APPENDIX K
Berrien and VanBuren County, Michigan
Discovery Report

Discovery Report

Great Lakes Coastal Flood Study

Lake Michigan
State of Michigan

Berrien County and Van Buren County
County-based Report

February 2013

FEMA

SUBMITTED BY:

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Project Area Community List

Berrien County	Berrien County (cont.)	Van Buren County
Benton Charter, Township of	New Buffalo, City of	Covert, Township of
Benton Harbor, City of	New Buffalo, Township of	South Haven Charter, Township of
Bridgman, City of	Shoreham, Village of	
Chikaming, Township of	St. Joseph Charter, Township of	
Coloma, City of	St. Joseph, City of	
Coloma, Township of	Stevensville, Village of	
Grand Beach, Village of	Three Oaks, Township of	
Hagar, Township of	Three Oaks, Village of	
Lake Charter, Township of		
Lincoln, Township of		
Michiana, Village of		

This list includes all communities within the Project Area covered by this report for the Great Lakes Coastal Study under consideration for new Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning (Risk MAP) products and datasets, which may include Flood Insurance Studies (FISs) and Flood Insurance Rate Maps (FIRMs). Not all communities will receive new/updated FEMA Risk MAP products and datasets or FISs and FIRMs.

Table of Contents

List of Tables

List of Figures

List of Attachments

Acronyms and Abbreviations

AAL	Average Annualized Loss
CAV	Community Assistance Visit
CBRS	Coastal Barrier Resources System
CID	Community Identification Number
CIS	Community Information System
CMAG	Coastal Management Assistance Grant
C-MAN	Coastal Marine Automated Network
CNMS	Coordinated Needs Management Strategy
CO-OPS	Center for Operational Oceanographic Products and Services
CRS	Community Rating System
DFO	Department of Fisheries and Oceans
FEMA	Federal Emergency Management Agency
FIPS	Federal Information Processing Standards
FIRM	Flood Insurance Rate Map
FIS	Flood Insurance Study
GLCRG	Great Lakes Coastal Restoration Grant
HAZUS-MH	Multi-Hazard Risk Assessment and Loss Estimation Software Program
HWM	High Water Mark
HUC8	Hydrologic Unit Code 8
LOMA	Letter of Map Amendment
LOMC	Letter of Map Change
LOMR	Letter of Map Revision
LOMR-F	Letter of Map Revision based on Fill
MLI	Midterm Levee Inventory
NDBC	National Data Buoy Center
NFIP	National Flood Insurance Program
NGDC	National Geophysical Data Center
NID	National Inventory of Dams
NOAA	National Oceanic and Atmospheric Administration
NWS	National Weather Service
Risk MAP	Risk Mapping, Assessment, and Planning
SFHA	Special Flood Hazard Area
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

I. Discovery Overview

The Federal Emergency Management Agency (FEMA) Risk Mapping, Assessment, and Planning, or Risk MAP, program, helps communities identify, assess, and reduce their flood risk. Through Risk MAP, FEMA provides information to enhance local mitigation plans, improve community outreach, and increase local resilience to floods.

During the Discovery phase of Risk MAP project development, FEMA:

- Gathers information about local flood risk and flood hazards
- Reviews mitigation plans to understand local mitigation capabilities, hazard risk assessments, and current or future mitigation activities
- Supports communities within the coastal area to develop a vision for the future
- Collects information from communities about their flooding history, development plans, daily operations, and stormwater and floodplain management activities
- Uses all information gathered to determine which areas require mapping, risk assessment, or mitigation planning assistance through a Risk MAP project
- Develops Discovery Map and Report that summarize and display the Discovery findings

The Discovery process involves coordination with Great Lakes stakeholders, data collection and analysis, community interviews, a Discovery Meeting with stakeholders affected by the study, and development of recommendations based on an analysis of data and information gathered throughout the process

i. Great Lakes Coastal Flood Study

FEMA has initiated a coastal analysis and mapping study that may result in updated Flood Insurance Rate Maps (FIRMs) for coastal counties along the Great Lakes. The new coastal flood hazard analyses will utilize updated 1-percent-annual-chance (100-year) flood elevations obtained from a comprehensive storm surge study being developed by the U.S. Army Corps of Engineers (USACE).

The Great Lakes Coastal Flood Study (CLCFS) will incorporate modern analysis of historic storm and high water events and provide for updated flood risk information serving United States communities having shoreline along the Great Lakes. The storm surge study is one of the most extensive coastal storm surge analyses to date, encompassing coastal floodplains in the eight States with coastlines on the Great Lakes.

An updated coastal flood study is needed to obtain a better estimate of coastal flood hazards on the Great Lakes. The current, effective FIRMs are outdated primarily due to the age of data and the coastal methodologies used in producing them. Major changes in National Flood Insurance Program (NFIP) policies and methodologies have been implemented since the effective date of many flood insurance studies in the area, creating the need for an update that will reflect a more detailed and complete hazard determination.

The Great Lakes Coastal Flood Study includes a system-wide solution that provides a comprehensive analysis of storm and high water events within the Great Lakes Basin. This program is funded through the FEMA Risk MAP program. FEMA, USACE, Association of State Flood Plain Managers (ASFPM), State partners, and FEMA contractors will collaborate in updating the coastal methodology and flood maps, and create new flood risk products. FEMA manages the NFIP, which is the cornerstone of the national strategy for preparing communities for flood-related disasters.

ii. Purpose of Great Lakes Discovery

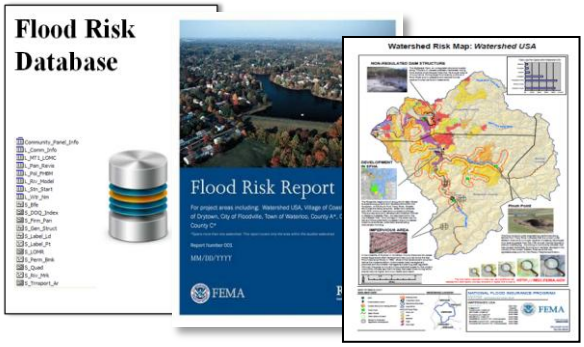
The Great Lakes Discovery process will includes data collection, information exchange between all governmental levels of stakeholders, spatial data presentation, cooperative discussion with stakeholders to better understand the Great Lakes area, and a collaborative approach on the project planning in detail. The process allows FEMA to continue to vet the Great Lakes coastal study methodologies with a large stakeholder group, to discuss local priorities and data, to discuss mitigation strategies and coastal issues, and to move towards projects that will successfully identify the risks associated with Great Lakes flooding.

The Discovery process also helps FEMA better identify the types of datasets or products that are useful at the local level, especially as it relates to identifying new mitigation strategies and actions and for use in local planning efforts. Products that may be available to communities as a result of this Great Lakes flood study include updated FIRMs, coastal flood risk products, calibrated models for storm surge and wave analysis on each of the lakes, and accurate depictions of water level and wave response on each lake occurring during hundreds of actual events. The type of product a community receives is dependant not only on the coastal flood study analysis results, but also on the type of data, local or nationally, that is available.

The following section describes the Coastal Flood Risk Products that a community may receive, as well as some products that are under development for the Great Lakes study areas.

iii. Coastal Flood Risk Products

As part of a Risk MAP project, FEMA will seek to provide State and community officials with three flood risk products to help them gain a better understanding of flood risk and its potential impact on communities and individuals. These products will also enable communities to move forward with informed mitigation actions to reduce identified risk. Delivery of the products discussed below will depend on available data, results of coastal analysis, local partnerships and needs, and fiscal year funding.



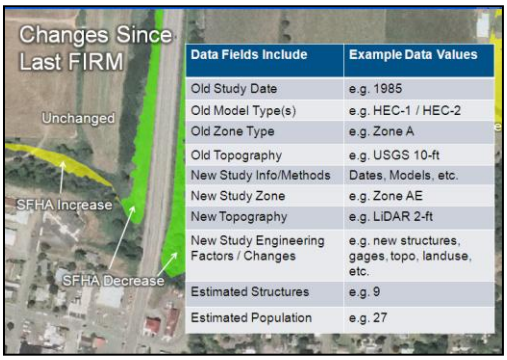
The three products are:

- Flood Risk Database
- Flood Risk Report
- Flood Risk Map

These products will summarize information captured in flood risk datasets that may be generated during a Risk MAP, or flood risk, study. The flood risk datasets could include regular and enhanced products. Standard flood risk datasets, also termed products, are listed below:

Changes Since Last FIRM (CSLF)

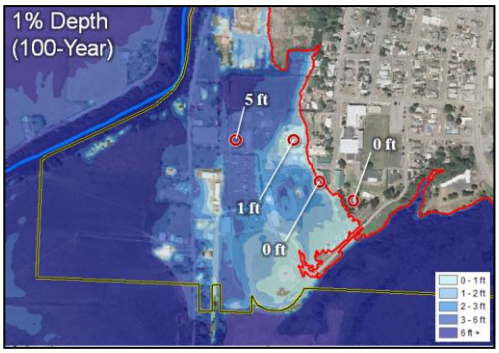
- Identify Areas and Types of Flood Zone Change:
    - Compares current effective (previous) with proposed (new) flood hazard mapping
- Flood zone changes are categorized and quantified



- Provide Study/Reach Level Rationale for Changes Including:
    - Methodology and assumptions
    - Changes of model inputs or parameters (also known as Contributing Engineering Factors).

Flood Depth and Analysis Grids (1-percent-annual-chance event only)

- Reflect total depth (i.e. stillwater and waves). Will be created for the 1% frequency event of the engineering studies performed and as appropriate for the data. Wave runup areas may not be applicable.
- Created using the regulatory mapping and associated zone breaks as input



Flood Risk Assessment (HAZUS-MH)

- Hazard-United States Multi Hazard (HAZUS-MH) combines science, engineering and mathematical modeling with GIS technology to estimate losses of life and property—and shows those losses on a map
- HAZUS-MH estimates impacts to the physical, social, and economic vitality of a community from earthquakes, hurricane, winds, and floods
- Coastal flood risk assessments will be similar to riverine, but will use coastal depth grids as input for refined analysis.
- HAZUS-MH analysis and data can support adoption of high regulatory standards for structures in high loss areas
- HAZUS-MH results can help to provide justification to find mitigation projects to protect citizens and properties from losses during future coastal flood events

HAZUS MH
EARTHQUAKE • WIND • FLOOD

For more information about HAZUS and data inputs, visit http://www.fema.gov/plan/prevent/hazus/index.shtm or enter keywords "fema HAZUS" into an internet search engine.

In addition, FEMA is looking into the possibility of developing some unique Great Lakes coastal flood risk products that utilize datasets that have recently been collected or will be collected as part of the GLCFS:

- Storm Response Erosion Data: Dataset is expected to contain the results from erosion analysis in response to the 1-percent-annual chance flood event

- Shoreline Feature Data: Dataset was developed by the USACE and contains primary and secondary land use tables, as well as coastline type, materials, and vegetation. The current dataset contains data at one-mile spacing. The dataset does not include field-based reconnaissance or sediment/subsurface soil collection.

The delivery of these standard flood risk products and the Great Lakes coastal flood risk datasets will be dependent on the location of the Risk MAP study and coastal analysis, data availability, and partnerships with local communities. Not all communities will receive flood risk products.

II. Stakeholder Communication and Coordination

Communication and coordination with Federal, State and local stakeholders is key to the success of the GLCFS. A large emphasis has been placed on identifying stakeholders early and often and working with those stakeholders continually throughout the study process, from Discovery all the way through flood map and flood risk product development. Through outreach, the goal is to increase understanding of the new coastal study methodologies and the tools and processes that will be available for risk-based community planning, and to increase flood hazard awareness within the Great Lakes Coastal Region.

i. Lake Michigan Discovery Stakeholder Coordination

Meetings, emails, telephone calls, and letters are essential to communicate effectively throughout the life of this Lake Michigan Coastal Flood Study project, which has begun with this Discovery process.

To kick-off this Discovery process, FEMA formed a group of core stakeholders, which included representatives from FEMA Region V, STARR (mapping partner to FEMA), USACE, National Oceanic and Atmospheric Administration (NOAA), ASFPM, State National Flood Insurance Provider (NFIP) Coordinator, State Hazard Mitigation Officer (SHMO), and State Engineers. The core stakeholders reviewed the Discovery plan, objectives, and key outcomes for Lake Michigan Discovery with FEMA, provided suggestions for outreach and communication, and raised any concerns as it related to Lake Michigan and the coastal flood study process. Following this kick-off process, outreach, communication, and coordination with local stakeholders was initiated.

Discovery Meeting invitations were sent to local community and county stakeholders within the Berrien and Van Buren Counties portions of the Lake Michigan Coastal Flood Study project. In addition, an email invitation was sent to a larger list of stakeholders, including but not limited to other federal agencies, universities, watershed groups, Great Lakes associations, technical stakeholders, and emergency management agencies.

Representatives from local governments, including cities, townships, and villages are considered fundamental stakeholders in this process because they have been elected or appointed to represent the interests of the residents of the Project Area. See Lake Michigan Basin-wide report for a complete list of the stakeholders invited to the Discovery Meeting.

Discovery Meeting invitations also included a Coastal Data Request Form (Attachment A). Communities were asked to provide information on data available at the local level that may be of use during the flood study update, and during the development of the coastal flood risk products discussed earlier in this report. The Coastal Data Request Form included data requests for:

- Base Map Data
- Coastal Data
- Historic Flood Data
- Risk Assessment
- Flood Mitigation Information
- Community Plans and Projects
- Other comments/concerns based on local knowledge

A compilation of responses to the coastal data request form can be found in Section IV, Summary of Data Analysis, of this report.

In addition to the hard copy letter invitations, and in order to improve communication and data sharing leading up to the Discovery Meeting, FEMA offered local communities an opportunity to attend pre-Discovery Meeting conference call, referred to as an Information Exchange Session. The conference call information was included in the Discovery Invitation letters mailed to local community officials, and an email reminder was sent out as well. The session's intent was to begin the process of learning about local data availability and what the critical issues are for the Great Lakes communities.

Stakeholder correspondence, invitations, meeting minutes, and presentations related to the information exchange session can be found in Attachment B, Berrien and Van Buren Counties Pre-Meeting Correspondence.

III. Berrien and Van Buren Counties Discovery Meeting

The Discovery Meeting for Berrien and Van Buren Counties coastal communities was held on September 10, 2012 in St. Joseph, MI. Communities potentially affected by coastal flooding were invited to the Discovery Meeting. The purpose of this meeting was to facilitate discussion

about study needs, mitigation project needs, desired compliance support, and local flood risk awareness efforts.

The objectives of the Discovery Meeting included:

- Continuation and expansion upon stakeholder engagement
- Discussion of data inputs from Federal, state and local stakeholders
- Identification of local coastal flood hazard needs and areas of concern
- Identification of flood risk products and datasets that best advance coastal mitigation action
- NFIP regulatory updates
- Discovery schedule and deliverables

The Discovery Meeting presentations included the following information:

- An overview of the GLCFS and schedule
- Review of the Discovery process and outcomes
- Discussion of coastal mapping and flood risk topics
- Discussion of how the study may affect communities, including compliance requirements
- Review of hazard mitigation opportunities and grant funding
- Encouragement and facilitation discussion regarding coastal study needs, mitigation project needs, desired compliance support, and local flood risk awareness efforts

Draft Discovery Maps for Berrien and Van Buren Counties (Attachments C-D) were displayed and utilized during the meeting to stimulate discussion regarding areas of coastal flood risk concern and areas of hazard mitigation interest. The draft Discovery Map shown at the meeting included geospatial and tabular data that had been collected prior to the meeting:

Geospatial Data:

- Average Annualized Loss (AAL) data
- Coastal Barrier Resources System (CBRS)[1]

[1] CBRS consists of the undeveloped coastal barriers and other areas located on the coasts of the United States that are identified and generally depicted on a series of maps. CBRS areas are ineligible for most new Federal expenditures and financial assistance.

