Channels - 1970

FWQA-LHBO

St. Clair River

Station No.	Depth (ft.)	Date	Ammonia-Nitrogen (mg/kg)		Organic-Nitrogen (mg/kg)		COD (mg/kg)		Phenols (ug/kg)	
			Wet B	Dry B	Wet B	Dry B	Wet B	Dry B	Wet B	Dry B
37.0	24	5/18	11	14	130	160	6500	8200	98	
33.0	30	5/18	11	12	120	130	3300	3700	180	200
25.5	5	5/18	5	7	220	290	6700	8700	98	
10.0N		6/8					6200	7700		
10.9		6/8					6000	7700		
9.0S		6/8					4200	5100		
7.0S		6/8					3300	4000		

TABLE 11

Bottom Sediment Sample Analysis
Michigan Navigation Channels - 1970

FWOA-LHBO

Black River 5/18

Station No.	Depth (ft.)	Sediment Description: Color	Odor*	Oil	Percent Composition	% Passing No. 10 Mesh Screen
0.25	25	black	Ds	yes	sand-70, mud-30	
0.50	14	black-brown	"	"	sand-60, mud-30, ooze-10	99
0.75	18	black	"	"	sand-60, mud-40	
1.0	13	black-brown	"	"	mud-50, sand-40, ooze-10	
1.25	14	black-brown	"	"	mud-80, silt-10, paper floc-10	
1.50	15	light brown	"	"	mud-50, paper floc-50	
1.75	11	black	"	no	mud-50, sand-40, ooze-10	97

Station No.	Depth (ft.)	Solids (percent) Total	Solids (percent) Tot. Vol.	Mercury (mg/kg) Wet B	Mercury (mg/kg) Dry B	Oil & Grease (mg/kg) Wet B	Oil & Grease (mg/kg) Dry B
1.75	11	57.0	4.6	.2	-	820	1400
0.50	14	53.2	5.8	.2	.4	1100	2100

Station No.	Depth (ft.)	Total Iron (mg/kg) Wet B	Total Iron (mg/kg) Dry B	Total Phosphorus (mg/kg) Wet B	Total Phosphorus (mg/kg) Dry B	Ammonia-Nitrogen (mg/kg) Wet B	Ammonia-Nitrogen (mg/kg) Dry B
1.75	11	5800	10,000	270	470	28	49
0.50	14	58	110	270	510	31	58

Station No.	Depth (ft.)	COD (mg/kg) Wet BC	COD (mg/kg) Dry B	Phenol (ug/kg) Wet B	Phenol (ug/kg) Dry B
1.75	11	37,000	65,000	290	510
0.50	14	56,000	105,000	110	210

TABLE 12

Bottom Sediment Sample Analysis
Michigan Navigation Channels - 1970

FWQA-LHBO

Pine River 5/18

Station No.	Depth (ft.)	Sediment Description: Color	Odor*	Oil	Percent Composition	% Passing No. 10 Mesh Screen
0.5	21	brown	Ds	no	mud-50, sand-20, ooze-20, clay-10	99

Station No.	Depth (ft.)	Solids (percent) Total	Solids (percent) Tot. Vol.	Mercury (mg/kg) Wet B	Mercury (mg/kg) Dry B	Oil & Grease (mg/kg) Wet B	Oil & Grease (mg/kg) Dry B
0.5	21	48.3	6.7	.2	.4	460	950

Station No.	Depth (ft.)	Total Iron (mg/kg) Wet B	Total Iron (mg/kg) Dry B	Total Phosphorus (mg/kg) Wet B	Total Phosphorus (mg/kg) Dry B	Ammonia-Nitrogen (mg/kg) Wet B	Ammonia-Nitrogen (mg/kg) Dry B
0.5	21	140	290	390	810	62	130

Station No.	Depth (ft.)	Organic-Nitrogen (mg/kg) Wet B	Organic-Nitrogen (mg/kg) Dry B	COD (mg/kg) Wet B	COD (mg/kg) Dry B	Phenol (ug/kg) Wet B	Phenol (ug/kg) Dry B
0.5	21	220	460	33,000	68,000	390	810

TABLE 13

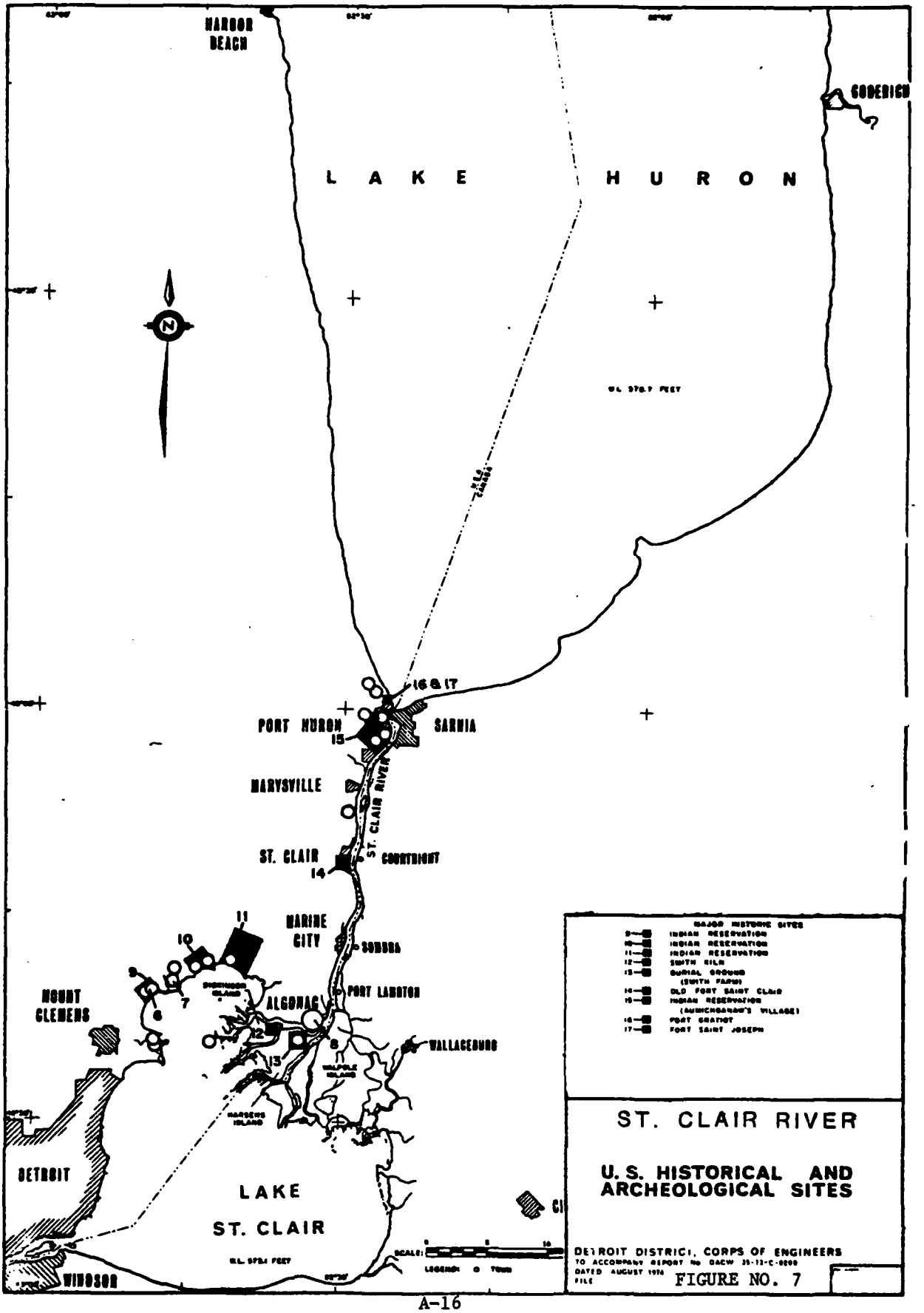
Summary of Sediment Quality - 1970

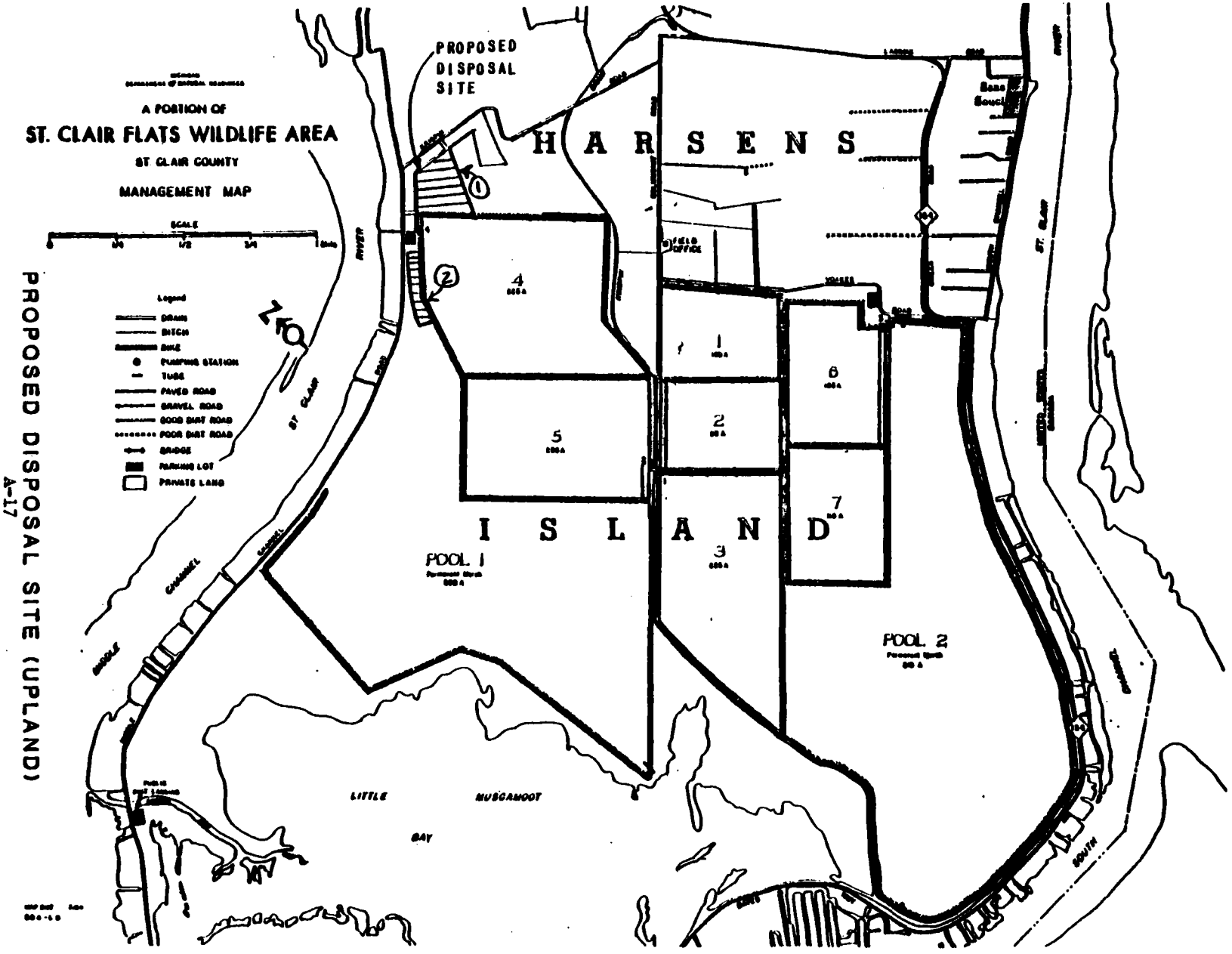
Project/Location	No. of Samples	No. of Analyses	Pollution Status	General Quality & Remarks
St. Clair River	8	63	u	Samples collected in or adjacent to navigation channels; sand, stones, silt; generally clean, some traces of mercury; sediments along Ontario shoreline known to contain extremely high levels of mercury. More surveillance needed.
Pine River (trib. to St. Clair River)	1	9	p	Mud, ooze, sand; high vol. solids, COD, trace of mercury.
Black River (trib. to St. Clair River)	7	16	p	Mud, sand, ooze; high COD, oil; mod. vol. solids.

