Environmental Restoration

APPENDIX G

HULL AND ASSOCIATES

(NEW CDF NEAR WOODTICK)

U.S. Army Engineer District, Buffalo • 1776 Niagara Street • Buffalo New York 14207

PRELIMINARY ENVIRONMENTAL ASSESSMENT FOR BENEFICIAL REUSE OF TOLEDO HARBOR DREDGED SEDIMENTS FOR SHORELINE PROTECTION

FOR THE

TOLEDO-LUCAS COUNTY PORT AUTHORITY

FEBRUARY 1999

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EXECUTIVE SUMMARY

A Preliminary Environmental Assessment was conducted for the Toledo-Lucas County Port Authority to determine likely or potential, short- and long-term effects of constructing and operating an off-shore, confined disposal facility (CDF) in Lake Erie waters east of the Woodtick Peninsula, which is located in Southeastern Michigan and Northwestern Ohio. Construction and operation of a CDF in this location of Western Lake Erie would facilitate long-term management of locally derived, channel-maintenance dredge spoils and could present a viable alternative to open-lake disposal of such spoils. Equally important, this alternative could be considered beneficial reuse as construction of such an off-shore CDF could protect the Woodtick Peninsula and other important natural resources from further shoreline erosion and degradation.

Specifically, the purposes for conducting this Preliminary Environmental Assessment were to: (1) identify and characterize existing components of the natural environment as well as human-related resources and activities occurring within the defined project area; (2) determine the potential for beneficial as well as potential adverse or unknown impacts of the proposed activity on each component; and (3) develop general recommendations for addressing potential adverse effects, and for collecting additional information to more accurately assess existing conditions and potential effects.

To conduct this assessment, readily available information was gathered from various sources including government and agency records, published literature, and interviews with individuals familiar with different aspects of habitats and activities occurring in the project area. Cursory field reconnaissance was also conducted in selected portions of the project area to corroborate existing data and also to collect additional information. To facilitate synthesis, evaluation, and discussion of information gathered during this assessment, four geographic/ecological regions were arbitrarily delineated within the project area: Lake Erie waters, Woodtick Peninsula proper, the Bay Area, and the Mainland.

Preliminary assessment of existing environmental conditions in the project area indicate that the area is dominated by deepwater habitat, with much smaller portions of the area comprised of ecologically and economically important diked and non-diked wetlands, shallow-water habitats, and uplands. Deepwaters occurring mainly within Lake Erie and the Bay Area serve as habitat for a variety of

benthic and fish species, one of which is recognized as having Special-Concern status. Wetlands and related shallow-water habitats occur primarily in diked and non-diked portions of the Bay Area, on Mainland peripheries, and on the Peninsula proper; these habitats currently host a diverse array of wildlife and aquatic floral/faunal communities, including a number of floral or faunal species recognized as Threatened, Endangered, or Special-Status. And finally, uplands occur primarily on the Mainland, but also as dikes and islands in the Bay Area and on certain portions of the Peninsula proper; these habitats currently host various wildlife and the majority of human-related activities occurring in the project area, including a number of recognized historical/cultural sites. Many of the private, public, and commercial interests in the project area are directly or indirectly dependent on the habitats and related natural communities described above. These interests are diverse and include, but are not limited to: use of Mainland areas for farming operations; use of diked wetlands for waterfowl hunting; use of deepwater areas for fishing and recreational boating; and use of a water intake canal directly behind Woodtick for the purpose of power generation.

In addition to providing important upland and wetland habitat of its own, the Woodtick Peninsula has historically offered significant physical protection to Bay Area wetland and shallow-water habitats by acting as a barrier to significant, lake-related erosional forces. Degradation of the Peninsula, particularly during high lake-water levels, ultimately threatens not only Woodtick itself, but also the important habitats and human economic interests related to them. Further degradation of Woodtick by natural processes is accentuated through regional coastline-management practices.

Results of a preliminary assessment of anticipated beneficial effects of CDF construction and operation indicate that the proposed activity would provide substantial protection to upland, wetland, and shallow-water habitats currently existing on Woodtick Peninsula proper. As a direct result of helping to preserve the Peninsula and its habitats, similar habitats presently occurring in the North Maumee Bay area would also be protected. In turn, the private, public, and commercial activities that depend on these natural habitats and the wildlife contained therein would also be maintained. One of the most economically significant commercial activities that could benefit greatly from CDF installation is shipping and Port-related commerce, which involves regular dredging of the Toledo Harbor Channel which, in turn, involves the need for a repository for long-term disposal of dredge spoils.

Installation of the CDF adjacent to Woodtick would also promote development of new and valuable wetland, shallow-water, and/or upland habitats, not only in the CDF itself but also behind the CDF, adjacent to the Peninsula. Habitat development adjacent to the CDF should occur as a result of calmer waters, which should promote greater sediment deposition. Such habitat development would also be dependent on long-term lake levels and also on the littoral-zone, erosional, or depositional processes prevailing in the coastal region between Woodtick and the CDF. Hydrologic and sedimentological conditions that could be expected to occur after CDF placement will need to be computer-modeled to reflect different possible locations and configurations for an off-shore CDF.

In addition to numerous ecological and socioeconomic benefits, CDF construction and operation may also have several unknown effects. The specific type and extent of new habitat development in the area would be dependent on long-term lake levels as well as on prevailing hydrologic and sedimentologic conditions along the Woodtick shoreline. Also uncertain is the potential effect that placement of the CDF near an existing thermal discharge into the lake may have on local water temperatures, and the potential impact that localized related temperature changes may have on benthic and deepwater habitats and communities. This issue will also be further addressed by hydrologic/sedimentologic computer modeling.

Potential adverse effects of CDF construction and operation on project-area habitats and communities would likely, or could, include the following: permanent loss of deepwater and benthic habitat in the CDF footprint zone; periodic episodes of water-quality degradation adjacent to the CDF; potential impacts to habitats and ecosystems developing in the CDF itself, depending on how the CDF is managed/operated and also on the quality of sediments being discharged into the CDF; and the loss of certain habitat types (e.g. deepwater areas) through their conversion to other habitat types (e.g. shallow-water areas or wetlands). Aside from unavoidable losses of particular habitat acreage through habitat conversions, the potential adverse effects outlined could be mitigated or minimized through: natural fish and benthic population shifts to adjacent and similar habitats, away from the CDF footprint zone; natural dilution of short-term water-quality impacts near the CDF; and implementing methods for construction and operation of the CDF that minimize impacts to adjoining and CDF-bound habitats and inhabitants.

In summary, results of this Preliminary Environmental Assessment indicate that anticipated long-term benefits to project-area ecology and socioeconomics as a result of CDF construction and operation near Woodtick would collectively outweigh any potential short-term adverse effects resulting from the proposed activity.

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1.0 INTRODUCTION AND PURPOSE

Research is being conducted by the Toledo-Lucas County Port Authority and other agencies to investigate possible long-term solutions for management of dredged sediments derived from the Toledo Harbor Channel, located in the Maumee Bay and Maumee River in Northwestern Ohio (Figure 1). A long-term sediment-management strategy is needed for the following reasons: (1) continued deepwater (open-water) disposal of dredged harbor-channel sediments, which has historically been the mode of containment for most non- or slightly contaminated sediments in Lake Erie, no longer appears acceptable to regulatory agencies involved with the oversight of such activities and (2) limited available storage capacity remaining in most existing and nearby confined containment facilities (CDFs).

In response to the Port Authority's need to develop a long-term sediment-management strategy, Hull & Associates, Inc. (HAI) submitted a grant proposal to the Port Authority (HAI, 1995), who then forwarded the proposal to the Ohio Water Development Authority, for a multi-tasked investigation designed to evaluate the containment of sediments dredged from the Toledo Harbor Channel in a manner which would provide for long-term, ecologically sound sediment management as well as beneficial use of the sediments, specifically for the purposes of shoreline protection. In general, the grant proposal called for developing methods and preliminary costs for siting and constructing a new and innovatively designed CDF to be located adjacent to and north of the Toledo Harbor Channel, approximately three-quarters of a mile offshore from (east of) the Woodtick Peninsula (Figure 2). The Woodtick Peninsula is an approximately four-mile long, linear series of subaerial upland and emergent wetland landforms which are separated by channels of various depths. The Peninsula is located north of the Toledo Harbor Channel on the western coast of Lake Erie in Southeastern Erie Township, Monroe County Michigan (Figure 2). Placed east of the Peninsula, the CDF would not only offer a nearby location for long-term containment and environmental isolation of dredged spoils, but would also serve as a physical barrier to hydrologic erosive forces that have been impacting the Woodtick Peninsula for decades (Campbell, 1990). Additionally, the CDF would also be designed so as to promote development of high-quality floral and/or faunal habitat in the immediate CDF vicinity, and/or to enhance such habitat that already exists in the area.

An important component of the proposed, multi-task investigation involves conducting a preliminary assessment of potential impacts of the proposed activity on the Woodtick Peninsula and surrounding environment (Figure 3). Within the context of this assessment, the term "environment" is broadened to include potential impacts of the proposed activity to human resources and related activities occurring in the project area, as well as potential impacts to the natural environment, including faunal and floral habitats. The term "preliminary" reflects the fact that this assessment is based on a review of readily available, published or verbally transmitted information, supported by a limited amount of field reconnaissance of portions of the project area.

Specifically, the purposes for conducting this Preliminary Environmental Assessment were to:

1. identify existing components of the natural environment as well as human-related resources and activities occurring in the project area and to characterize current conditions for each, to the degree possible, using readily available information

2. determine the potential for beneficial as well as potential adverse or unknown impacts of the proposed activity on each component

3. develop recommendations for mitigating potential adverse or unknown effects of the proposed activity, and for collection of additional information, if it is concluded that insufficient data are available to adequately assess current environmental conditions and/or potential impacts of the proposed activity on existing conditions

The following sections include: a brief description of the proposed activity (Section 2); discussions of existing (pre-activity or baseline) conditions of the natural and human-related environment (Section 3); an assessment of potential impacts of the proposed activity on each environmental component in the project area, including recommendations for possible mitigative responses and collection of additional data for assessment purposes, if deemed necessary (Section 4); and finally, conclusions and recommendations (Section 5). Additional documents are also being prepared pursuant to HAI's proposed multi-task investigation, for submittal to the Port Authority under separate cover. These additional documents include: Preliminary Geotechnical Investigation report; Identification/Evaluation of Initial Facility Design Parameters; Preliminary Ecosystem Enhancement Plan; a Preliminary Final CDF Conceptual Layout/Design Plan; and Preliminary Cost Analysis for Construction/Operation.

2.0 GENERAL DESCRIPTION OF PROPOSED ACTIVITY

The proposed activity for which potential environmental impacts are preliminarily assessed herein comprises two different phases. These two phases, which may occur consecutively or concurrently, include:

Construction of an off-shore CDF which, in its entirety, would be approximately 3.5 miles long and approximately 0.5 miles wide. The structure would be located approximately three-quarters of a mile offshore of the Woodtick Peninsula in approximately six to ten feet of water, based on current water levels (Figure 2). The precise location, dimensions, and configuration for the CDF structure, as well as materials to be used in its construction, are being developed as part of other investigative tasks, and would depend on regulatory requirements for property access, access to the CDF from existing roadways, the potential for constructing new access ways, and other factors.

Operation of the CDF for management of sediments dredged from the Toledo Harbor Channel over a period of approximately 30 years, assuming a total CDF capacity of approximately 24,000,000 cubic yards and an average annual dredging volume of approximately 800,000 cubic yards per year. These calculations are based on all spoils dredged from the Toledo Harbor as well as the Maumee River being placed into the proposed CDF.

The proposed activity is considered in phases because the nature and degree of environmental stresses potentially imparted to the project area during each phase may vary significantly. For example, the construction phase would likely involve a substantial, but short-term and localized increase in lake-water turbidity during preparation for and placement of the CDF's rip-rap walls. In contrast, long-term operation (post-construction) activities would typically involve the transfer/offloading of dredged sediments from barges into CDF cells, drainage of sediment pore waters from contained sediment through weirs during dewatering and settlement processes, and general CDF maintenance activities. Relatively little increase in lake-water turbidity would be expected during CDF operation under typical conditions, although porewaters draining from

confined non-harbor sediments and potential affects to adjacent floral and faunal communities should be considered (Velleux et.al., 1993), were such sediments to be discharged into the CDF. As will be addressed in the preliminary conceptual layout and CDF design plan, and in the Ecosystem Enhancement Plan, the precise location, dimensions, configuration, and primary/secondary structural features of the proposed CDF would likely be based on a variety of factors including: anticipated CDF design life; predominant lake currents; wave impacts; and a variety of other physical and environmental factors. Nevertheless, for the purposes of conducting this preliminary assessment, the conceptual design for the proposed CDF - as shown in Figure 2 - offers an adequate portrayal of its general location, dimensions, and configuration. As it is beyond the scope of this task, this assessment does not include an evaluation of potential impacts resulting from dredging activities themselves.

3.0 IDENTIFICATION AND CHARACTERIZATION OF EXISTING ENVIRONMENTAL CONDITIONS IN PROJECT AREA

In this section, the existing (pre-activity or baseline) components of the natural and human-related environment occurring in the project area are identified and their conditions characterized, to the extent possible, using readily available information. The environmental components identified herein, each of which may have the potential for being beneficially and/or adversely impacted by the proposed activity over the short and/or long term, include the following:

Components of the natural environment:

1. hydrologic and sedimentological processes
2. uplands
3. wetlands
4. occurrence and quality of deepwater areas
5. benthos
6. fish and fisheries
7. wildlife
8. Threatened, Endangered, and Special-Status species

Components of the human environment:

9. private, public, and commercial property uses
10. cultural and historic resources
11. socioeconomics

For each component, existing conditions in the project area are summarized using readily available, published literature as well as any other readily available, non-published information derived from interviews with knowledgeable individuals, e.g. regulatory personnel, site managers, or property owners. For the purposes of this preliminary assessment, the project area (Figure 3) is defined to encompass an approximately 15 square-mile area of Southeastern Michigan and Northwestern Ohio, bound to the east by that portion of Lake Erie in which the proposed CDF is to be located and, to the

west, primarily by Interstate Highway 75. The project area's northern boundary is set coincident with the city of Luna Pier, Michigan (approximately five miles north of the Peninsula) while the southern boundary is set coincident with the Toledo Harbor Channel.

To facilitate discussions of existing conditions for each of the natural and human-related environmental components, the project area is considered to be comprised of four geographically and more-or-less ecologically distinct portions, or areas, each of which inherently contains a different quantity and distribution of upland, wetland, and/or deepwater aquatic habitats available for use by benthic organisms, fish, and other wildlife. These different geographic/ecological portions of the project area are portrayed graphically in Figure 4 and are also described below:

- **The Lake Erie Area**, which is an open-water area located east of the peninsula consisting of shallow (littoral-zone) waters less than approximately six feet deep as well as deeper (limnetic-zone) waters ranging in depth from approximately six to ten feet, depending on lake-water levels. This geographic/ecological portion of the project area is the general location for construction of the proposed CDF. This portion of the project area also currently serves, or could serve, as habitat for various aquatic species including fish and benthic organisms, and selected bird species as well.

- **The Woodtick Peninsula (proper)**, which, taken as a whole, is an approximately four-mile long, spit-like barrier structure which is typically comprised (during most years) of interspersed yet interconnected upland, wetland, and shallow open-water areas. Collectively, this portion of the project area currently serves, or could serve, as habitat for a large variety of aquatic organisms as well as wetland- or upland-based wildlife.

- **The Bay Area**, which is an area collectively comprised of Maumee Bay to the south and North Maumee Bay to the north. Maumee Bay is virtually all open-water, habitat, whereas North Maumee Bay is typically comprised of a variety of habitats including diked and undiked littoral-zone areas, diked and undiked wetland areas, and several isolated uplands (i.e. islands). Given such ecological diversity, the Bay Area - like the Woodtick Peninsula proper - currently serves, or could serve, as habitat for a large variety of aquatic organisms as well as wetland- and terrestrial-based wildlife.

- **The Mainland Area**, which is comprised primarily of uplands located either immediately east of Interstate 75 or on the peninsula landforms separated by Maumee Bay, the Ottawa River, and Halfway Creek (Figure 4). Given its geographical position, this particular portion of the project area principally serves as habitat for humans (mainly croplands and residential areas), but also no-doubt for terrestrial and wetlands-based wildlife as well. This is not to say, however, that human occurrence and activity is limited to the Mainland area. On the contrary, human occurrence and activity - and even dependency to a degree - extends throughout all four geographic/ecological portions of the project area, as discussed in the following sections.

3.1 Hydrologic And Sedimentological Processes

Perhaps no other aspect of the natural environment of the Western Basin of Lake Erie has a greater controlling influence on the occurrence, extent, and overall quality of aquatic, wetland, and terrestrial ecosystems or habitats than does lake-water hydrology and the sedimentological processes related to lake-water flow. Approximately ninety percent of the total inflow into Lake Erie comes from the Detroit River. By virtue of the river's magnitude and geographic position, this inflow has a significant effect on the general direction and magnitude of surface and sub-surface water currents flowing throughout the lake's Western Basin (Herdendorf, 1987). However, the river-dominated lake currents are often subsequently modified by strong winds, bottom topography, and shoreline configurations. The wind factor in particular can often ultimately dictate lake-flow patterns, not only in the Western Basin, but in other portions of Lake Erie as well (Herdendorf, 1987).

Perhaps the most important role that wind plays in terms of sedimentological processes occurring in Lake Erie is in the generation of waves and wave-induced currents. Such hydrologic forces can bring about significant sediment erosion and transport, particularly during large storm events (Lick, 1992). Storm-driven waves, including seiches, are created by infrequent, yet strong northeasterly winds and propagated westward, towards the Michigan and Ohio coastlines. Such wave action has periodically degraded large portions of beach-front property in the Western Basin through the process of direct bank washover, particularly during periods when lake levels were high, as in the early 1970s and the late 1980s (Figure 5; Campbell, 1990). During times of relatively high water levels, Carter et. al. (1981) have measured coastal erosion rates of sand beaches and marshes along the western Lake Erie coastline of as high as approximately three feet per year. Wind-driven waves can not only erode coastal areas through bank washover, but can also bring about the formation of powerful alongshore (littoral) currents which run parallel to the shoreline and which, in combination with bank washover, can bring about significant coastal degradation (Herdendorf, 1973).

Ironically, according to Carter et. al. (1981) and others, net shoreline degradation in many coastal areas of Michigan and Ohio has been accelerated over the last 100 years or so through increased construction of dikes, groins, and revetments designed to protect coastlines from erosion by waves and littoral currents. That is, the placement of a dike or groin in one shoreline area effectively isolates "feeder" sand beaches and bars that have historically served as source areas for replenishing sands to coastal areas located down current of the protected shoreline area - down-current areas which have also been impacted by wave- and current-induced erosion (Carter et. al., 1981). As discussed in subsequent sections, some researchers (e.g. Meadows et. al., 1992) believe this process to be at least partially responsible for the long-term physical degradation of the Woodtick Peninsula. The large flux of finer-grained sediments from the Maumee River into the Western Basin (Herdendorf et. al., 1977), although having a significant effect on overall benthic habitat and characteristics, apparently has little direct impact on such peninsula shoreline dynamics.

3.2 Uplands

Relatively dry, or "upland", portions of the project area are defined as those areas in which the surface or sub-surface hydrologic regime is not sufficiently wet to elicit development of "wet" vegetation, soil, and hydrologic characteristics uniquely associated with wetlands (USACE, 1987). Uplands occurring throughout the project area, as designated by the U.S. Fish & Wildlife Service (USFWS), are portrayed in a 1981 National Wetlands Inventory (NWI) map (Figure 6) and also in a 1990 property-use map of Erie Township (Figure 7) which was prepared independently by the Southeastern Michigan Council of Governments (SEMCOG); designated upland areas are shown on both maps in orange to facilitate comparison of mapped occurrence and distribution. In general, the occurrence and distribution of uplands as shown in Figures 6 and 7 is more-or-less equivalent, with differences attributed to several different factors including: variation in methods of map preparation, which were generally based on reviews of aerial photographs; differences in the degree of ground truthing involved in positive identification of apparent upland areas, (as inferred from aerial photograph review); and finally, actual differences in the degree of subaerial land exposure as a function of differences in lake-water levels during 1981 and 1990 (Figure 5).

As shown in Figures 6 and 7, uplands occurring along peripheries of the Ohio and Michigan mainlands, on the Woodtick Peninsula proper, and throughout the North Maumee Bay region comprise only a small percentage of the total project area, on the order of less than about ten percent. Nevertheless, these uplands are an important element of the project area for a number of reasons: (1)

several mainland-based properties play host to key private, public, and/or commercial activities that depend directly or indirectly on the long-term viability of the Woodtick Peninsula, as discussed in Section 3.9; (2) uplands occurring on Woodtick as well as those occurring in the form of dikes in North Maumee Bay help protect Bay Area wetland and aquatic ecosystems from erosive hydrologic processes; (3) uplands occurring in the southern portion of North Maumee Bay host important archeological and/or historical sites, as discussed in Section 3.10; and (4) the uplands themselves offer important habitat for various wildlife, as discussed in Section 3.7.

Regarding uplands on the Mainland portion of the project area: Uplands westward to the project area's western boundary (Interstate 75) are comprised primarily of privately owned farmlands as well as some forested and shrub lands (Figures 7 and 15). Some residential, recreational, and commercial properties also occur towards northern and southern Mainland areas (Figure 7) including a coal-powered utilities company, the Consumers Power Company (referred to herein as Consumers Power), which occupies a significant portion of the northern part of the project area (Figures 7 and 15). As a water-dependent industry, Consumers Power has a significant presence in the project area in terms of its current cyclic (seasonal) intake and discharge of lake water during power generation, as described in Section 3.9. Several other mainland-based (though water- and wetland-dependent) properties also occur in the area, including the privately owned Erie Shooting and Bay Creek Hunting Clubs (Figure 15). These two entities, the former of which has a particularly significant affect on ecosystem dynamics within North Maumee Bay by virtue of its size and diked operations, are discussed in greater detail in subsequent sections.

Regarding uplands on the Woodtick Peninsula proper: Uplands in this portion of the project area are sparse in occurrence, are physically separated from one another by wetland and/or open-water areas, and periodically appear along northern and southern portions of the Peninsula, presumably as a function of relatively higher land-surface elevations in these areas (Figures 5 through 7). Substrates occurring in the northern and southern peninsula areas are typically either gently sloping sandy beaches, significant portions of which are non-vegetated (e.g. Photograph 1), or are poorly drained and periodically flooded loamy soils (USDA-SCS, 1981; Campbell, 1988). Based on floristic surveys conducted in the past on and around the Peninsula, a large variety of "dry to wet" woody and herbaceous plant species (referring to relative frequencies of species occurrence in uplands versus wetlands) have been observed. Results of such surveys conducted on Woodtick by Jaworski et. al. in 1981 (as referenced in Herdendorf, 1987) and by Campbell in 1987 and 1988 (Campbell, 1988)

indicated the presence of cottonwood, wild grape, crack willow, jewelweed, box-elder, and smartweed, as well as a variety of other emergent, non-woody species (see Appendix A in Campbell, 1988). Cursory reconnaissance of portions of the project area in March 1998 indicated the continued presence of many of these same woody and herbaceous species in northern and southern portions of the Peninsula, as well as continued large expanses of non-vegetated beach and sand-bar areas (Photographs 2 through 4).

Based on a review of maps and other available historical data (e.g. Figure 8), the subaerial extent and distribution of the Woodtick Peninsula appears to have changed significantly over time as a collective result of the following processes: (1) long-term fluctuations in lake water levels (Figure 5; Campbell 1990); (2) wave and current-induced erosional and depositional processes which have reshaped the shore and shoal areas (Campbell, 1988; USACE, 1982); (3) changes in the occurrence, distribution, and types of wetland and upland vegetative communities, and differences in exactly how such ecosystems are defined; and (4) decreases in the availability of "feeder" sands from up-current coastal areas, as discussed in Section 3.1. A review of available information also indicates that erosion of uplands (and wetlands) in the Peninsula area have proven most severe when lake water levels are relatively high, which is when the degree of upland and wetland inundation - and exposure of these ecosystems to erosive forces like wave action - is the greatest (Jaworski and Raphael, 1976). In this regard, complete breaches of the peninsula have developed rapidly in certain areas of Woodtick as the result of single, large storm events occurring during high-water periods (Campbell, 1988). In contrast, Woodtick uplands (and wetlands) are most protected from the ever-present, lake-borne wave and current-induced erosive forces when lake-water levels are relatively low, particularly when feeder sands are readily available from up-current areas (Meadows et. al., 1992).

Regarding uplands located in the Bay Area: Uplands in this portion of the project area primarily comprise two different types: (1) a continuous, approximately 60-foot wide by five-mile long man-made dike, constructed in approximately 1945, that encloses the approximately 1,100-acre Erie Shooting Club property, located in the northern part of North Maumee Bay (Figures 6 and 15); and (2) the naturally occurring Indian and Gard Islands, located at the southern end of North Maumee Bay (Figure 6). Like uplands (and wetlands) on the Woodtick Peninsula proper, Bay Area dikes and islands are and have been vegetated by a variety of woody and herbaceous species (Campbell, 1988) as well as exposed to significant fluctuations in lake water levels over time. However, by virtue of their position behind (west of) Woodtick, most of these relatively more secluded upland areas

(particularly the islands) have not been subject to significant wave and current-induced erosion, as have uplands and wetlands on the Peninsula proper. As discussed in Sections 3.10 and 3.11, Bay Area uplands are significant in terms of their role in local-land use and habitat/ecosystem establishment and protection, as well as being locations for historically and culturally significant sites.

In summary, the Woodtick Peninsula proper, including its coastline, appears to have undergone cyclic periods of erosion and accretion over geologic time as a direct result of the naturally occurring processes of short and long-term water-level fluctuations, plant growth and peat accumulation (which occurs as a function of water-level changes), and the natural sedimentological processes of littoral erosion and sedimentation (Meadows et al., 1992). However, during historical times (i.e. within approximately the last 80 to 90 years) a relative lack of feeder sands from now-isolated areas north of the Peninsula appear to have combined with natural processes to bring about significant net erosion of portions of the Peninsula (Meadows et. al., 1992). As a result of this peninsula degradation, relatively minor (but noticeable), erosion has also periodically occurred to some diked areas located directly to the west of the peninsula, in North Maumee Bay (Mr. Ken Reau, Manager of The Erie Shooting Club, personal communication). Little to no such erosion has apparently occurred to Mainland areas to the west and south of the shooting club's diked area, presumably in large part due to the presence of the dike as well as their distance from open-lake waters (Campbell, 1988). In any event, the general relationship between peninsula protection and dike stability is apparent.

3.3 Wetlands

Relatively wet, or "wetland", portions of the project area are defined as those areas that are saturated or inundated by surface or ground water at a frequency and duration sufficient to support a prevalence of vegetation uniquely adapted for life in saturated soil conditions (USACE, 1987). Wetlands can include swamps, bogs, and estuarine marshes, and can technically occur in open-water areas of up to approximately six feet deep (i.e. littoral-zone waters), although most wetlands in this area have typically occurred in shallower waters (Jaworski and Raphael, 1976). Wetlands occurring throughout the project area are shown in green in Figures 6 and 7. As with uplands, the mapped occurrence and distribution of wetlands across the project area differ slightly between the NWI and SEMCOG maps due to differences in methods of map preparation, variable degrees of ground

truthing, and actual, temporal differences in lake-water levels (which is a significant control on wetland distribution and occurrence). And, as with uplands, wetlands comprise a relatively small yet critically important percentage (about five percent) of the total project area.

As a result of regional draining, ditching, and diking activities along with agricultural and metropolitan development in general, only a small percentage of wetlands that were originally present along the western coast of Lake Erie in the late 1800s remain intact today (Figure 10). Coastal wetland acreage remaining in the Western Basin - approximately 150 square miles - typically occurs behind protective structures such as berms or dikes (Herdendorf, 1987). As can be seen from Figure 10 (and despite the coarse scale of this graphic), wetlands located across the project area appear to represent a significant, remaining wetland resource in this part of the Western Basin.

Herdendorf (1992) considers three different categories of coastal wetlands in Lake Erie, based on the type of physical protection afforded the wetland body: (1) coastal lagoons, which occur behind naturally occurring barrier beaches; (2) managed marshes, which are protected by earthen or rip-rap dikes; and (3) estuarine areas, which are wetlands that have developed in drowned river mouths. According to Herdendorf's classification scheme, project-area wetlands, which occur to some extent in all geographic/ecological portions except Lake Erie (Figure 4), could generally be considered as either coastal lagoons or managed marshes. Coastal lagoons comprise approximately 1,400 acres of wetlands interspersed throughout the islands, shallow coastal waters, and channels of the Woodtick Peninsula, plus the approximately 200 wetland acres occurring south and north of the diked area (along the Mainland periphery). Managed marshes comprise approximately 1,100 acres of wetlands occurring within Erie Shooting Club's diked area. Furthermore, according to the USFWS classification scheme (Figure 6), virtually all of the lagoonal or managed-marsh-type wetlands occurring across the project area would be considered palustrine (swamp-like) in nature and are typically characterized by either a complete lack of vegetation ("POW") or by the presence of emergent ("PEM") or forested ("PFO") wetland flora. Results of floristic surveys conducted in the past across the managed-marsh area (Jaworski et al., 1981, as referenced in Herdendorf, 1987) further indicated the presence of various emergent and woody wetland species including arrowhead, rushes, cattails, purple loosestrife, smartweed, jewelweed, reed-canary grass, cottonwoods, and willows. As seen in Photograph 10, a large population of American Lotus *(Nelumbo lutea)* can also be found growing in the calm waters on the western side of Woodtick, just south of Consumers Power. A review of relatively recent (1996) aerial photographs of the project area as well as

observations made during March 1998 field reconnaissance of selected portions of the project area (e.g. Photograph 5) more-or-less confirmed the general occurrence, distribution, and types of wetlands portrayed in Figures 6 and 7, as well as many of the same herbaceous and woody species noted during previous floristic surveys of the area (see Photographs 6 and 7).

The importance of wetlands in the project area and in nearby coastal locations to the overall ecological health and well-being of Lake Erie's Western Basin cannot be overstated (Herdendorf, 1987) as cannot, in turn, the importance of the Woodtick Peninsula to the existence of project-area wetlands (Campbell, 1990). The peninsula provides direct protection to non-diked, Bay Area wetlands from wave and current-induced erosion as well as indirect protection of Erie Shooting Club's managed wetlands through its (the Peninsula's) physical protection of the Club's dike structures. In turn, the managed and non-managed wetlands in the project area provide for a large number of biological, physical, and economic functions to the local ecosystem overall, including spawning and nursery sites for fish, wintering and nesting sites for waterfowl, mainland protection from wave action, and non-consumptive recreational uses (Herdendorf, 1992; Jaworski and Raphael, 1976). As mentioned previously, the value of the Woodtick Peninsula proper and its related wetlands is particularly great now in light of diminishing wetland acreage remaining in the Western Basin (Figure 10).

The remaining coastal wetlands, including those in the project area, have themselves shown significant changes over time, primarily as a result of changes in lake water levels and wave- and current-induced erosion, but also due to historical changes in regional land-use practices, e.g. ditching, draining, etc. (Herdendorf, 1987). In terms of changes occurring in the project area in particular, Figure 11 illustrates the net increase in deepwater (non-wetland) areas between 1901 and 1974 at the expense of marsh areas, while, in contrast, upland (non-marsh) acreage appeared to show little change spatially. Other studies have also shown similar decreases in emergent-wetland acreage from the early 1900s to the 1970s or 80s, particularly in the North Maumee Bay (e.g. Jaworski et.al., 1981 as referenced by Herdendorf, 1987). Most of this reduction in wetland acreage probably occurred prior to dike construction in about 1945.

As illustrated by the Erie Shooting Club's managed marsh, which has reportedly been operating in North Maumee Bay since the late 1800s, diking allows for water-level control in wetlands as well as protection of wetland habitat from hydrologic erosive forces. Consequently, diked wetlands in the

project area have shown the least degree of physical degradation over time (Mr. Reau, personal communication). Indeed, dike construction and subsequent management of enclosed wetlands for particular waterfowl or fish species is a common way of maintaining wetlands intact throughout many areas of the Western Basin (e.g. USFWS, 1993). Given the potential for significant changes in lake-water levels, which can be instrumental in bringing about upland and wetland degradation, physical isolation of wetlands and direct management of water levels therein is believed by many researchers and site managers to be an effective way of preserving Lake Erie's coastal wetlands (e.g. USFWS, 1993). In summary, in lieu of dike construction around the entire perimeter of the Woodtick Peninsula proper and subsequent water-level management therein, a reduction in wave- and current-induced coastal erosion as a result of CDF construction, as discussed herein, would be the most practical and effective way to minimize hydrologic damage to Woodtick and its associated and important wetland ecosystems.

3.4 Occurrence And Quality Of Deepwater Areas

Open water, or "deepwater", portions of the project area are defined as inundated areas coincident with the limnetic zone (waters ranging in depth from approximately six to ten feet) or shallower littoral zone where emergent or submergent macrophytic plant vegetation as well as hydric substrate are absent (USACE, 1987). Deepwater areas are shown in blue, in Figures 6 and 7, along with uplands and wetlands. Deepwater areas typically comprise the mouth of the Maumee and Ottawa Rivers (and Halfway Creek), the Northwestern half of Maumee Bay, much of North Maumee Bay, and the waters of Lake Erie east of Woodtick. Specifically, deepwaters in the project area are mapped as limnetic lacustrine, littoral lacustrine, or riverine open-water areas ("L1OW", "L2OW", and "R2OW"), or as "lakes" or "Great Lakes" waters in Figure 7. The mapped occurrence and spatial distribution of deepwater areas presumably differ slightly between the NWI and SEMCOG maps mainly due to temporal differences in lake-water levels (which control the location and extent of coastal inundation, depending on bank elevation and slope) and also probably as a result of differences in map-preparation methods and degrees of ground truthing, to lesser degrees. In contrast to uplands and wetlands, deepwater areas dominate the project area, comprising on the order of about seventy-five percent of the area.

Lake and bay water quality is an important aspect of Woodtick and its adjacent ecosystems in that water quality directly influences fish, planktonic, and benthic habitats and, in turn, can be significantly modified by water's interaction with wetland vegetation and soils. Water quality can

generally be defined by its chemical, microbiological, and physical characteristics, as well as by the presence or absence of known organic and/or non-organic contaminants. Adequate water-quality data are available for Lake Erie, including the Western Basin and major tributaries (Herdendorf et. al., 1977; Sweeney, 1993; Richards and Baker, 1993; Dolan, 1993), and for the Maumee Bay area in particular (Herdendorf and Cooper, 1975; Fraleigh et. al., 1979). For the purposes of this preliminary assessment, and in lieu of more location-specific water-quality data (such as those data available for the Maumee and North Maumee Bays), data available for the "Western Basin" in general are considered to be representative of waters occurring in the Lake Erie portion of the project area (Figure 4), where the CDF would be located. Based on a review of available published data, several generalizations may be made regarding general water-quality trends over time as well as relative differences in water quality between Lake Erie and Bay Area portions of the project area at any given time:

1. As illustrated in Figure 12, significant spatial variability appears to exist in the quality of deepwaters occurring throughout the project area (Herdendorf and Cooper, 1975).

2. Maumee Bay water quality is primarily a function of the quality of waters emanating from the Maumee River – the bay's principle tributary to the southwest - as well as the quality of water within the open Western Basin to the east, which is largely influenced by the Detroit River. In turn, water quality within North Maumee Bay is probably more a function of Maumee Bay water quality and that of waters emanating from the nearby Ottawa River. Once waters are discharged to the Bay Area, wetland ecosystems may further modify the quality of these bay waters, particularly as it occurs within diked areas (Herdendorf, 1987).

