BARNES NURSERY IN

3511 West Cleveland Rd. Huron, Ohio 44839
419 433 5525 *phone* 800 421 8722 *toll free* 419 433 3555 *fax*

01 MAR 14 PM 1:34

Barnes

March 13, 2001

Michael G. Montone
Biologist, Regulatory Branch
Buffalo District, Corps of Engineers
1776 Niagara Street
Buffalo, NY 14207-3199

RE: Individual Permit Application No. 2000-02170

Dear Mike

With this letter I am please to transmit two copies of an application for an Individual permit (Application No. 2000-02170) for an after the fact project titled "East Sandusky Bay Hydrology Restoration Project". Copy no. 1 contains some color illustrations, whereas copy no. 2 is a black and white reproduction. We have utilized the form provided by you (Application For Department of Army Permit 33 CFR 325) as a guide in preparing our application. Thank you for your assistance in providing these guidelines.

Please contact us if you require any additional information

Sincerely,

Robert Barnes
Barnes, Nursery, Inc.

3-14

CATAWBA GARDEN CENTER
1283 N.E. Catawba Rd., SR 53 Port C nton, Oh
419 797 9797 *phone* 419 797 9716 *fax*

APPLICATION FOR DEPARTMENT OF ARMY PERMIT

1. APPLICATION NO.: 2000-02170 (1) 01 MAR 14 PM 1:34
2. FIELD OFFICE CODE:
3. DATE RECEIVED:
4. DATE APPLICATION COMPLETE:

Copy No. 2
B&W
Illustration

5. APPLICANT'S NAME: Barnes Nursery, Inc.

6. APPLICANT'S ADDRESS: 3511 Cleveland Road West, Huron, Ohio 44839

7. APPLICANT'S TELEPHONE NO.: (419) 433-5525

8. AUTHORIZED AGENT: Robert W. Barnes, President

9. AGENT'S ADDRESS: Barnes Nursery, Inc., 3511 Cleveland Road West, Huron, OH 44839

10. AGENT'S TELEPHONE NO. (419) 433-5525

11. STATEMENT OF AUTHORIZATION: Barnes Nursery, Inc. hereby authorize Robert W. Barnes, President, to act on behalf of the corporation in the processing of this application and furnish, upon request, supplemental information in support of this application.

APPLICANT'S SIGNATURE: Rw Barnes DATE: 3/13/01

12. PROJECT NAME: East Sandusky Bay Hydrology Restoration Project

13. NAME OF WATERBODY: East Sandusky Bay of Sandusky Basin, Lake Erie (NOAA 1997)

14. PROJECT STREET ADDRESS: 3511 Cleveland Road West, Huron, OH 44839

15. LOCATION OF PROJECT: Huron Township, Erie County, Ohio

16. GEOGRAPHIC LOCATION: Section 3, Township 6, Range 22;
Latitude 41°26'N, Longitude 82°37'W (see Figure 1)

17. DIRECTIONS TO THE SITE: Project site located approximately 3.5 miles west of the center of Huron, Ohio. From Huron, proceed west on Ohio Route 2 for two miles to the Rye Beach Road exit; then north for 0.15 miles to intersection with US Route 6 (Cleveland Road West); then 1.35 miles west to the entrance to Barnes Nursery and Garden Center. The project is located about 3,000 feet north of the salesroom.

18. NATURE OF ACTIVITY:
(1) Restore former hydrologic circulation to a portion of East Sandusky Bay in the vicinity of property owned by Barnes Nursery, Inc.;
(2) Establish new avifauna habitat on a series of islands on a barren mudflat adjacent to (north) of the restored hydrologic channel;
(3) Provide deep water (~ 5 feet) fish and aquatic vegetation habitat in the restored hydrologic channel; and
(4) Promote the development of approximately 5 acres of coastal wetland on a barren mudflat adjacent to (south) of the restored hydrologic channel.

Detailed description and rationale for these proposed activities are given below and illustrated in the accompanying drawings and photographs.

The proposed project consists of three primary elements: (1) a hydrologic channel 1,500 feet long, 50 feet wide, and 5 feet deep; (2) a series of 5 islands with a total linear length of about 1,500 feet, each island 60 feet wide, 6 feet high, and with a 4-to-1 slope (run to rise) on all sides; and (3) a narrow feeder channel 500 feet long, 3 feet wide, and 1.5 feet deep which connects to an existing, natural circulation channel (see Figures 1, 2, and 3). The elevation of the mudflat surrounding the project site is approximately 570.8 feet (IGLD, 1985) or 1.6 feet above Low Water Datum (LWD). Thus, the bottom elevation of the hydrologic channel lies at about 565.8 feet (-3.4 feet LWD), the top elevation of the islands is about 576.8 feet (+7.6 feet LWD), and the bottom elevation of the narrow, feeder channel is about 568.8 feet (-0.4 feet LWD).

The pre-construction configuration of the project site is shown in Figure 4. Pursuant to Nationwide Permit No. 27 (2000-02170), issued by the US Army Corps of Engineers to Barnes Nursery, Inc. on June 20, 2000, most of the work proposed above for elements No. 1 and No. 2 was completed in July 2000 (see Figure 5). At the distal (west) end of the hydrologic channel, construction had encroached about 130 feet in an emergent wetland and a mound of earth about 10 to 15 feet high was stock-piled at the distal end of the island. Work on the project was halted before it could be graded to project height.

Work that remains to be completed on the proposed project includes:

(1) Pull the hydrologic channel back about 200 feet (east) and restore former topography where wetland encroachment has occurred;
(2) Grade the island to relatively uniform elevation about 6 feet high;
(3) Modify the single island into 5 separate islands by cutting circulation channels approximately every 300 feet, which will result in 7 water passages through the archipelago;
(4) Grade the side slopes of the islands to a 4-to-1 slope (run to rise) to foster wetland plant zonation (see Figure 6); and
(5) Excavate a narrow, feeder channel (500 feet long and 1.5 feet deep) by dragging steel plow connected cable to a winch temporally mounted on the distal end of the island.

The feeder channel will permit water from an existing, natural drainage channel to flow into the hydrologic channel during low water periods. It will also serve as a to and fro conduit for enhanced wetland water circulation.

19. PROPOSED PROJECT PURPOSE:

The hydrologic conditions in East Sandusky Bay have been altered through human activities over the past century to the point where a natural channel through the bay has partially filled with sediment and no longer carries adequate water for the agricultural irrigation needs of Barnes Nursery, Inc. The proposed project will reestablish a portion of the former channel that once flowed through the east bay in the vicinity of Barnes Nursery property, thereby providing a supply of irrigation water for nursery stock.

The east bay has also experienced other environmental degradation attributable to Federal, State, and private construction projects. The impacts of these previous projects are detailed below. The proposed project will reverse some of this degradation by reestablishing deep water fish and aquatic vegetation habitat, restoring some 5 acres of coastal wetland, and creating avifauna habitat on barren mudflats. The mudflats now occupy the position of the former channel through the east bay and lush coastal wetlands that once flanked the channel. These features have been lost through increased sedimentation and wave attack.

DEGRADATION OF CEDAR POINT AND EAST SANDUSKY BAY

East Sandusky Bay is formed by Cedar Point, the largest sand deposit along the Ohio shore of Lake Erie. This 7-mile-long sand spit is derived almost entirely from erosion of the coastal bluff to the east. At its northwest terminus, adjacent to the Cedar Point jetty, the spit exceeds 3,000 feet in width. At its base, and for several miles northwestward, however, the sand spit is only 100 to 300 feet wide.

The first nearshore bathymetric surveys of the study area were conducted by the US Army Corps of Engineers in 1877. This agency repeated selected sounding profiles in 1939 and 1949 (US Army Corps of Engineers 1953). The Ohio Department of Natural Resources, Divisions of Shore Erosion and Geological Survey also conducted nearshore surveys in 1961 and 1971 (Herdendorf 1971, Carter and Guy 1980). A localized study of the bottom depths near the base of Cedar Point was conducted by the Ohio State University, Center for Lake Erie Area Research in 1972, before and after a major November storm (Herdendorf 1972). A report on the effects of this storm was also prepared by the Division of Geological Survey (Carter 1973b). In 1986, the University of Akron (Bray 1988) studied the transgressive barrier beach west of the NASA Pumping Station (Sheldon Marsh State Nature Preserve). The most recent bathymetric map of western Lake Erie was published in the Journal of Great Lakes Research (NOAA 1997).

Moseley (1905) is the first investigator to describe the recession processes into East Sandusky Bay active at the base of the Cedar Point spit. In 1904, he noted the spit was only 30 to 60 feet wide near Sawmill Creek, which then flowed into Sandusky Bay rather than directly into Lake Erie as is now the case (see Figure 7). East for the next 5,000 feet it ranged from 50 to 100 feet wide. He found that in a number of places the lake had washed over the sand spit and in the marsh. As a result the shore of the spit facing the marsh contained numerous projections or alluvial fans and was not an even outline like that of the lake shore. This process of plucking sand from the lake shore and redepositing it in the marsh during storm events appears to be the primary mechanism for shore recession (transgression) along the base of the spit.

In 1899, the Cedar Point Company acquired property at the base of Cedar Point, extending from the Huron Township line southeastward to the mouth of Sawmill Creek. In about 1914, this company constructed an entrance road to the Cedar Point sand spit, approximately 3,000 feet west of Sawmill Creek, constricting the flow of Sawmill Creek into the east bay. A roadway (Willow Drive and Cedar Point Chaussee) was then built along the spit for about 6 miles to the northwest to provide access to a lakeside resort and amusement park. Within three years, high lake level storms destroyed a large part of the roadway and required the placement of wooden pilings along the eastern 4,000 feet of the roadway at the base of the spit. In 1918, this section of the roadway was finally destroyed by storms and had to be abandoned (US Army Corps of Engineers 1947). A New Entrance Road was then constructed about 6,500 feet west of the original entrance road. The New Entrance Road was opened in 1920 and remains in service by virtue of massive lakeshore protection works at its eastern end (Frohman 1969) and stone revetments along the causeway crossing East Sandusky Bay.

In 1942, a federal pumping station was constructed at the lakeward end of the Old Entrance Road. Shore recession continued at a rapid pace. Thus, massive shore protection works have been required to preserve the station. The result is that the pumping station (now operated by NASA) which once stood on a straight beach, now juts out into the lake over 1,000 feet beyond the barrier beach to the west.

The shoreline west of Sawmill Creek is actively receding at an average rate of 10 to 15 feet/year as determined by the Ohio Department of Natural Resources, Division of Shore Erosion (Hartley 1961). The Division of Geological Survey attributes most of this loss to the existence of federally-owned breakwaters at Huron which project 3,200 feet into the lake and effectively stop the movement of beach material in the littoral zone (Hartley 1964). As a result, the shore west of Huron is starved of sand which normally moves from east to west along this reach of the Lake Erie shoreline. West of the beach-poor area, the Cedar Point spit begins and sand is somewhat more plentiful on the shore although the beaches are receding.

Surveys by the US Army Corps of Engineers (1953) showed that prior to the construction of the Huron harbor structures the rate of shore loss was relatively slow (1.5 feet/year, 1877-1939) as compared to the extremely rapid rate (20 feet/year) for the period 1939-1949. The final 1,200 feet of extension of the Huron west jetty was completed in 1935 (Carter and Guy 1980).

