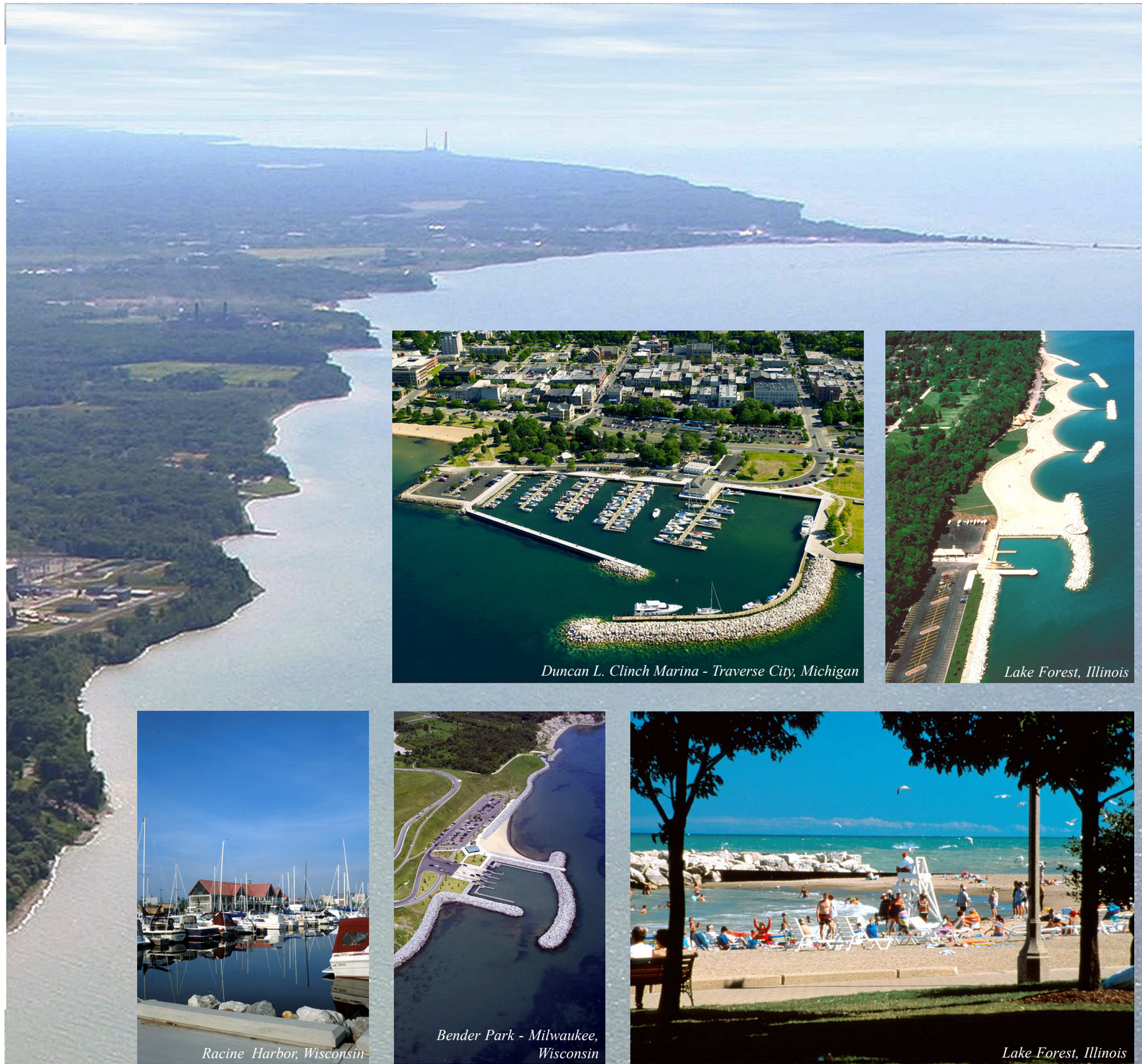

Duncan L. Clinch Marina - Traverse City, Michigan

Lake Forest, Illinois

Racine Harbor, Wisconsin

Bender Park - Milwaukee, Wisconsin

Lake Forest, Illinois

LAKE COUNTY COASTAL DEVELOPMENT PLAN

Lake County Planning Commission
January 2005

JJR
landscape architecture
planning
urban design
civil engineering
environmental science

Acknowledgments

JJR would like to recognize the enthusiasm and commitment shared by those groups and individuals who have devoted so much of their time and energy to this project. In addition to the members of the Lake County Coastal Planning Committee (LCCPC), Ohio Department of Natural Resources, Ohio Environmental Protection Agency, and the US Army Corps of Engineers, special recognition is extended to Jason Boyd, Senior Planner for the Lake County Planning Commission, and Harry L. Allen, Jr., Chairman of the LCCPC, for their unwavering vision of a refreshed relationship between the waterfront and the County's residents, businesses, and visitors. Continued commitment to the idea of a comprehensive plan that is focused on Lake County's unique and valuable relationship with Lake Erie will provide many dividends not only for Lake County, but for all that share Lake Erie and its resources.

Lake County Coastal Planning Committee

Jason Boyd, *Senior Planner, Project Leader*
Harry L. Allen, Jr., *Chairman, North Perry Village Resident*
Larry Advey, *Administrator, Madison Township*
B. Robert Amjad, *Vice President, Hemisphere*
Dick Baker, *Madison Township*
Ron Balog, *President, Grand River Council*
Jim Barchok, *Retired, Lake County Planning Commission*
Lee Bodnar, *Administrator, Painesville Township*
Al Buescher, *Mentor-on-the-Lake Resident*
Mark Cain, *Eastlake Port Authority*
Jack Crislip, *Painesville Township Resident*
Kyle Dreyfuss-Wells, *Executive Director, Chagrin River Watershed Partners*
David Gilmer, *Lake County Commissioner Representative*
Verne Horton, *Fairport Harbor Village Resident*
Andrew Kakas, *Fairport Harbor Port Authority*
Angela Keneven-Zanella, *Eastlake City*
James Kish, *Lake County Development Council*
Ed Klco, *North Perry Village Council*
Kurt Kraus, *Director of Parks, Recreation and Public Lands, City of Mentor*
Bruce Landeg, *Lake County Chief Deputy Engineer*
Deborah Neale, *Lakeline Village Council*
Dave Noble, *Executive Director, Lake Metroparks*
Mark Rising, *Willowick City Planning Commission*
Thomas Rutledge, *Eastlake Resident*
Dennis Sholtis, *Fairport Harbor Port Authority*
Chuck Stephenson, *Mentor Harbor Yacht Club*
Ron Traub, *Community Development Director, City of Mentor*
Vince Urbanski, *Lake Metroparks*
Mark Welch, *Perry Township Zoning Commission*
Robert Zeitz, *Friends of Ward Creek*

All past committee members who have participated since 2001

Ohio Department of Natural Resources

This plan was prepared by the Lake County Planning Commission under award NA03NOS4190052 from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce through the Ohio Department of Natural Resources, Office of Coastal Management. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the National Oceanic and Atmospheric Administration, Department of Commerce, Ohio Department of Natural Resources, or the Office of Coastal Management.

David Mackey, P.E., *Chief*
Yetty Alley, *Local Liaison*
Deborah Beck, *Natural Resource Engineer*
April Dunlap, *Natural Resource Engineer*
Steve Holland, *Consistency Coordinator*
Bridget Stefan, *Submerged Lands Lease Coordinator*

Ohio Environmental Protection Agency
Mike Smith

United States Army Corps of Engineers
Tom Bender, PE

Lake County Planning Commission
Darrell Webster, *Director*
Jason Boyd, *Senior Planner*
Ann Myers, *Secretary*

Special thanks are extended to the following entities for their vision and support of this project:

The Cleveland Foundation
Board of Lake County Commissioners
Avery Dennison
Cohen & Company
Consumer's Ohio Water
Deming Real Estate & Development
Fairport Harbor Village
First Merit Bank
Hemisphere Corporation
Jack & Jeanette Crislip
Jim Barchok
Lake County Development Council
Lake County Soil & Water Conservation
Lake County Visitors Bureau
Lake Erie Marine Trades Association, Inc.
Lake Metroparks
Laketran
Madison Township
Mentor Harbor Yacht Club
Mentor-on-the-Lake
North Perry Village
Osborne, Inc.
Painesville Township
Perry Corporate Center LLC
Perry Township
R. W. Sidley, Inc.
District Trust for Public Lands
Willoughby City

Prepared by JJR, LLC
625 Williamson Street
Madison, Wisconsin 53726
608.251.1177
www.jjr-us.com

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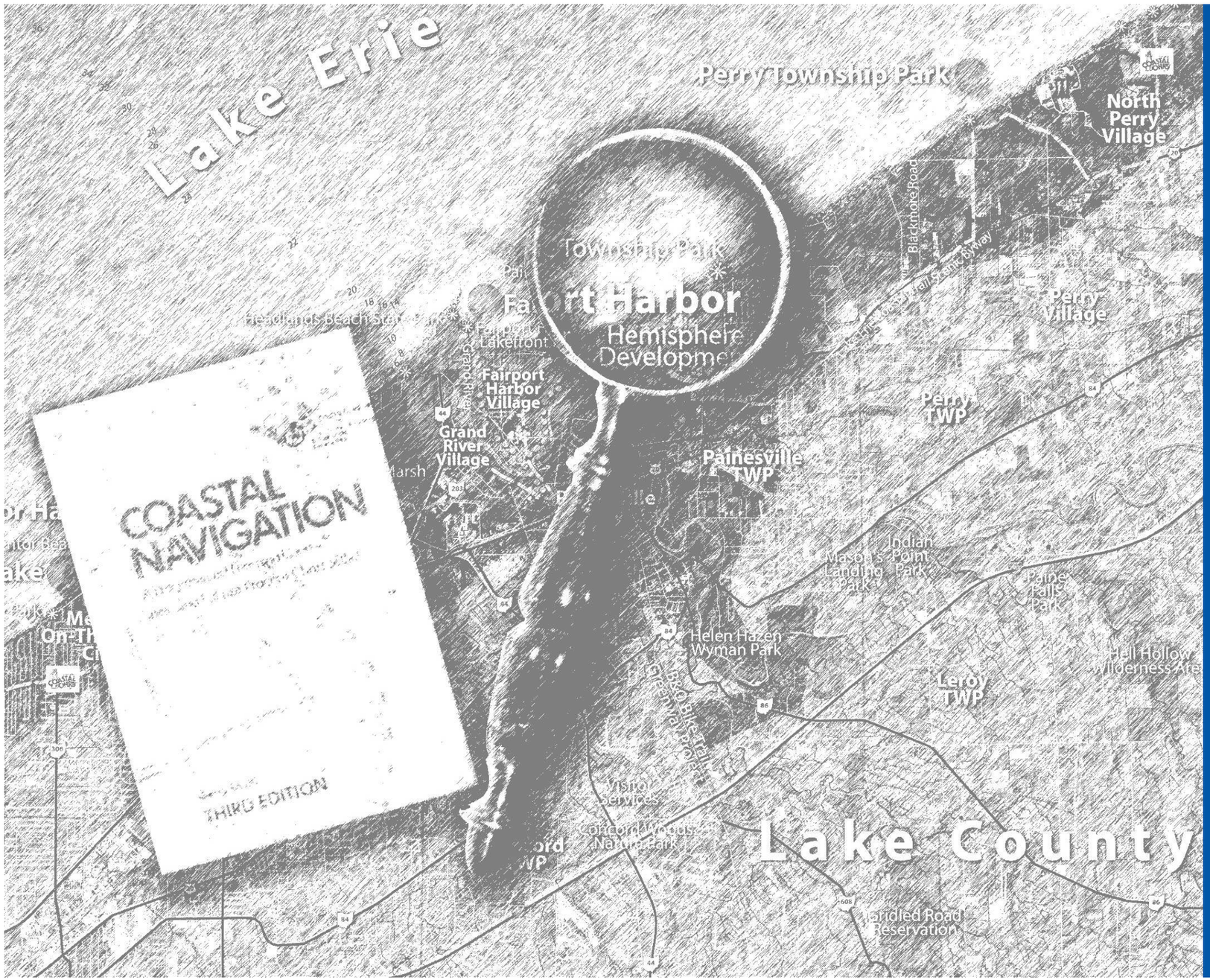
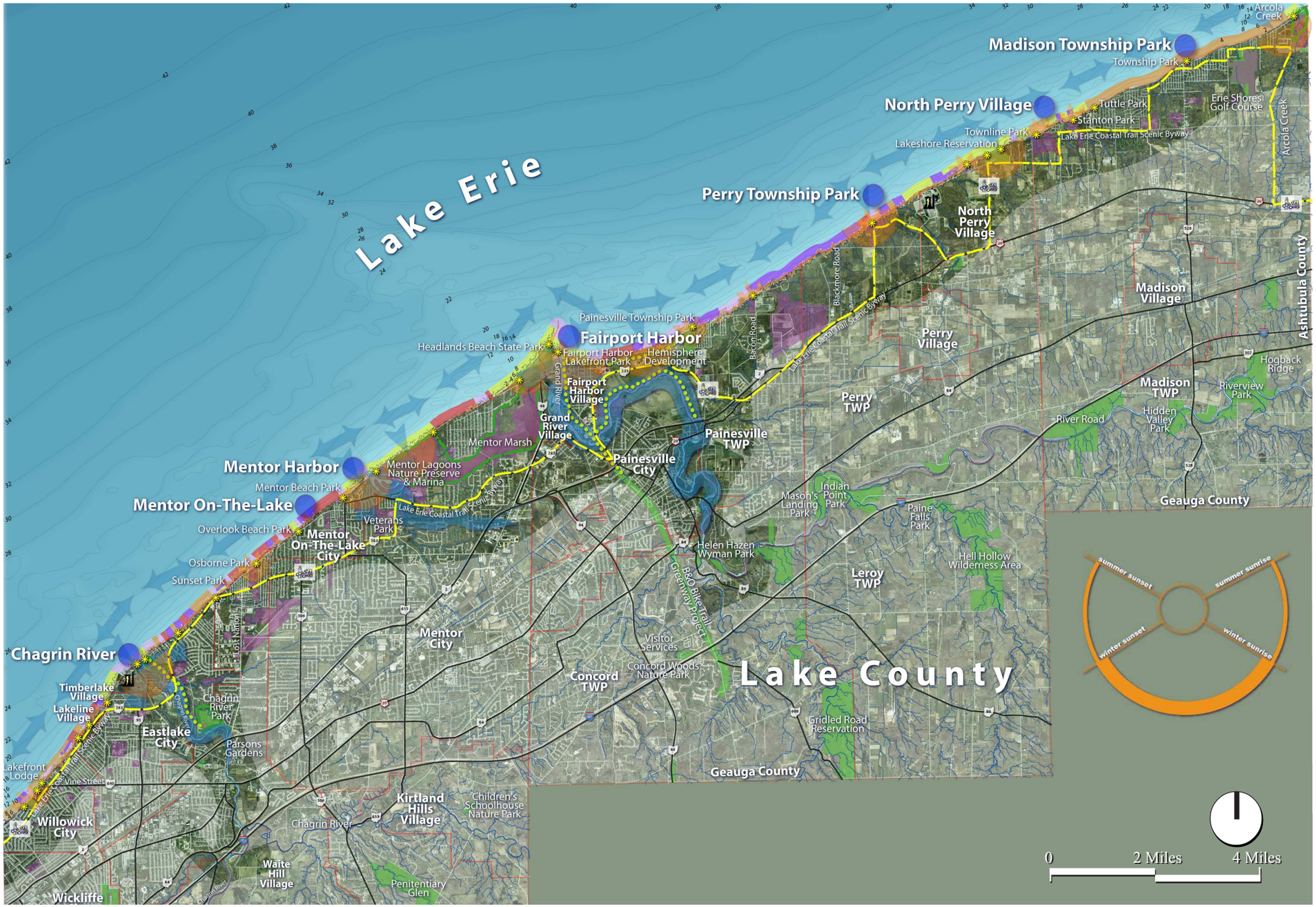


Executive Summary


Lake Erie
Madison Township Park
Township Park
North Perry Village
Tuttle Park
Stanton Park
Townline Park
Lakeshore Reservation
Lake Erie Coastal Trail Scenic Byway
Erie Shores Golf Course
Arcola Creek
Perry Township Park
North Perry Village
Blackmore Road
Madison Village
Ashtabula County
Painesville Township Park
Fairport Harbor
Headlands Beach State Park
Fairport Harbor Lakefront Park
Hemisphere Development
Becon Road
Grand River
Fairport Harbor Village
Perry Village
Perry TWP
Madison TWP
Hogback Ridge
Riverview Park
Hidden Valley Park
River Road
Grand River Village
Mentor Marsh
Painesville TWP
Painesville City
Mentor Harbor
Mentor Lagoons Nature Preserve & Marina
Mentor Beach Park
Mentor On-The-Lake
Overlook Beach Park
Veterans Park
Mentor On-The-Lake City
Osborne Park
Sunset Park
Mason's Landing Park
Indian Point Park
Paine Falls Park
Geauga County
Helen Hazen Wyman Park
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Lakeline Village
Eastlake City
Chagrin River Park
Parsons Gardens
Gridled Road Reservation
Lakefront Lodge
Vine Street
Willowick City
Kirtland Hills Village
Children's Schoolhouse Nature Park
Waite Hill Village
Penitentiary Glen
Wickliffe
Summer sunset
Summer sunrise
Winter sunset
Winter sunrise
0
2 Miles
4 Miles
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Natural Unstable Shoreline
Protected Shoreline - Satisfactory
Protected Shoreline - Unsatisfactory
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Access Corridor Linkages
Ohio Coastal Scenic Byway
Beach
Bluff
Blue Trail
Coastal Destination Opportunities

Executive Summary

The Lake County Planning Commission has developed a comprehensive Coastal Development Plan (CDP) as part of a county-based initiative to refocus attention on the value of Lake Erie as a major environmental, economic, and recreational resource. Many individual studies have been conducted along the shoreline over the years resulting in a substantial data base of information. This study attempts to quantify the data and extract the most relevant information in order to synthesize a comprehensive, integrated plan. Information was augmented and updated by new digital aerial photography of the entire Lake County coastline.

The process for creating the CDP included the participation of representatives from numerous Lake County communities through the formation of the Lake County Coastal Planning Committee. It also included the critical input of various representatives from the United States Army Corps of Engineers (USACE), Ohio Environmental Protection Agency (OEPA), and the Ohio Department of Natural Resources (ODNR) in an advisory capacity.

As a document, the Coastal Development Plan:

- provides a record of existing coastal conditions along the Lake County shoreline to serve as a benchmark for future shoreline improvements;
- identifies existing land use patterns and the location of potential land use opportunities for improved shoreline use, lake access, and the creation of coastline "destinations" for residents and visitors of Lake County;
- identifies potential technical solutions for protecting shoreline beaches, bluffs, and harbors, and creating safe environments for boaters and shoreline recreation;
- addresses the feasibility of several potential project areas along the coastline by understanding the existing conditions, developing alternative concepts, and providing an opinion of probable costs for each of these sites; and
- discusses strategies for implementing potential projects and lists potential funding sources.

Section I of the report, "Background", serves as an introduction to the project and provides background information and a summary of the process used to develop this plan. Section II of the report, "Coastal Development Plan", provides an overall plan of the county, reviews goals of the project, elements of the Lake County coastal environment, land and water use, existing shoreline edge conditions in the county, and a brief summary of some of the regulatory issues and permitting that may effect future projects. Section III of the report, "Potential Implementation Projects", provides a more in-depth review of the feasibility and potential cost of several project sites located along the Lake County shoreline. The concepts and highlights of each of the potential implementation projects are briefly summarized on pages 4 - 7 of this Executive Summary. The report concludes with section IV, "Implementation Strategy". This section outlines a series of strategies for moving forward with the implementation of specific coastal projects along the Lake County shoreline, and provides a list of potential funding sources and their contacts.