3. "Poor-quality" waters occur throughout much of Maumee Bay and are generally characterized by relatively high turbidity (clays, silts, and organics) and nutrient levels, low dissolved oxygen coupled with high biochemical oxygen demand (BOD), and the presence of various organic and inorganic contaminants. Poor-quality Bay Area waters are a direct reflection of poor-quality tributary waters (Fraleigh et. al., 1979). Contamination of the Maumee and Ottawa Rivers, and therefore Maumee Bay, is the combined result of a variety of past municipal, industrial, and agricultural impacts (USACE, 1993). As a result of degraded river and bay water qualities, fish consumption and contact advisories were established by the Ohio Department of Health and are still currently in effect (Mr. Brent Kuenzli, Northwest District Office, Ohio EPA, personal communication). Over the last few decades, however, more stringent regulatory controls and various pollution-abatement programs have been employed which have focused on point-source cleanups, the prevention of point and non-point-source pollution, and minimizing contaminant flux into bay tributaries (e.g. Ohio EPA, 1990; Ohio Lake Erie Commission, 1998; Dolan, 1993). As a result of these efforts, some improvement in tributary and bay water qualities has been noted (Ohio Lake Erie Commission, 1998; Dolan, 1993; Richards and Baker, 1993).

4. Turbidity levels are also reported to be relatively elevated in western Lake Erie marshes and estuaries (Herdendorf, 1987), which may also be representative of wetlands within the North Maumee Bay area as well. Nevertheless, the estuarine and coastal marshes of Western Lake Erie, as well as wetlands in general, are also known to act as "sinks" for many types of organic and inorganic contaminants, including suspended sediments, thus serving to improve water quality overall (Herdendorf, 1987; Kadlec and Knight, 1996).

5. Water quality in Maumee Bay tends to improve eastward, as bay waters mix with the higher-quality waters of Lake Erie (Fraleigh et al., 1977). Lake Erie waters have typically been characterized by low turbidity, low nutrients, and low BOD, as well as trace to below-detection levels of most contaminants (e.g. Figure 12). As stated above, such relatively clean Lake-Erie waters should more or less reflect the general quality of waters typically occurring in the proposed CDF area.

Over and above the occurrence of contaminated *waters* in river and bay portions of the project area, and despite some apparent improvements in river and bay water qualities, the contamination of river and bay *sediments* is still generally considered to be the most conspicuous environmental problem in the Maumee River and Bay Area. Sediments containing detectable to significant levels of various organic and inorganic contaminants have been identified in portions of Maumee Bay as well as in the Maumee and Ottawa Rivers (Ohio EPA-DERR, 1995; Ohio EPA, 1998; Ohio EPA, 1990). Sediments occurring towards the north end of Maumee Bay are also known to be contaminated (unpublished data on file at Ohio EPA- Northwestern Division Office), although no data appear to be available for sediments in the North Maumee Bay proper, or within the shooting club's diked area. As a note, an unknown portion of the sediment occurring within the diked area is reportedly derived from Consumers Power dredging activities, which are periodically conducted for the purpose of keeping clear their intake canal, which is located directly west of the Peninsula proper, (Photograph 11; Figure 2) (Mr. William Schoenlein, Consumers Power Company, personal communication).

Discussions of contaminated sediments are relevant to discussions of water quality in that many of the water-quality contaminants mentioned above can be chemically bound to the principal constituents of turbid water (e.g. Lick, 1991) and can ultimately settle out as contaminated bottom sediments (Bedford and Shah, 1978). Consequently, a gross, yet apparent, correlative spatial relationship appears to exist between contaminated waters and sediments throughout the project area. For example, large populations of contamination-tolerant sludge worms (*Tubificid* species) typically

occur in the more highly contaminated Maumee Bay sediments (which are beneath more highly contaminated bay waters), but decrease in abundance towards the relatively cleaner Lake Erie sediments and waters to the east (Figure 13).

In summary, water quality throughout and near the project area appears to have improved overall during the last few decades. Nevertheless, contaminated and/or eutrophic waters and sediments still occur throughout much of the project area, including in Maumee Bay (Ohio Lake Erie Commission, 1998; Hoke et. al., 1987). Despite such impacts, these waters and sediments as well as nearby wetlands continue to serve as habitat for fish, waterfowl, benthic organisms, and other wildlife - including some Threatened, Endangered, and Special-Status species as discussed in Section 3.8. Following are discussions of the aquatic, wetland, and terrestrial fauna and flora that presently occur in the upland, wetland and aquatic habitats described above.

3.5 Benthos

Benthic organisms, zoobenthos in particular, are invertebrate species (e.g. worms, flies, shellfish, and molluscs) that spend all or part of their life cycles in subaqueous sediments. According to Kreiger (1992) and Herdendorf (1987), the composition and abundance of zoobenthic communities present is controlled by a variety of abiotic as well as biotic factors related to either the natural environment or to contamination. Common controlling *abiotic* factors include: concentration gradients of nutrients and suspended sediments; sustained high turbidity; flushing with stormwater runoff; long- and short-term water-level changes; physical characteristics of available substrates (e.g. sandy versus clayey sediments); and the presence of contaminants. *Biotic* factors which can strongly influence zoobenthic composition and abundance include: selective predation; the composition, distribution, and density of emergent/submergent wetland plant beds; spatial and seasonal variation in planktonic food sources; and habitat disruption by bottom-feeding fishes. Furthermore, the relative influence of many of these factors, and therefore the benthic composition and abundance ultimately observed, depend largely on the *type* of aquatic ecosystem involved, that is, a near-shore or coastal wetland environment versus a deepwater (limnetic or non-wetland littoral) area. A significant quantity of data appear to have been collected to date on zoobenthic communities occurring in deepwater zones of the Western Basin of Lake Erie (e.g. Pliodzinskas, 1979), however, relatively little data appear available for Lake Erie coastal wetlands (Krieger, 1992; Herdendorf, 1987). Consequently, a

reasonably adequate assessment of probable zoobenthic communities occurring in Lake Erie (Figure 4) may be derived, whereas zoobenthic composition and abundance in wetland portions of the project area can only be speculated upon, in the apparent absence of site-specific data.

Regarding zoobenthic occurrence in deepwater zones of western Lake Erie: Prior to the late 1950s, the soft, clay rich lake bottom of the Western Basin was primarily occupied by mayflies (*Hexagenia* spp.), freshwater mussels (family *Unionidae*), amphipods (*Gammarus* spp.), midges (family *Chironomidae*), and caddisflies (genus *trichoptera*) (USACE, 1974). However, as a result of significant fluxes of contaminated waters and sediments from the Maumee Bay and other regional source areas during the 1960s and 70s, regional and local benthic communities underwent dramatic shifts. In particular, the abundance and diversity of contamination-sensitive benthic species generally decreased while populations of contamination-tolerant worm and fly (dipeteran) species increased (Schloesser et. al., 1995). As of 1979, benthic communities along the Michigan coast and in the Toledo and Maumee Bay region were dominated by aquatic earthworms or Tubificids *(Oligochaetes)*, both in terms of populations (>80 percent) and number of species present, >30 percent (Pliodzinskas, 1979). Through greater controls on the discharge of pollutants, sewage, and nutrients into the bay and its tributaries during the 1980s (e.g. Dolan, 1993; Richards and Baker, 1993), contaminant fluxes into the Western Basin were decreased significantly and, as a result, numbers of various insect species (e.g. *Hexagenia*) have increased slightly in some areas while the still-dominant Oligochaete populations have decreased slightly (Kolar et. al., 1997; Nalepa et. al., 1991). Nevertheless, despite these apparent improvements in benthic habitat as a result of the various pollution-abatement programs, there have been other biological stresses imposed on recovering benthic communities. For example, unionid mussel populations are threatened by the invasive and well-known, exotic zebra mussel *(Dreissena ploymorpha)* (Nalepa et. al., 1991).

Regarding zoobenthic occurrence in wetlands of the project area: Except for studies conducted in the Lake Erie islands region, the lower Detroit River, and Sandusky Bay, investigations of zoobenthic communities in wetlands of the Western Basin appear to be scarce (Herdendorf, 1987), thus implying an absence of such data for the project area. Furthermore, in light of the many abiotic and biotic factors controlling benthic communities, it would be difficult to speculate on benthic occurrence in the project area. Nevertheless, it is relevant to note that obvious differences typically occur between invertebrate fauna of open, coastal wetland environments and the fauna of diked marshes (Herdendorf, 1987). Open wetland habitats appear to be dominated by Oligochaetes and

dipterian larvae while physically protected marshes tend to contain other insect orders (e.g. dipterian, chironomids). The same degree of benthic diversity may also be expected between diked and non-diked Bay Area wetlands (Figure 6), particularly considering the potentially significant differences in sediment-contaminant levels occurring between these two types of project-area wetlands. That is, the majority of sediments within the diked area have reportedly been enclosed since about 1945 (Mr. Reau, personal communication) and have therefore not received the same sediment-borne contaminant fluxes as have sediments located in non-diked areas, adjacent to the mouths of the Ottawa and Maumee Rivers.

Despite the apparent lack of information related to benthic organisms across the project area, the benthic community in general is believed to play an important role in the environmental (food-chain) dynamics of aquatic ecosystems, including wetland ecosystems (Jude and Pappas, 1992); it is expected that this is generally the case within the project area as well. Firstly, the behavior of relatively sessile, benthic organisms as reliable "indicators" of environmental quality was addressed in Section 3.4. Secondly, bioturbation (sediment burrowing) by benthic organisms, especially Oligochaetes and midge larvae, can result in the release of sediment pore waters and the nutrients and contaminants dissolved therein into the overlying water column (Krieger, 1992). And finally, in terms of food-chain pathways, benthic as well as epiphytic (plant-attached) organisms occurring in wetlands are known to serve as an important food source for fish as well as for waterfowl populations (Krieger, 1992).

In summary, although conditions appear to be improving, benthic communities across the project area - including open waters off the coast of Woodtick - still appear to be comprised of the more contamination-tolerant species, in continued response to decades of degradation of bay waters and sediments. Environmental impact to this lower realm of the food chain, which serves as an important food source for fish and waterfowl species, has likely had a measurable and long-term impact on overall ecosystem dynamics. Case in point: years after contamination abatement programs were implemented and a significant decrease in the flux of contaminants into the bay area had occurred, a public health advisory was issued by the Ohio EPA against consumption of bottom-feeding carp and channel catfish taken from Lake Erie (Ohio EPA, 1990).

3.6 Fish And Fisheries

Fish and fisheries refers to the various sport, forage, and commercial fish communities known or expected to inhabit project-area waters, either on a permanent or periodic (seasonal/life-cycle) basis. The composition and abundance of fish communities present is dependent on many of the same factors that typically dictate zoobenthos occurrence, including: habitat and food-source availability (including substrate type); water quality (including turbidity and temperature); physical conditions (e.g. wave action), and species competition and predation (e.g. Jude and Pappas, 1992). Also, as with the occurrence and distribution of benthic organisms, the relative influence of many of these factors on the composition and abundance of fish communities present depend on whether a wetland or non-wetland (deepwater) environment is considered. Abundant historical and relatively recent data are available regarding fish and fisheries of deepwater areas of Lake Erie's Western Basin in general and for the Maumee Bay region in particular (Ohio EPA, 1990; Knight and Vondracek, 1993; USACE, 1993). Additionally, considerable data are also available regarding fish communities within Lake Erie's coastal wetlands (Jude and Pappas, 1992; Herdendorf, 1987), although little site-specific data appear to be available for project-area wetlands in particular.

Regarding fish occurrence in deepwater zones of Western Lake Erie: As with historical shifts in benthic communities, deepwater fish species and populations have also changed somewhat over time due to industrial contamination, eutrophication due to nutrient loading, and the introduction of new fish species into Lake Erie (USACE, 1974). In particular, walleye (*Stizostedion v. vitreum*) populations in the basin had declined substantially by the 1960s as a result of overall habitat degradation. Species decline is also in part a result of changes to the benthic community (Ohio EPA, 1990) in that several benthic species are primary food sources for walleye (USACE, 1974). By approximately 1980, walleye fisheries in the Western Basin - an area which has periodically been referred to as the "walleye capital of the world" - had been restored somewhat as a result of environmental cleanups and resultant habitat improvements. Still, a public health advisory had been issued in 1987 against consumption of carp and channel catfish from Lake Erie (Ohio EPA, 1990), as a result of sediment contamination by PCBs and the presence of other contaminants.

Currently, pelagic and open-water fish species including yellow perch, freshwater drum, white bass, and walleye likely dominate Lake Erie waters off the Woodtick coast, based on the relatively recent data published by USACE (1993). Other species that likely occur in these waters also probably include common carp, emerald shiner, gizzard shad, and channel catfish. Shiner species have been

known to occur in high densities in six to twelve feet of water off of the Woodtick coast (USACE, 1993). This is probably because shiners are attracted to warm-water discharges such as that occurring at the base of Woodtick – warm waters which originate from Consumers Power (Herdendorf et. al., 1977). Although spending most of their adult lives in open-lake waters, many of the above species also inhabit limnetic and littoral waters of the Maumee Bay and its tributaries for at least some portion of their life cycle to spawn and/or rear their young (Goodyear et. al., 1982). Maumee Bay appears to be a major spawning and/or nursery area for gizzard shad (*Dorosoma cepedianum*), a forage species considered to be the most important food source for walleye in the Western Basin (USACE, 1993). Other fish species known to occur at least periodically in Maumee Bay and/or North Maumee Bay are summarized in Table 1.

Regarding fish occurrence in project-area wetlands: In general, coastal wetlands are known to provide spawning and nursery habitat for some fish species, cover for juvenile and forage fish, and feeding areas for predator fish (Herdendorf, 1987). Fishes associated with coastal marshes can typically be divided into two categories: (1) species that are directly dependent on coastal marshes for spawning and nursery areas or (2) species that are not necessarily dependent on marshes for such uses, but which make opportunistic use of such areas for spawning, nursing, and feeding. Of the site-specific data available, species which are typically considered to be "wetland-dependent" and which occur in the project area, include bowfin, black crappie, yellow perch, and northern pike (Table 1). In fact, the wide variety of species known to occur in Maumee and North Maumee Bay (Table 1) is likely due in part to the variety of habitat, food, and protection offered by non-diked wetlands occurring within the North Maumee Bay region (Figures 6 and 7). A report by USACE (1993) lists 62 species of fish that have been known to occur in nearshore and offshore areas of the Maumee Bay. Of the 62 species listed, many are "seasonal visitors" usually in the spring or fall during spawning season. Some of the species are also rare or endangered, as addressed in a later section.

In contrast to the wide variety of fish species present in non-diked portions of the project area, only a limited number of fish species - carp, sunfish, gizzard shad, crappie, and goldfish - exist within the managed (diked) wetlands of North Maumee Bay (Jude and Pappas, 1992). These fish species inhabit these wetlands perhaps as a result of limited habitat variability and/or because they are unable to migrate out of the wetland due to gates blocking their movement into open bay waters (Herdendorf, 1987).

In summary, correlative relationships appear to exist between: (1) health and prosperity of fish *and* benthic communities via food chain dynamics; (2) aquatic and benthic communities *and* the availability of benthic and vegetative habitat offered by emergent wetlands and other nearby littoral-zone areas; and (3) the survival and prosperity of Lake Erie's fish populations and fisheries *and* the presence of wetland and littoral-zone environments having a direct hydraulic link to open lake waters (Herdendorf, 1987). It should follow, then, that protection/conservation of non-diked wetland and related shallow-water habitats like those occurring in the Maumee and North Maumee Bays would have far-reaching, beneficial implications in terms of the prosperity of the Lake Erie aquatic ecosystem in general. The relationship between fisheries of the hydraulically isolated, diked wetlands of North Maumee Bay and the Lake Erie ecosystem is less direct. However, as discussed in the following section, these diked wetlands offer an important habitat for a variety of waterfowl and other wildlife.

3.7 Wildlife

Wildlife is inclusively defined herein as amphibian, reptile, mammalian, and bird (waterfowl and non-migratory) species that are known to inhabit or utilize wetland and/or terrestrial (upland) ecosystems of the project area during at least some part of the year.

A wide variety of amphibians and reptiles, including salamander, newt, toad, frog, turtle, and snake species were known to have inhabited North Maumee Bay wetlands and/or Woodtick wetland environments as recently as 1980 (Campbell, 1988). Many if not all of these species reportedly still exist within the project area (Mr. Reau, personal communication).

Various mammals, including whitetailed deer, muskrat, raccoon, mink, and opossum are known to have inhabited publicly and privately owned wetlands and uplands occurring within and near the project area (Herdendorf, 1987; Herdendorf and Hartley, 1980). In particular, wetlands and uplands occurring within the State of Michigan's Erie State Game Area, which includes Indian Island and portions of Woodtick Peninsula (Figure 15), have been habitat for shorebirds, wading birds, and songbirds while similar habitat owned by the Nature Conservancy and leased by Erie Shooting Club (Figure 15) have been habitat for bald eagles, whitetailed deer, and waterfowl as recent as 1998 (Mr. Reau, personal communication).

The western end of Lake Erie is located directly within several migratory pathways (i.e. fall migration corridors) for a variety of waterfowl species (Figure 16). Wetlands along these pathways offer resting areas, shelter, and food stops for migrating species including mallards, canvasbacks, and Canada geese. Therefore, given the project-area's position along these migration routes, resident and migratory waterfowl, waterbird, and wading-bird species are perhaps the most noteworthy wildlife occurring in the project area in terms of abundance, diversity, and ecological and socioeconomic importance. In fact, Erie Shooting Club's diked wetland/open-water area has been exclusively managed for waterfowl production of mallards, pintails, and Canada geese. Management specifically involves controlling water levels within the diked area to derive open-water acreage as well as to select for the growth of particular upland and emergent wetland plant species (buckwheat, millet, coontail, and corn) to be used for waterfowl food and shelter (Photographs 8 and 9). According to Mr. Reau, a variety of waterbird and wading bird species also utilize wetlands and open waters in the diked area, including herons, eagles, and shorebirds. Mr. Reau further noted the common use of adjacent, non-diked wetlands and near-shore environments by the same bird species. Another, smaller and privately owned shooting club - the Bay Creek Hunting Club - which is also managed for migratory waterfowl production, is located just north of the Erie Creek Shooting club (Figure 15).

Bald eagles, a well-known federal and state (Michigan) threatened species, have also historically inhabited wetland areas of Lake Erie's Western Basin. However, their numbers had, until about 15 years ago, diminished greatly as a result of loss and degradation of habitat, including food sources. Relatively recent regulatory protection of the eagles and their habitat has resulted in population increases, according to Mr. Mark Shieldcastle, Eagle Specialist, Ohio Department of Natural Resources (Ohio EPA, 1996). Bald eagles reportedly occur within the project area. Specifically, a single pair of bald eagles have maintained an active nesting site on the premises of the Erie Shooting Club for the past several years, according to Mr. David Best, biologist with the USFWS, East Lansing, Michigan office (personal communication). According to Mr. Best, only four or five viable bald eagles nests occur in Lake Erie's Western Basin, and this is one of those nests; Mr. Shieldcastle corroborated Mr. Best's statement (personal communication).

In summary, wetlands as well as related upland and shallow-water aquatic environments play an important role in maintaining abundant wildlife populations and diversity in the project area, not only in terms of providing refuge and habitat, but also through providing food, nesting, and breeding

grounds. Furthermore, as discussed in the following section, upland, wetland, and deepwater environments of the project area also play host to a number of Threatened, Endangered, and Special-Status species.

3.8 Threatened, Endangered, And Special-Status Species

Written inquiries were addressed to regulatory agencies in Michigan and Ohio to determine if (and specifically where) Threatened, Endangered, and/or Special-Status faunal and floral species exist within project-area boundaries. In particular, written requests for information regarding such species were submitted to the following agencies: Michigan Department of Natural Resources, Natural Heritage Section (MDNR-NHS); Ohio Department of Natural Resources, Division of Natural Areas & Preserves (ODNR-DNAP); and USFWS, East Lansing, Michigan. Copies of these request letters are included in Appendix A. For clarification, in Michigan, "State Threatened" means there are ten or less of a population or individuals of a species in a given area; "State Endangered" means that three or less of a population or individuals of the species are found in a given area; and "Special Concern" means that the species is rare, or that there is inadequate information on the species and it may be on the verge of becoming threatened (Ms. Lori Sargent, Endangered Species Specialist, MDNR-NHS, personal communication). Similarly, and although specific definitions differ somewhat, Ohio also recognizes species that are "Endangered", "Threatened" and "Special Interest" (ODNR, 1997).

Information contained in responses received from these agencies (also included in Appendix A) are summarized in Table 2 as well as on Figure 14. Figure 14 graphically portrays approximate species locations, when such information was provided. As shown in both Table 2 and Figure 14, a number of Threatened, Endangered, and Special-Status species reportedly occur throughout the project area. Further, many of these species are emergent wetland plant species reportedly occurring on or immediately behind (west of) the Woodtick Peninsula proper (Figure 14) on properties owned by the State of Michigan, the Nature Conservancy, or private entities (Figure 14). One particularly notable floral occurrence is the State-Threatened American Lotus (*Nelumbo lutea*) which seasonally grows in dense stands just west of Woodtick and south of Consumers Power (Photograph 10). In addition to the bald eagle – a well-known, federal and state (Michigan) threatened species discussed in Section 3.7 – as well as several floral species listed, several fish (silver chub, mooneye, and silver lamprey)

and bird (king rail) species are also included in the list. Finally, the channel darter, which is a State-Threatened fish species in Ohio, reportedly inhabits the Toledo Shipping Channel, according to the DNR (Appendix A).

In summary, it is apparent that the diverse array of aquatic, wetland, and upland ecosystems occurring in the Bay Area, peripheral Mainland areas, and also perhaps on the Woodtick Peninsula itself serve as habitat for a variety of Threatened, Endangered, and Special-Status species. Consequently, if any or all of these habitats were to be adversely impacted, either directly or indirectly, so to would be the plant or animal species occurring in these habitats. The issue of protective setback or buffer zones between such sensitive habitats and CDF construction-related activities would be considered pursuant to relevant and appropriate agency requirements.

3.9 Private, Public, And Commercial Property Uses

There are a variety of privately, publicly, and commercially owned properties in the Michigan portion of the project area (Figure 15). A large percentage of the North Maumee Bay as well as the entire Woodtick Peninsula proper are part of the Erie State Game Area, which is owned by the State of Michigan (Figure 15). Another large portion of the North Maumee Bay area - approximately 2,200 acres - is owned by the Nature Conservancy, of which approximately 1,100 acres is leased to the Erie Shooting Club and approximately 1,000 acres is leased to private individuals for waterfowl hunting (Figure 15). The Bay Creek Hunting Club, which is located north of the Nature Conservancy property, owns and operates an additional approximately 200 acres (Figure 15). Finally, Consumers Power owns approximately 400 acres of commercial property located at the base (north end) of Woodtick (Figure 15).

The Ohio portion of the project area, which is not shown on Figure 15, comprises either publicly owned waters of Maumee Bay or privately owned properties along the Mainland, in the Point Place area north of Toledo, Ohio (Figure 4).

Current property uses: Many project-area property uses are dependent either directly or indirectly on Lake Erie and associated Bay Area waters. Additional, land-based agricultural and residential areas also occur in some Mainland areas (Figure 7). In Michigan, property uses reportedly range from privately owned residential and agricultural to publicly owned open-lake areas, as well as designated recreational and wetland-rich nature areas (Figure 7). Commercial property ownership in Michigan

primarily includes Consumers Power. Consumers Power depends greatly on Lake Erie, with a canal containing a cooling water intake pipe located just west of Woodtick Peninsula (Figure 2) and a spent cooling-water (thermal) discharge pipe into Lake Erie, which is located near the base of Woodtick Peninsula (Photograph 11). The Woodtick Peninsula protects the intake-pipe from sediment accumulation. However, due to periodic peninsula erosion into, and sediment accumulation within, the canal over time, periodic dredging of the canal is required to maintain its optimum depth of four to six feet (Mr. Schoenlein, personal communication). Further, Consumers Power's thermal discharge into Lake Erie (Campbell, 1988) during summer peak-flow conditions equals approximately 250,000 gallons per minute (Mr. Schoenlein, personal communication) and is known to have a measurable effect on lake water temperatures in the area (Herdendorf et. al., 1977). Consumers Power is required to monitor this discharge under a NPDES permit which tracks the quality of their discharge water into Lake Erie and water temperatures in the discharge area (Mr. Schoenlein, personal communication)

In the Ohio portion of the project area, the waters of Maumee Bay and Lake Erie are used for recreation, commercial fishing, and shipping commerce (USACE, 1993). The privately owned properties in this area are probably mainly residential in nature, although there may be croplands as well. As a result of Woodtick providing protected backwater areas, many marinas and boat launches are also located along the western edge of the Maumee Bay, and near the mouth of the Maumee and Ottawa Rivers (USACE, 1993).

Future property uses: It is anticipated that property use within the dominant, Michigan portion of the project area will not change significantly in light of current ownership. A dominant portion of the project area is owned by the Nature Conservancy (Figure 15), who apparently bought the property to restrict development in the area (Mr. Reau, personal communication). Another large tract of property designated as the Erie State Game Area and owned by the State of Michigan (Figure 15) will also likely not change ownership/use for similar reasons. Several Threatened, Endangered, and Special-Status species also occur in these areas which may also limit local development due to the various state and federal laws designated to protect such species and their habitat. And as discussed in the following sections, cultural and historic resources also occur in the area, which may further limit local development for similar reasons.

Property use in the Ohio portion of the project area is also not expected to change significantly from its current use also due to the nature of the property, in that a majority of the property is open waters of the Maumee Bay and Lake Erie. This portion of the project area is also the location for the Toledo Shipping Channel (Figure 1), which is necessary for ship navigation (Ohio EPA, 1990; USACE, 1993).

In summary, open waters dominate much of the project area, with much of the area, including related wetlands and uplands, managed by private and state entities for preservation and/or sustained recreational or commercial purposes. Little change is expected in local property ownership and use not only by virtue of the nature of property ownership (e.g. the Nature Conservancy and MDNR), but also in light of various laws and regulations protecting rare wildlife species and historical/cultural resources occurring in the area. Additionally, a coastal-zone management plan proposed by Monroe County planners and commissioners for the Woodtick Peninsula area (Monroe County Planning Department, 1986) includes a number of strategies designed for long-term preservation of the Woodtick area, including plans for restricting development through zoning ordinance regulations and preparing erosion-control measures for protecting culturally/historically important upland areas.

3.10 Cultural And Historic Resources

The project area encompasses a variety of upland, wetland, and aquatic habitats attractive to early natives for a number of reasons. This area was ideal because water, food, shelter, transportation, and other necessities were all present (Campbell, 1988).

Information-request letters were submitted to the State Historic Preservation (SHP) office in Michigan and to the SHP office in Ohio to determine the specific presence/location of any such cultural/historical resources. Copies of these request letters are included in Appendix A. Previously published articles, reports, etc., that pertained to the project area in this regard were also reviewed for such information.

The SHP office in Michigan responded that "no historic properties exist" within project-area boundaries (Appendix A); Ms. Martha Macfarlane, Environmental Review Coordinator, verbally re-confirmed the office's original findings. Furthermore, the SHP office in Ohio concluded that one

archaeological site, Site # 33-LU-453, was located in the project area. However, due to limited time and staff, the Ohio office could not provide any additional information regarding the nature and location of this site.

In contrast to information received from SHP offices, a review of previously published literature indicated a number of sites in the project area with recognized cultural and historical significance. Herdendorf and Hartley (1980) noted a total of seventeen known archaeological sites, primarily habitation sites, in the vicinity of the North Maumee Bay area. Indian and Gard Islands, which are located west of Woodtick (Figure 6), have evidence of encampment sites and Indian burial mounds (Campbell, 1988; Monroe County Planning Department, 1986); these islands also reportedly represent the first site of recorded Indian agriculture in the Great Lakes region (Campbell, 1988). The southernmost tip of the Woodtick Peninsula also contains encampment and burial sites (Campbell, 1988); Mr. Reau of the Erie Shooting Club retains a number of Indian artifacts found on the club and surrounding properties, and also noted the presence of Indian burial grounds on shooting-club property. Additionally, Turtle Island, which is located approximately one mile east of the southernmost tip of Woodtick along the Michigan/Ohio state line (Figure 1), is the site of a former lighthouse. The lighthouse was reportedly built in 1831 and decommissioned (abandoned) in 1904. Turtle Island is reportedly privately owned (Carter et. al., 1995).

In summary, despite the limited findings by relevant SHP offices, a number of cultural and historical sites appear to be located within the project area, based on an in-house review of other published literature. No such areas are reportedly located in shallow or deepwaters of Lake Erie, nor are any such areas, with exception to Turtle Island, reportedly found proximal to the proposed CDF location. As a note, Indian and Gard Islands have reportedly displayed some degree of hydrologic degradation over time, primarily as a result of high lake-water levels, but also due wave action as well (Mr. Reau, personal communication).

3.11 Socioeconomics

Industrial and recreational; water-dependent activities occurring in the project area directly or indirectly bring a significant amount of money into the local economy. Shipping and Port-related commerce in particular brings millions of dollars to the economy of Northwest Ohio and Southeast Michigan (USACE, 1993; Ohio Lake Erie Commission, 1998); Toledo-Lucas County Port Authority related activities contribute over 500 million dollars annually to the economy of Northwest Ohio and

Southeast Michigan, both direct and indirectly. Furthermore, in the five-county area around Toledo, approximately 5,000 jobs are created by Port-related activities, with a combined payroll of almost 110 million dollars and over 18 million dollars in taxes generated (HAI, 1995).

Most of the recreational activities in the area are dependent on having relatively calm, protected waters while the shipping industry relies on maintained channels to facilitate passage through the Maumee Bay and Maumee River areas (see Figure 1). Due to Western Lake Erie's relatively shallow depths and high input of sediment from the Maumee River, dredging of the local shipping channels remains necessary (USACE, 1993, 1962). In open waters, shallow water depths also make the lake dangerous to fishermen and pleasure boaters due to rough water, large waves, and seiches which occur on a seasonal basis. In the summertime, many boaters utilize areas adjacent to Woodtick, with shallow waters around and behind the peninsula busy with boats and other personal watercraft (Mr. Reau, personal communication). As mentioned previously, marinas and boat launches are located along the western edge of the Bay and near the mouth of the Maumee and Ottawa Rivers (USACE, 1993). Licenses, fees, and gas regularly sold to these local marina/boat users are just a small portion of what recreational boaters contribute to the local economy.

As discussed in previous sections, waterfowl hunting is also very popular in the project area, with two significant private clubs in close proximity in North Maumee Bay (see Figure 15). Mr. Reau indicated that many waterfowlers hunt off of Woodtick and in the open waters behind the Peninsula where many ducks raft when the lake becomes too rough. These hunters not only regularly spend money on yearly club memberships, but also on licenses, guns, shells, and equipment. The Federal and State waterfowl stamps that hunters are required to purchase also contribute money to the protection of wetlands of the project area, as well as wetland protection in other parts of the country. Nationwide, approximately 4.8 billion dollars were spent in 1996 on hunting licenses, stamps, tags, permits, land leasing and ownership, membership dues and contributions, and outdoor-sporting magazines (Field and Steam, 1998).

Consumers Power, located at the base of Woodtick, generates electricity for Monroe County, Michigan. The power plant also provides jobs to local residents, and the income and property taxes the plant provides to the local economy is likely substantial. As discussed in previous sections, the power company's cooling-water intake is located in a relatively shallow canal positioned just west of

the Peninsula proper. Operation of this canal depends on relatively calm waters in the immediate canal area, which minimizes sediment infilling of the canal and the need for periodic maintenance dredging.

In summary, the social and economic base of much of the project area is highly water dependent, either directly or indirectly, and has been for many years. In particular, many of the recreational and commercial activities occurring in the area depend on the calm waters created west of, and as a result of, Woodtick's presence. Furthermore, commercial-shipping activities in the area also depend on open channels – channels which periodically require dredging and subsequent management of the dredged material.

4.0 PRELIMINARY ASSESSMENT OF POTENTIAL ENVIRONMENTAL EFFECTS OF PROPOSED ACTIVITY

Anticipated beneficial as well as potentially adverse or unknown effects of the proposed activity (as generally described in Section 2.0) on existing faunal and floral communities, their habitats, and/or human utilization of the project area are discussed in this section, and are summarized in abbreviated form in Table 3. Also included in this section are possible mitigative responses which could address potential adverse effects.

As discussed in Section 2.0, the precise location, dimensions, and configuration of the off-shore CDF as well as materials from which it would be constructed are currently being considered, with each facet of CDF design depending on a variety of factors. A number of CDF design details would likely have a significant impact on the nature and degree to which hydrologic and sedimentological processes currently occurring within portions of the project area would be altered by the proposed activity, particularly in the Lake Erie and Peninsula portions of the project area (Figure 4). Paramount in this regard would be the CDF's proposed location in littoral waters off the Woodtick coast and the potential for inclusion of a CDF access dike emanating from near Consumers Power and stretching out into the littoral zone, trending east-west (Figure 2). Computer modeling will be conducted in order to predict the effects that different CDF designs, locations, and configurations would likely have on local hydrologic and sedimentological processes over time. Due to uncertainties in potential CDF-induced changes in these key processes, additional uncertainties would also exist as to potential effects of the proposed activity on other environmental components, including wetland and deepwater habitats in Lake Erie and Peninsula portions of the project area in particular (Figure 4). In contrast, it is anticipated that a lack of certainty with respect to CDF design details will have a minimal impact on predicting potential effects of the proposed activity on environmental components of the Bay Area and Mainland portions of the project area.

4.1 Hydrologic And Sedimentological Processes

4.1.1 Anticipated Beneficial Effects

Regardless of the CDF's exact location and configuration, a significant and permanent reduction in wave action - particularly waves originating from northeasterly/easterly winds - in the littoral zone west of (behind) the CDF would be expected. Reduced wave action should, in turn, result in shoreline protection through a reduction in bank washover and wave-related coastal erosion of the

Woodtick Peninsula. Additionally, reduced wave action in these shallow Lake Erie waters should also result in reduced restructuring of subaqueous/subaerial sand bars which is a process known to periodically occur off the Woodtick coast (Campbell, 1988). Relatively calmer waters behind the CDF may then promote the deposition of locally derived suspended fines and/or sands derived from littoral drift originating from northern coastal areas. Increased sediment deposition behind the CDF may then ultimately result in a net decrease in water depths in some areas, thus ultimately promoting changes in the type and quantity of floral and faunal habitats available. The potential for conversion of deepwater areas (>six feet deep) to shallow-water and/or wetland habitat in some areas of Lake Erie waters behind the CDF, however, is ultimately dependent upon establishment and maintenance of relatively lower lake-water levels over the long term as well as the presence of an available seed bank for wetland initiation; long-term changes in lake water levels in this non-diked portion of the coastline are uncontrollable.

Additionally, calmer waters off the Woodtick coast, coupled with possible deposition of imported and/or locally derived sediments along its lakeside edge, should promote the stability of upland and wetland habitats presently existing on the Peninsula proper (Figures 6 and 7). Calmer waters should also promote the partial or perhaps complete infilling of open-water, intra-island channels that are known to occur within the peninsula structure (Campbell, 1988). Again, the formation of a more contiguous and "complete" Woodtick Peninsula, in contrast to its existing piecemeal structure, would depend on establishment and maintenance of relatively lower lake-water levels over the long term. Spatial continuity of the peninsula would also depend on: (1) continued availability of sands from feeder beaches to the north, assuming that this - rather than locally derived fine-grained sediments - is the main source for accreted sediments and (2) continued flow of sediment-bearing littoral currents southward along the Woodtick coast. As discussed in Section 4.1.2, the effect of CDF placement on littoral-drift processes will be addressed by computer modeling of the preliminary design.