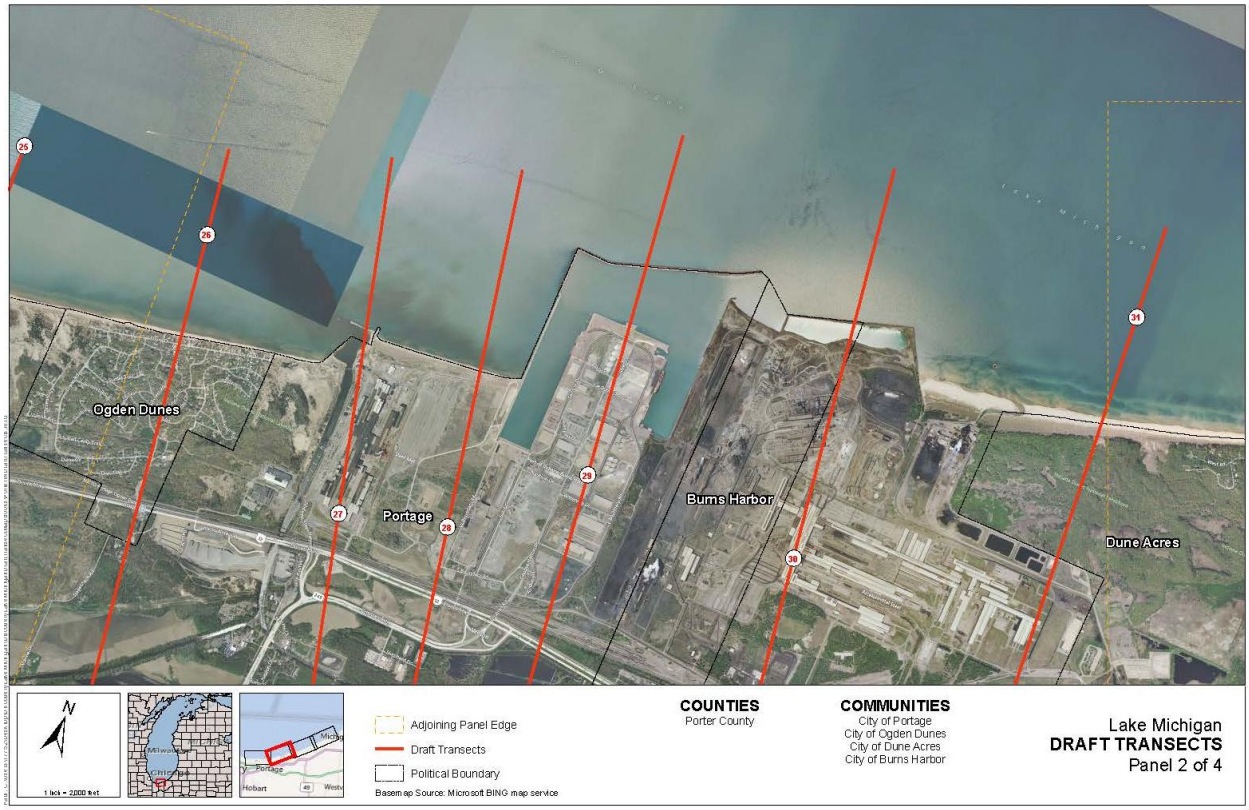
- Coordinated Needs Management Strategy (CNMS)[2] Data
- Proposed Coastal Transect Locations
- Effective Special Flood Hazard Areas (SFHAs)
- Jurisdictional Boundaries
- Letters of Map Change (LOMCs)
- Levees
- Shoreline
- Streams
- United States Geologic Survey (USGS) Gages
- Watershed Boundaries

Attendees were asked to cooperatively identify Areas of Concern and Areas of Mitigation Interest (AoMIs) within Berrien and Van Buren Counties, Lake Michigan study area using the Discovery Map and through general discussion during the meeting.

In addition to the draft Discovery Map, figures showing the location of initially proposed coastal transects around Berrien and Van Buren Counties were available for review and comment immediately following the meetings. Stakeholders were encouraged to review proposed transects and provide comments related to their location. Maps of proposed locations presented at the Discovery Meeting can be found in Attachment E. A sample map is shown in Figure 1:

[2] CNMS is a FEMA initiative to update the way FEMA organizes, stores, and analyzes flood hazard mapping needs information for communities. CNMS defines an approach and structure for the identification and management of flood hazard mapping needs that provides support to data-driven planning and the flood map update investment process in a geospatial environment. CNMS makes information related to mapping needs readily accessible and more usable. Currently, CNMS only captures riverine needs. It is expected coastal needs will be captured in this system in the future.

Figure 1: Sample Proposed Transect Figure



All comments provided during the Discovery Meeting on the draft Discovery Map and transect locations have been compiled into Table 1 below.

Table 1: Stakeholder General and Transect Location Comments

State	County	Community	FIPS	CID	Comment	Type
Michigan	Berrien	City of Benton Harbor	26021	260032	Refer to City of St. Joseph Coastal Study for areas north and south of Benton Harbor.	General Comment
Michigan	Berrien	City of Benton Harbor	26021	260032	Shift transect to the south.	Transect Comment
Michigan	Berrien	City of Benton Harbor	26021	260032	Suggest adding a transect between BER22 and BER23.	Transect Comment

Discovery meeting minutes, sign in sheets, PowerPoint presentation, and correspondence have been included in the Attachment F, Berrien and Van Buren Counties Discovery Meeting Documents.

IV. Summary of Data Analysis

During the Discovery phase of the Lake Michigan Coastal Flood Study project, a massive collection of tabular and spatial data was conducted for all communities from Federal and State sources. In addition, information was collected through phone conversations, information exchange session conference calls, and the Discovery Coastal Data Request forms. Section III above lists the types of data collected for the study area prior to the Discovery Meeting. The information that follows in Table 2 is divided into two sections: one section listing data that can be used for Risk MAP products and the other listing information that helped the study team form a better understanding of the Project Area, specifically as it may relate to mitigation and planning interests.

Table 2: Data Collected for Berrien and Van Buren Counties, MI

Data Types	Deliverable/Product	Source	Date of Data Collection	Level
Average Annualized Loss Data (AAL)	Discovery Map	Federal Emergency Management Agency (FEMA)	June 2012	Nationwide
Census Blocks	Discovery Map	U.S. Census Bureau	June 2012	Countywide
Contacts	Discovery Report	Local Community Websites, State/FEMA updates	June 2012	Countywide
Community Assistance Visits (CAVs)	Discovery Report	FEMA Community Information System (CIS)	July 2012	Countywide
Community Rating System (CRS)	Discovery Report	FEMA's "Community Rating System Communities and Their Classes"	July 2012	Nationwide
Comprehensive Plans	Discovery Report	Local Community Websites	July 2012	Countywide
Coastal Barrier Resources System (CBRS)	Discovery Map	U.S. Fish and Wildlife Service	July 2012	Nationwide
Coastal Construction	To Be Collected	U.S. Army Corps of Engineers (USACE)	TBD	Nationwide

Data Types	Deliverable/Product	Source	Date of Data Collection	Level
Coordinated Needs Management Strategy (CNMS)	Discovery Map	FEMA	July 2012	Countywide
Critically Erosion Beach Areas	To Be Collected	To Be Collected	TBD	Statewide
Critical Facilities	Discovery Report	Local Mitigation Plan	July 2012	Countywide
Dams	Discovery Report	USACE, National Inventory of Dams, Flood Insurance Rate Map (FIRM) Database	July 2012	Countywide
Declared Disasters	Discovery Report	FEMA's "Disaster Declarations Summary"	June 2012	Nationwide
Demographics, Industry	Discovery Report	U.S. Census Bureau, Local Mitigation Plans	June 2012	Countywide
Effective Floodplains	Discovery Map	FEMA Map Service Center and Mapping Information Platform	June 2012	Countywide
Hazard Mitigation Plans and Status	Discovery Report	Local Mitigation Plans	July 2012	Countywide
Hazard Mitigation Assistance Program Grants Received	Discovery Report	FEMA's "Hazard Mitigation Program Summary" Community Input	June 2012	Nationwide
Hazard Mitigation Projects	Discovery Report	Local Mitigation Plans	July 2012	Countywide
High Water Marks	To Be Collected	To Be Collected	TBD	Countywide
Historical Flooding	Discovery Report	Effective Flood Insurance Study (FIS), Local Mitigation Plans	July 2012	Countywide
Historical Storm Events	Discovery Report	Effective FIS, Local Mitigation Plans	July 2012	Countywide

Data Types	Deliverable/Product	Source	Date of Data Collection	Level
Individual/Public Assistance	Discovery Report	FEMA's "Public Assistance Subgrantee Summary"	June 2012	Nationwide
Insurance Policies	Discovery Report	FEMA CIS	July 2012	Nationwide
Letters of Map Change (LOMCs)	Discovery Map	FEMA's Mapping Information Platform	July 2012	Countywide
Meteorological Gages	Discovery Map	National Oceanic and Atmospheric Administration (NOAA) Great Lakes Environmental Research Laboratory	July 2012	Regionwide
Ordinance	Discovery Report	Local Community Websites	July 2012	Countywide
Repetitive Loss	Discovery Report	FEMA CIS	July 2012	Countywide
Shoreline Classification	Discovery Map	USACE	July 2012	Regionwide
Stream Gages	Discovery Map	USGS	July 2012	Countywide
Water Level Gages	Discovery Map	NOAA Department of Fisheries and Oceans	July 2012	Regionwide
Wave Gages	Discovery Map	NOAA	July 2012	Regionwide

i. Data that can be used for future Coastal Flood Risk Products

I.IV.i.1 Average Annualized Loss (AAL) Data

The Average Annualized Loss (AAL) data provide a general understanding of the dollar losses associated with a certain flood frequency events and are used to get a relative comparison of flood risk. They are determined by FEMA's Multi-Hazard Risk Assessment and Loss Estimation Program, otherwise known as HAZUS-MH.

HAZUS-MH, a free risk assessment software application from FEMA, is the most widely used flood risk assessment tool available. HAZUS-MH can run multiple flood scenarios (riverine and coastal) to estimate hazard related damage. HAZUS-MH can also be used to evaluate flood

damage based on new/proposed mitigation projects or future development patterns and practices, and it can run specialized risk assessments, such as those attributable to dam or levee failures.

HAZUS-MH includes national datasets that can be supplemented with local data. If local detailed data are available, users may utilize this data to perform more refined HAZUS analyses. Augmenting HAZUS-MH national data with local data can improve the accuracy and resolution of analysis results. Additional information about the HAZUS-MH process and tool can be found at http://www.fema.gov/protecting-our-communities/hazus.

The HAZUS-MH analysis data presented in this report is based on approximate flood boundaries and national datasets. The calculation is based on flood elevation estimates using a 10-meter Digital Elevation Model (DEM) on streams with drainage areas of at least 10 square miles. The results are shown in table 3 below. Information can also be obtained from the report titled FEMA *HAZUS AAL Usability Analysis*, dated April 13, 2011 (Federal Emergency Managment Agency, 2011). AAL data summarized at the census block level are shown on the draft Discovery Maps (Attachments C-D).

Table 3: HAZUS AAL Data for Berrien and Van Buren Counties, MI

FIPS Code	County	Total (in thousands of $)	Building (in thousands of $)	Content (in thousands of $)
26021	Berrien	762,417	316,939	415,839
26159	Van Buren	85,579	32,196	48,222

Source: FEMA
FIPS = Federal Information Processing Standards

I.IV.i.2 Coastal Recession

In Michigan, areas prone to erosion along the Lake Michigan shoreline are subject to special setback requirements established by the Michigan Department of Environmental Quality (DEQ). The DEQ identifies High Risk Erosion Areas (HREA) as those shorelands of the Great Lakes and connecting waters where active erosion has been occurring at a long-term average rate of one foot or more per year. The erosion can be caused from one or several factors, including high water levels, storms, wind, ground water seepage, surface water runoff, and frost. The high risk erosion area regulations require setback distances to protect new structures from erosion for a period of 30 to 60 years, depending on the size, number of living units and type of construction.

Approximately 300 miles of Michigan's Great Lakes Coast are designated as high risk erosion area. Updates of the recession rate studies, which form the basis of the setbacks, are periodically conducted to reflect changing water levels and shore protection efforts.

High risk erosion areas and critical dune areas are illustrated on maps available in the Appendix. For Berrien County, those maps include:

- Chikaming Township
- Hagar Township
- Lake Township

- Lincoln Township
- New Buffalo Township
- St. Joseph Township
- Benton Township

For Van Buren County, maps are available for:

- Covert Township
- South Haven Township

These high risk erosion area and critical dune area maps can be found at the Department of Environmental Quality's High Risk Erosion Areas website at http://michigan.gov/deq/0,1607,7-135-3313_3677_3700-107407--,00.html.

We are currently working to collect additional coastal erosion data along the eastern coastline of Michigan for Lake Michigan. If you have any data that you would like to submit, please contact FEMA Region V.

I.IV.i.3 Federal Land

Federal lands data were obtained from the National Atlas at http://nationalatlas.gov/mld/fedlanp.html. This map layer shows those lands owned or administered by the Federal Government, including the Bureau of Land Management, the Bureau of Reclamation, the U.S. Department of Agriculture Forest Service, the Department of Defense, the U.S. Fish and Wildlife Service, the National Park Service, and other agencies. Only areas of 640 acres or more are included. There are no federal lands in either Berrien or Van Buren Counties.

I.IV.i.4 Jurisdictional Boundaries

Jurisdictional boundaries were obtained for Berrien and Van Buren Counties and Incorporated Areas from a derived set of TIGER line files available through the U.S. Census Bureau geography division. TIGER line files were last derived from the TIGER database in 1997. To learn more about TIGER line files and other Census TIGER database derived data sets visit http://www.census.gov/geo/www/tiger .

I.IV.i.5 Local Data

As part of the Discovery process, communities were asked to complete a Coastal Data Request Form (Attachment A) and identify data available at the local level that may be of use for the flood study update and development of the coastal flood risk products discussed earlier in this report. The Coastal Data Request Form included requests for base map data, coastal data, historic flood data, risk assessment information, mitigation information, and community plans and projects.

At the time this report was created, Berrien County provided information through use of the Coastal Data Request Form.

Appendix Q. Local Data from Stakeholders: Coastal Data Request Form Compilation compiles all the information collected from Lake Michigan communities from the completed Coastal Data Request Forms, during the Discovery Meeting, or through phone conversations and email.

I.IV.i.6 Publicly Owned Land

There were no publicly-owned lands found along the shoreline of Berrien and Van Buren Counties within the study area at the time this report was created (FEMA 2011b).

I.IV.i.7 Shoreline Information

A shoreline feature dataset was generated by USACE Detroit District using 2012 oblique photographs. The dataset captures shoreline type, land use, coverage, and vegetation type along the entire Great Lakes shoreline, including Lake Michigan. The approximate shoreline along Berrien and Van Buren Counties that is covered by this Great Lakes Coastal Flood Study is 59.02 miles. Tables 4 through 7 below summarize the database contents for Berrien and Van Buren Counties.

Table 4: Summary of Shoreline Types

COUNTY	Total Shoreline (mile)	Artificial Shoreline (mile)	Boulders, Bedrock (mile)	Cohesive Clays and Silts (mile)	Sand (mile)	Shingles, Pebbles, Cobbles (Mile)
Berrien County	44.62	9.95	0	0	34.67	0
Van Buren County	14.4	4.35	0	0	10.05	0

Source: USACE 2012, Lake Michigan Shoreline Classification

Table 5: Summary of Shoreline by Land Use

COUNTY	Total Shoreline (mile)	Commercial /Industrial (mile)	Forested (mile)	Low Density Residential (mile)	Moderate Density Residential (mile)	Park Land (mile)
Berrien County	44.62	3.73	1.24	11.26	22.16	4.97
Van Buren County	14.4	1.87	1.24	8.01	2.04	0

Source: USACE 2012, Lake Michigan Shoreline Classification

Table 6: Summary of Shoreline Coverage

COUNTY	Total Shoreline (mile)	Bluff 2'-10' (mile)	Coastal Wetland (mile)	Dune 2'-10' (mile)	Flat Coast (mile)	High Bluff 10'+ (mile)	High Dune 10'+ (mile)	Other (mile)
Berrien County	44.62	0	0	4.75	1.87	8.08	29.91	0
Van Buren County	14.4	0	0	0	2.49	0	11.92	0

Source: USACE 2012, Lake Michigan Shoreline Classification

Table 7: Summary of Shoreline Vegetation Types

COUNTY	Total Shoreline (mile)	High Density Shrubs/ Trees (mile)	Low Density Shrubs / Trees (mile)	Manicured Lawn (mile)	Moderate Density Shrubs/ Trees (mile)	None (mile)	Unmaintained Non-Woody Vegetation (mile)
Berrien County	44.62	6.91	6.23	0.62	30.87	0	0
Van Buren County	14.4	9.26	2.49	0	2.66	0	0

Source: USACE 2012, Lake Michigan Shoreline Classification

I.IV.i.8 Stream Lines/Hydrograph

Stream lines were obtained from USGS's National Hydrography Dataset (NHD). The NHD is a digital vector dataset for use by Geographic Information Systems (GIS). It contains features such as lakes, ponds, streams, rivers, canals, dams and stream gages. The datasets are designed to be used in general mapping and analysis of surface-water systems. Data can be downloaded from http://nhd.usgs.gov/data.html.

I.IV.i.9 Topography, Bathymetry, and Oblique Imagery

New Data Collected for Great Lakes Coastal Flood Study

As part of the Great Lakes Coastal Flood Study, LiDAR was collected to develop topographic and bathymetric data along the Lake Michigan shoreline. Topography is the configuration of natural and man-made features of a surface area and their relative position and elevations. Bathymetry is the underwater equivalent to topography.

The LiDAR data, collected and processed by USACE, is expected to become available in late 2012 or early 2013 for this study area. The transect-based coastal flood hazard analysis, as well as the mapping of the coastal flood risks, will utilize this new data. Existing high-resolution bathymetric and topographic data is available at http://csc.noaa.gov .

USACE has also collected oblique imagery for the entire Great Lakes coastline in 2012. Oblique imagery is captured at an angle, as compared to an overhead view provided by orthophotos, and allows users a 3-dimensional view of landscape, buildings, and other features. This dataset may be useful to communities during emergency response, planning, and management of assets, critical facilities, and public properties along the Lake Michigan shoreline. The oblique images

can also be used to identify the shoreline types and identify obstructions to the coastal flood hazard analysis.

The oblique imagery for the entire Great Lakes can be viewed from http://greatlakes.usace.army.mil/.

Other Data Available:
The NOAA Coastal Services Center, Digital Coast, hosts a variety of digital coastal data, including bathymetric and topographic data, and is located at http://www.csc.noaa.gov/digitalcoast .

I.IV.i.10 Transportation

The Bing Map service has been used as a basemap layer on the Discovery Map, and includes a transportation layer. For more information on Bing Map services and how they can be used in GIS, please visit http://www.arcgis.com/home and search for "Bing Maps".

I.IV.i.11 Watershed Boundaries

U.S. Geological Survey (USGS) Hydrologic Unit Code 8 (HUC8) watershed boundaries were obtained from the National Atlas 2011 "Raw Data Download" (http://nationalatlas.gov/atlasftp.html).