In summary, the Coastal Development Plan describes the overall coastal environment and documents a plan in response to this environment resulting in an accessible, economically viable and locally relevant Lake County coastline. The creation of the plan should:

- lead to enhanced grant award leverage created by a regional effort;
- serve as a catalyst for landside planning of projects at the local or regional level; and
- facilitate the selection of specific coastal projects for implementation.

Chagrin River (Offshore Breakwaters)

Provides a protected harbor and safe passage between the river and the lake, and addresses the river-based sedimentation at the entrance. Possible alternatives or variations to this concept include:

- the extension of the breakwater westward to the First Energy Power Plant intake structure;
- the extension of the breakwater southward toward the shoreline to provide public fishing access; and
- the potential development of a new 160 slip marina within the protected harbor east of the First Energy Power Plant.

Mentor-on-the-Lake and Mentor Beach Park

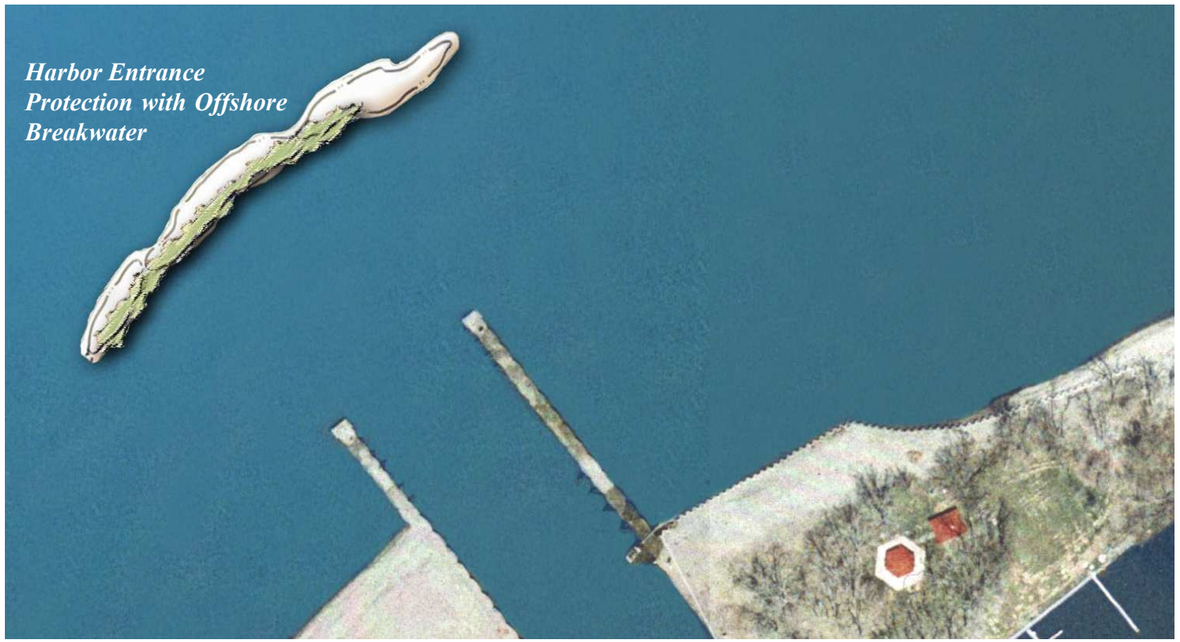
Reasonable but effective and durable alternatives for private property owners to address shoreline erosion with the intent of:

- protecting and stabilizing the shoreline in an efficient, cohesive, and environmentally sensitive manner; and
- creating a more accessible and usable shoreline for private and public properties.

At Mentor Beach Park, the intent is to provide an effective and permanent solution for protecting the water treatment station pump house. This could be accomplished through the use of a simple stone revetment as shown here. This area may also be suitable for a series of offshore breakwaters similar to the Perry Township Park or Townline Park design. Properly placed, these structures could create a more user-friendly beach environment and protect the existing water intake structure. Placing the breakwater in front of existing pavilion would be a logical location for this added amenity. The concept expressed here also indicates the potential for future shoreline path linkages to the east and west.

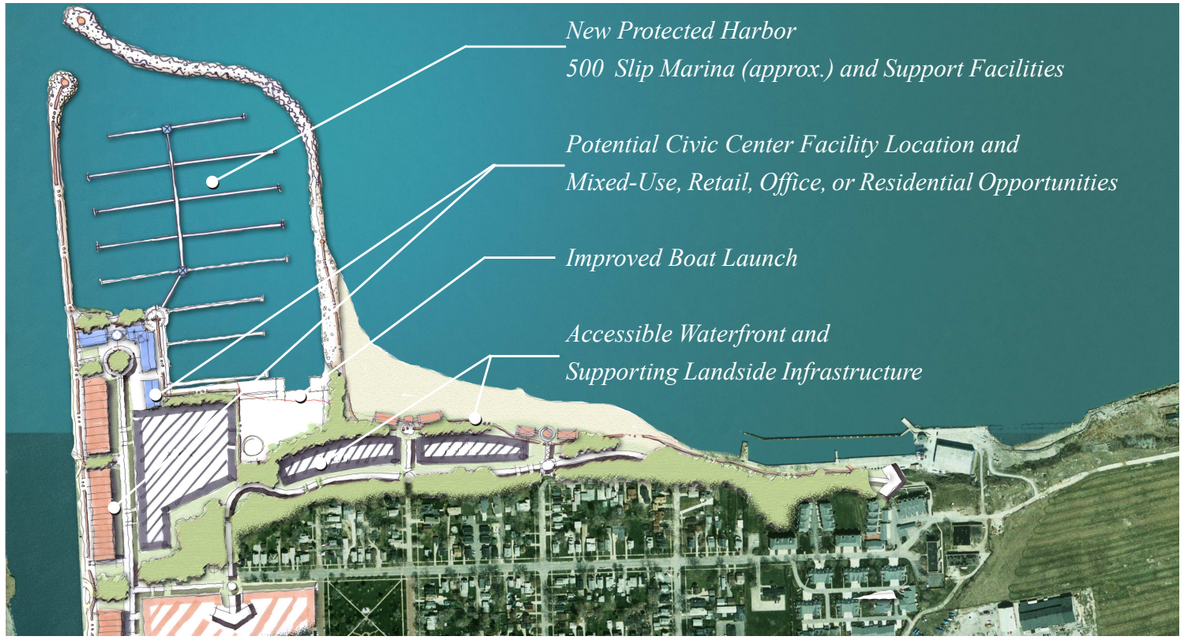
Mentor Harbor

Protection of the harbor through the use of an offshore breakwater. This will require either a sand bypass system or scheduled maintenance dredging to keep the entrance channel open.
Sand that is bypassed or dredged should be placed east of the entrance channel to maintain the littoral drift system. Major elements of this concept include removal of the partially submerged barge, channel dredging, and construction of an approximately 650 foot long rubblemound breakwater .



Fairport Harbor Marina

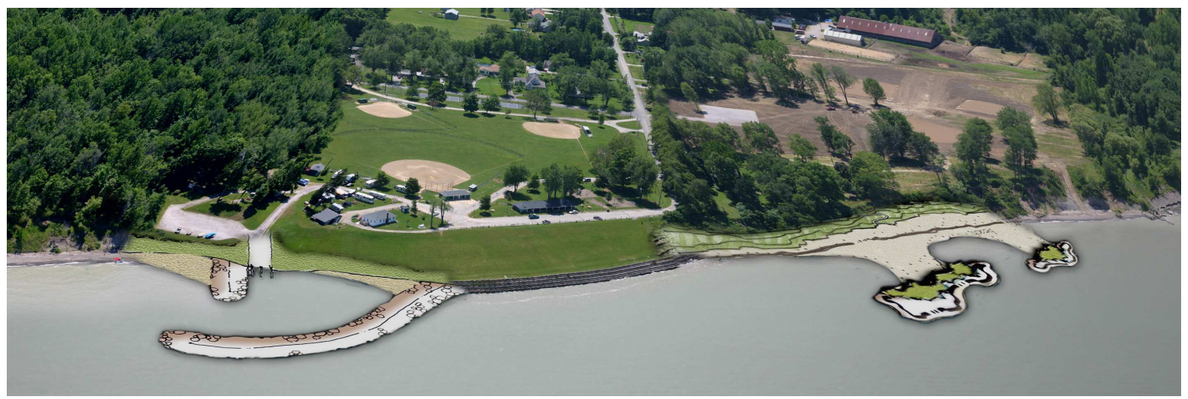
Improvements and expansion of the transient marina amenities and services to create a mixed-use harbor facility. Includes a nearly 500 slip marina inside of a protected harbor; harbormaster building; supporting utility and landside infrastructure; and improved access to the waterfront for fishing and recreational use.

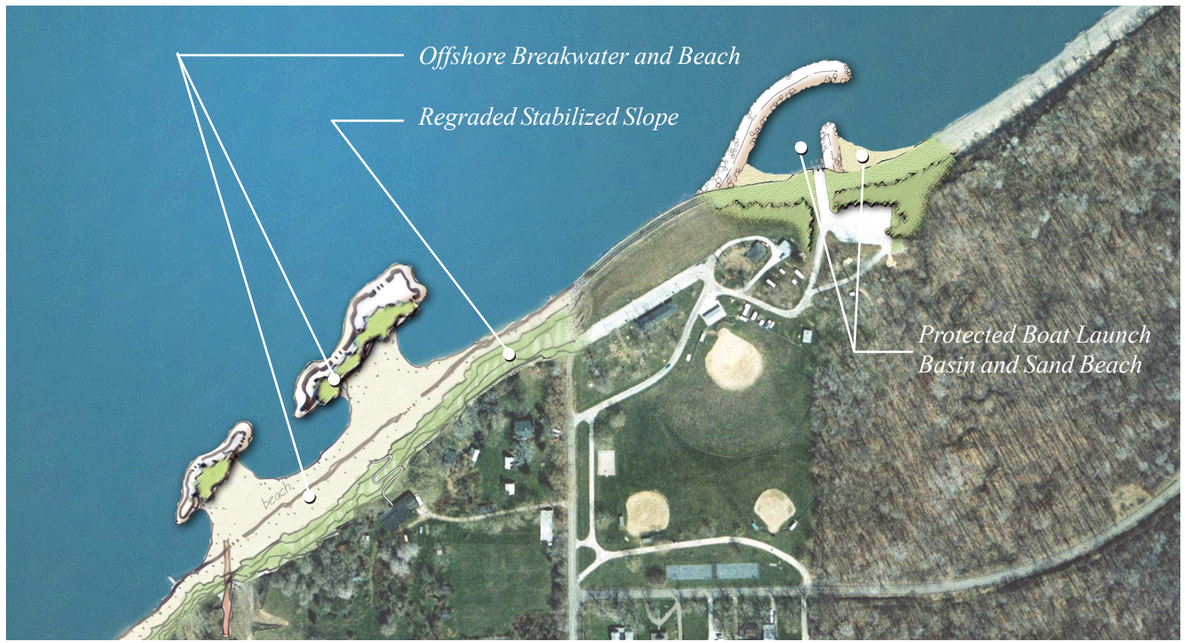


Perry Township Park

Concept for approximately 2000 lineal feet of shoreline that includes:

- the protection and stabilization of the bluff west of the concrete revetment (Camp Roosevelt Area);
- creation of a more usable shoreline or beach at the base of the bluff;
- incorporation of ADA access to the lake as part of a new Senior Center constructed on the Camp Roosevelt property; and
- provision of a protected harbor and improved the boat launch facility at the east end of the park.

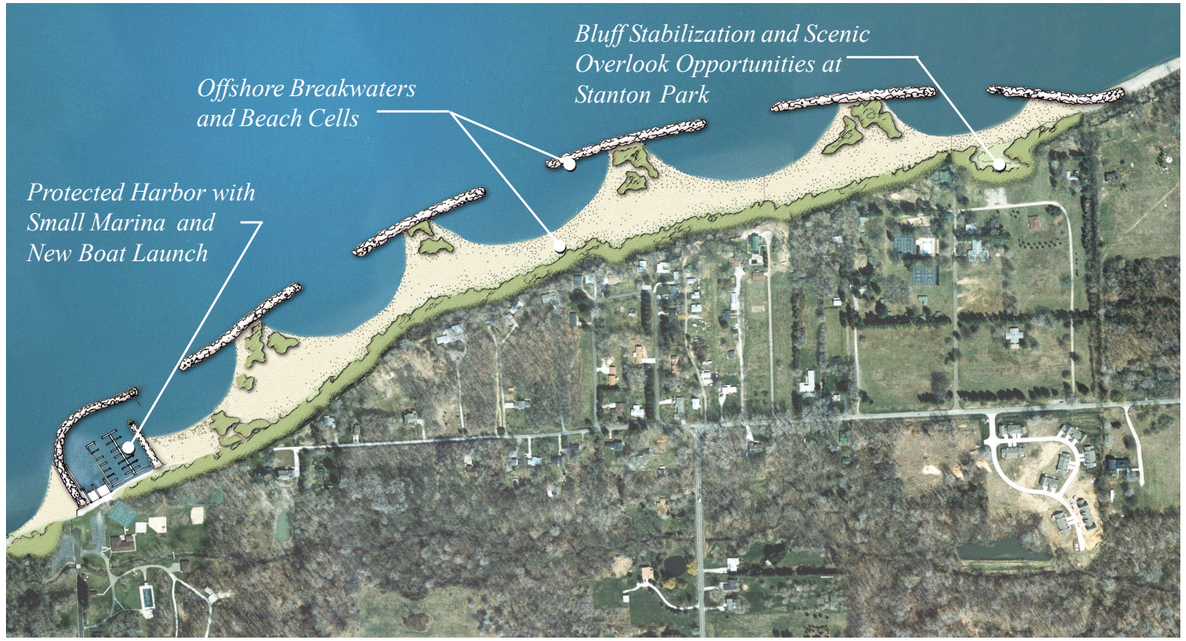




Townline and Stanton Parks in North Perry Village and Madison Township

New calm-water boat launch, marina, and offshore barrier structures as part of an integrated safe harbor and passive recreation waterfront design. These improvements are intended to protect the shoreline and create substantial recreational boating and swimming beaches along the shoreline between the two parks Highlights and elements of this concept include:

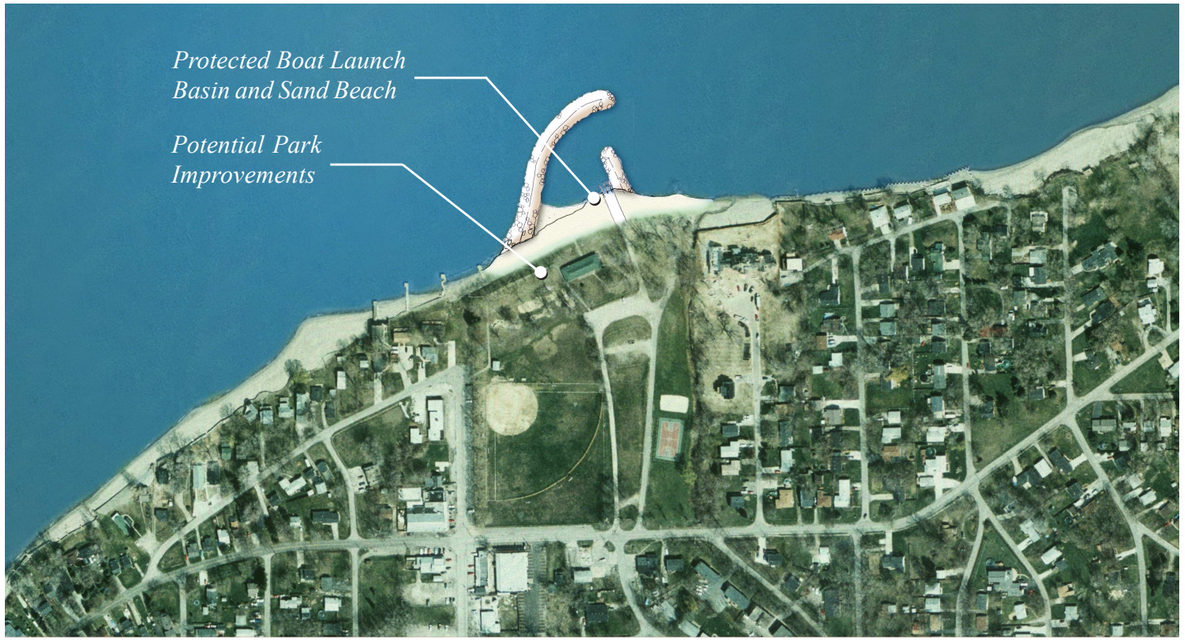
- a protected harbor for recreational water craft;
- small marina with dockage for approximately 40 boats;
- new boat launch within the protected harbor;
- supporting marina infrastructure including driveways and parking, water and electrical utilities, deicing system;
- waterfront access and sand beaches for recreation and fishing;
- slope stabilization at Stanton Park; and
- scenic overlook structures at both Townline and Stanton Park.

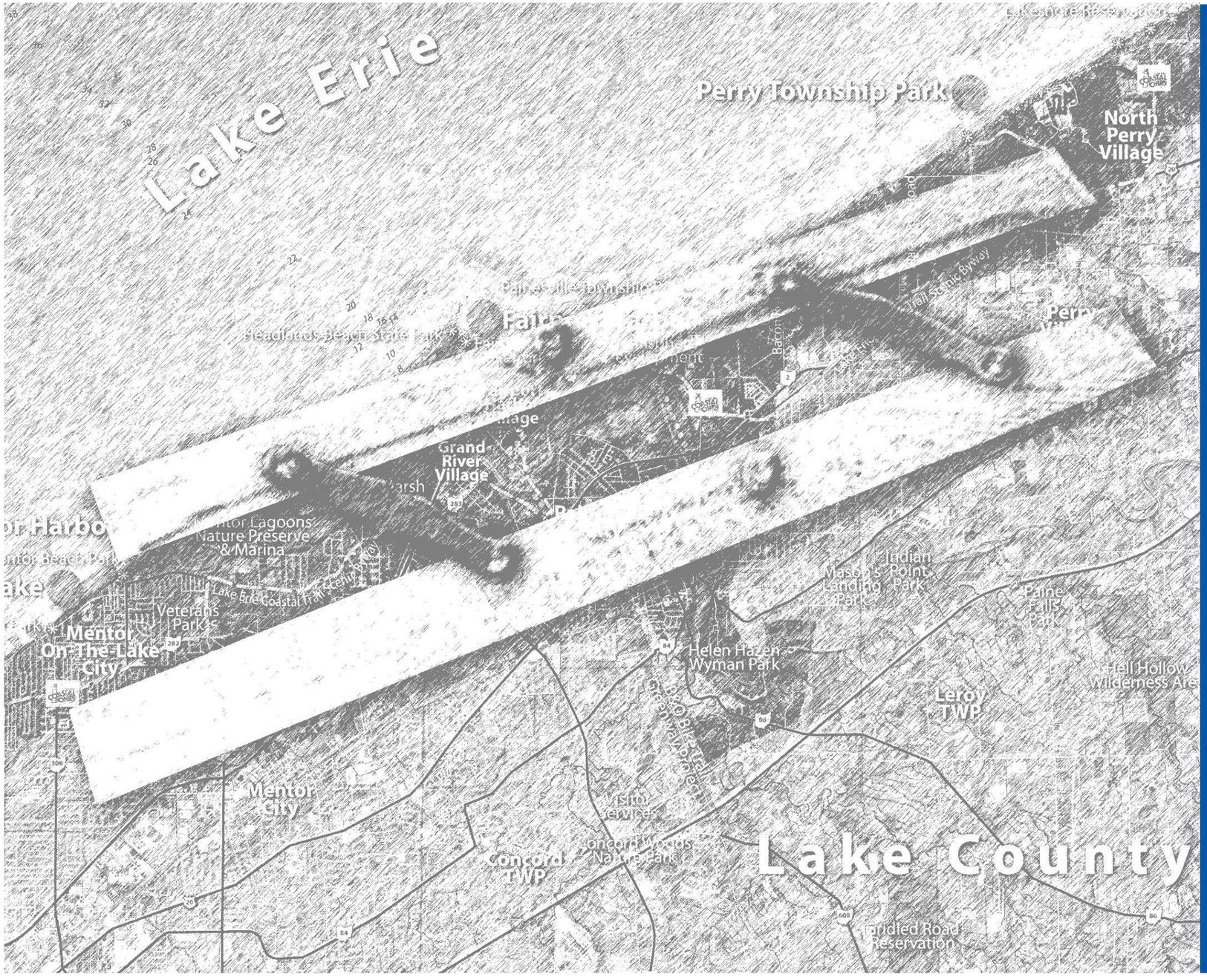


Madison Township Park Boat Launch

Concept for protected boat launch at the 12 acre public park with approximately 660’ of shoreline that includes:

- improved parking areas and access to the launch;
- replacement of concrete structures along the shoreline with offshore breakwaters; and
- enlargement and enhancement of the public beach.