The results of an analysis of repetitive aerial photograph surveys of the base of Cedar Point by the Division of Geological Survey for the period 1937-1973, show that the unprotected portions of the shoreline were rapidly receding (Carter and Guy 1980). For 3,000 feet east of the Old Entrance Road and 5,000 feet to the west, the shore recession rate was 5 to 10 feet/year.

Additional studies by the Division of Geological Survey showed that during the period 1961 to 1970, a period of relatively low lake levels, the beach approximately 300 feet west of Sawmill Creek was receding into the Sandusky Bay marshes at a rate of 6 feet/year (Herdendorf 1971). High lake levels in 1972 greatly increased this rate. Studies by the Ohio State University, Center for Lake Erie Area Research showed that in one storm alone (November 13-14, 1972) approximately 50 feet of shore recession occurred between Sawmill Creek and Sheldon Marsh (Herdendorf 1972).

During high-water storm events lake levels can rise to elevations between 3 to 6 feet above Low Water Datum (Chart Depth). Northeast storms are responsible for the greatest water level rise, highest wave heights and thus, the highest shore recession rates. The Ohio Division of Geological Survey has compiled a list of severe northeast storms on Lake Erie during the period 1861 to 1972 (Carter 1973b):

August 1861	April 1882	April 1965
July 1878	May 1903	April 1966
September 1878	July 1943	July 1969
August 1879	May 1946	November 1972
January 1881	March 1952	

No criteria for judging a storm as "severe" was provided in the report, but the author observed that 11 of the 14 damaging storms occurred when the lake was above its long-term average elevation of 571 feet (IGLD, 1985) or 1.8 feet above Low Water Datum.

Because the most serious episodes of rapid shore recession or avulsion on Lake Erie are associated with high-water storm events (Carter 1973b, p.3), a documentation of the number and periodicity of these events can be instructive in the analysis of shoreline changes. To develop a chronology of storm events, water level gauging records maintained by the US Army Corps of Engineers for Toledo, Ohio were analyzed. For the 100-year period, 1890-1990, each storm which produced a water level rise to an elevation of 6.0 ft (or greater) above Low Water Datum was catalogued. The monthly stillwater level for the month in which the storm occurred was then subtracted from the maximum lake elevation during the storm to obtain the maximum height of the storm surge. An analysis of water levels at Marblehead indicated that northeast storms would produce a storm surge height of approximately 50% of that recorded at Toledo for the base of Cedar Point. This relationship was used to project likely water levels for Cedar Point for each storm observed at Toledo. In the past 100 years, approximately 60 such events have occurred. Table 1 lists the most severe storms. These storms are plotted on a Lake Erie water level hydrograph in Figure 8.

TABLE 1. MAJOR STORM EVENTS RESULTING IN SIGNIFICANT RECESSION OF CEDAR POINT SPIT INTO EAST SANDUSKY BAY

	Toledo, Ohio		Projections for Cedar Point		
Date	Max Elev Above LWD	Monthly Mean Stillwater Elev	Storm Surge Ht	Storm Surge Ht	Max Elev Above LWD
YEARS: 1903-1946					
May 1903	NA				
Mar 1913	NA				
1917-19, 29-30	NA				
Jul 1943	NA				
May 1946	NA				
YEAR: 1952					
22 Mar	6.50	3.70	2.80	1.40	5.10
YEAR: 1966					
27 Apr	7.07	1.47	5.33	2.67	4.14
YEAR: 1969					
6 Jul	6.01	4.05	1.96	0.98	5.03
YEAR: 1972					
13-14 Nov	7.40	3.52	3.87	1.94	5.46
YEAR: 1973					
8-9 Apr	8.07	4.76	3.31	1.66	6.42
YEAR: 1974					
8 Apr	8.27	4.43	3.84	1.92	6.35
YEAR: 1975					
14 Mar	7.92	3.98	3.94	1.97	5.95
YEAR: 1976					
24-25 Apr	7.20	4.39	2.81	1.41	5.80
YEAR: 1980					
14 Apr	8.08	3.87	4.21	2.11	5.98
YEAR: 1982					
5-6 Apr	7.36	3.65	3.71	1.86	5.51
YEAR: 1984					
28 May	6.99	3.66	3.33	1.67	5.33
YEAR: 1985					
30-31 May	6.20	4.76	1.44	0.72	5.48
YEAR: 1986					
6-7 Feb	7.64	4.36	3.28	1.64	6.00

EXPLANATION

This table shows the major storms for the past 100 years which resulted in a water level of 6.0 ft or greater above Low Water Datum (elevation 575.2 IGLD, 1985 or 576.1 MSL) at Toledo as recorded by the US Army Corps of Engineers. The storm surge heights and maximum elevations for Cedar Point are projected based on the consideration that a longitudinal storm surge (N67°E) must travel an additional 35 miles to reach Toledo, thereby generating a level approximately 50% higher (average about 1.5 ft) at Toledo. NA – precise water level data not available but believed to be at least +6.0 ft LWD

One particularly destructive event (13-14 November 1972) has been especially well documented for the base of Cedar Point (Herdendorf 1972). In May 1972, three offshore depth profiles were made with a recording fathometer between Sawmill Creek and Sheldon Marsh. These were repeated in November following the high water storm. Profile line 0+00 was located near the west bank of Sawmill Creek mouth, profile line 4+00 was located 400 feet to the west at a swimming beach, and profile line 8+00 was located 800 feet west of the creek mouth, within a coastal woodlot.

The results of the three echo sounder profiles from the beach out to 100 m offshore are shown graphically on Figure 9. The average area loss (vertical plane) from the shore out to 300 m was 290 square feet, which if converted to the volume of loss for the 800-foot stretch of beach, equals 23,300 cubic feet. If this value is projected for the entire 3000-foot-long beach that then existed between Sawmill Creek and the NASA pumping station, the total volume of loss during the storm was about 953,500 cubic feet. The amount of horizontal shore recession was 50 feet near the mouth of Sawmill Creek and 15 feet for the more westerly profiles. This yields an average retreat distance of 25 feet for the storm. A visual inspection of the retreat near the NASA pumping station indicated a similar degree of shoreline recession. Thus, the 25-foot average horizontal loss appeared to be a reasonable estimate for the entire 3000 feet reach of shore. This would equate to a loss of 1.86 acres of shore.

Carter et. al. (1981) provide an excellent summary of shoreline changes at the base of Cedar Point spit during the period 1972 to 1980. Their account of shore processes following the major breaching event in November 1972 is presented below:

> "The spit has undergone significant changes in the past decade. In November 1972 the spit was breached near the east entrance road about 1.2 miles west of the water intake. Since that time the spit, in contrast to the newly formed barrier island to the west, has receded landward, with the rate of recession increasing toward the tip of the spit. The average rate of recession from 1973 to 1980 has been 85 feet/year at the tip of the spit and 6.5 feet/year at the landward end of the spit adjacent to the pump station. At the same time the spit has lengthened and become narrower as sand is both washed over and transported along the spit. The most obvious explanation for the accelerated recession in the 1970s has been the combination of high lake level and northeast storms, however, a likely, more basic underlying reason is a decreased sand supply.
>
> The Huron jetties, by trapping and/or modifying the net longshore transport of sand from east to west, have starved the shore to the west, which includes the Cedar Point spit-barrier. As sand west of the structures has been gradually but inexorably transported west away from the structures, the shore has become subjected to greater wave energy. Man-made structures built to protect the shore have exacerbated the overall problem by acting as local barriers (such as the seawall surrounding the NASA pump station) as well as by protecting the shore and thus reducing the quantity of sand entering the longshore-transport system. Presumably, as sand is transported farther to the west, more and more of Cedar Point will have to be protected to offset the loss of sand.
>
> The Division of Natural Areas and Preserves, which oversees the marsh, has an interesting management question that has both economic and ecological ramifications. Options include stabilizing the existing spit, rebuilding the spit to its former position in line with the barrier, and leaving the spit alone. We feel that because of the small amount of sand in the littoral system, it is unlikely that the barrier will build lakeward, even during a period of low lake level. Thus the spit could remain in its present position in the short term but over the long term will likely migrate farther landward, reducing the area of marsh behind it and eventually becoming an embayment of the lake. To stabilize the existing spit without man-made structures will probably require at least beach nourishment, possibly with sand trapped by the Cedar Point jetty to the west and/or sand trapped by the Huron jetty to the east."

The November storm of 1972, which was responsible for breaching the basal portion of the Cedar Point spit about 1,200 feet east of the New Entrance Road, has had long-term consequences. By 1973, the open-water breach had widened to 1,700 m (Carter and Guy 1980), effectively creating a second opening into Sandusky Bay. Since that time the beach between the NASA pumping station and the east end of the Chaussee has continued to recede, and migrate landward into Sandusky Bay (see Figure 10).

By June 1987, the spit had breached at a number of other locations west of the NASA structure, resulting in an arcuate series of barrier islands rather than the former sand spit which once stretched between the pump station and the Chaussee. The largest opening (about 650 feet wide) was located adjacent to the pumping station, while the original 1972 breach at the Chaussee end of this segment of shore had narrowed to about 200 feet. The western end of this shore segment had stabilized as evidenced by extensive vegetative cover and the existence of stable inlet features, including sedimentary structures analogous to flood-and ebb-tide deltas. However, the eastern end of the barrier continued to recede. The portion of the barrier fronting Sheldon Marsh that was detached from the structures protecting the pumping station in 1972 was 250 m farther inland in 1987 (see Figure 11). This represents an average recession for the 15 year period of over 50 feet/year.

Prolific growth of aquatic plants in the marshes at the east end of Sandusky Bay and other wetlands along western Lake Erie has resulted in a deposit of marsh "muck" overlying the ancient lake clays (Savoy 1956). The marsh deposits consist of decayed organic matter mixed with varying amounts of clay, silt, and sand. Sand is only abundant in areas near the barrier beaches where storms have carried sand wedges into the marshes. These deposits vary from a grayish brown to a rich, brownish black. In thickness, the deposits range from a thin veneer to nearly 3 feet. On the floor of the marshes these deposits are quite soft and porous with abundant, loosely coherent plant remains. In places, these deposits occur beneath the barrier beach deposits, and locally they are exposed where wave action has cut into the beach. The recent geological history of the Cedar Point shore indicates that the barrier beaches have migrated shoreward over the marshes, and thus have preserved marsh deposits beneath the beach sands. Bray (1988) found that the barrier bar at Sheldon Marsh has steadily advanced landward over the marshlands as a result of the overwashing of beach sand into the marsh during northeast storms and the sweeping of sand in through breaches (see Figure 11). During this advance, the compacted marsh deposits which have been overridden by the bar are eventually exposed to current and wave attack at the beach front. When the marsh deposits themselves are eroded, they contribute a black, peaty material to the beach face which discolors the nearshore water of the lake (Herdendorf 1987). The muck deposits, if they ever extended inland to the project site, have been eroded away leaving a barren, hardpan-like surface of lacustrine clay (Pincus 1960).