Berrien County contains portions of three HUC-8 watersheds and Van Buren County contains portions of three HUC-8 watersheds. The sub basin names and HUC-8 codes are listed below in Table 8:

Table 8: HUC-8 Watersheds in Berrien and Van Buren Counties

County	Huc_8	Sub Basin
Berrien	4040001	Little Calument-Galien
Berrien	4050001	St. Joseph
Berrien	4050002	Black-Macatawa
Van Buren	4050002	Black-Macatawa
Van Buren	4050001	St. Joseph
Van Buren	4050003	Kalamazoo

ii. Other Data and Information

Berrien County is located in extreme southwest portion of the State of Michigan, bordered on the south by the State of Indiana, on the shore of Lake Michigan. According to the 2010 census, Berrien County has a population of 156,813, which is a decrease from 162,456 in 2000. The county has a total area of 1,581.38 square miles, of which 571.0 square miles is land and 1,010.39 square miles is water (U.S. Census Bureau, 2010). The St. Joseph River is a major geographical feature, flowing mostly north and west through the county from Niles to its mouth on Lake Michigan at St. Joseph. The southwest of the county is drained by the Galien River and

its tributaries. Paw Paw Lake is in the north of the county, along with the Paw Paw River, which flows into the St. Joseph River just before it enters Lake Michigan. A tiny portion along the Indiana state line is drained by small tributaries of the Kankakee River, which ultimately flows into the Mississippi River. This is one of the few areas of Michigan drained by the Mississippi River, the other being an area of Michigan's Upper Peninsula near the Wisconsin boarder. Additional information on Berrien County can be found at http://www.berriencounty.org/.

Van Buren County is located the southwest portion of the State of Michigan, on the shore of Lake Michigan. According to the 2010 census, Van Buren County has a population of 76,258, which is a slight decrease from 76,263 in 2000. The county has a total area of 1,090.19 square miles, of which 610.86 square miles is land and 479.33 square miles is water (U.S. Census Bureau, 2000). Additional information on Van Buren County can be found at http://www.vbco.org.

I.IV.ii.1 Coastal Barrier Resources Systems

The Coastal Barrier Resource System (CBRS) is a nationwide system of protected coastal areas that includes ocean-front land, the Great Lakes and Other Protected Areas (OPAs). The Coastal Barrier Resources Act (CBRA) of 1982 designated undeveloped coastal barrier lands and associated aquatic habitat as part of the Coastal Barrier Resources System (CBRS). This law does not regulate how people can develop land in the CBRS, but the Federal government does not encourage development of these areas. By electing to build in CBRS areas, owners are responsible for the full cost and are ineligible for most federal expenditures and financial assistance programs.

Coastal barriers serve as important buffers between coastal storms and inland areas, often protecting properties on land from serious flood damage. Coastal barriers also provide protective habitat for aquatic plants and animals.

The CBRS boundaries around Lake Michigan were obtained from U.S. Fish and Wildlife Service (FWS) at http://www.fws.gov/CBRA/Maps/Data_Disclaimer_Shapefiles.html and are dated June 15, 2010. No coastal barrier units were found along Lake Michigan Shoreline in Berrien and Van Buren Counties.

I.IV.ii.2 Coastal Structures

The USACE maintains a large infrastructure of over 900 coastal structures in the United States. These coastal structures protect harbors and shore-based infrastructure, provide beach and shoreline stability control, provide flood protection to varying degrees, and protect coastal communities, roadways and bridges, etc. These maintained coastal structures include seawalls, bulkheads, revetments, dikes and levees, breakwaters, groins, sills/perched beaches, and jetties and piers. The Enterprise Coastal Inventory Database (ECID) from the USACE Engineer Research and Development Center (ERDC) was obtained to identify these structures along Lake

Michigan. This data is presented in tabular form in the lake-wide Lake Michigan Discovery Report.

I.IV.ii.3 Community Assisted Visits

Statewide Community Assistance Visits (CAVs) are part of the evaluation and review process used by FEMA and local officials to ensure that each community adequately enforces local floodplain management regulations to remain in compliance with NFIP requirements. Generally, a CAV consists of a tour of the floodplain, an inspection of community permit files, and meetings with local appointed and elected officials. During a CAV, observations and investigations focus on identifying issues in various areas, such as the community's floodplain management regulations (ordinance), community administration and enforcement procedures, engineering or other issues within the FIRMs, other problems in the community's floodplain management, and problems with the biennial report data. Any administrative problems or potential violations identified during a CAV are documented in the CAV findings report. The community is notified and given the opportunity to correct those administrative procedures and remedy the violations to the maximum extent possible within established deadlines. The summary of CAV visits were extracted from the FEMA Community Information System (CIS) (https://portal.fema.gov/famsVuWeb/home) July 2012. Table 9 below shows the summary of CAV dates by community within this study area.

Table 9: Summary of Community Assisted Visits in Berrien and Van Buren Counties, MI

County	Community	CID	CAV Date	FIRM Date
Berrien County	Benton Charter, Township of			
Berrien County	Benton Harbor, City of	260032	3/4/1993	04/17/06
Berrien County	Bridgman, City of	260033	3/5/1993	04/17/06
Berrien County	Chikaming, Township of	260258	7/11/2001	04/17/06
Berrien County	Coloma, City of	260556	5/18/2011	04/17/06
Berrien County	Coloma, Township of	260034	4/09/2004	04/17/06
Berrien County	Grand Beach, Village of	260268		04/17/06
Berrien County	Hagar, Township of	260035	4/09/2004	04/17/06
Berrien County	Lake Charter, Township of		3/5/1993	
Berrien County	Lincoln, Township of	260037	11/5/2003	04/17/06
Berrien County	Michiana, Village of	260275		04/17/06
Berrien County	New Buffalo, City of	260038	3/5/1993	04/17/06
Berrien County	New Buffalo, Township of	260039	7/11/2001	04/17/06
Berrien County	Shoreham, Village of	260280		(NSFHA)
Berrien County	St. Joseph, City of	260044	1/31/1995	04/17/06
Berrien County	St. Joseph Charter, Township of	260045		04/17/06

County	Community	CID	CAV Date	FIRM Date
Berrien County	Stevensville, Village of	260557		04/17/06
Berrien County	Three Oaks, Township of	261111		04/17/06
Berrien County	Three Oaks, Village of			
Van Buren County	Covert, Township of	260259		12/03/09
Van Buren County	South Haven Charter, Township of	260212		12/03/09

CAV = Community Assisted Visit

I.IV.ii.4 Community Rating System

The Community Rating System (CRS) is a voluntary incentive program to provide flood Insurance premium discounts to NFIP-participating communities that take extra measures to manage floodplains above the minimum requirements. A point system is used to determine a CRS rating. The more measures a community takes to minimize or eliminate exposure to floods, the more CRS points are awarded and the higher the discount on flood insurance premiums. The list of CRS communities is available on FEMA's Website site at http://www.fema.gov/library/viewRecord.do?id=3629. No communities in Berrien and Van Buren Counties participate in the CRS program.

I.IV.ii.5 Comprehensive Plans

A comprehensive plan is a land use document providing framework and policy direction for land use decisions. Comprehensive plans usually include chapters detailing policy direction affecting land use, transportation, housing capital facilities, utilities, coastal and rural areas. Comprehensive plans identify where and how growth needs will be met.

The Berrien County Master Plan is intended to guide land use decisions and provide direction to current and future Planning Commissions and Boards which will implement it. With this plan, the Planning Commission also seeks the cooperation of the professional and citizen planners in each of Berrien County's cities, villages and townships. While the Berrien County Master Plan provides overall guidance in managing the growth and development of the County, much of the responsibility for implementation will fall to the local governments. A copy of the Berrien County Master Plan can be found at their website at http://www.berriencounty.org/econdev/pdfs/Master%20Plan%20Draft.pdf?PHPSESSID=64e73e67c9a1441736e05f8e39b586d1.

The Van Buren County Planning Commission has developed the 2005 Comprehensive Plan to establish goals that, if strived for, will shape and direct the future of Van Buren County, providing a consistent and sustainable land-use pattern in the county. The Plan will focus on the existing

conditions and trends within the county and is to be used as a resource for those making land use decisions in Van Buren County. The intent is to provide a process for making decisions and the information necessary to complete that process. The desired outcome is a sustainable development pattern in Van Buren County. A copy of the Van Buren County Comprehensive Plan can be found at their website at http://www.vbco.org/downloads/final_vbc_comp_plan_july_2006.pdf.

I.IV.ii.6 Coordinated Needs Management Strategy (CNMS) and NFIP Mapping Needs

During FEMA's Flood Map Modernization program from 2003 to 2008, FEMA adhered to Procedure Memorandum No. 56 which states that, "Section 575 of the National Flood Insurance Program Reform Act of 1994 mandates that at least once every five years FEMA assess the need to review and update all floodplain areas and flood risk zones identified, delineated, or established under Section 1360 of the National Flood Insurance Act, as amended." This requirement was fulfilled through the Mapping Needs Assessment process. Other mechanisms such as the Mapping Needs Update Support System (MNUSS) and scoping reports were used to capture information describing conditions on the FIRMs and the potential for a map update. FEMA's Coordinated Needs Management Strategy (CNMS) was initiated through FEMA's Risk MAP program in 2009.

CNMS is a FEMA initiative to update the way FEMA organizes, stores, and analyzes flood hazard mapping needs information for communities. CNMS defines an approach and structure for the identification and management of flood hazard mapping needs that provides support to data-driven planning and the flood map update investment process in a geospatial environment. The goal is to identify areas where existing flood maps are not up to FEMA's mapping standards. More information about the CNMS can be found at http://www.fema.gov/library/viewRecord.do?id=4628 .

There are three classifications within the CNMS: "Valid," "Unverified," and "Unknown." New and updated studies (those with new hydrologic and hydraulic models) performed during the Map Modernization program were automatically determined to be "Valid." The remaining studies went through a 17-element validation process with seven critical and 10 secondary elements. Validation elements apply physical, climatological, and environmental factors to stream studies to determine validity. A stream study has to pass all of the critical elements and at least seven secondary elements to be classified as "Valid." The remaining streams are classified as "Unverified" or "Unknown". Studies for which flood hazard data are identified as having critical or significant secondary change characteristics are classified as "Unverified." Streams with a status of "Unknown" are those that have a study underway, will be evaluated in the future, or do not have sufficient information to determine whether they are "Valid" or "Unverified" (FEMA 2012a).

Table 10 below summarizes the results of the validation analysis obtained from CNMS in June 2012.

Table 10: CNMS Status for Berrien and Van Buren Counties, MI

County	FIPS	Unknown (stream miles)	Unverified (stream miles)	Valid (stream miles)	Total (stream miles)
Berrien County, MI	26021	0.80	47.83	231.84	280.47
Van Buren County, MI	26159	1.55	1.67	72.20	75.42

I.IV.ii.7 Critical Facilities

Critical facilities are the facilities that can impact the delivery of vital services, cause greater damages to other sectors of a community, or put special populations at risk.

Hospitals, roads, schools, and shelters are all examples of critical facilities that play a central role in disaster response and recovery. Understanding which facilities are exposed, and the degree of that exposure, can help reduce or eliminate service interruptions and costly redevelopment. Incorporating this information into development planning helps communities get back on their feet faster. In Berrien County, 2% of critical facilities and 2% of road miles (54 miles) are within the floodplain. (National Oceanic & Atmospheric Administration, 2009). Information regarding Van Buren County was not available at the time of this report.

Location of critical facilities with a county or community can be viewed from the NOAA Coastal Services Center, Critical Facilities Flood Exposure Tool at http://www.csc.noaa.gov/criticalfacilities/

I.IV.ii.8 Critically Eroded Beaches and Beach Nourishment/Dune Replacement Projects

Critically eroded beaches and beach nourishment/dune replacement projects were not identified in Berrien and Van Buren Counties at the time this report was issued.

A Coastal Engineering Study for the City of St. Joseph, Michigan was prepared in August 2012. The purpose of the report was to evaluate the coast of Lake Michigan with St. Joseph city limits and to provide recommendations for shoreline management to protect natural resources, preserving the Lake Michigan shoreline, advancing the economic and environmental well-being, health, safety, and general welfare of the City; and preserve/enhance property values by preserving the natural character of the shoreline. A copy of the report is available in Attachment H.

I.IV.ii.9 Dams

The National Inventory of Dams (NID) is a congressionally authorized database that documents dams in the United States and its territories. The current NID, published in 2010, includes information on 84,000 dams that are more than 25 feet high, hold more than 50 acre-feet of water, or are considered a significant hazard if they fail. The NID is maintained and published by the USACE, in cooperation with the Association of State Dam Safety Officials, States and territories, and Federal dam-regulating agencies. The database contains information about the dams' locations, sizes, purposes, types, last inspections, regulatory facts, and other technical data. The information contained in the NID is updated approximately every 2 years.

Table 11 below is a summary of documented dams by county in Berrien and Van Buren counties. The NID is available at the USACE Website https://nid.usace.army.mil/.

Table 11: Documented Dams for Berrien and Van Buren, MI

County	Name	Primary Purpose	Dam Type	River
Berrien	Chikaming Springs Farm Dam	Recreation	Earth	Tributary to Galien River
Berrien	Trickett Dam	Recreation	Earth	Painter Creek
Berrien	Dayton Lake Dam	Recreation	Earth	Galien River
Berrien	Denardo Dam	Recreation	Earth	Tributary to Lake Michigan
Berrien	French Paper Company Dam	Hydroelectric	-	Saint Joseph River
Berrien	Niles	Hydroelectric	-	St Joseph River
Berrien	Berrien Springs Dam	Hydroelectric	-	Saint Joseph River
Berrien	Buchanan	Hydroelectric	-	St Joseph River
Berrien	Forkers Dam	Recreation	Earth	Tributary to Galein River
Berrien	Welch Dam	-	Earth	Tributary to Paw Paw
Berrien	Jelinek Dam	Recreation	Earth	Tributary to Galein River
Van Buren	Wolf Lake Fish Hatchery Dams	Other	Earth	Trib to Campbell Creek
Van Buren	Maple Lake Dam	Other	-	S Br Paw Paw River
Van Buren	Briggs Dam	Hydroelectric	-	South Branch Paw Paw River

I.IV.ii.10 Levees

The table below presents levee information from the National Levee Database (NLD), developed by the U.S. Army Corps of Engineers (USACE). The NLD does not contain all levees located in the United States. The database contains information to facilitate and link activities, such as flood risk communication, levee system evaluation for the NFIP, levee system inspections, floodplain management, and risk assessments. The NLD continues to be a dynamic database

with ongoing efforts to add levee data from federal agencies, states, and tribes. There are 0.2477 miles of levees in Berrien County, Michigan. No levees were identified in Van Buren County at the time of this report.

Table 12: Summary of Levees in Berrien County, MI

County	System Name	Length (Miles)	Inspection Rating	Inspection Date	Risk Assignment
Berrien	Paw Paw River	0.2477	Not provided.	-	No

In addition, FEMA developed a Midterm Levee Inventory (MLI) report which compiled a database of structures designed to provide at least the minimum level of protection from the base flood level (1- percent-annual-chance flood), as this standard is the minimum level of protection recognized by the NFIP for accreditation. FEMA also maintains a Mid-term Levee Inventory (MLI), updated in November 2011, which can be accessed through FEMA's Regional Service Centers (RSCs). RCS contact information is listed on https://hazards.fema.gov/femaportal/docs/RSC%20Contact%20Information.pdf.

I.IV.ii.11 Declared Disasters

The FEMA Disaster Declarations Summary is a dataset describing all federally declared disasters. This information begins with the first disaster declaration in 1953 and features all three disaster declaration types: major disaster, emergency, and fire management assistance. The dataset includes declared recovery programs and geographic areas (County data not available before 1964; fire management records are considered partial because of the historical nature of the dataset).

The list of FEMA's disaster declarations is available on the FEMA Website at http://www.fema.gov/data-feeds. Table 13 below lists the major disaster declarations declared in Berrien and Van Buren Counties.

Table 13: Declared Disasters in Berrien and Van Buren, MI

Declared County/Area	Disaster Number	Declaration Date	Incident Type	Description
Berrien	363	12/1/1972	Flood	Severe Storms and Flooding
Berrien	371	4/12/1973	Flood	Severe Storms and Flooding
Van Buren	371	4/12/1973	Flood	Severe Storms and Flooding
Berrien	465	4/26/1975	Flood	Severe Storms, High Winds, and Flooding
Van Buren	465	4/26/1975	Flood	Severe Storms, High Winds, and Flooding
Berrien	631	9/8/1980	Flood	Severe Storms and Flooding
Van Buren	631	9/8/1980	Flood	Severe Storms and Flooding

Declared County/Area	Disaster Number	Declaration Date	Incident Type	Description
Berrien	654	3/29/1982	Flood	Flooding
Van Buren	774	9/18/1986	Flood	Severe Storms and Flooding
Berrien	1527	6/30/2004	Severe Storm(s)	Severe Storms, Tornadoes, and Flooding
Van Buren	1527	6/30/2004	Severe Storm(s)	Severe Storms, Tornadoes, and Flooding

I.IV.ii.12 Flood Insurance Policies

A community's agreement to adopt and enforce floodplain management ordinances, particularly with respect to new construction, is an important element in making flood insurance available to home and business owners. For this Discovery project, data on flood insurance policies were also gathered.

Table 14 below summarizes the numbers and premiums of insurance policies, the total coverage, and the numbers and dollar amounts of paid losses in communities of Berrien and Van Buren Counties. The data were based on Community Summary Reports extracted from FEMA's CIS website (https://portal.fema.gov/famsVuWeb/home) in July 2012.