I.
Background

National Statistics

- *An estimated 68.84 million Americans participated in recreational boating during 2002.*
- *The number of recreational watercraft owned in the U.S. last year was estimated at 17.3 million, representing a 10 percent increase since 1988.*
- *An estimated $30.3 billion was spent nationwide last year on the purchase of new and used boats, motors, engines, trailers, accessories and other marine related expenditures. This is nearly triple the $11.2 billion that was spent in 1993.*

Ohio Statistics

- *Ohio ranks eighth nationally in the number of registered watercraft.*
- *Ohio's population increased 4.7 percent from 10,847, 115 in 1990 to 11,353,140 in 2000. Over the same period, the number of registered recreational watercraft increased 10.1 percent from 378,249 to a record 418,701.*
- *There are 800 marinas and boat dealerships and more than 88,000 docks and rack storage spaces present in Ohio.*

Economic Impact

- *Recreational boating in Ohio contributes an estimated $1.5 billion annually to the state's economy and supports 19,500 jobs.*
- *More than 5.5 million is paid annually in watercraft registration fees. Ohio watercraft owners paid $12.1 million in state fuel taxes during fiscal year 2001.*
- *Excluding boat payments, the typical boat owning household spends an average of $5,625 annually on recreational boating.*

The Average Boat/Boater

- *The average size of a boat in Ohio is 18.5 feet long, valued at $8,900.*
- *The average Ohio boater is 49 years old with an average income of more than $40,000.*
- *Most boat owners are married with families and dual incomes. The average boat-owning household owns 1.7 boats and/or personal watercraft.*
- *The average boater goes on 18 outings a year, typically within 38 miles of their Ohio residence.*

(Adapted from Boating in Ohio Fact Sheet, Ohio Department of Natural Resources whose sources include: Boating Associations of Ohio; Census Bureau; National Marine Manufacturers; ODNR Division of Watercraft; Ohio Division of Travel and Tourism; Ohio Sea Grant)

Project Introduction

The Lake County coastline is characterized by a broad range of physical conditions unprotected but stable sandy beaches, steep eroding bluffs, partially armored private residences, and communities and harbors with various degrees of accessibility and shelter. While there have been numerous coastal studies conducted at various locations along the Lake County shoreline, there has never been a comprehensive understanding of conditions on a countywide basis according to the Lake County Planning Commission.

With this in mind, the Lake County Planning Commission began an initiative in 2001 to provide a more detailed understanding of the shoreline issues, concerns, and opportunities for the twelve Lake County lakefront communities. This included Coastal Comprehensive Plans for Eastern Lake County, Western Lake County, and the Village of Fairport Harbor. While these plans were in progress, the Lake County Coastal Planning Committee (LCCPC) was formed to begin preliminary feasibility analysis and needs assessment for potential projects along the entire shoreline. Members of the LCCPC represented waterfront and non-waterfront communities, businesses, and individual citizens with a vested interest in the condition and development of the shoreline. The Committee allows for a multi-jurisdictional approach to coordinating future planning and development possibilities along the shoreline. Through the use of community meetings and discussions, the LCCPC identified priority projects for consideration at a level beyond the scope and vagueness of previous coastal research projects and reports.

In February, 2004, the LCCPC issued a Request for Proposal to provide coastal planning and engineering services for the Lake County coastline. The work for the project was subdivided into two separate but closely linked components: 1) a Coastal Development Plan; and 2) engineering feasibility studies for the priority projects identified earlier by the LCCPC.

The Coastal Development Plan expresses an understanding of the overall coastal environment in terms of physical conditions and land use, and provides an overall coastal development framework for addressing each of these issues and opportunities. The engineering feasibility of priority projects identifies feasible concepts for potential projects that the LCCPC would like to pursue in the near future. This document serves as a summary of this effort and provides the foundation for establishing viable waterfront projects that will serve as catalysts to upland planning of recreational, socioeconomic and cultural destinations within Lake County.

Timeline of Previous Studies

The following timeline indicates the most recent major milestones for Lake County coastal planning (courtesy of the Lake County Planning Commission):

July 2001	Lake County Planning Commission receives a Coastal Management Assistance Grant (CMAG) from the Ohio Department of Natural Resources Office of Coastal Management to complete *Eastern Lake County Coastal Comprehensive Plan.*
Fall 2001	Local planning committees formed in lakefront communities; start of Fairport Harbor Comprehensive Plan.
January 2002	LCCPC created to address coastline on countywide scale; Fairport Harbor Comprehensive Plan completed.
Sept. 2002	*Eastern Lake County Coastal Comprehensive Plan* completed.
Spring 2003	LCCPC identifies priority implementation projects and need for coastal engineering feasibility analysis. Committee begins to secure funding for feasibility study.
Summer 2003	Lake County receives second CMAG to prepare the *Western Lake County Comprehensive Plan*.
Fall 2003	Local planning committees formed in western Lake County lakefront communities. LCCPC membership expanded to encompass representatives from the entire county.
Dec. 2003	LCCPC secures funding for the Coastal Development Plan and Engineering Feasibility Study.
Jan. 2005	Lake County Coastal Development Plan Complete.

Project Process

The process for the formation of the Coastal Development Plan and the Priority Implementation Projects consisted of a series of tasks that can be divided into the following groups:

a) *Project Initiation* - data gathering/synthesis; stakeholder input; issue identification; and project goals/objectives;
b) *Coastal Development Plan and Priority Implementation Project Alternatives* – analysis of coastal conditions and land uses; development of alternatives for the priority implementation projects and review against program goals and regulatory requirements; and,
c) *Final Consensus and Project Report* - selection and adjustments of preferred alternatives; probable construction costs; project identification and implementation feasibility; and final report.

Project Initiation

This project was kicked-off with a one day workshop that included meetings with the LCCPC, county waterfront stakeholders, and regulatory agency personnel to discuss the goals and direction of the project. The workshop also included a countywide bus tour to potential implementation projects sites to review site specific issues and concerns. Prior to this meeting, JJR gathered reports and background data from the county and other Great Lakes sources for Lake Erie. JJR also photographed the entire 27 mile long county coastline and each of the potential project implementation areas from the air. This included still digital photographs and a digital video. This information was synthesized and presented at the Kickoff meeting workshop.

Coastal Development Plan and Priority Implementation Project Alternatives

Following the Kickoff meeting, JJR reviewed physical coastal conditions and land use issues in preparation of the draft Coastal Development Plan. This included a classification of the coastline into distinctive categories for potential management treatment, each of which are discussed in the Coastal Development section of this report. In addition to shoreline character, the CDP identifies physical processes (longshore transport, major drainages), significant existing land uses (public and private ownership, natural areas), and potential land use opportunities (waterfront access locations and linkages, overlooks, and priority implementation locations).

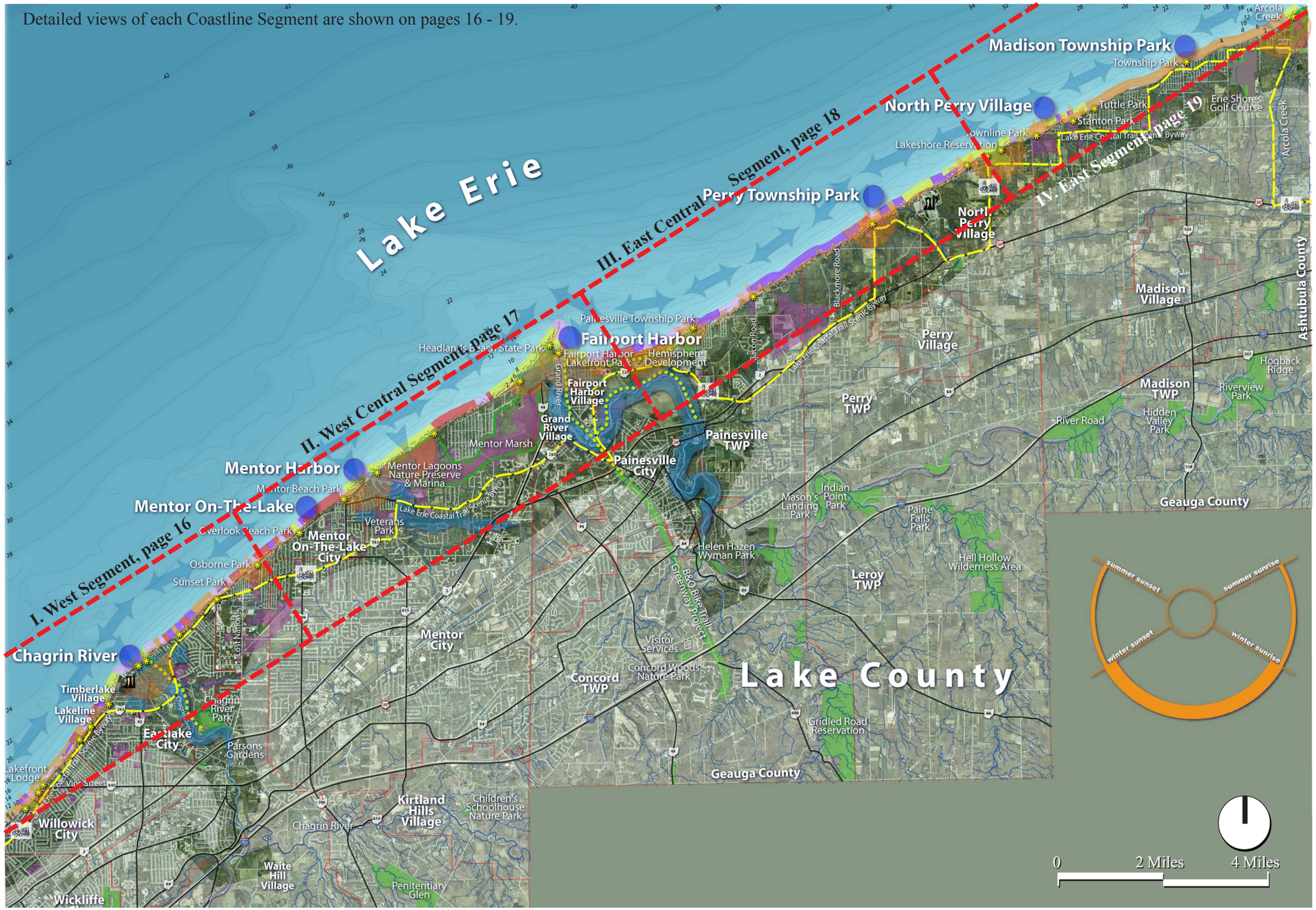
Alternative concepts for each of the priority project sites were developed in order to test the desired site development programs against physical limitations of each site. The draft CDP and priority project site alternatives were presented to the LCCPC in late July 2004 for review and comment. A follow-up workshop with members of the ODNR, USACE, and OEPA, was conducted in late August to review the merits of the draft CDP and project site alternatives against standard regulatory requirements.

Final Consensus and Project Report

Based on the regulatory agency workshop noted above, additional alternatives were developed and reviewed with key LCCPC members and community representatives resulting in the final CDP and consensus site development concepts presented in this report. Plans and cross sections from each of the consensus concepts were used to calculate areas and quantities for concept level opinion of probable construction costs. A brief discussion and summary of potential costs are presented in the Priority Implementation Plans section of this report. JJR and Lake County representatives made a final presentation of the CDP to the LCCPC and county stakeholders in mid December 2004.

II. Coastal Development Plan

Detailed views of each Coastline Segment are shown on pages 16 - 19.



Legend

- Shoreline Conditions
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  - Natural Unstable Shoreline
  - Protected Shoreline - Satisfactory
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  - Protected Shoreline - Condition to be Determined
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- Natural Areas
- Parks
- Public Ownership
- Municipal Boundaries
- Power Plants
- Public Access Opportunities
- Projects Sites
- Overlook Opportunities
- Access Corridor Linkages
- Ohio Coastal Scenic Byway
- Beach
- Bluff
- Blue Trail
- Coastal Destination Opportunities

Overview

The overall goal of the Coastal Development Plan (CDP) is to produce a coastal perspective on a countywide shoreline and development strategy. This strategy includes:

- enhancing grant award and public funding leverage influenced through a regional effort;
- encouraging land-side planning of projects within jurisdictions; and
- devising a logical sequence of individual coastal projects resulting in an accessible, economically viable and locally relevant Lake County coastline.

The CDP articulates the overall coastal environment and identifies the opportunities associated with this valued coastal setting. The approach for the CDP considers both the physical coastal environment and the relationship of various coastal uses and associated development and recreational opportunities.

Elements of the physical coastal environment include:

- wave climate, lake levels, and bathymetry;
- longshore sediment transport and shoreline recession;
- shoreline ecosystem restoration needs and opportunities.

Land and water use opportunities associated with the coastline include:

- the creation of appropriately spaced, attractive port or coastal destinations along the county coastline;
- linkages to and along the shoreline;
- improved public access to the water;
- improved boater access and safety;
- marine recreation;
- environmental enhancement; and
- education.

Many of these elements are identified and documented on the overall Coastal Development Plan (facing page) and are discussed briefly in the following paragraphs.

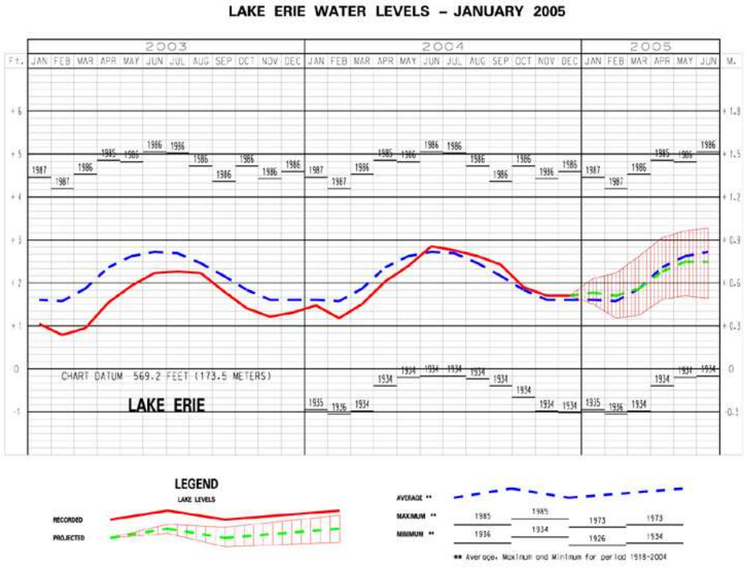
Within the scope of this study a preliminary inventory and description of the 27 miles of Lake County coastline attempts to synthesize, categorize and describe the physical condition of the Lake County shoreline between Willowick (west end) and Arcola Creek (east end). This section concludes with a summary of the regulatory issues that are likely to be encountered as individual priority projects are considered for implementation.

Physical Coastal Environment

Many of the physical processes that impact and determine the form, condition and quality of the Lake County shoreline have been studied and documented. For this project, the CDP extracts relevant data from available information to identify general trends and patterns that need to be considered on a countywide planning scale.

Wave climate, lake levels, and bathymetry

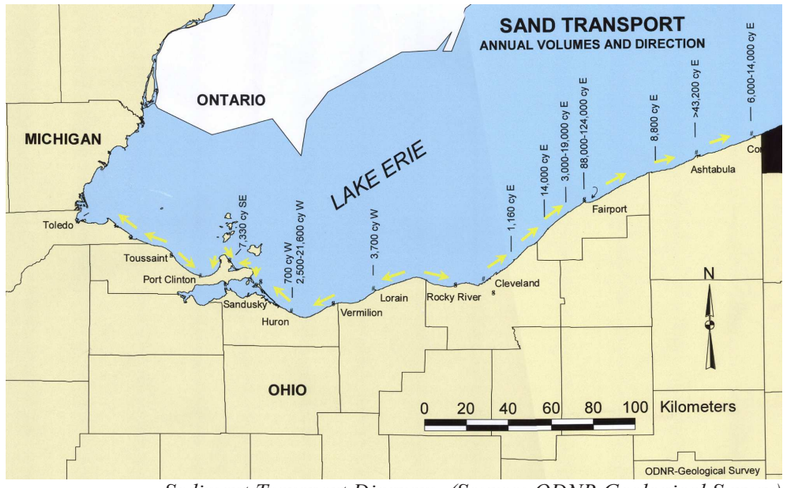
The primary factor affecting the formation and appearance of the coastline is wave action. Waves are the predominant cause of most shore erosion, sediment transport and deposition. The size, force, and direction of waves is a function of lake levels, bathymetry (lake bottom shape and depth) wind direction, and distance over open water which wind from a certain direction blows (fetch). The wave climate in Lake County can be severe due to a shoreline with direct exposure to the northeast through northwest. This condition and the effect on the shoreline can be exacerbated at high lake levels (current lake levels are approximately at historic norms).



(Source: USACE Monthly Bulletin of Great Lakes Water Levels - Jan. 2005)

Longshore sediment transport and shoreline recession

Sediment transport is the sediment material that is moved by waves and currents. The sediment contained in the long shore transport system is a result of continual bluff erosion. Although material moves in both directions along the shoreline, the predominant direction in Lake County is southwest to northeast. It is a major factor in determining the viability or feasibility of many coastline projects since interrupting this pattern with shoreline structures can 1) rob coastal areas of their beaches and cause shoreline recession; and 2) choke bays, inlets and harbors with excessive sedimentation. While there are many areas that are sensitive or subject to shoreline recession and degradation within the county, particularly sensitive areas include all private and public lands with natural beaches. In contrast, areas that experience significant sand deposition include the harbors at Eastlake, Mentor-on-the-Lake, and Fairport.



Sediment Transport Diagram (Source: ODNR Geological Survey)

Shoreline ecosystem preservation and restoration opportunities

Increased development both inland and along the shoreline has had a significant impact on the appearance and condition of the shoreline. It has been estimated that up to 85% of Ohio's coastline is developed or contains shoreline structures. This study estimates that up to 60% of the Lake County shoreline is armored at private and public properties (per the shoreline classification described later in this section). It is within this context that opportunities for preserving, enhancing, or recreating shoreline ecosystems should be identified. These include beaches, natural areas, coastal wetlands, rivers, streams, and other drainages that contribute to the Lake Erie coastal environment. (The *Shoreline Edge Conditions* addresses this in more detail later in this section).

Land and Water Use

One of the driving forces for the creation of the CDP was the idea of a "Protected Passage" along the coastline as a way of maximizing marine recreational opportunities and ensuring safe travel for boaters living and visiting Lake County, while still providing for existing commercial/industrial activities. For the recreational boater, offshore breakwaters can extend the short recreational boating season on Lake Erie while providing numerous protected destination points. For the nonmarine user and tourist base that makes-up the majority of people and business in the Lake County region, the protection of coastal and riverfront areas through offshore barrier structures can provide multiple opportunities for land-based commercial, residential, and recreational investments; dining and entertainment with attractive waterfront addresses.