TABLE 14. Wildife in the Vicinity of the Federal Navigation Channel, St. Clair River, Michigan. *

Class and Species	Scientific Group	Density	Trend
BIG GAME			
White-tailed Deer	Odocoileus virginlanus	Low	Increasing
WATERFOWL			
Ducks	Anatinae; Aythyinae; Merginae	High	Stable
Geese	Anserinae	Medium	Increasing
SMALL GAME			
Cottontail Rabbit	Sylvilagus flordanus	Medium	Stable
Ring-necked Pheasant	Phasianus colchicus	High	Stable
Ruffed Grouse	Bonasa umbellus	Low	Stable
Gray Squirrel	Sciurus carolinensis	Low	Decreasing
Fox Squirrel	Sciurus niger	Medium	Stable
Woodcock	Philohela minor	Low	Stable
Mourning Dove	Zenaidura macroura	High	Stable
Bobwhite Quail	Colinus virginianus	Low	Stable
FURBEARERS			
Muskrat	Ondatra zibethica	High	Stable
Mink	Mustela vison	Medium	Stable
Beaver	Castor canadensis	Low	Decreasing
Weasel	Mustella spp.	Medium	Stable
Raccoon	Procyon lotor	Medium	Increasing
Skunk	Mephitis mephitis	High	Increasing
Opossum	Didelphis marsupialis	High	Stable
Badger	Taxidea taxus	Low	Stable
NON-GAME			
Woodchuck	Marmota monox	Medium	Stable
Red Fox	Vulpes fulva	Medium	Stable
Gray Fox	Urocyon cinereoargenteus	Low	Stable
Crow	Corrus spp.	High	Stable
Red Squirrel	Tamiasciurus	Low	Stable
Coyote	Canis latrans hudsonicus	Low	Stable
Raptors	Strigiformes; Buteos	Medium	Stable
ENDANGERED; THREATENED			
Indiana bat	Myotis sodalis		
UNUSUAL OR UNIQUE ANIMALS			
Sandhill Crane	Grus canadensis	Medium	Stable

*Appendix 17 (Wildlife) Great Lakes Basin Framework Study.

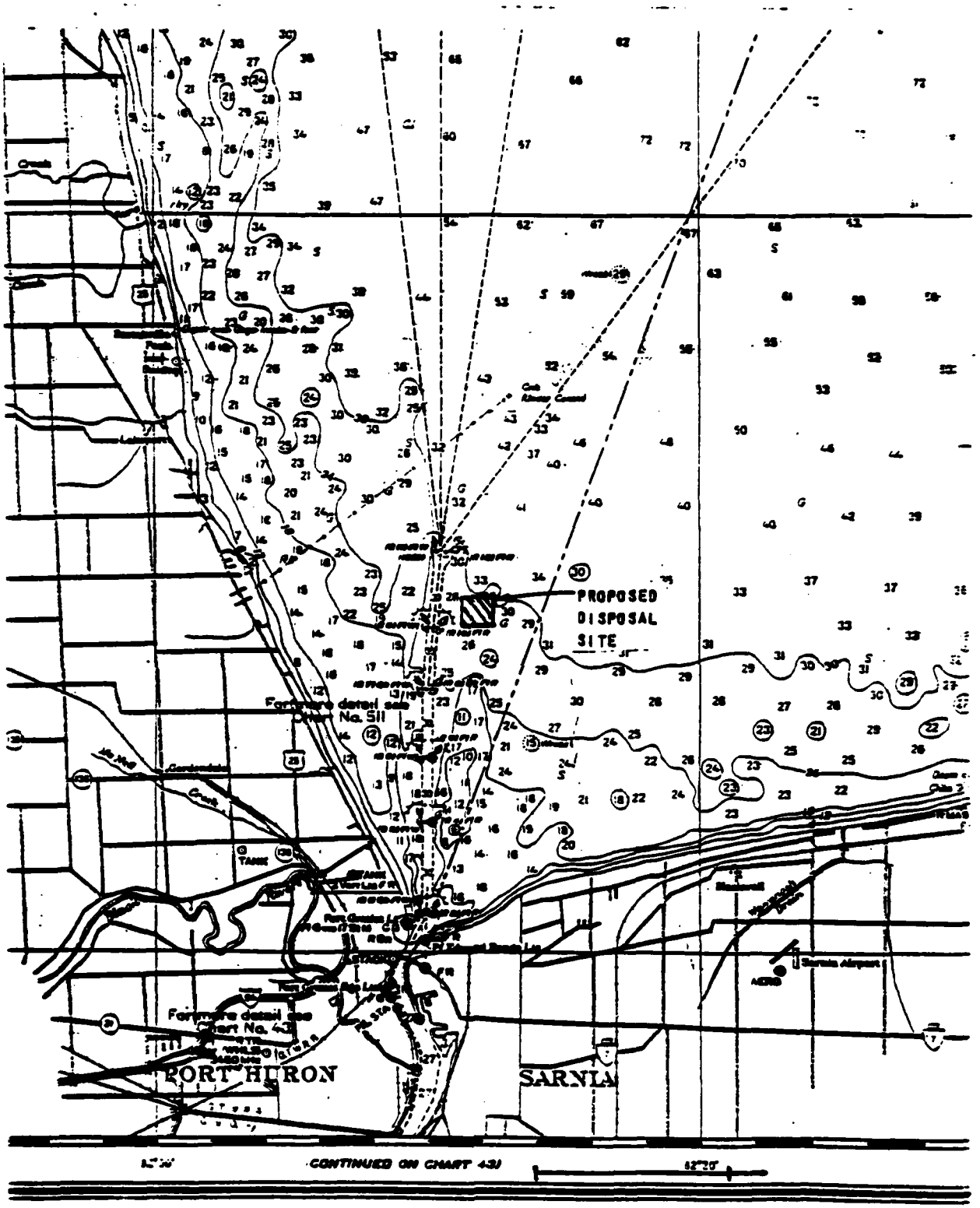

HARBOR BEACH
GODERICH
L A K E H U R O N
PORT HURON
SARNIA
16 & 17
15
MARYSVILLE
ST. CLAIR RIVER
ST. CLAIR
COURTRIGHT
14
MARINE CITY
SOMBRA
ALGONAC
PORT LAMBTON
MOUNT CLEMENS
WALLACEBURG
DETROIT
LAKE ST. CLAIR
WINDSOR
MAJOR HISTORIC SITES
9 INDIAN RESERVATION
10 INDIAN RESERVATION
11 INDIAN RESERVATION
12 SMITH KILN
13 BURIAL GROUND (SMITH FARM)
14 OLD FORT SAINT CLAIR
15 INDIAN RESERVATION (ANIMICKANAN'S VILLAGE)
16 FORT GRATIOT
17 FORT SAINT JOSEPH
ST. CLAIR RIVER
U. S. HISTORICAL AND ARCHEOLOGICAL SITES
DETROIT DISTRICT, CORPS OF ENGINEERS
TO ACCOMPANY REPORT NO DACW 35-73-C-0000
DATED AUGUST 1974
FILE
FIGURE NO. 7



PROPOSED DISPOSAL SITE (UPLAND)

A-17

FIGURE NO. 8



PROPOSED DISPOSAL SITE (OPEN WATER)

A-18

FIGURE NO. 9

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

MAR 24 1976

Brigadier General Robert L. Moore
U.S. Army Corps of Eningeers
North Central Division
536 South Clark Street
Chicago, Illinois 60605

Dear General Moore:

Enclosed for your information is our report on the bottom sediment survey conducted on the St. Clair River, Michigan on 5 October 1976.

The sediments in the St. Clair Cutoff Channel are suitable for restricted open lake disposal. These sediments should be dredged first, disposed of, and covered over by the unpolluted sediments found throughout the remainder of the federal project.

Sediments from the remainder of the federal project are suitable for unrestricted open lake disposal.

Sincerely yours,

Christopher M. Timm, Director
Surveillance and Analysis Division

Enclosure as
stated

CC: Col. Hays, Detroit District COE
FAB/TSB
William Turney ., Michigan DNR
A.R. Winklhofer, Dir., MODO

APPENDIX A
ATTACHMENT 1

ST. CLAIR RIVER, MICHIGAN

REPORT ON THE DEGREE OF POLLUTION OF
BOTTOM SEDIMENTS

SAMPLED: OCTOBER 5, 1975

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION V
GREAT LAKES SURVEILLANCE BRANCH

DISCUSSION OF RESULTS

The sediments sampled were generally gravel and sand with clay, while SCR75-10 was all clay (Tables I and III).

The bulk sediment analysis results (Table II) indicates an absence of pollution at all stations except SCR75-10 where moderate to heavy metals pollution was found. The high metals concentrations likely result from the ability of clay size particles with very high surface area to mass ratios to tie up metals by an ion-exchange mechanism. (The sample was 99% clay size particles - see Table III). Traces of metals pollution were also found at SCR75-2 and SCR75-6.

Macroinvertebrates were generally absent (Table I). This is likely due to the harsh bottom environment rather than to pollution.

Based upon analysis of all the data collected, the sediments at all sampled sites except SCR75-10 are classified as unpolluted. The sediments in the vicinity of SCR75-10 are classified as moderately polluted.

The sediments at all sites except SCR75-10 are suitable for unrestricted open lake disposal. Because of the moderate pollution found at SCR75-10, sediments in the St. Clair Cutoff Channel are suitable for restricted open lake disposal. The restriction placed on their disposal is that the St. Clair Cutoff Channel be dredged first, disposed of, and be covered over at the disposal site with the unpolluted sediments found throughout the remainder of the federal project.

The previous sediment survey carried out on 25 April 1973 indicated very high cadmium pollution in the vicinity of SCR75-1 and SCR75-2. The present survey found only traces of cadmium at these sites.

TABLE I
FIELD OBSERVATIONS

HARBOR: St. Clair River, Michigan

SAMPLED: October 5, 1975

STATION NO.	DEPTH (ft.)	OBSERVATIONS				
		COLOR	SAMPLE DESCRIPTION	ODOR	OIL	GENERAL REMARKS
SCR 75-1	35		Gravel, sand	None	None	No benthos
SCR 75-2	35		Gravel, sand, some clay	None	None	No benthos
SCR 75-3	35		Gravel, some sand	None	None	Sample not kept no benthos
SCR 75-4	32		Gravel, some sand	None	None	One live snail empty snail shells sample not kept
SCR 75-5	44		Gravel, some sand	None	None	Sample not kept
SCR 75-6	33	Brown sand grey clay	Sand, gravel, clay	None	None	No benthos
SCR 75-7	38	Brown, black specks	Coarse	None	None	No benthos
SCR 75-8	35	Brown, black specks	Sand	None	None	No benthos
SCR 75-9	35	Brown	Gravel, sand, traces of grey clay	None	None	Shells, no benthos
SCR 75-10	36	Grey	Thick clay	None	None	No benthos

TABLE I.