Bray (1988) in studying the sand spit which lies at the base of Cedar Point concluded that the barrier beach fronting Sheldon Marsh is a transgressing barrier which is moving landward at a rapid rate (see Figure 10). He observed that "evidence of this is the relic peat that underlies the barrier and nearshore environments." The mechanism of this migration of the barrier bar is illustrated in Figure 12 from research published by Johnson (1965). A cross-section from research by Savoy (1956) on the barrier beach at Magee Marsh in western Lake Erie (see Figure 13) shows how wave action can exhume peat deposits offshore from a transgressing barrier bar. Metter (1953) conducted studies of the sedimentary processes along Cedar Point in 1951. He also observed that "swamp muck" originally deposited in the Sandusky Bay marshes extends under the Cedar Point sand spit and is exposed in the nearshore bottom of Lake Erie (see Figure 14).

In further discussing the mechanism of the transgression at Sheldon Marsh, Bray (1988) states, "Because the sand body is so thin the entire barrier migrates landward reworking all of the underlying facies [distinctive sediment types]. The sand body is lenticular and probably compacts lagoon sediments as it migrates landward. Behind the barrier the modern organic-rich muds capping the stiff clay are soft and easily compacted but in the nearshore the peat is tough and resistant to further compaction. However, this peat is being eroded and transported landward as peat blocks [see Figure 15] so that there may be no evidence of its existence in the stratigraphic record."

The Ohio Department of Natural Resources, Division of Geological Survey (Sandusky Office) maintains a collection of aerial photographs of the Ohio shoreline of Lake Erie, most at a scale of 1 inch = 400 feet (1:4800). Table 2 lists all of the photographs in the Geological Survey files that cover the Sawmill Creek/Sheldon Marsh/Cedar Point area. These include some 150 images for the period October 1937 to April 1990. These photographs can be very instructive in documenting the degradation of the base of Cedar Point spit and East Sandusky Bay. Of particular interest, the photographs show (1) the sand spit fronting Sheldon Marsh breached in November 1972 and since that time the eastern end of the spit has progressively migrated hundreds of feet into the marsh exposing massive beds of peat to wave attack and erosion and (2) following the breaching event, accumulation of peat on the lakeward side of the Sheldon Marsh sand spit are common. Figure 11, an aerial photograph taken on April 5, 1987 during a northeast storm, shows extensive erosion of peat (black material) by waves and its transportation to the west by alongshore currents. Accumulations of peat can also be seen along the lakeward side of the spit. Unfortunately, much of the peaty material exhumed because of the transgression of the sand spit is transported to the west were it fowls recreational beaches at the Cedar Point amusement park, necessitating their closure from time to time.

Point Retreat condominium and marina development starting in the late 1980s at the northwest boundary of Sheldon Marsh State Nature Preserve, has resulted in changes in the shoreline and nearshore bottom of Lake Erie in the vicinity of the easterly end of the Cedar Point sand spit and entrance channel to the Point Retreat marina in Sandusky Bay. These changes have included reshaping and narrowing the SE tip of the spit, dredging the marina boat basin, and removing a portion of the former, now submerged, Cedar Point road bed that fronts Sheldon Marsh. Field observations of the shoreline and SCUBA observations of the lake bottom, by our consultant, revealed that these activities have exposed beds of peaty, organic material which now lie within the wave erosion and channel scour zones of the lake and bay.

The Ohio Department of Natural Resources, in cooperation with NASA, maintains a nearly one-mile long causeway that severs the heart of Sheldon Marsh and runs all the way to the barrier beach (see Figure 16). This causeway is based on the original Cedar Point entrance road that was constructed in 1914. In the late 1980s the roadway was widened to approximately double its original width and armored with rip-rap along its east and west sides (no permits appear to have been obtained for this work within a wetland and across navigable waters of the United States). Unfortunately, bridges or culverts were either not included in the project or are now inoperable. As a result the Sawmill Creek Resort marshes to the east have been hydrologically isolated from Sandusky Bay by the roadway (see Figure 17). This barrier to drainage from the Sawmill Creek marshes has exacerbated the poor hydrologic conditions in East Sandusky Bay and further degraded water circulation in the vicinity of the Barnes Nursery property.

In the past several decades since the Ohio Department of Natural Resources acquired Sheldon Marsh and the sand spit forming the barrier between East Sandusky Bay and Lake Erie, no actions have been taken to protect the barrier from wave erosion. The barrier has been continually breached by storms, allowing lake waves to penetrate the bay and disrupt aquatic habitats to the point where emergent marsh vegetation is very limited in areal extent. Thus the bay shoreline fringing the Barnes Nursery property, primarily composed of emergent wetland vegetation, has experienced severe erosion and shoreward recession, as well as sediment influx that has destroyed the natural hydrologic channels. This lack of a protected, quiescent environment is the primary reason for the absence of a high quality mixed emergent marsh in East Sandusky Bay and the disappearance of drainage channels.

In summary, as late as 1909, Sawmill Creek flowed into East Sandusky Bay in the vicinity of present day Sheldon Marsh State Nature Preserve (see Figure 18). The flow was carried by a deep water channel, locally known as Black Channel, which transited the bay between the south shore and the Cedar Point sand spit. In 1911 a roadway was constructed out to the sand spit that bridged the channel. Erosion and shoreline recession, primarily caused by sand starvation resulting from the construction of Federal harbor structures at Huron (Hartley 1964, Carter 1973a, Herdendorf 1975,

Carter et al. 1981, US Army Corps of Engineers 1984), eventually allowed Sawmill Creek to empty directly into Lake Erie nearly a mile to the east and the sand spit road was washed out. In the 1940s, a Federal water pump station (now NASA) was built near the old Sawmill Creek mouth at the lakeward end of what was left of the and the roadway. Later, the roadway was hardened to prevent flow from east (after ODNR acquired Sheldon Marsh in 1979). The lack of flow from the east, coupled with the receding sand spit, caused increased sedimentation to take place in East Sandusky Bay, eventually filling the channel, leaving widespread mud flats visible during low water periods. Because Cedar Point spit was permitted to breach to the point where flow from the west now enters Lake Erie at Point Retreat, the interior part of East Sandusky Bay and Sheldon Marsh do not receive the flushing action through the Willow Drive causeway (east access road to Cedar Point) opening that they once did. This too has tended to dramatically change the hydrology. The construction of a deep water channel will help restore some original hydrology to the east bay.

TABLE 2. INVENTORY OF AERIAL PHOTOGRAPHS FOR SAWMILL CREEK/SHELDON MARSH AND CEDAR POINT, ERIE COUNTY, OHIO

		------Photograph Number------			
Date	Flight Line	Sheldon Marsh/ Sawmill Creek	Cedar Point	Scale	Source
4-18-90	9010801	006-009	015-026	1:12000	ODNR
4-20-89	8911002	213-216; 256-260	225	1:12000	ODNR
4-05-87	8712403	255-257		1:4800	ODNR
3-28-86	8608701	144-151	179-182	1:4800	ODNR
4-23-82	8211309	235-242		1:4800	ODNR
5-05-80	6791-1	21-27	1-4	1:4800	ODOT
4-19-79	7910912	93-100		1:4800	ODNR
4-17-78	7810714	69-74		1:4800	ODNR
3-25-77	7708410	83-90		1:4800	ODNR
2-20-76	7605109	144-148		1:4800	ODNR
4-26-73	5196-20	617-624	642-645	1:4800	ODOT
11-16-72	5161-13	262-271	237-241	1:3000	ODOT
1968	3881-23	599-606	624-627	1:4800	ODOT
7-23-64	PW-2EE	217			ASCS
5-7-56	713-1	23-30	1-4	1:4800	ODOT
5-11-49	198-V-6		53-56	1:4800	ODNR
5-11-49	198-V-5	47-51		1:4800	ODOT
1949	198-V-7	86-91		1:4800	ODOT
1949	198-V-8		104-105	1:4800	ODOT
4-11-38	PW-9	746		1:7900	AAA
10-31-37	PW-4	524			AAA
10-31-37	PW-3		238		AAA

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ECONOMIC JUSTIFICATION FOR PROJECT

The availability of irrigation water is paramount to the operation of Barnes Nursery, Inc. Without access to Sandusky Bay water the nursery can not survive. With mid-summer 2001 Lake Erie water levels predicted at over 1 foot below last summer's levels (which were critically low in 2000 leaving the east bay dry much of the summer), the nursery is in a perilous situation. Numerous other options for obtaining irrigation water have been explored, none are economically viable.

Our back is to the wall and we must ask for help! Our business after 50 years of high standards in the industry, supplying jobs for more than 200 people and providing a strong economic base for our county is at risk. The importance of water is an issue of primary concern. There is an emergency here that only the US Army Corps of Engineers can help us resolve. Water is only 600 feet away from our hydrologic channel. Just a small water way no more than one and a half feet deep would provide the necessary water to allow our 50 year old company to continue its operation. Without water we will not be able to continue, thus closing our doors after 50 years.

20. REASONS FOR DISCHARGE:

Material dredged from mudflat at the project site to create the hydrologic channel will be placed adjacent to channel to form a series of islands on the north (lakeward) side of the channel. The islands will serve several purposes: (1) provide erosion control from waves generated in East Sandusky Bay and Lake Erie during periods of barrier bar overtopping, (2) retard sediment infilling of the hydrologic channel, (3) foster establishment of a diverse wetland plant community by adding approximately 4,000 feet of shoreline to the bay (sloped to provide the proper gradient for plant zonation to occur), and (4) create high-quality avifauna habitat in a low-disturbance environment.

21. TYPE OF MATERIAL BEING DREDGED AND AMOUNT:

The sediment forming the mudflat at the project site is composed of consolidated lacustrine clay tending toward "hardpan" (Pincus 1960). Excavation of the hydrologic channel (1,500 feet long; 50 feet wide; 5 feet deep) will require the removal of approximately 14,000 cubic yards of clay. Excavation of the narrow feeder channel (500 feet long, 3 feet wide, and 1.5 feet deep) will yield about 80 additional cubic yards of clay.

22. SURFACE AREA OF WETLANDS OR OTHER WATERS FILLED:

The proposed project will result in no filling of wetlands. Approximately 2.0 acres of barren mudflat in East Sandusky Bay will receive fill to form a series of islands.

23. IS ANY PORTION OF WORK COMPLETED? YES X

Approximately 1,500 feet of hydrologic channel has been dredged pursuant a Nationwide Permit No. 27, issued by the US Army Corps of Engineers on June 20, 2000. This work was undertaken during the period June 21 to July 21, 2000. The excavated material was placed on the north side of the channel in the form a linear island. The channel is approximately 50 feet wide and 4 to 5 feet deep. The island is 5 to 6 feet high and 50 to 60 feet wide with a 4-to-1 slope (run to rise) on each side. In September 2000 the island was seeded with rye grass at the request of the US Army Corps of Engineers.