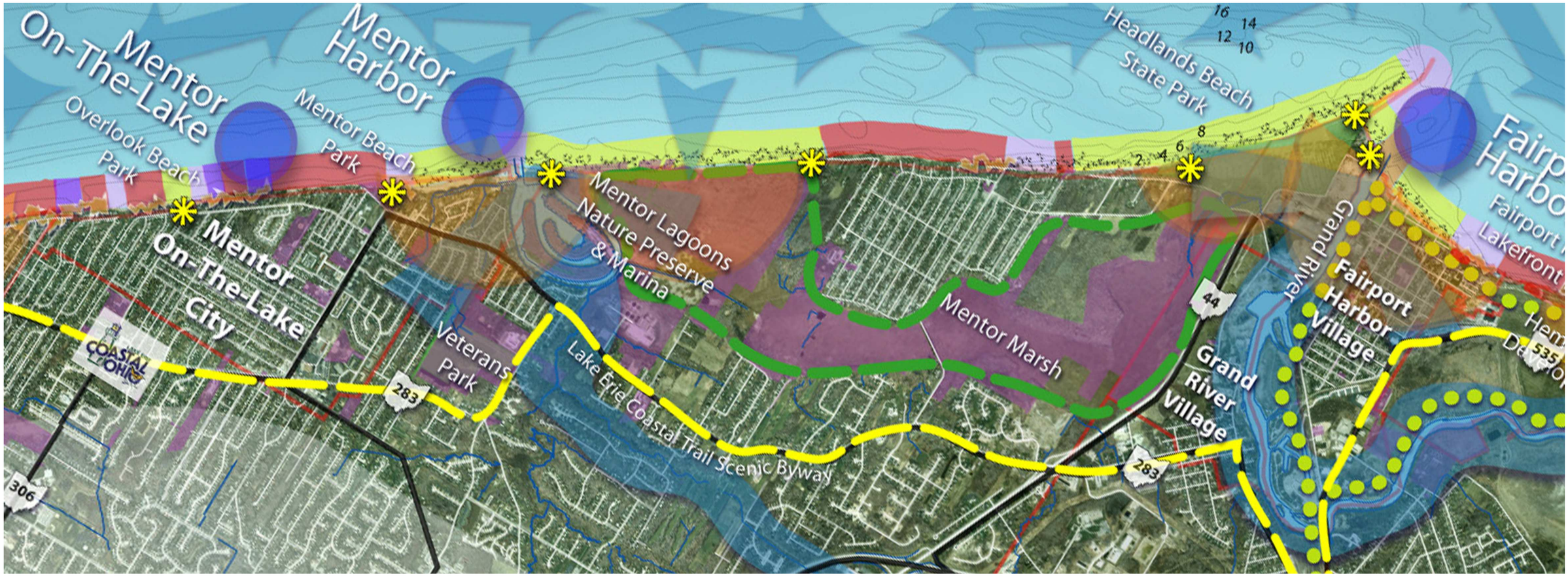
In Racine, Wisconsin, 15 out of everyone 100 residents visited the lakefront before the redevelopment program began; since project completion, an estimated 75 out of 100 residents have visited the area due to the various amenities that attract a diverse user base. In order to attract such investment, the shoreline must be protected in order to provide a "canvas" for shore side investment.

Various approaches for creating a protected passage were considered. One concept includes the development of an approximately 20-25 mile long, 1000-2000' wide navigable channel protected by a breakwater barrier. The barrier would extend from Geneva State Park to the Chagrin River. The challenges associated with this approach are formidable, including concerns related to the impact on longshore sediment transport; lake and shoreline ecology; maintaining adequate recreational water depths, not to mention the costs and time spent on the analysis and approval process. Subsequent meetings with representatives of ODNR, OEPA, and the USACE confirmed these concerns. Members of the ODNR believe that such an approach will cost millions of dollars to research and require at least a decade to complete.

Another approach is to decrease the travel distance for boaters to safe refuge by providing destinations and protected harbors at reasonable travel distances along the coastline. This approach is aligned with the identification of the priority projects that are discussed in more detail later in this report.

Creation of appropriately spaced, attractive port or coastal destinations along the county coastline

The CDP identifies the opportunity to create coastal destinations along the Lake County coastline. In addition to the priority project areas listed and described in



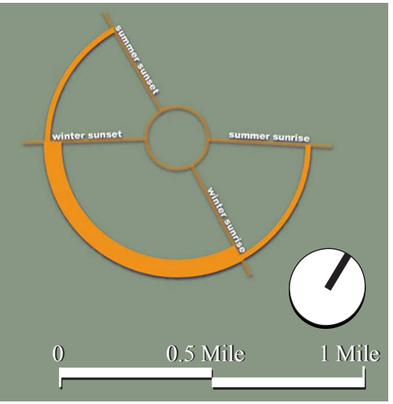
Legend

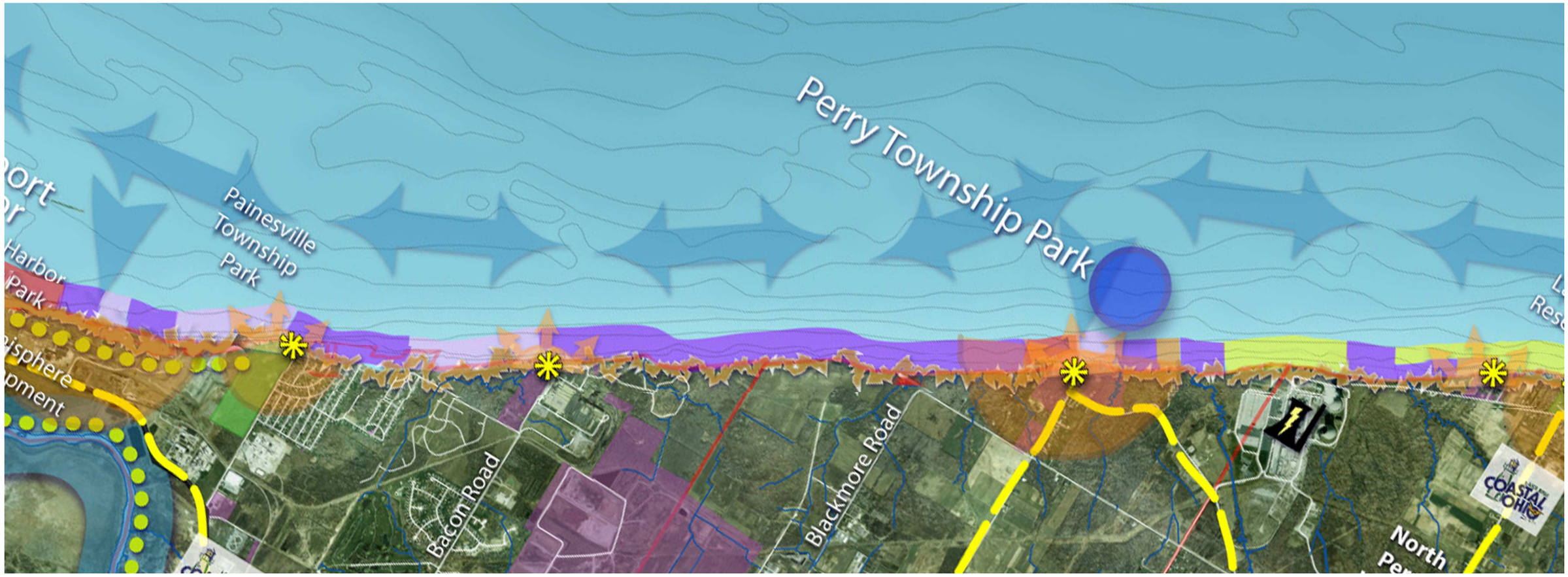
Shoreline Conditions

- Natural Stable Shoreline
- Natural Unstable Shoreline
- Protected Shoreline - Satisfactory
- Protected Shoreline - Unsatisfactory
- Protected Shoreline - Condition to be Determined

- Major Drainages
- Natural Areas
- Parks
- Public Ownership
- Municipal Boundaries
- Power Plants
- Public Access Opportunities
- Projects Sites

- Overlook Opportunities
- Access Corridor Linkages
- Ohio Coastal Scenic Byway
- Beach
- Bluff
- Blue Trail
- Coastal Destination Opportunities





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Shoreline Conditions

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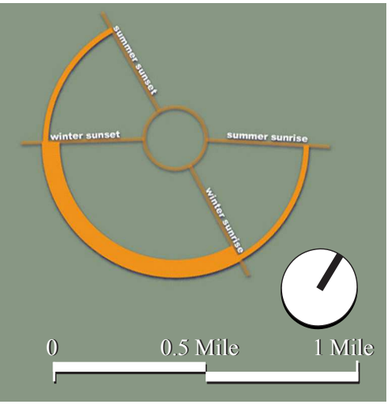
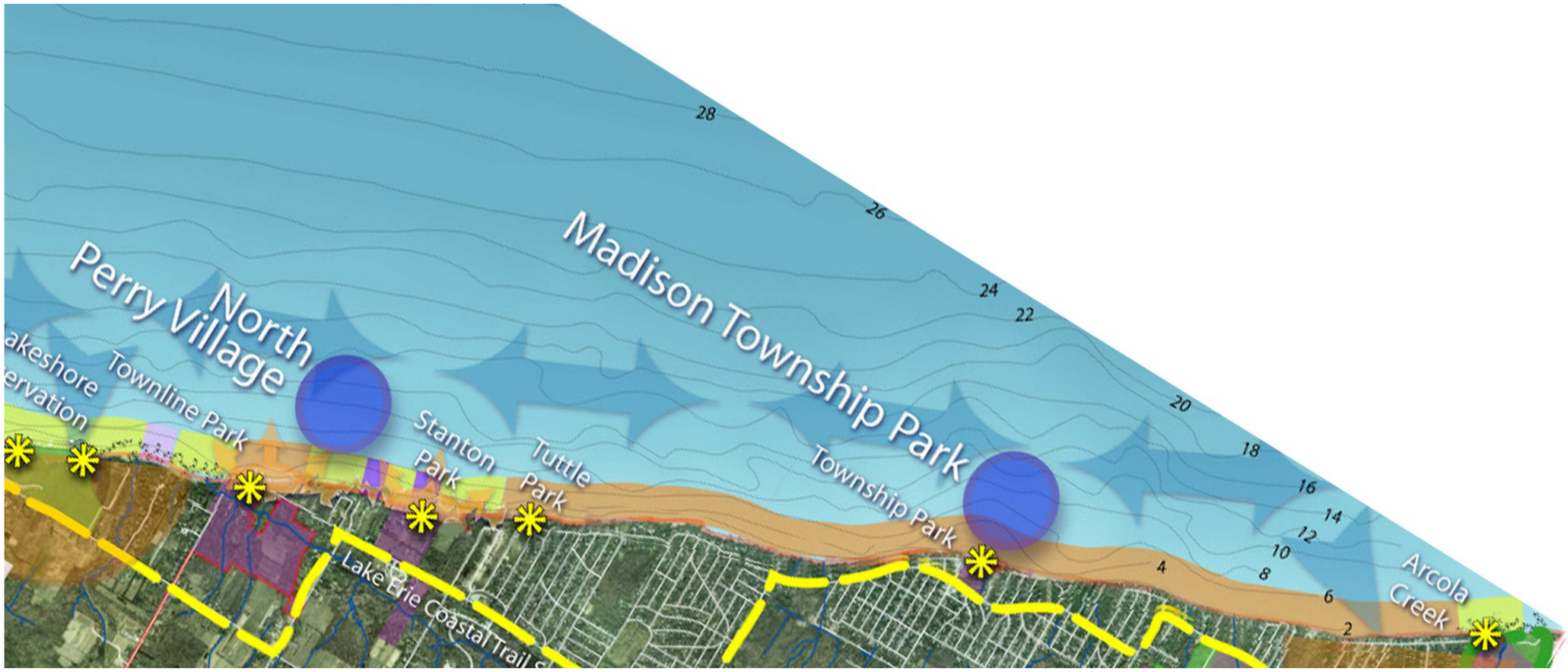




this report, potential destinations include: Lakefront Lodge, City of Willowick; Osborne Park, City of Willoughby; Mentor Lagoons Marina and Nature Preserve, City of Mentor; Headlands Beach State Park, west of Fairport; Painesville Township Park; Lakeshore Reservation, Lake Metroparks; and Arcola Creek, Madison Township. Whether it is for shopping, recreation, pristine natural areas, beaches, lakefront camping, swimming, or sunbathing; each of these locations possess something of unique interest or value to visitors and residents of Lake County.

Linkages to and along the coastline

The CDP identifies existing and potential/future access corridors and linkages. These linkages consist of signed routes or trails that facilitate travel to the shoreline and bring water-based activities closer to "inland" residents of Lake County.

Routes that are identified on the CDP include future bikeways in the following locations: west side of the county along the Chagrin River corridor; central part of the county between the City of Painesville and Fairport, partially along the Grand River; and central to eastern part of the county between Fairport and Painesville Township Park, and to points eastward along the coastline. The *"Ohio Coastal Scenic Byway"* also provides a mapped and signed east-west route near the county shoreline.

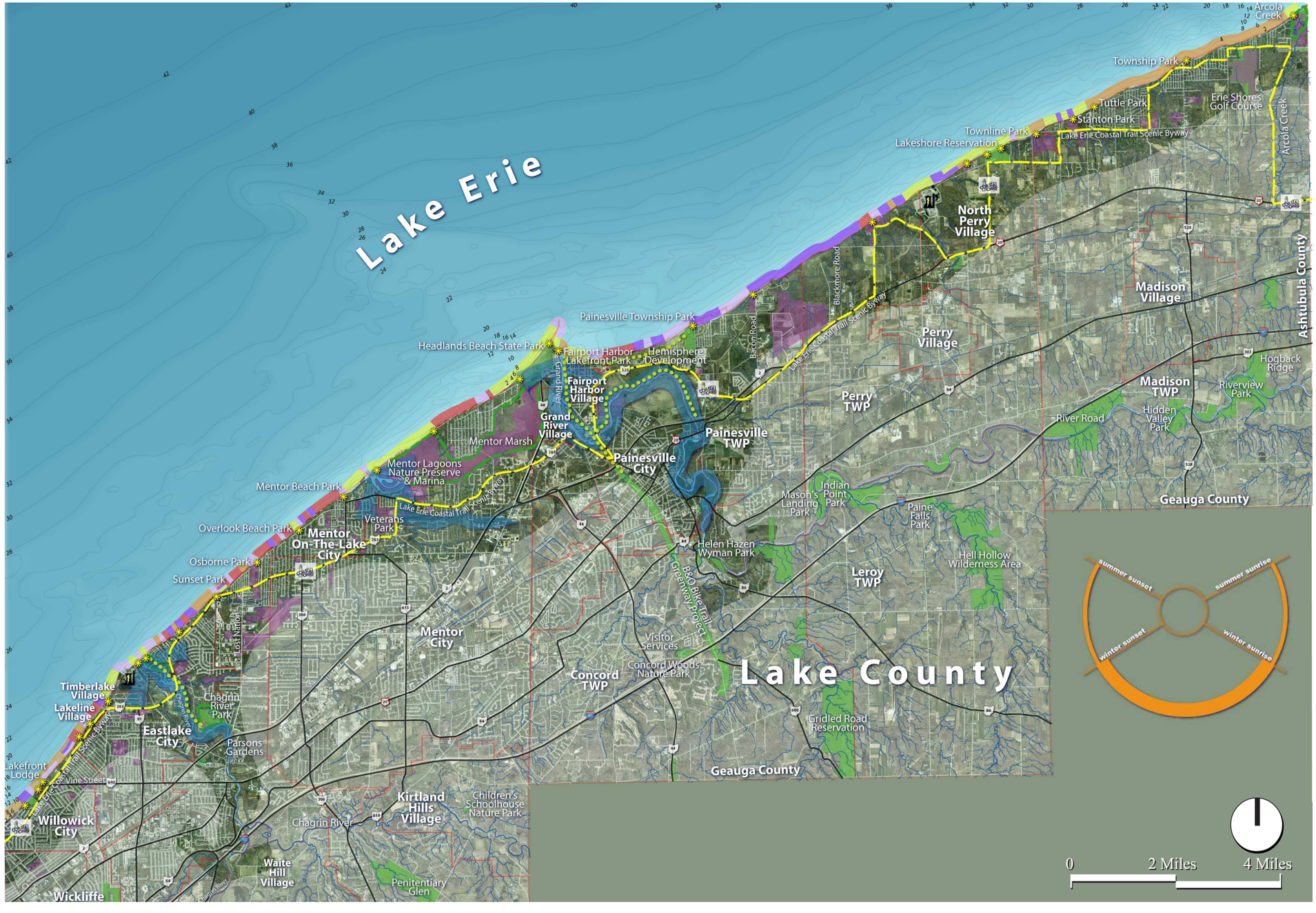
Improved public access to the water

In addition to lake access corridors, the CDP identifies existing and potential locations for viewing and accessing the water. Most of these locations are at public or semi public parks and properties. Some of these locations are located on high bluffs and possess tremendous potential as overlooks. These locations should also be evaluated for steps and ADA accessible paths where access to the water is difficult to impossible due to steep or eroding bluffs.

Improved boater access and safety, and marine recreation

As noted earlier, a core principle of the CDP is the idea of creating safe boating and marine recreation opportunities. This idea is addressed through the creation of strategically located shoreline destinations and the potential implementation projects. These projects should improve boater safety and extend the amount of time and weather conditions that allow boaters and recreational water craft enthusiasts to remain on the water.

Shoreline Edge Conditions Classification



Shoreline Conditions

- Natural Stable Shoreline
- Natural Unstable Shoreline
- Protected Shoreline - Satisfactory
- Protected Shoreline - Unsatisfactory
- Protected Shoreline - Condition to be Determined

Shoreline Edge Conditions Classification

As part of the initial data gathering stage of this project, JJR flew, photographed and videotaped the entire Lake County shoreline between Willowick and Arcola Creek in order to better understand the coastal conditions and physical appearance of the shoreline. This reconnaissance showed that there is significant variability in the appearance, types of treatments, and effectiveness of treatments of the shoreline. A detailed review and description of the many different conditions and their effectiveness would be difficult at this scale and is not within the scope of this study. Instead, the CDP attempts to synthesize the various observable conditions into five categories that can serve as a benchmark of conditions as they exist in 2004. The five conditions are:

1. Natural stable shoreline
2. Natural unstable shoreline
3. Protected shoreline – satisfactory
4. Protected shoreline – unsatisfactory
5. Protected shoreline – condition to be determined.

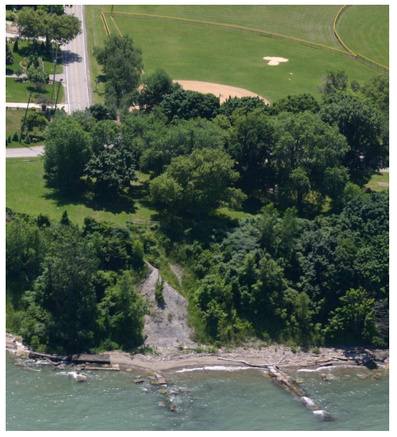
The approximate location of each of these conditions is indicated on the overall coastal plan as accurately as possible (ground checking is required to provide verification of exact limits, conditions, and effectiveness of shoreline treatments). A brief description of category and photographic example are provided in the following pages.

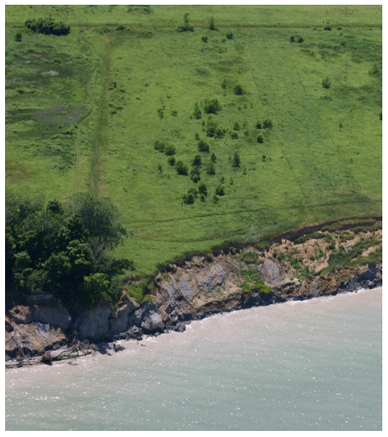
1. Natural stable shoreline

Areas of the shoreline where no apparent shoreline protection structure or treatment has been used. These areas are primarily natural sand beaches that work very well to protect the shoreline and bluffs from serious erosion or degradation as long as the longshore sediment transport system remains uninterrupted. Many of these areas are associated with the public parks and recreation areas located along the Lake County shoreline.