BULK SEDIMENT ANALYSIS RESULTS

HARBOR: St. Clair River, Michigan

SAMPLED: October 5, 1975

PARAMETER	SCR75-1	SCR75-2	SCR75-6	SCR75-7	SCR75-8	SCR75-9	SCR75-10
Total Solids %	75.7	60.7	54.2	73.2	68.3	62.8	47.6
Volatile Solids %	<1	2.88	2.40	1.26	<1	1.10	3.58
Chem. Oxy. Demand	<1,000	5,400	17,000	1,000	<1,000	6,600	30,000
T. Kjel. Nitrogen	42	94	380	180	<10	110	650
Oil-Grease	400	400	<250	<250	<250	<250	500
Mercury	<0.1	<0.1	0.2	<0.1	0.1	0.1	<0.1
Lead	18	23	25	13	<10	11	30
Zinc	31	85	64	20	14	26	92
T. Phosphorous	110	190	410	85	<10	110	650
Ammonia Nitrogen	<10	<10	20	<10	<10	<10	43
Manganese	150	274	390	170	94	170	610
Nickel	16	38	35	12	<8	12	48
Arsenic	5	20	9	5	2	2	7
Barium	<20	27	66	<20	<20	<20	120
Cadmium	<1	<1	<1	<1	<1	<1	<1
Chromium	6.8	14	17	3.2	<2	7.6	31
Magnesium	13,900	14,500	19,300	9,000	6,500	14,200	19,300
Copper	9.6	26	32	4.8	2.8	7.4	46
Iron	7,300	19,000	19,000	6,000	3,400	7,200	29,000

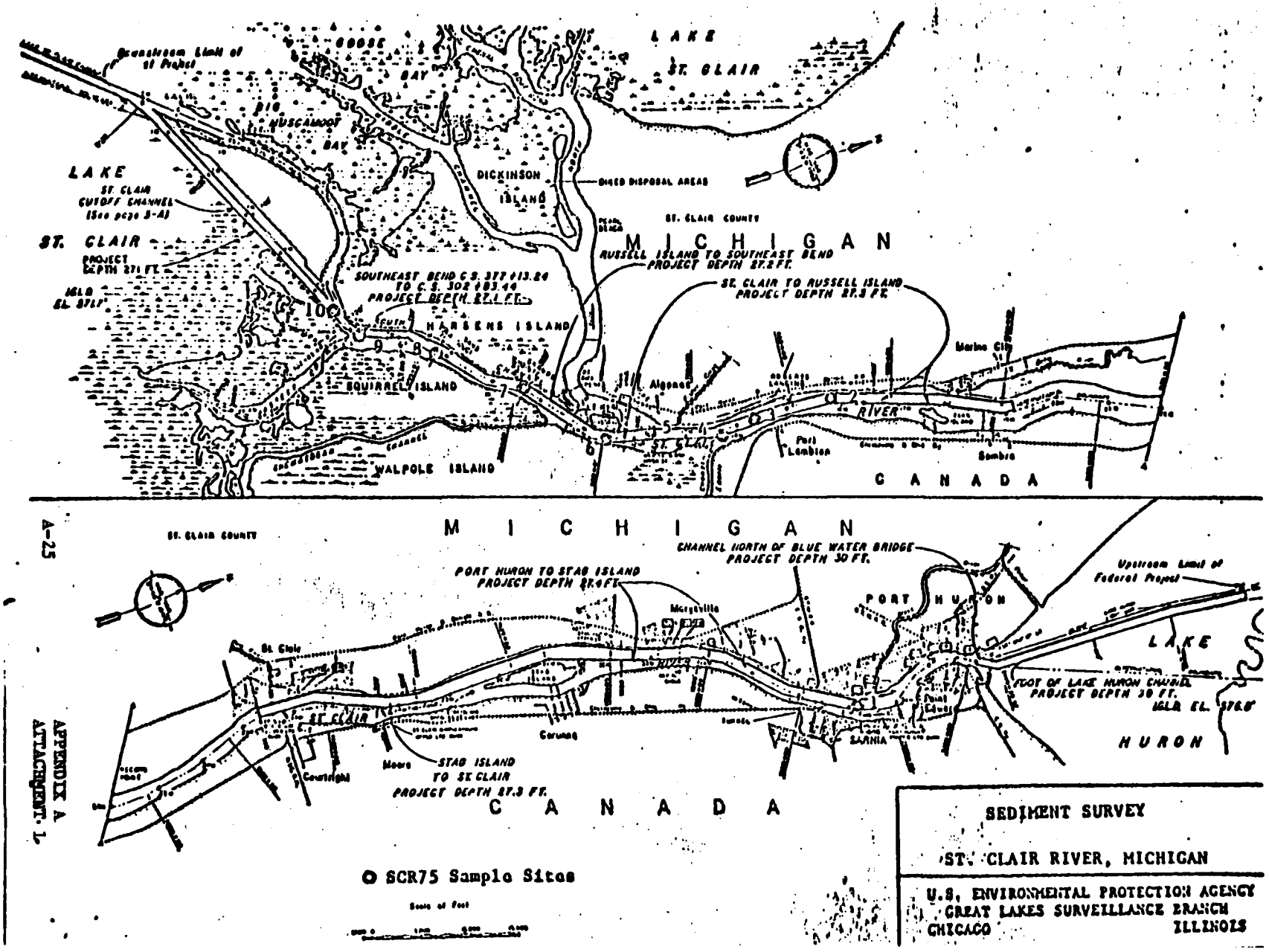
All values mg/kg dry weight unless otherwise noted.

TABLE III
SIEVE ANALYSIS RESULTS

HARBOR: St. Clair River

SAMPLED: October 5, 1975

SIEVE NO. AND DESCRIPTION	SEDIMENT SIZE ANALYSIS BY PERCENT AT EACH STATION						
	SCR 75-1	SCR 75-2	SCR 75-6	SCR 75-7	SCR 75-8	SCR 75-9	SCR 75-10
Retained on #10 Medium Gravel and Larger	Rocks	65(Rocks)	26(Rocks)	3	<1	26(Rocks)	<1
Retained on #20 Fine Gravel		6	6	18	1	1	<1
Retained on #60 Medium and Coarse Sand		9	9	67	92	53	<1
Retained on #200 Fine Sand		3	7	1	1	5	1
Passing #200 Silts and Clays		17	52	11	6	15	99



SEDIMENT SURVEY

ST. CLAIR RIVER, MICHIGAN

U.S. ENVIRONMENTAL PROTECTION AGENCY
GREAT LAKES SURVEILLANCE BRANCH
CHICAGO ILLINOIS

A-25

APPENDIX A
ATTACHMENT 1

APPENDIX B

CORRESPONDENCE RECEIVED IN RESPONSE TO
DRAFT ENVIRONMENTAL IMPACT STATEMENT

OCT 1975

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
230 S. DEARBORN STREET, 32nd FLOOR
CHICAGO, ILLINOIS 60604

(ER-75/832)

Colonel James E. Hays
District Engineer
U. S. Army Engineer District
Detroit
P. O. Box 1027
Detroit, Michigan 48231

October 14, 1975

Dear Colonel Hays:

The Department of the Interior has reviewed the Draft Environmental Statement for Maintenance Dredging of Federal Navigation Channels in St. Clair River, Wayne County, Michigan, as requested in Mr. McCallister's transmittal letter of August 20, 1975, to our Assistant Secretary, Program Development and Budget. Our comments relate to areas of our jurisdiction and expertise and have been prepared in accordance with the National Environmental Policy Act of 1969.

ENVIRONMENTAL IMAPCT OF THE PROPOSED ACTION

The presence of aboriginal sites in the St. Clair Flats area is recognized on page 8 of the statement. As both the cut-off channel and the north channel cross these flats and maintenance dredging material may be placed on upland sites, the statement should address the possibility that such material may adversely impact presently unknown cultural resources. In order to fulfill the intent of Executive Order 11593, Protection and Enhancement of the Cultural Environment, the Corps of Engineers should have all areas affected surveyed by a professional archeologist. Any sites discovered should be evaluated for inclusion of the National Register of Historic Places.

We recommend that the environmental impact statement include language to the effect that the sponsoring agency has checked the National Register of Historic Places and, in consultation with the State Historic Preservation Officer, determined that no properties listed on, nominated to, or eligible for the National Register would be affected by the proposal.

Sincerely yours,

Madonna F. McGrath

Madonna F. McGrath
Acting Special Assistant
to the Secretary

AMERICAN REVOLUTION BICENTENNIAL

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

Mr. P. McCallister
Chief, Engineering Division
U.S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

We have completed our review of the Draft Environmental Impact Statement (EIS) for Maintenance Dredging of the Federal Navigation Channels in the St. Clair River, Michigan as requested in your letter of August 20, 1975.

In general, the EIS adequately describes the project. However, in order to evaluate the project's environmental impacts, additional information is required on the "upland" shore disposal sites mentioned on pages 1, 3, 23 and 25. The location of these sites should be specified and illustrated on a map or aerial photo exhibit. Furthermore, a detailed description of the environmental setting of each of these sites should be presented with a discussion of its past and present use, if any.

As you know, we commented on a Public Notice for this project on March 25, 1975 and requested that dredge spoil not be placed upon wetlands or shallow water areas along St. Clair River or in St. Clair Lake. Every effort should be made to preserve and protect the river and delta wetlands in the project area.

Our July 19, 1974 letter to your office indicated that the bottom sediments in the St. Clair River Federal Navigation Channel at river miles 17.5 and 37.0 are polluted. Since the sampling coverage in these two areas was poor, and no delineation was made of the polluted zone, we resampled this river on September 29, 1975. This sampling schedule was noted in our September 11, 1975 letter to Brigadier General Moore. As soon as the results of this survey are available, we will reevaluate the existing additional classification of the river. Where bottom sediments are determined polluted, delineation of the polluted zones will be provided. The EIS should discuss the history of mercury - contaminated sediments in the St. Clair River.

[illegible] sewage treatment in St. Clair County (Algonac, Ira and Clay [illegible] facilities plan under an EPA planning grant has been submitted [illegible] Clair County for improved sewage treatment collection and [illegible] grants are currently being processed.

In accordance with EPA procedures, we have rated this project as LO (lack of objection) and have classified the EIS as Category 2 (additional information is required to fully evaluate the project's total environmental impact). The date and classification of our comments will be published in the Federal Register in accordance with our responsibility to inform the public of our views on other agency's projects. We appreciate the opportunity to review this Draft EIS. When the Final EIS is filed with the Council on Environmental Quality, please forward two copies to us. If you have any questions regarding our comments, please contact Mr. Gary A. Williams at 312/353-5756.