24. ADDRESSES OF ADJOINING PROPERTY OWNERS AND LEASEES ON THE WATERBODY:

Figure 19 depicts the property owners of East Sandusky Bay in the vicinity of the proposed project site. The addresses of these property owners are listed below:

1. Cedar Fair Limited Mr. Richard Kinzel
   1 Cedar Point
   Sandusky, Ohio 44879
   (419) 627-2350

2. James A. Corso and Judith Corso
   2070 Cleveland Road
   Sandusky, Ohio 44770
   (419) 627-9940

3. Charles D. Corso
   3504 Hull Road
   Huron Twp, Ohio 44839
   (419) 625-5318

4. J.S.M. Development Limited
   111 East Shoreline Drive
   Sandusky, Ohio 44870
   John T. Murray, General Partner (419) 624-3000 ext 205

5. Joan Tracht
   3403 Cleveland Road West
   Huron, Ohio 44839
   (419) 433-2430

6. Dr. R.E. Dwight
   3219 Cleveland Road West
   Huron, Ohio 44839
   (419) 433-4850

7. Dr. John A. Krebs
   1221 Hayes Avenue
   Sandusky, Ohio 44870
   (419) 626-3272

8. State of Ohio
   Department of Natural Resources
   Division of Natural Areas & Preserves
   1899 Fountain Square Court
   Columbus, OH 43224-1331
   Stu Lewis, Chief (614) 265-6453

9. Sawmill Creek Resort L.P.
400 Sawmill Creek
Huron, Ohio 44839
(419) 433-3800

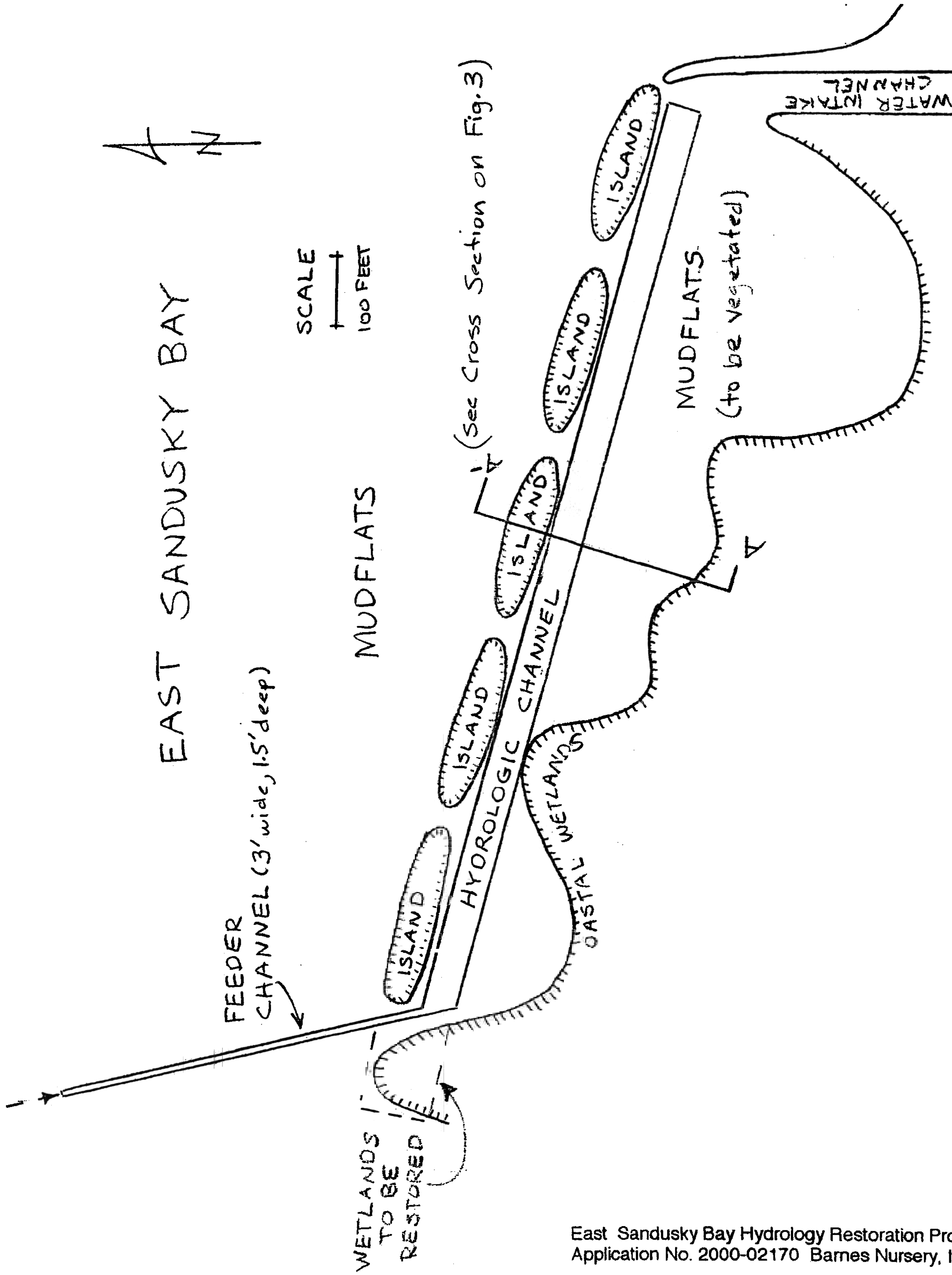
10. NASA
6100 Columbus Avenue
Sandusky, Ohio 44870
(419) 625-1123

26. LIST CERTIFICATIONS OR APPROVALS/DENIALS FROM AGENCIES FOR PROJECT:
In April 2000, Barnes Nursery, Inc. applied to the Buffalo District, US Army Corps of Engineers (USACE) for authorization for an irrigation project in East Sandusky Bay. In May 2000, this request was coordinated with the Ohio Department of Natural Resources, the Ohio Environmental Protection Agency, the US Fish and Wildlife Service (USFWS), and the regional Soil and Water Conservation District (SWCD). In June 2000, representatives of USFWS and SWCD met with Buffalo District USACE staff biologists at the proposed project site. A determination was made that the proposed project would enhance wetlands by creating a deep-water habitat and waterfowl nesting islands. On June 20, 2000 a Nationwide Permit No. 27 (NWP 27) was issued by USACE to construct a 3,000-foot-long channel flanked by earthen nesting islands. By July 21, 2000, approximately half of the project had been completed. On that date Barnes Nursery was instructed to stop work while USACE reevaluated the project. In January 2001, the Buffalo District Commander USACE determined that the primary purpose of the project was to provide a constant water supply to support nursery operations rather than habitat enhancement, thereby deeming NWP 27 inapplicable for this type of project and that the permit affirmation was issued in error. At that time, Barnes Nursery was given the options of restoring the site to its pre-construction condition or applying for an after-the-fact authorization to be evaluated as an Individual permit (IP). The document represents the later option, an IP application.

26. APPLICATION SIGNATURES:
Application is hereby made for an Individual permit to authorize the work described in this application. I certify that to the best of my knowledge the information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein as the duly authorized agent of the applicant, Barnes Nursery, Inc.

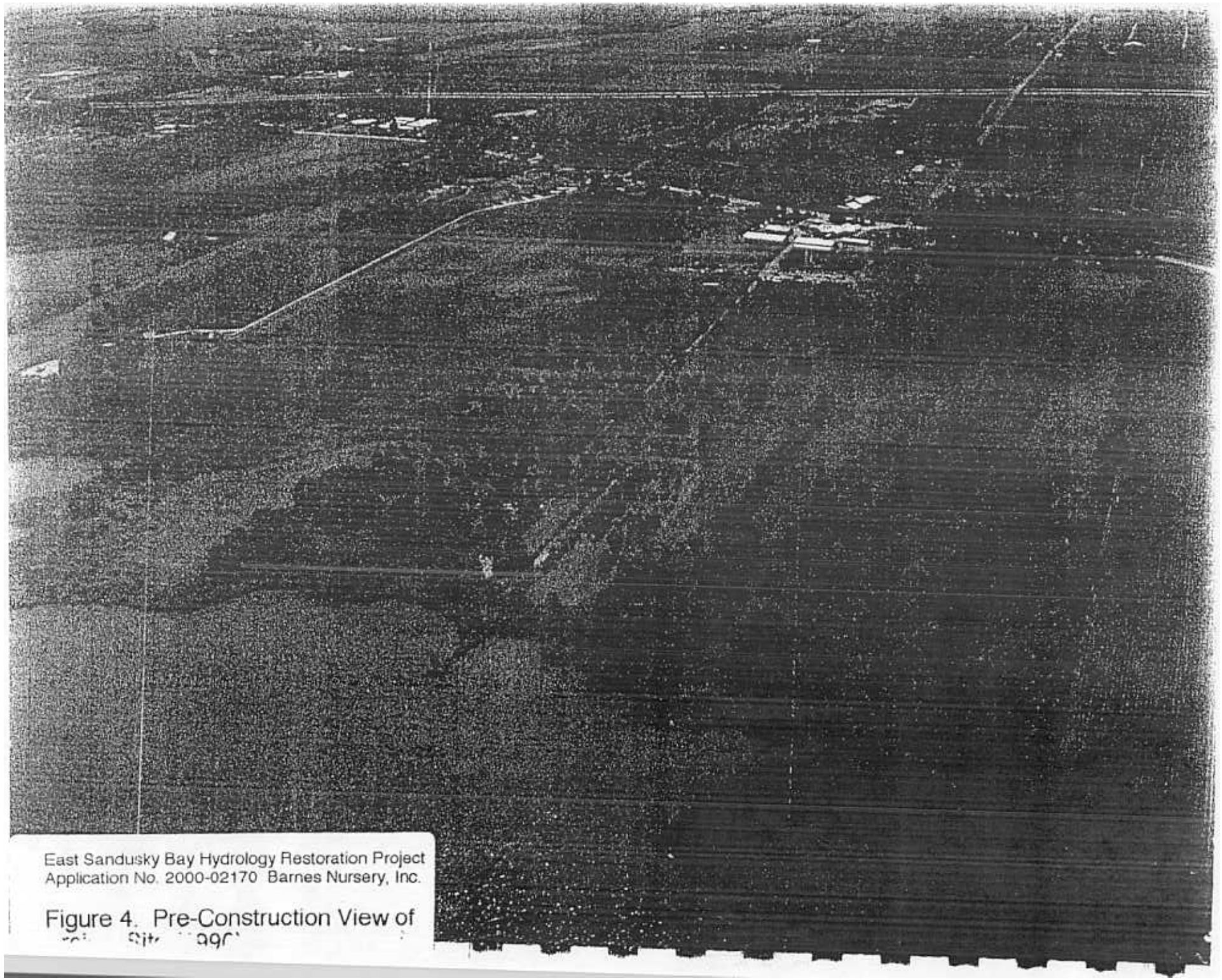
R W Barnes — Signature of Applicant — 3/13/01 — Date

R W Barnes — Signature of Agent — 3/13/01 — Date



East Sandusky Bay Hydrology Restoration Proje
Application No. 2000-02170 Barnes Nursery, Inc