2. Natural unstable shoreline

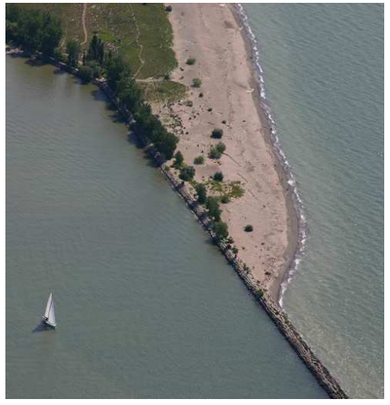
These areas do not appear to have any type of shoreline protection, and show active erosion resulting in the deposition of soil material directly into the lake. Most of these areas are banks and bluffs with waves acting directly on the toe of the bluff. On the positive side, these areas provide material that nourishes the littoral drift system. On the negative side these areas may threaten private residences, building structures, and land area.





3. Protected shoreline – satisfactory

These areas consist of coastline that has been armored or protected with some type of structure that has been placed along the shoreline. The structures range from vertical seawalls, to interlocking modular concrete units to rubblemound revetments and breakwaters. Areas in this category along the coastline appear to be stable and provide a consistent, uniform treatment with a generally acceptable appearance. Traditional and commonly used shoreline protection structures that are constructed on and along the shoreline such as seawalls and revetments typically do not yield or sustain beaches. Structures that protrude into or are placed in shallow water such as breakwaters, jetties, and groins may create and/or sustain beaches.



4. Protected shoreline – unsatisfactory

These areas consist of coastline that appears to have received shoreline protection treatment at some point in time, but still exhibit signs of erosion or ineffectiveness. Treatment types are extremely variable and inconsistent between and within sites, resulting in an extremely uneven and unattractive appearance. These areas tend to be associated with private properties and residences.

5. Protected shoreline – condition to be determined

These areas generally consist of coastline with multiple types of shoreline protection whose specific type and/or effectiveness are not discernible from the existing photographs and data. As in category 4, these areas tend to be located along private properties and residences.

Regulatory Issues and Permitting

The list and description of federal, state, and local regulations can be extensive when it comes to proposing or implementing projects along the Lake Erie shoreline. A summary of some of the more common coastal regulations related to shoreline construction are listed below.

Federal Regulations

Section 10 of the Rivers and Harbors Act of 1899 - permit from the USACE: Various sections establish permit requirements to prevent unauthorized obstruction or alteration of any navigable water of the United States. The most frequently exercised authority is Section 10 (33 U.S.C. 403) that covers construction, excavation, or deposit of materials in, over, or under navigable waters.

Section 404 (of the Clean Water Act) - permit from the USACE: - for construction, excavation, or deposition of materials in, over, or under navigable waters of the United States. In 1972, amendments to the Federal Water Pollution Control Act added the Section 404 authority (33 U.S.C. 1344) to the program. The Secretary of the Army, acting through the Chief of Engineers, is authorized to issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into waters of the United States at specified disposal sites.

State of Ohio Regulations

Section 401(of the federal Clean Water Act) Water Quality Certification from OEPA: - A Section 401 certification from the State is required to obtain a federal Clean Water Act Section 404 permit from the U.S. Army Corps Engineers, or any other federal permits or licenses for projects that will result in a discharge of dredged or fill material to any waters of the State. The Ohio EPA Section 401 Water Quality Certification Program is authorized by Section 401 of the Clean Water Act (33 U.S.C. 1251) and the Ohio Revised Code Section 6111.03(P). Ohio Administrative Code (OAC) Chapter 3745-32 outlines the application process and criteria for decision by the Director of Ohio EPA. In order for Ohio EPA to issue a Section 401 certification, the project must comply with Ohio's Water Quality Standards (OAC 3745-1) and not potentially result in an adverse long-term or short-term impact on water quality.

Ohio Coastal Management Program Federal Consistency Determination - Federal Consistency is the requirement that certain Federal agency projects, permits, and funding having reasonably foreseeable effects on Ohio's designated coastal area must be consistent with the enforceable policies of the Ohio Coastal Management Program (OCMP). The enforceable policies are identified by underlined text in the OCMP Document. Consistency reviews are the responsibility of the Office of Coastal Management. The reviews consider comments and concerns of local, state, and federal agency agencies, as well as those of the general public. Projects are also reviewed to assure that the proposed activities receive all necessary State permits and authorizations. Federal Consistency is a requirement of the Coastal Zone Management Act of 1972 and its associated Federal regulations.

ODNR Shore Structure Permit:- required to construct any assortment of shore protection structures for the purpose of controlling erosion, wave action or inundation along the Ohio shoreline of Lake Erie.

ODNR Coastal Erosion Area (CEA) Permit: - required to construct a permanent structure within a designated Lake Erie Coastal Erosion Area.

ODNR Submerged Lands Lease:- a lease agreement with the State of Ohio to place private improvements on submerged lands in the State of Ohio which is defined as territory from the southerly shore of Lake Erie to the international boundary line.

Local Regulations

Floodplain Regulations: - these may be included in local zoning or building codes.
County or Municipal Ordinances: - may require a building permit or place limitations on construction activities.

Specific requirements related to the regulations listed above can be found in a number of USACE, OEPA, and ODNR publications and websites including:

1. *"Coastal Guidance Sheet No. 1: Coastal Regulations";*
2. *Combined Coastal Management Program and Final Environmental Impact Statement for the State of Ohio" – prepared by the Division of Real Estate and Land Management, ODNR.*
3. *www.usace.army.mil/inet/functions/cw/cecwo/reg/press/overview.pdf*
4. *www.epa.state.oh.us/dsw/401/401appl_s.pdf*
5. *www.ohiodnr.com/coastal*

Regulatory Agency Participation

As a precursor to the regulatory permit process, the sequential evolution of the CDP has involved representatives from the ODNR, OEPA, and USACE at various points in order to:

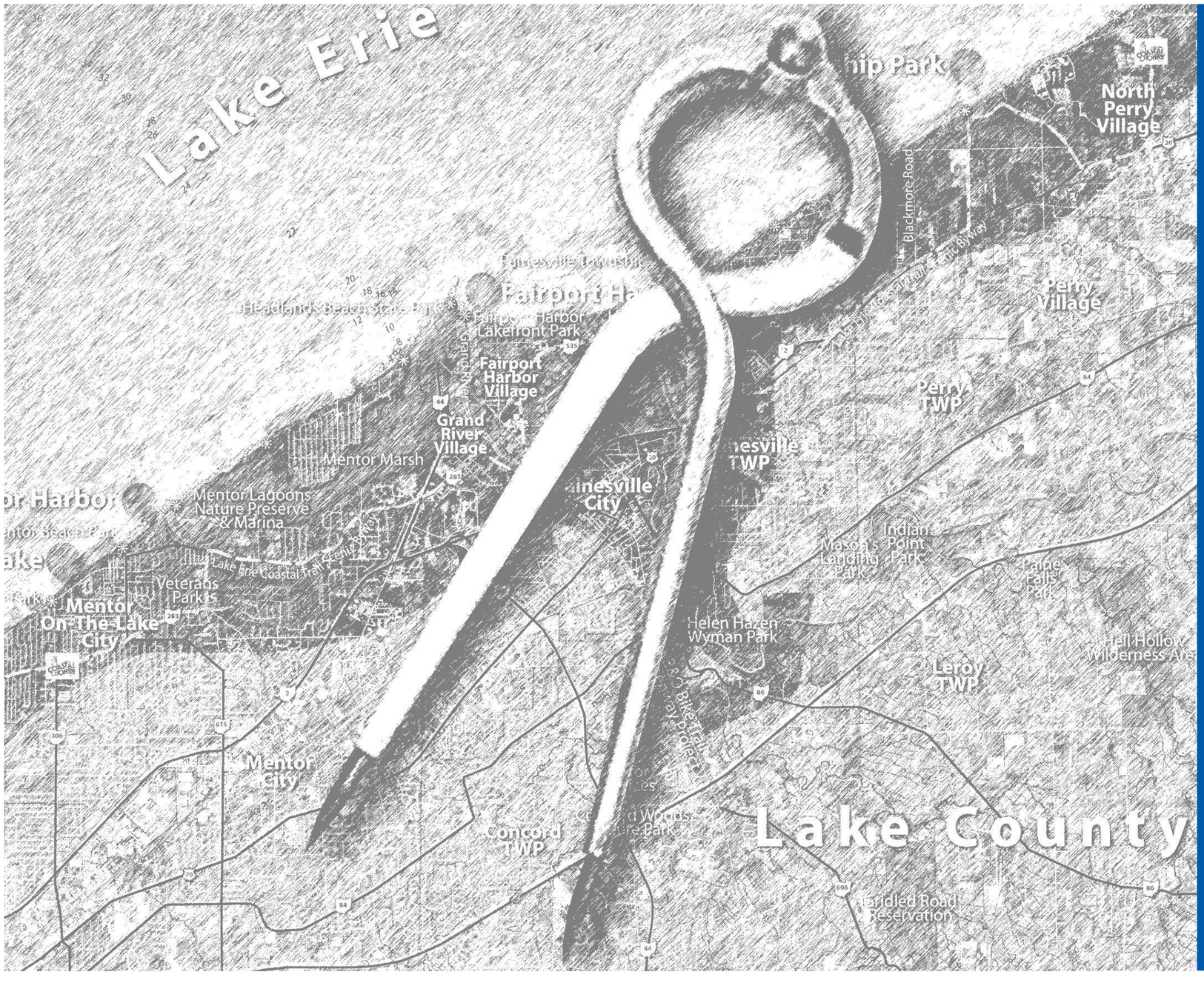
- review potential coastline alternatives;
- solicit their opinions, issues, and concerns; and
- to gain an overall reading of the regulatory feasibility of potential coastline development strategies and enhancements.

This involvement included attendance at two, all-day workshops participation in two conference calls, and a meeting to review the preferred concepts. It is the intent of the County to continue to cooperate and work closely with the regulatory agencies as new projects that evolve from this plan are implemented.

US Army Corps of Engineers®

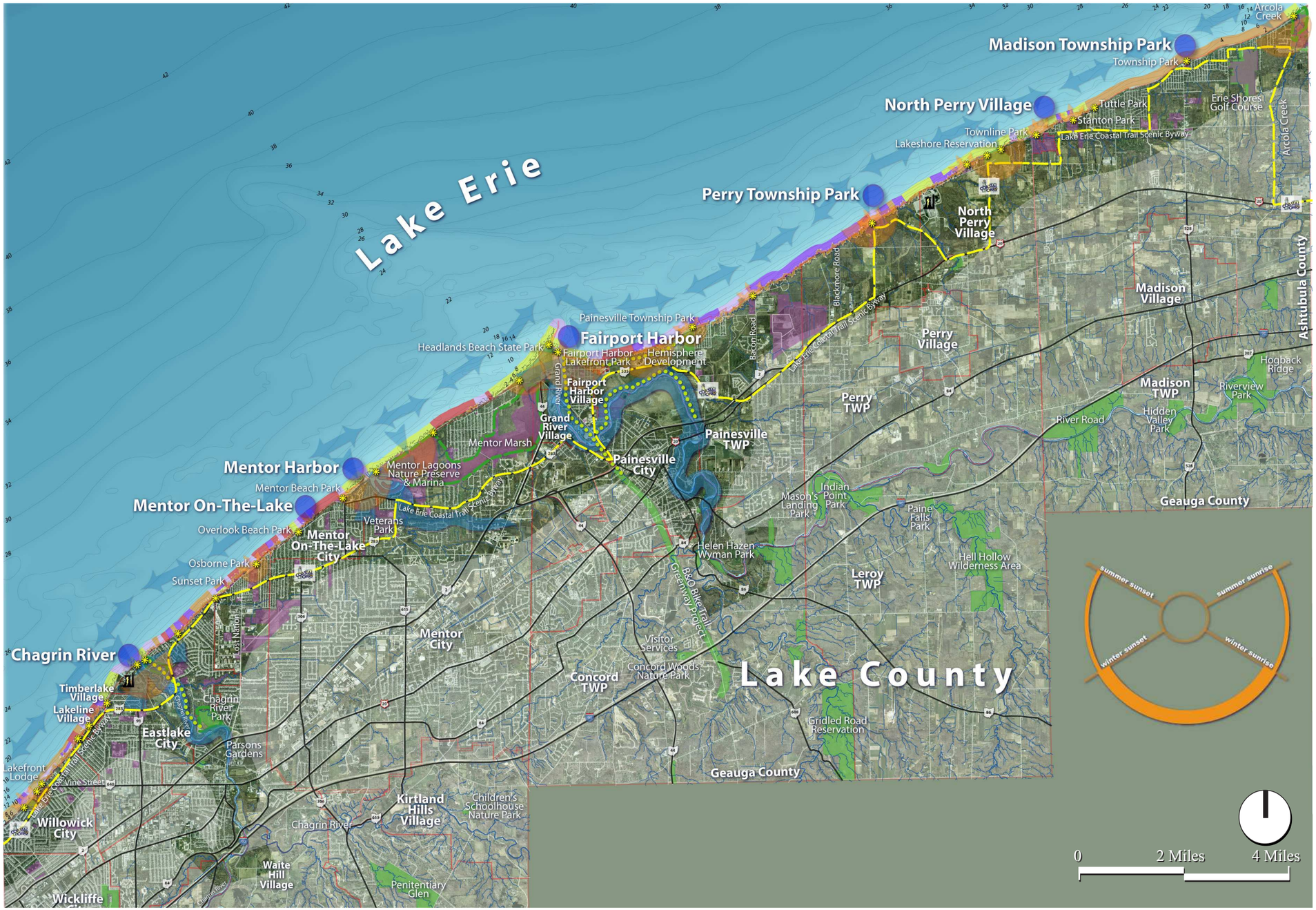
Ohio Office of Coastal Management

OhioEPA



III. Potential Implementation Projects

Priority Implementation Project Areas



Legend

- Shoreline Conditions
  - Natural Stable Shoreline
  - Natural Unstable Shoreline
  - Protected Satisfactory Shoreline
  - Protected Unsatisfactory Shoreline
  - Protected To Be Determined
- Major Drainages
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Introduction

The primary purpose of identifying the implementation projects was to provide a more detailed examination of each of these potential project sites. Specific ideas and project sites were determined by the LCCPC prior to the CDP and then adjusted during the CDP process. The criteria for determining the selection of potential projects included:

- Physical factors related to shoreline and bluff erosion; harbor entrance safety for boaters; and sediment deposition within the harbors.
- strategic location along the Lake County shoreline for providing refuge from storms.
- Shoreline and waterfront development that could serve as an economic stimulus for Lake County by providing a catalyst for land based development.
- Additional optimal recreation opportunities.
- Regional interest and potential for project funding.

Specific coastline development ideas and project sites were examined with respect to the following:

- existing site conditions;
- development program (type of use, size, area, number of facilities, etc.) for each site;
- specific design parameters and technical issues that may impact the development of the site;
- conceptual design - potential design alternatives for each site, evaluation of alternatives, and selection of a consensus direction for each site;
- potential implementation costs; and
- potential phasing of each project (if applicable).

As of this time, the project areas include (listed west to east):

- Chagrin River Offshore Breakwaters – safe harbor access improvements;
- Mentor-on-the-Lake - shoreline protection and potential beach creation through the creation of offshore breakwaters;
- Mentor Harbor - safe harbor access improvements and dredging;
- Fairport Harbor Marina – harbor improvements and marina expansion;
- Perry Township Park – boat launch improvements and bluff protection;
- Townline Park and Stanton Park in North Perry Village and Madison Township - shoreline improvements at the each of the parks including an improved boat launch, potential marina, shoreline enhancement/beach protection and access;
- Township Park in Madison Township - protected launch facility and potential park improvements.

The identification of these projects for initial improvement in this study does not preclude the addition of other prospective projects. Changes in coastline dynamics, shoreline ownership rights, environmental regulatory policies and concerns, or the availability of funds will potentially affect or modify the implementation of Lake County waterfront projects. The facing page shows the location of areas that have been initially identified for improvements along the Lake County shoreline. Subsequent pages further illustrate and describe each of these project areas.

Breakwater and Revetment Cross Sections for the Lake County Coastline

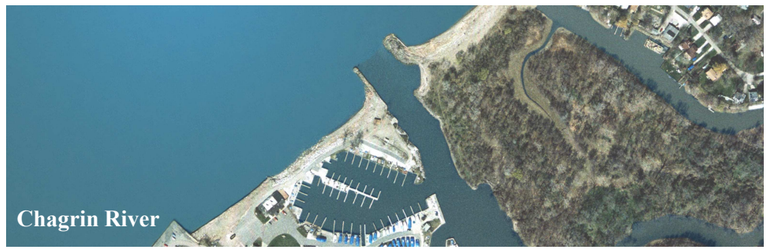
All of the implementation projects described in the following pages include either breakwaters and/or revetments as part of their design. The following discussion is presented as the basis for determining potential breakwater and revetment cross sections for these projects. The cross sections provide a practical representation of the approximate size of the structures, and help in cost estimation.

Based on previous studies, the design wave climate along this reach of the Lake County shoreline is estimated at approximately 11 feet. This height was used for the conceptual analysis of the shore protection structures. The breakwater structures assumed a typical three layer system with larger armor stone placed over smaller filter stone which is placed over a smaller core material. It was assumed the breakwaters would have a crest width that would accommodate three armor stones. The side slopes were assumed with 2H to 1V slopes and the toe of the structures was excavated approximately 2 feet to account for toe scour. The height of the breakwaters was estimated at +9.5 LWD. The different sizes of breakwater stone have different cost associated with them. However, at this level of concept development, we have assumed an overall average cost of the stone at approximately $40/ton. In addition, we have added a design contingency to account for the existing conditions that are not known at this time. They include, bathymetric contours, geotechnical investigation, site specific wave climate and construction cost variations.

Mentor Harbor

Fairport Harbor

Perry Township Park


Chagrin River

North Perry Village/Madison Township

Mentor On-The-Lake

Madison Township Park

Chagrin River Offshore Breakwaters

Aerial view of the Chagrin River and First Energy electric power plant looking southeast

Aerial view of Chagrin River and navigation channel looking south

Entrance channel of Chagrin River looking north

Existing Site Conditions

Located in Eastlake, the mouth of the Chagrin River empties into Lake Erie just east of the First Energy electric power plant. There are approximately 1, 400 recreational boats in the Chagrin River corridor. A sheetpile jetty on the west and stone revetment/breakwater on the east form a short channel between the lake and the river. The location and orientation of the channel provides very little wave protection. This lack of protection frequently results in unfavorable wave climate for watercraft using this entrance. Breakwaters that form the water intakes and discharge for the power plant extend several hundred feet into the lake and likely disrupt the predominant easterly flow of the littoral drift. However, deposits in the river mouth from bedload sediment result in dredging to maintain adequate navigation depth at the entrance and through the channel. Sedimentation in the channel has increased in recent years due to upstream development patterns and the increase in impervious surfaces. The original river channel located just to the east of the main entrance is typically blocked from Lake Erie by sand deposits. Normal discharge flow of this channel is not strong enough to counteract wave energy of the lake, resulting in the closed channel.

Development Program

The primary goals for this site are to provide a protected harbor and safe entrance to the river from the lake, and address the issue of sedimentation. There has also been interest expressed in developing a facility that provides public access to the lake for fishing and other recreational use. In accordance with this idea, the existence of the First Energy intake and discharge structures adjacent to the Chagrin River site present the opportunity to consider the development of a protected harbor and marina east of the power plant.

Specific Design Parameters and Technical Issues

Specific design parameters and technical issues that will have to be addressed for the Chagrin River entrance include:

- entrance channel configuration with respect to wave climate and boater safety;
- river bedload sand deposition in the entrance channel area and secondary channel to the east;
- river ice flows;
- public access/ADA access to the waterfront;
- regulatory agency permitting for placement of protective offshore structures and for minor filling of the lakebed;
- land use agreements to provide adequate space for landbased marina support facilities. This would be a logical next step in the implementation of this project.