Table 14: Summary of Flood Insurance Policies and Claims for Berrien and Van Buren Counties

County	CID	No. Policies	Total Premium	Total Coverage	Number of claims since 1978	Dollar ($) paid for claims since 1978
Berrien	26021	412	$262,444	$85,066,200	264	$2,653,726
Van Buren	26159	90	$72,752	$16,623,300	23	$93,605

I.IV.ii.13 Gage Data

The NOAA Coastal Services Center, Digital Coast, hosts a variety of digital coastal data, including gage data, and is located at http://www.csc.noaa.gov/digitalcoast .

Meteorological Stations

The National Data Buoy Center (NDBC) is a part of the NOAA National Weather Service (NWS). NDBC designs, develops, operates, and maintains a network of data collecting buoys and coastal stations. NDBC provides hourly observations from a network of about 90 buoys and 60 Coastal Marine Automated Network (C-MAN) stations. All stations measure wind speed, direction, and gust; atmospheric pressure; and air temperature. Water level is measured at selected stations. The historical and current data are available at the NDBC Website http://www.ndbc.noaa.gov/.

Table 15 below shows the meteorological station identification number and location for the gages in the Lake Michigan Berrien and Van Buren Counties Coastal Flood Study area. Meteorological stations are also shown on the Discovery map.

Table 15: Meteorological Stations in Lake Michigan, Berrien and Van Buren, MI by NOAA

County	Station ID	Location	Owner	Data	Years of Historical Data
Berrien	45026	St. Joseph	Limno Tech	Wind, wave height, air temperature, water temperature, dew point	2011 - present
Berrien	SJOM4	St. Joseph	National Weather Service Central Region	Wind, atmospheric pressure, air temperature	2007 - present
Van Buren	SVNM4	South Haven	Great Lakes Environmental Research Laboratory	Wind, air temperature	2005 - present

In addition, the Great Lakes Environmental Research Laboratory is a part of NOAA focused on the Great Lakes. It maintains multiple datasets, including a collection of meteorological data for both the United States and Canada. The datasets can be found online at http://www.glerl.noaa.gov .

Stream Gages

The USGS National Water Information System Web Interface (http://waterdata.usgs.gov/nwis, provides real-time data for any given stream gage location. Table 16 below shows the gage identification numbers and locations for the gages in Berrien and Van Buren Counties. USGS stream gage locations are also shown on the Discovery Map.

Table 16: Stream Gage Stations in Berrien and Van Buren Counties, MI

County	Gage ID	Begin Date	End Date	Gage Location
Berrien	4101500	10/1/1930	9/30/2011	St. Joseph River at Niles, MI
Berrien	4102500	10/1/1951	9/30/2011	Paw Paw River at Riverside, MI
Van Buren	4102700	10/1/1965	9/30/2011	South Branch Black River near Bangor, MI

Water Level Station

Great Lakes water levels constitute one of the longest, high quality hydrometeorological data sets in North America with reference gage records beginning around 1860 with sporadic records back to the early 1800's. NOAA's Center for Operational Oceanographic Products and Services (CO-OPS) maintains several water level stations along Lake Michigan. CO-OPS' primary motivation is the collection and dissemination of high quality and accurate measurements of lake level for

scientific studies. The station information and water level data are available at NOAA CO-OPS Website http://tidesandcurrents.noaa.gov/station_retrieve.shtml?type=Great Lakes Water Level Data&state=LakeMichigan.

The monthly high and low water level data from the year 1918 to 2011 for Lake Michigan are available at the USACE Website: http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/.

The Great Lakes Water Levels Report provides daily mean water levels of Lake Michigan for the past three months. The data are available at the USACE Website: http://www.lre.usace.army.mil/greatlakes/hh/greatlakeswaterlevels/currentconditions/great lakes waterlevels/.

Wave Gage/Buoy Stations

As mentioned above, the NDBC provides hourly observations from a network of about 90 buoys and 60 C-MAN stations. In addition to standard meteorological observation, all buoy stations and some C MAN stations measure sea surface temperature, wave height and period. Conductivity and water current are measured at selected stations. The historical and current data are available at NDBC Website http://www.ndbc.noaa.gov/.

I.IV.ii.14 Hazard Mitigation Plans

Hazard Mitigation Plans (HMPs) are prepared to assist communities to reduce their risk to natural hazard events. The plans are used to develop strategies for risk reduction and to serve as a guide for all mitigation activities in the given county or community.

A local hazard mitigation plan is a long-term strategic/guidance document used by an entity to reduce future risk to life, property, and the economy in a community. A hazard mitigation plan has the following elements:

- A public participation process for bringing together diverse stakeholders in the jurisdiction(s) to provide an array of input into the plan
- A risk assessment to identify the hazards, determine the people and property subject to those hazards, and estimate vulnerability
- A mitigation strategy that contains goals, objectives, and an action plan to implement priority mitigation actions that reduce risk
- A maintenance process to ensure the plan is reviewed and updated
- An adoption requirement to ensure the support from participating jurisdictions

Local mitigation plans are required to be updated every 5 years to maintain eligibility for FEMA Hazard Mitigation Assistance (HMA) grant programs. The status of current hazard mitigation

plans for Berrien and Van Buren counties is shown in the Table 17 below. The data was obtained from FEMA's Plan Approval Status Report based on Regional reports for the end of June 2012.

Table 17: Hazard Mitigation Plan Status for Berrien and Van Buren Counties, MI

County	Approval Date	Expiration Date
Berrien	12/22/2005	12/22/2010
Van Buren	5/5/2005	5/5/2010

The State of Michigan has issued a comprehensive document listing Hazard Mitigation Success Stories. The document was prepared by the Emergency Management and Homeland Security Division, Michigan Department of State Police and Michigan Citizen- Community Emergency Response Coordinating Council (MCCERCC) and was issued in 2011. Michigan Hazard Mitigation Success Stories can be downloaded at http://www.michigan.gov/documents/msp/Michigan_Hazard_Mitigation_Success_Stories_May_2011_Final_Edition_web_355580_7.pdf

I.IV.ii.15 Hazard Mitigation Grant Program

Hazard mitigation initiatives are intended to actively reduce a community's vulnerability to hazards and are developed to accurately reflect a community's need. A variety of hazard mitigation projects have been submitted to FEMA's Hazard Mitigation Grant Program (HMGP).

A summary of HMGP projects can also be downloaded from https://explore.data.gov/catalog/raw

I.IV.ii.16 Historical Flooding & High Water Marks

In the analysis of a flood event, often the high watermark is identified to determine the maximum elevation of floodwaters. If a high watermark on a tree, building or other fixed object can be identified and measured following a flood event, the floodwater elevation and therefore the extent of flooding can be determined. Such high watermark information combined with storm data, lake level and river stage data can be useful when modeling the extent of flooding associated with specified flood events.

The high watermark should not be confused with the term 'Ordinary High Watermark' (OHW). The OHW is the line along the Lake Michigan shoreline that defines the boundary between uplands and submerged lands and designates a line of regulatory jurisdiction. The line is often used to define the boundary between public and private lands.

The following information on flood concerns were noted for Berrien County:

Berrien County municipalities reported the following concerns related to flooding:

- In Baroda and Baroda Township, Hickory Creek occasionally floods.

- Galien has had erosion on the shoreline of Lake Michigan, which caused the loss of some homes and property.
- In Lincoln Charter Township, James Drive neighborhood is considered to be in a floodplain.
- In New Buffalo, there was flooding at the Lake Michigan shoreline due to a surge and New Buffalo frequently experiences severe lakefront and river basin erosion due to wind and water from Lake Michigan.
- Niles Township has flooding and erosion issues from the St. Joseph River off Old US-31 at the Harbor Towne Apartments and in the ThorneAcre, Washington Court, and Echo Valley areas. Niles Township is also concerned about Brandywine Creek flooding around the Bond and Beeson Road areas and on 3rd Street, north of Beeson.
- Shoreham has had flooding on South Lakeshore Drive after heavy rain and has a problem with shoreline erosion on Lake Michigan.
- In St. Joseph Charter Township, Eagle Pointe Marina and adjacent properties are in a floodplain. St. Joseph Charter Township has properties at risk for flooding near the St. Joseph River and Hickory Creek.
- In Watervliet, Mill Creek is a potential flood concern.

Overall, Berrien County considers riverine and urban flooding to be a moderate hazard for mitigation purposes. However, as mentioned above some of the impacts individual communities due to flooding are considerable and will require mitigation planning for implementing effective solutions.

No High Water Mark (HWM) data was found within Berrien and Van Buren Counties for Lake Michigan. If local stakeholders have available HWM data or historic photographs, they are encouraged to submit them to FEMA Region V, Mitigation Division.

I.IV.ii.17 Letters of Map Change

A Letter of Map Change (LOMC) is a letter that reflects an official revision to an effective NFIP map. LOMCs are issued in place of the physical revision and republication of the effective FIRM. LOMCs include completed cases of Letters of Map Amendment (LOMAs) and Letters of Map Revision (LOMRs), including LOMRs based on fill (LOMR-Fs), and conditional LOMRs.

Table 18 below lists the number of LOMCs in Berrien and Van Buren counties. No Conditional LOMAs or Conditional LOMR-Fs were included. The LOMCs are shown on the Discovery Maps. Clusters of LOMCs indicate a need for updated maps. The list of LOMC cases were obtained from the FEMA Mapping Information Platform Website (https://hazards.fema.gov/femaportal/wps/portal).

Table 18: Summary of LOMC cases in Berrien and Van Buren Counties, MI

County	Number of Letters of Map Amendments	Number of Letters of Map Revisions – Based on Fill	Number of Letters of Map Revisions – Floodway Removal	Number of Letters of Map Revisions
Berrien County	138	11	3	2
Van Buren County	159	4	0	0

I.IV.ii.18 Locally Identified Mitigation Projects

The table in Attachment G lists the potential mitigation actions and strategies as pulled from each of the County level Hazard Mitigation Plans (Berrien and Van Buren Counties).

I.IV.ii.19 Ordinances

For States that have demonstrated a commitment to, and experience in, the application of NFIP minimum floodplain management criteria, 44 CFR §60.25(d) allows FEMA to consider State approval or certification of community floodplain management ordinances as meeting NFIP requirements. This provision provides Regional Offices with the latitude to approve floodplain management regulations based on their review and approval by the State. However, the Regional Office must still formally approve the regulations in the Community Information System (CIS).

The requirements that apply to a community are referred to by the NFIP and appear in CIS as the community's "Level of Regulations." The Level of Regulations, determined by the most detailed data that FEMA has provided the community, is designated as (a), (b), (c), (d), (e), or (f), or (d) and (e) for communities with both floodways and V zones.

County regulations regarding development within known flood hazard areas can range from ordinances with minimum NFIP requirements to strong, pro-active ordinances. Stronger ordinances not only regulate and protect new and improved development in existing Special Flood Hazard Areas (SFHAs), but also seek to mitigate the growth of SFHAs. Increase of SFHA can be caused by increased runoff from developed areas and the degradation of natural flood control areas, such as wetlands and forests. Ordinance information for Berrien and Van Buren counties is shown in Table 19 below.

Table 19: NFIP Program Status and Ordinance Level for Berrien and Van Buren, MI

County	Community	CID	Program Status	Level of Adopted Regulation
Berrien	Benton Charter, Township of	260031	Participating	D
Berrien	Benton Harbor, City of	260032	Participating	D
Berrien	Bridgman, City of	260033	Participating	D

County	Community	CID	Program Status	Level of Adopted Regulation
Berrien	Chikaming, Township of	260258	Participating	D
Berrien	Coloma, City of	260556	Not Participating	
Berrien	Coloma, Township of	260034	Participating	C
Berrien	Grand Beach, Village of	260268	Participating	D
Berrien	Hagar, Township of	260035	Participating	D
Berrien	Lake Charter, Township of		Not Participating	
Berrien	Lincoln, Township of	260037	Participating	D
Berrien	Michiana, Village of	260275	Participating	D
Berrien	New Buffalo, City of	260038	Participating	D
Berrien	New Buffalo, Township of	260039	Participating	D
Berrien	Shoreham, Village of	260280	Participating	C
Berrien	St. Joseph, City of	260044	Participating	D
Berrien	St. Joseph Charter, Township of	260045	Participating	
Berrien	Stevensville, Village of	260557	Participating	D
Berrien	Three Oaks, Township of	261111	Not Participating	
Berrien	Three Oaks, Village of		Participating	
Van Buren	Covert, Township of	260259	Participating	C
Van Buren	South Haven Charter, Township of	260212	Participating	D

I.IV.ii.20 Proposed Transects

Transects are shore perpendicular profiles along which coastal flooding analysis is performed. Transects are used to transform offshore conditions onshore and are used to define coastal flood risks inland of the shoreline. They are spaced to define representative segments of a shoreline reach. The transect layout for coastal hazard analysis and subsequent floodplain delineation is determined by physical factors such as changes in topography, bathymetry, shoreline orientation, and land cover data, in addition to societal factors such as variations in development and density. Base maps were reviewed to determine the proposed transect locations for hazard modeling along the Lake Michigan shoreline.

The proposed transect layout is shown on the draft Discovery Map for Berrien and Van Buren Counties (Attachment C-D) and includes an identification number for each transect.

Stakeholders were provided with the proposed transect shapefiles (GIS digital data) upon request, and the proposed transects were also reviewed during Discovery Meetings. Input from local officials was requested regarding the placement and the number of transects. Comments regarding placement of transects in Berrien and Van Buren Counties, Michigan are shown in Table 20.

Table 20: Stakeholder Comments Regarding Transect Placement

State	County	Community	FIPS	CID	Comment	Type
Michigan	Berrien	City of Benton Harbor	26021	260032	Shift transect to the south.	Transect Comment
Michigan	Berrien	City of Benton Harbor	26021	260032	Suggest adding a transect between BER22 and BER23.	Transect Comment

I.IV.ii.21 Pre-Disaster Mitigation (PDM) Program

The Pre-Disaster Mitigation (PDM) program is a nation-wide competitive grant program that was created to assist State and local governments, including Indian Tribe governments, with the funding to implement cost-effective hazard mitigation activities prior to disasters. The intent of this program is to reduce overall risk to people and property, while also minimizing the cost of disaster recovery.

Grants awarded during past fiscal years can be downloaded from the Pre-Disaster Mitigation Archives at http://www.fema.gov/pre-disaster-mitigation-grant-program/pre-disaster-mitigation-archives

I.IV.ii.22 Great Lakes Coastal Restoration Grants

The Great Lakes received $475 million for restoration efforts in 2010, as part of the Great Lakes Restoration Initiative, or GLRI. Michigan Sea Grant was awarded more than $1.5 million to help restore particular areas in the region and is leading two projects while assisting on five others. The projects focus on endangered fish, invasive species, beach contamination, water pollution and sound boating and marina operations.

Additional information can be found at Michigan Sea Grant website http://www.miseagrant.umich.edu/explore/restoration/.

I.IV.ii.23 Public Assistance Projects

The mission of FEMA's Public Assistance (PA) Grant Program is to provide assistance to State, Tribal and local governments, and certain types of Private Nonprofit organizations so that communities can quickly respond to and recover from declared disasters or emergencies.

Through the PA Program, FEMA provides supplemental Federal disaster grant assistance for debris removal, emergency protective measures, and the repair, replacement, or restoration of disaster-damaged, publicly owned facilities and the facilities of certain Private Non-Profit (PNP) organizations. The PA Program also encourages protection of these damaged facilities from future events by providing assistance for hazard mitigation measures during the recovery process.

Table 21 below presents a summary of PA projects in Berrien and Van Buren counties. Detailed project descriptions for completed PA projects can be downloaded from https://explore.data.gov/catalog/raw .