Figure 2. Planview of Project

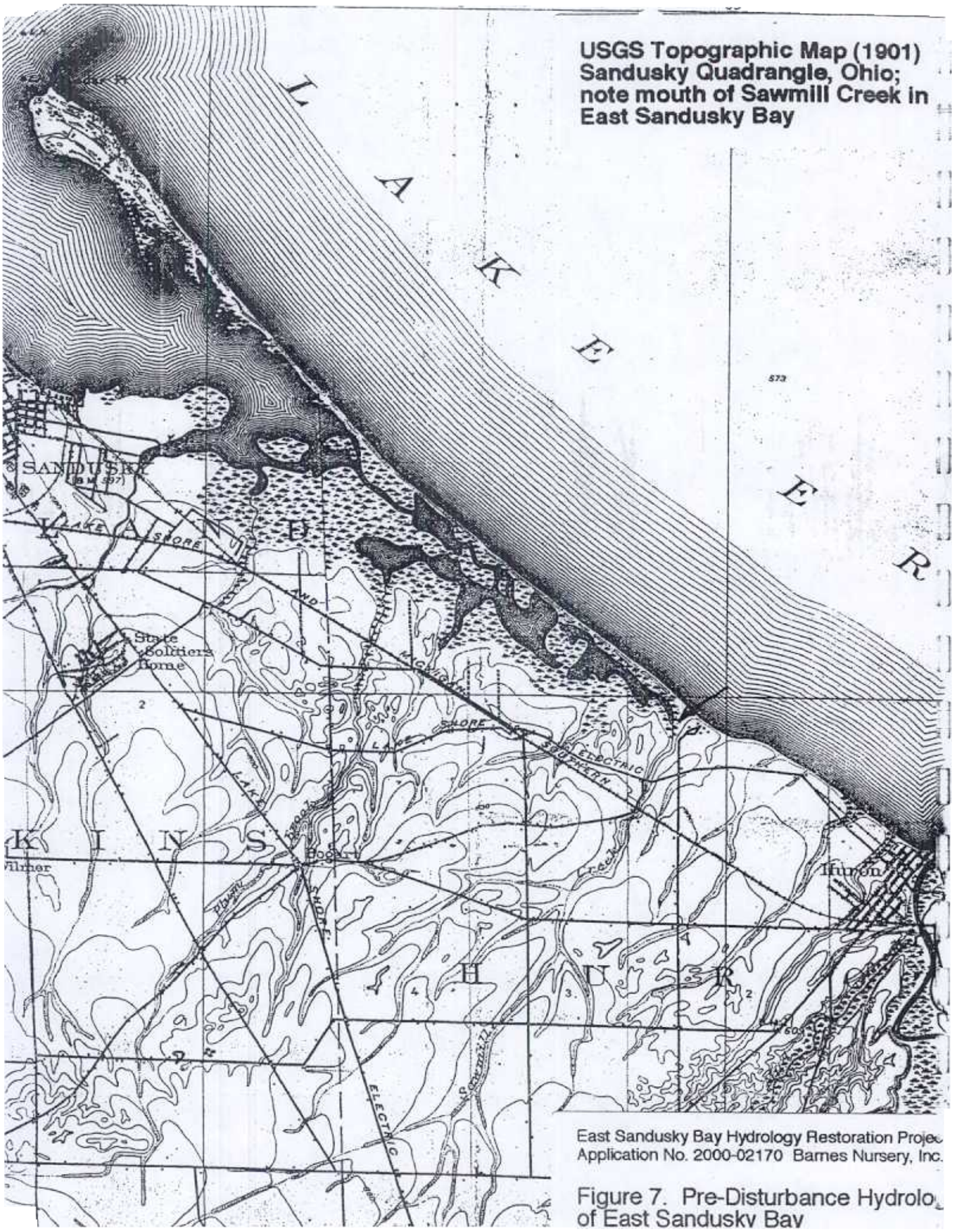


East Sandusky Bay Hydrology Restoration Project
Application No. 2000-02170 Barnes Nursery, Inc.

Figure 4. Pre-Construction View of

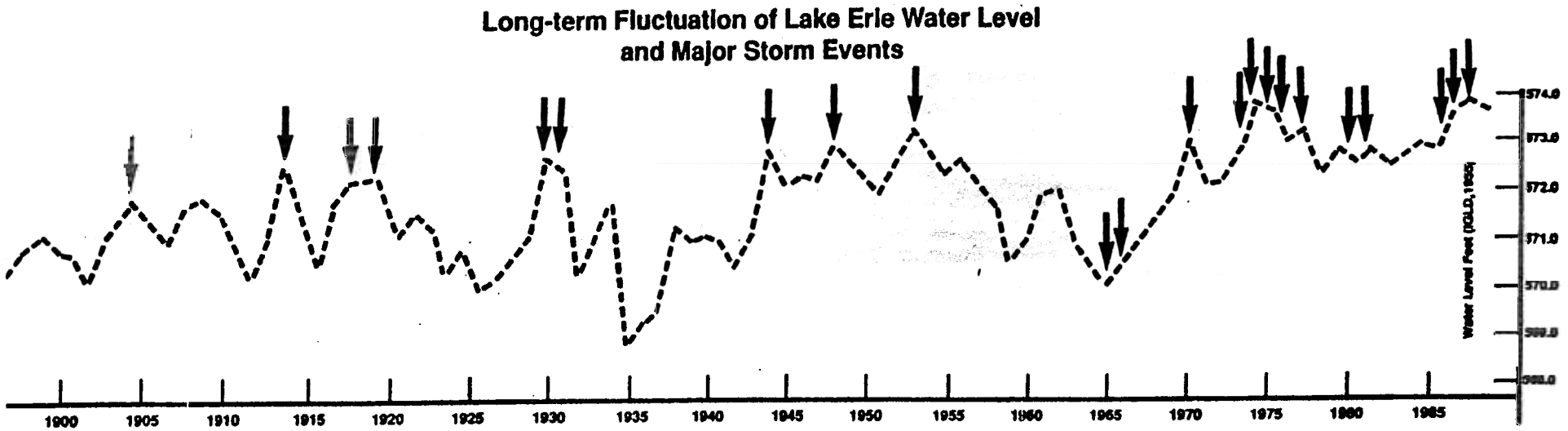
East Sandusky Bay Hydrology Restoration Project
Application No. 2000-02170 Barnes Nursery, Inc.

Figure 5. Work Completed to Date on Project (August 2000)



East Sandusky Bay Hydrology Restoration Projec
Application No. 2000-02170 Barnes Nursery, Inc.

Figure 7. Pre-Disturbance Hydrolo
of East Sandusky Bay



Major storm events that have effected Cedar Point in the past 100 years.

East Sandusky Bay Hydrology Restoration Project
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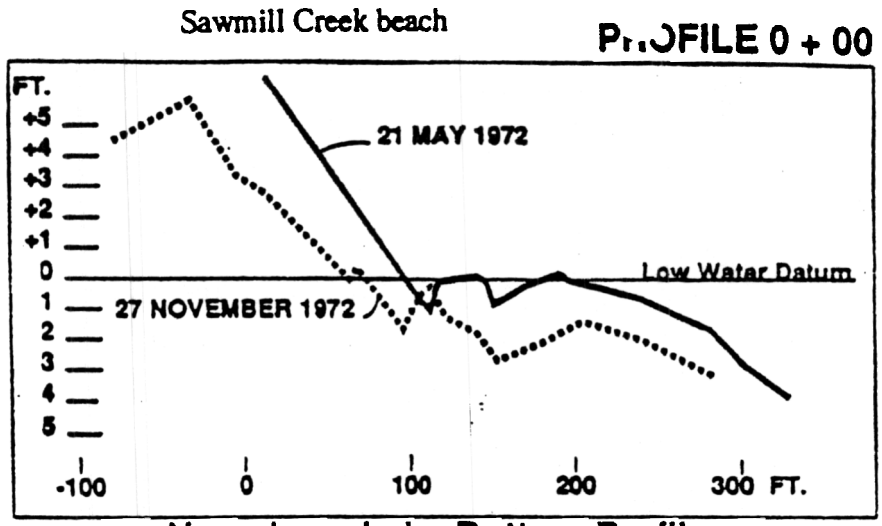
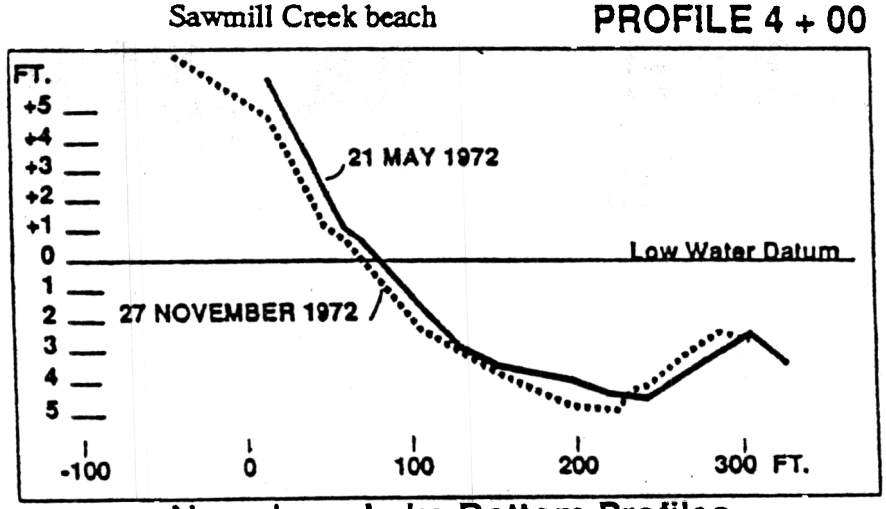
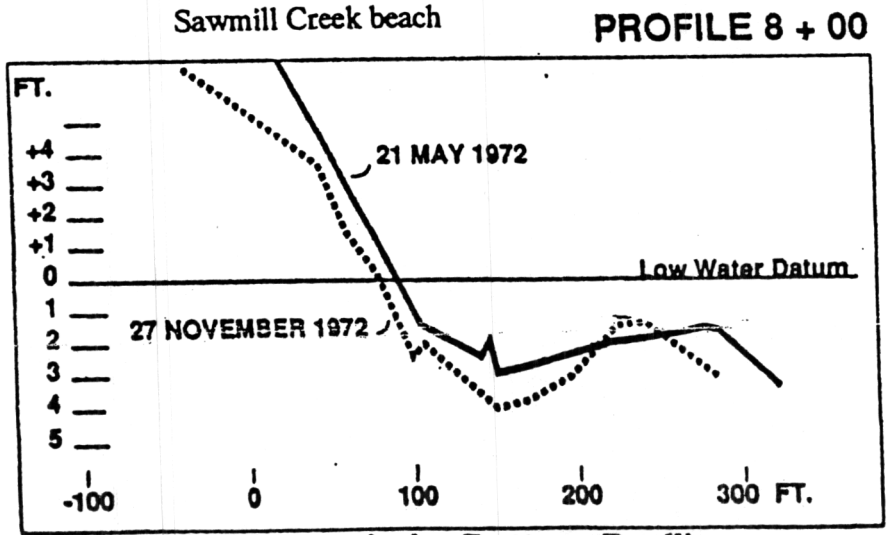
Figure 8. Major Storm Events at Project Site