Conceptual Design

The selected concept provides a protected harbor and safe wave climate at the entrance to the Chagrin river by placing offshore breakwaters several hundred feet north of the river. The breakwaters are extended to the west and to the east to provide two protected entrances to the navigation river channel and to allow the original channel to the east to remain open. Dredging to a 6’ depth would be part of the original installation. However, until additional erosion control measures to reduce sedimentation upstream are in place, dredging near the mouth of the channel will need to be continued as part of an annual maintenance program. In 2004, approximately 28,000 cubic yards of sediment were dredged from the Chagrin River corridor.
Highlights and elements of this concept that are part of the Opinion of Probable Construction Costs include:

- offshore breakwaters;
- protected harbor infrastructure including driveways and parking, fuel system, utilities, deicing system;
- public waterfront access;
- fish cleaning station; and
- reopening of the original river channel to improve water quality and river channel access.

Summary of Opinion of Probable Construction Costs

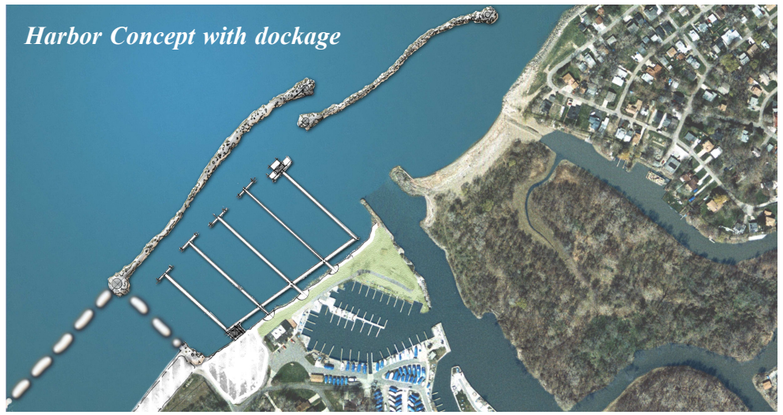
1. Demolition and Site Preparation	$ 181,000
2. Land-Based Site Improvements	$ 1,900,000
3. Water-Based Site Improvements	$ 9,541,000
Total	**$ 9,538,000***

*Annual dredging costs are not part of this estimate but should be considered.

Notes/Assumptions
1. All costs in 2004 dollars.
2. The site is a clean, non-contaminated site, ready for construction.
3. Does not include improvements to existing breakwaters or seawalls.
4. Marina basin dredged to 6' or greater navigable water to support boat dockage.
5. A new marina building assumes 5,000 sf at $250/sf.
6. For planning and costing purposes, dockage assumes 10' wide main pier, 10' head piers, 5' wide finger piers, and 40' long slips.
7. Final breakwater/revetment/sheetpile design and engineering will require appropriate geotechnical and hydraulic analysis.
8. Opinion of Probable Construction Cost does not include the 25% conceptual design contingency or 10% design and engineering fees.

An alternative concept (not part of cost summary) includes the addition of dockage, and supporting infrastructure for a 160 slip marina. Variations of this alternative include the potential extension or connection of a breakwater to the south bulkhead wall or to the First Energy Breakwater which would facilitate the creation of a fishing pier and observation overlook cell.

Aerial oblique of preferred concept

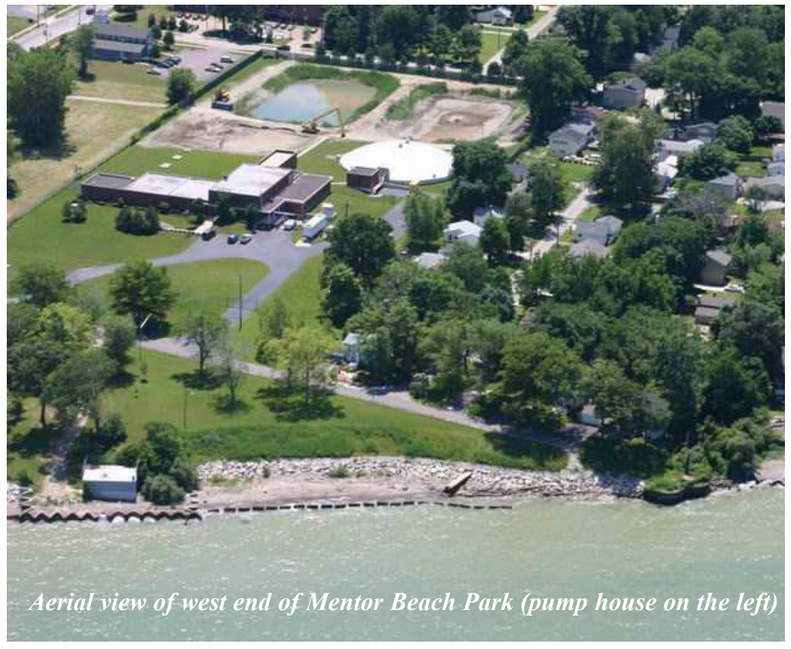


Harbor Concept with dockage

Mentor-on-the-Lake and Mentor Beach Park

Aerial view of east end of Mentor Beach Park

Shoreline conditions looking west at pump house



Aerial view of west end of Mentor Beach Park (pump house on the left)

Looking east past community center building

Existing Site Conditions

A high percentage of shoreline in Mentor-on-the-Lake (MOTL) is subject to severe beach and bluff erosion. Much of the shoreline in MOTL is privately owned and as a result has received a variety of erosion control measures ranging from no treatment to modular sea walls to very elaborate stone and concrete structures. The results of this disjointed array of structures is a shoreline with an inconsistent appearance, debatable effectiveness, and marginal usability.

At Mentor Beach Park, strong wave action and erosion of the beach are threatening the water treatment station pump house. Most of the shoreline east and west of the pump house is armored with a stone revetment that appears to be generally effective. However, the area out in front of the pump house is protected by concrete seawalls that are continually overtopped, and are particularly ineffective at higher lake levels.

Development Program

Individual Property Owners
The general program approach for private property owners addressing beach and bluff erosion is to provide a variety of reasonable but effective and durable alternatives with the intent of:

- protecting and stabilizing the shoreline in an efficient, cohesive, and environmentally sensitive manner; and
- minimizing disruption of the down shore littoral drift system.

Mentor Beach Park
At Mentor Beach Park, the short term priority is to provide an effective and permanent solution for protecting the water treatment station pump house. Longer term priorities include:

- creating a more accessible and usable public shoreline and beach; and
- providing appropriately lit user friendly trails.

Specific Design Parameters and Technical Issues

For the construction of stone revetments and potential construction of offshore breakwaters, specific design parameters and technical issues that will have to be addressed include:

- bathymetry and water depths;
- lakebed conditions and the ability to support shore protection structures;
- potential disruption of the littoral drift system;
- regulatory agency permitting for placement of protective offshore structures and for minor filling of the lakebed.

Conceptual Design

Individual Property Owners
Depending on the condition of the individual property, the shore protection required could be quite diverse. An eroding slope may require slope regrading in combination with rubblemound structures. Properties with wide expanses of existing beach material may require little or no shore protection. The following menu of options may be required based on actual existing conditions and desired uses:

- Slope regrading, terracing, dewatering and revegetation;
- Beach nourishment;
- Shore protection structures including, breakwaters, revetments, steel sheetpiling and other vertical edge treatments, bioengineering; and
- Dockage, individual boat launch and retrieval configurations.

Pump House at Mentor Beach Park
The proposed solution for the protection of the water treatment station pump house includes the placement of a stone revetment that fronts the lakeside of the pump house and ties into existing stone revetments located to the east and west of the pump house. Although not included in the opinion of probable construction costs, this area may also be suitable for a series of offshore breakwaters similar to the Perry Township Park or Townline Park design. Properly placed, these structures could create a more user-friendly beach environment and protect the existing water intake structure. Placing the breakwater in front of the existing pavilion would be a logical location for this added amenity. The concept expressed here also indicates the potential for future shoreline path linkages to the east and west (also not included in the estimated costs). Currently there is limited beach access.

Summary of Opinion of Probable Construction Costs - Mentor Beach Park

1. Demolition and Site Preparation	$	25,000
2. Land-Based Site Improvements	$	0
3. Water-Based Site Improvements	$	100,000
(Stone Revetment) **Total**	**$**	**125,000**

Notes/Assumptions:
1. All costs in 2004 dollars.
2. The total cost is for a stone revetment in front of the pumphouse only. Costs for other potential improvements to the rest of the park, including offshore breakwaters, are not included.
3. The site is a clean, non-contaminated site, ready for construction.
4. No Land-based site amenities improvements are included.
5. Final revetment design and engineering will require appropriate geotechnical and hydraulic analysis.
6. Opinion of Probable Construction Cost does not include a normal 25% concept level design cost contingency or 10% design and engineering fees.

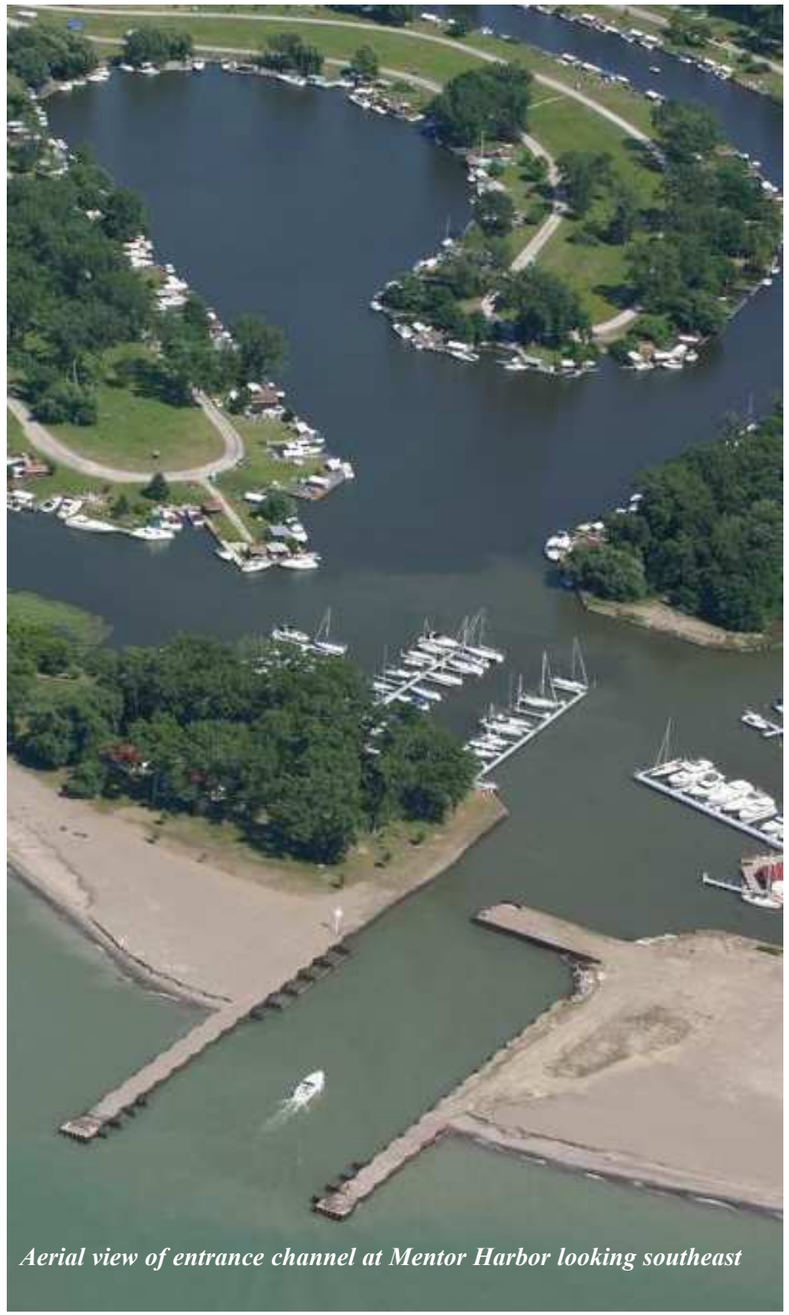
Aerial oblique of preferred concept

Path to Lake, Klode Park, Wisconsin

Revetment in front of water intake structure

Walkway along Beach and Revetment, Bender Park, Wisconsin

Mentor Harbor



Aerial view of entrance channel at Mentor Harbor looking southeast

Sheetpile jetties and sunken barge at Mentor Harbor entrance looking south

Sheetpile jetties at Mentor Harbor entrance looking north

Existing Site Conditions

Mentor Harbor, located just east of Mentor-on-the-Lake, is the location for the Mentor Harbor Yacht Club and the city-owned Mentor Lagoons Marina. The marinas are located in the Mentor Lagoons that were excavated inland from the shore of Lake Erie. A 200 foot wide channel between two steel sheetpile jetties forms the entrance to the Lagoons. The orientation of the channel exposes the harbor to wind and waves from the northwest through northeast direction and creates hazardous conditions for boaters entering or exiting the lagoons. Difficult navigation through the channel is exacerbated by the presence of a sunken barge at the south end of the channel that was placed to reduce wave energy entering the lagoons. The channel is constricted to approximately 60 feet in width by the barge. Although the jetties do not appear to have changed the littoral drift pattern, significant shoaling at the channel entrance requires dredging several times a year. A Coastal Barrier Resource Area (CBRA) is located immediately east of the harbor and should be considered under any concept that is developed.

Development Program

The goal for this site is to examine the existing channel entrance and evaluate potential solutions that 1) protect the harbor and allow for safe navigation through the channel into the lagoons; and 2) effectively redirect, reduce, or remove the deposition of sand at the entrance to the channel.

Specific Design Parameters and Technical Issues

As noted above, shoaling at the entrance and difficult and hazardous navigation through the channel are the issues that require attention at this site. The conflicting nature of these issues means that the solution to one tends to worsen the situation with the other. To address this situation, a better understanding of various site specific conditions will be required in order to consider the most functional and cost effective solutions. To do this, more detailed site specific bathymetric survey and coastal wind/wave analysis will be required.

Conceptual Design

The USACE conducted a study of this harbor that was completed in October, 2003. They evaluated a series of ten alternatives that could be simplified to four general concepts with minor variations: 1) Dog-leg piers as an extension of the west jetty; 2) a detached breakwater several hundred feet offshore that would cover each side of the entrance channel; 3) rubble mound absorbers internal to the channel and harbor, and 4) sand bypass systems or dredging with internal rubble mound absorbers. The USACE dismissed all concepts because they would either not be "economically justified due to the weighted recreational benefits derived from the economic analysis", or because of the potential disruption of the littoral drift and possible impact on the downdrift shoreline, particularly the Mentor Marsh CBRA.

Protection of the harbor and safe navigation through the channel is difficult top provide without the corresponding accumulation of sediment in the entrance and disruption of the littoral drift (at least until the entrance channel is filled). The concept shown here provides the protection of the harbor through the use of an offshore breakwater but requires either a sand by pass system or scheduled dredging to keep the entrance channel open. Sand that is bypassed or dredged should be placed east of the entrance channel to maintain the littoral drift system.

At the present time, there are few places along the Great Lakes where communities undertake sand-bypassing as opposed to mechanical or hydraulic dredging. Sand bypassing is typically used on the east and west coasts in areas requiring the removal of large volumes of sand consisting of uniform gradation. Along this reach of shoreline, there are smaller quantities of material to move and the sand is mixed with cobbles, gravels, and miscellaneous debris, making it less than ideal for sand-bypassing.

Placement of the offshore breakwater eliminates waves coming through the entrance channel and allows the removal of the sunken barge. Major elements of this concept that are part of the Opinion of Probable Construction Costs include removal of the sunken barge, channel dredging, and construction of an approximately 650 foot long rubblemound breakwater.

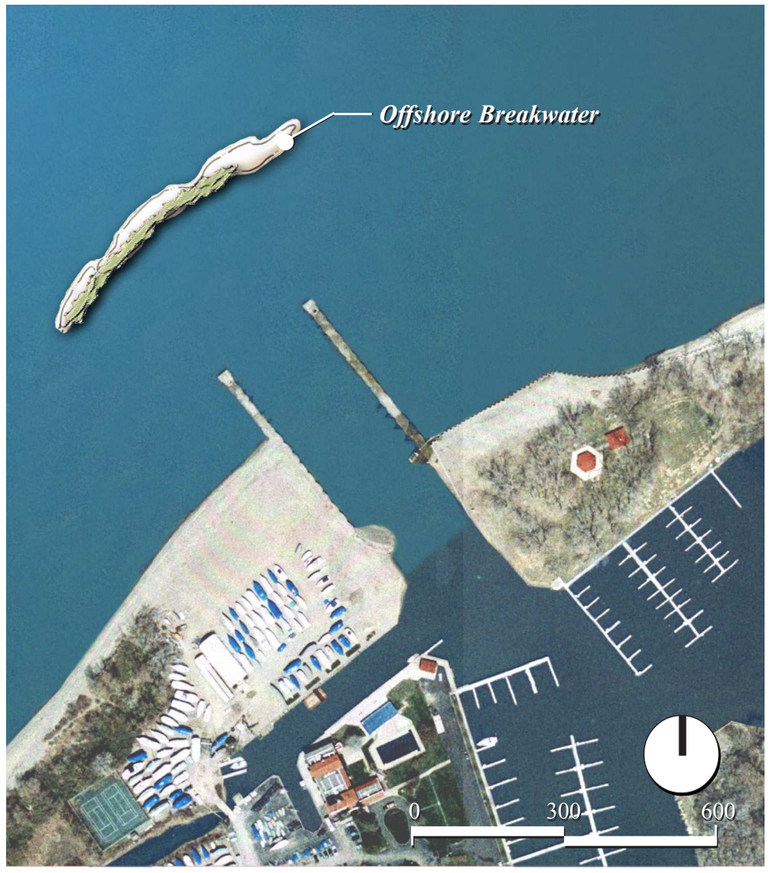
Summary of Opinion of Probable Construction Costs

1. Demolition and Site Preparation	$ 175,000
2. Land-Based Site Improvements	$ -
3. Water-Based Site Improvements	$ 1,928,000
Total	**$ 2,103,000**
Bioengineered Breakwater Alternative	$ 2,718,000

Notes/Assumptions
1. All costs in 2004 dollars.
2. The site is a clean, non-contaminated site, ready for construction.
3. Does not include improvements to Sheetpile along channel.
4. Channel basin dredged to 10' navigable water depth or greater.
5. No Land-based site improvements shown.
6. Final breakwater/revetment/sheetpile design and engineering will require appropriate geotechnical and hydraulic analysis.
7. Opinion of Probable Construction Cost does not include the 25% conceptual design contingency or 10% design and engineering fees.

Aerial oblique of preferred concept

Rubblemound breakwater/revetment structure



Bioengineered breakwater structure

Fairport Harbor

Aerial view of federal navigation channel at Fairport Harbor looking south towards the entrance of the Grand River

Fairport Harbor Beach and boat launch looking west

Edge conditions at Fairport Harbor Beach

Existing Site Conditions

Located at the mouth of the Grand River, Fairport Harbor is Lake County's largest and most commercially active port on Lake Erie. The harbor is largely protected by federal breakwaters located to the west and the east of the navigation channel. Portions of the east breakwater have settled into the lakebed and are partially submerged creating an unsafe condition for boaters. The harbor is also subject to sand deposition behind the federal breakwater during storm events from the north and east. This results in annual dredging to keep the federal navigation channel clear and to maintain adequate navigation depth at the small boat launch and transient dock area. Elements of the Fairport waterfront include:

- Lakefront Park - a popular beach that is owned by the village, but managed by Lake Metroparks. Annual visitor rates in 2000 -2003 ranged between 217,164 and 299,853;
- a two-lane boat launch
- parking for 150-170 vehicles and trailers; and
- Small number of transient slip to accommodate 14-20 vessels.

Development Program

As identified in the Fairport Harbor Comprehensive Plan, the village would like to improve and expand its transient marina amenities and services to create a mixed-use harbor facility. The intent is for this facility to act as a catalyst for development in the downtown Fairport area by attracting users and business to the surrounding area. The improvements and amenities are to include:

- a protected calm water marina with 400-500 slips for seasonal and transient use;
- supporting infrastructure including harbormaster building, parking, improved boat launch, utilities;
- improved access to the lake and river waterfront including ADA accessible piers; and
- capitalize on the mixed-use and recreation potential of the Grand River corridor.