Table 21: Public Assistance Projects for Van Buren and Berrien Counties, MI

County	Applicant	Education Applicant	Number of Projects	Federal Share Obligated
Berrien	Benton Harbor Area Schools	Yes	1	$4,907.20
Berrien	Benton Harbor, City Of	No	1	$7,865.36
Berrien	Berrien County Intermediate School District	Yes	1	$4,004.89
Berrien	Berrien, County Of	No	1	$1,544.93
Berrien	Berrien County Road Commission	No	1	$79,788.69
Berrien	Brandywine Public Schools	Yes	1	$1,585.22
Berrien	Bridgman, City Of	No	1	$4,310.77
Berrien	Bridgman Public Schools	Yes	1	$1,680.31
Berrien	Buchanan, City Of	No	1	$8,049.15
Berrien	Buchanan Community School District	Yes	1	$3,710.54
Berrien	Coloma, City Of	No	1	$3,668.44
Berrien	Coloma Community Schools	Yes	1	$3,235.94
Berrien	Coloma Emergency Ambulance Service	No	1	$4,010.48
Berrien	Community Emergency Services Inc. Medic 1 Amb	No	1	$0.00
Berrien	Eau Claire Public Schools	Yes	1	$1,362.22
Berrien	Eau Claire, Village Of	No	1	$1,913.21
Berrien	Gateway Rehab Center	No	1	$1,290.87
Berrien	Lake Michigan Catholic Schools	Yes	1	$2,500.64
Berrien	Lake Michigan College	Yes	1	$4,827.25
Berrien	Michigan Lutheran High School	Yes	1	$850.82
Berrien	New Buffalo Area Schools	Yes	1	$1,528.91
Berrien	New Buffalo, City Of	No	1	$3,580.04
Berrien	Niles, City Of	No	1	$23,155.60
Berrien	Niles Community Schools	Yes	1	$13,509.17
Berrien	Niles Township Fire Department	No	1	$1,546.38
Berrien	River Valley School District	Yes	1	$3,021.08
Berrien	Shoreham, Village Of	No	1	$958.07
Berrien	St Joseph Catholic Church & School	Yes	1	$4.34

County	Applicant	Education Applicant	Number of Projects	Federal Share Obligated
Berrien	St. Joseph, City Of	No	1	$10,534.85
Berrien	St Joseph Public Schools	Yes	1	$4,353.03
Berrien	St Mary Of The Lake Church	No	1	$0.00
Berrien	Three Oaks, Village Of	No	1	$4,641.28
Berrien	Trinity Lutheran Church & School	Yes	1	$1,415.71
Berrien	Watervliet, City Of	No	1	$2,474.31
Berrien	Watervliet Public Schools	Yes	1	$1,548.03
Van Buren	Bangor, City Of	No	1	$2,624.17
Van Buren	Bangor Public Schools	Yes	1	$2,034.78
Van Buren	Bloomingdale, Village Of	No	1	$3,516.12
Van Buren	Decatur Public Schools	Yes	1	$1,679.11
Van Buren	Decatur, Village Of	No	1	$3,545.20
Van Buren	Gobles Public Schools	Yes	1	$2,145.08
Van Buren	Hartford, City Of	No	1	$4,503.55
Van Buren	Hartford Public Schools	Yes	1	$1,715.53
Van Buren	Lawrence Public Schools	Yes	1	$985.11
Van Buren	Lawrence, Village Of	No	1	$4,642.57
Van Buren	Lawton, Village Of	No	1	$2,310.44
Van Buren	Mattawan Consolidated School	Yes	1	$2,568.84
Van Buren	Mattawan, Village Of	No	1	$1,394.30
Van Buren	Paw Paw Public Schools	Yes	1	$4,567.84
Van Buren	Paw Paw, Village Of	No	1	$6,146.97
Van Buren	South Haven Area Emergency Services	No	1	$2,653.34
Van Buren	South Haven, City Of	No	1	$7,666.78
Van Buren	South Haven Public Schools	Yes	1	$5,390.40
Van Buren	Van Buren County Road Commission	No	1	$37,759.37
Berrien	Andrews (Andrews University)	Yes	1	$0.00
Berrien	Benton Charter Township	No	1	$0.00
Berrien	Benton Harbor Area Schools	Yes	1	$11,438.85
Berrien	Benton Harbor, City Of	No	1	$1,054.14
Berrien	Berrien County Intermediate School District	Yes	1	$4,862.30
Berrien	Berrien, County Of	No	1	$2,380.14
Berrien	Berrien County Road Commission	No	1	$70,368.66
Berrien	Berrien Springs, Village Of	No	1	$2,138.48
Berrien	Brandywine Public Schools	Yes	1	$1,430.65

County	Applicant	Education Applicant	Number of Projects	Federal Share Obligated
Berrien	Bridgman, City Of	No	1	$4,379.65
Berrien	Bridgman Public Schools	Yes	1	$899.67
Berrien	Buchanan, City Of	No	1	$5,100.21
Berrien	Buchanan Community Schools	Yes	1	$1,964.77
Berrien	Coloma, City Of	No	1	$3,817.68
Berrien	Coloma Community Schools	Yes	1	$4,254.12
Berrien	Eau Claire Public Schools	Yes	1	$1,563.09
Berrien	Eau Claire, Village Of	No	1	$1,789.10
Berrien	Galien Township Schools	Yes	1	$794.10
Berrien	Lakeland Regional Health	No	1	$7,168.76
Berrien	Lake Michigan College	Yes	1	$3,625.54
Berrien	Lakeshore Public Schools	Yes	1	$1,686.68
Berrien	New Buffalo Area Schools	Yes	1	$0.00
Berrien	Niles, City Of	No	1	$16,186.92
Berrien	Niles Community Schools	Yes	1	$10,320.18
Berrien	Niles Township Of	No	1	$0.00
Berrien	River Valley School District	Yes	1	$2,264.93
Berrien	Southwest Michigan Regional Airport	No	1	$7,817.33
Berrien	Stevensville, Village Of	No	1	$2,829.09
Berrien	St Joseph, City Of	No	1	$13,053.85
Berrien	St Joseph Public Schools	Yes	1	$7,251.70
Berrien	St Marys Schools	Yes	1	$1,567.80
Berrien	Watervliet, City Of	No	1	$2,898.31
Berrien	Watervliet Public Schools	Yes	1	$800.41
Van Buren	Bangor, City Of	No	1	$3,251.62
Van Buren	Bangor Public Schools	Yes	1	$1,748.73
Van Buren	Bloomingdale Public Schools	Yes	1	$1,233.18
Van Buren	Bloomingdale, Village Of	No	1	$2,213.36
Van Buren	Breedsville, Village Of	No	1	$1,049.19
Van Buren	Decatur Public Schools	Yes	1	$6,960.21
Van Buren	Decatur, Village Of	No	1	$2,870.53
Van Buren	Gobles, City Of	No	1	$2,661.19
Van Buren	Gobles Public Schools	Yes	1	$1,018.37
Van Buren	Hartford, City Of	No	1	$3,544.76
Van Buren	Hartford Public Schools	Yes	1	$2,223.70
Van Buren	Lakeview Community Hospital Authority	No	1	$1,504.48
Van Buren	Lawrence Public Schools	Yes	1	$1,998.58
Van Buren	Lawrence, Village Of	No	1	$1,647.69

County	Applicant	Education Applicant	Number of Projects	Federal Share Obligated
Van Buren	Lawton Community Schools	Yes	1	$0.00
Van Buren	Lawton, Village Of	No	1	$1,265.00
Van Buren	Mattawan Consolidated School	Yes	1	$1,661.21
Van Buren	Mattawan, Village Of	No	1	$934.33
Van Buren	Paw Paw Public Schools	Yes	1	$4,948.17
Van Buren	Paw Paw, Village Of	No	1	$3,411.54
Van Buren	South Haven Area Regional Airport Authority	No	1	$2,305.65
Van Buren	South Haven, City Of	No	1	$7,693.45
Van Buren	South Haven Public Schools	Yes	1	$2,744.69
Van Buren	Van Buren County	No	1	$1,444.01
Van Buren	Van Buren County Road Commission	No	1	$36,833.09
Van Buren	Van Buren Intermediate School District	Yes	1	$2,775.42

I.IV.ii.24 Regulatory Mapping

A FIRM is a regulatory map created by the NFIP for floodplain management and insurance purposes. The FIRM shows a community's base-flood elevations (BFE), flood zones and floodplain boundaries. FIRM maps with effective dates and NFIP Program participation status for Berrien and Van Buren Counties are listed in Table 22 by community. Berrien County has been modernized to digital mapping, but Van Buren County is still in process. Effective FIRMs and Flood Insurance Studies (FIS) can be downloaded from FEMA's Map Service Center (MSC) at https://msc.fema.gov .

Table 22: Effective Status of Berrien and Van Buren Counties, MI

County	Community	CID	Status	Effective Date
Berrien	All Jurisdictions	26021	Published	4/17/2006
Van Buren	County	26159	Published	3/12/2009

I.IV.ii.25 Repetitive Loss/Severe Repetitive Loss

The following communities located in Berrien and Van Buren Counties (not limited to the study area) have incurred repetitive losses.

Table 23: Repetitive Loss/Severe Repetitive Loss for Berrien and Van Buren Counties, MI

County	Community	CID	No. of Repetitive Losses	Total Area Population
Berrien	Chikaming, Township of	260258	2	3,692
Berrien	Coloma, City of	260556	2	1,600

County	Community	CID	No. of Repetitive Losses	Total Area Population
Berrien	Coloma, Township of	260034	10	5,123
Berrien	Hagar, Township of	260035	2	3,964
Berrien	Royalton, Township of		11	4,520
Berrien	St. Joseph, City of	260044	2	8,789
Berrien	Watervliet, City of		2	1,867
Van Buren	Covert, Township of	260259	4	3,141
Van Buren	South Haven, City of	260211	2	5,021

I.IV.ii.26 Socio-Economic Analysis

The 2010 American Community Survey 1-year estimate indicates the median income for a household in Berrien County was $40,329 and the median income for a family was $51,305. Males had a median income of $26,745 versus $16,289 for females. The per capita income for the county was $22,337. About 12.1% of families and 16.8% of the population were below the poverty line, including 28.5% of those under the age 18 and 8.3% of those age 65 or over.

In Van Buren County, the median income for a household in the county was $44,242 and the median income for a family was $53,642. Males had a median income of $28,079 versus $18,124 for females. The per capita income for the county was $21,495. About 10.0% of families and 14.8% of the population were below the poverty line, including 21.1% of those under the age 18 and 11.8% of those age 65 or over.

Additional information on demographics and socioeconomic trends can be found at the U.S. Census Bureau.

I.IV.ii.27 State-level Datasets, Programs, and Information

USGS Studies

Michigan Coastal Zone Enhancement Program Assessment and Strategy (2011-2016): Every five years, the Coastal Zone Management Act encourages states and territories to conduct self-evaluations of their coastal management programs to assess significant changes in the state's coastal resources and management practices, identify critical needs, and prioritize areas for enhancement under the Coastal Zone Enhancement Program. More information on this program can be found at http://coastalmanagement.noaa.gov/enhanc.html. The Coastal Zone Enhancement Program Assessment and Strategy can be downloaded at http://coastalmanagement.noaa.gov/mystate/docs/mi3092011.pdf .

The Michigan Coastal Management Program website, located at www.mi.gov/coastalmanagementprovides information on the Program including information on its permitting, coastal planning and technical assistance programs. Michigan's Coastal Management Program was developed under the federal Coastal Zone Management Act and approved in 1978. Since then, the Program has assisted organizations in protecting and

enhancing their coastal areas, funded studies related to coastal management, and helped to increase recreational opportunities in Michigan's Great Lakes coastal area.

Coastal Zone Boundary maps can be downloaded at
http://www.michigan.gov/deq/0,4561,7-135-3313_3677_3696-90802--,00.html

A list of previously awarded coastal management grants can be found here:
http://www.michigan.gov/deq/0,4561,7-135-3313_3677_3696-171451--,00.html

V. Risk MAP Projects and Needs

This section provides information about the planned next steps for the Lake Michigan Great Lakes Coastal Flood Study (GLCFS), including information about the upcoming coastal study, potential for mitigation technical assistance within the project area, changes in compliance as a result of the coastal flood study, future communications, and how unmet needs will be addressed.

i. Future Coastal Study

Information and data collected as part of this Berrien and Van Buren Counties Discovery effort and provided in this report will be utilized in the upcoming GLCFS for Lake Michigan.

A summary of the GLCFS project can be found at http://www.greatlakescoast.org/ under Great Lakes Coastal Analysis & Mapping.

The following is a summary of the work expected to be performed for Lake Michigan as part of the GLCFS. The scope of work described in this section is subject to change.

All engineering and mapping analysis performed as part of this study will follow guidance provided within FEMA's Draft Guidelines and Specifications for Coastal Studies Along the Great Lakes, issued on May 8, 2012 (Federal Emergency Management Agency, 2012).

Engineering & Mapping:
Coastal flood hazard analyses and mapping for all communities of the United States located along the Lake Michigan shoreline will be performed. This analysis will include the creation of bathymetric and topographic map data inventory, base map acquisition, and coastal flood hazard analysis.

National Flood Insurance Program Integration:
Regulatory Digital Flood Insurance Rate Map (DFIRM) files will be updated through FEMA's Physical Map Revision (PMR) process, using the results from the work performed in the Engineering and Mapping task described above.

Coastal flood maps (or workmaps) will be produced for the study area and reviewed with local community officials. The workmap will include the 1%- and 0.2%-annual chance Special Flood Hazard Area (SFHA), Coastal High Hazard Zone (VE Zone) and Coastal A Zone (AE Zone), Base Flood Elevations (BFEs) and Limit of Moderate Wave Action (LiMWA).

Not all communities will receive regulatory DFIRM panels as a result of this study. Distribution of updated regulatory DFIRM panels will be based upon the results of the coastal analysis and stakeholder discussions with FEMA.

Coastal Flood Risk Assessment Products:

Coastal flood risk products were introduced in section 1 iii of this report. Depending on available data, results of coastal analysis, fiscal year funding, and community partnerships with FEMA, coastal flood risk products may be generated for identified coastal communities in Berrien and Van Buren Counties as summarized in Table 24.

Table 24: Potential Flood Risk Products

County	State	Flood Risk Map and Flood Risk Report	Changes Since Last FIRM	Flood Depth and Analysis Grids	Optional Flood Risk Assessment Products
Berrien	MI	X	X	X	TBD
Van Buren	MI	X	X	X	TBD

A Flood Risk Map, Flood Risk Report and Flood Risk Database may also be developed as part of this process, in conjunction with the above described products, and is also dependant on results of coastal analysis, data available, fiscal year funding, and partnerships with local communities.

ii. Potential Mitigation Projects

Mitigation Planning Technical Assistance (MPTA) is available to help communities plan for and reduce risks by providing communities with specialized assistance. MPTA is a part of the Risk MAP program and includes risk assessment, mitigation planning, and traditional hazard identification (flood mapping) activities. MPTA is one available part of the Risk MAP process, as it can help communities increase awareness and take action to reduce risk. Technical assistance can be performed at any time during the hazard mitigation planning process.

Unfortunately, not every community will receive MPTA as part of a Risk MAP project. Forming a partnership between FEMA and a local community is an essential part of initiating a MPTA project. Assistance will be prioritized after all data and information is collected and assessed by FEMA in coordination with the local communities to determine where MPTA

resources would be beneficial. Communities should alert FEMA of any resources that are available at the local level, and of actions they are interested in implementing in partnership with FEMA.

Technical assistance is available through Risk MAP to assist communitites in identifiying, selecting, and implementing activities to support mitigation planning and risk reduction. Technical assistance activities should be based on the needs of the community and assist with already established capabilities.

Such activities could include (but are not limited to):

- Advising in the creation of initial Hazard Mitigation Plans
- Advising in the update of existing Hazard Mitigation Plans
- Training to improve a community's capabilities for reducing risk
- Assistance in incorporating flood risk datasets and products into potential and effective community legislation, guidance, regulations, procedures, etc.
- Assistance with the creation, acquisition and incorporation of GIS data into potential and effective maps, planning mechanisms, emergency management procedures, etc.
- Facilitating the identification of data gaps and interpret technical data to identify risk reduction definiencies that should be corrected.

At the time of this report, specific potential future mitigation projects were not identified during the Discovery Meeting or Discovery process for communities in Berrien and Van Buren counties. Continued discussion regarding FEMA partnership with local communities to assist in developing new mitigation actions and moving those actions forward will be essential as this coastal project moves forwards.

iii. Compliance

FEMA uses a number of key tools to determine a community's compliance with the minimum regulations of the NFIP. Among them are Community Assistance Visits (CAVs), the Letter of Map Change (LOMC) process, and Submit-for-Rates. These tools help assess a community's implementation of their flood damage reduction regulations and identify any floodplain management deficiencies and violations.

The CAV is a visit to a community by a FEMA staff member or staff of a state agency on behalf of FEMA that serves the dual purpose of providing technical assistance to the community and assuring that the community is adequately enforcing its floodplain management regulations. Potential violations may be identified during the CAV visit as a result of touring the floodplain, inspecting community permit files, and meeting with local appointed and elected officials. Open CAVs can be indicative of unresolved violations.

Violations can also be discovered when LOMR-F applications depict a non-compliant structure based on elevation data; or can be found through Submit-for-Rate requests, which occur when a structure applies for flood insurance but has been identified as being two or more feet below Base Flood Elevation (BFE). Elevation comparisons identified through LOMR-F applications and Submit-for-Rates imply structures were not built compliantly.

If administrative problems or potential violations are identified, the community will be notified and given the opportunity to correct those administrative procedures and remedy the violations to the maximum extent possible within established deadlines. FEMA or the state will work with the community to help them bring their program into compliance with NFIP requirements. In extreme cases where the community does not take action to bring itself into compliance FEMA may initiate an enforcement action against the community.

During this Discovery process, stakeholders were provided with information regarding NFIP requirements that are associated with coastal hazard zones, as well as information about new FEMA guidance related to moderate wave action. These topics, including coastal SFHAs, building requirements in VE Zones, and the LiMWA, are discussed in detail at http://www.greatlakescoast.org and can also be found in the basinwide Lake Michigan Discovery Report (Federal Emergency Managment Agency, 2012).

iv. Communication

Throughout this Discovery process, community representatives and local stakeholders indicated the need to be kept informed about the results of Discovery, the upcoming coastal flood study, and opportunities for public input throughout the study process.

Ongoing communication and coordination will be an essential part of this Lake Michigan Coastal Flood Study for Berrien and Van Buren Counties. Throughout this study process, Federal, State, and local stakeholders for Berrien and Van Buren Counties will be kept informed via email, phone calls, letters, newsletters, and meetings.

The Great Lakes Coastal Flood Study website http://www.greatlakescoast.org is an excellent resource where stakeholders can obtain the most update-to-date information about the status of the Great Lakes Coastal Flood Study, data collection, upcoming meetings, new technical reports, the latest methodologies, factsheets, and much more.

FEMA encourages stakeholders to remain involved throughout the study process and will seek to identify partnership opportunities during the study process.

v. Unmet Needs

During the Discovery Meetings and throughout the Discovery process, Lake Michigan stakeholders identified concerns with proceeding with a new coastal flood risk study. Many stakeholders were concerned about what to expect in terms of extent of new SFHA boundaries. FEMA acknowledged this concern and noted that upcoming engineering and production will include the distribution of draft workmaps and other flood risk products designed to give local stakeholders an opportunity to review and comment on flood risk data before the data is carried into NFIP FIRM maps.

In addition, comments related to the proposed transects were raised during the Discovery Meeting by State and County representatives. These comments were noted and will be considered as the study continues to move forward. It should be noted that transects proposed in this report remain subject to change.