Nearshore Lake Bottom Profiles
Before and After November 1972 Storm



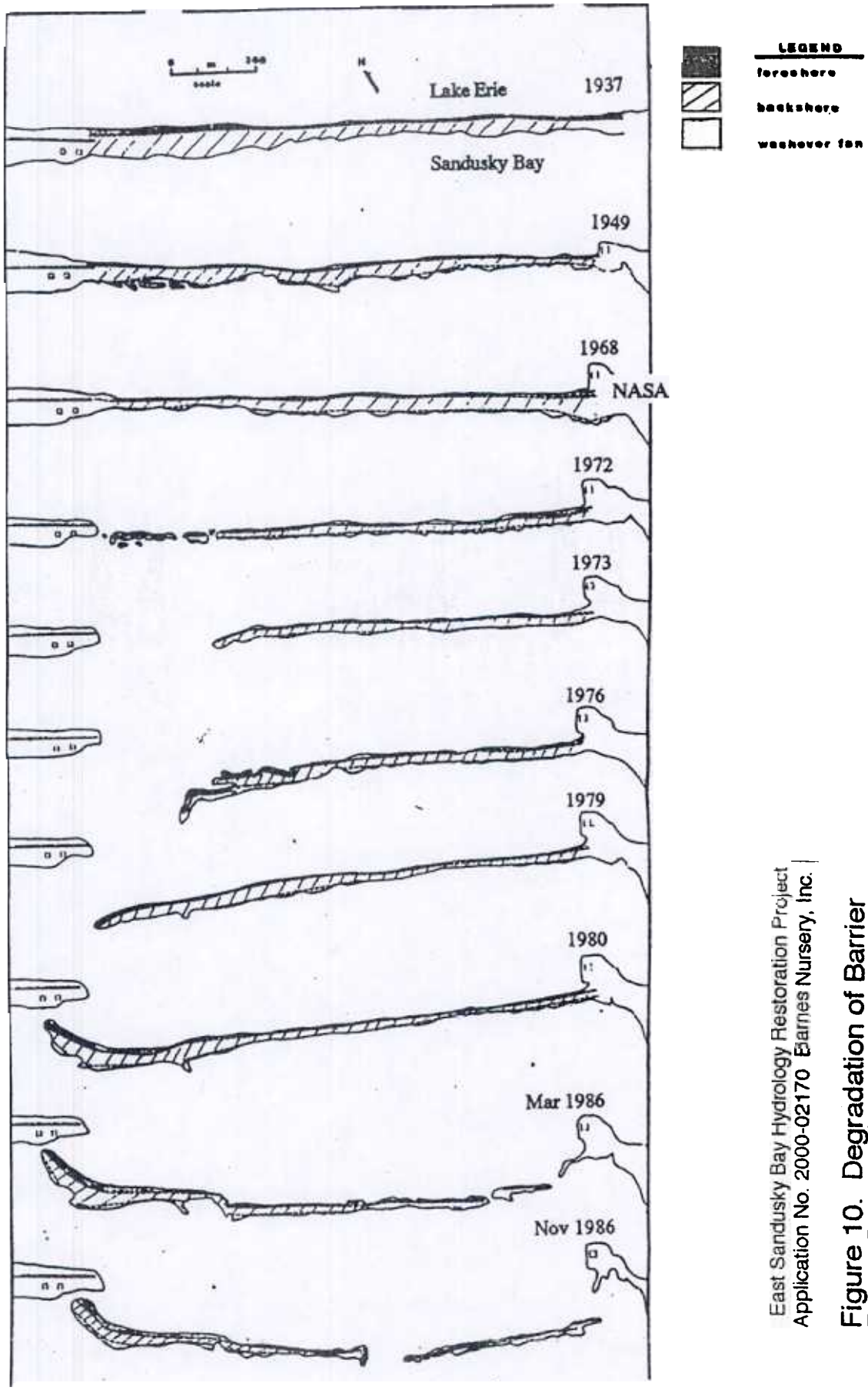
Nearshore Lake Bottom Profiles
Before and After November 1972 Storm



Nearshore Lake Bottom Profiles

East Sandusky Bay Hydrology Restoration Project
Application No. 2000-02170 Barnes Nursery, Inc.

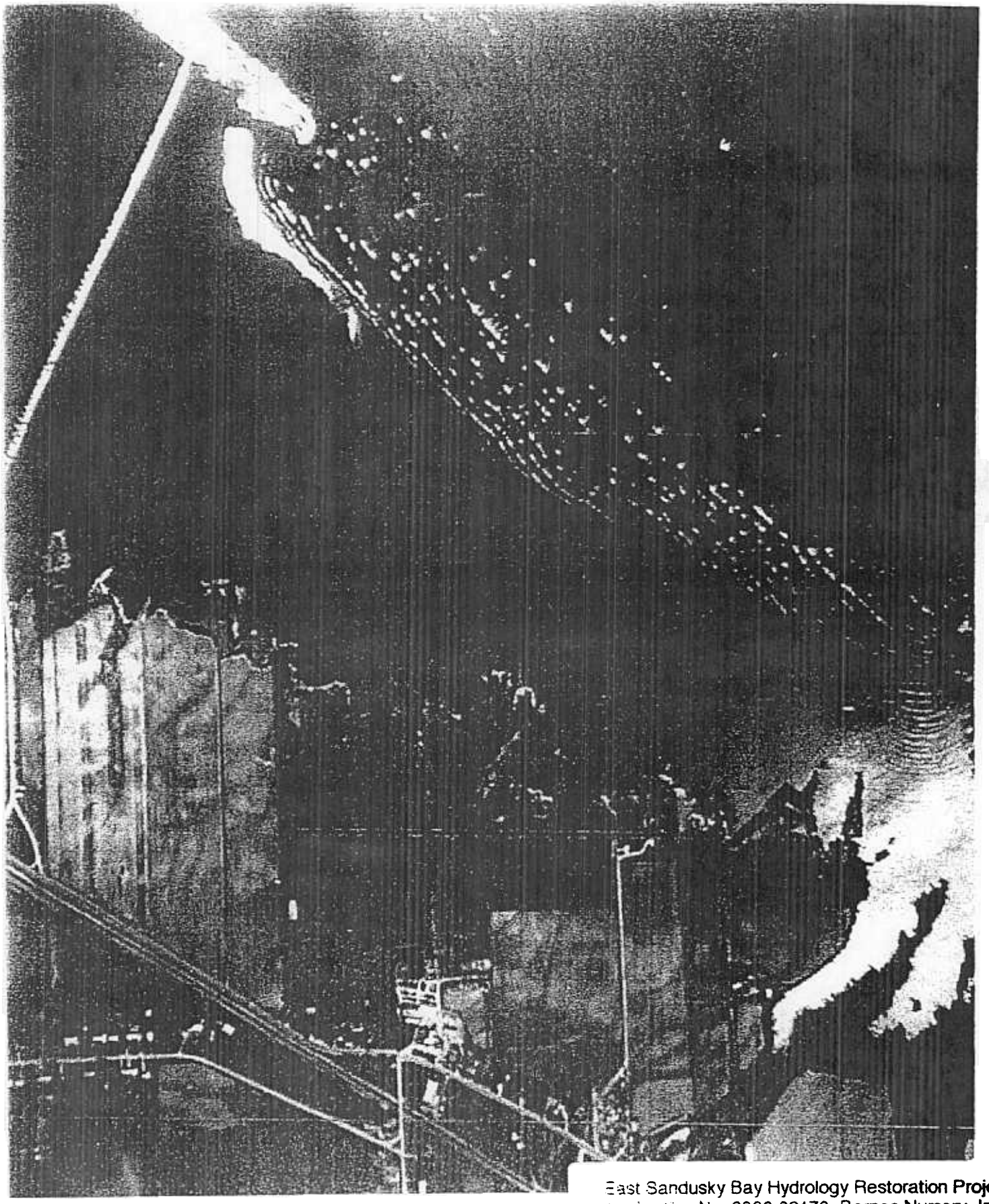
Figure 9. Impact of November 1972
Storm on Sawmill Creek Shore



East Sandusky Bay Hydrology Restoration Project
Application No. 2000-02170 Barnes Nursery, Inc.

Figure 10. Degradation of Barrier Bar at Base of Cedar Point Spit

Changes in the morphology and position of Sheldon Marsh barrier bar from 1937 to 1986 (after Bray 1988).



East Sandusky Bay Hydrology Restoration Projec
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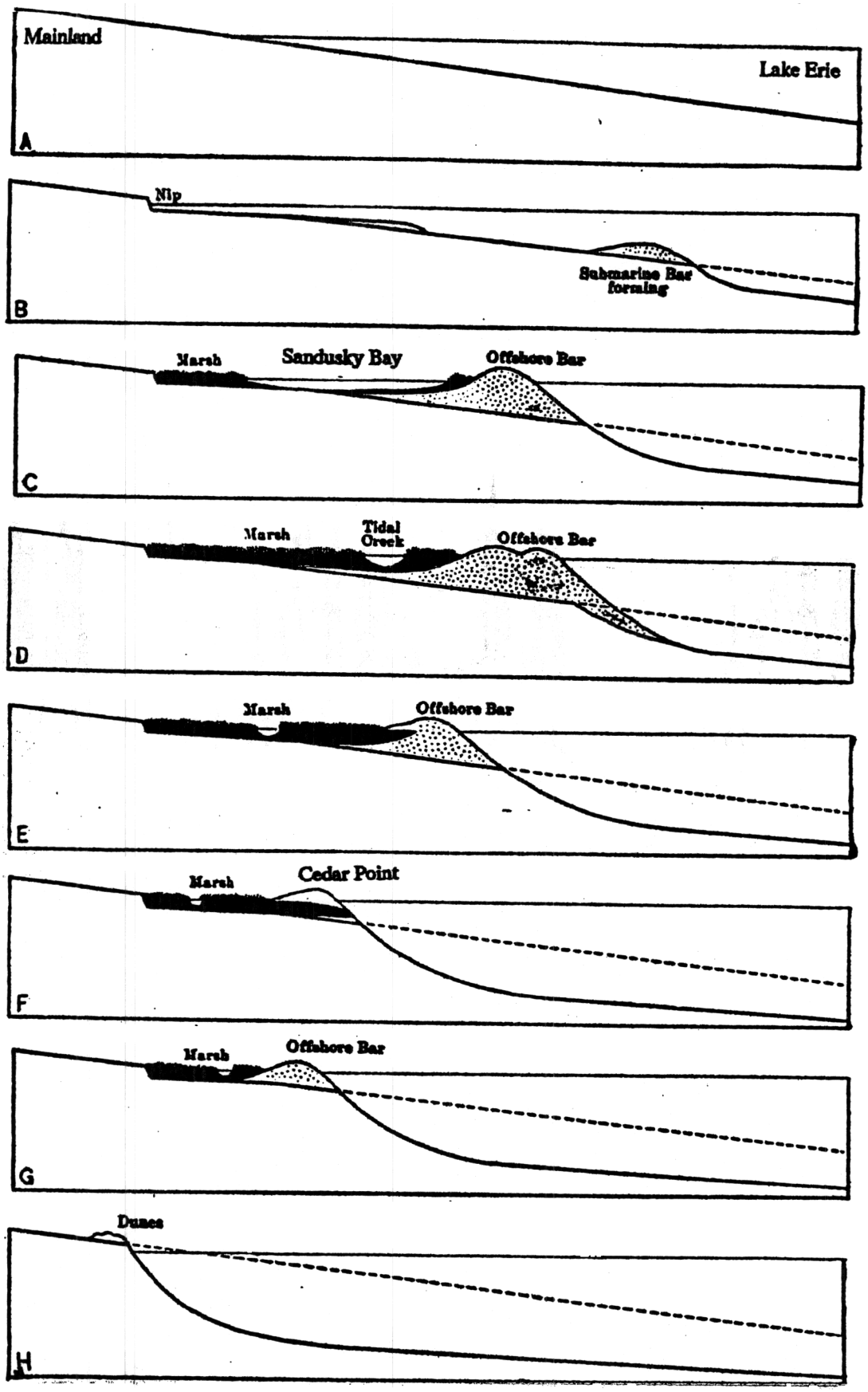
Figure 1-1 Aerial Photograph of
April 1987 Storm at Project Site



Stages in the history of a transgressing bar (after Johnson 1965). Stage F simulates the current position of Cedar Point. Note the peat deposits exposed off the lakeward shore.