Sincerely yours,

Donald A. Wallgren
Chief,
Federal Activities Branch

UNITED STATES DEPARTMENT OF COMMERCE
The Assistant Secretary for Science and Technology
Washington, D.C. 20230

November 3, 1975

Mr. P. McCallister
Chief, Engineering Division
Corps of Engineers - Detroit District
U. S. Department of the Army
P. O. Box 1027
Detroit, Michigan 48231

ATTN.: Mr. Jack Collis

The draft environmental impact statement "Maintenance Dredging of the Federal Navigation Channels in the St. Clair River, Michigan", which accompanied Mr. B. G. DeCook's letter of August 20, 1975, has been received by the Department of Commerce for review and comment.

The statement has been reviewed and the following comments are offered for your consideration.

The draft environmental impact statement decribes a navigation channel extending the length of the St. Clair River, but does not indicate whether all or segments of the channel will be dredged. U. S. Environmental Protection Agency analyses of bottom sediments (Page 19, paragraph 2; Table 8, page A-5; and Table 13, page A-11) leads them to conclude that the bottom sediments are polluted. Until specific reaches are determined to be unpolluted, the EPA observations should preclude any maintenance dredging.

Use of the projected disposal site in Lake Huron (Page 3, paragraph 1) will not isolate spoil as implied but can create problems. Water depth at the site is 12 to 18 feet; this is shallow enough that relatively minor wave action and littoral drift will disperse sediments in Lake Huron and move the sediment back into the river through resuspension and traction.

The rationale on Page 21, paragraph 1, ignores the total problem of suspended material by dismissing it once this material has left the river. A primary control on suspended sediment transport is the stream velocity. The marked decrease at the head

of Lake St. Clai will cause a substantial part of the load to drop out of suspension rather than to diffuse widely through the lake. Significance of this problem relates to the degree of pollution of the material put into suspension.

On page 23, (Effect on terrestial biota) planned disposal sites are not identified. These should be known before operations so that site specific impacts can be looked at. We hope that the Corps of Engineers will work with the State Dredge Spoil Disposal Committee in determining sites.

Removal of shoals from the river will restore the navigation channel to project dimensions. River water will return to project levels. Disposal of the spoil in other parts of the river will cause minor, not measurable, raise of water levels. The net effect on water levels from dredging and spoil disposal will be of a minor raise over the project levels.

Thank you for giving us an opportunity to provide these comments, which we hope will be of assistance to you. We would appreciate receiving six (6) copies of the final statement.

Sincerely,

Sidney R. Galler
Deputy Assistant Secretary
for Environmental Affairs

Advisory Council
On Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

September 5, 1975

U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231

ATTN: Environmental Resources Branch

Dear Sir:

This is in response to your request of August 20, 1975, for comments on the draft environmental statement for the proposed maintenance dredging of the St. Clair River Federal navigation channels, Michigan. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the National Historic Preservation Act of 1966; Executive Order 11593 of May 13, 1971; and the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 CFR Part 800), the Advisory Council on Historic Preservation has determined that while you have discussed the historical and archeological aspects related to the proposed undertaking, the Council needs additional information to adequately evaluate the effects on those cultural resources. Please furnish additional data indicating:

a. Compliance with Section 800.4(a) of the Council's Procedures

Under Section 800.4(a), the Corps is responsible for identifying properties located within the area of the undertaking's potential environmental impact that are included in or eligible for inclusion in the National Register of Historic Places. The final environmental statement on this project should be revised to reflect compliance with this section in regard to eligible National Register properties.

b. Contact with the Michigan State Historic Preservation Officer (SHPO)

To insure a comprehensive review of cultural resources, the Advisory Council suggests that the final environmental statement contain evidence of contact with the Michigan State Historic Preservation Officer and that a copy of his comments concerning the effects of the undertaking upon these resources be included in the final statement.

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

Should you have any questions or require any additional assistance, please contact Jordan Tannenbaum at 202-254-3380 of the Advisory Council staff.

Sincerely yours,

John D. McDermott
Director, Office of Review and
Compliance

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE Room 101, 1405 South Harrison Road
East Lansing, Michigan 48823

September 8, 1975

U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231
ATTN: Environmental Resources Branch

Gentlemen:

The draft environmental impact statement for the proposed maintenance dredging of the St. Clair River Federal navigation channels to the authorized project depth, was received by this office for review and comment.

We have reviewed the draft environmental impact statement and have the following comments:

Throughout the Statement it is insinuated that the major portion of the dredged material will be disposed of in deep water and the deep water disposal sites have been identified in the Statement. However, it is noted that a portion of the dredged material is to be placed ashore at upland sites. The Statement does not indicate the extent of the upland disposal, neither the yardage to be disposed of nor the land area to be used for the upland disposal. The Statement also does not indicate the proposed location of the upland disposal areas nor affect on land use of the upland disposal. It would seem desirable to expand the Statement to cover these items.

In paragraph C (1) (a), it is stated, "The periodic placement of dredged material would impede the establishment of vegetative cover." It would seem desirable to state that re-establishment of vegetative cover is part of the project.

We appreciate the opportunity to review and comment on this proposed project.

Sincerely yours,

Arthur H. Cratty
State Conservationist

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
NORTHEASTERN AREA, STATE AND PRIVATE FORESTRY
6816 MARKET STREET, UPPER DARBY, PA. 19082
(215) 596-1618

8400
October 6, 1975

Mr. P. McCallister
Chief, Engineering Division
Department of the Army
Detroit District, Corps of Engineers
P.O. Box 1027
Detroit, Michigan 48231

Refer to: Draft Environmental Statement, St. Clair River Navigation Channels

Dear Mr. McCallister:

We believe that impacts of the above project on land vegetation will be minor. Perhaps shrubs and trees could be used to improve aesthetic appearances of diked disposal sites.

Thank you for the opportunity to review this report.

Sincerely,

DALE O. VANDENBURG
Staff Director
Environmental Quality Evaluation

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
DETROIT AREA OFFICE
5TH FLOOR, FIRST NATIONAL BUILDING, 660 WOODWARD AVENUE
DETROIT, MICHIGAN 48226

REGION V
300 South Wacker Drive
Chicago, Illinois 60606

September 18, 1975

IN REPLY REFER TO:
5.1PP (Furton)
Tel. (313)226-7906

Mr. P. McCallister
Chief, Engineering Division
Attn: Environmental Resources Branch
U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

Re: Draft Environmental Impact Statement
Maintenance Dredging of Federal Navigational
Channels in the St.Clair River, Michigan

The subject draft statement has been reviewed and no objections to the action are warranted.

However, from a planning perspective relative to existing and proposed residential use, the onshore land fills should be adequately identified.

Any negative impacts insofar as amenties of residential use may be reduced or depreciated in valuation would be an important consideration in the environmental clearance of a project proposed for H.U.D. participation.

The opportunity for comment is appreciated.

Sincerely,

Wesley F. Furton

Wesley F. Furton
Acting Environmental
Clearance Officer

NATURAL RESOURCES COMMISSION
CARL T. JOHNSON
E. M. LAITALA
DEAN PRIDGEON
HILARY F. SNELL
HARRY H. WHITELEY
JOAN L. WOLFE
CHARLES G. YOUNGLOVE

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

HOWARD A. TANNER, Director

September 17, 1975

Mr. Philip McCallister
Environmental Resources Branch
U.S. Army Corps of Engineers
P.O. Box 1027
Detroit, Michigan 48231

Re: NCEED-ER

Dear Mr. McCallister:

We have reviewed the draft environmental impact statement on the proposed Maintenance Dredging of Federal Navigational Channels in the St. Clair River. We find the statement basically adequate in the description of the project and much of the associated environmental impacts.

Our major concern is in regard to the disposal sites for the dredged materials. We strongly object to the proposed disposal site located in the North Channel adjacent to Point AuChenes (Figure 2). These are important sturgeon grounds and a large complement of brown trout (20,000 this past year) are stocked in this area. We are therefore absolutely opposed to any dumping of dredge spoils in the north channel.

With reference to the disposal area identified in Lake Huron $3\frac{1}{4}$ miles north of the Blue Water Bridge, we would prefer that the spoil be deposited in deeper water to the north,a mile further out, in about 40 feet of water near the U.S.-Canadian boundary. The 15 to 20-foot depths in the designated area are walleye, perch, and catfish grounds which seasonally attract many fishermen and should not be disturbed. It would also appear that materials deposited at the designated site in depths of 20 feet or less and within $\frac{1}{2}$-mile of the navigation channel, would be moved back into the channel to the south during a northeaster.

It is also stated (page 3) that the dredged materials may be placed on shore at selected upland sites. The location of these sites is not given. They should be identified and described in the statement. Where are these sites?

We are also concerned over the distribution of fines during the dredging process due to the history of mercury useage and disposal into the St. Clair River channel. While the data presented in Tables 9 and 10 would indicate that the presence of mercury in the sediments is within the standard, we remain concerned about the dispersion of mercury and other heavy metals (i.e. zinc) which can be widely spread by the strong currents over the bottom of the channel and Lake St. Clair downstream and can subsequently enter the food chain. We reiterate our comments provided in the response to the draft environmental impact statement on the maintenance dredging of navigation channels (downstream) in Lake St. Clair (our letter, Sept. 5, 1975). Has the Corps conducted any research on methods of clarifying overflow waters during dredging activities?

Additionally, we would urge that a larger number of sediment samples be taken by the EPA in future years along this navigation channel. This is important to make certain that the levels of mercury and other heavy metals remain well within the EPA guidelines and to insure that any chemical containment problem will be quickly detected and corrected.

The remainder of our comments will be addressed to page and paragraph of the text.

Page 1, paragraph 3
It is stated that the derrickboat is scheduled for maintenance operations June 5 to August 30, 1975. We assume the year cited is an error, and will be corrected in the final statement.

Also, mention should be made whether the dredging will begin in the uppermost reach of the area to be dredged and proceed downstream. This would seem desirable to minimize re-deposition of disturbed materials back into the channel.

Page 20, "Environmental Impact"
This section does not adequately describe how dredging will affect various species of fish--their reproduction, migration, feeding and living. This aspect should be thoroughly covered in the final environmental impact statement.

Page 21, paragraph 4
We agree that the dredging does not directly affect shoreline erosion problems. However, the large ships that use the deepened channel do cause some degree of erosion damage. This should be mentioned in the statement.

Finally, P.A. 326 of 1913 states that approximately 18,000 acres of the St. Clair Flats are dedicated to the paramount use for public hunting and fishing. Information contained in paragraph 1 on page 14 seems contrary to this Act. We suggest this be clarified or corrected in the final statement.

Should you have any questions regarding our position on the designated disposal sites or other comments made on the environmental statement, please contact us.