VI. Close

Federal, State and local stakeholders were interested in the Discovery processes and in ensuring that local existing information and data that may assist in the upcoming Lake Michigan flood study was provided to FEMA so that it may be considered for use as the study progresses. Many stakeholders were interested in learning more about the new methodologies being used as part of the Great Lakes Coastal Flood studies, and how their community would be specifically affected by the flood study.

The information gathered in this Discovery process for Berrien and Van Buren Counties will provide invaluable information as the Lake Michigan Coastal Flood Study proceeds.

VII. References

Federal Emergency Management Agency. 2011a. *HAZUS Flood Average Annualized Loss Usability Analysis*. April 13, 2011.

Federal Emergency Management Agency, 2011b, "Public Owned Land," Mapping Information Platform. Accessed June 2012. https://hazards.fema.gov/femaportal/wps/portal.

Federal Emergency Management Agency, 2012a, Coordinated Needs Management System, http://cnms.riskmapcds.com/HelpCNMS.html, accessed July 2012.

Federal Emergency Management Agency, 2012b, Mitigation Planning Report with Transmittal Memo, May 2012.

U.S. Army Corps of Engineers, Great Lakes Hydraulics and Hydrology Branch, 1977. *Report on Great Lakes Open-Coast Flood Levels*.

U.S. Army Corps of Engineers, Detroit District, 2012, Lake Michigan Shoreline Classification obtained on July 3, 2012.

U.S. Census Bureau, 2010, State and County Quick Facts, http://quickfacts.census.gov/, accessed on July 30, 2012.

VIII. Attachments

The Discovery Report and appendices are stored digitally under their respective folders on the FEMA Mapping Information Platform (MIP) at:

LakeMichigan\Discovery\Project_Discovery_Initiation\Discovery_Report\

This Discovery Report and attachments are also available for download from the following website: http://www.greatlakescoast.org/

A. Coastal Data Request Form
B. Berrien and Van Buren Counties Pre-Meeting Correspondence
C. Berrien County Draft Discovery Map
D. Van Buren County Draft Discovery Map
E. Berrien and Van Buren Counties Proposed Transects
F. Berrien and Van Buren Counties Discovery Meeting Documents
G. Locally Identified Mitigation Projects
H. City of St. Joseph Coastal Engineering Study (August 17, 2012)

Attachment A.

Coastal Data Request Form

U.S. Department of Homeland Security
536 S. Clark St. 6th Floor
Chicago, IL 60605
FEMA

Community Discovery Coastal Data Request Form

Thank you for taking the time to complete this questionnaire. We are interested in obtaining coastal-specific data for your community. It will provide important information to help FEMA understand coastal flood risk issues in your community and to work with you in increasing your community's resilience to coastal flooding through implementation of the Risk MAP program. In addition, this form can be used as a way to prepare for the upcoming Discovery Meeting, as the topics on this form will be discussed throughout the meeting.

Once you have completed the questionnaire, please return the form:

Via e-mail: GreatLakesFloodStudy@starr-team.com
By mail: Holly Davis
Atkins/STARR
7406 Fullerton Street, Suite 350
Jacksonville, Florida 32256

Please provide as much information as possible. If you have any questions about the Discovery process or about completing this questionnaire, please contact:

Holly Davis, holly.davis@starr-team.com, (904) 363-8451

Contact Information	
Community/Organization	
Name:	
Title:	
Address:	
E-mail:	
Phone:	
Contact Preference	☐ Email ☐ Phone ☐ Mail

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Base Map Data		*Please select available data type*	
	Topography (e.g., LiDAR or contour data)	☐ *Hard copy*	☐ *Digital*
	Property information (e.g., Building footprints, parcel data, tax assessor's data)	☐ *Hard copy*	☐ *Digital*
Coastal Data			
	Coastal structures (e.g., seawalls, levees, jetties, groins, etc.)	☐ *Hard copy*	☐ *Digital*
	Coastal features (i.e., dunes and bluffs)	☐ *Hard copy*	☐ *Digital*
	Shoreline change data	☐ *Hard copy*	☐ *Digital*
	Locations of beach nourishment or dune restoration projects	☐ *Hard copy*	☐ *Digital*
	Areas of significant beach or dune erosion	☐ *Hard copy*	☐ *Digital*
	Mean high water	☐ *Hard copy*	☐ *Digital*
	Mean lake level	☐ *Hard copy*	☐ *Digital*
Other Data			
	Hydraulic structures (e.g., bridges, culverts, levees, dams) with inspection status, if available	☐ *Hard copy*	☐ *Digital*
	Elevated roads	☐ *Hard copy*	☐ *Digital*
	Critical facilities	☐ *Hard copy*	☐ *Digital*
	Other known hazards with geographical boundaries, i.e., landslide hazard areas, storm surge inundation zones, wildfire hazard areas, etc.	☐ *Hard copy*	☐ *Digital*
	Other relevant data	☐ *Hard copy*	☐ *Digital*

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Please provide the following information about the community:

Historical Flood Data		
Are you aware of any coastal flooding issues not represented on effective FIRMs:	☐ yes ☐ no	If yes, please explain and provide inundation areas of historic flooding events if available.
Risk Assessment		
Does your community have HAZUS-based loss estimates from average annualized loss?	☐ yes ☐ no	If yes, please describe:
Does your community have other risk assessment data?	☐ yes ☐ no	If yes, please describe:

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Flood Mitigation Information		
Does your community have a hazard mitigation plan?	☐ yes ☐ no	If yes, what is the status of the hazard mitigation plan? ☐ being reviewed ☐ it has been adopted ☐ it is currently being updated ☐ it is planned for updates
Does the plan reflect any coastal flood hazards?	☐ yes ☐ no	If yes, please explain:
Does the hazard mitigation plan indicate any data deficiencies for flood hazards that could be addressed through a flood study, especially near coastal zones?	☐ yes ☐ no	If yes, please explain:
Does your community have on-going mitigation projects, such as acquisition, elevation, flood control, soil stabilization, natural systems restoration, floodproofing, etc.	☐ yes ☐ no	If yes, please describe the projects and their locations:

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Any specific coastal mitigation projects?	☐ yes ☐ no	If yes, please explain:
Does your community have experience with coastal flood disasters and flood disaster recovery?	☐ yes ☐ no	If yes, please explain:
Does your community coordinate floodplain management programs with programs for the management and planning of open space? If possible, any coastal specific?	☐ yes ☐ no	If yes, please explain:

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Have you had any prior proactive mitigation actions and planning efforts that resulted in reduced losses? If possible, any coastal specific?	☐ yes ☐ no	If yes, please describe:
Has your community applied and granted Individual Assistance/Public Assistance grants for declared disasters?	☐ yes ☐ no	If yes, please describe and provide the locations of these grants projects:
Has your community applied for FEMA Hazard Mitigation Grants program or other mitigation funds (USACE, NRCS, USGS, state Hazard Mitigation officer, etc.) in the past?	☐ yes ☐ no	If yes, please describe and provide the locations of on-going/planned/finished grants projects/structures:

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How would you rank the community's ability to implement mitigation actions and to communicate flood risk to citizens?		☐ high ☐ medium ☐ low
Community Plans and Projects		
Does your community have a comprehensive plan?	☐ yes ☐ no	If you answered yes and you have a hazard mitigation plan, was your hazard mitigation plan coordinated with the comprehensive plan? ☐ yes ☐ no
Does your community's comprehensive plan have a special consideration for coastal areas?	☐ yes ☐ no	If yes, please explain elements/regulations that affect coastal area development.
Does your community have a coastal zone management plan?	☐ yes ☐ no	If yes, please provide a digital or hard copy of the plan.
Does your community have planning staff or a planning/zoning commission and other measures, such as ordinances, administrative plans, or other programs contributing to effective administration of floodplain zoning, building codes, open space preservation, and coastal zone management?	☐ yes ☐ no	If yes, please explain this group's role in floodplain management and provide examples of the types of programs in place:

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Does your community have areas of recent or planned development/re-development and areas of high growth or other natural land changes (e.g., wildfires or landslides):	☐ yes ☐ no	If yes, please describe:
Are there any locations of other ongoing studies or projects and studied areas that have been modified since the effective map and require an updated study (e.g., highway improvement, seawall improvement, etc.)	☐ yes ☐ no	If yes, please describe:
Any other comments/concerns based on local knowledge:		

Attachment B.

Berrien and Van Buren Counties Pre-Meeting Correspondence

Davis, Holly A

Subject: FEMA's Great Lakes Coastal Flood Study: Discovery Information Exchange Session for Van Buren and Berrien County, MI
Location: Call in number: 1-877-537-6647 Participant Code: 31578 and WebEx

Start: Mon 8/6/2012 1:00 PM
End: Mon 8/6/2012 2:00 PM

Recurrence: (none)

Meeting Status: Meeting organizer

Organizer: Davis, Holly A

Required Attendees:

Optional Attendees:

Good Morning,

You are receiving this meeting invitation because you have been identified as a ***Lake Michigan*** local community stakeholder. You should have recently received an invitation in the mail from the Federal Emergency Management Agency (FEMA), regarding the ***Great Lakes Coastal Flood Study*** effort, inviting you to attend a Discovery Meeting in September, as well as this information exchange session, scheduled for **Monday, August 6, 2012 at 1pm ET**. More information about the ***Great Lakes Coastal Flood Study*** may be found at http://www.greatlakescoast.org.

While the WebEx and call-in information was provided in the letter, I wanted to also provide this information to you via email to serve as a reminder. Below is the call-in and WebEx information:

Date:	Monday, August 6, 2012
Time:	1:00pm – 2:00pm ET
Link to WebEx:	https://www.webex.com/login/attend-a-meeting
Meeting No:	658 935 489
Call in number:	877-537-6647
Participant Code:	31578

This informal session will begin the process of learning about your available local coastal data, hazard mitigation strategies, and what the critical flooding issues are in your community so that we can then work with you to determine how to best utilize that information during FEMA's Great Lakes study. A data request form is attached to help facilitate the discussion. We encourage open discussions throughout this meeting and will use the information to better cater our upcoming Discovery Meetings as well. Attendees of this conference call, as well as the Discovery Meetings, may include, but certainly are not limited to, community leaders, emergency managers, GIS specialists, engineers, outreach specialists, and local planners.

We look forward to speaking with you on Monday, and appreciate your participation in this process. If you have any questions, or are not able to attend this session but would like to learn more, please do not hesitate to contact me directly. My information can be found below.

Thanks,
Holly

Holly A. Davis
STARR Team
Tel: (904) 363-8451 | Fax: (904) 363 8811 | Cell: (904) 476 9840 |

Great Lakes Coastal Flood Study
Information Exchange WebEx Meeting
Berrien and Van Buren County, Michigan
August 6, 2012 1:00pm ET

Attendance:
Cecil Derringer, City Manager, City of St. Joseph
John Hodgson, Community Development Director, City of St. Joseph
Tim Zebell, City Engineer, City of St. Joseph
Derek Perry, Deputy City Manager, City of St. Joseph
Erin Maloney, FEMA Region V
Stacey Roberts, STARR
Holly Davis, STARR
Laura Keating, STARR

Discussion/Q&A:

- **North side of the St. Joseph River inlet has been filled for development; has acquired appropriate permits.**
- **East side of the Paw Paw River – residential development area surrounded by a golf course.**
- **NW corner of St. Joseph and Paw Paw River – Marina in planning phase. Is partially filled above BFE; has acquired appropriate permits.**
- **City of St. Joseph has been conducting a coastal study (consultants) of their own:**
    - **North of River - St. Joseph Pier trapped sand resulting in accretion. The public believe that this is permanent and therefore want to build, some have built closer than City believes is safe. Concerned for when the water levels trend back higher**
    - **City of St. Joseph is working towards an ordinance (in the fall) that will require setbacks.**
    - **Concerned with how and where seawalls and other coastal structures are constructed. T North of the St. Joseph River they may prohibit coastal structures all together, while south of the St. Joseph River they may just regulate structures. Concern is to maintain public access along the shoreline.**
- **There is concern regarding transect location – There appears to only be one transect in the area of the City of St. Joseph, and it appears there would be a better location. The City of St. Joseph would like to adjust the one representative transect or include additional transects in specific locations.**
- **City of St. Joseph will share their study with the STARR team when it is final. They should have a final report this week.**
- **Suggested that STARR reach out to Lex Winans, at Berrien County, for the most current County-wide topographic and aerial photography data (1998-1999).**
- **A resident located north of the St. Joseph River, has also had topographic data (lidar and aerials?) flown; the City of St. Joseph will inquire to see if they can provide that data.**

- **City of St. Joseph FIRM maps are from 2006. Will these maps, which have been amended via LOMR's, become the new base map for our coastal analysis? The City would like to see the changes to the map panels amended by letter represented visually on the base maps.**
- **Corps of Engineers harbor dredging with placement of dredged material on beaches – Section 111 project – also buried seawall in the vicinity of the nourishment**
- **Check with Berrien County for their hazard mitigation plan update**
-

Wrap-up and Adjourn

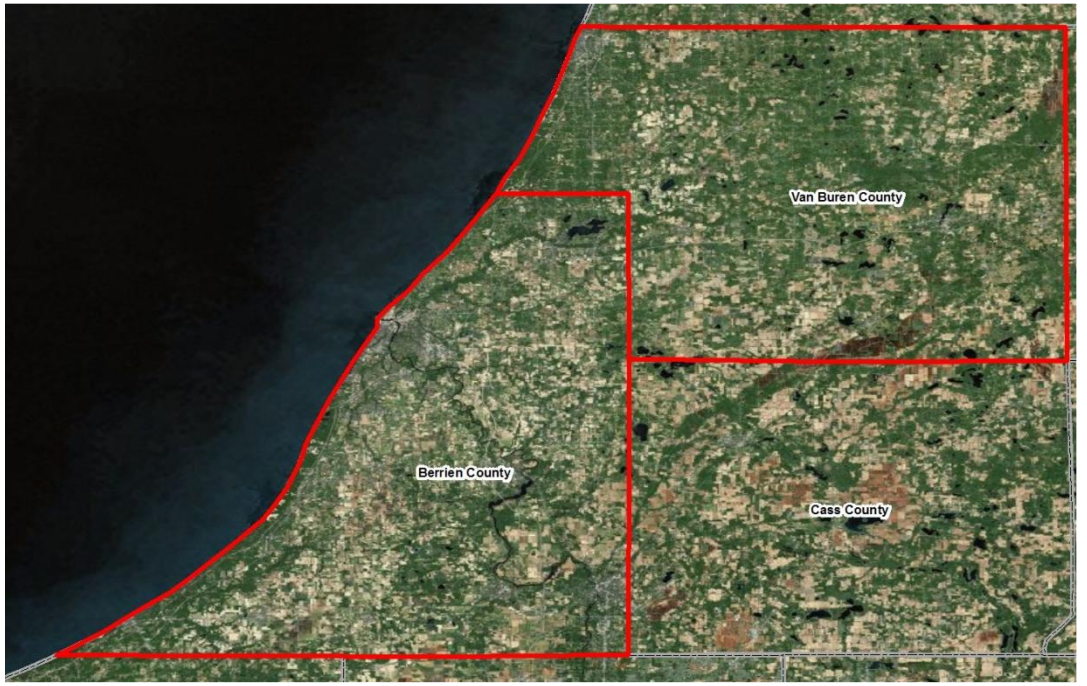
- Holly Davis, STARR, will send follow-up email, including a copy of the presentation and draft transects, to the entire group of invitees.

Action Items

- Great Lakes website has Corps reports on lake level modeling, but does not seem to include resulting data? At save points? Continue to track down availability of data. Requested Bill Dally forward email in which he was provided data location for our pilot study.
- Request from Corps further information/data on beach nourishment project conducted under Section 111 beneficial use project dredging the harbor. Looked on District site and did not find information on project.