The formation of a more contiguous peninsula structure through reduced wave-induced erosion and perhaps increased net sediment deposition would also virtually eliminate wave propagation west of the Peninsula and into the North Maumee Bay area. The virtual elimination of wave propagation through the Peninsula proper and into North Maumee Bay should have direct and positive consequences for several project-area property owners. In particular, reduced wave-induced erosion of the approximately five miles of dikes which surround the Erie Shooting Club (Figure 15, Photograph 11) should mean reduced dike maintenance and upkeep costs. Additionally, formation of

a more contiguous peninsula should result in less lakeside, littoral-zone sediments being transported and deposited into Consumer Power's intake canal located directly behind the Peninsula. Lower rates of sediment deposition into this canal should translate into less dredging and lower canal-maintenance costs for Consumers Power and their customers.

The Mainland portion of the project area currently receives little to no direct, lake-borne wave-action impact in the current absence of an off-shore CDF. Therefore, little to no direct, beneficial (or adverse) effect on the Mainland is expected as a result of CDF-induced calmer waters, and perhaps increased sediment deposition within local Lake Erie waters and the Peninsula proper. Nevertheless, CDF placement should have a number of positive indirect effects on Mainland-based activities, as discussed in subsequent sections.

4.1.2 Potential Adverse or Unknown Effects and Migitative Responses

As described above, placement of the CDF east of Woodtick would significantly reduce wave action in the littoral zone immediately behind the CDF, thereby promoting the deposition of at least locally derived sediments in this area, and also perhaps sediments imported from the north as well. However, the CDF's specific short- and long-term effects on the flow of southbound littoral currents including CDF affects on the related processes of littoral-drift deposition and/or erosion are unknown until computer modeling is completed and the data are evaluated; the potential impact that variable lake water levels and other non-CDF factors may have on such effects is also unknown and will also be considered during modeling efforts.

Potential installation of the east-west trending dike in the littoral zone near Consumers Power (Figure 2) could significantly affect littoral-current flow and sediment input, as could the continued discharge of heated waters from Consumers Power into the lake in this area, as discussed in Section 3.9. One possible mitigative response to potential dike effects would be to remove the dike when the CDF is completed and/or to relocate such access ways to the southern end of the Peninsula, so as to not interfere with local littoral processes.

As stated previously, the effect of CDF placement on littoral currents and related erosional/depositional processes within the project area over time – including the potentially modifying influence of water level changes and other non-CDF related factors - will be modeled. Specifically, computer models will be developed to predict likely short- and long-term changes in

flow patterns and potential impacts on key littoral-zone processes as a function of specific CDF design, location, and configuration. These littoral-zone processes include: (1) the rate and extent of net sediment erosion versus net sediment deposition occurring behind the CDF; (2) the type of sediment deposited behind the CDF, assuming net accretion of littoral drift prevails; and (3) the degree of spatial and temporal variability in sediment erosion or accretion expected to occur behind the CDF. The potential impact of other, non-CDF related factors on these same littoral-zone processes - namely lake water levels, the availability of feeder sands to the north, the east-west dike at the base of Woodtick (if built), and Consumers Power discharge – will also be considered in model development. Furthermore, the prevailing short- and long-term impacts of CDF placement and non-CDF related factors on flow patterns and sediment erosion/accretion processes occurring on the CDF's *lakeward* side are also unknown and will therefore need to be investigated.

Computer modeling could also benefit from a detailed analysis of observed effects of similar structures on littoral-zone processes in other areas of the Western Basin. Site-specific, computer-modeling results may be considered when preparing the preliminary CDF design/configuration so that negative impacts on littoral drift as a result of shoreline protection would be minimized, if not enhanced.

In summary, the CDF structure - regardless of its precise configuration and off-shore location - should result in a significant and permanent reduction in wave action and bank washover along the Woodtick coast, thereby resulting in protection of this unique landform as well as protection and promotion of nearby habitats. Calmer waters occurring behind the CDF may also promote sediment deposition and potential habitat changes, particularly when sediment source(s) are available. Long-term lake water levels (i.e. spatial extent of inundation) within this non-diked portion of the lake will also have a dominant influence on habitat occurrence within the project area, regardless of CDF construction. Computer modeling will be conducted in order to determine what effect that particular configurations and/or locations for CDF placement would have on littoral-zone processes, which would dictate to a large degree ultimate sediment erosion or accretion within the Woodtick/CDF area. The potential modifying effects of other, non-CDF factors on littoral-zone processes - including but not limited to water level changes and feeder-sand availability - will also be considered during modeling efforts.

4.2 Uplands

4.2.1 Anticipated Beneficial Effects

As discussed in the previous section, upland habitats currently existing on the Woodtick Peninsula should be stabilized and those habitats occurring in the North Maumee Bay region (on diked areas and on Indian and Gard Islands) could be better protected as a result of CDF-induced calmer waters and resulting potential net sediment accretion along the Woodtick coast. The maintenance of existing upland habitat as a result of the presence of a CDF to buffer wave action and to provide the potential development of new upland habitat within portions of the CDF itself over time (Landin, 1996) would promote protection of upland flora and fauna that occur in the area, potentially including some of those species considered to be Threatened, Endangered, or Special-Status.

4.2.2 Potential Adverse or Unknown Effects and Migitative Response

As discussed in the previous section, the spatial occurrence and distribution of uplands on the Woodtick Peninsula and in the Bay Area and Mainland areas (Figure 4) – despite the CDF's mitigation of many shoreline erosion processes - would ultimately depend on long-term lake water levels. The potential for conversion of existing wetlands into uplands and also perhaps even the development of new, isolated upland/wetland complexes on sandbar structures behind the CDF will be evaluated by computer modeling.

Additionally, it is also worth noting the obvious in terms of habitat dynamics in general, and the potential changes that could occur in habitat quantity and distribution after CDF placement. A net increase in upland acreage (habitat) within the project area would, by definition, necessitate a corresponding net decrease in wetland, shallow-water, and/or deepwater habitat. Given even slight changes in lake-water levels and/or net sediment accretion, the low slopes that typify the Woodtick coast (Campbell, 1988; Meadows et. al., 1992) may promote such dynamic habitat shifts. In this regard, it is also worth considering that the CDF could theoretically be designed and located so as to deliberately *promote* the development of one particular habitat type (e.g. deepwaters) over another (e.g. wetlands) adjacent to the CDF. This being the case, it is expected that regulatory agencies governing the protection and use of upland, wetland, and deepwater habitats would have significant collective input into the CDF's final design, location, and configuration.

4.3 Wetlands

4.3.1 Anticipated Beneficial Effects

Placement of the CDF off the coast of Woodtick Peninsula should create calmer waters between the CDF and the Peninsula and should therefore offer shoreline protection from direct wave action and bank washover. This may promote some new wetland areas and/or shallow-water areas near the Peninsula, with development of submergent and/or emergent beds in these calmer waters, depending on the available seed bank and the deposition of sediments in this area. Assuming that a diverse seed bank of wetland species is readily available to the area, the likelihood of spatial variability in water depths behind the CDF should promote development of diverse suites of submergent, emergent, and floating herbaceous wetlands plant species. Again, creation of such wetland or shallow-water habitat in this area would be dependent on sedimentation behind the CDF, which is being modeled (Section 4.1), and on Lake Erie water levels, which will fluctuate uncontrolled in this area. Wetlands may also develop within the CDF itself depending on the available seed bank and on how the CDF is operated/managed; wetlands may develop in the CDF such as those currently found in the Grassy Island CDF, located in the Toledo Harbor (Herdendorf, 1987).

Enhancement or creation of new wetland areas on the Peninsula proper, as a result of calmer waters in the area, may also provide more habitat for floral and faunal species including some of the Threatened, Endangered, and Special-Status species listed in Table 2. Creation of wetlands in this area would also depend on sedimentation and long-term lake levels.

Within the Bay Area portion of the project area, the wetlands that occur in the diked areas would not be directly affected by the CDF, or by its potential impacts on hydrological/sedimentological processes. However, the dikes may be protected from the erosive waves previously penetrating the Peninsula. Non-diked wetlands in the open-water areas of North Maumee Bay would also benefit from any decreased wave action from Lake Erie as well, although the existence of these wetlands would ultimately depend on lake water levels (Herdendorf, 1992).

Wetland occurrence on the Mainland portion of the project area is somewhat limited (see Figure 6). Nevertheless, protection or promotion of wetland development in such areas is important due to the limited amount of wetlands that occur in the Western Basin. Theoretically, if an increase in lake-water levels occurs, some upland areas may be converted to wetlands, although such conversions would be constrained by upland land use (e.g. I-75) as well as zoning in the area.

4.3.2 Potential Adverse or Unknown Effects and Migitative Responses

The impact of non-harbor sediments on wetland ecosystems that may develop in the CDF, assuming that such sediments could potentially be discharged to the CDF from other portions of the project area, would be unknown. Additionally, any wetland habitat occurring or developing behind the CDF may be adversely impacted by chronic to periodic episodes of increased turbidity during CDF construction and operation phases. Increased turbidity could serve to reduce light penetration to submergent species, or smother emergents upon sediment deposition. Water quality within the wetlands could also be degraded during CDF construction and/or operation through: re-suspension of potentially contaminated colloidal particles; reduction in dissolved oxygen as well as increases in BOD and chemical oxygen demand (COD); and contamination by oil, grease, and dredged-sediment spillage during construction or sediment-offloading operations. The potential for short-term degradation of water quality during CDF construction is unavoidable, as is periodic spillage of oil, grease, and dredged sediments during operations. However, adverse impacts to water quality during CDF operations could be minimized by offloading sediments on the CDF's lakeward side, away from wetland areas (which would likely develop primarily on the landward side of CDF). Additionally, any degradation of water quality through turbidization or spillage would be rapidly dispersed and diluted to low levels in the lake. Potential impacts from CDF construction/operation activities could also be minimized by conducting such activities during less ecologically critical times of the year, e.g. during non-spawning seasons.

Pore waters draining from the CDF as a result of dewatering of discharged non-harbor sediments could be contaminated to some degree, depending on the nature and origin of the sediments. The impact of pore waters on water quality could be minimized by controlling/managing the quantity and quality of non-harbor sediments placed into the CDF. Furthermore, a NPDES permit could be required to monitor pore waters discharging from the CDF. Potential impacts of pore-water elutriation on adjacent wetland or deepwater habitats should be minimal and short-term as a result of dispersion/dilution affects.

If inappropriately designed and/or located, the CDF could promote sediment deposition well off the coast of Woodtick (i.e. on its lakeward side), potentially reducing deposition along and adjacent to the Peninsula proper. This could theoretically result in the Peninsula and near-shore areas not being restored/maintained, but instead result in some possible (and ineffective) infilling of open waters located well off-shore (resulting in no net development of shallow-water or wetland areas). If

computer modeling indicates that sediment deposition along the Woodtick coastline cannot be adequately addressed by proper CDF design and placement, one possible mitigative response for such a potential occurrence would be to monitor rates of sediment buildup in deeper off-shore, open-water areas and address such sediment buildup appropriately (assuming that development of shallow-water or wetland habitat may be favored over deepwater habitat).

Any potential adverse effects to wetlands in the Bay Area portion of the project area are unknown at this time. Again, the spatial extent and occurrence of these wetlands would be affected by long-term changes in lake water levels (particularly wetlands in non-diked areas), regardless of CDF construction. Additionally, regardless of CDF installation, development of wetlands along the Mainland as a result of long-term water level increases could necessarily result in loss of upland habitat.

4.4 Occurrence And Quality Of Deepwater Areas

4.4.1 Anticipated Beneficial Effects

As addressed in earlier sections, the CDF could potentially be made available to retain sediments dredged from non-harbor portions of the project area – an activity that could ultimately serve to enhance project-area ecosystems, including deepwater habitats. Additionally, as discussed in Section 4.11, highly significant *socioeconomic* benefits would also be realized through CDF construction and operation in that it would allow for continued maintenance of the Toledo Harbor Channel, and Port activities and commerce occurring in deepwater areas in general.

4.4.2 Potential Adverse or Unknown Effects and Migitative Response

A permanent loss of approximately 600 acres of deepwater habitat would occur within the CDF footprint zone. One likely mitigative response for this would simply be the natural relocation of fish and benthic species to other nearby, and similar habitats. Additionally, the spatial extent and occurrence of deepwater areas behind and adjacent to the CDF is ultimately a function of long-term trends in lake water levels as well as the extent to which sedimentation occurs behind/adjacent to the CDF. A mitigative response would not exist for this, other than controlling water levels through diking, or dredging, if significant infilling were to occur.

There may also be periodic and short-term degradation of water quality adjacent to the CDF, on lakeward and also perhaps coastal sides, during its construction and operation. Mitigative responses for such potential impacts to water quality are discussed in Section 4.3.2. Finally, the effect of thermal discharges from Consumers Power into Lake Erie (Section 3.6) on deepwater habitat in this area could be modified, if this factor is not adequately considered during CDF design development.

4.5 Benthos

4.5.1 Anticipated Beneficial Effects

Within the Lake Erie portion of the project area, habitat attractive to various benthic organisms may develop behind the CDF, in wetlands and shallow-water areas that may develop in this area; wetlands typically have high primary productivity which translates into a rich food source for benthic organisms (Jude and Pappas, 1992). Significant benthic habitat may also develop within portions of the CDF itself, depending on how the CDF is managed over the long term.

On and within the Woodtick Peninsula proper, development of wetlands or shallow-water habitats for colonization by selected benthic organisms may also occur, assuming appropriate hydrologic and sedimentological conditions prevail (see Section 4.1). Finally, CDF containment of sediments dredged from non-harbor portions of the project area, if feasible, would generally promote the presence of cleaner bottom surfaces across the project area and therefore an overall improvement to benthic habitats.

4.5.2 Potential Adverse or Unknown Effects and Migitative Response

A permanent loss of approximately 600 acres of benthic habitat would occur in the CDF footprint within the Lake Erie portion of the project area. One likely possible mitigative response for this habitat loss would be the natural recolonization of nearby deepwater areas by displaced benthic organisms or their offspring. As a note, no Threatened, Endangered, or Special-Status benthic species reportedly occur in this portion of the project area (see Table 2).

Also, short-term disturbance of benthic habitats adjacent to the CDF would likely occur through increased turbidity (as discussed previously), which could bury less-mobile benthic species and/or disrupt benthic filter-feeding activities. This short-term degradation of water quality may also adversely impact benthic communities in other ways, e.g. changes in dissolved oxygen levels. As mentioned previously, the mitigative response for this occurrence would be the natural recolonization

of nearby, deepwater and wetlands habitat. Additionally, periodic and short-term degradation of water quality by increased turbidity and perhaps other contaminants should have minimal impacts on benthic communities due to dispersion/dilution effects.

A probable, long-term physical instability of the quality and/or extent of benthic habitats may occur in the CDF itself during its operation, assuming that such populations eventually inhabit the CDF. One possible mitigative response for this would be to manage the contained sediments such that disturbances to wetlands and deepwater habitats are minimized, as much as is practicable.

The impact of sediments potentially dredged from non-harbor portions of the project area and discharged into the CDF on benthic organisms contained therein is unknown at this time. One possible mitigative response for this would be to monitor/control the quality of sediments discharged into the CDF and to conduct operations such that such sediments are contained at greater depths within the CDF, away from the surface areas most likely to be inhabited by benthic organisms.

As discussed previously, it is uncertain as to the type, extent, and quality of wetlands and/or shallow-water habitats that would develop behind the CDF, including what types and quantities of sediments would be deposited. All of these factors would collectively control habitat for benthic communities in this area (Beyer and Stafford, 1991). The CDF design would provide for net sediment deposition in the area.

As described in Section 3.9, thermal discharges from Consumers Power into Lake Erie waters near the base of Woodtick (Campbell, 1988) have resulted in noticeable and at least seasonal increases in lake-water temperatures in this area (Herdendorf et. al., 1977). The impact that CDF placement near such a discharge point could potentially have on lake-water temperatures, and temperature fluctuations, is uncertain, as discussed in Section 4.4.2. Consequently, impacts to benthic habitat and communities in this immediate area would also be unknown. The CDF design and placement would be proposed to minimize any such changes.

Finally, development of habitat for benthic colonization in the Peninsula proper would be at the expense of existing wetland or upland habitats. A possible mitigative response does not exist for this (short of dike construction), although it is expected that, as for other areas, mobile faunal inhabitants of converted wetlands or uplands and/or their offspring could readily relocate to, and colonize, adjacent existing or developing wetland or deepwater areas.

4.6 Fish And Fisheries

4.6.1 Anticipated Beneficial Effects

CDF construction near the Woodtick coast would result in the creation of new and unique fish habitat for spawning and refuge within and adjacent to rip-rap and/or rock-armored portions of the CDF structure. Construction of fish-spawning shelves located along inland and lakeward borders of the structure would also create additional fish habitat, as discussed in the Ecosystem Enhancement Plan (submitted under separate cover).

Creation of wetland and related shallow-water habitat behind the CDF would also offer additional and significant areas for spawning, refuge, and feeding areas for fish. As discussed previously, decreased wave action in this area should promote aquatic plant growth, which creates habitat attractive to fish as well as benthic species. Furthermore, replacement of deepwater areas with wetland and shallow-water areas should be beneficial to many fish species in terms of providing more areas for spawning, rearing young, and feeding (Herdendorf, 1987; Jude and Pappas, 1992); this is particularly the case in light of the relative paucity of wetland acreage currently in the Western Basin (Figure 6).

Potential development of wetland and shallow-water habitat on the Peninsula proper through conversion of deepwater habitat could also serve as spawning, feeding, nesting, and/or refuge areas for a variety of fish species (Jude and Pappas, 1992). Again, this would depend on prevailing hydrological and sedimentological processes that are to be modeled.

Within the Bay Area portion of the project area, many fish utilize the shallow-water areas and wetlands for spawning, rearing young, and feeding (Herdendorf, 1987; USACE, 1993). Such areas are crucial to any body of water that supports a good fishery, such as the Western Basin of Lake Erie. Protecting these areas would help improve and maintain fish stocks, which, as discussed in Section 4.11, are an important socioeconomic component of this region.

4.6.2 Potential Adverse or Unknown Effects and Migitative Response

In the Lake Erie portion of the project area, one likely short-term effect of CDF construction and operation would be localized chronic to periodic disruption of fish communities, through disruption of wetlands and deepwater habitat, as discussed previously. However, the long-term effect of this should be minimal due to dilution effects, along with natural relocation of mobile fish communities to non-impacted areas. As a note, no Threatened, Endangered, or Special-Status fish species reportedly occur in this portion of the project area (see Table 2).

As for *benthic* fish communities (e.g. darters, and sculpin), the effect of CDF-related disturbances are uncertain. Also uncertain is the effect of potentially significant temperature changes within shallow waters behind the CDF, as a result of the possible redirection of thermal discharges from the nearby Consumers Power outfall, as discussed previously. Such resulting temperature changes could be detrimental to fish that are sensitive to radical temperature changes, such as the gizzard shad *(Dorosoma cepedianum)* and certain minnow species *(e.g. Cyprinidae sp.)*. As discussed previously, one possible mitigative response to this would be to design the CDF so as to minimize temperature increases in the shallow waters around Woodtick, at least during critical periods of the year.

Another potential adverse effect of CDF construction would be the permanent removal of approximately 600 acres of deepwater fish habitat adjacent to the CDF that may currently be used by various fish species for spawning and feeding, as well as the potential loss of an unknown portion of deepwater habitat behind the CDF through its potential conversion to wetland or shallow-water habitat. As with benthic species and their offspring, fish communities can also relocate to abundant nearby deepwater areas, which should mitigate this effect. Furthermore, the rock armor on the CDF perimeter, as described in the Ecosystem Enhancement Plan, would also provide substrate for fish communities that generally is not available in Western Basin waters (USACE, 1974). The potential creation of additional wetland and related shallow-water habitat in this area should also offer an increase in valuable spawning, refuge, and feeding areas for fish communities (Herdendorf, 1987; Jude and Pappas, 1992).

The potential for periodic degradation of water quality adjacent to the CDF through sediment dewatering and elutriation could adversely impact nearby fish communities, either directly or indirectly, through impacting benthic communities and food-chain dynamics in general. One possible mitigative response for this, as discussed previously, could be controlling and managing the

quality of sediments placed into the CDF, in coordination with elutrient monitoring. Additionally, dispersion and dilution should also limit the potential impact of such a process on adjacent fish communities.

On the Peninsula proper, as described previously, development of wetland and shallow-water habitats for fish usage would necessarily be at the expense of existing deepwater habitat, which occurs in channels between upland islands. Such a conversion would result in habitat reduction for some fish species that rely on deepwater areas for their habitat, e.g. *Salmonid* and *Osmerid* species. A mitigative response for this does not exist, although it is expected that fish species that had inhabited converted deepwater areas could readily relocate to, and colonize, adjacent deepwater areas located either to the west or east of Woodtick Peninsula.

Any potential effects on fish habitat and/or communities within the Bay Area portion of the project area would likely be insignificant in light of its relatively great distance from the proposed CDF, coupled with the dominant control that Bay Area tributaries have on bay water quality and dynamics (e.g. Herdendorf et. al., 1977).

4.7 Wildlife

4.7.1 Anticipated Beneficial Effects

In the Lake Erie portion of the project area, development of wetlands within the CDF itself, if managed accordingly, could serve as habitat for various wildlife, including waterfowl and fur bearers. Exposed rock armor on the sides of the CDF structure may also serve as resting, nesting, and feeding areas for some species of birds, as described in the Ecosystem Enhancement Plan. The eventual development of wetlands behind the CDF, as discussed in previous sections, would also serve as habitat for waterfowl and fur bearers. At the very least, calmer surface waters areas behind the CDF would provide for shelter/resting areas for resident and migratory waterfowl, and newly developed wetland areas behind the CDF would provide waterfowl with nesting, feeding, and refuge areas.

On the Peninsula proper, development of wetlands and/or upland habitats - assuming appropriate hydrologic and sedimentological conditions prevail - could further serve as feeding, nesting, and/or refuge areas for a variety of resident and migratory waterfowl and other wildlife.

4.7.2 Potential Adverse or Unknown Effects and Migitative Response

In the Lake Erie portion of the project area, it is uncertain as to the potential impact that variable sediment quality in the CDF may have on the health of local wildlife, either directly or through impacts to food-chain dynamics. One potential mitigative response would be to monitor and control the quality of sediments discharged into the CDF, and conduct dredging/discharging operations such that non-harbor sediments, if placed into the CDF, experience the least amount of exposure within the upper portions of contained sediments. And as described previously, development of wetland and/or upland habitats on the Peninsula proper for year-round or seasonal wildlife usage would necessarily occur at the expense of deepwater and/or existing wetland habitats. A mitigative response for this does not exist, although it is expected that fish and some benthic species could relocate to, and colonize, adjacent existing deepwater or wetland areas.

4.8 Threatened, Endangered, And Special-Status Species

4.8.1 Anticipated Beneficial Effects

As discussed in Section 3.8, no Threatened, Endangered, or Special-Status faunal or floral species reportedly occur within the Lake Erie portion of the project area. However, a number of such species reportedly occur in the project area, mainly in the Bay Area region, immediately west of Woodtick Peninsula, and perhaps on the Peninsula itself. Such sensitive species reportedly include the bald eagle, various emergent wetland plants, and several fish species (Figure 14).

Installation of the CDF near Woodtick would substantially reduce bank washover and direct wave impacts to the Peninsula's eastern coast, thus helping to keep the peninsula intact, thereby protecting existing diked and non-diked wetlands in North Maumee Bay (Section 4.3.1). Protection of these wetland and shallow-water areas would, in turn, help protect the Threatened, Endangered, and Special-Status species that inhabit them. Protection of such "support" habitats for the lower-food-chain species that inhabit them (e.g. fish and benthic organisms) would also directly promote the protection and well-being of the more mobile and upland-based, higher-food-chain species such as the Federal and State (Michigan) Threatened bald eagle, two of which reportedly occur within the North Maumee Bay (Section 3.7).

As discussed in Section 4.3.1, CDF construction should not only help promote protection of existing habitat for Threatened, Endangered, and Special-Status species (and other important wildlife), but may also result in the development of additional such habitat, specifically new wetland and shallow-

water areas behind the CDF (depending on seed-bank availability, lake-water levels, and prevailing post-construction hydrologic and sedimentologic conditions) as well as wetlands in the CDF structure itself (depending on how the CDF is operated and managed).

4.8.2 Potential Adverse or Unknown Effects and Mitigative Response

No Threatened, Endangered, or Special-Status species reportedly occur in the Lake Erie portion of the project area, therefore, the potential for potential adverse effects would not be applicable in this area.

In regards to potential adverse or unknown effects to such species in other portions of the project area, the Bay Area and Peninsula proper in particular: impacts to wetland, shallow-water, and/or upland habitats, as discussed in detail in Sections 4.2.2 and 4.3.2, would likely also impact Special-Status species and other wildlife that occur in these habitats. Uncertainties exist as to the type and specific locations of new habitat development as well as conversion of existing habitats (e.g. wetlands to uplands) due to uncertainties in sedimentologic/hydrologic conditions prevailing adjacent to and near the CDF structure. Nevertheless, despite such questions, many of which should be addressed through computer modeling efforts, wetland habitats occurring in diked areas of North Maumee Bay – as well as the sensitive species that inhabit them – should be much less prone to adverse impacts than would non-diked wetlands. Finally, wetlands developing adjacent or near to the CDF – and any special species inhabiting them – could be temporarily impacted by periodic water-quality degradation (increased turbidity and perhaps also pore-water elutriation) during CDF construction and operation. As well, any such species could also theoretically be impacted by inhabiting wetland areas developing in non-harbor sediments potentially contained in the CDF itself. Potential mitigative responses to address each of these potential concerns and/or unknowns are outlined in Sections 4.2.2 and 4.3.2.

4.9 Private, Public, And Commercial Property Uses

4.9.1 Anticipated Beneficial Effects

As described in previous sections, CDF installation near Woodtick Peninsula would help to protect the Peninsula and diked areas in North Maumee Bay from erosion, thereby helping to maintain existing wetland and related habitats which are both ecologically as well as economically valuable

for the project area and local economies. Furthermore, the proposed activity should promote development of new and valuable wetland and shallow-water habitats adjacent to and in the CDF, which would add to the existing habitat base.

Construction and operation of the CDF in this area would also allow for the Toledo Port Authority's continued and long-term use of the Toledo Harbor Channel for shipping and commerce by providing a nearby and large-volume repository for containment of dredged harbor sediments. Permanent removal of such sediments from local ecosystems should serve to increase the quality of Bay Area waters as well as related aquatic habitats.

Finally, promoting long-term stability of the Peninsula proper through CDF construction - assuming that the appropriate hydrologic/sedimentological conditions prevail - should also minimize sedimentation into, and ultimately protect, the Consumers Power water-intake channel; this should lessen the company's need for periodic channel dredging and spoil management.

In summary, as a result of CDF construction, no degradation or significant modifications would be expected to occur to project-area properties in terms of the occurrence and/or quality of existing deepwater, wetland, and upland areas – habitats on which so many of the existing private, public, and commercial property uses directly or indirectly depend. On the contrary, as described above, the CDF should serve to enhance and sustain, over the long term, commerce-related activities (shipping and power generation) as well as consumptive and non-consumptive recreational activities (fishing, hunting, bird watching, etc.) that already occur in the area.

4.9.2 Potential Adverse or Unknown Effects and Mitigative Response

Theoretically, if the occurrence, quality, or overall character of existing project-area properties (i.e. habitats) were to be significantly and adversely impacted by CDF construction off the Woodtick coast, then private, public, and commercial property uses of these areas would also likely be negatively impacted.

Short of drastic, CDF-independent changes in lake-water levels, which could, for example significantly effect farming operations or interstate travel on the Mainland, significant and/or long-term adverse impacts of the proposed activity on project-area ecology are not expected.

Consequently, substantial changes to existing and future property uses for private, public, and/or commercial purposes are not expected. Relatively minor, and short term, adverse effects may occur, however.

In terms of recreational use of the project area, the CDF structure would not necessarily "blend in", aesthetically speaking, with its natural surroundings. One possible mitigative response for this would be to design the configuration and appearance of the CDF so that a more aesthetic blend with the natural environment is achieved; this is discussed in the Ecosystem Enhancement Plan.

Additionally, open waters on either side of the Peninsula, as well as between peninsula islands, are frequented during the summer months by recreational boaters, personal watercraft, and fisherman (Mr. Ken Reau, personal communication). CDF construction, in combination with development of shallower waters behind the structure and infilling between peninsula islands, would change navigational pathways for recreational boaters in the area, as well as perhaps the extent and public use of lake-front beaches. Such uses could be enhanced by the concurrent construction of several deepwater conduits through and around the CDF structure (e.g. USACE, 1974). Placement of rock-armor protective facing on the CDF's lakeward side (see Ecosystem Enhancement Plan) creates a potentially dangerous situation for recreational boaters (USACE, 1974); one possible mitigative response for this would be the incorporation of warning buoys/areas into the CDF design.

4.10 Cultural And Historic Resources

4.10.1 Anticipated Beneficial Effects

As discussed in Section 3.10, cultural or historically significant resources (sites) reportedly do not occur within the Lake Erie portion of the project area. Furthermore, information obtained from respective Michigan and Ohio State Historic-Preservation offices also indicated an absence of cultural and/or historically significant sites in other geographic/ecological regions of the project area as well, with the exception of a single, recorded archeological site in Ohio. However, an in-house review of previously published and relevant documents indicated the presence of Turtle Island in Lake Erie waters as well as a number of land-based sites within the project area with recognized cultural/historical significance. These sites, most of which occur on Indian and Gard Islands and on the Woodtick Peninsula itself (with the exception of Turtle Island) include Indian campsites, burial grounds, and early agricultural areas.

In much the same way that physical protection of wetland habitat, for example, serves to preserve sensitive species populating such ecosystems, so too would protection of upland areas from coastline erosion serve to help protect cultural/historical resources which occur on Woodtick Peninsula and on Indian and Gard Islands; CDF placement should have neither adverse nor beneficial affects on Turtle Island, given the island's lakeward position relative to the proposed CDF (Figure 2). The protective effects of CDF placement on cultural/historical resources on Woodtick proper would probably be more apparent than on those occurring on the islands, in light of the islands' more interior locations in North Maumee Bay. As described previously, CDF installation would substantially reduce bank washover and direct wave impacts to Woodtick, thus helping to keep these upland areas of Woodtick and the cultural/historic sites on them intact. Helping to keep Woodtick intact would result in eliminating the potential for wave propagation into the North Maumee Bay area, thus helping to protect the island coastlines. As discussed in previous sections, protection of these peninsula- and island-based resources would be dictated, to a large degree, by long-term lake water levels, and the extent of upland flooding that occurs as a result of such changes.

4.10.2 Potential Adverse or Unknown Effects and Mitigative Response

In that no cultural/historic resources appear to occur in the Lake Erie portion of the project area – where the CDF would actually be placed, thus burying a given site - no potential adverse effects to the known, upland-based resources would be expected. On the contrary, the potential for adverse effects to these resources through erosional losses of host upland areas – particularly on Woodtick proper – would be increased were the CDF *not* to be placed in this proposed location.

4.11 Socioeconomics

4.11.1 Anticipated Beneficial Effects

As described in Section 3.11, many of the major commercial, industrial, and recreational activities occurring in the project area, except for farming operations on the Mainland, are water-dependent activities, either directly or indirectly. Installation of the proposed CDF would greatly facilitate continuing this range of activities within the project area, all of which are critical to the socioeconomic well-being of the region. That is, the proposed activity would facilitate the following: (1) continued and perhaps even enhanced consumptive and non-consumptive recreational use of local natural resources through helping to protect local shorelines and nearby diked areas, thus assisting in preservation of important wetland habitat and wildlife proliferation; (2) continued economical use of the Consumers Power water intake channel adjacent to (behind) Woodtick through minimizing

sediment accumulation therein and the need for maintenance dredging and spoil disposal; (3) continued shipping and commerce activities through the Port of Toledo through offering a nearby location for long-term disposal and management of sediments dredged from the Toledo Harbor Channel; and (4) ultimate acceleration of Bay Area restoration and permanent ecological/economic enhancement through potentially offering a repository for non-harbor sediments. Finally, the CDF construction project would, itself, also bring in additional revenue to this region over a certain period of time through creating jobs, the need for construction materials, other support activities. etc.

4.11.2 Potential Adverse or Unknown Effects and Mitigative Response

No adverse effects to project-area socioeconomics would be expected were the CDF to be built and operated east of Woodtick. On the contrary, potentially significant and long-term adverse effects would likely occur for many different project-area factions if the CDF were *not* constructed as proposed. The absence of adequate off-shore protection in the form of a CDF would: (1) permit wave action to threaten Woodtick and nearby coastlines and dikes and therefore related wildlife habitat which support local consumptive/non-consumptive resource use; (2) eliminate the potential for forming new and valuable wetland/shallow-water habitat; (3) increase the potential for more costly channel-maintenance dredging on the part of Consumers Power (were Woodtick to further degrade); and, perhaps of most direct socioeconomic consequence (4) fail to provide a solution for long-term management of channel maintenance dredge spoils, possibly limiting long-term use of the Toledo Harbor Channel for shipping and commerce, which could have a serious impact on the regional economy.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Results of this Preliminary Environmental Assessment indicate that a variety of deepwater, upland, wetland, and related shallow-water habitats currently exist across the four geographic/ecological portions (Lake Erie waters, Woodtick Peninsula proper, the Bay Area, and the Mainland) delineated within the 15-square-mile project area. In terms of acreage, the area is dominated by deepwater habitat, which occurs almost exclusively in Lake Erie and Bay Area portions of the project area, including in the proposed location for the CDF, which would be placed approximately one-half mile east of the Woodtick Peninsula in Lake Erie Waters; additional deepwater habitat also likely occurs in some inter-island, channeled areas occurring within the defined boundary of the Peninsula proper. Much smaller portions of the project area are currently comprised of uplands and wetlands, as well as shallow-water habitats. Project-area uplands occur mostly within the Mainland area, but also in the Bay Area as manmade dikes and naturally occurring islands (most of which occur in North Maumee Bay); some upland acreage also occurs on the Peninsula proper. Wetlands are confined to diked and non-diked regions of North Maumee Bay, portions of the Peninsula proper, and along Mainland periperhies.

Despite the spatial inequity of non-deepwater habitat across the project area relative to deepwater habitat, Mainland and Bay Area-based uplands, wetlands, and shallow-water habitats are of great importance to the area, both ecologically and economically. Upland, wetland, and shallow-water habitats host an important and diverse array of wildlife, aquatic (fish and benthos), and human communities. These communities include, but are not limited to: various fish species that use the sheltered (diked and non-diked) wetlands and shallow waters of the Bay Area for spawning and feeding (e.g. bowfin, crappie, perch, shad); migratory and resident waterfowl that use diked and non-diked wetlands for feeding, resting, and breeding (e.g. duck, geese, heron); and a significant human population that depends, either directly or indirectly, on these wildlife and fish species, and their habitats, for consumptive/non-consumptive recreational uses (e.g. waterfowl hunters, owners/operators of local hunting clubs, and bird/nature enthusiasts). Project-area uplands, wetlands, and shallow waters also reportedly serve as habitat for a number of recognized Threatened, Endangered, or Special-Status faunal and floral species including bald eagles, king rail, and American Lotus. Additionally, a number of recognized historical/cultural resources, including

Indian burial grounds, camp, and agricultural sites, also reportedly occur on Bay Area islands and on Woodtick Peninsula; no such historical/cultural sites or environmentally sensitive species reportedly occur in the Lake Erie portion of the project area, where the proposed CDF would be constructed.