Sincerely,

Howard A. Tanner

Howard A. Tanner
Director

HIGHWAY COMMISSION
Peter B. Fletcher
Chairman
CHARLES H. HEWITT
Vice Chairman
Hannes Meyers, Jr.
CARL V. PELLONPAA

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, GOVERNOR

DEPARTMENT OF STATE HIGHWAYS AND TRANSPORTATION

STATE HIGHWAYS BUILDING — POST OFFICE DRAWER K — LANSING, MICHIGAN 48904

JOHN P. WOODFORD, DIRECTOR

August 27, 1975

Mr. P. McCallister, Chief
Engineering Division
U.S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

Dear Mr. McCallister:

The Environmental Liaison Section has reviewed the Draft Environmental Statement for "Maintenance Dredging of Federal Navigational Channels in the St. Clair River, Michigan", and believes the need for this project (maintenance of the waterway for safe passage of National and International waterborne commerce) is obvious and clearly defined in the Statement. The Statement does, however, raise three important issues which should be clarified in the Final Environmental Statement. These are:

1. There is an inconsistency between the statement on page 1 which indicates "all materials scheduled for removal from the St. Clair River are from stretches classified as being clean and suitable for open water disposal." However, on page 30, the statement indicates the Environmental Protection Agency's testing in 1973-74 showed bottom sediments are polluted and non-tested sediments should not be assumed non-polluted and such areas should be sampled and classified prior to maintenance dredging."

2. The statement notes that "removed material will be disposed in deep open water areas, or placed ashore at upland sites." Although the location of deep water disposal sites are clearly shown in Figure No. 2, the upland sites are not. Since upland disposal could have a very severe adverse environmental impact due to the high water table of upland sites adjacent to the river, it is suggested if such upland sites are used that their locations be shown.

MICHIGAN
THE GREAT LAKE STATE

B-15

3. On page 1, it is indicated that this maintenance operation will be performed "in 1975 and subsequent years thereafter as required to remove shoals." This statement seems to suggest that this Environmental Statement is of the "class action" variety and additional Statements will not be prepared for subsequent years. Although this procedure would be acceptable if such things as the condition of bottom sediments do not change, the Environmental Protection Agency's test results show bottom conditions can and often do change. Therefore, it is suggested that a clarification be made of whether additional Statements will be prepared for subsequent dredging and, if so, under what conditions.

Sincerely,

for G. Robert Adams, Administrator
Environmental and Community
Factors Division

AD-A106 935 CORPS OF ENGINEERS DETROIT MI DETROIT DISTRICT F/G 13/2
MAINTENANCE DREDGING OF THE FEDERAL NAVIGATION CHANNELS IN THE --ETC(U)
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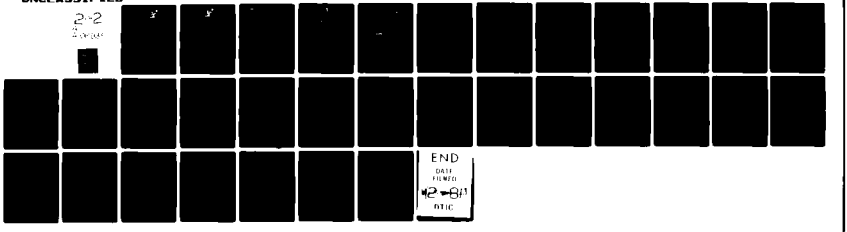


City Engineering Department
Ninth Floor Cadillac Tower
Detroit, Michigan 48226

September 3, 1975

Coleman A. Young, Mayor
City of Detroit

BEH:JJC
Maintenance Dredging
Channels in the St. Clair River

Colonel James E. Hays
Department of the Army
Detroit District, Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Attention: P. McCallister

Dear Sir:

The above proposed project has been reviewed insofar as Detroit City Engineering Department interests are concerned.

There is no apparent conflict between Detroit City Engineering Department interests and the proposed operations.

Very truly yours,

H. E. DUDLEY
Director

By J. J. COVERT
Assistant City Engineer,
Administrative

GS
JS:mjs

cc: File

Detroit Metro Water Department
Water Board Building
Detroit, Michigan 48226
(313) 224-4800

Coleman A. Young, Mayor
City of Detroit

September 15, 1975

U. S. Army Corp of Engineers
Detroit District
P.O. Box 1027
Detroit, Michigan 48231

Gentlemen:

Re: St. Clair River Maintenance Dredging

We are concerned about the temporary decrease in water quality during the 130,000 cubic yard annual dredging announced in the September 5, 1975 Federal Register.

Please send us a complete copy of the Environmental Impact Statement issued August 25, 1975.

Very truly yours,

D. Suhre
Director of Engineering

GJH/es

Detroit Edison
2000 Second Avenue
Detroit, Michigan 48226
(313) 237-8000

September 4, 1975

U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231

ATTENTION: Environmental Resources Branch

SUBJECT: U.S. Army Corps of Engineers
Draft Environmental Statement,
"Maintenance Dredging of Federal
Navigation Channels in the St.
Clair River" dated August, 1975.

Gentlemen:

The Detroit Edison Company has reviewed the above referred Draft Environmental Statement, and believes the work, as proposed, to be in the best interests of Edison and our customers and residents of southeastern Michigan.

Sincerely,

Robert A. Briggs
Director
Architectural-Civil
Engineering Division
Generation Engineering
Department

RBC:kw

REGISTERED SURVEYOR #1018

RIVERSIDE 8-6008

RALPH ROGERSON

4701 GREEN DRIVE

HARSENS ISLAND, MICHIGAN

Aug 25, 1975

Dept. of the Army
Detroit District, Corps of Engineers,
ATTN: EnvironmentalResources Branch.

I reviewing the DRAFT ENVIRONMENTAL STATEMENT dated Aug. 1975 I find that every aspect both pro & con has been covered giving the reader a clear view of both sides of the question - To Dredge or not to Dredge the Shoals of the St. Clair River.

As a resident and a Reg. Surveyor, a hunter and fisherman for the past 30 years, I have observed first hand life on Harsens Island and the surrounding area.

First we must consider the Shipping Industry that help to hold down costs of practically all our commodies. It is necessary to have deep draft Vessels as they now exists so the shoals have to be removed.

The present depthes should not be deepened. As during Low Water Times they now suck out the water from the adjoining canals and when the water returns a great deal of sand returns filling up the canals.

Should they have a 12 month season ? Some ships are still not being used. For the past 25 years my Pier has withstood the ice , but last year when the Coast Guard helped the ice bound ships my Dock was opened aside breaking the piling and dumping a portion into the river.

At high water times a stiffer control on the Vessels must be maintained as a few especially at night forget there is a Speed Limit. At Normal Speeds the Freighters do very little damage. It is the Cruisers Speed that is not controlled.

It is my observation that when the materials from the shoals are dumped into the River in as much as they mostly consist of heavy sand and gravel that they quickly sink to the bottom. Due to the fast current and channel from drop off to drop off that is made of relatively smooth clay the freighters as they are close to the bottom drag considerable materials along with them.

It is not in my opinion that the Contractors, unless opening an existing canal , a good idea to dig an opening from deep water to shallow as that creates a change of current that could cause erosion. If they dug into the shallows between the hillheads and the drop off very little effect could be noticed and those holes so to speak would make excellent fishing holes. The small amount of disturbance a contractor makes while driving in a hillhead and filling in behind it has also a very small impact on fish life.

It is then my opinion that it is true we must consider all aspects of wild life, fish, etc and protect them and conserve them, it is also true that People also must be considered and allowed to protect their properties. Lets take positive approaches and consider whether something is detrimental before shutting down many contractors and putting them out of business.

Respectfully submitted,

Ralph Rogerson

Law - Surveying - Topography - Levels - Waterway Surveys

8-20

MICHIGAN DEPARTMENT OF STATE
RICHARD H. AUSTIN SECRETARY OF STATE

LANSING
MICHIGAN 48918

MICHIGAN HISTORY DIVISION
ADMINISTRATION, ARCHIVES, HISTORIC SITES, AND PUBLICATIONS
3423 N. Logan Street
517-373-0510
STATE MUSEUM
505 N. Washington Avenue
517-373-0515

September 29, 1975

U.S. Army Corps of Engineers, Detroit District
P.O. Box 1027
Detroit, MI 48231
Attn.: Environmental Resources Branch

Gentlemen:

Dr. Lawrence Finfer, Environmental Review Coordinator, has reviewed the proposals for maintenance dredging and disposal in the following areas:

Lake St. Clair
St. Clair River
Saginaw Bay/River
St. Marys River/Straits of Mackinac
Grand Haven Harbor/Grand River

He concludes that these projects will have no effect on cultural resources. Thank you for giving us the opportunity to comment.

Sincerely yours,

Martha M. Bigelow

Martha M. Bigelow
Director, Michigan History Division
and
State Historic Preservation Officer

APPENDIX C

CORRESPONDENCE RECEIVED IN RESPONSE TO PUBLIC NOTICE CONCERNING MAINTENANCE DREDGING, ST. CLAIR RIVER

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1027
DETROIT, MICHIGAN 48231

IN REPLY REFER TO

NCECO-O 12-STC

12 February 1975

PUBLIC NOTICE

HOPPER DREDGE AND DERRICKBOAT MAINTENANCE
ST. CLAIR RIVER

1. The U. S. Army Corps of Engineers proposes to perform annual maintenance dredging of the Federal Navigation Channels in St. Clair River, in 1975 and in each subsequent year when required to remove shoaling. The material removed will be disposed in deep open water or placed ashore at upland sources. All materials scheduled for removal from the St. Clair River are from stretches classified as being clean and suitable for open water disposal.

2. The proposed dredging is being reviewed under the following laws:

Federal Water Pollution Control Act of 1972, the National Environmental Policy Act of 1969, the Fish and Wildlife Act of 1956, the Marine Protection Research and Sanctuaries Act of 1972, the Endangered Species Act of 1973, as well as the various Congressional Acts authorizing construction and maintenance of the Federal project.

3. The annual removal of shoaling of these navigation channels is essential to the safe navigation of domestic and foreign deep draft vessels sailing between Lake St. Clair and Lake Huron. U. S. waterborne commerce on the St. Clair River in 1973 was about 119 million tons of cargo.

4. The Federal project consists of a navigation channel extending from the 30 foot contour of Lake Huron through the St. Clair River to Algonac, thence through the South Channel adjacent to Harsens Island into Lake St. Clair. Dredging in the Canadian waters of the Cut Off Channel is not accomplished by the United States Government, and is not a part of the dredging under consideration here. The material removed consists mostly of sand and silt. Average annual volume of material removed is about 130,000 cubic yards. The maintenance is accomplished by a Corps of Engineers hopper dredge working during summer and autumn and a Corps of Engineers derrickboat working during spring and summer.

5. The open water disposal sites used by the hopper dredge are located in deep water off Lake Huron, 3-1/4 miles north of the Blue Water Bridge and in deep water off the North Channel adjacent to Point AuChenes. (See sketch). Dredged material may also be placed ashore at an upland site. The material removed by derrickboat is small in volume and consists primarily of scattered obstructions of hard material. The latter will be disposed of in deep water outside and adjacent to the section of the channel from which it was removed, or placed ashore at upland sites.

Inc. No. 1

NCECO-O 12-STC
HOPPER DREDGE & DERRICKBOAT
MAINTENANCE ST. CLAIR RIVER

12 February 1975

6. The removal of this material, including the disposal, is part of the regular annual maintenance. Copies of this notice are being sent to the Environmental Protection Agency, the Department of the Interior, the Coast Guard, the State of Michigan, the Department of Commerce, St. Clair County, the City of Port Huron, the City of Marysville, the City of Marine City, the City of Algonac, and other Federal, State and Local agencies, as well as to known interested groups and individuals.

7. A preliminary determination has been made that an Environmental Statement shall be prepared for the maintenance of this project. The Environmental Assessment thereof is under preparation. This is in addition to the Environmental Statement which has been published in final form for the new confined disposal site on Dickinson Island, St. Clair River and which after completion will be for disposal of polluted material dredged from the United States section of the Cut-Off Channel.