FEMA

Information Exchange Session for Lake Michigan Discovery



Van Buren and Berrien Counties, Michigan
August 6, 2012
1pm – 2pm ET

RiskMAP
Increasing Resilience Together

Great Lakes Coastal Flood Study
greatlakescoast.org

Purpose of Information Exchange

- Introduction to Risk MAP
- Introduction to Great Lakes Flood Study and Discovery
- Learn more about your areas of concern, coastal flood risk, and coastal mitigation
- Bring the right people to the table early
- Identify data gaps

Risk MAP (Mapping, Assessment, and Planning) Vision

FEMA

Goals

1. Address gaps in flood hazard data
2. Increase risk awareness to encourage risk reduction
3. Risk-based Mitigation Planning resulting in risk reduction actions
4. Enhanced digital platform to improve communication and sharing of risk data
5. Align programs and develop synergies

RiskMAP
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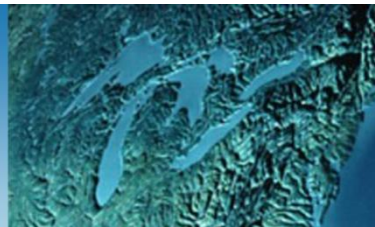
Great Lakes Coastal Flood Study
greatlakescoast.org



Overview of Great Lakes Coastal Flood Study

FEMA

- Latest models, data, and technology
- Deliver updated flood maps and flood risk datasets
- Equip Federal Agencies, eight States and hundreds of coastal communities with data and planning tools to facilitate actions to enhance resiliency of the Great Lakes ecosystem

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greatlakescoast.org

Hazard Mitigation Resources, Strategies & Actions

FEMA

- **Recent community hazard mitigation experiences?**
  - *Public Works*
  - *Building Standards*
  - *Community Planning and Hazard Mitigation Plan Update*
  - *Communication Processes, GIS, etc.*
- **New option to document ideas and actions through the FEMA Mitigation Action Form**

Land Use Ordinances	Local Building Codes	Mitigation Projects	Community Identified Mitigation Programs	Management Best Practices
Zoning, Setbacks, Floodplain Management, etc.	IBC, IRC, Local Regulations, etc.	Acquisition, Elevation, Floodproofing, etc.		Integration of natural hazards into other planning mechanisms

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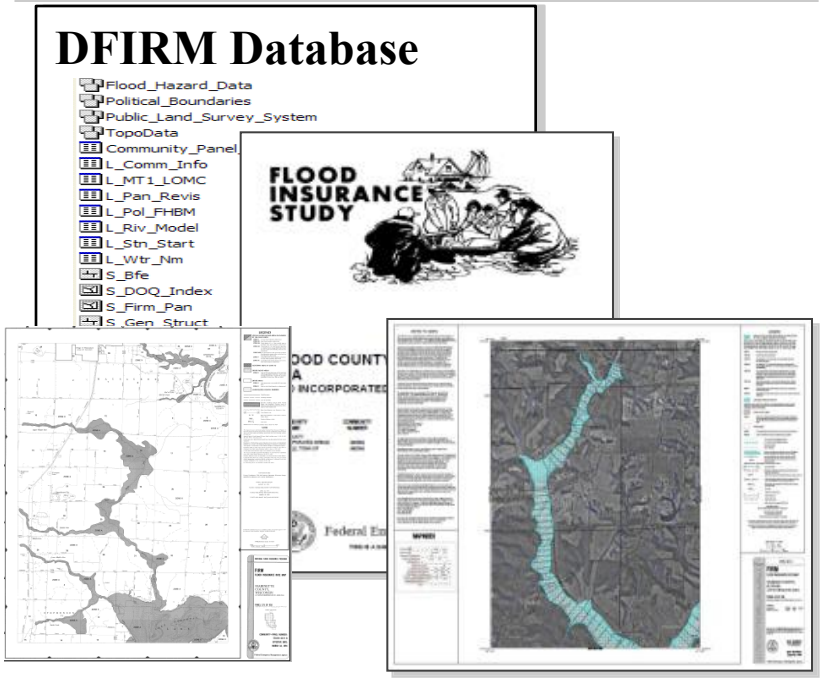
Products and Datasets: Regulatory and Non-regulatory

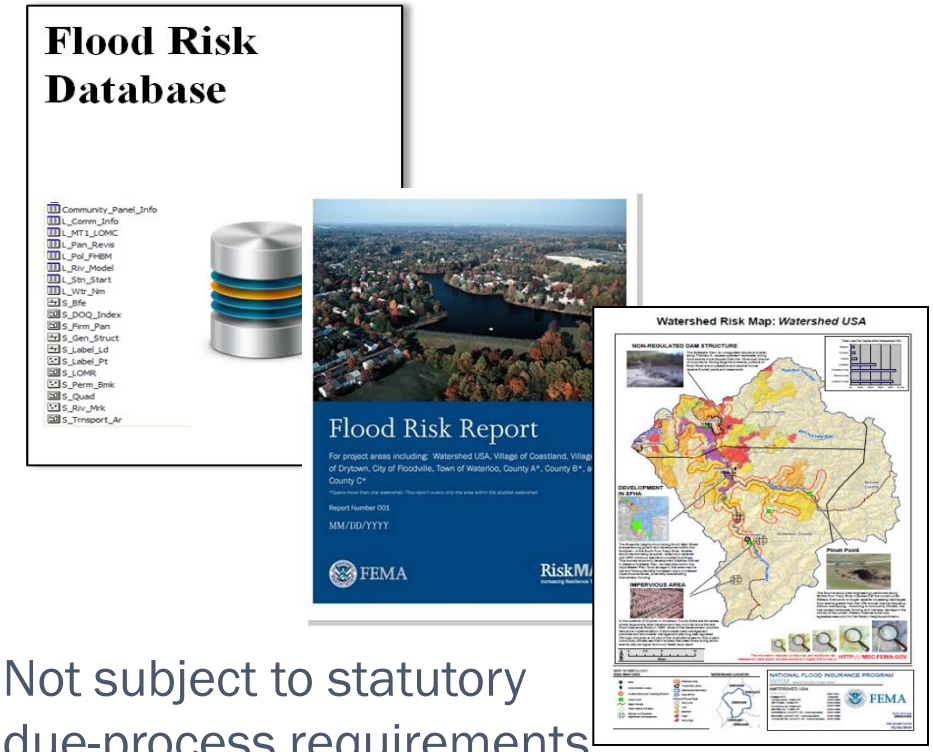
FEMA

Traditional Regulatory Products



Subject to statutory due-process requirements

Non-Regulatory Products



Not subject to statutory due-process requirements

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Products and Datasets: Coastal Products in Development

FEMA

Erosion

Red Lantern Restaurant, Lake Michigan, IN

Lake Levels

Lake Michigan Shoreline
Reference

Shoreline Feature

Upper Peninsula Shoreline
Reference

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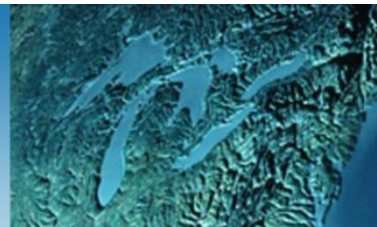


Risk MAP Overview: Shoreline Features Database

Shoreline Material
Sand
Cohesive
Cobble
Diamicton*
Shingle
Bedrock
Artificial

Primary Land Use
High Density Residential
Moderate Density Residential
Low Density Residential
Commercial/Industrial
Park Land
Farm Land
Forested

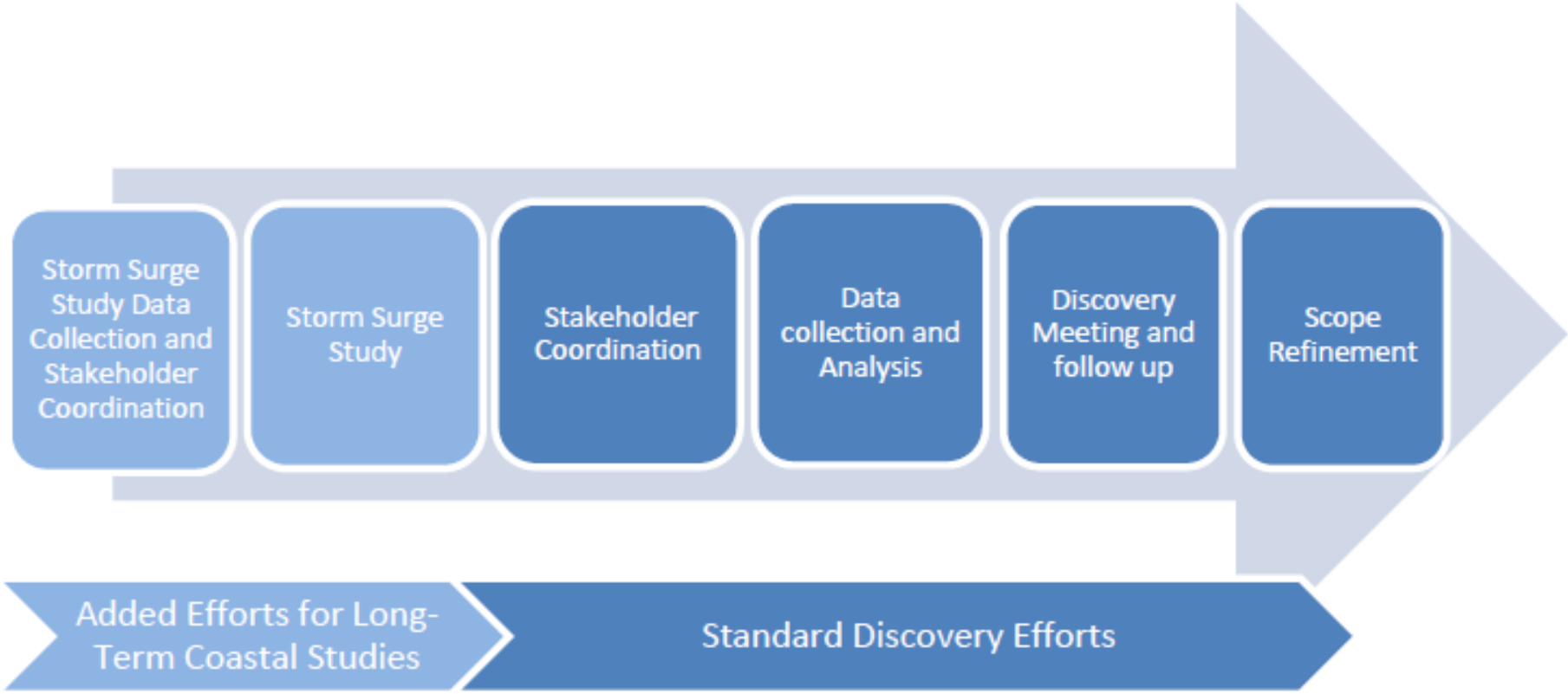
Primary Coast Type
High Dune, 10'+
Dune, 2' - 10'
High Bluff, 10'+
Bluff, 2' - 10'
Coastal Wetland
Flat Coast

Primary Vegetation
None
High Density Shrubs/Trees
Moderate Density Shrubs/Trees
Low Density Shrubs/Trees
Manicured Lawn
Native Vegetation

- Contains primary and secondary Land Use tables – same for coast type and vegetation.
- Current project collects data at one-mile spacing, for scoping and cost
- Current project does not include field-based reconnaissance or sediment/subsurface soils collection

Great Lakes Coastal Flood Study
Discovery Process Overview

FEMA



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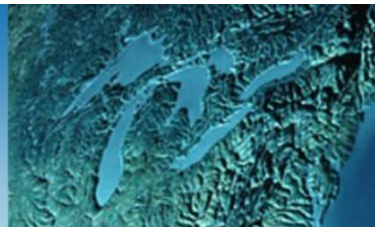

Great Lakes Coastal Flood Study
Discovery Meeting

Discovery Meeting Venue	Discovery Meeting Address	Discovery Meeting Date, Time
Berrien County Administrative Building	701 Main Street St. Joseph, Michigan 49085	Monday 09/10/2012; 2:00 - 4:00 PM ET

Draft Discovery Meeting Agenda

- Why are we here?
- Coastal mapping and flood risk topics to be aware of
- How does this apply to my community?
  - NFIP compliance, hazard mitigation opportunities, and grant funding
- Interactive Session
  - Utilization of Coastal Flood Risk Products for Planning and Mitigation, Identification of Existing Local Coastal Data, View and Discuss Local Coastal Areas of Concern Using the Discovery Map, Discuss Mitigation Action Opportunities and Introduce the Mitigation Action Form
- Wrap Up

Draft Transect Map Station: Talk to technical staff about draft transects and view draft transects in GIS

Mitigation Resources, Strategies, and Actions Station: Talk with FEMA and State staff about areas of concern and potential mitigation actions to help reduce risk. Fill out Mitigation Action Form.

Great Lakes Coastal Flood Study
Discovery Products

- **Final Discovery Report**
  - Single, comprehensive report for all of Lake Michigan, with appendices for each coastal community by county
  - Includes pre-discovery data, meeting agenda, sign-in sheets, discussion topics, decisions made, etc.
- **Final Discovery Maps**
  - Including feedback from participants
  - Visual representation of meeting outcomes

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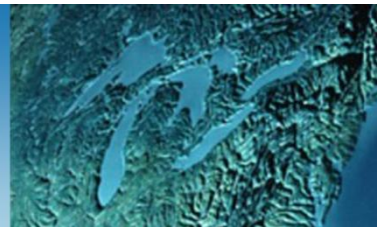
Increasing Resilience Together

Great Lakes Coastal Flood Study
greatlakescoast.org

Who Should Attend the Discovery Meeting?

- **Community Officials**
  - CEO and Floodplain Administrators (FPAs)
  - Planners, GIS Specialists, Engineers, Outreach Specialists, Emergency Managers, and Community Leaders
- **State Representatives**
  - State Hazard Mitigation Officer (SHMO), National Flood Insurance Program (NFIP) Coordinators, Cooperating Technical Partners (CTPs)
- **Other Federal Agencies (NOAA, USACE, USGS)**
- **Regional Planning Agencies**
- **Great Lakes Organizations**



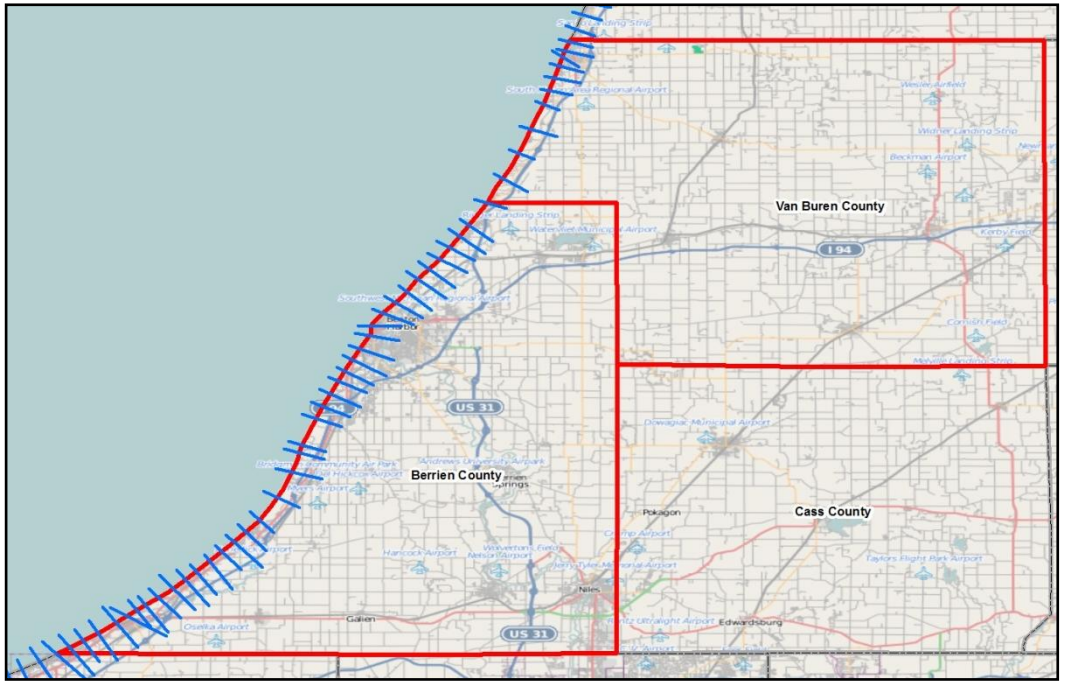
Great Lakes Coastal Flood Study
Discovery Study Area

FEMA

Lake Michigan coastal communities in Van Buren and Berrien Counties, Michigan

Berrien County
City of Benton Harbor
City of Bridgman
Chikaming Township
City of Coloma
Coloma Township
Village of Grand Beach
Hagar Township
Lake Charter Township
Lincoln Charter Township
Michiana Village
City of New Buffalo
New Buffalo Township
Shoreham Village
Benton Charter Township
St. Joseph Charter Township
Village of Stevensville
City of St. Joseph
Township of Weesaw
Three Oaks Township
Three Oaks Village

Van Buren County
Covert Township
South Haven Charter Township
Geneva Township



RiskMAP
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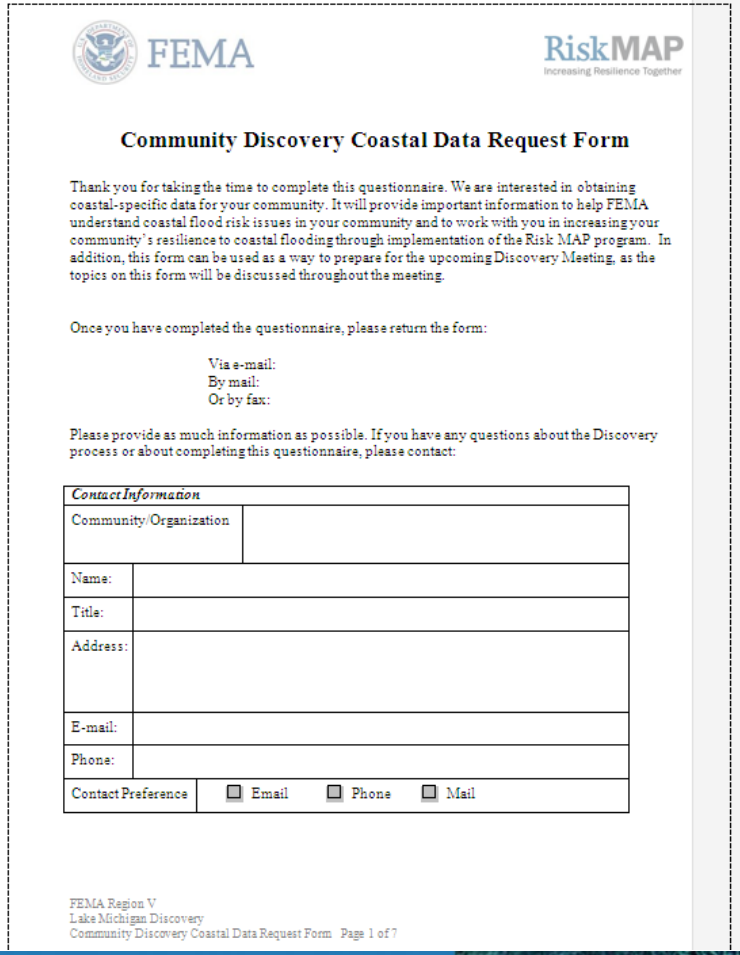
Great Lakes Coastal Flood Study
greatlakescoast.org

Data Request Form Overview

- Contact Information
- Base Map Data
- Coastal Data
- Other Data
- Historic Flood Data
- Risk Assessment
- Flood Mitigation Information
- Community Plans and Projects
- Any Other Comments/ Concerns Based on Local Knowledge



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Community Discovery Coastal Data Request Form

Thank you for taking the time to complete this questionnaire. We are interested in obtaining coastal-specific data for your community. It will provide important information to help FEMA understand coastal flood risk issues in your community and to work with you in increasing your community's resilience to coastal flooding through implementation of the Risk MAP program. In addition, this form can be used as a way to prepare for the upcoming Discovery Meeting, as the topics on this form will be discussed throughout the meeting.