Figure 12. Conceptual Drawing of Cedar Point Bar Transgression

East Sandusky Bay Hydrology Restoration Project
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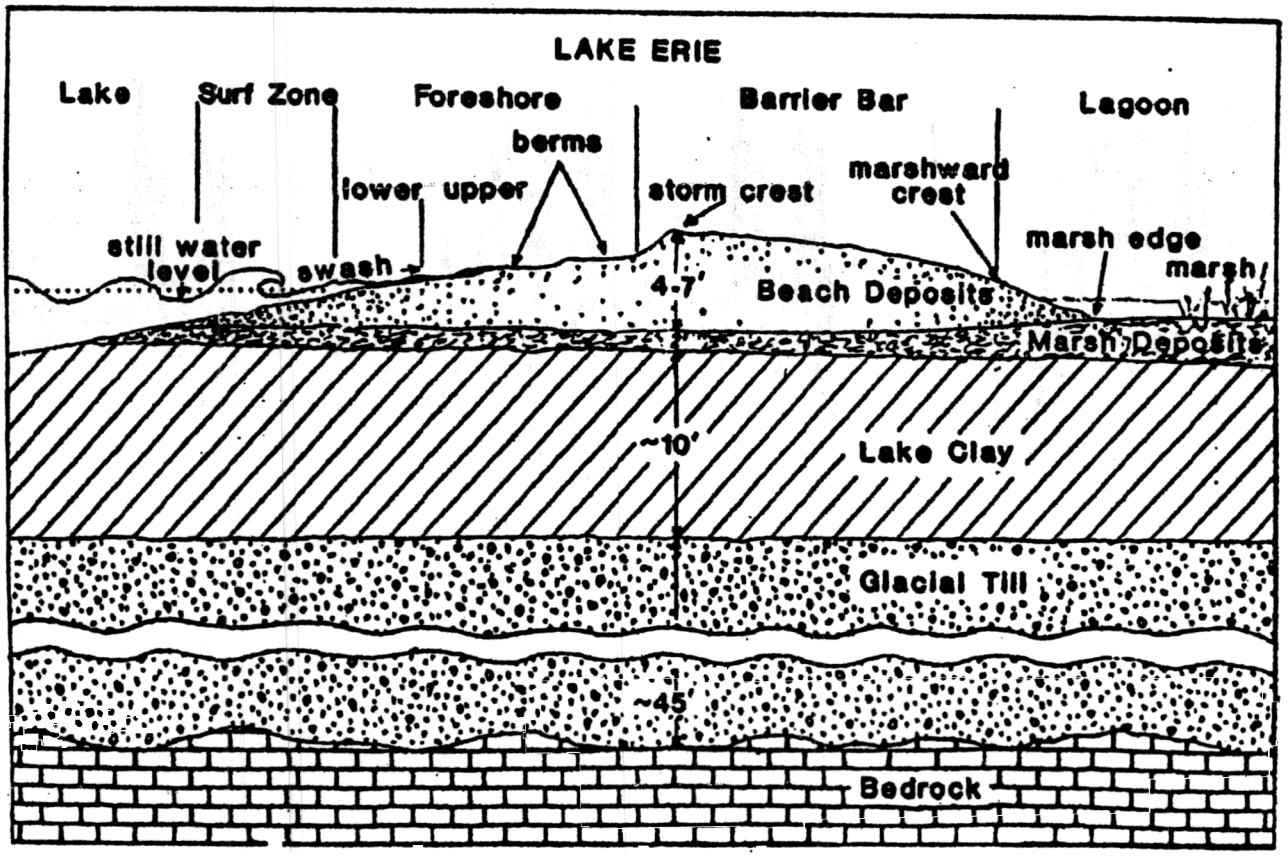
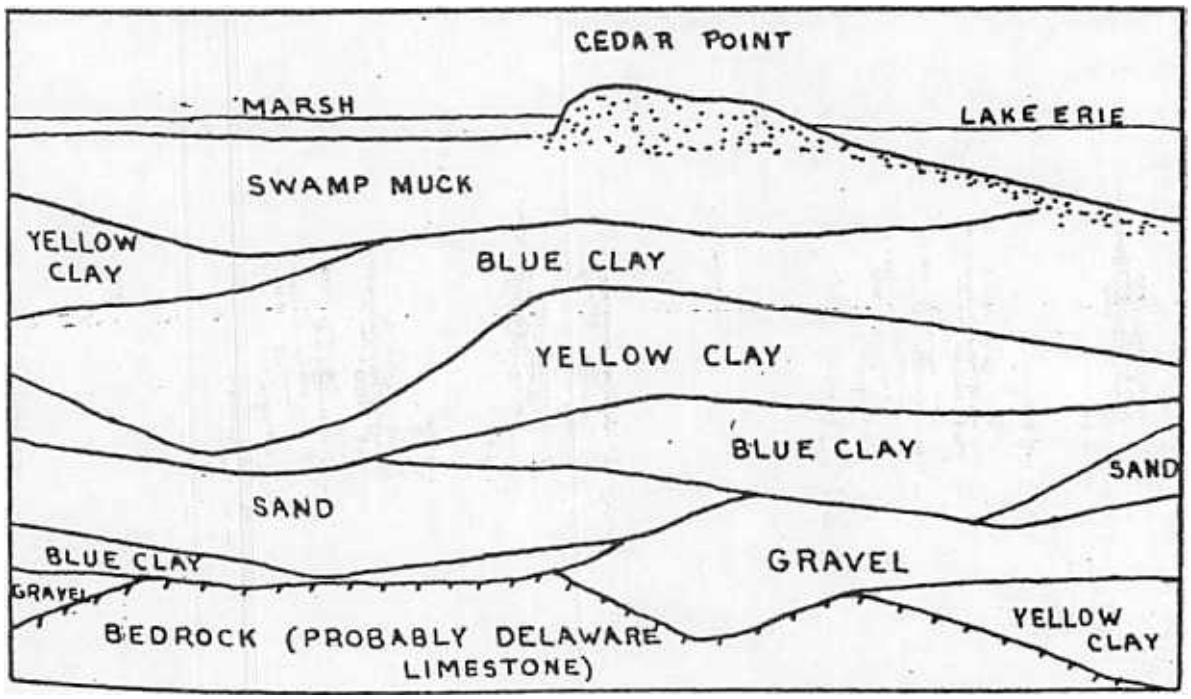

LAKE ERIE
Lake
Surf Zone
Foreshore
Barrier Bar
Lagoon
berms
lower
upper
storm crest
marshward crest
still water level
swash
marsh edge
marsh
4-7'
Beach Deposits
Marsh Deposits
~10'
Lake Clay
Glacial Till
~45'
Bedrock



East Sandusky Bay Hydrology Restoration Project
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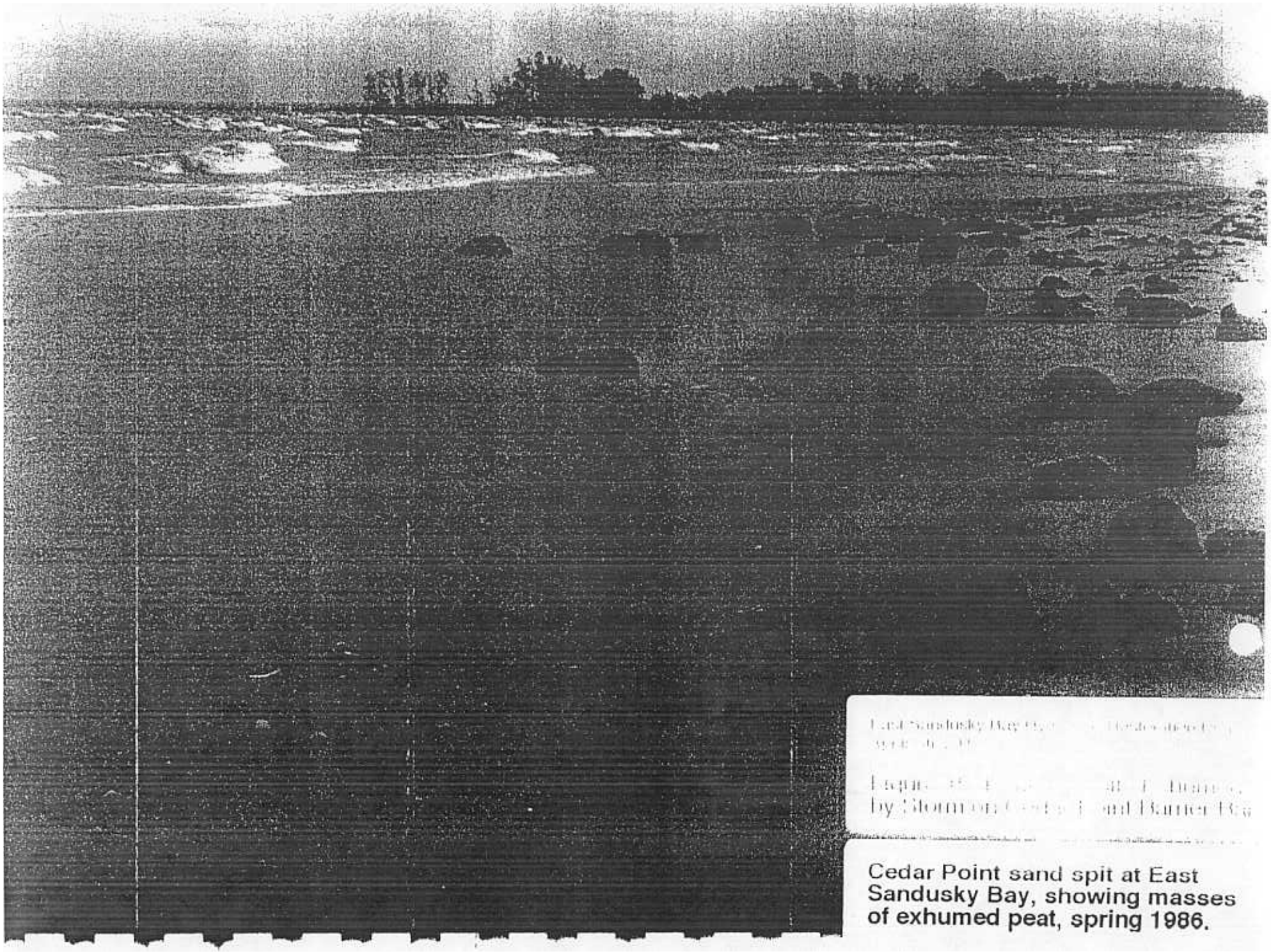
Figure 14. Generalized Cross-Section of Cedar Point Barrier Bar

Diagrammatic cross-section of Cedar Point (after Metter 1953). Note position of peat deposits under Cedar Point.



Cedar Point sand spit at East Sandusky Bay, showing masses of exhumed peat, spring 1986.