8. Any person who has an interest which may be affected by the disposal of this dredged material may request a public hearing. The request must be submitted in writing to the District Engineer within thirty (30) days of the date of this notice and must clearly set forth the interest which may be affected and the manner in which the interest may be affected by this activity.

9. Designation of the proposed disposal sites for dredged material associated with the Federal project shall be made through the application or guidelines promulgated by the Administrator EPA in conjunction with the Secretary of the Army. If these guidelines alone prohibit the designation of these proposed disposal sites, any potential impairment to the maintenance of navigation, including any economic impact on navigation and anchorage which would result from the failure to use this disposal site, will also be considered.

10. This notice is being published in conformance with 33 US Code of Federal Regulations 209.145, "Federal Register, Vol, 39, No. 141, Monday, 22 July 1974, pp. 26635-26641". Any interested parties desiring to express their views concerning the proposed disposal may do so by filing their comments in writing with this office not later than 4:30 P.M., 30 days from date of issuance of this notice.

James E. Hays
JAMES E. HAYS
Colonel, Corps of Engineers
District Engineer

Notice to Postmasters:

It is requested that the above notice be conspicuously and continuously posted for 30 days from the date of issuance of this notice.

URAL RESOURCES COMMISSION
HILARY F. SNELL
Chairman
CARL T. JOHNSON
. M. LAITALA
HARRY H. WHITELEY
OAN L. WOLFE
HARLES G. YOUNGLOVE

STATE OF MICHIGAN

WILLIAM G. MILLIKEN, Governor

DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926
A. GENE GAZLAY, Director

February 20, 1975

District Engineer
Detroit District
U. S. Corps of Engineers

Refer to your file NCECO-O 12-STC

We acknowledge receipt of your public notice dated 12 February 1975 with reference to the application of U.S. Army Corps of Engineers (name and address of applicant)

for a Federal permit maintenance and hopper dredge (description of project)

in St. Clair River (water affected).

The Department of Natural Resources ( ) will object (X) will not object to the work as proposed. Under authority of (X) Act 346, P.A. 1972, as amended, ( ) Act 247, P.A. 1955, as amended, a permit ( ) has been (X) has not been issued to the applicant.

Our objection is based on the following:

Our approval is subject to the following:

State permit not required.

Copies to:
Regional Manager Laycock
Fish Division
Game Division
Water Resources
Waterways
District Adams - Boyer
Fed. Pollution
Applicant

DALE W. GRANGER, Chief
Hydrological Survey Division

D. J. Haywood
Submerged Lands Management Section
Bureau of Water Management

Inc. No. 2

DETROIT DIST. FEB 75 11 53

C-4

DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD

Address reply to:
COMMANDER (mep)
Ninth Coast Guard District
1240 East 9th St.
Cleveland, Ohio 44199
Phone: 216-522-3919

5922
5 March 1975

Department of the Army
Ditroit District, Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Re: Notices of Application for Permit
NCECO-O 16-SG
NCECO-O 20-SG
NCECO-O 12-STC

Dear Sir:

The Notices of Application for Permit listed above have been reviewed by this office and at this time we interpose no objections.

Sincerely,

E. J. SULLIVAN
Commander, U. S. Coast Guard
Chief, Marine Safety Division (Acting)
By direction of the Commander,
Ninth Coast Guard District

Copy to:
COMDT(G-WEP)

PRNTS DET DST
10 MAR 75 1 : 33

C-5 Inc. No. 3

United States Department of the Interior

NATIONAL PARK SERVICE
MIDWEST REGION
1709 JACKSON STREET
OMAHA, NEBRASKA 68102

IN REPLY REFER TO:

L7423 MWR CL

MAR 5 1975

Colonel James E. Hays
District Engineer
Detroit District, Corps of Engineers
P. O. Box 1027
Detroit, Michigan 48231

Dear Colonel Hays:

Reference your notices of February 12, 1975, pertaining to maintenance dredging in the St. Clair River, Saugatuck Harbor, and Saginaw River, Michigan.

No established or studied units of the National Park Service or sites registered or eligible for registration as National Historic, Natural or Environmental Educational Landmarks appear to be adversely affected by the proposal. Accordingly, we have no objections to the performance of this work as related to these areas.

The National Park Service Midwest Archeological Center has no records of any archeological sites in the immediate area of the proposed actions. Our only comment is that in the event archeological remains are revealed by dredging activities, operations should be suspended and immediate notification provided to Dr. James E. Fitting, State Archeologist, Michigan History Division, Michigan Department of State, 208 North Capitol Avenue, Lansing, Michigan 48918.

The State Historic Preservation Officer should be contacted for information on other properties eligible for, or already entered on the National Register of Historic Places. The SHPO to contact is Dr. Martha Bigelow, Director, Michigan History Division, Department of State, Lansing, Michigan 48918.

The National Register should also be consulted. The National Register includes established National Park Service historic areas, national historic landmarks and properties of regional, state or local significance which are nominated by the State Historic Preservation Officer.

AMERICAN REVOLUTION BICENTENNIAL 1776-1976

Inc. No. 4

Should these consultations reveal that any cultural resources will suffer adverse impact because of the proposed actions, a detailed plan for preservation of threatened remains or mitigations of the impact should be implemented prior to the issuance of the permits.

Sincerely yours,

Merrill D. Beal

Merrill D. Beal
Regional Director

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Federal Building, 14 Elm Street
Gloucester, Massachusetts 01930

March 10, 1975

Col. James E. Hays
District Engineer
Department of the Army
Corps of Engineers
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Hays:

We have received project plans for the public notices listed on the attached sheet concerning Federal navigation channel maintenance dredging projects.

Although we appreciate having the opportunity to review these notices of application, we will be unable to evaluate their adequacy or to comment upon them because of present budget and staff limitations.

Sincerely yours,

Russell T. Norris
Regional Director

Attachment

PRNTS DEF DST
14 MAR 75 113 07

C-8

Inc. No. 5

Public Notice No.	Date
NCECO-O	Feb. 3, 1975
NCECO-O-11WL	Feb. 3, 1975
NCECO-O-12STC	Feb. 12, 1975
NCECO-O-15FR	Feb. 3, 1975
NCECO-O-16SG	Feb. 12, 1975
NCECO-O-17LUD	Feb. 3, 1975
NCECO-O-18CH	Feb. 3, 1975
NCECO-O-19PE	Feb. 3, 1975
NCECO-O-20SG	Feb. 12, 1975
NCECO-O-21LE	Feb. 3, 1975
NCECO-O-23LL	Feb. 3, 1975

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN STREET
CHICAGO, ILLINOIS 60604

Colonel James E. Hays
District Engineer
U. S. Army Engineer District, Detroit
P. O. Box 1027
Detroit, Michigan 48231

MAR 2. 1975

Dear Colonel Hays:

Reference is made to Public Notice NCECO-O 12-STC for Hopper Dredge and Derrickboat Maintenance Dredging of the Federal Navigation Channels in St. Clair River, Michigan which was transmitted to us on February 12, 1975. We note that it is the purpose of the proposed action as described in subject Public Notice to dispose sediment materials from the St. Clair River in open water disposal sites. Since the Public Notice is not specific to what reaches of St. Clair River will be dredged and subject to open water disposal practices, we request that this information be provided to us so that we may verify which stretches have been "classified as being clean and suitable for open water disposal." For U.S. EPA's delineation of the polluted sediment zones and unpolluted sediment zones of St. Clair River, please contact Mr. David Kraus, Great Lakes Surveillance Branch at 312-353-5826.

Due to the high levels of mercury in St. Clair River's sediments and the potential adverse effects of increasing concentrations of waterborne mercury upon the aquatic ecosystem by open water disposal of mercury polluted sediments, reaches of St. Clair River not previously sampled or classified by the U. S. EPA shou' not be assumed to be unpolluted. Any such areas within the project limits should be sampled prior to maintenance dredging, and if such sediments are classified polluted by U. S. EPA, these sediments may require confinement.

According to the Public Notice, spoil may be placed "...adjacent to the section of the channel from which it was removed, or placed ashore at upland sites." A considerable number of wetlands exist west of Algonac along the navigation channel. Spoil should not be placed upon wetlands or shallow water inlets along the St. Clair River or in St. Clair Lake. U. S. EPA defines wetlands in the May 2, 1973 Federal Register as swamps, bogs, and other low-lying areas which during some period of the year will be covered in part by natural nonflood waters. It is our policy to give particular cognizance to any proposal that has the potential to damage such wetlands, to recognize their value and to preserve and protect them from damaging misuses. The Corps of Engineers policy regarding the safeguard of wetlands as described in the April 3, 1974 Federal Register is highly desirable and consistent with

Enc. No. 6

our own views. Such policy could substantially discourage the unnecessary alteration and destruction of wetlands considered to be vital to a delta-estuary.

We note that a Draft Environmental Impact Statement (EIS) for Maintenance Dredging on the St. Clair River is being prepared. As you know, we reviewed the Draft EIS for a Confined Disposal Facility (CDF) on Dickinson Island on December 22, 1972. Consideration should be given to the recommendations made in these comments with regard to minimizing the potential adverse water quality effects of maintenance dredging and disposal. A copy of our comments on the Draft EIS for this CDF have been attached for your convenience.

Local water treatment plants served by the St. Clair River should be continually kept informed of maintenance dredging activities so appropriate treatment adjustments or shutoff can be made. Dredging and disposal operations should be timed to prevent any interference with fish spawning and migration to and thru the St. Clair River from Lake St. Clair and/or Lake Huron. All necessary precautions should be taken to mitigate the adverse effects on benthos, nursery and feeding grounds when disposing of dredge materials.

The opportunity to comment on this Public Notice is appreciated.

Sincerely yours,

Donald A. Wallgren
Chief,
Federal Activities Branch

ENVIRONMENTAL PROTECTION AGENCY
1 North Wacker Drive
Chicago, Illinois 60606

December 22, 1972

Colonel Myron D. Snoke, District Engineer
U.S. Army Engineer District, Detroit
P.O. Box 1027
Detroit, Michigan 48231

Dear Colonel Snoke:

Reference is made to your letter of October 2, 1972, requesting our comments on the Draft Environmental Impact Statement (EIS) for the Diked Disposal Area on Dickinson Island, Michigan. We apologize for the delay in replying to your request. We have completed our review and believe the project to be environmentally satisfactory. We submit the following comments pertaining to this particular project:

1. Description of Action. The EIS should contain the preliminary plans for the dike and the outfall weir construction. These plans should include a cross sectional view with identification of the materials used in the construction of the dike and the probable sources of these materials. A calculation of the minimum detention time should also be included in the EIS.

   There should be an adequate ponding area in the containment basin when the accumulation of dredge spoil approaches design capacity. This is a necessary requirement to insure that sufficient detention time is obtained in order to remove a maximum amount of settleable solids throughout the life of the project.

   The EIS should discuss whether or not private dredging contractors will be allowed to use the disposal facility. If private contractors are allowed the use of the disposal site, the requirements for fees, equipment, and pollution control should be discussed.

2. Environmental Setting Without the Project. A program of wildlife management was mentioned as being initiated by the Michigan Department of Natural Resources. An outline of this program and the effects that the project will have on it should be included in the EIS.