In addition to recreational uses of project-area wetlands and shallow waters, important commercial and private uses of upland habitat in the project area currently include farming operations in Mainland areas and power generation at the Consumers Power plant, which is located at the base of Woodtick. Consumers Power also operates a water intake canal located immediately west of the Peninsula. The peninsula appears to protect the canal from accelerated sediment infilling, although maintenance dredging of the canal is still required on a periodic basis. Because much of the project-area property is reportedly owned by either the Nature Conservancy or the State of Michigan – entities typically focused on property and habitat conservation rather than development - it is anticipated that current property uses will not change significantly in the future.

The significance of project-area uplands and wetlands as habitat for sensitive species and other important flora and fauna should not in any way, however, diminish the importance of local deepwater habitats and related fish/benthic communities to area boaters and sports fishermen. Not only do deepwaters of the Bay Area and Lake Erie portions of the project area serve as habitat or spawning areas for numerous fish species important to the Western Basin (e.g. perch, walleye, shiners, and catfish), but the Toledo Harbor Channel itself – which defines the southern terminus of the project area - also reportedly serves as habitat for the Channel Darter, a State Threatened fish species.

Conversion of wetlands to farmable acreage during historic times has significantly reduced the extent of this ecologically and economically important habitat in Lake Erie's Western Basin. The coastal or coast-related wetlands remaining – including acreage occurring in the project area – have themselves undergone considerable changes as well as some apparent net loss (i.e. conversion to deepwater habitat) over the last decades as a result of inundation and erosional losses by shoreline currents, wave impact, and/or bank washover, all of which may be accentuated by higher lake-water levels. In addition to offering important upland and wetland habitat of its own, the Woodtick Peninsula has historically offered significant physical protection to these remaining Bay Area wetland and shallow-water habitats through acting as a barrier to, but recipient of, lake-related erosional forces; continued degradation of the Peninsula, particularly during high water levels, ultimately threatens not only

Woodtick itself, but also important Bay Area habitats. The degradation of Woodtick through such natural erosional mechanisms is further accentuated through regional coastline-management practices. That is, the construction of dikes and revetments "upstream" of the peninsula shoreline is apparently serving to reduce the availability of "feeder" sands which are needed to replenish erosional losses from the Peninsula.

Results of a preliminary assessment of anticipated beneficial effects of CDF construction and operation indicate that the proposed activity should provide substantial protection to upland, wetland, and shallow-water habitats currently existing on Woodtick Peninsula proper. Increased shoreline protection of this natural landform should occur through significant and permanent reduction in direct wave impacts and bank washover along Woodtick's eastern shore. As a direct result of helping to preserve the Peninsula and its habitats, wave propagation into the Bay Area (particularly North Maumee Bay) would be eliminated, thus helping to protect non-diked wetlands in the bay and along the Mainland periphery, as well upland dike structures surrounding significant Bay Area wetland resources. One significant factor dictating preservation of existing (non-diked) habitats across much of the project area is long-term lake levels and uncontrollable changes therein. Nevertheless, wildlife and aquatic communities populating and depending on existing project-area habitats, including a number of sensitive species, would greatly benefit from habitat preservation through CDF installation. Furthermore, a number of recognized historical/cultural sites also occur on Peninsula uplands as well as islands in the southern portion of the Bay Area, all of which would also be directly or indirectly protected from erosion through CDF installation.

Various human communities – including private, public, and commercial interests – also depend on existing wetland, upland, and deepwater habitats and their wildlife and aquatic occupants for consumptive/non-consumptive recreational uses (e.g. Bay Area hunting clubs and recreational boaters) and also for power generation. All of these entities would directly benefit from CDF installation. Furthermore, the Toledo Port Authority and regional shipping interests in general would greatly benefit from CDF installation near Woodtick, as this would offer a nearby location for long-term discharge of sediments dredged from the Toledo Harbor Channel, which is necessary to keep the Port viable and operating. As a potential nearby repository for dredged non-harbor sediments, this CDF could also theoretically provide for accelerated restoration and enhancement of Maumee Bay ecosystems.

In addition to protecting and preserving existing upland and deepwater habitats, CDF installation near Woodtick may also promote development of new and valuable wetland, shallow-water, and/or upland habitats in the area. New wetland and perhaps also upland habitats should develop within the CDF structure itself, as well as new and unique fish habitat at CDF peripheries. New wetland, shallow-water, and/or upland habitats should also develop in the area between the CDF and Woodtick as well as within boundaries of the Peninsula proper. Habitat creation outside of the CDF structure should occur as a result of CDF-induced calmer waters, which should promote a greater degree of sedimentation. As with preservation of existing habitats, formation of new, stable habitats would be dependent on long-term lake levels. Formation of new wetlands and shallow-water habitat behind Woodtick would also be contingent on prevailing littoral currents moving along Woodtick's eastern coast and how CDF placement affects sedimentation processes related to these currents. Sediment deposition behind the CDF, which would promote wetland and shallow-water habitat development, is also likely dependent on a ready source for current-transported sands to the north of Woodtick. Post-CDF hydrologic and sedimentological conditions that could be expected to prevail along the eastern coast of Woodtick will be modeled as a function of different CDF locations and configurations.

In addition to the numerous ecological and socioeconomic benefits outlined above, CDF construction and operation may also have several unknown or adverse effects to the project area. As discussed previously, the type and extent of new habitat development would be dependent on long-term lake levels as well as prevailing hydrologic/sedimentologic conditions along the Woodtick shoreline, which will be modeled. Also uncertain is the potential effect that placement of the CDF near Consumers Power's thermal discharge into Lake Erie may have on local water temperatures, and the potential impact that such changes may have on benthic and deepwater habitats and communities; this is also being considered as part of hydrologic/sedimentologic modeling efforts, and modeling results will likely be used to optimize placement/configuration of the CDF.

Potential adverse effects of CDF construction and operation on project-area habitats and communities would likely, or may, include one or more of the following items, which are presented in no particular order: (1) permanent loss of benthic and deepwater habitat within the CDF footprint; (2) periodic episodes of water-quality degradation adjacent to the CDF during its construction and operation; (3) potential ecosystem (food chain) impacts of dredged, non-harbor sediments potentially placed into the CDF to habitats and communities developing therein, as well as potential physical

instabilities in these CDF-bound communities due to CDF operations; and (4) the necessary loss of certain habitat acreage as a result of developing new and different habitat in its place. With exception to the habitat-conversion issue (item 4), each of these potential adverse impacts could be eliminated, or greatly minimized, as follows: (1) abundant (and similar) deepwater and benthic habitat presently occurs immediately adjacent to the CDF footprint which could be naturally utilized by displaced fish species and most benthic organisms and there offspring; (2) periodic episodes of water-quality degradation would be short term, given dispersion/dilution effects. Construction and operation activities could also be timed such that potential impacts to nearby wetland, shallow-water, and/or deepwater habitats are minimized; and (3) degradation of CDF-bound wetland and related habitats, and resultant potential impacts to food chain dynamics, could be minimized through appropriate sediment management in the CDF and perhaps physical segregation (isolation) of non-harbor sediments in the CDF.

In summary, results of this Preliminary Environmental Assessment indicate that anticipated benefits to project-area ecology and socioeconomics as a result of proposed CDF installation and operation near Woodtick collectively outweigh any potential adverse effects resulting from the proposed activity.

5.2 Recommendations

Potential development of new upland, wetland, and/or related shallow-water habitat adjacent to (behind) the proposed CDF and east of the Woodtick Peninsula would be dependent on hydrologic and sedimentologic conditions prevailing in this particular portion of the project area, as a result of CDF installation. Hydrologic/sedimentologic modeling efforts will be conducted which should, within limits, generally predict such prevailing conditions. It is recommended that uncertainties in anticipating habitat conversions and development as discussed herein, which are related to uncertainties in post-CDF hydrologic/sedimentological conditions, be revisited once modeling efforts have been completed and critically evaluated. A more in-depth review of feeder-sand availability north of Woodtick would also be useful, in that Peninsula preservation appears to be linked to this factor. Long-term lake levels would likely have a significant role in controlling prevailing hydrologic and sedimentologic conditions and therefore on habitat development and conversions within the project area; modeling efforts will be conducted such that potential influences of different lake levels on prevailing conditions are evaluated.

It is also recommended that dialogue be initiated between the regulatory agencies involved regarding the potential for habitat conversions as a result of CDF installation. That is, all parties should collectively understand and directly address the fact that a gain in acreage of one habitat type would necessarily require an equivalent loss in another habitat type, e.g. potential deepwater conversion to coastal wetlands. Such agencies and other interested parties should also, however, be made aware that the CDF could be designed and located in such a way so as to *promote* the formation of one habitat over another, if required. In a related note, it is further recommended that these same agencies coordinate with the Toledo Port Authority and other relevant parties to plan for CDF operations that optimize the potential for development of high-quality habitat within the CDF structure while at the same time exploring the potential for also using the CDF for disposal of non-harbor sediments, so as to promote development of higher-quality deepwater and wetland ecosystems within the northwestern Ohio/southeastern Michigan area.

In terms of more thoroughly establishing baseline (pre-activity) conditions, it is also recommended that up-to-date and/or more site-specific water-quality and sediment-quality data be collected in the project area, particularly for the North Maumee Bay region. Additional and up-to-date data for benthic species occurrence and abundance in wetland, shallow-waters, and deepwater portions of the project area would also be helpful in establishing baseline conditions for this important ecosystem component. An up-to-date delineation of jurisdictional wetlands presently occurring throughout the project area, coupled with an assessment of their relative quality in terms of habitat and ecosystem function (pursuant to appropriate regulatory guidelines) should also be contemplated. Such assessments would provide useful and timely information related one of the project-areas most ecologically (and economically) important habitats, and also provide a baseline of pre-construction conditions if a CDF is pursued.

Finally, a more complete investigation, and reconciliation, of officially recognized cultural/historical resources occurring in Ohio and Michigan portions of the project area with information contained in the published literature is suggested.

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TABLE 1
FISH SPECIES COMPOSITION OF THE MAUMEE BAY AND NORTH MAUMEE BAY REGION
Scientific and Common Names

Catostomidae
- Carpoides cyprinus — Quillback
- Catostomus commersoni — White sucker
- Moxostoma macrolepidotum — Shorthead redhorse
- Moxostoma anisurum — Silver redhorse
- Moxostoma erythrurum — Golden redhorse
- Ictiobus cyprinellus — Bigmouth buffalofish

Centrarchidae
- Pomoxis nigromaculatus — Black crappie
- Pomoxis annularis — White crappie
- Lepomis gibbosus — Pumpkinseed sunfish
- Ambloplites rupestris — Northern rockbass

Clupeidae
- Alosa pseudoharengus — Alewife
- Dorosoma cepedianum — Gizzard shad

Cyprinidae
- Carassius auratus — Goldfish
- Cyprinus carpio — Carp
- Hybopsis storeriana — Silver Chub
- Notropis atherinoides — Emerald shiner
- Notropis hudsonius — Spottail shiner

Escoidae
- Esox lucius — Northern pike

Ictaluirdae
- Ictalurus punctatus — Channel catfish
- Ictalurus melas — Black bulhead
- Ictalurus nebulosus — Brown bullhead

Lepisosteidae
- Lepisosteus osseus — Longnose gar

Osmeridae
- Osmerus mordax — Rainbow smelt

Percichthyidae
- Morone americana — White perch
- Morone chrysops — White bass

Percidae
- Perca flavescens — Yellow perch
- Percina caprodes — Logperch darter
- Stizostedion canadense — Sauger
- Stizostedion v. vitreum — Walleye

Percopsidae
- Percopsis omiscomaycus — Trout-perch

Scianenidae
- Aplodinotus grunniens — Freshwater drum

NOTE: Table compiled from "Fish, Wildlife, and Recreational Values of Michigan's Coastal Wetlands", 1978; "Atlas of the Spawning and Nursery Areas of Great Lakes Fishes, Vol. IX - Lake Erie", 1982.

TABLE 2
THREATENED, ENDANGERED, AND SPECIAL-STATUS SPECIES
OCCURING IN THE PROJECT AREA
Scientific and Common Names

Michigan

Scientific name	Common name	Status
Sagitaria montevidensis	Arrowhed	State threatened
Justicia americana	Water willow	State threatened
Nelumbo lutea	American lotus	State threatened
Eclipta prostrata	Yerba-de-tajo	Special concern
Hibiscus moscheutos	Swamp rose mallow	Special concern
Carex frankii	Frank's sedge	Special concern
Carex hyalinolepis	Sedge	Special concern
Hypericum sphaerocarpum	Round-fruited St. John's wort	Special concern
Rallus elegans	King rail	State endangered
Elaphe vulpina gloydi	Eastern fox snake	State threatened
Haliaeetus leucocephalus	Bald eagle	Fed/State threatened
Hybopsis storeriana	Silver chub	Special concern

Ohio

Scientific name	Common name	Status
Percina copelandi	Channel darter	Threatened
Ichthyomyzon unicuspis	Silver lamprey	Threatened
Hiodon tergisus	Mooneye	Special interest
Sterna hirundo	Common tern	Endangered

Note: This table was compiled using information received from requests sent to the Michigan Department of Natural Resources, Natural Heritage Section; Ohio Department of Natural Resources, Division of Natural Areas & Preserves; and United States Department of the Interior, Fish and Wildlife Service.

TABLE 3

SUMMARY OF ANTICIPATED BENEFICIAL EFFECTS AND ADVERSE OR UNKNOWN EFFECTS RELATED TO CDF CONSTRUCTION AND OPERATION NEAR WOODTICK PENINSULA

Ecosystem Component	Anticipated Beneficial Effects	Potential Adverse or Unknown Effects
Hydrologic & Sedimentological Processes	1) Increased shoreline protection through significant and permanent reduction in wave impacts and bank washover at eastern shore of Woodtick Peninsula 2) Promotion of stability of upland/wetland habitat on and within Peninsula proper as result of shoreline protection. 3) Potential development of diverse wetland and related shallow-water habitat as result of increased sedimentation in calmer waters behind CDF and within boundaries of Peninsula proper. 4) Virtual elimination of wave propagation into much of Bay Area, which facilitates protection of Bay Area dike structures, non-diked wetland and related shallow-water habitat, and naturally occurring islands. 5) Decrease effort/cost expended by Consumers Power to maintain water intake canal adjacent to (west of) Peninsula, as result of decreased infilling due to decreased peninsula erosion.	1) Extent, rate, spatial occurrence, and type(s) of net sediment accumulation and habitat development along eastern shore of Woodtick and within Peninsula proper through sediment deposition by littoral currents from north unknown and depend mainly on: (a) results and evaluation of hydrologic/sedimentologic computer modeling; b) long-term availability of feeder sands from north; (c) physical effects of Consumers Power discharge on current flow; and (d) long-term lake-water levels. 2) Extent and long-term development and stability of upland, wetland, and/or shallow-water habitat in project area *in general* (i.e. behind CDF, within boundaries of Peninsula proper, and in North Maumee Bay area) dependent on long-term lake water levels.
Uplands	1) Stabilization and protection of existing natural and manmade (diked) uplands on Peninsula proper and in Bay Area. 2) Potential development of upland habitat within Peninsula proper, as result of sediment accumulation and habitat conversion. 3) Potential development of upland habitat within CDF Structure itself, depending on how CDF managed/operated.	1) Development of upland habitat outside of development within CDF structure necessarily involves equivalent loss of other habitat type(s), e.g. wetlands. 2) See item 2 of summary of unknown effects for "Hydrologic and Sedimentological Processes".
Wetlands	1) Potential development of wetland and related shallow-water habitats behind CDF, depending on seed-bank availability and other factors. 2) Potential wetlands development in CDF structure itself, depending on how CDF manager/operated. 3) Enhancement and/or creation of wetlands on Peninsula proper. 4) Ultimate protection of wetlands in North Maumee Bay area through physical protection of peninsula and bay area dike structures.	1) Uncertain of impact of non-harbor sediments on wetland habitat development/quality in CDF (if such sediments placed into CDF). 2) Any development of wetland habitat outside of development within CDF structure necessarily involves equivalent loss of other habitat type(s), e.g. uplands or deepwater areas. 3) Periodic episodes of short-term water-quality degradation (e.g. increased turbidity, BOD, oil/grease levels, decreased oxygen, and/or elutriation of potentially contaminated pore waters) may occur in wetlands developing/occurring near CDF construction and operation. 4) See item 2 of summary of unknown effects for "Hydrologic and Sedimentological Processes".

Note: Discussions of possible mitigative responses for potential adverse or unknown effects included in body of text.

TABLE 3 (cont.)

SUMMARY OF ANTICIPATED BENEFICIAL EFFECTS AND ADVERSE OR UNKNOWN EFFECTS RELATED TO CDF CONSTRUCTION AND OPERATION NEAR WOODTICK PENINSULA

Ecosystem Component	Anticipated Beneficial Effects	Potential Adverse or Unknown Effects
Occurrence and Quality of Deepwater Areas	1) General improvement of water quality throughout project-area ecosystems facilitated by CDF potentially offering repository for placement of non-harbor sediments from other portions of project area.	1) Loss of deepwater areas within CDF footprint area. 2) Uncertain of potential water-temperature changes/fluctuations occurring near CDF as result of CDF placement, coupled with thermal discharge into Lake Erie from Consumers Power.
Benthos	1) Would benefit from potential habitat development behind and within CDF, and within boundaries of Peninsula proper. 2) Would benefit from eventual improvement of habitat throughout project-area ecosystems facilitated by CDF offering potential repository for placement of non-harbor sediments from other portions of project area.	1) Loss of benthic habitat within CDF footprint area. 2) Uncertain of potential water-temperature effects on habitat, per item 2 of "Occurrence/Quality of Deepwater Areas". 3) Periodic episodes of short-term degradation (e.g. increased turbidity and potential sediment accumulation) may impact benthic habitat developing/occurring near CDF as result of CDF construction and operation. 4) Long-term physical instability of benthic habitat in CDF structure, depending on how CDF managed/operated. 5) Potential impact to benthic organisms and overall food chain dynamics as result of development of benthic habitat in non-harbor sediments potentially in CDF. 6) Could be impacted through unknown shifts in habitat type/occurrence, per items 1 and 2 of "Hydrologic and Sedimentological Processes".
Fish & Fisheries	1) Would benefit from creation of new and unique habitat related to rip-rap, rock-armor, and spawning-shelf components of CDF structure. 2) Would benefit from potential creation of new wetland and related shallow-water habitats behind CDF, and potentially within boundaries of peninsula proper; such habitat would typically be more conducive to spawning, feeding, and rearing young than would deepwater habitat.	1) Periodic episodes of short-term degradation of water quality may impact habitat developing/occurring near CDF as result of CDF construction and operation. 2) Loss of habitat within CDF footprint area. 3) Uncertain of potential water-temperature effects on habitat, per item 2 of "Occurrence/Quality of Deepwater Areas". 4) Development of wetlands habitat at expense of deepwater habitat. 5) Could be impacted through unknown shifts in habitat type/occurrence, per items 1 and 2 of "Hydrologic and Sedimentological Processes".

Note: Discussions of possible mitigative responses for potential adverse or unknown effects included in body of text.

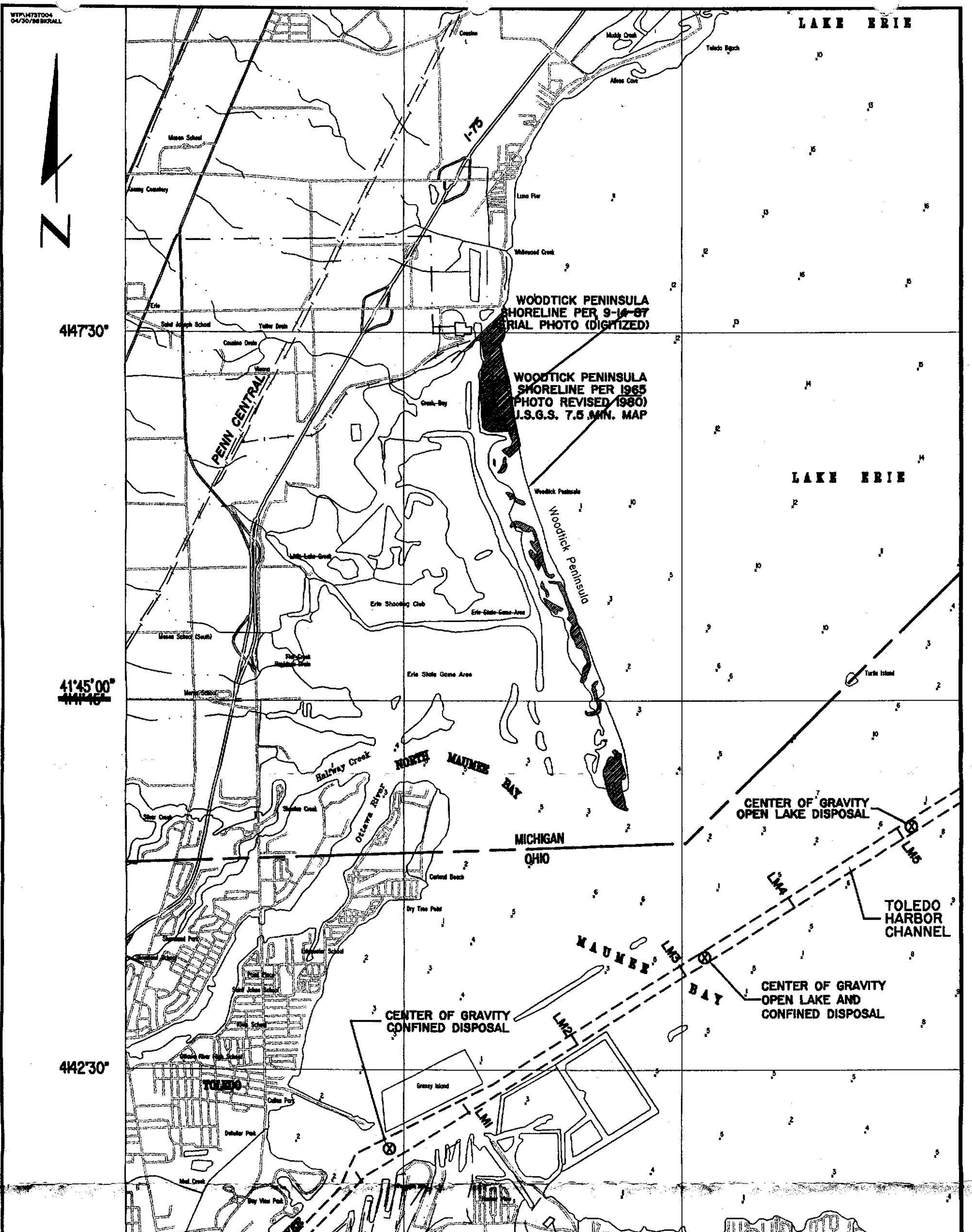
TABLE 3 (cont.)

SUMMARY OF ANTICIPATED BENEFICIAL EFFECTS AND ADVERSE OR UNKNOWN EFFECTS RELATED TO CDF CONSTRUCTION AND OPERATION NEAR WOODTICK PENINSULA

Ecosystem Component	Anticipated Beneficial. Effects	Potential Adverse or Unknown Effects
Wildlife	1) Would benefit from preservation and potential development of wetland and upland habitat throughout project area, as a result of increased shoreline and dike protection. 2) Would benefit from habitat development within CDF itself, depending on how CDF is managed/operated. 3) Would benefit from development of subaerial habitat around CDF perimeter, i.e. atop rip-rap and rock armor apron.	1) Development of some habitat types (e.g. particular wetland and/or upland ecosystems) at expense of other habitat types (e.g. particularly deepwater and/or wetland ecosystems). 2) Potential impact to wildlife and food-chain dynamics overall as result of habitat development for lower-chain species within non-harbor sediments potentially in CDF. 3) Could be impacted through unknown shifts in habitat type/occurrence, per items 1 and 2 of "Hydrologic and Sedimentological Processes".
Threatened, Endangered, and Special-Status Species	1) See sections for "Fish and Fisheries" and "Wildlife"	1) See sections for "Fish and Fisheries" and Wildlife".
Private, Public, and Commercial Property Uses	1) Habitat preservation and potential development would maintain and enhance current consumptive/non-consumptive property uses across project area, including consumptive/non-consumptive recreation as well as power generation (allows for continued, economical use of Consumers Power intake canal). 2) Would enable continued commerce-related activities in Toledo area through allowing discharge of dredged sediments from Toledo Harbor Channel. 3) Would benefit from eventual ecological improvement of project-area ecosystems facilitated by CDF offering potential repository for placement of non-harbor sediments.	1) CDF structure would not necessarily "blend in" with local natural environment. 2) Potential development of shallower waters adjacent to CDF and within boundary of Woodtick Peninsula proper would change navigational pathways for recreational boaters.
Cultural and Historic Resources	1) See item 1 of "Uplands" section.	1) See item 2 of summary of unknown effects for "Hydrologic and Sedimentological Processes", as it pertains to potential fate of upland areas.
Socioeconomics	1) See discussion for "Private, Public, and Commercial Property Uses" section.	1) None anticipated.

Note: Discussions of possible mitigative responses for potential adverse or unknown effects included in body of text.

FIGURES



1"=4,000'

0 1000 2000 4000

SCALE IN FEET

NOTES:

1. PLANE OF REFERENCE
   LOW WATER DATUM 568.6 IGLD

2. WATER DEPTHS AT SPECIFIC POINTS IN LAKE ERIE EAST OF WOODTICK DERIVED FROM U.S.G.S. 7.5 MIN. MAPS:
   ERIE, MICHIGAN 1967 - PHOTOREVISED 1979
   OREGON, OHIO 1965 - PHOTOREVISED 1980

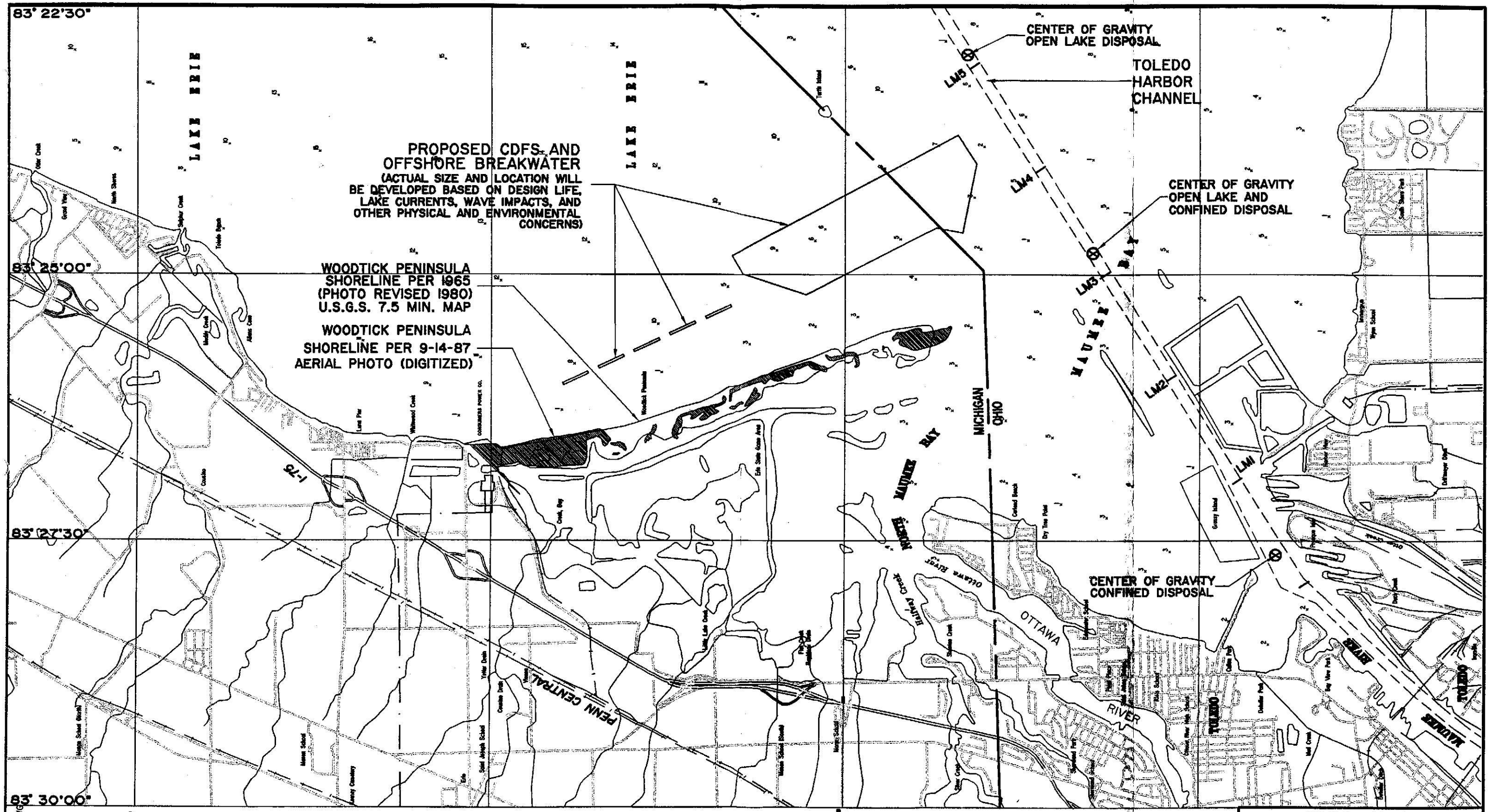
Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 1
TOLEDO HARBOR CHANNEL

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
FEBRUARY 1999 WTP004



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11/15/99 GAC

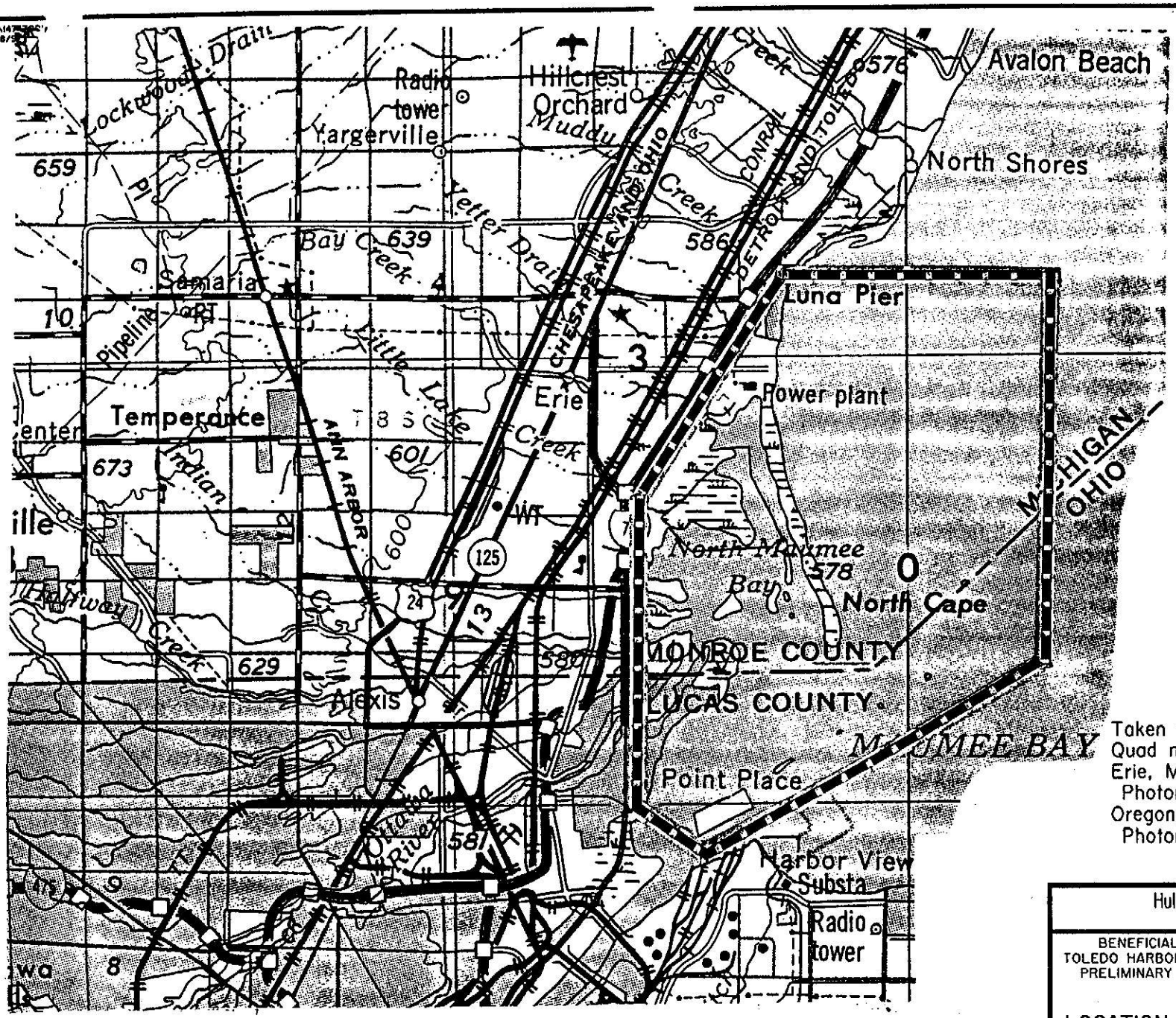
Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 2
CONCEPTUAL DESIGN AND PLACEMENT FOR CONFINED DISPOSAL FACILITY
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
FEBRUARY 1999

WTP005



NOT TO SCALE

DENOTES OUTER BOUNDARY OF STUDY AREA

Taken from U.S.G.S. Quad maps:
Erie, Mich. - 1967
Photorevised 1979
Oregon, Ohio - 1965
Photorevised 1980

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 3
LOCATION MAP OF STUDY AREA

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE: JANUARY 1998 WTP004

WTP\1473T000
01/28/98 BKRALL

N

41° 47'30"

41° 45'00"

41° 42'30"

LAKE ERIE

LAKE ERIE WATERS

WOODTICK PENINSULA

LAKE ERIE

MAINLAND

BAY AREA

MICHIGAN
OHIO

NORTH MAUMEE BAY

MAUMEE BAY

MAUMEE RIVER

I-75

PENN CENTRAL

Woodtick Peninsula

Halfway Creek

Ottawa River

TOLEDO

TOLEDO

Cousino

Muddy Creek

Toledo Beach

Allens Cove

Mason School

Kenney Cemetery

Saint Joseph School

Yeiter Drain

Cousino Drain

Vienna

Little Lake Creek

Erie Shooting Club

Erie State Game Area

Mason School (South)

Marian School

Shoreland Park

Shoreland School

Ottawa River High School

Grassy Island

Detwiler Park

Mud Creek

Bay View Park

Detwiler Ditch

Duck Creek

Otter Creek

Harbor View

Wynn School

South Shore Park

Driftmeyer Ditch

1"=4,000'

0 1000 2000 4000

SCALE IN FEET

PLANE OF REFERENCE
LOW WATER DATUM 568.6 IGLD

LEGEND

DENOTES OUTER BOUNDARY OF STUDY AREA

NOTE: COLORED AREAS DENOTE GEOGRAPHIC/ ECOLOGICAL PORTIONS OF STUDY AREA.