East Sandusky Bay Hydrology Restoration Project
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Figure 16. Sheldon Marsh Causeway to NASA Pump Station (Nov. 2000)

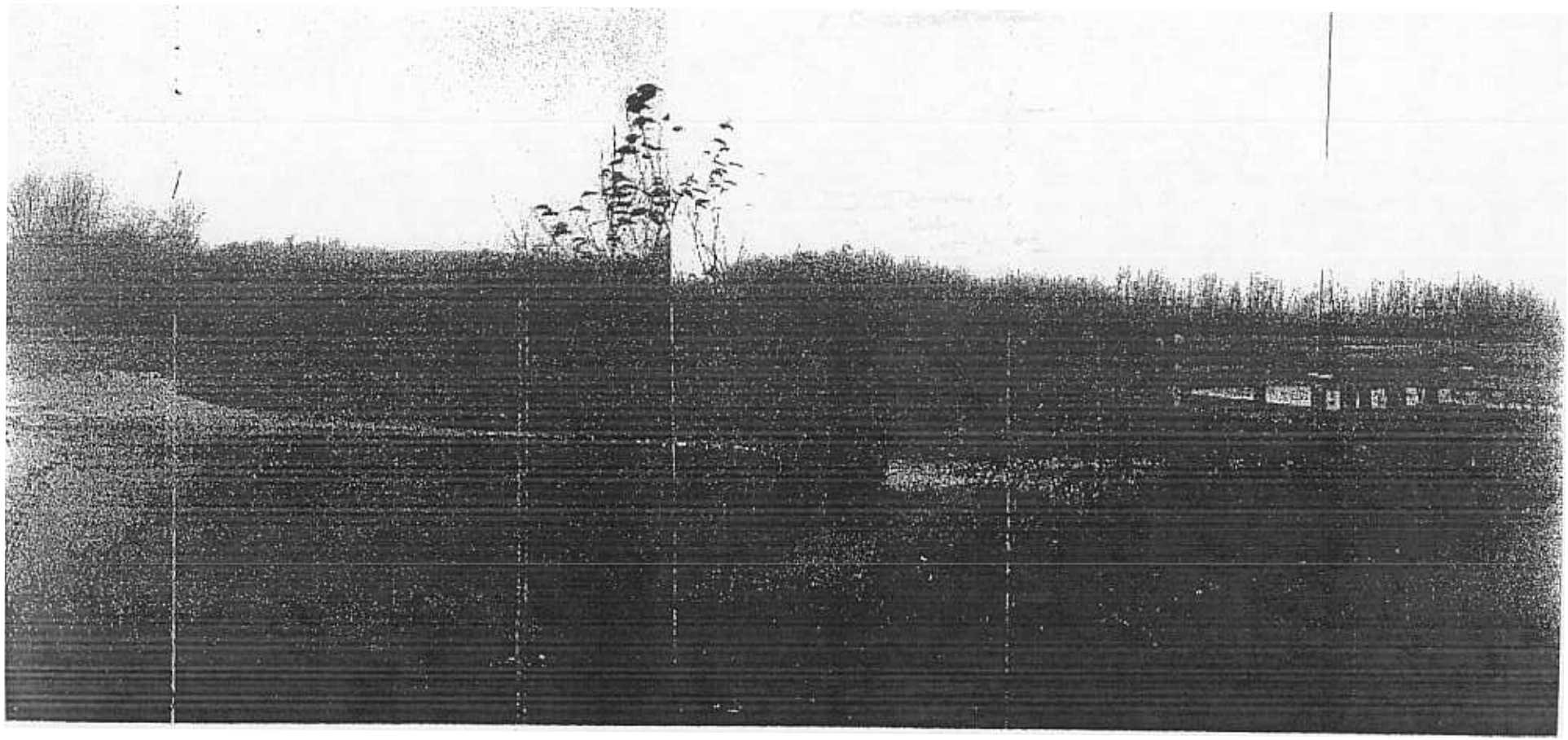

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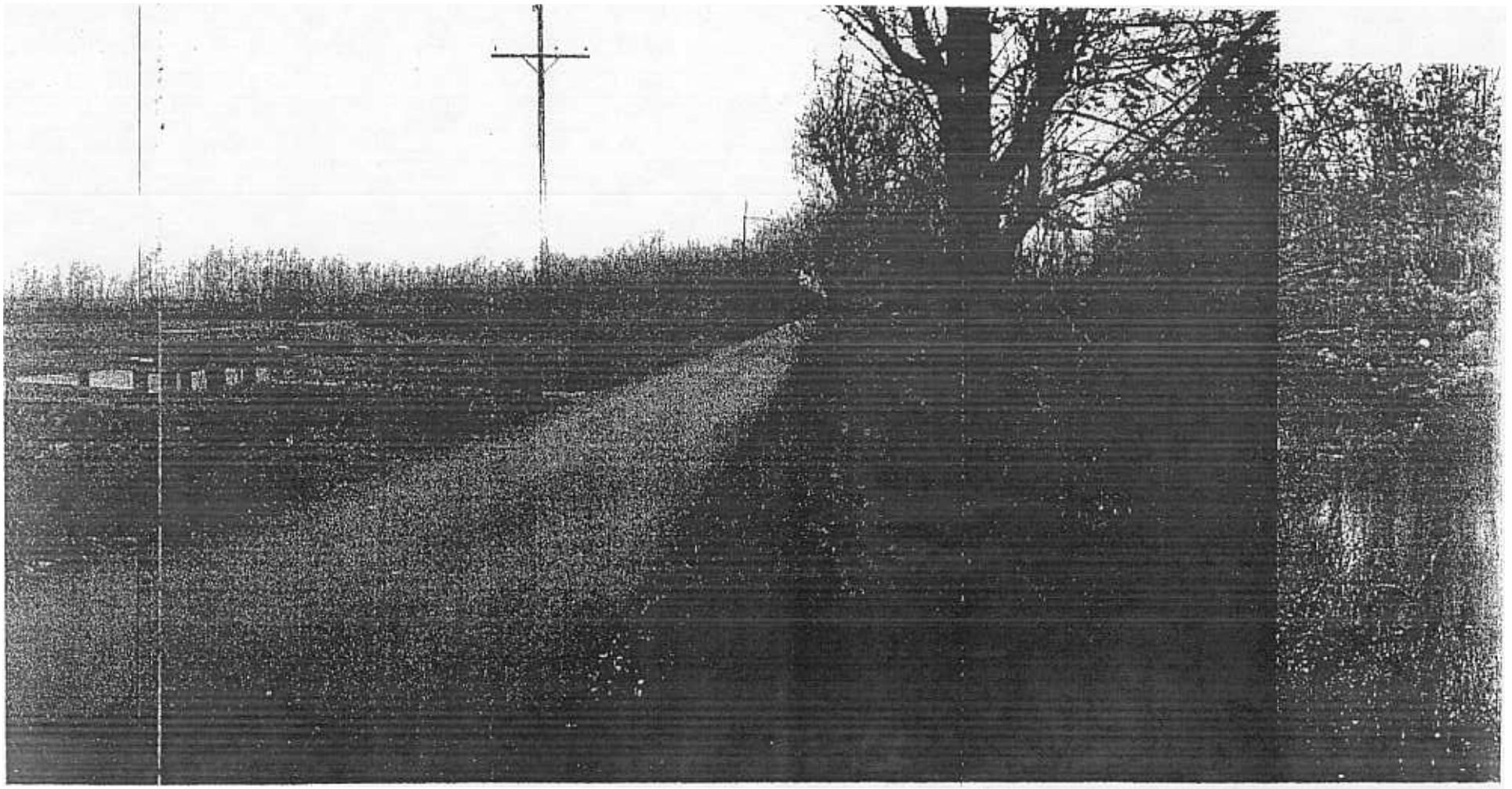
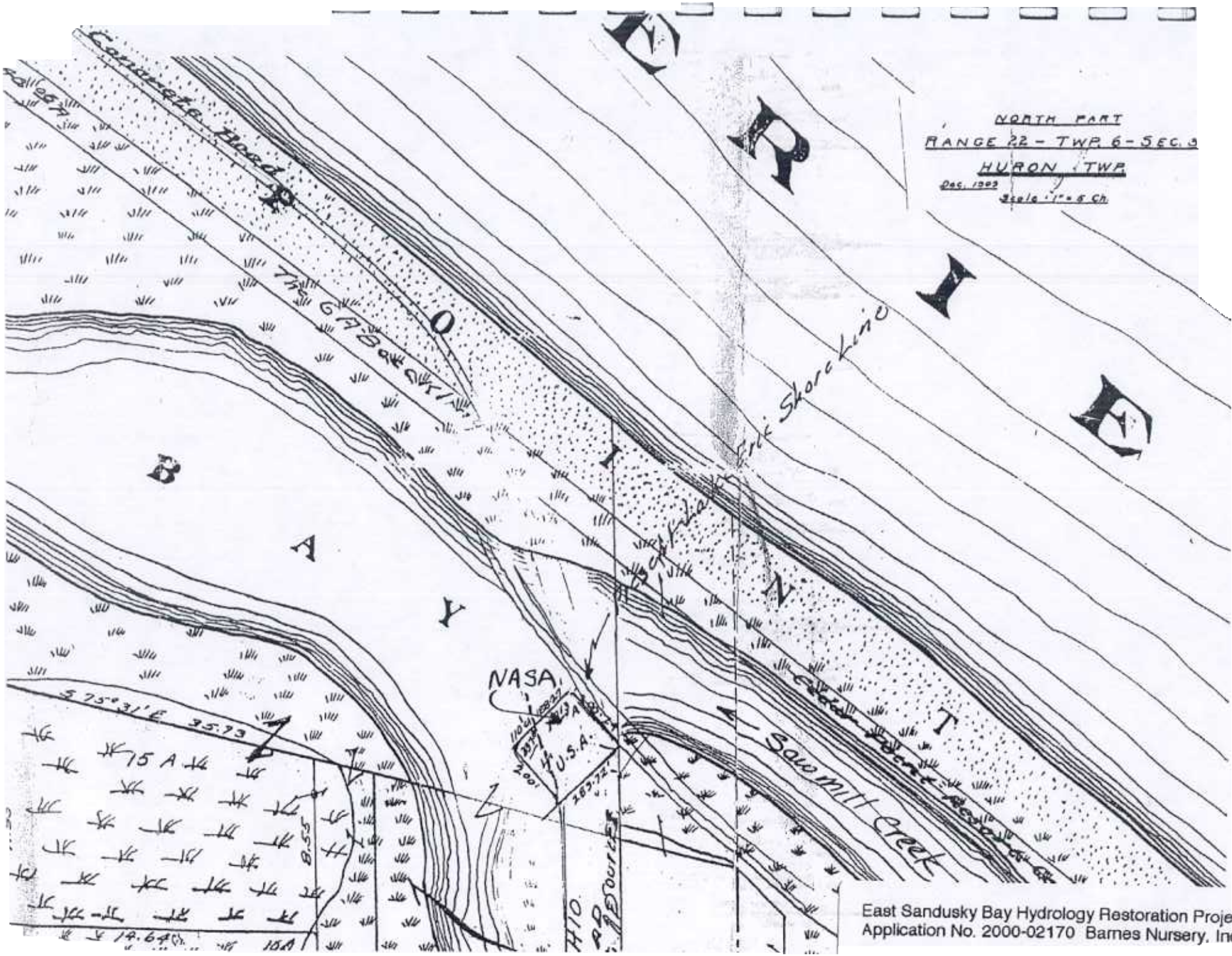
Figure 17. Sawmill Creek Marshes from NASA Causeway (Nov. 2000)





East Sandusky Bay Hydrology Restoration Project
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Figure 1 Plat Map 1909

East Sandusky Bay Hydrology Restoration Project
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Figure 19. Current Plat Map (2001)
Showing Adjoining Property Owners