3. The Environmental Impact of the Proposed Action. The EIS should include a discussion of the effects of dredging

Incl. No. 6 - Attachment A

C-12

72-204-133

Colonel Myron D. Stroke, District Engineer
U.S. Army Engineer District, Detroit

mercury-contamination spoil on the aquatic environment. As an example, the following paragraphs are excerpted from EPA report R2-72-077, Control of Mercury Contamination in Freshwater Sediments, October, 1972:

> "Mercury-contaminated dredge spoil placed on a landfill may release mercury due to oxidation and leaching. Release of mercury may be prevented by proper landfill design to prevent percolation and infiltration of oxygen-rich water, and by adding long-chain alkyl thiols to the spoil as it is put into place."
>
> "Mechanical dredging of mercury-contaminated sediments may increase local concentrations of waterborne mercury from less than 1 ppb to values on the order of 0.1 to 1.0 ppm. Of this increase, less that 1% is in the form of water-soluble mercury. The remaining 99% represents mercury bound to particulate matter, which will be redistributed by settling. The sediment so redistributed will be readily ingested by bottom-feeding fish. On the basis of laboratory experiments, we estimate that the amount of mercury resuspended in the water may be on the order of 10% of that removed with the dredge spoil. Hydraulic dredging may reduce the amount of material resuspended but will result in a higher percentage of water in the spoil. The mercury concentrations in the runoff water will probably require some reduction."

4. Adverse Environmental Effects Which Cannot Be Avoided Should The [illegible]. The disturbance of shoreline marshes and surrounding waters could have major adverse effects on benthos and fish communities during the spawning season. Construction of the disposal areas should not interfere with these critical periods. A program of immediate debris removal should be undertaken to prevent the accumulation of unsightly, deleterious and potentially polluted debris from entering Lake St. Clair or the North Channel of the St. Clair River. Special care should also be taken to prevent, control and remove any spillage of oils, fuels or any potentially polluted materials while working along or within the Lake or River's course.

On page 33, it is stated "If undesirable levels of pollutants from dredged materials are detected within the ponding waters which constitute a threat to the food chain, or in effluent waters, operations will be stopped and steps will be taken to correct the conditions." What steps would be contemplated to

Colonel Myron D. Snobe, District Engineer
U.S. Army Engineer District, Detroit

correct this situation?

Crustaceans have the tendency of concentrating pollutants without having any adverse effects on themselves. The higher concentrations of pollutants are passed on in the food chain with crustaceans suffering negative effects. A program of monitoring the concentrations of pollutants in these crustaceans should be conducted in the area of the disposal site to determine if mercury is being oxidized or leached from the site.

Methods of controlling silt from dredging operations should be considered in order to protect the valuable fishing resource of Lake St. Clair.

We appreciate the opportunity to review this EIS. When a copy of the Final EIS is filed with CEQ, please send us a copy.

Sincerely yours,

Donald A. Wallgren
Chief, Federal Activities
Branch

cc: Rubye Mullins, PAO, Washington, D.C.
CEQ, Washington, D.C.
F. Corrado, PAO, EPA, Reg. V., Chgo.
Scarlett Hatcher, OFA, EPA, Washington, D.C. w/cy of EIS
Kathi Weaver, OFA, EPA, Washington, D.C. w/cy of EIS Questionnaire
Conrad Klevino, Greatlakes Coordinators, Region V, Chgo.
Merle Tellekson, T.S., S&A, Region V, Chgo.

WDFRANZ/ds

Attachment A

STATEMENT OF FINDINGS
ON DETERMINATION NOT TO CONDUCT PUBLIC HEARING
ST. CLAIR RIVER, MICHIGAN

In accordance with 33 CFR 209.410, and pertinent laws on which these regulations are based, I have taken the following actions regarding the disposal of maintenance dredged material at St. Clair River, Michigan:

a. Reviewed and evaluated the maintenance operations in the light of overall public interest. I considered all known environmental, economic, and other effects. I found that it is in the overall public interest to continue maintenance of St. Clair River Channels concurrently with preparation of an Environmental Impact Statement (A copy of that finding is inclosure No. 1).

b. Issued a public notice describing the proposed disposal site and method of disposal. The notice invited comment. (See inclosure No. 2). Response was received from State of Michigan, DNR, without objection. The Environmental Protection Agency responded saying:

(1) Reaches not previously sampled, or classified, should not be assumed to be unpolluted.

(2) Areas not previously sampled, or classified should be sampled prior to dredging, and, if polluted, should be confined.

c. Considered other lack of response to the public notice as:

(1) Meaning that there is no objection to the proposed disposal of dredged material, provided that it is accomplished within the limitations prescribed by the EPA.

(2) Obviating any need for a public hearing at this time.

(3) Reinforcing my earlier finding that it is in the overall public interest to accomplish this work concurrently with the preparation of an Environmental Impact Statement.

d. Considered the requirements of 33CFR 209.145 to have been fulfilled, and directed the announced dredging and disposal within unpolluted reaches of the St. Clair River to proceed as scheduled.

JAMES E. HAYS
Colonel, Corps of Engineers
District Engineer

APPENDIX D

GLOSSARY

Absorption	- Ability to attract and hold, as water in a sponge.
Accretion	- Natural or artificial build-up of land by air or water deposition.
Adsorption	- Ability to attract and hold, as paint on a board.
Aerobic	- Any biologic process which requires oxygen to function.
Alkalinity	- A measure of the capacity of a solution to neutralize hydrogen ions and is associated with pH.
Anadromous	- Type of fish that ascend rivers from the sea to spawn.
Anaerobic	- Any biologic process which does not require oxygen to function.
Anoxic	- Without oxygen. Biological decay of organic and nutrient material in bottom sediments may consume dissolved oxygen in the water and create an anoxic condition at the water-sediment interface.
Aquatic Plants	- Plants that grow in water, either floating on surface, growing up from the bottom of the body of water or growing under the surface of the water.
Artificial Nourishment	- The process of replenishing a beach by artificial means.
Barge	- A flat bottomed motorless boat used for transporting heavy loads (must be moved by tug or tender).
Baymouth Bar	- A bar extending partially or entirely across the mouth of a bay.
Benthic	- Under water at the bottom of stream, lake or harbor.
Benthic Region	- Bottom of a body of water.
Benthos	- Bottom dwelling organisms.
Biomagnification	- Increasing accumulation of a substance (such as mercury) from organism to organism in a food chain.

Biomass	- Total amount of living material in an area.
Biota	- All the species of plants and animals occurring within a certain area.
BOD	- Biochemical Oxygen Demand. A measure of the amount of oxygen consumed in the biological processes that break down organic matter in water.
Breakwater	- A long narrow (rubble mound) pile of rock or a concrete structure in the water designed to break or moderate the effect of storm driven waves. Usually placed out into the water from shore at an entry channel to provide safer boat or ship navigation during stormy weather.
BSFW	- Bureau of Sport Fisheries and Wildlife (Federal).
Bulkhead	- A structure separating land and water areas, primarily designed to resist earth changes.
Bulkhead Line	- A "line" in the harbor beyond which a dock, pier, wharf or filled area may not extend.
CDF	- Confined Disposal Facility. Confined diked disposal area for dredged sediments.
Chelate	- Binding of heavy metal ions to organic (lignin) fibers; the ions may then be transported by the fibers as they float in the water.
Climate	- The average weather over time for a particular place.
COD	- Chemical Oxygen Demand. The amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water.
Coliform	- Any of a number of organisms common to the intestinal tract of man and animals, whose presence is an indicator of pollution.
Conductivity (Specific Conductance)	- A measure of a solution's capacity to convey an electric current.
Contaminant	- Something which will in some way degrade or dirty another thing or a natural system (such as oil in a river).

Conventional Pollutants	- Pheonols, phosphorous, nitrogen, iron, oil and grease, solids and heavy metals other than mercury.
Copper	- Copper (Cu) is a heavy metal which in trace quantities is essential to life, but which in greater amounts is toxic to life.
Cultural	- Produced by man or resulting from man's actions.
Datum Plane	- The horizontal place to which soundings, ground elevations, or water surface elevations are referred. Also REFERENCE PLANE. The plane is called a TIDAL DATUM when defined by a certain phase of the tide.
Depth, Project	- The depth below the official (LWD) lake water level to which navigation channel or basin dredging by the Corps has been authorized by Congress.
Depth, Control	- The actual depth of water that is available between the water surface and the lake or river bottom. It may be greater than project depth immediately after overdredging, or less than project depth if siltation has occurred; usually less than project depth.
Diesel Fuel	- Light fuel oil burned in diesel motors.
Diffusion	- Movement of one substance through another; for example, an odor in the air, a color in the water. Distance from the source results in more diffusion and less intensity.
Dike	- A mound of earth, sand, clay or other substance on land or in the water designed and built to retain something behind it.
Dissolved Solids	- The total amount of dissolved material, organic and inorganic, contained in water or wastes.
DNR	- Department of Natural Resources (State).
DO	- Dissolved Oxygen. The oxygen freely available in water. Unpolluted water will contain more DO than polluted water.
Dock	- A (permanent) structure projecting out from the shore to which a boat or ship can tie up.

Dredge - The equipment used to, and/or at the act of, removing muck, sand, gravel or stone sediment from harbor and/or navigation channel bottoms.

Dredge, Dipper - A barge mounted shovel, powered by steam or diesel, which operates by forcing its bucket into bottom sediments and scooping out material. Generally used to dredge sand, gravel and rock. Operates with about 80% solids 20% water.

Dredge, Clam-Shell - A barge mounted crane with a split-bucket or clam-shell suspended from it, powered by steam or diesel, which operates by dropping its clam-shell to the bottom by gravity where it is closed and lifted, along with the sediments it catches, from the bottom by wire cables. Generally used for dredging soft sediments, sand and gravel.

Dredge, Hydraulic - A barge or ship mounted vacuum suction device, sometimes fitted with an "eggbeater" type cutter head, powered by steam or diesel, which operates by breaking up the sediments with the rotating cutter head and may pump the material from the bottom through pipes to a discharge point at some distance from the equipment, in the water, on land or into a confinement facility. Generally used for dredging muck, soft sediments or sand. Operates with about 20% solids and 80% water.

Dredge, Peterson - A small bottom sediment sampling device which operates somewhat similar to a clam-shell dredge. Usually used to sample hard clay, sand, gravel or stoney bottoms.

Dredge, Ponar - A bottom sediment sampling device, smaller than a Peterson, which operates similar to a clam-shell dredge. Usually used to sample soft muck, sand and fine gravel sediments and associated benthos.

Dredge, Eckman - A bottom sediment sampling device, smaller than a Ponar, which operates similar to a clam-shell dredge, can be operated and retrieved by hand. Usually used to sample soft muck and sand and associated benthos.

Dredging - A method for deepening and widening streams, swamps or coastal waters by scraping and removing solids from the bottom to restore the authorized depths in the established projects.

Dunes - Ridges, mounds or hills of loose, windblown material, usually sand. Stable dunes are those which are covered with vegetation and generally not readily susceptible to erosion by wind or water runoff. Unstable dunes are those which are bare of vegetation and subject to movement or erosion by both wind and water.

Dynamic - Active processes - relating to movement.

Ecology - The study of organisms and their physical environment.