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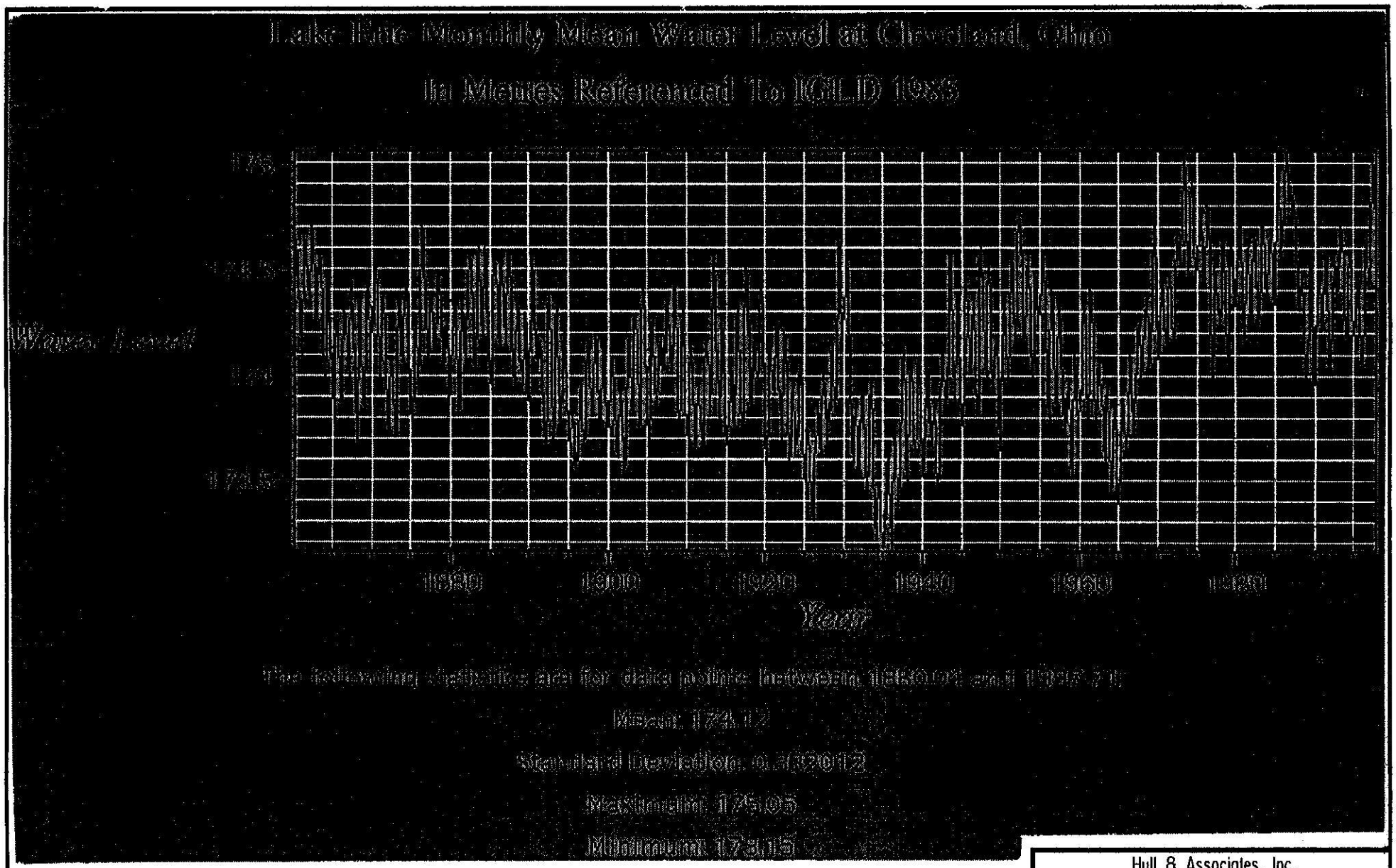
BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 4
GEOGRAPHIC/ECOLOGICAL PORTIONS OF PROJECT AREA

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
FEBRUARY 1999

WTP004



Hydrograph obtained from Army Corp. of Engineers, Buffalo NY office in January 1998.

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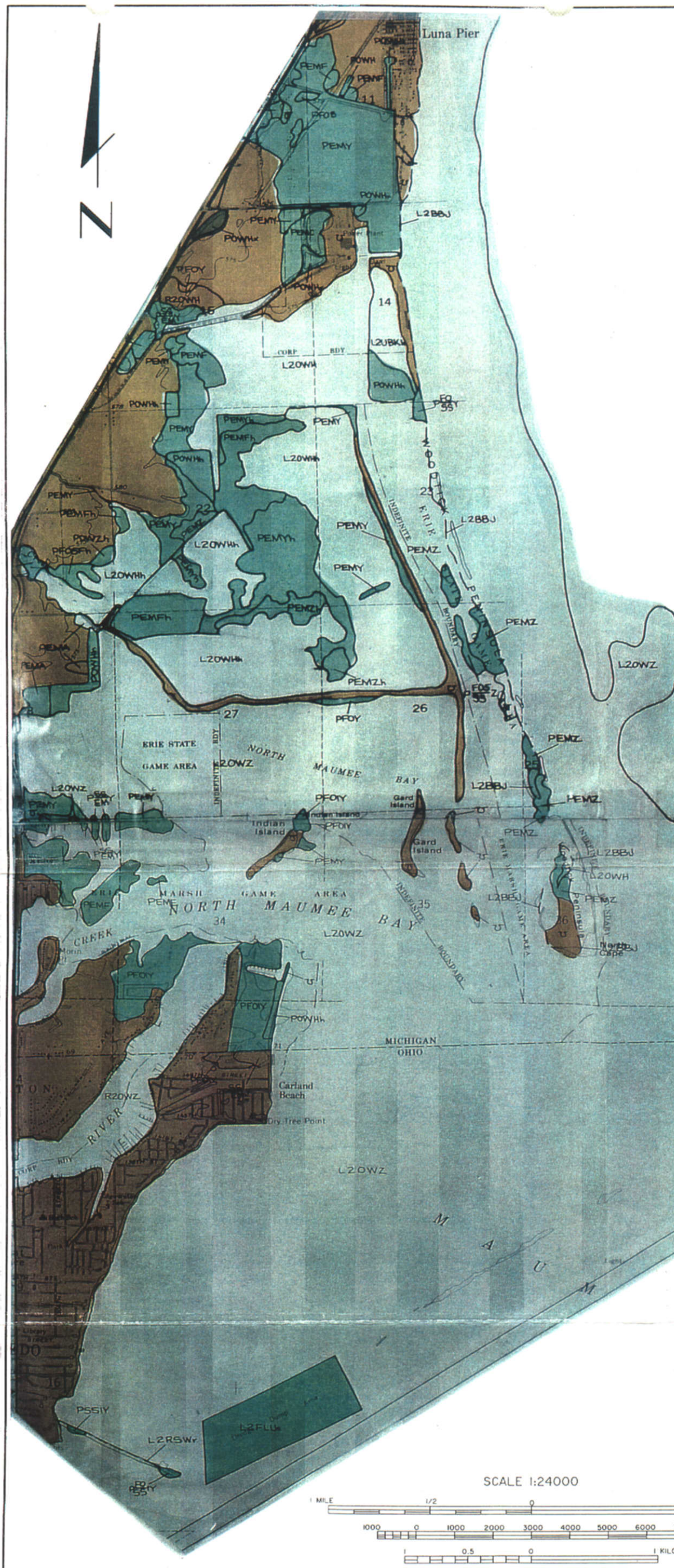
BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 5
LAKE ERIE WATER
LEVELS OVER TIME

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
JANUARY 1998

WTP004



LEGEND

PSSIY	PALUSTRINE, SCRUB/SHRUB, BROADLEAVED DECIDUOUS, SATURATED/SEMIPERMANENT/ SEASONALS
L2RSWr	LACUSTRINE, LITTORAL, ROCKY SHORE, INTERMITTENTLY FLOODED/TEMPORARY, ARTIFICIAL
$P^{FO}_{SS}IY$	PALUSTRINE, FORESTED/SCRUB/SHRUB, BROADLEAVED DECIDUOUS, SATURATED/ SEMIPERMANENT/SEASONALS
L2FLUs	LACUSTRINE, LITTORAL, FLAT, UNKNOWN, SPOIL
PFOIY	PALUSTRINE, FORESTED, BROADLEAVED DECIDUOUS, SATURATED/SEMIPERMANENT/ SEASONALS
$P^{SS}_{EM}Y$	PALUSTRINE, SCRUB/SHRUB, EMERGENT, SATURATED/SEMIPERMANENT/SEASONALS
POWHh	PALUSTRINE, OPEN WATER, PERMANENT, DIKED/IMPOUNDED
L2OWZ	LACUSTRINE, LITTORAL, OPEN WATER, INTERMITTENTLY EXPOSED/PERMANENT
PEME	PALUSTRINE, EMERGENT, SEASONAL SATURATED
PEMF	PALUSTRINE, EMERGENT, SEMIPERMANENT
PEMY	PALUSTRINE, EMERGENT, SATURATED/ SEMIPERMANENT/SEASONALS
PEMA	PALUSTRINE, EMERGENT, TEMPORARY
L2BBJ	LACUSTRINE, LITTORAL, BEACH/BAR, INTERMITTENTLY FLOODED
PEMZ	PALUSTRINE, EMERGENT, INTERMITTENTLY EXPOSED/PERMANENT
L2OWH	LACUSTRINE, LILTTORAL, OPEN WATER, PERMANENT
$P^{FO}_{EM}Y$	PALUSTRINE, FORESTED/SCRUB/SHRUB, SATURATED/SEMIPERMANENT/SEASONALS
L2UBKW	LACUSTRINE, LITTORAL, UNCONSOLIDATED BOTTOM, ARTIFICIAL, INTERMITTENTLY FLOODED/TEMPORARY
POWHx	PALUSTRINE, OPEN WATER, PERMANENT, EXCAVATED
PFOB	PALUSTRINE, FORESTED, SATURATED
PEMF	PALUSTRINE, EMERGENT, SEMIPERMANENT
POWH	PALUSTRINE, OPEN WATER, PERMANENT
PEMC	PALUSTRINE, EMERGENT, SEASONAL
PFOY	PALUSTRINE, FORESTED, SATURATED/ SEMIPERMANENT,/SEASONALS
R2OWH	RIVERINE, LOWER PERENNIAL, OPEN WATER, PERMANENT
PEMYh	PALUSTRINE, EMERGENT, SATURATED/ SEMIPERMANENT/SEASONALS, DIKED/ IMPOUNDED
L2OWHh	LACUSTRINE, LITTORAL, OPEN WATER, PERMANENT, DIKED/IMPOUNDED
PEMZh	PALUSTRINE, EMERGENT, INTERMITTENTLY EXPOSED/PERMANENT,DIKED/IMPOUNDED
PEMFh	PALUSTRINE, EMERGENT, SEMIPERMANENT, DIKED/IMPOUNDED
POWZh	PALUSTRINE, OPEN WATER, INTERMITTENTLY EXPOSED/PERMANENT,DIKED/IMPOUNDED
PFOSFh	PALUSTRINE, FORESTED, TEMPORARY TIDAL, SEMIPERMANENT,DIKED/IMPOUNDED
$P^{FO}_{SS}SZ$	PALUSTRINE, FORESTED/SCRUB/SHRUB, TEMPORARY TIDAL, INTERMITTENTLY EXPOSED/PERMANENT
L1OWH	LACUSTRINE, LIMNETIC, OPEN WATER PERMANENT
⊓	UPLAND AREA

SCALE 1:24000

1 MILE 1/2 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET - DATUM IS LOW WATER 568.6 FEET

NOTES: 1.) EACH OF THE AREAS IN THIS FIGURE ARE CLASSIFIED AS "UPLANDS", "WETLANDS" OR "DEEPWATER" AREAS. FOR COMPARISON TO SIMILAR INFORMATION SHOWN IN FIGURE 7. UPLAND AREAS = ORANGE, WETLAND AREAS = GREEN, DEEPWATER AREAS = BLUE.

WTP004.100.0007.DWG
11/10/99 BK

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

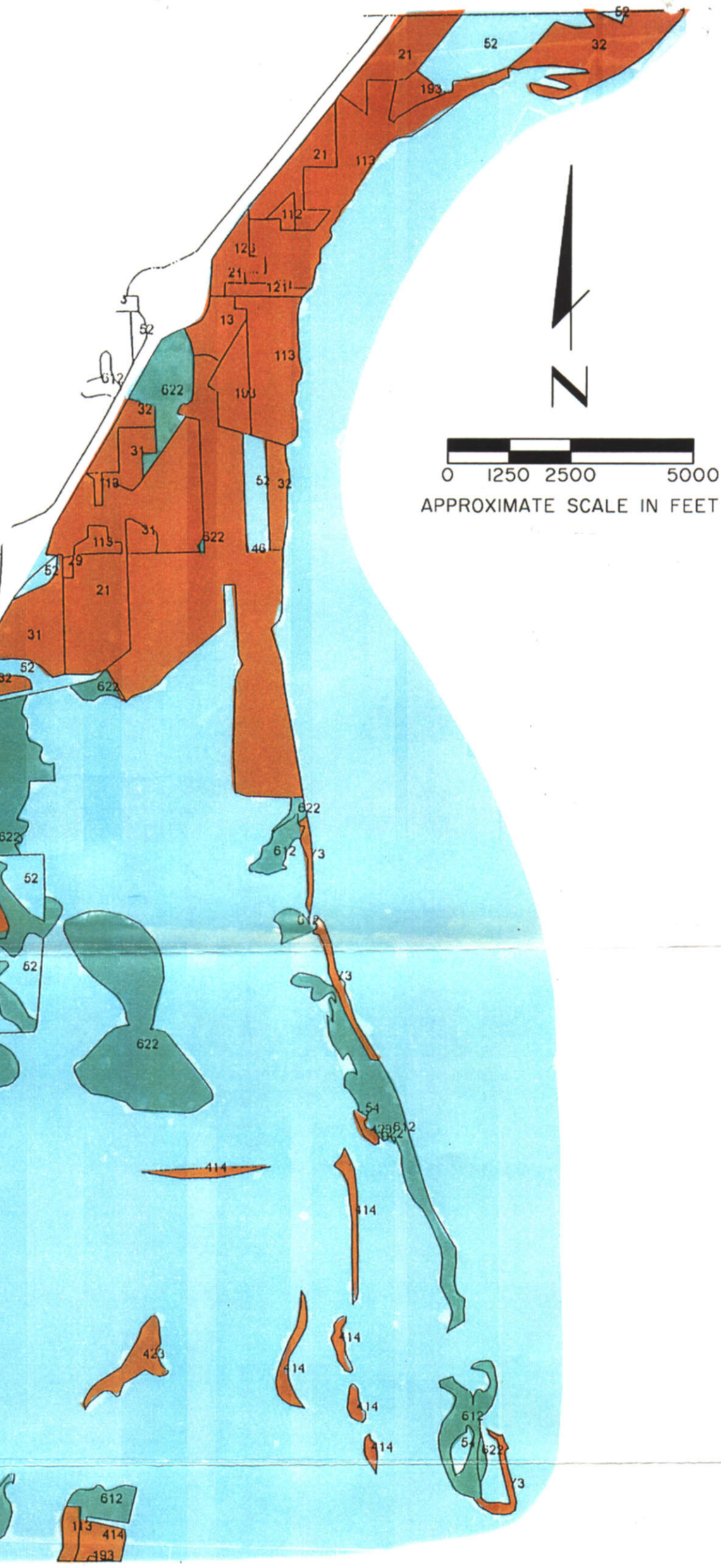
FIGURE 6
WETLAND INVENTORY MAP
FOR STUDY AREA

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
NOVEMBER 1999 WTP004

REPORTED LAND USES:

13	INDUSTRIAL ✳
113	SINGLE FAMILY RESIDENTIAL
112	MULTI-FAMILY RESIDENTIAL
121	PRIMARY CENTRAL BUSINESS DISTRICT
126	INSTITUTIONAL ESTABLISHMENTS
144	ROAD TRANSPORTATION
146	UTILITIES
193	OPEN SPACE/OUTDOOR RECREATION
21	CROPLANDS
29	OTHER AGRICULTURAL LANDS
31	HERBEAOUS OPENLAND
32	SHRUB LAND
414	FORESTED; LOWLAND HARDWOOD ✳
423	CONIFEROUS; LOWLAND CONIFER ✳
52	LAKES
54	GREAT LAKES
611	MIXED WOODED WETLAND
612	WETLANDS; SHRUB, SCRUB ✳
622	EMERGENT WETLAND
623	FLATS
73	SAND DUNES



NOTES:

1. MAP OBTAINED FROM SOUTHEAST MICHIGAN COUNCIL OF GOVERNMENTS (SEMCOG). BASE MAP REPORTEDLY DEVELOPED FROM THEIR REVIEW OF 1990 AERIAL PHOTOGRAPHS WITH LITTLE TO NO FOLLOW-UP GROUND TRUTHING.

2. LAND-USE CATEGORIES ACCORDING TO 1995 KEY PROVIDED BY SEMCOG.

3. ✳ INDICATES LAND USES NOT INCLUDED IN 1995 KEY BUT INSTEAD DERIVED FROM SEMCOG'S 1985 LAND USE MAP FOR ERIE TOWNSHIP.

4. EACH REPORTED LAND USE LISTED ABOVE IS CONSIDERED AS "UPLANDS", "WETLANDS", OR "DEEP WATER" AREAS, FOR COMPARISON TO SIMILAR INFORMATION SHOWN IN FIGURE 6; UPLAND AREAS = ORANGE, WETLAND AREAS = GREEN, DEEPWATER AREAS = BLUE

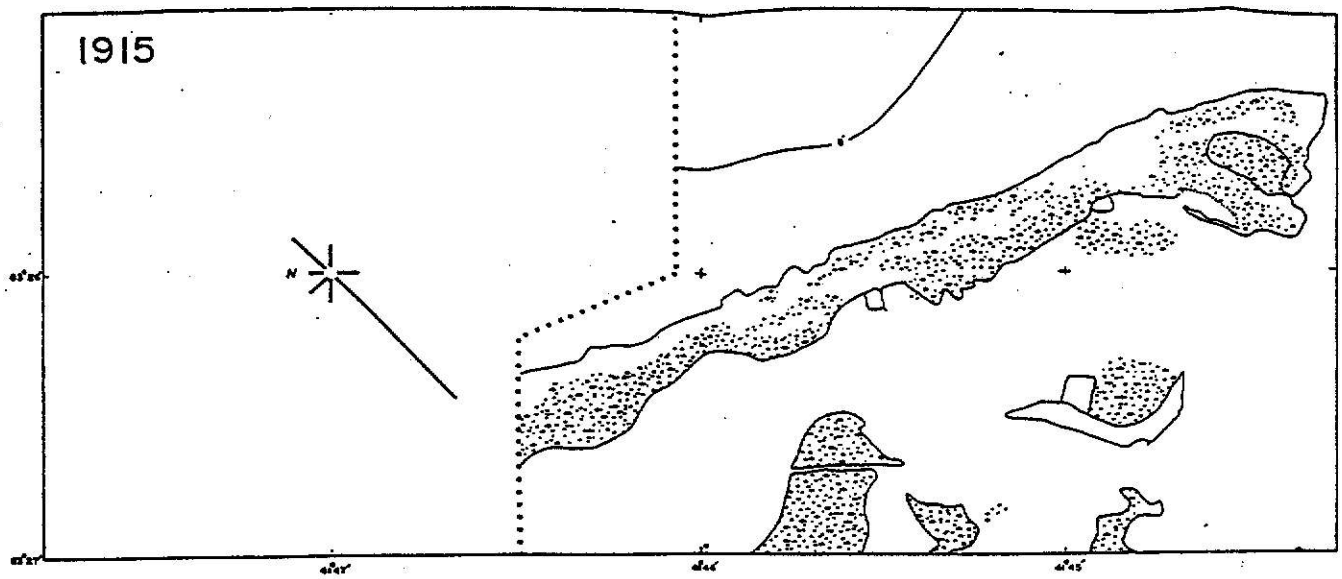
WTP\MAT31002
02/09/99SSMALL

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 7
REPORTED 1990 LAND USE WITHIN STUDY AREA
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
FEBRUARY 1999 WTP004



Derived from USACE, "Erosional History and Management Alternatives of Woodtick Peninsula, Michigan" April 1982

- UNIMPROVED DIRT ROAD
- ASPHALT ROAD
- RAIL LINE
- 6' DEPTH CONTOUR (Ird)
- UNCOVERS AT LOW WATER
- EXTENT OF AERIAL/CHART INFORMATION
- MARSHLAND
- FLY ASH DISPOSAL LAGOONS
- WHITING POWER PLANT
- DISCHARGE-WHITING POWER PLANT

1000 0 2000
FEET

WTP\WTP1001
01/28/98 BNRALL

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

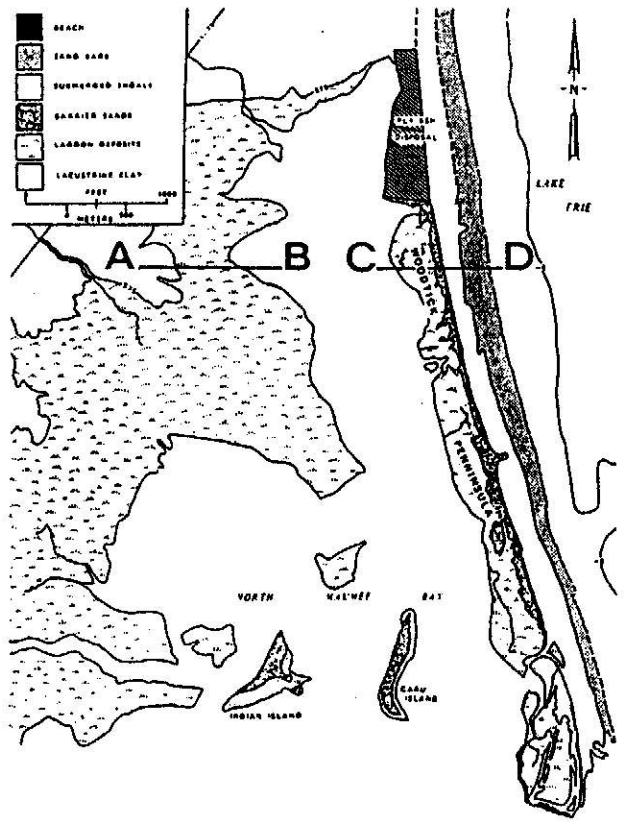
FIGURE 8
DIFFERENCE BETWEEN EXTENT OF WOODTICK PENINSULA IN 1915 & 1979

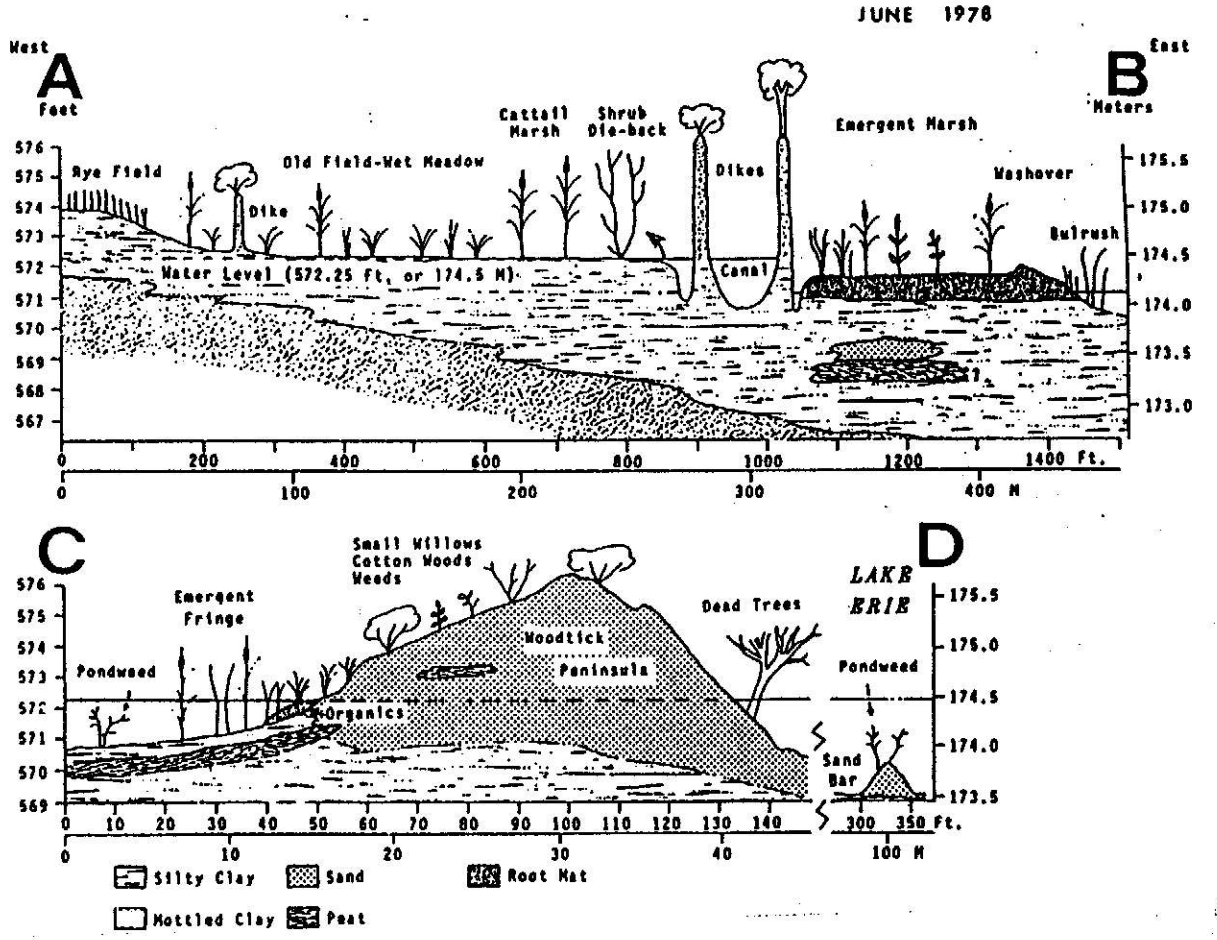
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE: JANUARY 1998

WTP004

WTP\14737001
01/28/98 BKRALL





Excerpted from Herdendorf, C.E. 1987 "The ecology of the coastal marshes of western Lake Erie: a community profile. U.S. Fish Wildl. Serv. Biol. Rep. 85(7.9). 171 pp. + microfiche appendices."

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

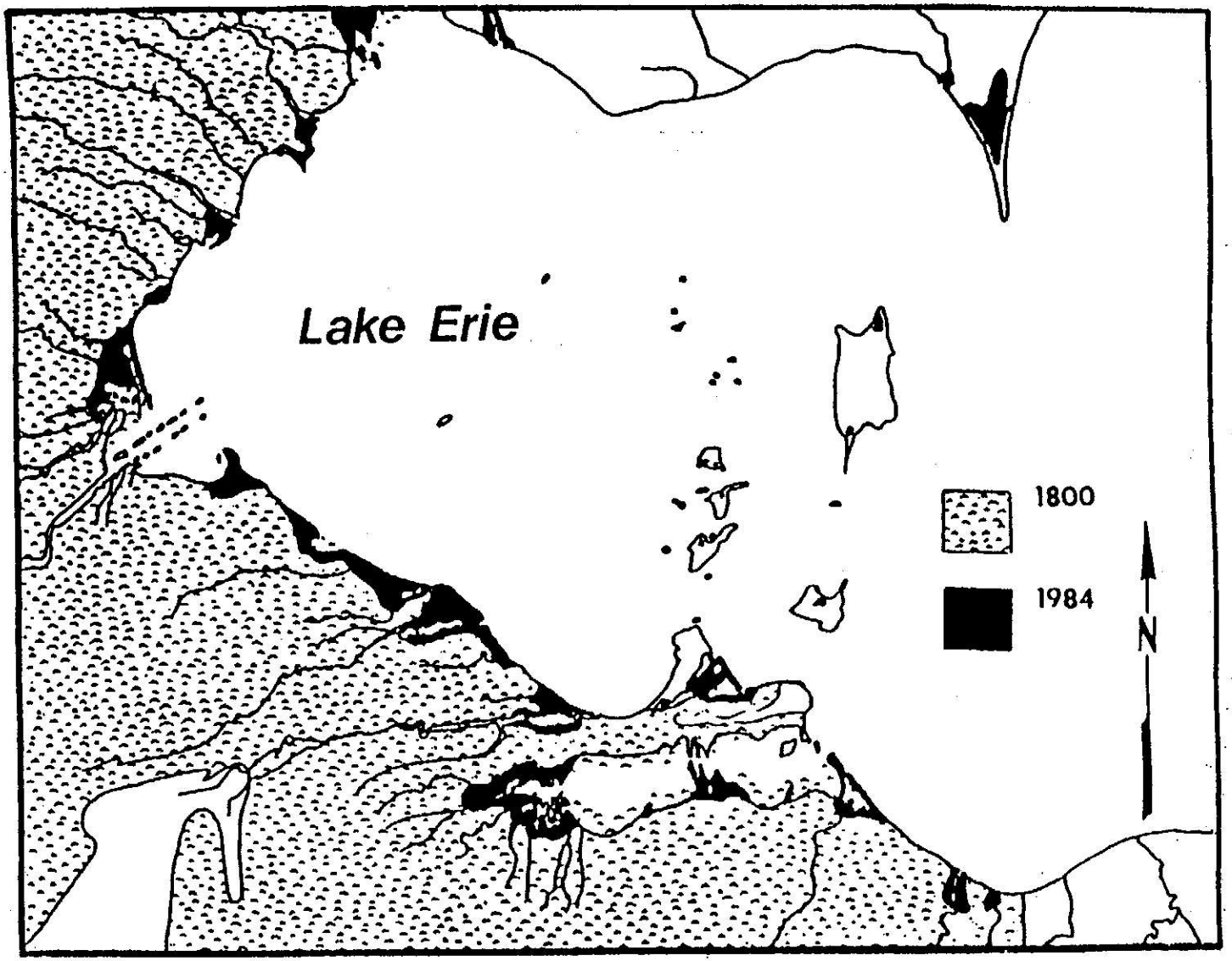
FIGURE 9
STRATIGRAPHY OF WOODTICK PENINSULA AND NORTH MAUMEE BAY WETLANDS

TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE: JANUARY 1998

WTP004

WTP\1473T001
01/28/98 SKRALL



Excerpted from Herdendorf, C.E. 1987 "The ecology of the coastal marshes of western Lake Erie: a community profile. U.S. Fish Wildl. Serv. Biol. Rep. 85(7.9). 171 pp. + microfiche appendices."

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

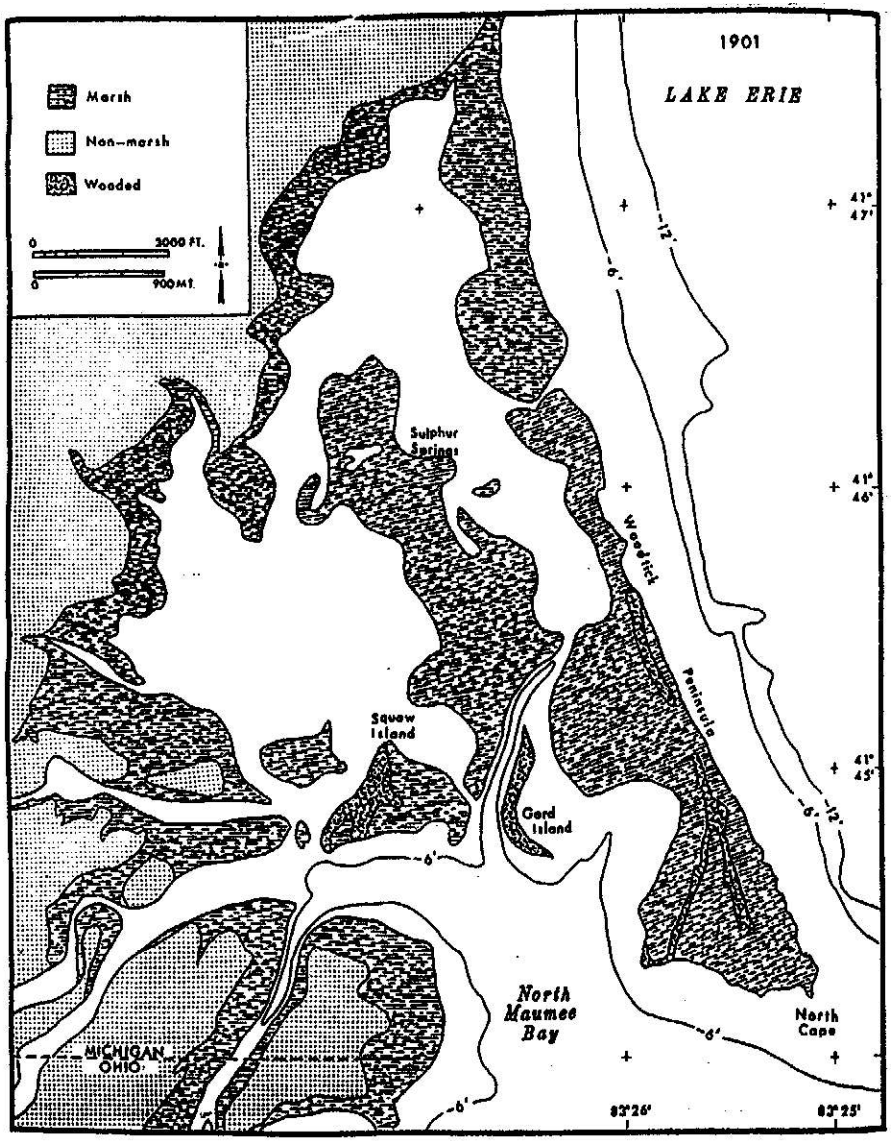
FIGURE 10
HISTORICAL OCCURRENCE OF WETLANDS
IN WESTERN BASIN OF LAKE ERIE

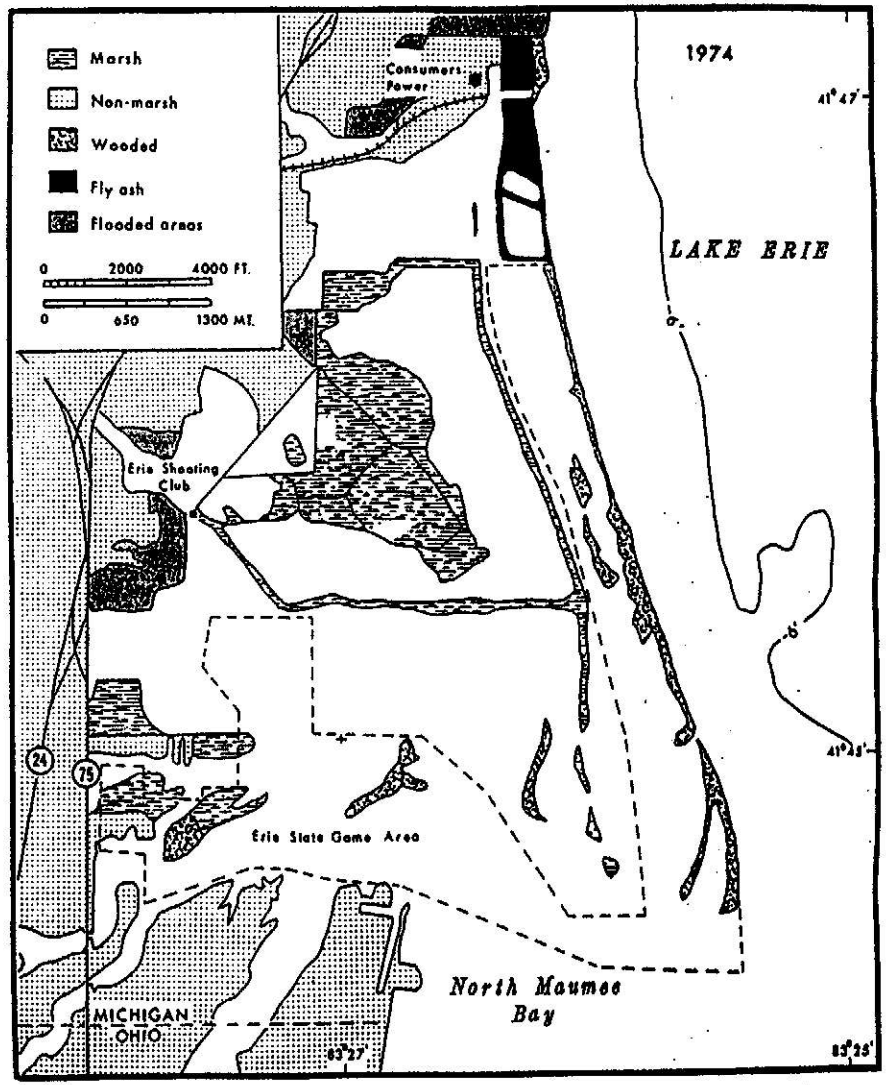
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
JANUARY 1998

WTP004

WTP\1473T001
01/28/98 BKRALL





Excerpted from "Jaworski and Raphael. 1976, Modification of Coastal Wetlands in Southwestern Michigan and Management Alternatives, Michigan Academician 8(3): 303-317."