The harbor improvements should occur within the framework of the Fairport Comprehensive plan.

Specific Design Parameters and Technical Issues

Specific design parameters and technical issues that will have to be addressed for Fairport Harbor include:

- sand deposition behind the federal breakwater during storm events from the north and east
- improved wave climate at channel and boat launch
- impacts of the east breakwater (partially submerged)
- regulatory agency permitting for placement of protective structures and for minor filling of the lakebed;
- reconfiguration of Lakefront Park to provide adequate space for land-based marina support facilities and new replacement facilities and beach area;
- land ownership of potential improvement sites at the north end of the river.

Conceptual Design

The selected development concept locates the marina next to downtown Fairport immediately east of the Grand River navigation channel. Protection of the marina is provided by an extension of the existing east jetty and creation of an east-west

rubblemound breakwater north of the jetty. A rubblemound breakwater is extended to the north from a location just west of Lakefront Park. (For a discussion of breakwater cross section design, see "*Breakwater and Revetment Cross Sections for Lake County Coastline" on page 31)*. The final configuration results in a protected marina entrance north of the entrance to the Grand River and away from Lakefront Park users. The location of the boat launch within the marina will result in protected water with adequate navigation depth. Sand deposition should be largely confined to the beach and along the new east breakwater. Land-based support facilities are as noted on the plan.

Summary of Opinion of Probable Construction Costs

1	Demolition and Site Preparation	$ 365,000
2	Land-Based Site Improvements	$ 6,925,000
3	Water-Based Site Improvements	$ 20,023,000
	Total	**$ 27,313,000**

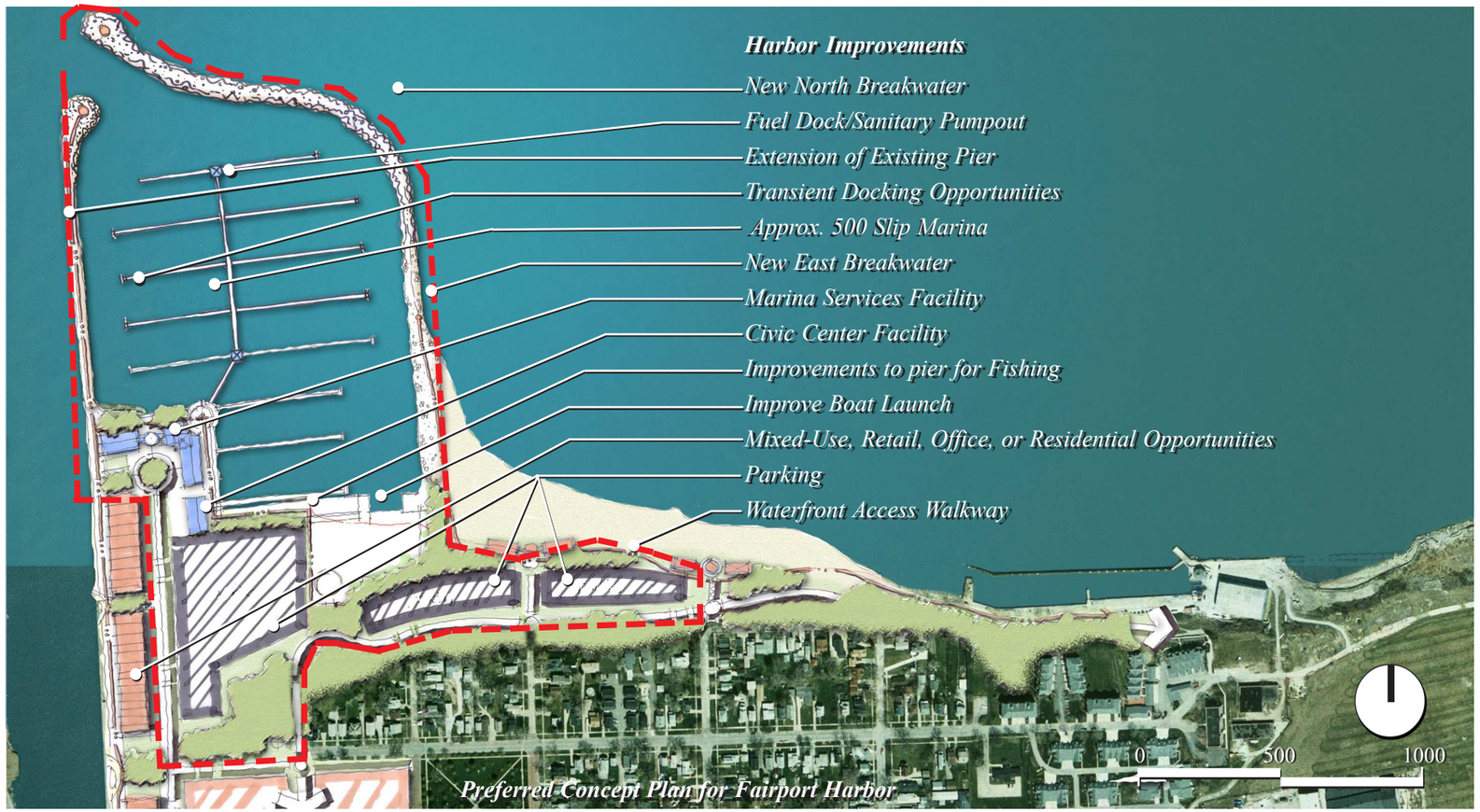
Notes/Assumptions

1 All costs in 2004 dollars.
2 The site is a clean, non-contaminated site, ready for construction.
3 Existing buildings to be demolished are free of asbestos and/or other hazardous materials.
4 Does not include improvements to existing breakwaters or seawalls (i.e. the outer Federal Breakwater).
5 Marina basin dredged to 6' or greater navigable water to support boat dockage. Assume that material in basin can be hydraulically dredged and is suitable as beach material.
6 A new marina building assumes 10,000 sf at $250/sf.
7 For planning and costing purposes, dockage assumes 15' wide main pier, 10' head piers, 5' wide finger piers, and 40' long slips.
8 Cost does not include non-marina-based buildings.
9 Final breakwater/revetment/sheetpile design and engineering will require appropriate geotechnical and hydraulic analysis.
10 Opinion of Probable Construction Cost does not include the 25% conceptual design contingency or 10% design and engineering fees.

An alternative concept that was considered included locating the marina east of the Lakefront Park in order to separate the marina from the river channel and to take advantage of potential partnerships with the existing private marina and the Hemisphere development. This might help to reduce the sediment load near the navigation channel by interrupting the flow from the east. The disadvantages of this location includes its greater distance from the downtown, less available land for landside support facilities, and potentially higher costs to create marina protection due to the need for protection on three sides.

Aerial oblique of preferred concept

Marina Amenities



Preferred Concept Plan for Fairport Harbor

Perry Township Park

Eroded bluff looking west

Concrete revetment looking east

Existing boat launch

Existing beach

East 1000 feet of shoreline showing small beach, boat launch, and concrete revetment

West 1000 feet of shoreline showing steeply eroding bluffs and future Senior Center Site

Existing Site Conditions

Perry Township Park is a 50 acre public park with approximately 1000 feet of shoreline along Lake Erie. The park is augmented by the recent purchase of Camp Roosevelt located immediately to the west which adds another 1000 feet of shoreline. Of the 2000 feet of public shoreline, access to the lake is limited to an unsafe boat launch and small beach comprising approximately 100-200 feet of shoreline at the far eastern end of the park. The remainder of the park shoreline consists predominantly of a concrete revetment - built in 1983 to protect against wave action at the toe of the bluff; and a steeply eroding bluff with little or no beach at the base. Access to the lake at these locations is nearly impossible.

Development Program

The primary goals for this site include:

- the protection and stabilization of the bluff west of the concrete revetment (Camp Roosevelt Area);
- creating a more usable shoreline or beach at the base of the bluff;
- incorporating ADA access to the lake as part of a Senior Center to be constructed on the Camp Roosevelt property; and
- providing a protected harbor and improved the boat launch facility at the east end of the park.

Specific Design Parameters and Technical Issues

Specific design parameters and technical issues that will have to be addressed for the development of this waterfront area include:

- water depths at the protected harbor/boat launch area
- littoral drift and potential sand deposition in the harbor entrance area;
- regulatory agency permitting for placement of protective offshore structures and for minor filling of the lakebed;
- geotechnical condition of the failing slope on the west side of the property.

Conceptual Design

The proposed solution for the severely eroding bluff on the west half of the site includes:

- cutting back the slope closer to a ratio of 2.5:1 (2.5 horizontal feet to 1 foot of vertical change), presuming that there is space at the top of the bluff;
- reinforcing the surface with erosion control fabric;
- providing groundwater drainage if necessary; and
- protecting the toe of the slope from erosive wave action with barrier island breakwaters and beaches.

The concept shows offshore bio-engineered breakwaters that would protect the shoreline and would create light watercraft and swimming opportunities, and the potential for coastal habitat. A scenic overlook structure and ADA accessible path would be incorporated into the bluff to gain access to the beach and lake and are included in the concept opinion of probable costs.

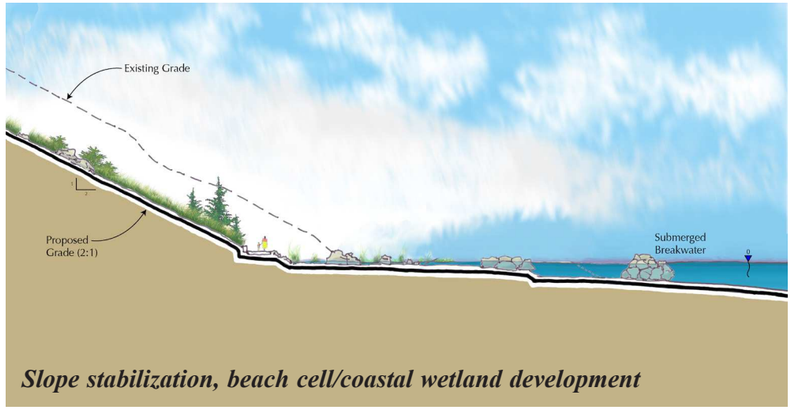
The eastern half of the site provides an improved boat launch facility within a small harbor that is protected by rubblemound breakwaters. The boat launch basin would be dredged and sand would be placed to the east of the boat launch to enhance the existing beach and to continue to supply the down shore littoral drift.

Summary of Opinion of Probable Construction Costs

1. Demolition and Site Preparation	$ 70,000
2. Land-Based Site Improvements	$ 355,000
3 .Water-Based Site Improvements	$ 3,644,000
Total	**$ 4,069,000**

Notes/Assumptions
1. All costs in 2004 dollars.
2. The site is a clean, non-contaminated site, ready for construction.
3. Does not include improvements to existing breakwaters or seawalls.
4. Boat Launch basin dredged to 6' water depth or greater.
5. Land-based site improvements are on west side only.
6. Final breakwater/revetment and slope stabilization design and engineering will require appropriate geotechnical and hydraulic analysis.
7. Opinion of Probable Construction Cost does not include the 25% conceptual design contingency or 10% design and engineering fees.

Aerial oblique of preferred concept



Slope stabilization, beach cell/coastal wetland development

North Perry Village/Madison Township

Aerial oblique of preferred concept

Existing Site Conditions

This project site is located near the boundary between North Perry Village and Madison Township. Townline Park in North Perry Village forms the west edge of the project. Stanton Park in Madison Township forms the east boundary. The area in between the two parks is made up of private residences. The project area encompasses approximately one mile of coastline.

Conditions along the one-mile of shoreline vary between naturally stable beaches and slopes to unprotected eroding slopes. Townline Park is a semipublic village park with an unsafe boat launch. A narrow sand beach is situated at the bottom of relatively stable vegetated slopes east of the boat launch area. Stanton Park is a public township park with a need for some bluff stabilization and possibly an improved access route to the water. A narrow beach at the base of relatively stable, vegetated bluffs is located along the western portion of the park. The private shoreline between the two parks contains a combination of treated and untreated shoreline and slopes that appear to be relatively stable with the exception of one small stretch of eroding bluff. The beach at the base of the bluff ranges between narrow to nonexistent. A variety of different concrete protection structures have been placed along this reach of shoreline in an effort to break wave energy and maintain the beaches.

Preferred concept for shoreline protection and beach creation

Development Program

The initial intent for the Townline and Stanton Parks was to locate a harbor of refuge basin between Geneva State Park and Fairport Harbor. This included the repair and replacement of the existing boat launch at Townline Park, and stabilization of the failing slope at Stanton Park. More recent strategies included the idea of placing offshore barrier structures to protect the shoreline and create substantial recreational boating and swimming beaches in the area between the two parks as part of an integrated safe harbor and passive recreation waterfront design.

Specific Design Parameters and Technical Issues

The NOAA bathymetric data used for this study indicates a very flat offshore profile resulting in relatively shallow water several hundred feet out from the shoreline. This may have significant implications in terms of recreational boating draft requirements, initial project dredging, and maintenance dredging. A more detailed site specific bathymetric survey and coastal wind/wave analysis will be required and may result in adjustments to the final design scheme as shown in this document.
Specific design parameters and technical issues that will have to be addressed for the development of this waterfront area include:

- water depths at the harbor of refuge/marina;
- littoral drift and potential sand deposition in the harbor entrance area;
- regulatory agency permitting for placement of protective offshore structures and for filling of the lakebed;
- and land use agreements between the Lake County/Madison Township and private landowners.

Conceptual Design

The concept shown in this report includes a series of offshore breakwaters and beaches, and a small harbor area that will:

- provide safe harbor for recreational boaters, anglers, and small commercial vessels;
- restore, enhance, and protect the shoreline and bluffs from erosive wave action;

- provide waterfront access and recreational beaches for swimmers and sunbathers; and
- create potential coastal wetland zones for enhanced fish and wildlife habitat.

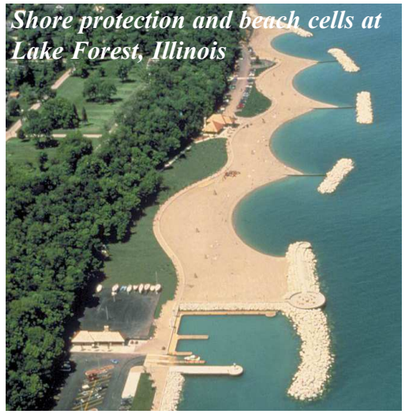
The beach forms shown are a result of the location of the breakwater and the type and nature of the beach material used to "fill" the beach cells. The beach shape will change slightly in response to storm events. Highlights and elements of this concept that are part of the Opinion of Probable Construction Costs include:

- a protected harbor for recreational water craft;
- small marina with dockage for approximately 40 boats;
- new boat launch within the protected harbor;
- supporting marina infrastructure including driveways and parking, water and electrical utilities, deicing system;
- waterfront access and sand beaches for recreation and fishing;
- slope stabilization at Stanton Park;
  scenic overlook structures at both Townline and Stanton Park.

Summary of Opinion of Probable Construction Costs

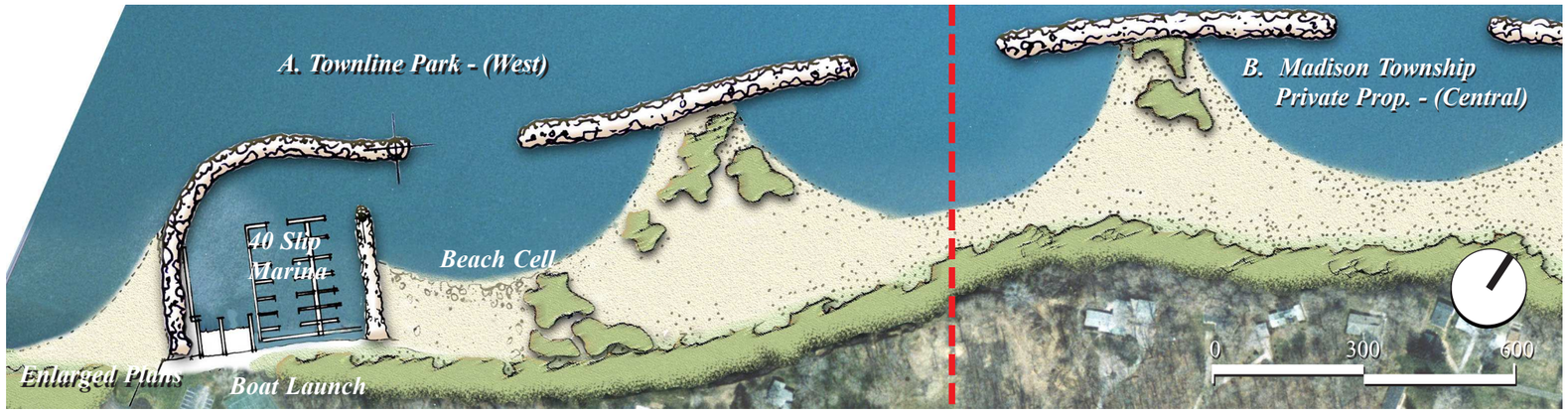
A. Townline Park - (West)		
1	Demolition and Site Preparation	$ 150,000
2	Land-Based Site Improvements	$ 767,000
3	Water-Based Site Improvements	$ 5,227,000
	Total	**$ 6,144,000**
B. Madison Township Private Prop. - (Central)		
1	Demolition and Site Preparation	$ 95,000
2	Land-Based Site Improvements	$ -
3	Water-Based Site Improvements	$ 4,500,000
	Total	**$ 4,595,000**
C. Stanton Park - (East)		
1	Demolition and Site Preparation	$ 95,000
2	Land-Based Site Improvements	$ 323,000
3	Water-Based Site Improvements	$ 1,750,000
	Total	**$ 2,868,000**

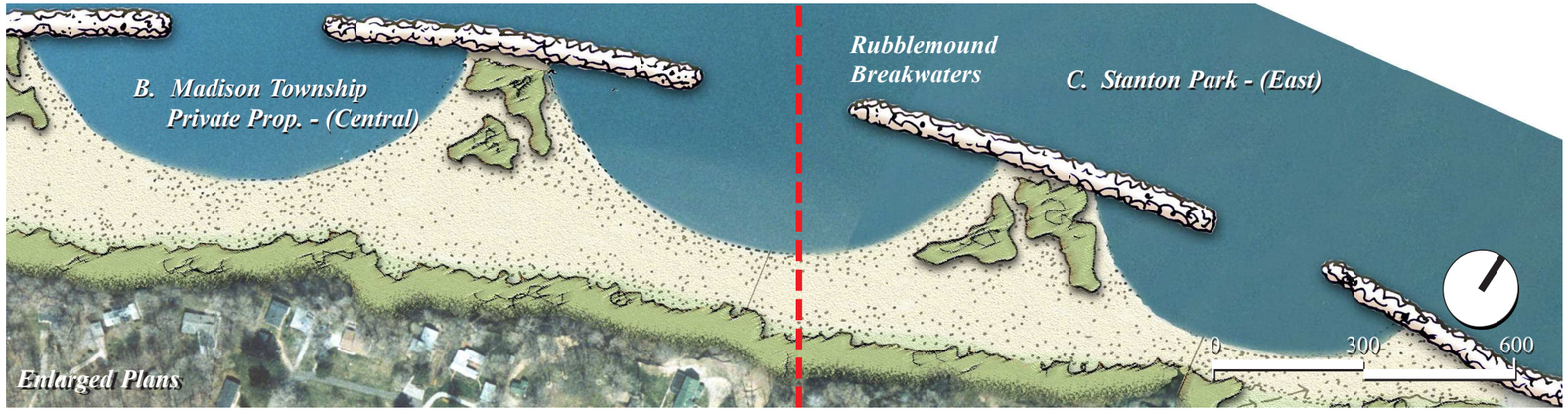
Notes/Assumptions:
1. All costs in 2004 dollars.
2. The site is a clean, non-contaminated site, ready for construction.
3. Does not include improvements to existing breakwaters or seawalls, or dock edges.
4. For planning and costing purposes, dockage assumes 10' head piers, 5' wide finger piers, and 40' long slips.
5. Marina basin dredged to 6' or greater navigable water to support boat dockage.
6. Bluffs above beaches will remain stable after placement of breakwaters and beaches.
7. Pedestrian access assumes 5% ADA down 40' bluff.
8. Final breakwater/revetment/sheetpile design and engineering will require appropriate geotechnical and hydraulic analysis.
9. Opinion of Probable Construction Cost does not include the 25% conceptual design contingency or 10% design and engineering fees.