E.I.A. - Environmental Impact Assessment

E.I.S. - Environmental Impact Statement. A document prepared by a Federal agency on the environmental impact of its proposals for legislation and other major actions significantly affecting the quality of the human environment. Environmental impact statements are used as tools for decision making and are required by the National Environmental Policy Act (NEPA).

Environment - Total surroundings. Environment may refer specifically to man or animal, natural or cultural, physical, chemical, biological, social, economic or any combination of the above.

Environmental Impact - A word used to express the extent or severity of an environmental effect.

EPA - Environmental Protection Agency.

Erosion - The wearing away of the land by the action of wind, water, gravity or a combination thereof. Shoreland erosion on the Great Lakes is most often a result of a combination of wind driving waves beating upon the shore and forming littoral currents, and high water levels.

Escarpment - A high vertical rock cliff or bluff which rises sharply from the water.

Eutrophication - Natural processes which result in water quality reduction via nutrient enrichment. Eutrophication over time changes open lakes to swamps and eventually to dry land.

Evolution	- Change over time.
Fauna	- Animals on land or in the water.
Fecal Coliform	- A group of organisms common to the intestinal tracts of man and of animals.
Flora	- Plants on land or in the water.
Fluvial	- Relating to sediment deposition by moving (river) water.
Food Chain	- Movement of food and energy from one form of life to another; for example, algae to zooplankton to fish.
Groin (British, GROYNE)	- A shore protective structure (built usually perpendicular to the shoreline) to trap littoral drift or retard erosion of the shore. It is narrow in width, and its length may vary from less than one hundred to several hundred feet (extending from a point landward of the shoreline out into the water). Groins may be classified as permeable or impermeable; impermeable groins having a solid or nearly solid structure, permeable groins having openings through them of sufficient size to permit passage of appreciable quantities of littoral drift.
Groundwater	- Water that exists in a saturation zone of the earths crust.
Harbor	- An area of water along the shoreline which is protected and affords anchorage to commercial and recreational water craft.
Impact	- The effect of one thing upon another. "Environmental" impacts may affect any one or combination of elements in the total environment and may be of positive or negative impact and of long or short duration.
Impermeable	- Able to confine water without any seepage.
Interface	- The point at which two substances, such as water and bottom sediments, come together.
Jetty	- A solid structure (somewhat similar in appearance to a boat dock) which projects from the shore for control of longshore drift erosion or sedimentation of the beach.

Lakers - "Boats" designed and built specifically for hauling bulk cargo such as iron ore, taconite pellets, coal or grain on the Great Lakes. "Average" present day lakers may be between 600 and 700 feet long and about 80 feet wide and carry 10,000 to 20,000 ton loads. New lakers are being built, however, which are 1,000 feet long, 100 feet wide and able to carry 40 to 50 thousand tons.

Latitude - Distance in degrees north or south of the Equator (0^{o}).

Leach - To remove a substance by water filtration or percolation.

Lead - Lead (Pb) a heavy metal which is toxic to life.

Littoral - The shallow waters that extend along the edge of a lake or sea.

Littoral Deposits - Deposits of littoral drift.

Littoral Drift - The bottom materials moved in the littoral zone under the influence of waves and current. Direction of movement or "transport" of littoral materials depends upon wind and wave direction.

Longitude - Distance in degrees east or west of a line (0^{o}) which passes from north to south through Greenwich, England.

Longshore Current - Somewhat similar to littoral drift.

Low Water Datum - LWD. An approximation to the plane of mean low water that has been adopted as a standard reference plane.

Marsh - A tract of soft, wet or periodically inundated land, generally treeless and usually characterized by grasses and other low growth.

Methylation - Change from an inorganic to an organic form usually as a result of bacterial action. For example, the metal mercury is relatively non-toxic if eaten; however, methyl-mercury is extremely toxic if eaten and can be transmitted via food chains.

Mercury	- A heavy metal, highly toxic if breathed or ingested. Mercury is residual in the environment, showing biological accumulation in all aquatic organisms, especially fish and shellfish.
mg/Kg	- Milligram per kilogram.
Monitoring Program	- To study the amount of pollutants present in the environment.
Mooring Facility	- A place where a ship is fastened.
Navigation Aids	- Lights, horns, bells, symbols placed and maintained by the U.S. Coast Guard to aid boat and ship navigation. Navigation aids are often placed on the outermost end of Corps breakwaters and piers.
Nekton	- Swimming aquatic insects and fish.
Nutrient	- Elements or compounds essential as raw materials for organism growth and development; for example, carbon, oxygen, nitrogen, and phosphorus.
Oligotrophic	- (Of a lake) weak in production due to a low supply of nutrients, resulting in a clean and clear body of water; in the past, the Great Lakes have been oligotrophic.
Organic	- Material of life origin; leaves, sticks, animals, fish.
Peninsula	- A "Finger" of land projecting out into, and surrounded on three sides by water.
Percolate	- Downward flow or infiltration of water through the pores or spaces of a rock or soil.
Permeable	- Able to allow water to seep through.
pH	- A measure of the relative acid or alkaline state of water. pH is measured on a scale of 0 to 14. A pH of 7 is neutral, a pH below 7 is acid, a pH above 7 is alkaline. Rainwater is usually slightly acid.

Phenols	- A group of organic compounds that in very low concentrations produce a taste and odor problem in water.
Phosphorus	- An element that while essential to life, contributes to the eutrophication of lakes and other bodies of water.
Phytoplankton	- The plant portion of plankton.
Piers	- Permanent structures constructed of stone, steel, cement or a combination of those materials, which are used to define and stabilize entry channels from the open lake into a harbor.
Plankton	- Small aquatic plants and animals whose movement is controlled by river, harbor and lake currents.
Pocket Harbor	- A harbor which does not have a river or stream flowing through it, which carries and deposits sediment loads.
Pollution	- Any change in water quality that impairs it for the subsequent user. These changes result from contamination of the physical, chemical, or biological properties of water.
Port	- A point (usually a harbor) at which ships load and unload commercial cargo.
ppm	- Parts per million.
ppb	- Parts per billion.
Pumpout Station	- A temporary dock where a connection is made between land and dredge piles; a booster pump may be used.
Revetment	- A permanent structure built of sheet steel piling or concrete placed to keep channel or harbor banks from caving into the water.
Riparian Right	- The right of an owner of land bordering on a stream or lake to have access to, and use of, the shore and water. The use of this water is restricted to riparian landowners, and the right is automatic, not created by use or forfeited through disuse.
Riprap	- A layer, facing, or protective mound of stones randomly placed to prevent erosion, scour, or sloughing of a structure or embankment; also the stone so used.

Scientific nomenclature - Scientific nomenclature of animals requires (1) that each species and genus found in the world shall have a name that is independent of change, such as pertains to common names used in many languages; (2) that each species and genus shall have separate names duplicated by none which refer to some other species or genus; and (3) that different names shall not be applicable to any one species or genus. The following is a breakdown of Categories of Higher Rank than Species and Genus:

Kingdon
Phylum
Class
Order
Family
Tribe
Genus
Species

Scow - A barge equipped with trap-doors in its bottom which is used for moving and dumping dredge spoil.

Secchi Disc - An eight inch diameter disk, divided into alternate black and white quadrants supported from its center by a hand line, which is dropped into the water to visually gauge light penetration.

Sediments - Clay, sand, gravel or stones which have been eroded from the land or from beneath the water, have been transported by river or lake currents, and re-deposited.

Seawall - A structure separating land and water areas primarily designed to prevent erosion and other damage due to wave action.

Seiche - Fluctuations above or below "normal" water level caused by wind, barometric pressure or a combination of both. A seiche usually does not last for more than several hours at any particular time or place.

Sheet Steel Piling - Interlocking lengths of steel driven into a stream, lake or harbor bottom next to the shore to prevent storm, wave or ship damage.

Shoal - A place where water is shallow, sometimes created by a sandbar, in the shipping channels, created by deposition of eroded material.

Shoreline Protection - Structural measures designed for placement along the shore to relieve erosion and flooding damages. Examples of structural measures are protective beaches, seawalls, groins and revetments.

Side Casting - The disposal of dredged sediments off to the side of the channel or basin being dredged. Side cast disposal may be either in the water or on land.

Silt - Finely divided particles of soil or rock. Often carried in cloudy suspension in water and eventually deposited as sediment.

Spoil - Sediments which have been dredged from beneath the water.

Stagnation - Lake of motion in the water that tends to entrap and concentrate pollutants.

Substrate - Any substance used as an attachment point by a microorganism.

Surface Water - Atmospheric water that runs off to collect in streams, ponds, or lakes, swamps, etc.

Tender - A boat smaller and less powerful than a tug, but used in essentially the same way.

Tertiary - Third in order in terms of importance. Also, refers to a final or ultimate process or effect which is dependent upon those processes or effects which have gone before.

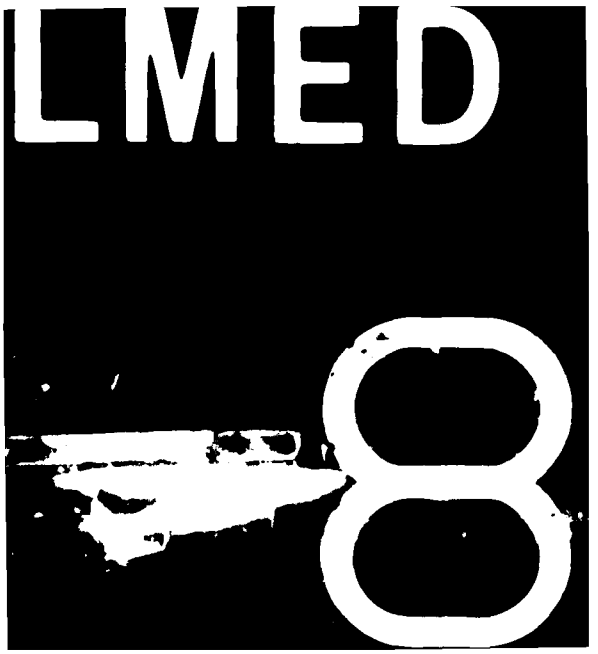
TKN - Total Kjeldahl Nitrogen. A measure of the ammonia and organic nitrogen, but does not include nitrite and nitrate.

Topography - The configuration of a surface including its relief, the position of its natural and man-made features.

Tug - A boat with a powerful motor used to move barges, dredges or other boats or ships.

Turbidity - A cloudy condition in water due to the suspension of silt or finely divided organic matter.

Volatile Solids (Total)	- A measure of the organic material that could decompose and thus exert an oxygen demand on a body of water.
Van Dorn Bottle	- A glass water sampling device which is constructed differently but is used in essentially the same manner as a Kemmerer.
Water Quality Criteria	- The level of pollutants, with respect to the chemical, physical, and biological characteristics, that affect the suitability of water for a given use.
Wave	- A ridge, deformation, or undulation of the surface of a liquid.
W.E.S.	- Waterways Experiment Station of the U. S. Army Corps of Engineers at Vicksburg, Mississippi.
Wharf	- A (permanent) structure alongside a channel or harbor edge to which a boat or ship can tie up.
Zinc	- Zinc (Zn) is a heavy metal which in trace quantities is essential to life, but which in greater quantities may be toxic to life.
Zooplankton	- Planktonic animals that supply food for fish.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