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

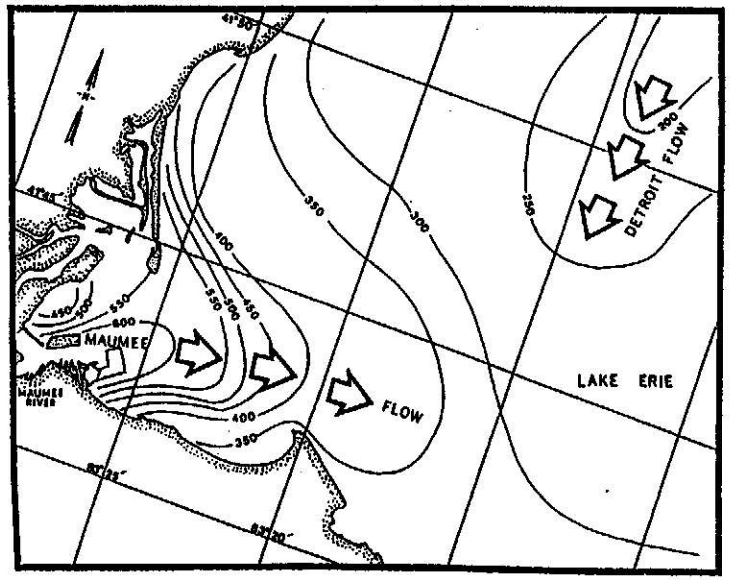
FIGURE II
DIFFERENCE BETWEEN WETLAND EXTENT IN STUDY AREA IN 1901 & 1974

TOLEDO-LUCAS COUNTY PORT AUTHORITY

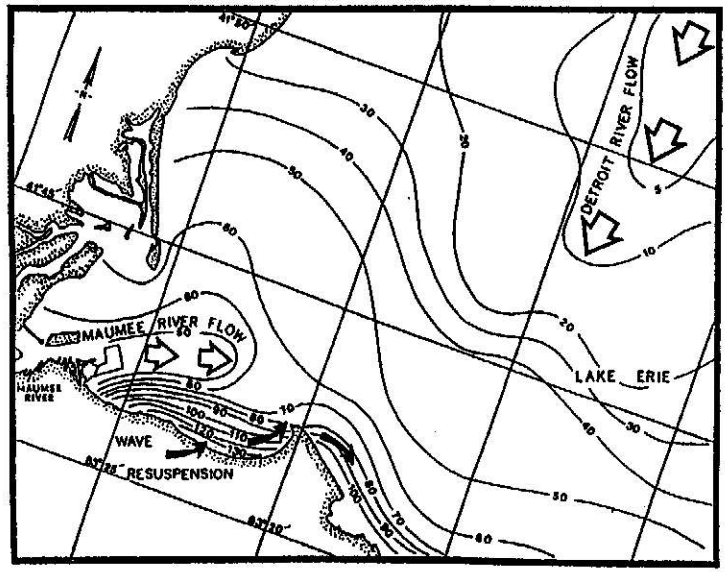
DATE: JANUARY 1998

WTP004

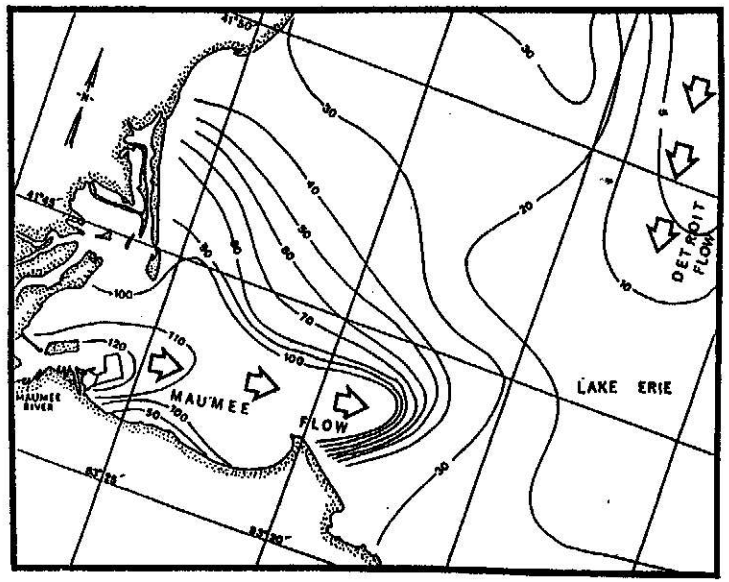
WTP\1473T001
01/28/98 BKRALL



CONDUCTIVITY IN SURFACE WATER OF MAUMEE BAY, MARCH 19-20, 1975 (Contour Interval: 50 umhos/cm)



TURBIDITY IN SURFACE WATER OF MAUMEE BAY, MARCH 19-20, 1975 (Contour Interval: 5-10 JTU)



SOLUBLE REACTIVE PHOSPHORUS IN SURFACE WATER OF MAUMEE BAY, MARCH 19-20, 1975. (Contour Interval: 10 µg/l, except in high and low concentration area, 50 µg/l respectively)

Excerpted from "Herdendorf C.E. and C.L. Cooper. 1975. Environmental Impact Assessment of Commercial Sand and Gravel Dredging in Maumee River and Maumee Bay of Lake Erie, CLEAR technical report No. 41, Ohio State University Center for Lake Erie Area research, Columbus, Ohio 379 p."

Hull & Associates, Inc.
TOLEDO, OHIO

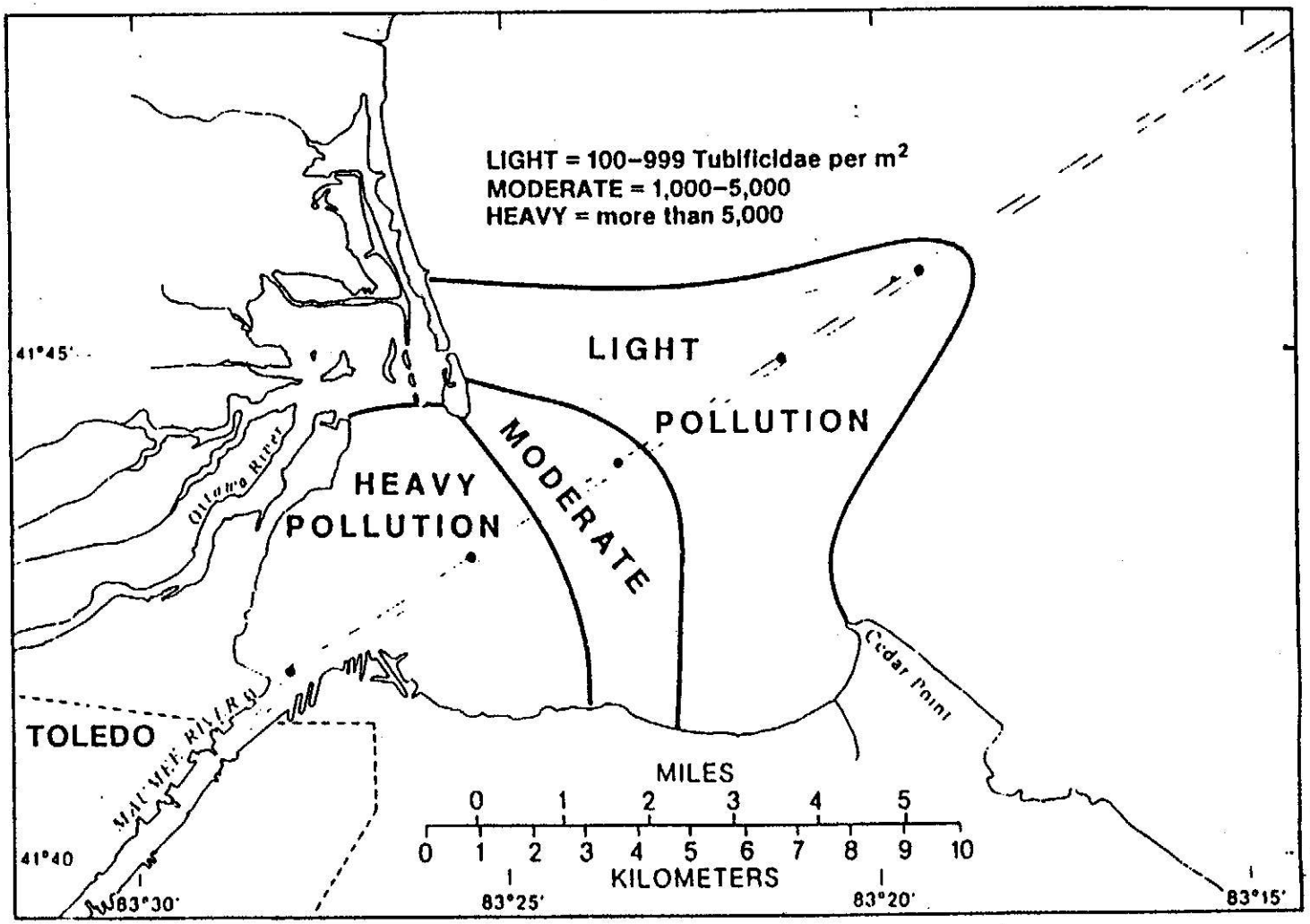
BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 12
SURFACE WATER CONDUCTIVITY, TURBIDITY, AND PHOSPHOROUS CONTENT IN STUDY AREA
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
JANUARY 1998

WTP004

WTP\1473T001
01/28/98 BKRALL

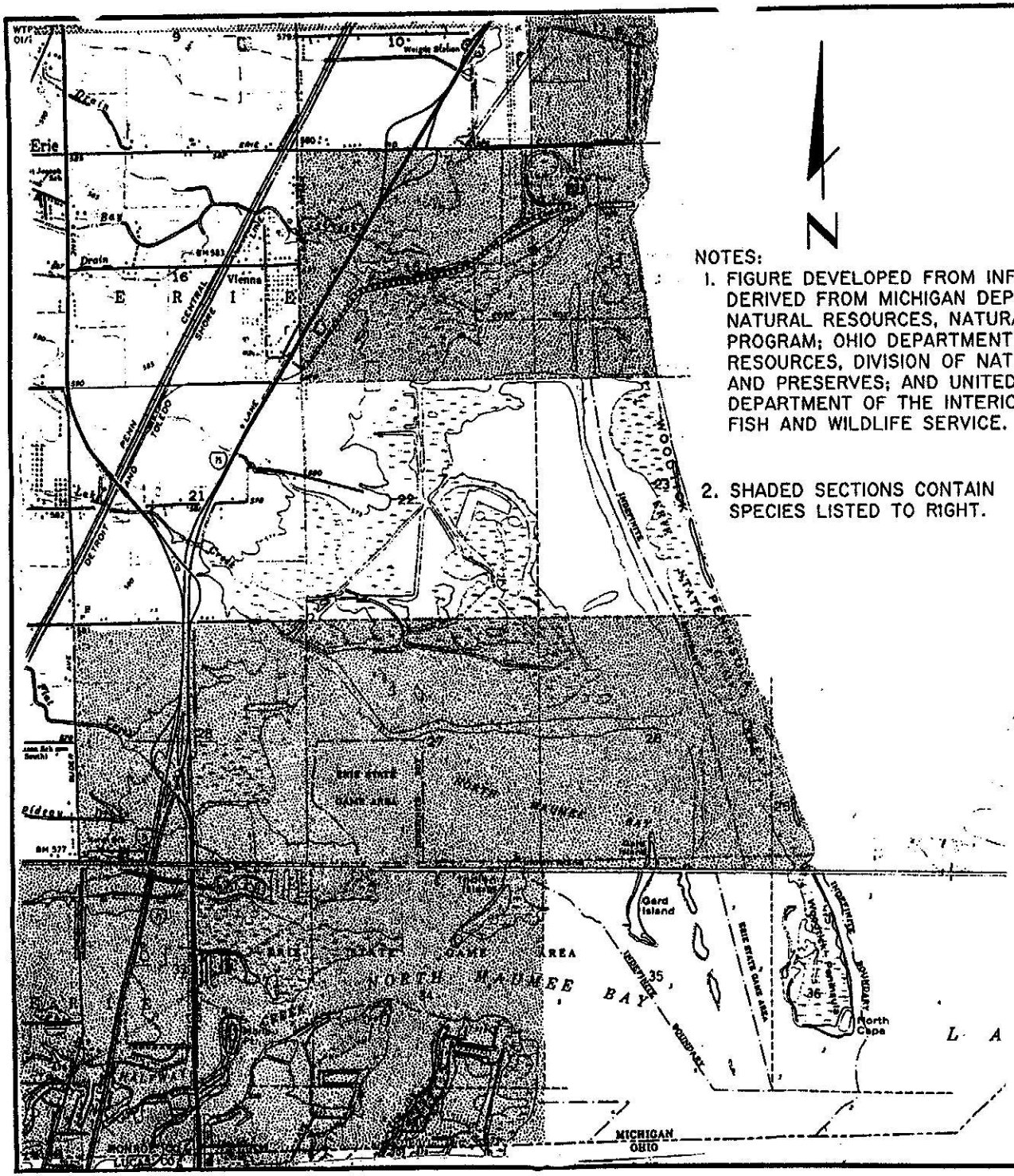


Excerpted from Herdendorf, C.E. 1987 "The ecology of the coastal marshes of western Lake Erie: a community profile. U.S. Fish Wildl. Serv. Biol. Rep. 85(7.9). 171 pp. + microfiche appendices."

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT
FIGURE 13
OCCURRENCE OF TUBIFICIDS
IN STUDY AREA AS AN INDICATION
OF SEDIMENT QUALITY
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE: JANUARY 1998 WTP004



N

NOTES:

1. FIGURE DEVELOPED FROM INFORMATION DERIVED FROM MICHIGAN DEPARTMENT OF NATURAL RESOURCES, NATURAL HERITAGE PROGRAM; OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF NATURAL AREAS AND PRESERVES; AND UNITED STATES DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE.

2. SHADED SECTIONS CONTAIN SPECIES LISTED TO RIGHT.

MICHIGAN

ARROWHEAD	- SEC. 11,15,28
WATER WILLOW	- SEC. 14
AMERICAN LOTUS	- SEC. 15,28,32
YERBA-DE-TAJO	- SEC. 11
SWAMP ROSE MALLOW	- SEC. 14
FRANK'S SLEDGE	- SEC. 33
ROUND FRUITED ST. JOHN WORT	- SEC. 15
KING RAIL	- SEC. 15
EASTERN FOX SNAKE	- SEC. 11,15,27,33
BALD EAGLE	- SEC. 26
SILVER CHUB	- SEC. 14
MAUMEE BAY ENVIRONMENTAL AREA	- SEC. 34

OHIO

SILVER LAMPREY	- WATERS OF MAUMEE BAY
MOONEYE	- WATERS OF MAUMEE BAY
COMMON TERN	MAUMEE BAY

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 14
LOCATION OF THREATENED, ENDANGERED AND SPECIAL SPECIES IN STUDY AREA
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE: JANUARY 1998 WTP004

WTP\J473T003
02/09/98BKRALL

STATE OF MICHIGAN

PRIVATE

CONSUMERS POWER COMPANY

BAY CREEK HUNTING CLUB

PRIVATE

NATURE CONSERVANCY
(approx. 1,100 acres leased by Erie Shooting Club & approx. 1,000 acres leased by private waterfowl hunters)

PRIVATE

STATE OF MICHIGAN ERIE STATE GAME AREA

PRIVATE

PRIVATE

MICHIGAN
OHIO

N

0 1000 2000 4000

SCALE IN FEET

NOTES:

1. UNLESS NOTED OTHERWISE, REPORTED PROPERTY OWNER IS ASSUMED TO OPERATE ON PROPERTY AS WELL.
2. UNLESS NOTED OTHERWISE, MAP DEVELOPED USING PARCEL MAPS OBTAINED FROM THE MONROE COUNTY AUDITORS OFFICE IN JANUARY 1998.
3. LOCATION AND EXTENT OF PROPERTY OWNED AND OPERATED BY CONSUMERS POWER COMPANY DERIVED FROM MAPS PROVIDED BY THE CITY OF LUNA PIER IN JANUARY 1998.

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF
TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 15
REPORTED LAND OWNERSHIP WITHIN PROJECT AREA
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
FEBRUARY 1999 WTP004

WTP\147:
04/30/9

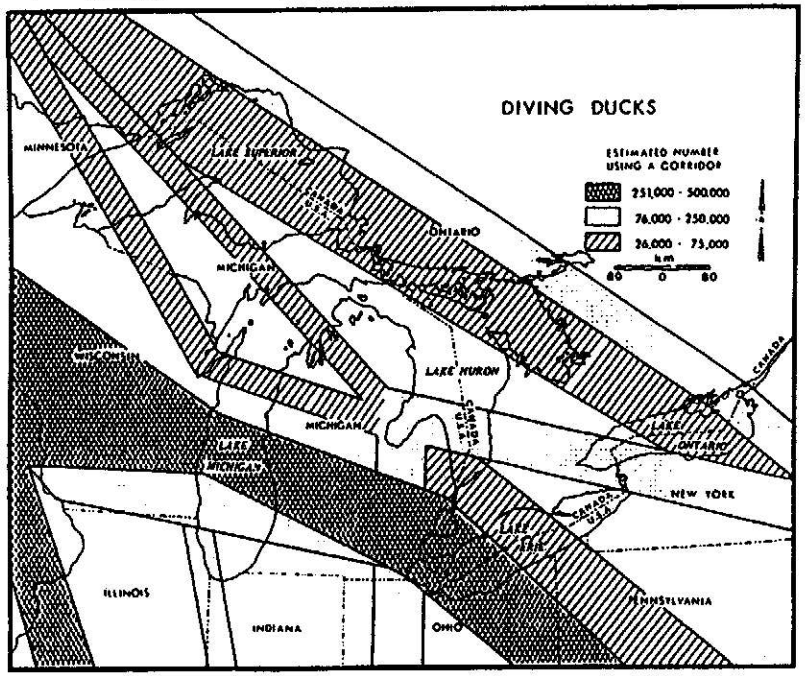


Fig. 3. Autumn migration corridors of diving ducks across the Great Lakes (after Bellrose 1968).

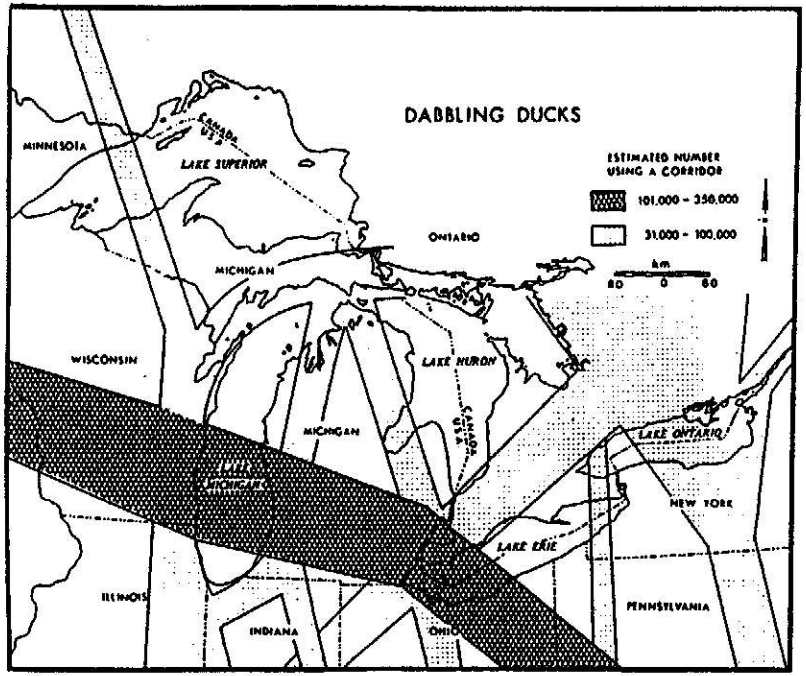


Fig. 2. Autumn migration corridors of dabbling ducks across the Great Lakes (after Bellrose 1968).

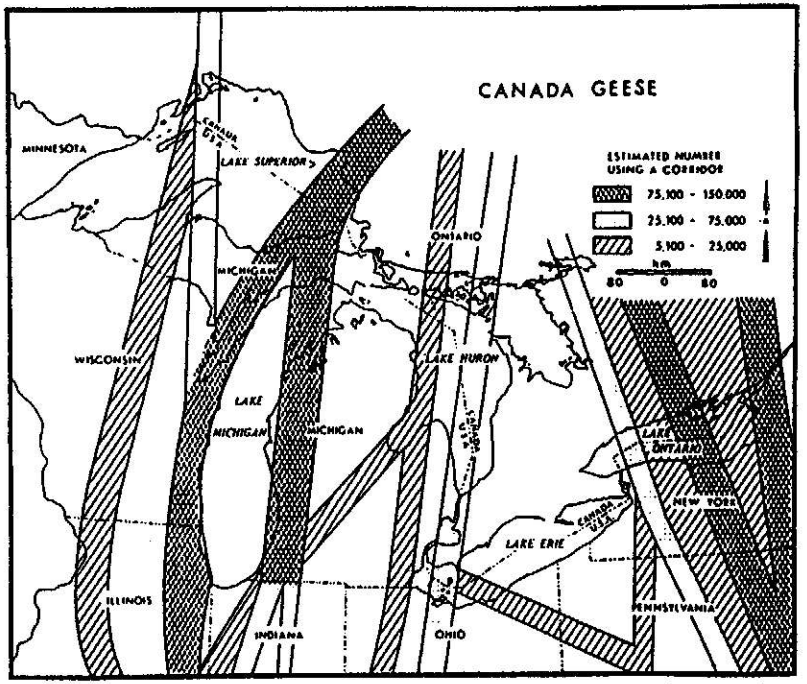


Fig. 4. Autumn migration corridors of Canada geese across the Great Lakes (after Bellrose 1968).

Excerpted from "The Great Lakes Marshes in Habitat Management for Migrating and Wintering Waterfowl in North America" T.A. Brookhout, 1989.

Hull & Associates, Inc.
TOLEDO, OHIO

BENEFICIAL USE AND MANAGEMENT OF TOLEDO HARBOR CHANNEL DREDGED SEDIMENTS
PRELIMINARY ENVIRONMENTAL ASSESSMENT

FIGURE 16
FALL MIGRATION CORRIDORS FOR WATER FOWL ACROSS STUDY AREA
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:
JANUARY 1998

WTP004

APPENDIX A

APPENDIX A

Appendix A-1	Request Letters to Michigan Natural Features Inventory and Response
Appendix A-2	Request Letter to ODNR, Division of Natural Area and Preserves and Response
Appendix A-3	Request Letter to Michigan State Historic Preservation Office and Response
Appendix A-4	Request Letter to USFWS Ecological Services and Response
Appendix A-5	Request Letter to Ohio Historic Preservation Office and Response

APPENDIX A-1

Request Letters to Michigan Natural Features Inventory and Response

Hull & Associates, Inc.

onroe Street
Toledo, Ohio 43606
(419) 241-7171
Fax (419) 241-3117

November 12, 1997

Ms. Jennifer Olson
Environmental Review Assistant
Michigan Natural Features Inventory
Environmental Review
P.O. Box 30444
Lansing, MI 48909-7944

RE: Request for Available Information on Threatened and Endangered Species
WTP004T.002

Dear Ms. Olson:

Hull & Associates, Inc. is currently collecting baseline ecological information as part of a preliminary Environmental Impact Assessment (Study) of the Woodtick Peninsula and surrounding area. The approximate boundary of the study area occurring within southeast Michigan (i.e., Monroe County) is shown on the attached map. The preliminary study is being conducted as part of a feasibility study investigating beneficial use and management of dredged sediments originating from within and near the study area.

This letter serves as a written request for information from your agency on any and all documented threatened and endangered species occurring within the study area; specific locations for such species within the defined area would also be helpful, if available.

Thank you in advance for your attention to this request. Please call either of the undersigned with questions, or if you need more information.

Sincerely,

Keith A. Carr,
Environmental Biologist

Joseph M. Jersak, Ph.D., CPSS

cc: Scott Lockhart, P.E., Hull & Associates, Inc. (w/attachment)

LAKE ERIE

LAKE ERIE

Conceptual CDFS AND OFFSHORE BREAKWATER
(ACTUAL SIZE AND LOCATION WILL BE DEVELOPED BASED ON DESIGN LIFE, LAKE CURRENTS, WAVE IMPACTS, AND OTHER PHYSICAL AND ENVIRONMENTAL CONCERNS)

WOODTICK PENINSULA SHORELINE PER 1965 (PHOTO REVISED 1980) U.S.G.S. 7.5 MIN. MAP

WOODTICK PENINSULA SHORELINE PER 9-14-87 AERIAL PHOTO (DIGITIZED)

CENTER OF GRAVITY OPEN LAKE DISPOSAL

TOLEDO HARBOR CHANNEL

LM5

LM4

CENTER OF GRAVITY OPEN LAKE AND CONFINED DISPOSAL

LM3

MAUMEE BAY

LM2

LM1

MICHIGAN
OHIO

MAUMEE BAY

NORTH CREEK

OTTAWA RIVER

CENTER OF GRAVITY CONFINED DISPOSAL

MAUMEE RIVER

TOLEDO

PENN CENTRAL

GL-1

41°50'

41°47'30"

41°41'45"

41°42'30"

1"=4,000'

1500 0 1500 4500

SCALE IN FEET

PLANE OF REFERENCE
LOW WATER DATUM 568.6 IGLD

WTP\06931
12/07/95 KRALL

Hull & Associates, Inc.
TOLEDO, OHIO

- - - equals:
Approximate Boundary of Assessment Area in Monroe Co., MI

STATE OF MICHIGAN

JOHN ENGLER, Governor
DEPARTMENT OF NATURAL RESOURCES
STEVENS T. MASON BUILDING, PO BOX 30028, LANSING MI 48909-7528

K.L. COOL, Director

REPLY TO:
NATURAL HERITAGE
P.O. BOX 30180
LANSING MI 48909

November 26, 1997

Mr. Keith A. Carr
Hull & Associates, Inc.
2726 Monroe Street
Toledo, OH 43606

Dear Mr. Carr:

The location of your proposed project (WTP004T.002) was checked against known localities for special natural features recorded in the Michigan Natural Features Inventory (MNFI) database, which is part of the DNR, Wildlife Division, Natural Heritage Program.

The MNFI database is an ongoing, continuously updated information base, which is the only comprehensive single source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the MNFI database indicate that a qualified observer has documented the presence of special natural features at a site. The absence of records in the database for a particular site may mean that the site has not been surveyed. Records are not always up-to-date, and may require verification. In some cases, the only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

The presence of threatened or endangered species does not necessarily preclude development but may require alterations in the development plan. An endangered species permit will be required from the Department of Natural Resources, Wildlife Division, under the Endangered Species Act: Part 365, Endangered Species Protection, of the Natural Resources and Environmental Protection Act, Act 451 of the Public Acts of 1994, being sections 324.36501 to 324.36507 of the Michigan Compiled Laws Annotated, if any threatened or endangered species would be taken or harmed. Special concern species are not protected under the Endangered Species Act, but recommendations regarding their protection may be provided. Protection of special concern species will help prevent them from declining to the point of being listed as threatened or endangered.

The following is a summary of the results of the MNFI review of your project, Monroe County, T8S R8E Sections 11, 14, 15, 22, 23, 26, 27, 28, 33, 34, 35, 36.

The following special features are known to occur on or near the site(s) and may be impacted by the project. Federally listed threatened or endangered species (marked with an asterisk *) may be affected by the project. Please contact the U.S. Fish and Wildlife Service, 2651 Coolidge Road, East Lansing, 48823 (517-351-2555) for information on federal regulations that apply to these species.

Arrowhead	**(state threatened)**	***Sagittaria montevidensis***	**Sec. 11, 15, 28**
Water willow	**(state threatened)**	***Justicia americana***	**Sec. 14**
American lotus	**(state threatened)**	***Nelumbo lutea***	**Sec. 15, 28, 32**
Yerba-de-tajo	**(special concern)**	***Eclipta prostrata***	**Sec. 11**
Swamp rose mallow	**(special concern)**	***Hibiscus moscheutos***	**Sec. 14**

Frank's sedge	**(special concern)**	***Carex frankii***	**Sec. 33**
Sedge	**(special concern)**	***Carex hyalinolepis***	**Sec. 15**
Round-fruited St. John's wort	**(special concern)**	***Hypericum sphaerocarpum***	**Sec. 15**
King rail	**(state endangered)**	***Rallus elegans***	**Sec. 33**
Eastern fox snake	**(state threatened)**	***Elaphe vulpina gloydi***	**Sec. 11, 15, 27, 33**
Bald eagle*	**(state, fed. threatened)**	***Haliaeetus leucocephalus***	**Sec. 26**
Silver chub	**(special concern)**	***Hybopsis storeriana***	**Sec. 14**
Maumee Bay Environmental Area			**Sec. 34**

The project site appears to include suitable habitat for the above listed threatened/endangered species. Potential impacts of the project that would likely negatively affect this/these species include [for example: alteration of wetland hydrology, removal of forest canopy, direct destruction of species, disturbance of critical habitat,...].

Because this project may affect protected species, **clearance from this office in the form of a "No Effect" statement will be needed before work on this project begins.** To obtain an evaluation for project clearance, please provide at least one of the following to this office:

1. Documentation of the presence/absence of the species' suitable habitat, described above, on the project site (for example, habitat delineation maps, aerial and/or ground photos, or a written statement from a knowledgeable source).

2. Documentation of whether or not the impacts of concern described above will occur, either directly or indirectly, because of this project.

3. Results from a complete and adequate survey showing whether or not the above listed species are present in the affected project area. Guidelines for conducting surveys can be obtained from this office on request.

Thank you for your advance coordination in addressing the protection of Michigan's Natural Resource Heritage. If you have further questions, please call me at 517-373-1263.

Sincerely,

Lori G. Sargent

Lori G. Sargent
Endangered Species Specialist
Wildlife Division

LGS:jao

APPENDIX A-2

Request Letter to ODNR, Division of Natural Area and Preserves and Response

Hull & Associates, Inc.

onroe Street
Toledo, Ohio 43606
(419) 241-7171
Fax (419) 241-3117

December 9, 1997

Ohio Department of Natural Resources
Division of Natural Areas and Preserves
Heritage Data Services
1889 Fountain Square Court
Building F-1
Columbus, Ohio 43224

RE: Request for Available Natural Heritage, and Threatened and Endangered Species Information
WTP004T.008

Dear Reviewer:

Hull & Associates, Inc. is currently collecting baseline ecological information as part of a Preliminary Environmental Assessment (Study) of the Woodtick Peninsula and surrounding area. The approximate boundary of the study area occurring within Ohio (i.e., Maumee Bay) is shown on the attached map. The preliminary study is being conducted as part of a feasibility study investigating beneficial use and management of dredged sediments originating within and near the study area.

This letter serves as a written request for information from your agency on any and all documented threatened and endangered species occurring within the study area; specific locations for such species within the defined area would also be helpful, if available. We would also like to be informed if any historic area or natural areas are located within the project boundaries.

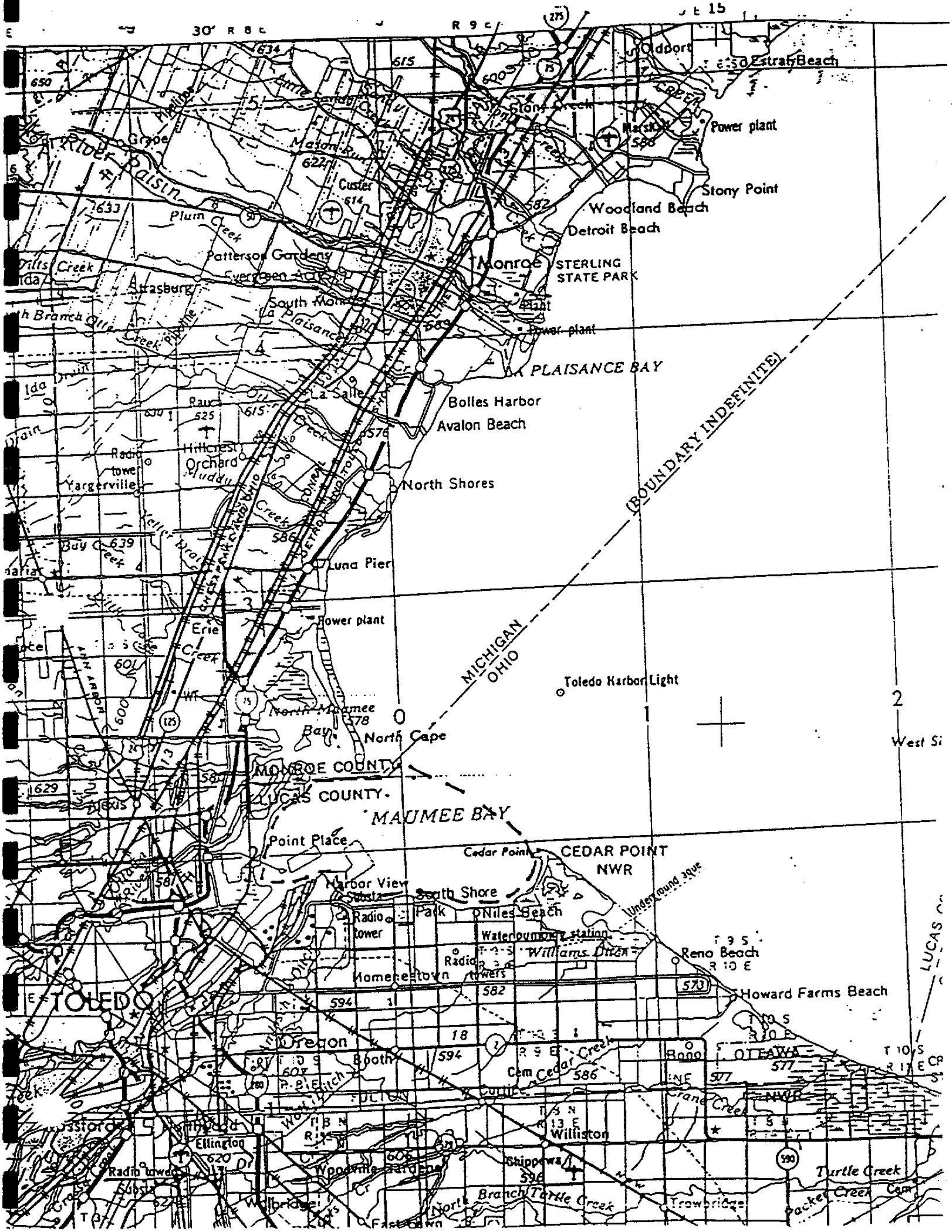
Thank you in advance for your attention to this request. Please call either of the undersigned with questions, or if you need more information.