Shore protection and beach cells at Lake Forest, Illinois

Beach cell, Bender Park, Wisconsin

Beach cell, Klode Park, Wisconsin





Madison Township Park Boat Launch

Existing Park boat launch

Existing Site Conditions

Madison Township Park is a 12 acre public park with approximately 660' of shoreline. Amenities at the park include a large public beach area, playground equipment, baseball diamond, basketball court and lakefront picnic pavilion. A 16-20' graded slope above the water provides great views of Lake Erie. A walking path with two entrance points provides access to the beach.

The shoreline is characterized by and numerous concrete cylinders and miscellaneous structures and debris used as a form of shoreline protection. While initial protection measures may have proven beneficial, this strategy results in an unfriendly environment to lake users and aesthetically unappealing appearance to visitors. A boat launch is located at the east end of the shoreline. The boat launch is exposed to wind and wave from all directions and is difficult to use other than when lake conditions are calm. This launch provides no protection, tie-ups or signage for recreational watercraft. While ample area exists for parking, launches at this site are limited due to safety. Preliminary data indicates that water depths are relatively shallow in and around the boat launch area.

Development Program

The near term goals for this site are to provide a protected and usable boat launch facility with improved signage, access, and parking. Long term goals include the enlargement and enhancement of the beach on the west side of the park.

Specific Design Parameters and Technical Issues

Specific design parameters and technical issues that will have to be addressed for the development of this waterfront area include:

- water depths at the protected boat launch area
- littoral drift and potential sand deposition at the entrance to the protected launch area;
- regulatory agency permitting for placement of protective offshore structures and for minor filling of the lakebed.

Conceptual Design

The eastern half of the site provides an improved boat launch facility within a small harbor that is protected by rubblemound breakwaters. The boat launch basin would be dredged and sand would be placed to the east of the boat launch to supply the down drift property.

Although not shown in the sketch, improvements to the west side of the park at the beach could include the replacement of the concrete cylinder structures with

offshore breakwaters. Beach cells for swimming sun bathing, and other recreational uses could be created by filling the areas behind the breakwaters with beach sand.

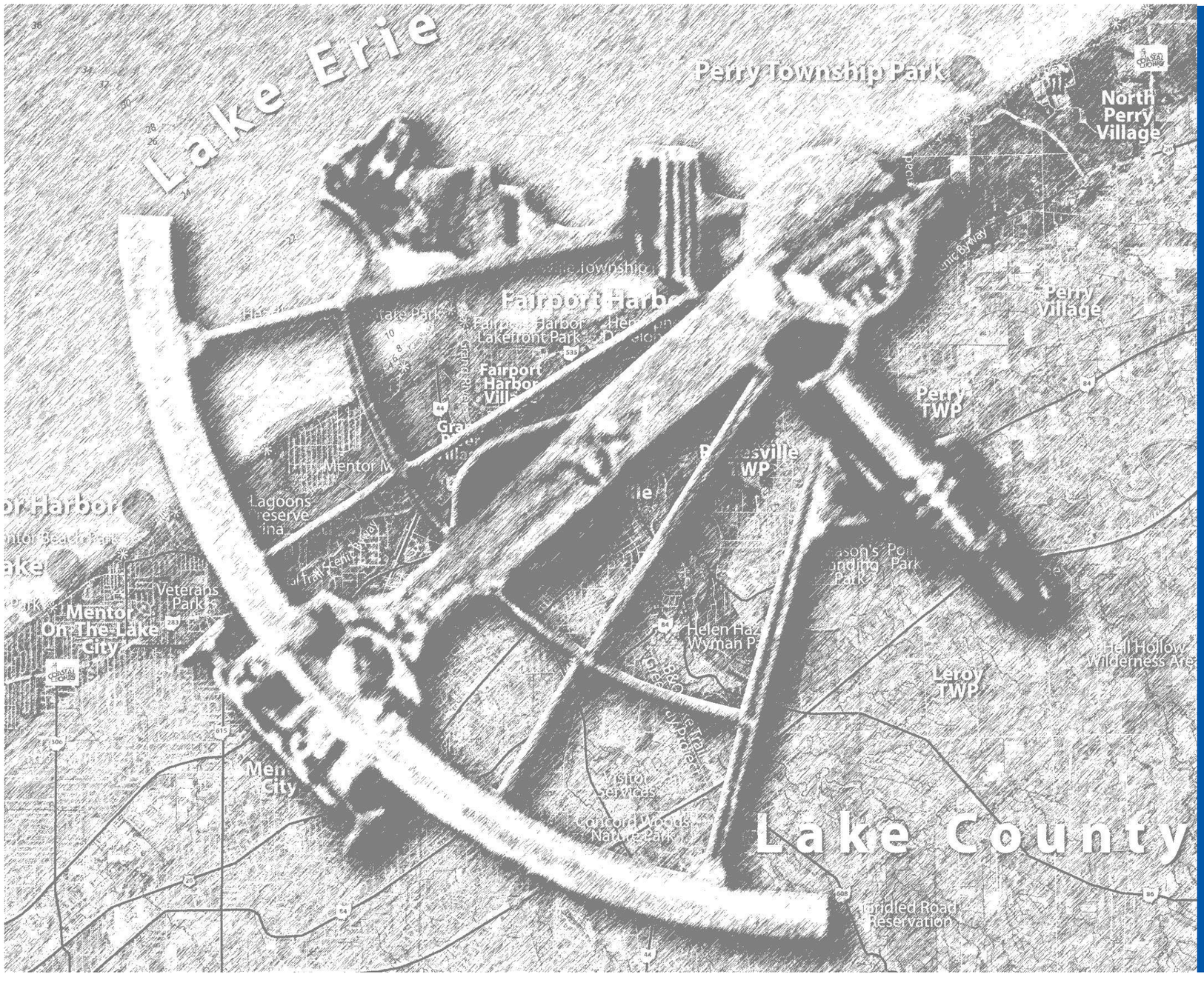
Opinion of probable construction costs for these improvements at this site have not been calculated. However, based on similar improvements shown at Perry Township Park, approximate "ballpark" costs may range as follows:

1. Boat Launch Ramp Facility	$	100,000 to 250,000
2. Rubblemound Breakwater/Revetment	$	800,000 to 1,200,000
3. Basin Dredging	$	100,000 to 200,000
4. Offshore Breakwater for Beach	$	300,000 to 600,000
5. Sand for Beach	$	50,000 to 200,000
Total	**$**	**1,350,000 to 2,450,000**

Notes/Assumptions
1. All costs in 2004 dollars.
2. The site is a clean, non-contaminated site, ready for construction.
3. Does not include improvements to existing breakwaters or seawalls.
4. Boat Launch basin dredged to 6' water depth or greater.
5. Offshore breakwaters are not "bioengineered".
6. Final breakwater/revetment/sheetpile design and engineering will require appropriate geotechnical and hydraulic analysis.

Aerial oblique of preferred concept

Protected boat launch at Bender Park, Milwaukee, Wisconsin



IV. Implementation Strategy

Strategies for Implementing Specific Projects

The results of the CDP describe the framework for a number of rewarding coastal projects in Lake County. To begin a long-term implementation policy, a short-term action policy should be developed and agreed upon by County stakeholders. A key component of any large-scale project is multi-jurisdictional or regional cooperation. This cooperation enables future efforts to leverage public financial resources on a large scale. The following action items are divided into four topics: General, Administrative/Management, Economic and Design. This outline can be used as a model to develop Lake County's future steps toward project implementation.

I. General Strategies

A. Report all findings to stakeholders and funders; officially adopt the plan.
B. Solicit financial assistance, based on this plan, from the elected leaders.
C. Encourage public/private/nonprofit investment strategies (i.e.Racine, Wisconsin).
D. Continue to stress the importance of "regionalism".
E. Conduct tour of successful lakefront projects throughout the Great Lakes for local officials to provide real-time examples.
F. Continue to apply for grants at the local, state, and federal level.
G. Market project(s) to mainstream citizen base of Lake County through newspapers and local community cable and educational networks.

II. Administrative/Management Strategies

From a long-term, administrative and financial perspective, the creation of a county or regional port authority may be beneficial in achieving large-scale project implementation. The following lists the advantages and disadvantages of a regional port authority:

Advantages
- Economies of scale
- Promotion of regionalism
- Power of eminent domain
- Promotion of economic development
- Promotion of water and lakefront revitalization
- Subsidization of less profitable or money-losing but essential facilities
- Port Authority Bond Reserve Fund

Disadvantages
- Territorial imperatives
- Overlapping responsibilities
- Lack of public accountability

III. Economic Strategies

A. Conduct market analysis for certain projects and the associated secondary investments. This is most important for the Fairport Harbor Marina.
B. Examine the return on project investment to potential stakeholders using examples from other lakefront projects.

IV. Design Strategies

A. Perform site specific bathymetry and geotechnical analysis of project area as well as surrounding zones that may be affected. **Note:** this should be performed when the decision-makers are confident that a project will be moving forward. Should a significant time period lapse, this work may need to be repeated due to changes that have occurred.

B. Solicit design and engineering services from consulting firms that specialize in waterfront development.

C. Maintain strong communication and project coordination with regulatory agencies throughout the entire process.

D. Hydraulic Model of project.

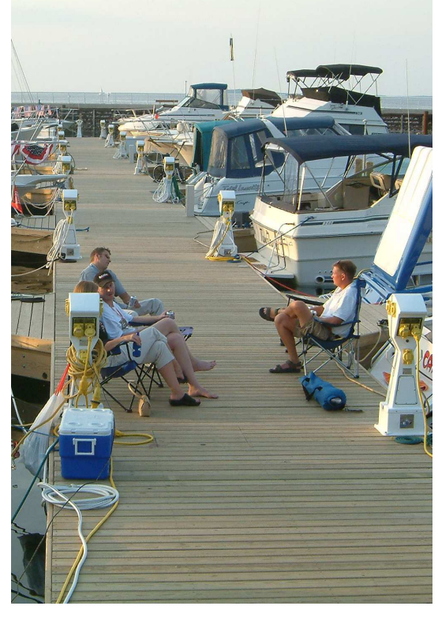
Funding

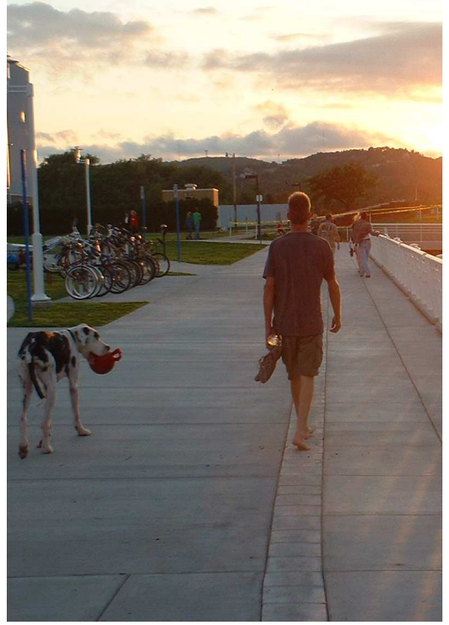
Defining a critical path for funding and phasing projects can be challenging due to the competition for funding sources. As funds become available, successful procurement of these funds will dictate project prioritization and implementation. It is recommended that the County identify a person or committee to proactively monitor funding opportunities and coordinate funding application efforts.

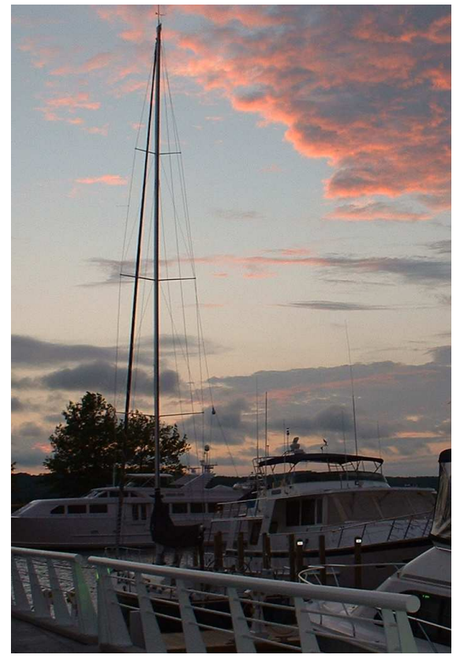
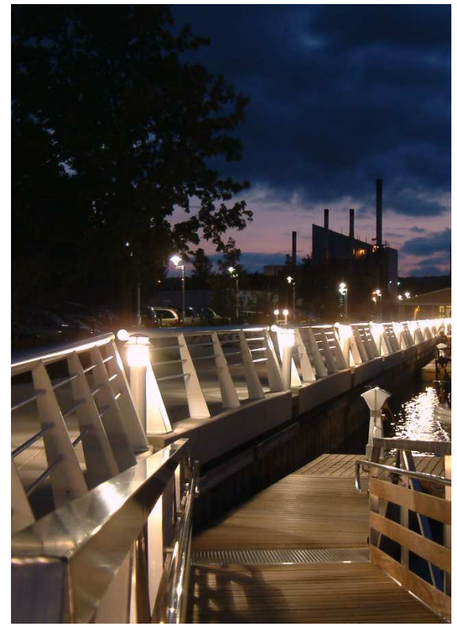
The chart on the following pages lists possible sources of funding. Although by no means complete, the list can serve as a starting point for the discovery of additional funding avenues and mechanisms for financing potential waterfront projects.

Potential Funding Sources for Waterfront Projects

Program Name	Administrated By:	Applies To:	Availability/Matching Requirements	Application Cycle	Contact
Lake Erie Protection Fund	Lake Erie Commission	The fund helps implement improvements to Ohio's portion of Lake Erie and its watershed. Large Grants $50,000-$100,000	None	Yearly (Next Application Spring 2005)	Ohio Lake Erie Commission office at 419-245-2514 or at lakeeriecommission@ameritech.net.
Water Pollution Control Funds	Ohio EPA	Financial (low-interest loans) and technical assistance for a wide variety of actions to protect or improve the quality of Ohio's rivers, streams, lakes, and other water resources.	None	Rolling Application Process	Assistance Administration Section for further information at (614) 644-2832
Federal Brownfields Economic Redevelopment Initiative	U.S. Environmental Protection Agency	Assessment Demonstration Grants can be used for preliminary investigation activities such as site assessment, site identification, site characterization, site remediation, planning and design, and community outreach. The grants cannot be used for the demolition or actual cleanup of a site.	None	Yearly (Next Application Fall 2005)	Economic Redevelopment Initiative, visit the EPA Brownfields web site at http://www.epa.gov/ brownfields/ or contact the RCRA/Superfund Hotline at (800) 424-9346.
Coastal Management Assistance Grants	ODNR, Office of Coastal Management	Funds awarded to help preserve, protect and enhance Ohio's Lake Erie coastal resources. Includes coastal projects, construction, and planning.	50% State 50% Local	Yearly (Next Application Fall 2005)	Yetty M. Alley Office of Coastal Management ODNR Coastal Services Center 105 West Shoreline Drive Sandusky, OH 44870 (419) 626-7986 Email coastal@dnr.state.oh.us
Erosion Control Loans	Ohio Water Development Authority (OWDA), with assistance from ODNR, Office of Coastal Management	A loan is available to the owners of properties that are wholly or partially in a designated CEA. The CEA consists of land areas along the shore that are anticipated to be lost due to Lake Erie related erosion. Examples include: revetments, seawalls, bulkheads, certain breakwaters, and other similar protective measures.	Loans can be used to cover costs for surveying, design, engineering, permitting, and construction.	Rolling Application Process	Lake County Commissioners Office 105 Main Street P.O. Box 490 Painesville, Ohio 44077 (440) 350-2366





Program Name	Administrated By:	Applies To:	Matching Requirements	Application Cycle	Contact
Land and Water Conservation Funds (LWCF)	ODNR, Division of Real Estate Management	Funding available to local units of government for outdoor recreation projects	Up to 50% reimbursement on project costs	Yearly, (Next Application, February 1, 2005)	Dameyon Shipley, 614-265-6646
Natureworks Parks & Recreation Funds	ODNR, Division of Real Estate Management	Can apply for acquisition, development, or rehabilitation of public park and recreation areas	Up to 75 percent reimbursement grant (state funding)	Yearly, typically winter (Next Application February 1, 2005)	Dameyon Shipley, 614-265-6646
Recreational Trail Program	ODNR, Division of Real Estate Management	Eligible projects include development of urban trail linkages, trail head and trailside facilities; maintenance of existing trails; restoration of trail areas damaged by usage; improving access for people with disabilities; acquisition of easements and property; development and construction of new trails.	Up to 80 percent matching federal funds is reimbursed	Yearly, February 1	Mary Fitch, ODNR, Division of Real Estate and Land Management, 1952 Belcher Drive, C-4, Columbus, Ohio 43224 • 614-265-6477 mary.fitch@dnr.state.oh.us
Clean Vessel Act (CVA)	Division of Watercraft	For public and private marinas. Grants provided by the U.S. Fish & Wildlife Service are designed to improve the number and availability of marine facilities for the proper disposal of sewage from boats. Approximately $9.5 million is available per year nationwide for construction of new or replacement pump-out and/or dump stations to public and private marinas.	The grant provides up to 100 percent cost-share funding.	Yearly, October 1	Dave Roseler 419-621-1302 dave.roseler@dnr.state.oh.us

Program Name	Administrated By:	Applies To:	Matching Requirements	Application Cycle	Contact
Cooperative Public Boating Facility Program	Division of Watercraft	Grants are provided from the Waterways Safety Fund for construction or improvement of public facilities for recreational boating on navigable waters. Projects include ramps, docks, parking and other items directly related to recreational boating facilities.	Matching grants are awarded on a competitive basis, 75/25 with grant providing 75 percent of the cost.	Yearly, April 1	Julie McQuade, 614-265-6443 julie.mcquade@dnr.state.oh.us
Boating Infrastructure Grants (BIGP)	US Fish and Wildlife Service through the Division of Watercraft	Communities, public and private tie-up facilities. Approximately $8 million is available nationwide each year for construction of transient moorage facilities for non-trailerable boats over 26-feet in length.	Matching grants are awarded on a competitive basis, 75/25 with the grant providing 75 percent of the cost. Funded through the Wallop Breaux Trust Fund.	Yearly, August 1	Dave Roseler 419-621-1302 dave.roseler@dnr.state.oh.us
Public Works and Economic Development Facilities Program Grants	Department of Commerce	Grants for distressed communities to attract new industry, business expansion, and to generate private sector jobs. Utility expansions and port improvements are among the eligible activities.	Estimated $200 million available FY '05 (Average of Financial Assistance in '03 $1,313,400)		
Economic Development Assistance Program	Economic Development Administration	Funds for economically distressed areas meeting certain criteria as determined in preapplication process. Designed for stimulating job growth.	$335 million available nationwide.	Rolling Application Process - Requires pre-application to determine eligibility to apply.	Chicago Regional Office 111 North Canal, Suite 855 Chicago, Illinois 60606-7204 Telephone: (312) 353-7706
USACE funds under numerous program names including Sec 206; Sec. 1135; Sec. 14; others	United States Army Corps of Engineers	Funds for aquatic ecosystem restoration; project modification to improve existing Corps projects (navigation); erosion control and watershed quality improvements.	$ 1- $5 million per project. $25 - $30 million available nationwide. 75/ 25 and 65/35 match requirements typical	Rolling Application Process - Typically requires pre-application to determine eligibility to apply.	General Questions - Buffalo District Telephone: (716) 879-4104