Sincerely,

Keith A. Carr,
Environmental Biologist

Joseph M. Jersak, Ph.D., CPSS

cc: Scott Lockhart, P.E., Hull & Associates, Inc. (w/attachment)



Oldport
Estral Beach
Stony Creek
Power plant
Stony Point
Woodland Beach
Detroit Beach
Grape
River Raisin
Custer
Plum Creek
Patterson Gardens
Monroe
STERLING STATE PARK
Strasburg
South Monroe
La Plaisance
Power plant
PLAISANCE BAY
La Salle
Bolles Harbor
Avalon Beach
Hillcrest Orchard
Yargerville
North Shores
(BOUNDARY INDEFINITE)
Luna Pier
Power plant
Erie
MICHIGAN
OHIO
Toledo Harbor Light
North Maumee Bay
North Cape
West Si
MONROE COUNTY
LUCAS COUNTY
MAUMEE BAY
Point Place
Cedar Point
CEDAR POINT NWR
Harbor View
South Shore Park
Niles Beach
Radio tower
Williams Ditch
Reno Beach
Howard Farms Beach
TOLEDO
Oregon
Booth
Cedar Creek
Bono
OTTAWA NWR
Crane Creek
Williston
Ellington
Radio tower
Woodville Gardens
Shippewa
North Branch Turtle Creek
Turtle Creek
Packer Creek
Trowbridge
Walbridge
LUCAS

DATA REQUEST

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF NATURAL AREAS AND PRESERVES
HERITAGE DATA SERVICES
1889 FOUNTAIN SQUARE COURT, BUILDING F-1
COLUMBUS, OHIO 43224
PHONE: 614-265-6453; FAX: 614-267-3096

INSTRUCTIONS:
Please fill out both sides of this data request form, sign it and return it to the address or fax number listed above along with: (1) a letter formally requesting data and describing your project, and (2) a map detailing the boundaries of your study area. A photocopy from the pertinent portion of a USGS 7.5 minute topographic map is preferred but other maps are acceptable. Our turnaround time is two weeks, although we can often respond more quickly.

FEES:
Fees are determined by the amount of time it takes to complete your project. The charge is $25.00 per ½ hour with a ½ hour minimum. We can perform a data search manually or by computer. The Heritage Data Services staff will determine the most cost-efficient method of doing your search. A cost estimate can be provided upon request. Unless otherwise specified, an invoice will accompany the data services response.

****

This request is being submitted by: ☐ fax ☒ mail ☐ both

Date: 12/9/97

Your Agency/Organization: Hull & Associates, Inc.

Your Name/Title: Keith A. Carr, Environmental Biologist

Address: 2726 Monroe Street

City/State/Zip: Toledo, Ohio 43606

Phone/Fax: (419) 241-7171/ (419) 241-3117

Project Name/Number: Project WTP004

Project is located on the following USGS 7.5 minute topographic map(s):

Oregon, Ohio - Michigan & Reno Beach, Ohio

If there is a program or contracting agency requiring this information, please give the name and phone number of a contact person:

DNR 5203
REV 9/97

The Natural Heritage Data Base contains records for the categories of species and features listed below. Check the appropriate boxes to indicate your selection.

PLANTS:
- ☐ Federal Status Only
- ☐ State Legal Status Only
- ☐ Rare (non-legal status)
- ☒ All of the above

ANIMALS:
- ☐ Federal Status Only
- ☐ State Legal Status Only
- ☐ Rare (non-legal status)
- ☒ All of the above

PLANT COMMUNITIES:
- ☒ All
- ☐ Wetlands Only
- ☐ Other_____

OTHER FEATURES:
- ☐ Geologic Features
- ☐ Breeding/Non-breeding Animal Concentrations
- ☐ Champion Trees
- ☐ State Nature Preserves and Natural Areas
- ☐ State Wild, Scenic and Recreational Rivers
- ☐ State Parks, Forests, Wildlife Areas
- ☒ All of the above
- ☐ Other_____

Besides name, location and status, specify any additional information you need:

If any of the above are located within the project area, please specify USGS section number if possible.

The area you want searched:
- ☒ study area as outlined on the map
- ☐ study area plus ½ mile radius
- ☐ study area plus 1 mile radius
- ☐ other_____

How will the information be used:

The information will be used to complete a preliminary environmental assessment.

The information supplied above is complete and accurate. Any material supplied by the Natural Heritage Data Base will not be published without prior written permission and without crediting the Division of Natural Areas and Preserves as the source of the material.

Your Signature Keith C. Cain

OHIO Department of Natural Resources

DIVISION OF NATURAL AREAS & PRESERVES
1889 Fountain Square, Columbus, OH 43224
(614) 265-6453; (614) 267-3096 FAX

George V. Voinovich • *Governor*
Donald C. Anderson • *Director*

December 15, 1997

Keith Carr
Hull & Associates, Inc.
2726 Monroe St.
Toledo, OH 43606

Dear Mr. Carr:

I have reviewed our Natural Heritage maps and files for the Ohio portion of the Woodtick Peninsula study area (WTP004T.008) on the Oregon and Reno Beach Quads. The numbers on the list below correspond to the areas marked in red on the accompanying map. A dot represents an exact location, a triangle a general location within a square mile, and a square a general location within greater than a square mile. Exactness is determined by the accuracy and detail of information provided by the surveyor. Common name, scientific name and status are given for each species.

OREGON QUAD

1. Bay Shore Power Station Water Intake
   Percina copelandi - Channel Darter, threatened
   Ichthyomyzon unicuspis - Silver Lamprey, threatened
   Hiodon tergisus - Mooneye, special interest

2. *Sterna hirundo* - Common Tern, endangered
   Ring-billed Gull Colony (breeding animal concentration)
   Herring Gull Colony (breeding animal concentration)

3. *Percina copelandi* - Channel Darter, threatened

Although information directly on shore was not requested, please note the location of Maumee Bay State Park, Mallard Club Wildlife Area and Cedar Point National Wildlife Refuge along the shoreline east of the mouth of the Maumee River. Please notify me if you would like to add these areas to your request. There would be an additional charge to provide the data for these areas. I have enclosed a map showing the location of Maumee Bay State Park. Mallard Club Wildlife Area, formerly part of Maumee Bay State Park, is located between the state park and the Cedar Point National Wildlife Refuge.

There are no existing or proposed state nature preserves or scenic rivers in the project study area. We are also unaware of any geologic features, non-breeding animal concentrations, champion trees, or state parks, forests or wildlife areas within the project study area.

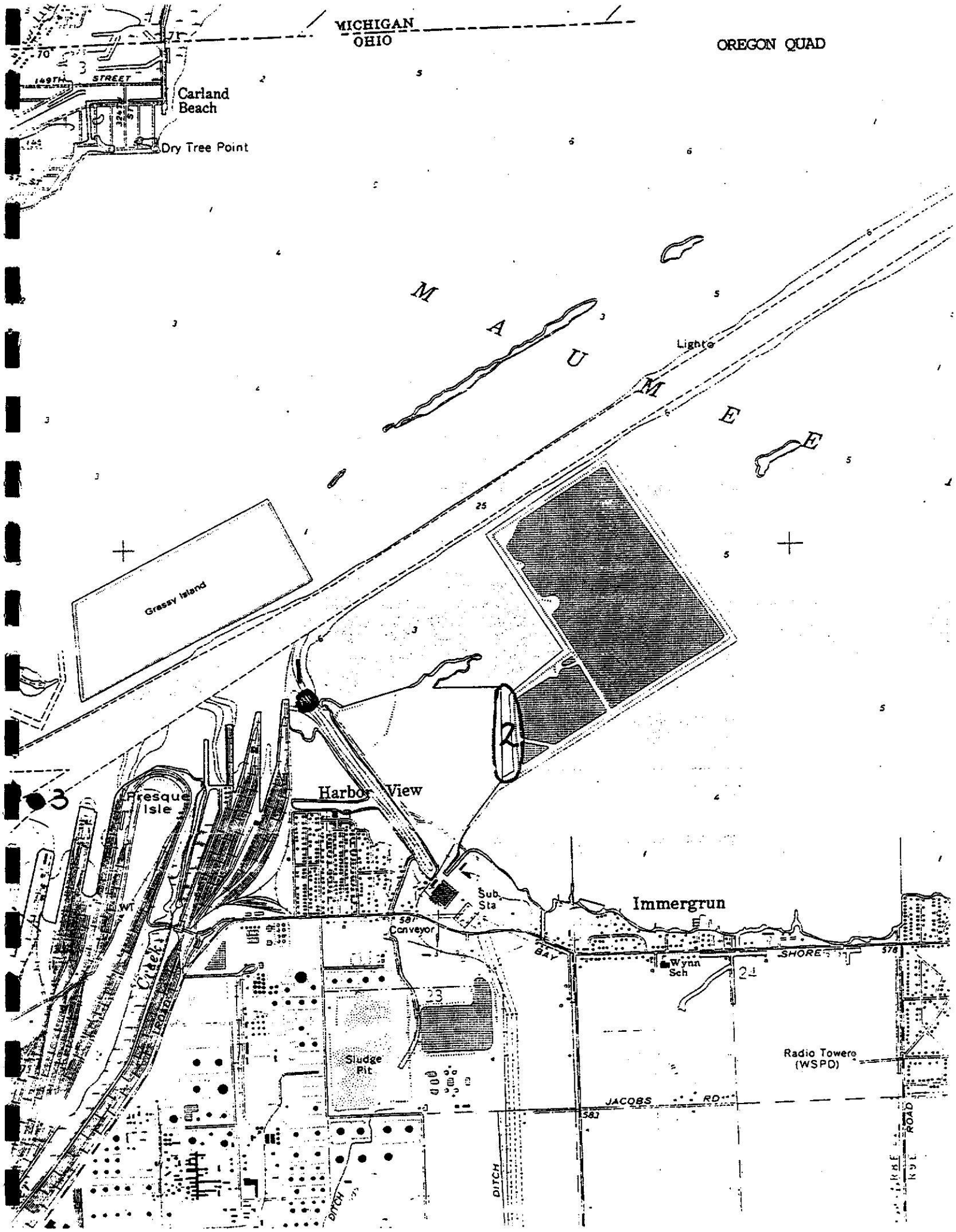
Our inventory program has not completely surveyed Ohio and relies on information supplied by many individuals and organizations. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Please note that although we inventory all types of plant communities, we only maintain records on the highest quality areas. Also, we do not have data for all Ohio wetlands. For additional information on wetlands and National Wetlands Inventory maps, please contact Jim Given in the Division of Real Estate and Land Management at 614-265-6770.

Please contact me at 614-265-6818 if I can be of further assistance.

Sincerely,

Debbie Woischke

Debbie Woischke, Ecological Analyst
Division of Natural Areas & Preserves


MICHIGAN
OHIO
OREGON QUAD
149TH STREET
Carland Beach
Dry Tree Point
MAUMEE
Lights
Grassy Island
Presque Isle
Harbor View
Sub Sta
Immergrun
581 Conveyor
BAY
SHORE
576
Wynn Sch
24
WT
Creek
Sludge Pit
Radio Towers (WSPD)
JACOBS RD
583
DITCH
ROAD

INVOICE

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF NATURAL AREAS & PRESERVES
NATURAL HERITAGE DATA SERVICES
1889 FOUNTAIN SQUARE COURT
COLUMBUS, OHIO 43224-1331
(614) 265-6453

User Identification

Name: Hull & Associates, Inc.
Contact: Keith Carr
Address: 2726 Monroe St.
Toledo, OH 43606

Payment due by: 1-15-1998

Billing Date: 12-15-1997	**Invoice Number:** Nº 3644	
Project(s):	**Heritage Services:**	**Cost:**
Woodtick Peninsula study area, Oregon & Reno Beach Quads, WTP004T.008	manual search, data provided ½ hr. @ $25.00/½ hr.	$25.00
	TOTAL	$25.00

Please remit check or money order payable to "Division of Natural Areas & Preserves" within 30 days. If the invoice is not paid within 30 days, the amount will be certified with the Ohio Attorney General. Return one copy of invoice with payment.

DNR 5216

Maumee Bay State Park

1400 Park Road #1
Oregon, Ohio 43618
Park Admin. Office - (419) 836-7758
Camp Office - (419) 836-8828
FAX - (419) 836-8711

printed on recycled paper
An Equal Opportunity Employer
Division of Parks & Recreation
Fountain Square • Columbus, Ohio 43224
George V. Voinovich, Governor
Frances S. Buchholzer, Director

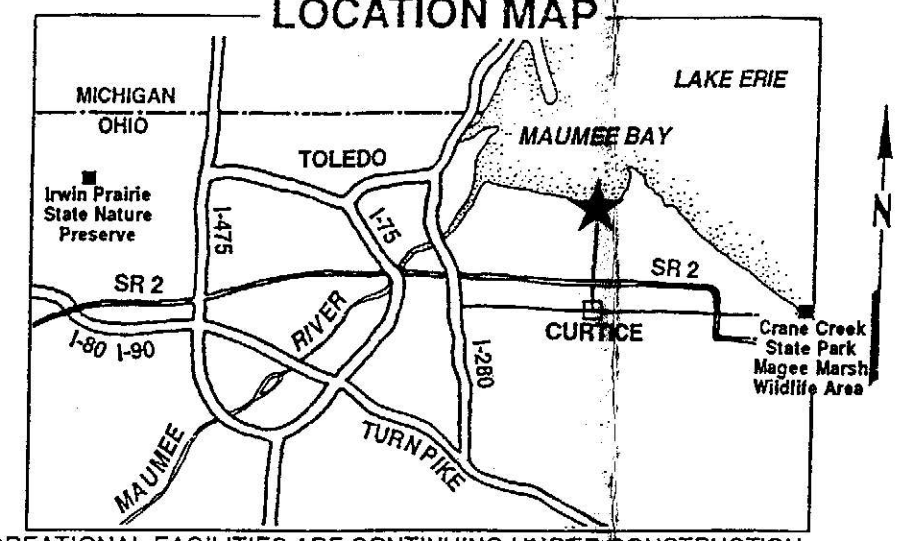
OHIO Department of Natural Resources

Maumee Bay Resort (Quilter Lodge)
1750 Maumee Bay park Road #2
Oregon, OH 43618
(419) 836-1466
(800) 282-7275 Reservations

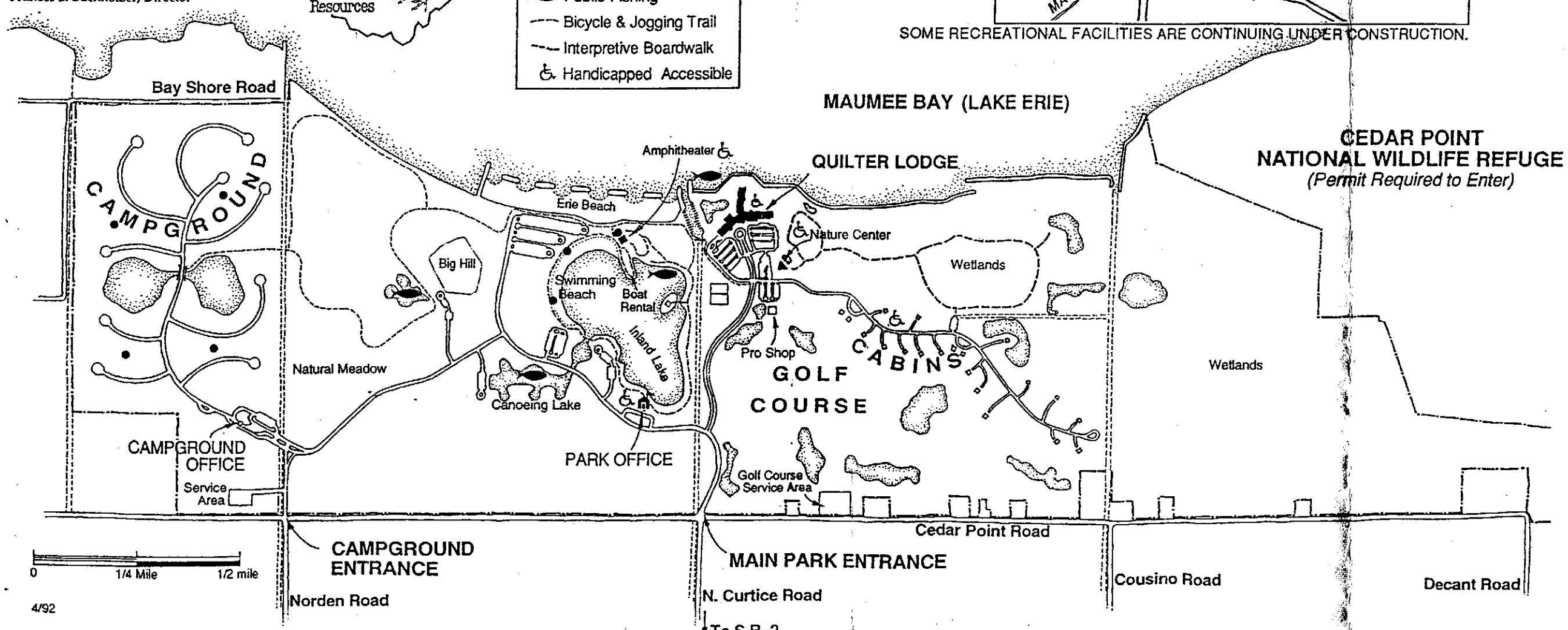
LEGEND

- Park Office
- Ditch
- Showerhouse/Bathroom
- Park Boundary
- Public Fishing
- Bicycle & Jogging Trail
- Interpretive Boardwalk
- Handicapped Accessible

LOCATION MAP



SOME RECREATIONAL FACILITIES ARE CONTINUING UNDER CONSTRUCTION.



4/92

Nature of the Area

Maumee Bay State Park is a tribute to Lake Erie. This precious gift is one of the largest bodies of fresh water in the world and it reflects the diverse natural heritage of Ohio.

The history of Lake Erie began with the glacial period known as the Pleistocene. Massive sheets of ice gouged and scoured the bedrock of Ohio. Testimony of the ice's force is found throughout the lake area. Small scratches in the rock surface known as glacial striations are common, while major grooves are rare but awesome.

The wetlands of the Maumee Bay area offer a vivid array of natural wonders. Wetlands contain more species of wildlife than any other habitat type, including: fox snake, northern water snake, painted turtle, chorus frog, green frog, spotted salamander, raccoon, muskrat, dragonfly, caddis fly, and water-striders. Over 300 species of birds have been recorded with shorebirds such as snipe, great blue heron, common gallinule and ring-billed gulls residing with waterfowl including Canada geese, pintails, redheads, and ruddy ducks. Songbirds include the red-winged blackbird, yellow warbler, killdeer and swamp sparrow. Spring migration brings many others including the colorful warblers. The plant life is diverse as well. Cattails, buttonbush, phragmites, bur-reed, cottonwood and black willow are just a few examples of the marsh plants at the park.

Several prairies exist in the park that offer interpretive experiences for those visitors interested in the various species and ecosystems found there.

Ring-necked pheasants densely populate the meadow areas of the park.

The Lake Erie shoreline sets the stage for the comeback of the 'd eagle in Ohio. Nesting pairs have been reported recently in .nio with the majority being in the western basin of Lake Erie.

History of the Area

Thirteen thousand years ago, Lake Erie was much larger than it is today – stretching from western New York to Fort Wayne, Indiana. As the lake receded to its present size, a great flat plain was formed (120 miles long and 30-40 miles wide). This area became known as the Great Black Swamp due to the color of the soil and dark shade beneath the trees. The Indians settled only near the well-drained lands beside the Maumee River and its tributaries.

For many years, the swamp was a tremendous barrier to western settlement. Most settlers traveled by boat on Lake Erie to reach southern Michigan. Major cities of the area circled the perimeter of the swamp; none lay within it except Bowling Green. In 1859, a law was passed providing for a system of public ditches to drain the land. By 1870, the swamp was still only half cleared. Eventually, after a period of intense lumbering and draining, the swamp had nearly vanished and the area became a major agricultural region.

Acquisition of park lands began in 1974 with matching funds from the Land and Water Conservation Fund. Maumee Bay officially became a state park in 1975.

Resort Lodge

Ohio's newest state park lodge opened in May of 1991. Quilter Lodge overlooking the Maumee Bay of Lake Erie offers 120 guest rooms each with balcony. Lodge features include racquetball courts, game room, saunas, whirlpools, indoor and outdoor pools, conference and meeting rooms, dining room and lounge, and a snack bar.

Resort Cottages

The deluxe cottages at the park are nestled among scenic wetlands and a picturesque golf course. The cottages are equipped with a gas fireplace, heating and air conditioning, fully equipped kitchen, living area, two bedrooms with a loft, or four bedrooms. Cottage guests may use all lodge facilities.

Camping

The park boasts a modern family campground with 256 sites. The campground is equipped with showerhouses, flush toilets and electricity. The campsites are open and spacious and border natural meadows and ponds which are open to fishing for campers only. Pet camping is also permitted. Rent-A-Camp units consisting of a tent, dining fly, cooler, cook stove and other equipment can be rented during the summer months. Modern showerhouses and playground equipment add to the camper's convenience.

Trails

Developed hiking trails in the park include the Mouse Trail, a 3-mile diverse trail winding through meadows and young woodlands, and several miles of paved combination trails for bicycling and cross-country skiing. Hikers will discover acres of meadow, marshland and woodland. A new boardwalk traversing swamp and marsh wetlands has interpretive signs, an observation blind and tower, and wheelchair accessible loop.

Picnicking

Picnic areas with tables and grills can be found adjacent to the beach areas.

Hunting and Fishing

Lake Erie known as the "walleye capital of the world" offers some of the best fishing opportunities in the midwest. Great catches of walleye, channel catfish, freshwater drum, smallmouth bass and yellow perch delight the fisherman. The man-made inland lake near the lodge offers good pan fishing opportunities. Bow hunting for deer and gun hunting for waterfowl when in season is permitted in designated areas. A valid Ohio hunting and fishing license is required. All wildlife regulations apply.

Winter Sports

This park invites you to the thrills and spills of winter activity. Cross-country skiing, ice skating, winter nature walks, and sledding on the area's top rated sledding hill await you.

Boating

Lake Erie offers unlimited opportunities for boaters. A 57-acre inland lake in the park is suitable for sailing, canoeing and other non-motorized boat use. Canoes, paddle boats, row boats and sail boats are available for rent.

Swimming

In addition to the lodge's pools (for lodge and cabin guests), the park boasts two sand beaches. One beach is located on the Lake Erie shore while the other lines the park's inland lake. A concession area and changing booths are provided. A large lakeside amphitheater lies between the two beaches.

Golfing

Maumee Bay's unique 18-hole "Scottish Links" style golf course has low, rolling mounds, bent grass fairways, greens and tees, numerous sand bunkers and ponds. A golf pro-shop is in operation with a PGA certified professional on staff. Lessons and golf outings can be arranged.

Nature Center

A state-of-the-art nature center staffed by a year-round naturalist is located in the park. The Trautman Nature Center is equipped with inter-active displays, a programming auditorium, research laboratory and viewing windows. In addition, a remote video monitoring system transmits wetland activity back to the center so that persons of all abilities can experience a wetland. A boardwalk trail is adjacent to the nature center.

Area Attractions .

Three national wildlife refuges exist in Ohio and they are all within a short distance of the park. Information on Cedar Point, West Sister and Ottawa National Wildlife Refuges may be obtained by calling (419) 898-0014.

Crane Creek Wildlife Experiment Station and Magee Marsh State Wildlife Area are located 15 miles east of Maumee Bay.

Adjacent to the wildlife area is Crane Creek State Park boasting one of the state's largest beaches and day-use facilities. It sports a 1/2 mile long boardwalk through marshes and is known as an excellent birdwatching location. Two state nature preserves, Louis W. Campbell and Irwin Prairie, are operated by ODNR's Division of Natural Areas and Preserves and are located within an hour drive of the park.

Facilities

Resource		
	Land, acres	1850
	Water, acres	L. Erie
	Nearby Wildlife Area, acres	2000
Day-use Activities	Fishing	•
	Hunting	•
	Hiking Trails, miles	10
	Picnicking	•
	Swimming Beach, feet	4000
	Beach Concession	•
	Nature Center	•
	Summer Nature Program	•
	Programs, year-round	•
Boating	Boat Rental	•
	Boating Limits	EMO
Winter Recreation	Sledding	•
	Ice Skating	•
	Cross-Country Skiing	•
Resort Facilities	Resort Cottages	20
	Lodge Rooms, #	120
	Restaurant	•
	Golf Course, # holes	18
	Tennis	•
	Game Room	•
	Indoor Swimming Pool	•
	Outdoor Swimming Pool	•
Camping	Campsites, #	256
	Campsites with Elec., #	256
	Pet Area	•
	Showers	•
	Flush Toilets	•
	Dump Station	•
	Rent-A-Camp Sites, #	3

Maumee Bay

State Park

Maumee Bay State Park offers not only the finest of recreational facilities in the Midwest but also a unique natural environment created by the convergence of the land and Lake Erie. The lodge, cabins and golf course are nestled among scenic meadows, wet woods and lush marshes teeming with wildlife. The balance of recreational facilities with the natural world gives visitors a diverse experience in a coastal environment.

APPENDIX A-3

Request Letter to Michigan State Historic Preservation Office and Response

Hull & Associates, Inc.

aarue Street
Toledo, Ohio 43606
(419) 241-7171
Fax (419) 241-3117

December 11, 1997

Ms. Martha MacFarlane
Environmental Review Coordinator
State Historic Preservation Office
Michigan Historical Center
717 West Allegan Street
Lansing, MI 48918-1800

RE: Request for Historical Review of Project Area by the Environmental Review Coordinator
WTP004T.010

Dear Ms. MacFarlane:

This letter serves as a formal request from Hull & Associates, Inc. to your office to perform a review for our project to determine if any areas of historical significance are located within the project area. Listed below are our responses to the items you require to perform this review.

- New or Old Project: This project is new and this is our first request for information from your office.
- Project Name: Beneficial Use and Management of Toledo Harbor Channel Dredge Sediments.
- Project Location: Within Erie Township, Monroe County, Michigan.
- Maps of Project Location: See Attached.
- Project Work Description: Our project involves developing plans for constructing a Confined Disposal Facility (CDF) to contain dredged sediments. The CDF would be located on the lakeward side of the Woodtick Peninsula and thus would provide for protection of the peninsula from further erosion, as well as protecting wetland and aquatic ecosystems associated with the peninsula.
- Project Impact Statement: We anticipate no significant negative impacts to ecological aspects of the project area as a result of CDF construction and operation; on the contrary, we anticipate such a project would greatly benefit the Woodtick Peninsula and its related ecosystems.

- Historic Significance and Context: In our research thus far, the only areas of historical significance within the project area appear to be Indian and Gard Islands. Again, we believe that CDF construction and operation would provide for protection of such historic resources.

- Date of Existing Building(s) Construction: Not Applicable.

- Photographs of Properties: We are not aware of any such structures occurring on or immediately adjacent to the Woodtick Peninsula, with the exception of Consumers Power located at the North end of the Peninsula.

- Federal Funding Source: This project was funded through a grant from the Ohio Water Development Authority.

- Agency or Consultant Contact Person and Phone Number: Not Applicable.

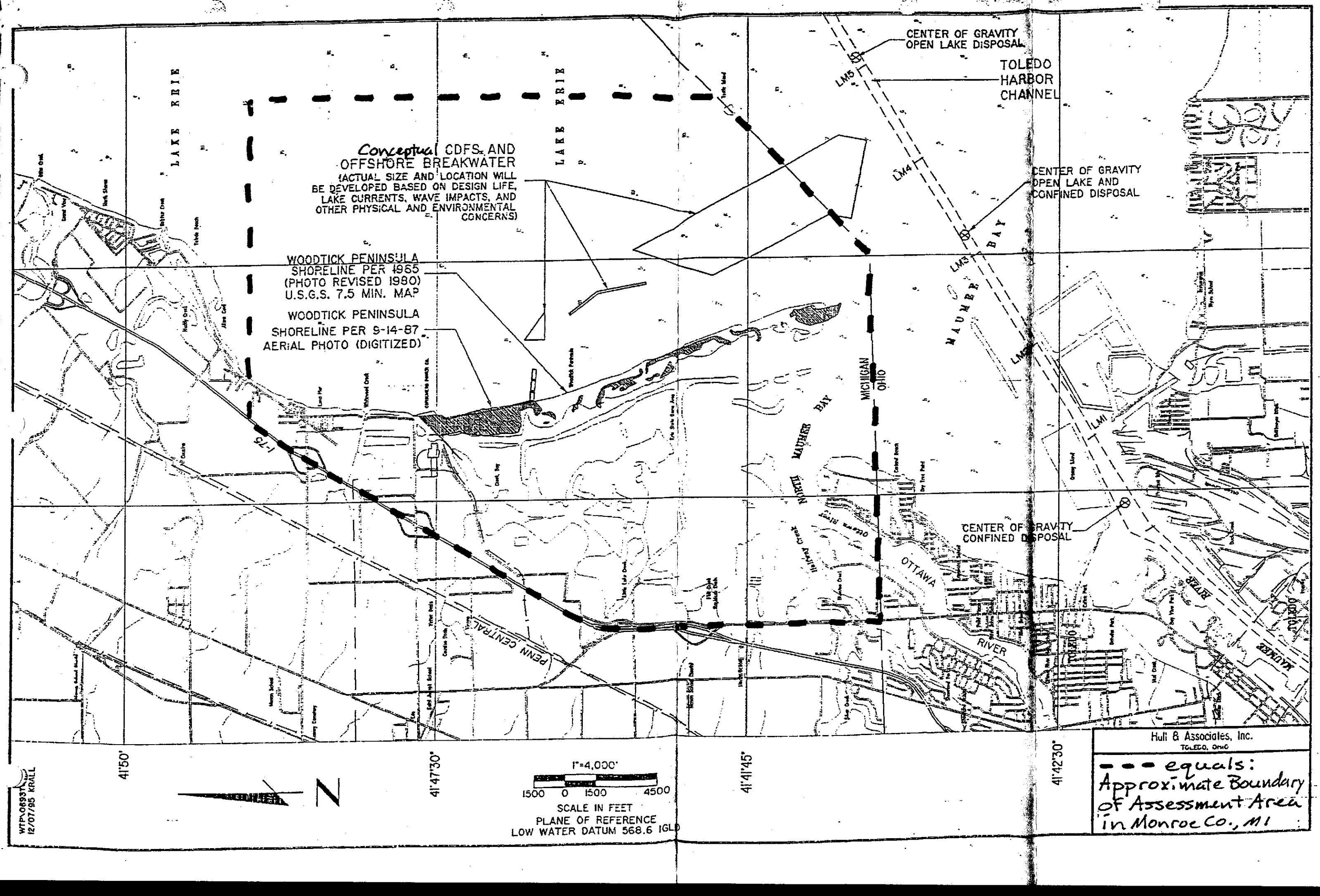
We would like to thank you in advance for your attention to this request. Please feel free to call either of the undersigned with questions, or if you need more information.

Sincerely,

Keith A. Carr
Environmental Biologist

Joseph M. Jersak, Ph.D., CPSS

cc: Scott Lockhart, P.E., Hull & Associates, Inc. (w/attachment)


LAKE ERIE
LAKE ERIE
Conceptual CDFS AND OFFSHORE BREAKWATER
(ACTUAL SIZE AND LOCATION WILL BE DEVELOPED BASED ON DESIGN LIFE, LAKE CURRENTS, WAVE IMPACTS, AND OTHER PHYSICAL AND ENVIRONMENTAL CONCERNS)
WOODTICK PENINSULA SHORELINE PER 1955 (PHOTO REVISED 1980) U.S.G.S. 7.5 MIN. MAP
WOODTICK PENINSULA SHORELINE PER 9-14-87 AERIAL PHOTO (DIGITIZED)
CENTER OF GRAVITY OPEN LAKE DISPOSAL
TOLEDO HARBOR CHANNEL
LM5
LM4
LM3
LM2
LM1
CENTER OF GRAVITY OPEN LAKE AND CONFINED DISPOSAL
MAUMEE BAY
MICHIGAN
OHIO
CENTER OF GRAVITY CONFINED DISPOSAL
OTTAWA RIVER
PENN CENTRAL
I-75
41°50'
41°47'30"
41°41'45"
41°42'30"
1"=4,000'
1500 0 1500 4500
SCALE IN FEET
PLANE OF REFERENCE
LOW WATER DATUM 568.6 IGLD
N
WTP\06931
12/07/95 KRALL
Hull & Associates, Inc.
TOLEDO, OHIO
--- equals: Approximate Boundary of Assessment Area in Monroe Co., MI

MICHIGAN DEPARTMENT OF STATE
Candice S. Miller, Secretary of State
Lansing, Michigan 48918-0001

STATE HISTORIC PRESERVATION OFFICE
Michigan Historical Center
717 West Allegan Street
Lansing, Michigan 48918-1800

January 14, 1998

MR KEITH CARR
HULL AND ASSOCIATES INC
2726 MONROE STREET
TOLEDO OH 43606

RE: ER-98-205 Beneficial Use and Management of Toledo Harbor Channel Dredge, Erie Township, Monroe County

Dear Mr. Carr:

Under the authority of the National Historic Preservation Act of 1966, as amended, we have reviewed the above-cited project at the location noted above. Based on the information provided for our review it is the opinion of the State Historic Preservation Officer (SHPO) that no historic properties exist within the area of potential effects for the project.

Please maintain a copy of this letter with your environmental review record for this project. If the scope of work changes in any way, or if artifacts or bones are discovered, please contact this office immediately. This letter evidences your compliance with 36 CFR 800.4, "Identifying Historic Properties," and the fulfillment of your responsibility to notify this office under 36 CFR 800.4(d), "When no historic properties found."

If you have any questions, please contact Martha MacFarlane, Environmental Review Coordinator, at (517) 335-2721. Thank you for this opportunity to review and comment.

Sincerely,

Brian D. Conway
State Historic Preservation Officer

BDC:JRH:JCB:cm

APPENDIX A-4

Request Letter to USFWS Ecological Services and Response

Hull & Associates, Inc.

onroe Street
Toledo, Ohio 43606
(419) 241-7171
Fax (419) 241-3117

December 17, 1997

Mr. Charles Wooley
Field Supervisor
U.S. Fish & Wildlife Service
Ecological Services
2651 Coolidge Road
East Lansing, MI 48823

RE: Request for Available Information on Threatened and Endangered Species
WTP004T.011

Dear Mr. Wooley:

Hull & Associates, Inc. is currently collecting baseline ecological information as part of a preliminary Environmental Impact Assessment (Study) of the Woodtick Peninsula and surrounding area. The approximate boundary of the study area occurring within southeast Michigan (i.e., Monroe County) and a small part of Ohio (i.e., Lucas County), is shown on the attached map. The preliminary study is being conducted as part of a feasibility study investigating beneficial use and management of dredged sediments originating from within and near the study area.

This letter serves as a written request for information from your agency on any and all documented threatened and endangered species occurring within the study area; specific locations for such species within the defined area would also be helpful, if available.

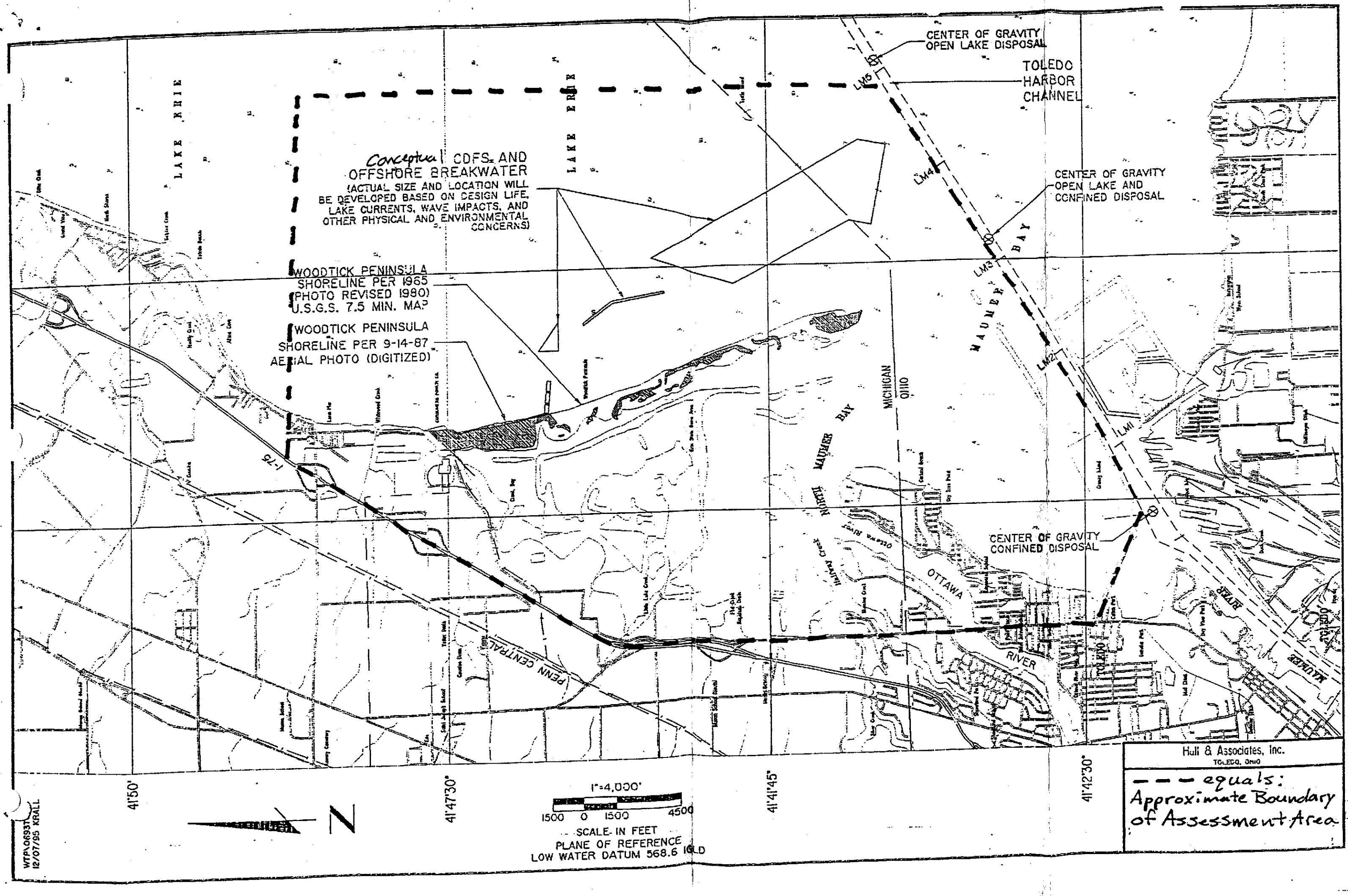
Thank you in advance for your attention to this request. Please call either of the undersigned with questions, or if you need more information.

Sincerely,

Keith A. Carr,
Environmental Biologist

Joseph M. Jersak, Ph.D., CPSS

cc: Scott Lockhart, P.E., Hull & Associates, Inc. (w/attachment)


LAKE ERIE
LAKE ERIE
CENTER OF GRAVITY
OPEN LAKE DISPOSAL
TOLEDO
HARBOR
CHANNEL
LM5
LM4
LM3
LM2
LM1
CENTER OF GRAVITY
OPEN LAKE AND
CONFINED DISPOSAL
Conceptual CDFs AND
OFFSHORE BREAKWATER
(ACTUAL SIZE AND LOCATION WILL
BE DEVELOPED BASED ON DESIGN LIFE,
LAKE CURRENTS, WAVE IMPACTS, AND
OTHER PHYSICAL AND ENVIRONMENTAL
CONCERNS)
WOODTICK PENINSULA
SHORELINE PER 1965
(PHOTO REVISED 1980)
U.S.G.S. 7.5 MIN. MAP
WOODTICK PENINSULA
SHORELINE PER 9-14-87
AERIAL PHOTO (DIGITIZED)
MAUMEE BAY
MICHIGAN
OHIO
MAUMEE BAY
CENTER OF GRAVITY
CONFINED DISPOSAL
OTTAWA
RIVER
TOLEDO
MAUMEE
RIVER
I-75
PENN CENTRAL
41°50'
41°47'30"
41°41'45"
41°42'30"
N
1"=4,000'
1500 0 1500 4500
SCALE IN FEET
PLANE OF REFERENCE
LOW WATER DATUM 568.6 IGLD
Hull & Associates, Inc.
TOLEDO, OHIO
--- equals:
Approximate Boundary
of Assessment Area
WTP\06931
12/07/95 KRALL

United States Department of the Interior

FISH AND WILDLIFE SERVICE
East Lansing Field Office (ES)
2651 Coolidge Road
East Lansing, Michigan 48823

IN REPLY REFER TO:

December 29, 1997

Keith Carr
Hull & Associates, Inc.
2726 Monroe St.
Toledo, OH 43606

Re: Endangered Species List Request, Preliminary Environmental Impact Assessment, Woodtick Peninsula, Monroe County, Michigan

Dear Mr. Carr:

This responds to your letter of December 17, 1997 requesting U.S. Fish and Wildlife Service (Service) review of threatened and endangered species occurrences in relation to the above referenced site.

The Service has determined that federally listed species pursuant to the Endangered Species Act (Act) of 1973 (as amended), may be present within the project area (Enclosure A). Federally listed species are also afforded protection pursuant to State of Michigan Public Act 204 (Endangered Species Act of 1974).

Under Section 7 of the Act and its implementing regulations (50 CFR 402.14(a)), the federal action agency is responsible for reviewing its actions at the earliest possible time to determine whether any action may affect listed species or critical habitat. Should the action agency determine that the project may affect listed species, then consultation with the Service is required. See enclosure B for the federal action agency's compliance requirements. The Service believes potential for adverse effects on federally listed species is sufficient that Section 7 consultation is advisable for this action.

Section 7(d) of the Act underscores the requirement that the federal agency, or their designee, or the permit or license applicant shall not make any irreversible or irretrievable commitment of resources during the consultation period which, in effect, would deny the formulation or implementation of reasonable alternatives regarding their actions on any endangered or threatened species.

If the project is modified or new information about the project becomes available that indicates additional listed or proposed species may be present and/or affected, consultation with this Service office should be reinitiated. The Service further advises that should any other species occurring in the project area become Federally listed or proposed, the Federal action agency for the work would also be required to reevaluate its responsibilities under the Act. Since threatened and endangered species data is continually updated, the Service suggests the lead federal agency annually request an updated Federal list of the species occurring in the project area.

The Service recommends you contact the State Endangered Species Coordinator, Mr. Tom Weise (Michigan Department of Natural Resources, Wildlife Division, phone: 517/337-1263) to determine the presence of state listed species. Federal species of concern may be State of Michigan listed species. The State Endangered Species Act requires permits in advance of any work that could potentially damage, destroy, or displace State-listed species.

The opportunity to provide comments is appreciated. Any questions can be directed to Tom Eitniear of this office at (517) 351-6283.

Sincerely,

Tom Eitniear

for Charles M. Wooley
Field Supervisor

Enclosures

cc: Michigan Department of Natural Resources, Wildlife Division, Lansing, MI
(Attn: Tom Weise)

Enclosure A

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES THAT MAY OCCUR WITHIN THE AREA OF:

Woodtick Peninsula, Monroe County, Michigan

Common Name	Scientific Name	Status
Bald Eagle	*Haliaeetus leucocephalus*	Threatened

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with U.S. Fish & Wildlife Service (Service) when a federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the federal agency after they have determined if their action may affect (adversely or benefically) a listed species; and

3. Conference with Service when a federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or a adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Major Construction Projects [1]

Requires federal agencies or their designees to prepare a Biological Assessment (BA) for major construction projects. The purpose of the BA is to identify any proposed and/or listed species which is/are likely to be affected by a construction project. The process is initiated by a federal agency in requesting a list of proposed and listed threatened and endangered species. The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with the Service. Sec. 7(d) states agencies shall not make any irreversible or irretrievable commitment of resources during the consultation process which would result in violation of the requirements under Section 7(a)(2). Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should: (1) conduct an onsite inspection of the area to be affected by the proposal which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the Service, state conservation departments, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to: Field Supervisor, U.S. Fish & Wildlife Service, 2651 Coolidge Rd., East Lansing, MI 48823-5202.

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[1] "Major Construction project" means any major federal action which significantly affects the quality of the human environment as referred to in NEPA (requiring an EIS) designed primarily to result in the building or erection of man-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes federal actions such as permits, grants, licenses, or other forms of federal authorization or approval which may result in construction.

APPENDIX A-5

Request Letter to Ohio Historic Preservation Office and Response

Hull & Associates, Inc.

2 roe Street
Toledo, Ohio 43606
(419) 241-7171
Fax (419) 241-3117

February 23, 1998

Mr. Mark Epstein
Department Manager
Ohio Historic Preservation Office
567 E. Hudson Street
Columbus, Ohio 43211

RE: Request for Available Archaeological and Historical Information
WTP004T.014

Dear Mr. Epstein,

Hull & Associates, Inc. is currently collecting baseline ecological information as part of a Preliminary Environmental Assessment (Study) of the Woodtick Peninsula and surrounding area. The approximate boundary of the study area occurring within Ohio (i.e. Maumee Bay) is shown on the attached map. The preliminary study is being conducted as part of a feasibility study investigating beneficial use and management of dredged sediments originating within and near the study area.

This letter serves as a written request for information from your office on any and all documented archaeological or historic areas occurring within the study area; specific locations for such areas within the defined area would also be helpful, if available. To the best of our knowledge there are not any buildings over fifty years old located within our study area.

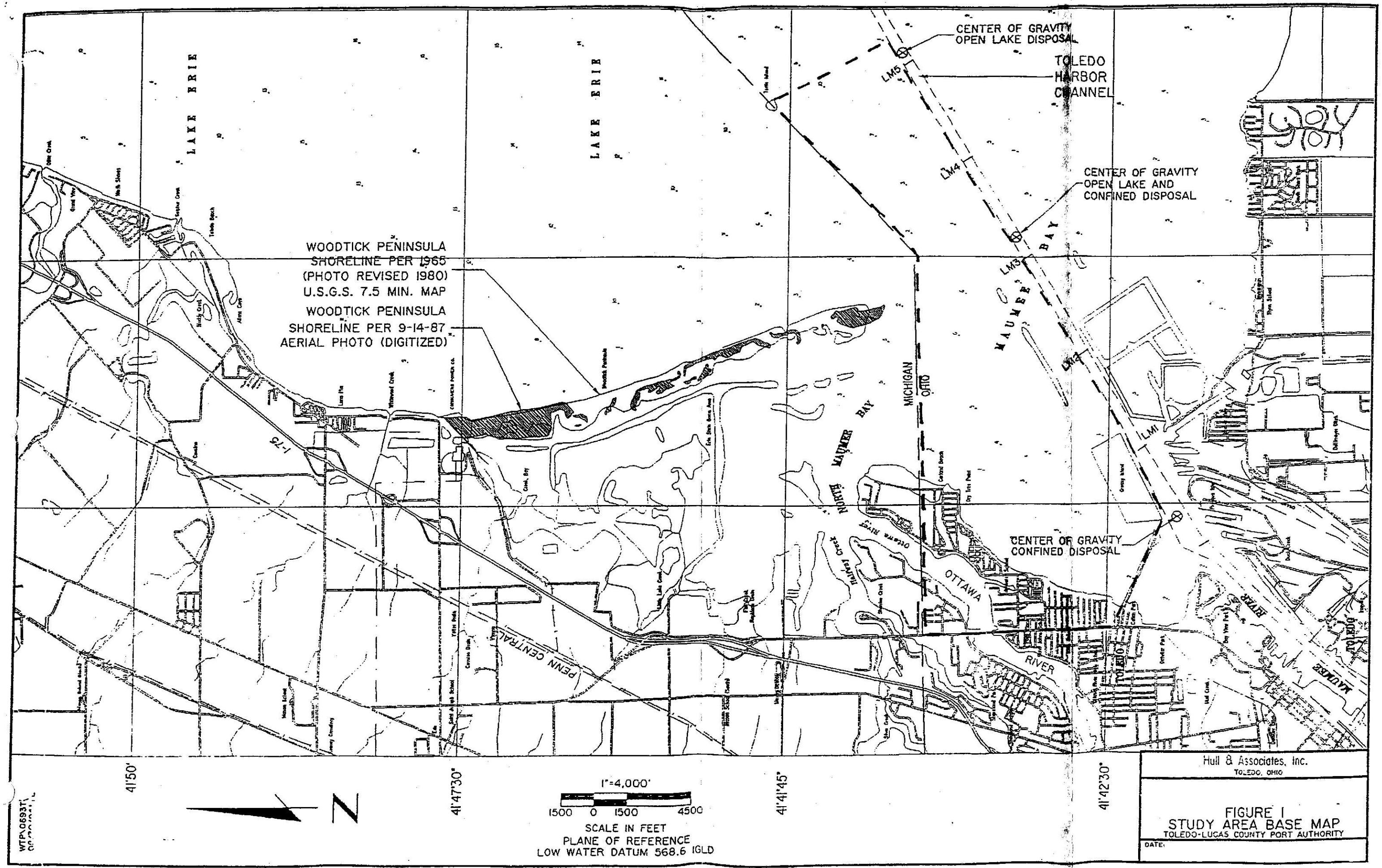
Thank you in advance for your attention to this request. Please call either of the undersigned with questions, or if you need more information.

Sincerely,

Keith A. Carr
Environmental Biologist

Joseph M. Jersak, Ph.D., CPSS

cc: Scott Lockhart, P.E., Hull & Associates, Inc. (w/attachment)



Hull & Associates, Inc.
TOLEDO, OHIO

FIGURE I
STUDY AREA BASE MAP
TOLEDO-LUCAS COUNTY PORT AUTHORITY

DATE:

Ohio Historic Preservation Office

567 East Hudson Street
Columbus, Ohio 43211-1030
614/ 297-2470 Fax: 614/ 297-2496

Visit us at www.ohiohistory.org/resource/histpres/

COPY

OHIO HISTORICAL SOCIETY
SINCE 1885

March 30, 1998

Keith A. Carr
Hull & Associates, Inc.
2726 Monroe Street
Toledo, Ohio 43606

Dear Mr. Carr:

This is in response to your letter dated February 23, 1998 requesting information concerning cultural resources in the proposed Woodtick Peninsula and surrounding area. Because of limited time and staff we do not have the resources to complete literature reviews which are the responsibility of the consultant. We can tell you that one archaeological site, 33-LU-453, has been documented within the project boundaries. Although we cannot fulfill your request, you are welcome to use our files. Our office maintains the Ohio Historic Inventory, the Ohio Archaeological Inventory, and the National Register of Historic Places for properties in Ohio. These files are available to the public. You may make an appointment with Terry Skiba at (614) 297-2470 to use these resources. Hours for the Ohio Historic Preservation Office are 9 AM to 5 PM, Monday through Friday.

Any undertaking which is federally funded, permitted or licensed is subject to Section 106 review to ensure that historic properties are considered. This office should be contacted once the project has been better defined.

If you have any questions about this matter you can reach me at (614) 298-2034.

Sincerely,

Julie Quinlan

Julie Quinlan, Program Coordinator
Resource Protection and Review

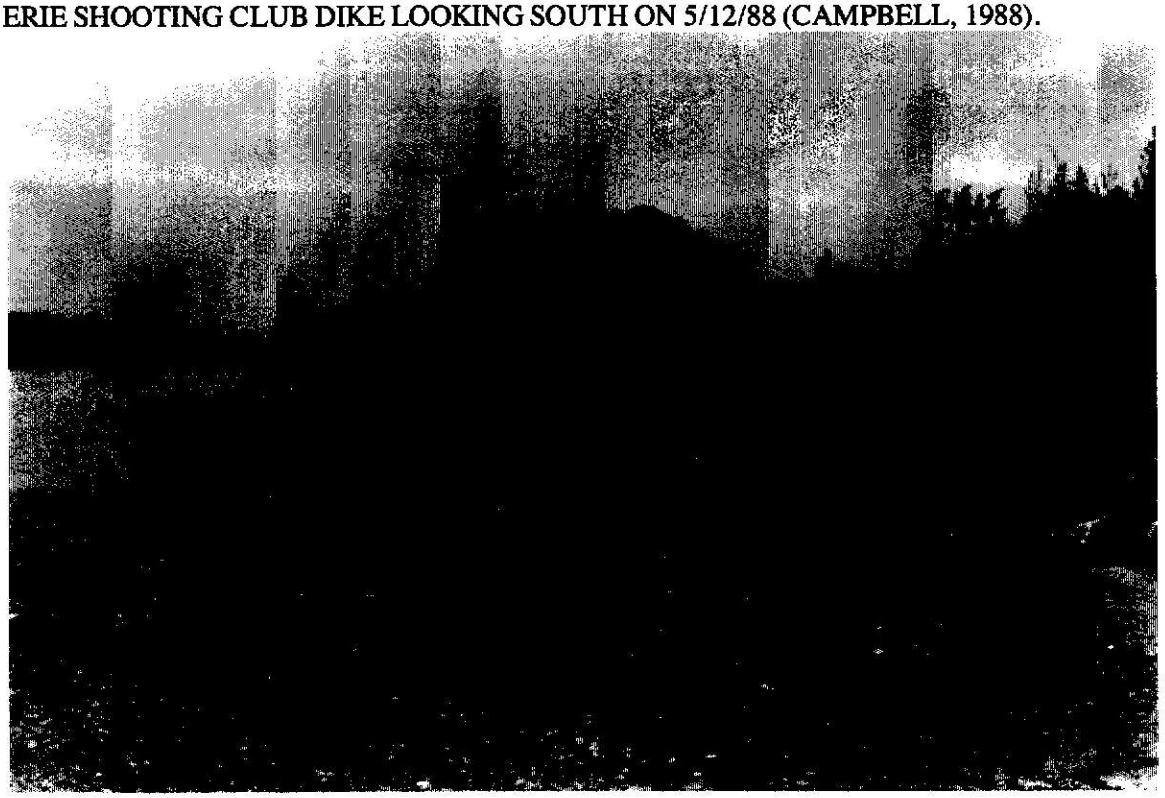
JAQ/jq

APPENDIX B

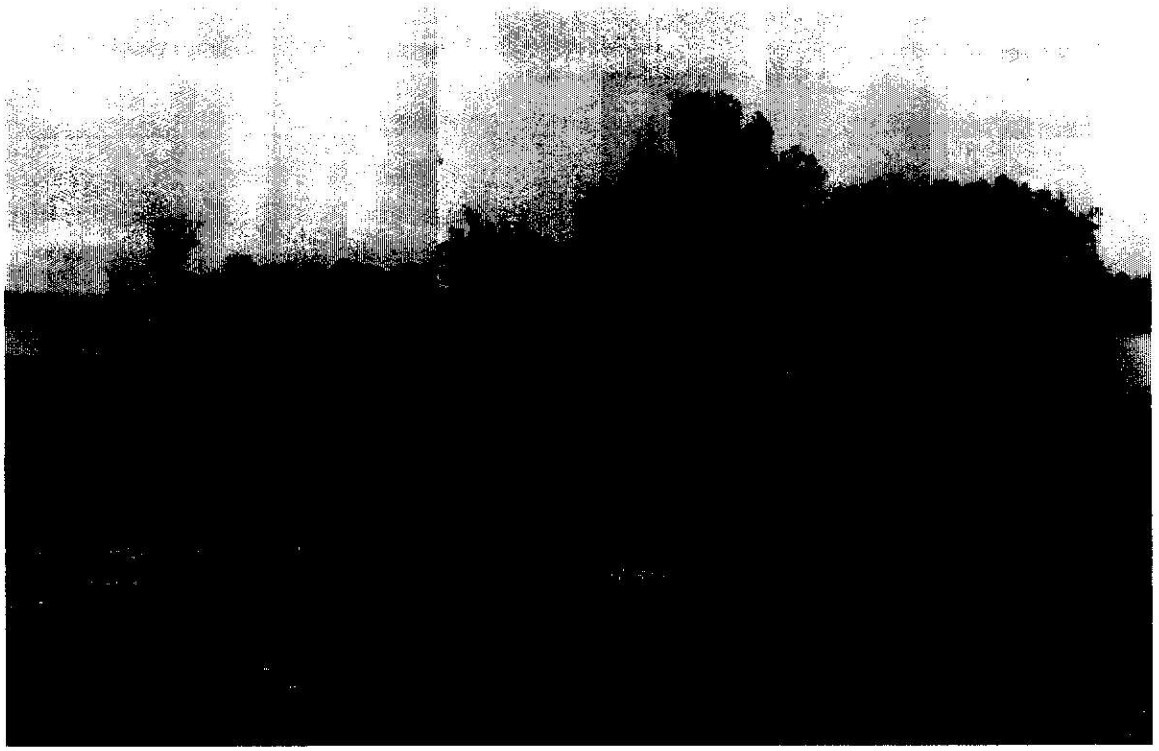
APPENDIX B

Photographs of Project Area

PHOTOGRAPH 1. MIDDLE SECTION OF WOODTICK PENINSULA, DIRECTLY EAST OF ERIE SHOOTING CLUB DIKE LOOKING SOUTH ON 5/12/88 (CAMPBELL, 1988).



PHOTOGRAPH 2. SOUTHERN TIP OF MIDDLE SECTION OF WOODTICK PENINSULA EAST OF THE ERIE SHOOTING CLUB, LOOKING NORTH ON 5/12/88 (CAMPBELL, 1988).



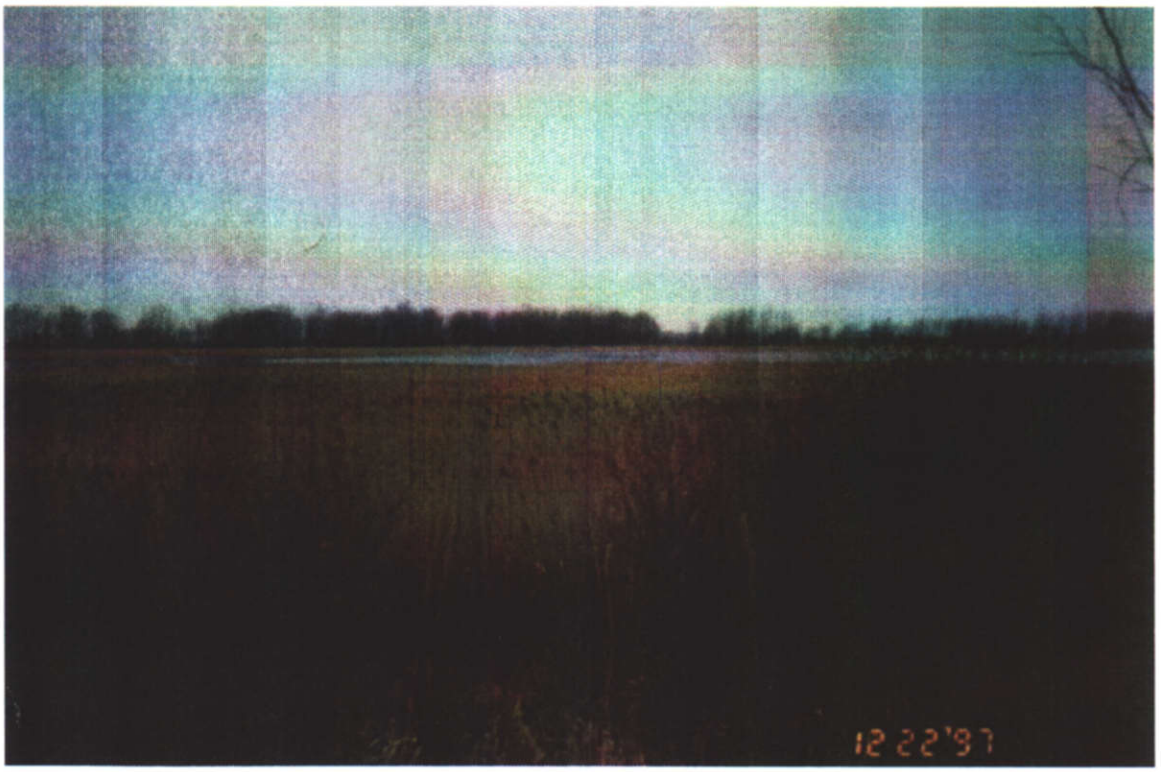
PHOTOGRAPH 3. VIEW OF THE INTERIOR PORTION OF THE MIDDLE SECTION OF THE WOODTICK PENINSULA, EAST OF ERIE SHOOTING CLUB DIKE LOOKING SOUTH ON 5/12/88 (CAMPBELL, 1988).

PHOTOGRAPH 4. VIEW OF A PORTION OF THE WOODTICK PENINSULA LOCATED SOUTH OF ERIE SHOOTING CLUD DIKE, LOOKING SOUTH FROM MIDDLE SECTION ON 5/12/88 (CAMPBELL, 1988).

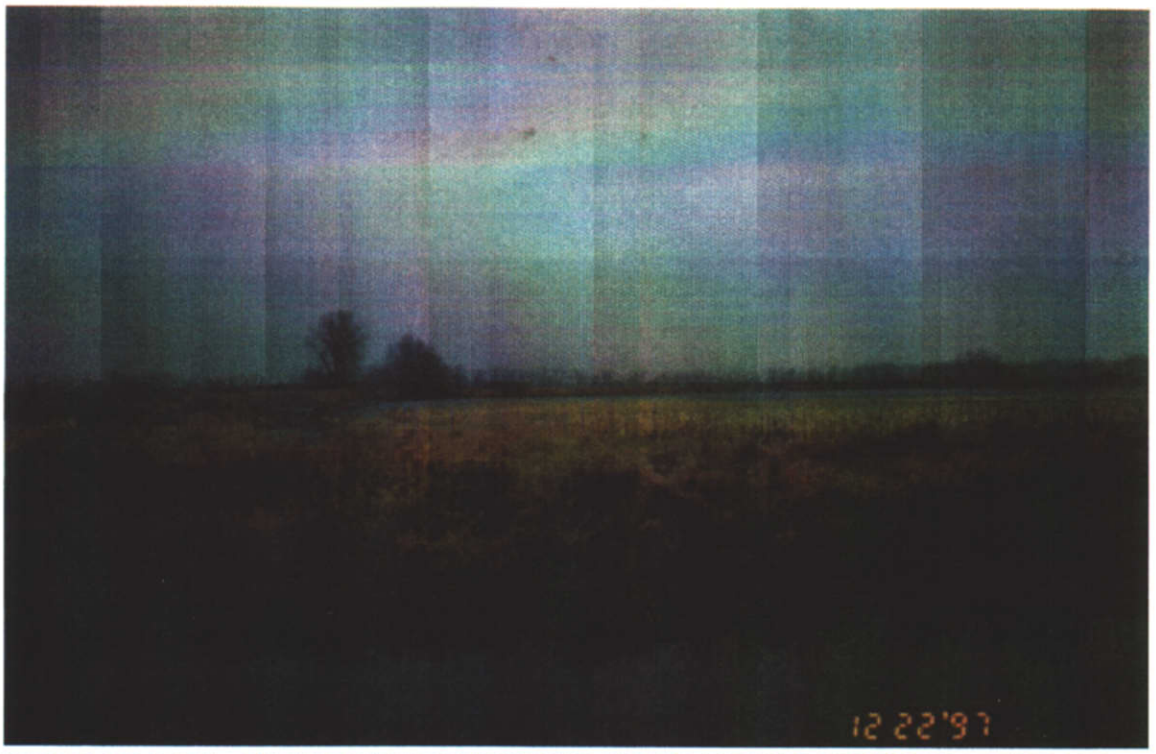
PHOTOGRAPH 5. INTERIOR PORTION OF THE DIKED-IN MARSH AT THE ERIE SHOOTING CLUB, LOOKING SOUTH FROM NORTHERN DIKE ON 12/22/97.

PHOTOGRAPH 6. VIEW OF NORTHERN PORTION OF THE WOODTICK PENINSULA LOOKING EAST FROM NORTHEAST CORNER OF THE ERIE SHOOTING CLUB DIKE ON 12/22/97.

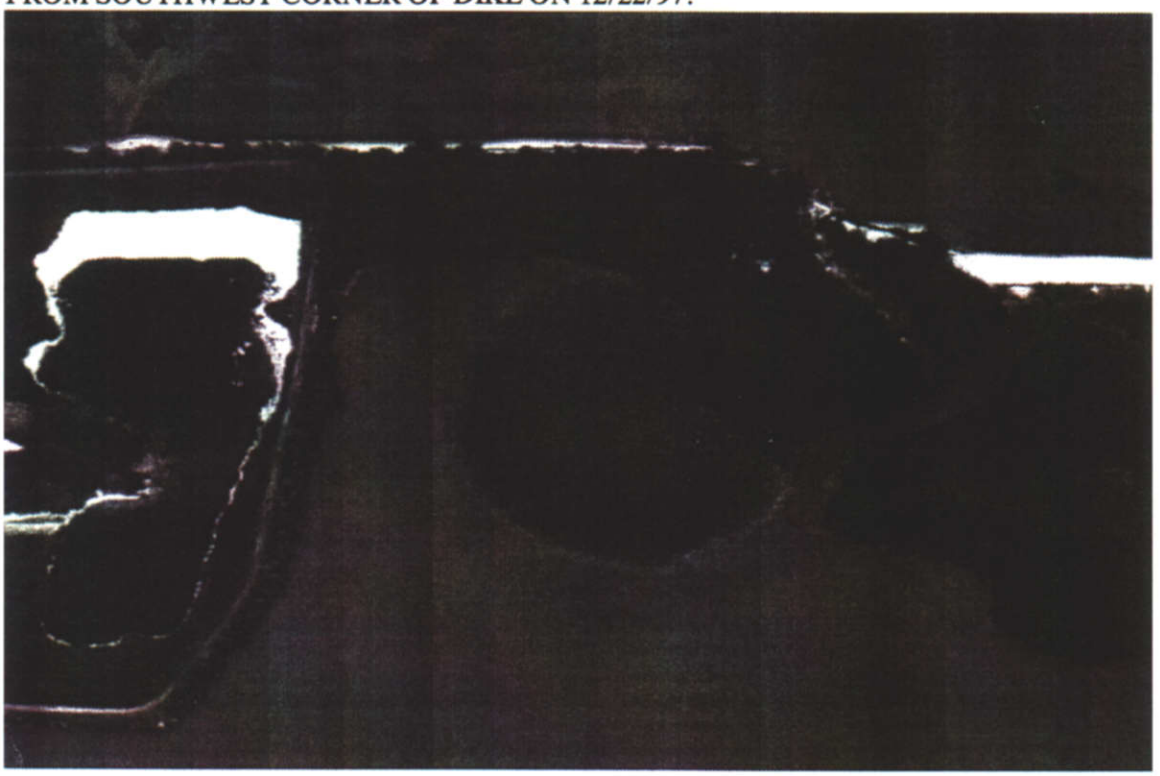
PHOTOGRAPH 7. VIEW OF THE INTERIOR PORTION OF WOODTICK PENINSULA, LOCATED EAST OF ERIE SHOOTING CLUB DIKE, LOOKING SOUTH FROM THE NORTHERN SECTION OF THE PENINSULA ON 5/12/88 (CAMPBELL, 1988).



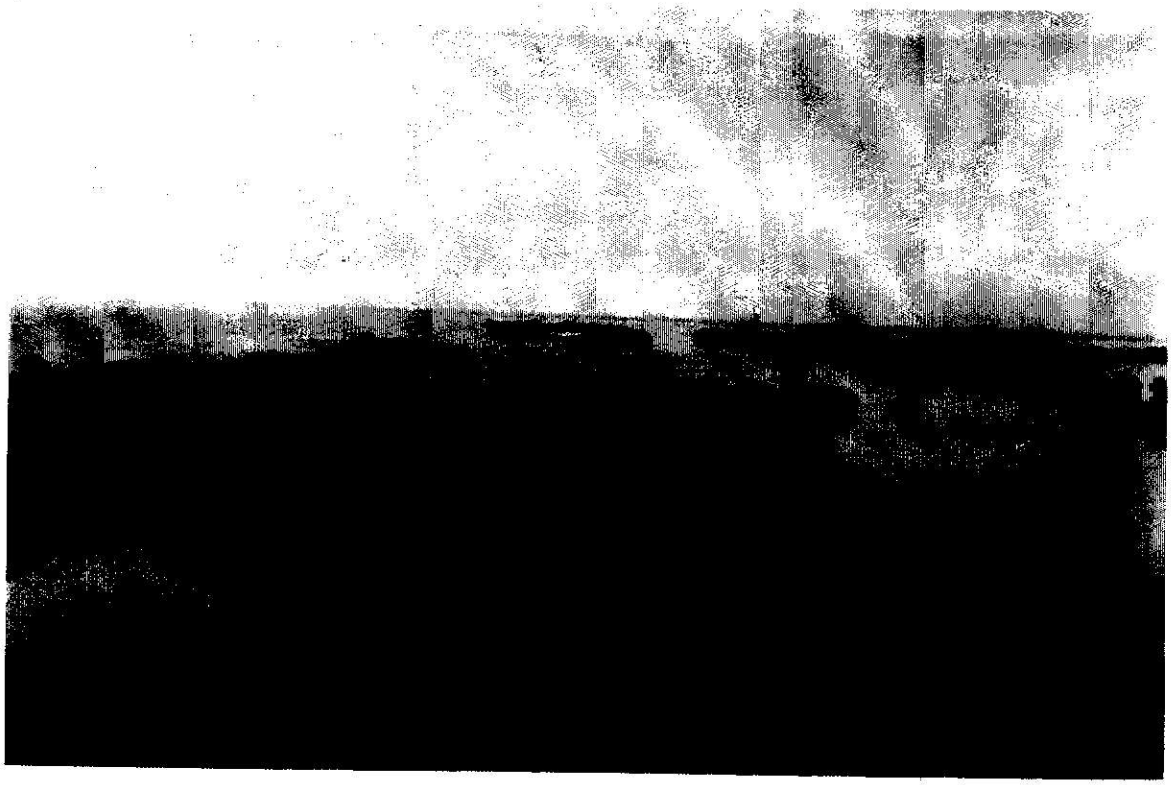
PHOTOGRAPH 8. VIEW OF ERIE SHOOTING CLUB'S INTERIOR SECTION OF DIKED-IN MARSH LOOKING WEST FROM EASTERN DIKE ON 12/22/97.



PHOTOGRAPH 9. VIEW OF ERIE SHOOTING CLUB MARSH LOOKING NORTHEAST FROM SOUTHWEST CORNER OF DIKE ON 12/22/97.



PHOTOGRAPH 10. AERIAL VIEW OF AMERICAN LOTUS GROWING ON THE WEST SIDE OF THE NORTHERN SECTION OF THE WOODTICK PENINSULA, NEAR CONSUMERS POWER (CONSUMERS POWER 7/25/95).



PHOTOGRAPH 11. VIEW OF WOODTICK PENINSULA AND CONSUMERS POWER INTAKE CANAL LOOOKING SOUTH FROM TOP OF CONSUMERS POWER; NOTE THE ERIE SHOOTING CLUB TO THE SOUTHWEST ON 8/3/87 (CAMPBELL 1988).