Once you have completed the questionnaire, please return the form:

Via e-mail:
By mail:
Or by fax:

Please provide as much information as possible. If you have any questions about the Discovery process or about completing this questionnaire, please contact:

Contact Information	
Community/Organization	
Name:	
Title:	
Address:	
E-mail:	
Phone:	
Contact Preference	☐ Email ☐ Phone ☐ Mail

FEMA Region V
Lake Michigan Discovery
Community Discovery Coastal Data Request Form Page 1 of 7

Review of Data Collected To Date

- Draft Transects
- Shoreline Classification Dataset
- Hazard Mitigation Plans
- Hazard Mitigation Grants Program (HMGP) projects
- Pre-Disaster Mitigation Program projects
- Declared Disasters
- Repetitive loss claims by community

Incident Type	Incident Begin Date	Incident End Date	Area Name
Flood	12/1/1972	12/1/1972	Berrien (County)
Flood	4/12/1973	4/12/1973	Berrien (County)
Flood	4/12/1973	4/12/1973	Van Buren (County)
Flood	4/26/1975	4/26/1975	Berrien (County)
Flood	4/26/1975	4/26/1975	Van Buren (County)
Flood	9/8/1980	9/8/1980	Berrien (County)
Flood	9/8/1980	9/8/1980	Van Buren (County)
Flood	3/29/1982	3/29/1982	Berrien (County)
Flood	9/10/1986	10/10/1986	Van Buren (County)
Severe Storm(s)	5/20/2004	6/8/2004	Berrien (County)
Severe Storm(s)	5/20/2004	6/8/2004	Van Buren (County)

Next Steps and Opportunity to Get Involved

- **Assessment of data and information provided**
- **Identification of best practices:**
  - Do you have an example of a local coastal mitigation best practice?
- **Discovery meeting involvement:**
  - Are you be interested in participating in Discovery Meeting facilitation?

THANK YOU FOR YOUR PARTICIPATION!

Who to Contact

- **For more information:** http://www.greatlakescoast.org/
- **Send completed questionnaires to:**
  - GreatLakesFloodStudy@starr-team.com
- **FEMA Region V**
  - Ken Hinterlong @ ken.hinterlong@fema.dhs.gov
  - Erin Maloney @ erin.maloney@fema.dhs.gov
- **STARR**
  - Holly Davis@ holly.davis@starr-team.com
  - Stacey Roberts @ stacey.roberts@starr-team.com

Questions?

Attachment C.

Berrien County Draft Discovery Map

MAP SYMBOLOGY

LEGEND

- Ports
- Dams
- USGS Gages
- Wave Gages
- Draft Transects
- Stream/River
- Watershed
- Waterbody
- Federal Lands
- Municipal Boundary
- County Boundary

AAL DATA/ Total Average Annualized Losses per Census Block

- $1,000 - $100,000
- $100,001 - $250,000
- $250,001 - $750,000
- $750,001 - $2,000,000
- $2,000,000+

Coordinated Needs Management Strategy (CNMS) - Status

- UNVERIFIED
- UNKNOWN
- VALID

Effective SFHA

- AE
- A
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

COASTAL STUDY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map

LAKE MICHIGAN COASTAL STUDY

BERRIEN COUNTY, MICHIGAN COASTAL STUDY COMMUNITIES

- Township of Benton Harbor
- City of Benton Harbor
- City of Bridgman
- Township of Chikaming
- City of Coloma
- Township of Coloma
- Village of Grand Beach
- Township of Hagar
- Township of Lake Charter
- Township of Lincoln
- Village of Michiana
- City of New Buffalo
- Township of New Buffalo
- Village of Shoreham
- Township of St. Joseph Charter
- Village of Stevensville
- City of St. Joseph
- Township of Weesaw
- Township of Three Oaks
- Village of Three Oaks

STARR

FEMA

Attachment D.

Van Buren County Draft Discovery Map

MAP SYMBOLOGY

LEGEND

- Ports
- Dams
- USGS Gages
- Wave Gages
- Draft Transects
- Stream/River
- Watershed
- Waterbody
- Federal Lands
- Municipal Boundary
- County Boundary

AAL DATA/ Total Average Annualized Losses per Census Block

- $1,000 - $100,000
- $100,001 - $250,000
- $250,001 - $750,000
- $750,001 - $2,000,000
- $2,000,000+

Effective SFHA

- AE
- A
- 0.2 PCT ANNUAL CHANCE FLOOD HAZARD

Coordinated Needs Management Strategy (CNMS) - Status

- UNVERIFIED
- UNKNOWN
- VALID

COASTAL STUDY LOCATOR

NATIONAL FLOOD INSURANCE PROGRAM

Discovery Map

LAKE MICHIGAN COASTAL STUDY

VAN BUREN COUNTY, MICHIGAN COASTAL STUDY COMMUNITIES

Township of Covert
Township of South Haven Charter
Township of Geneva

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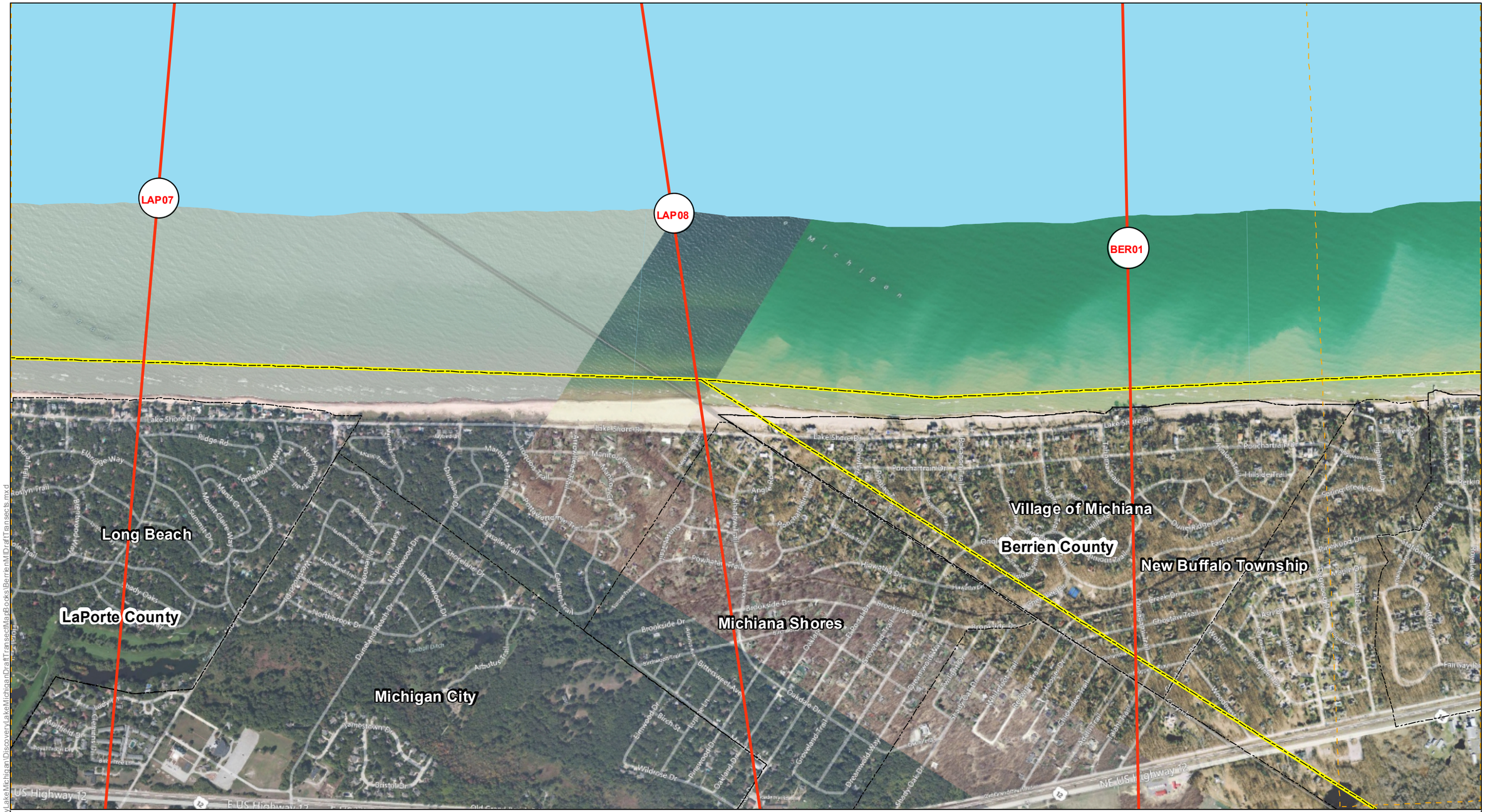
Attachment E.

Berrien and Van Buren Counties Proposed Transects



STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 1 of 17

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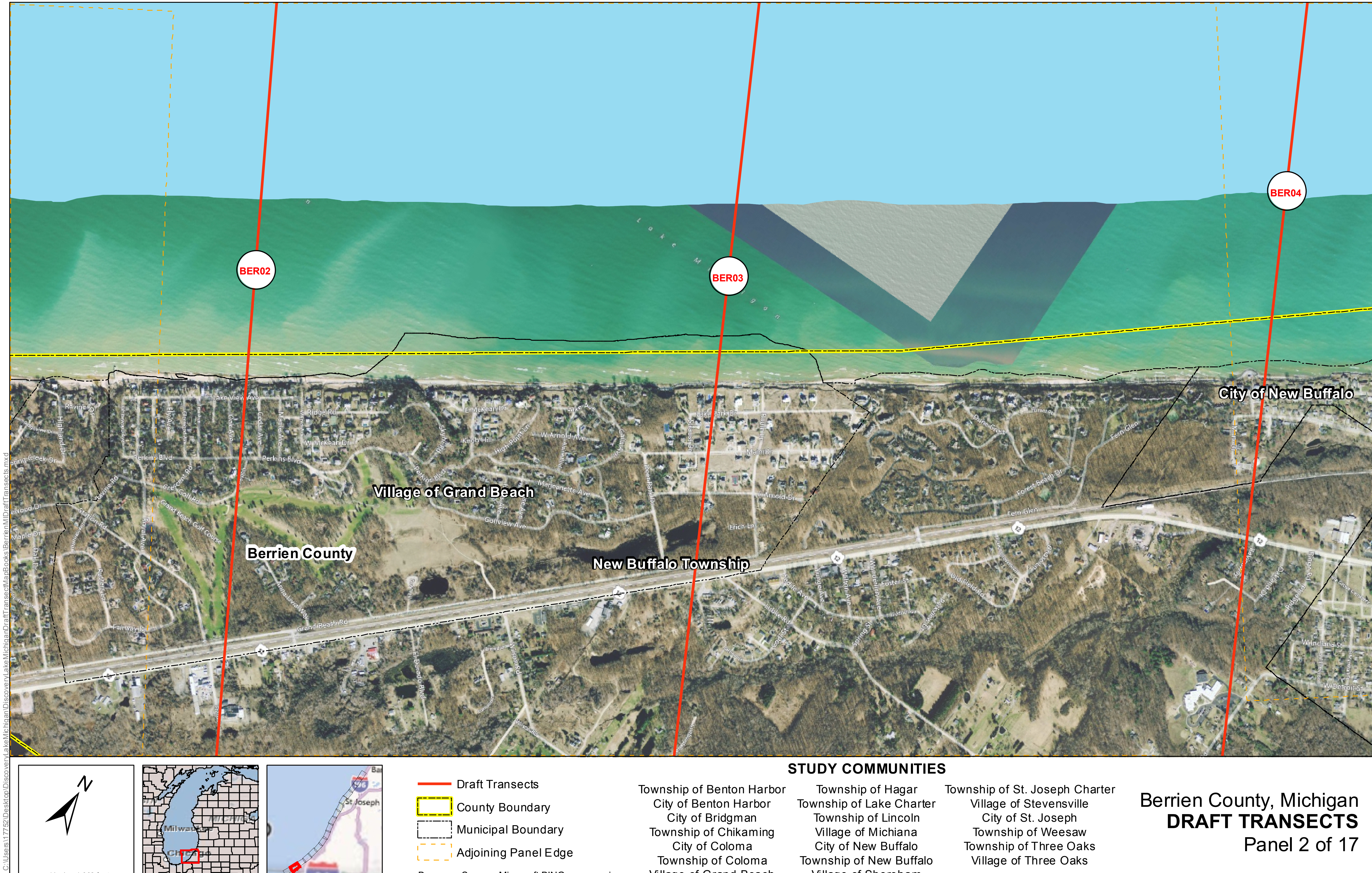

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 2 of 17

BER04

BER05

BER06

BER07

Berrien County

City of New Buffalo

New Buffalo Township

1 inch = 1,001 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 3 of 17

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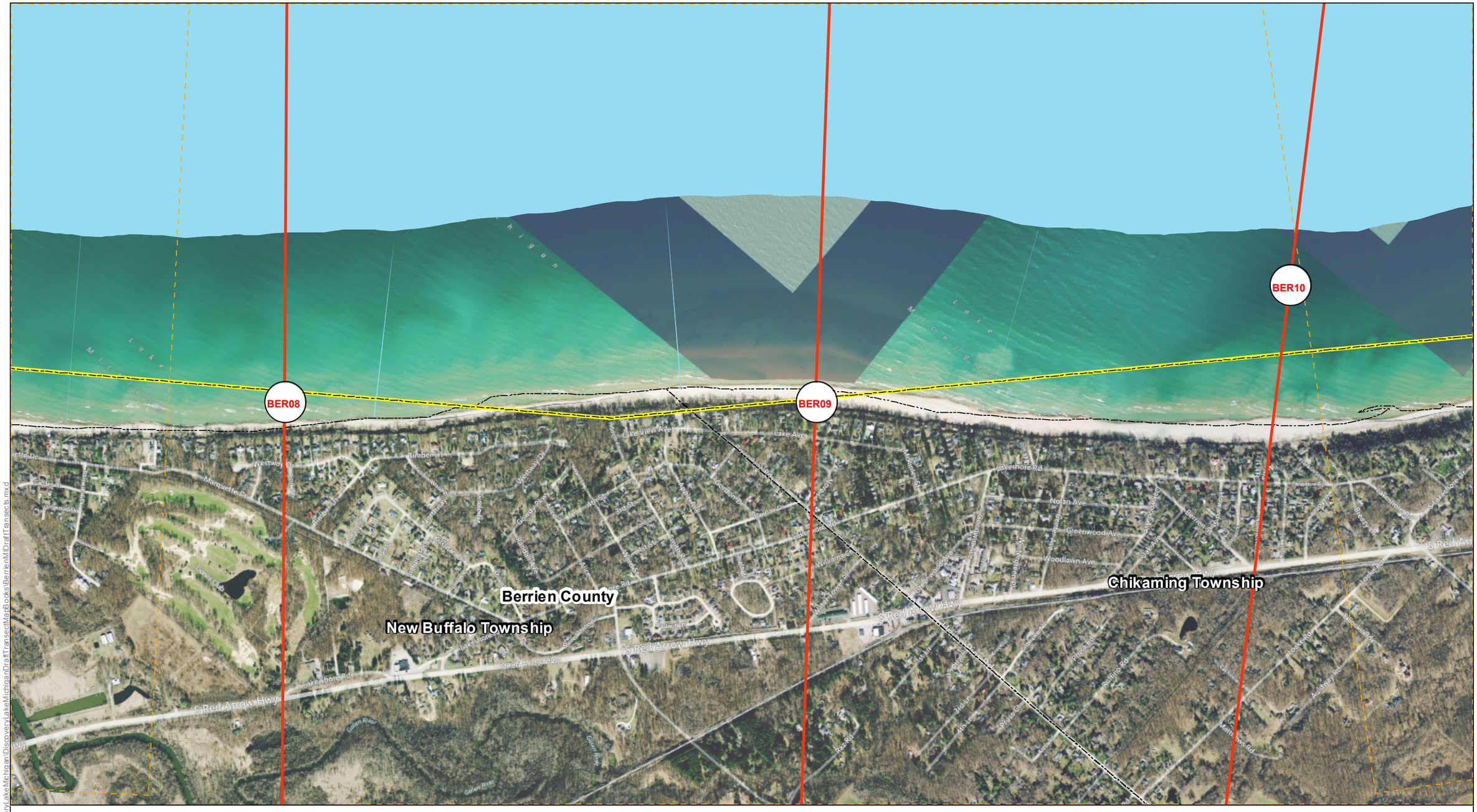

STUDY COMMUNITIES

Township of Benton Harbor	Township of Hagar	Township of St. Joseph Charter
City of Benton Harbor	Township of Lake Charter	Village of Stevensville
City of Bridgman	Township of Lincoln	City of St. Joseph
Township of Chikaming	Village of Michiana	Township of Weesaw
City of Coloma	City of New Buffalo	Township of Three Oaks
Township of Coloma	Township of New Buffalo	Village of Three Oaks
Village of Grand Beach	Village of Shoreham	

Berrien County, Michigan
DRAFT TRANSECTS
Panel 4 of 17

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1 inch = 1,001 feet

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 5 of 17

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BER13

BER14

BER15

Berrien County

Chikaming Township

1 inch = 1,001 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 6 of 17

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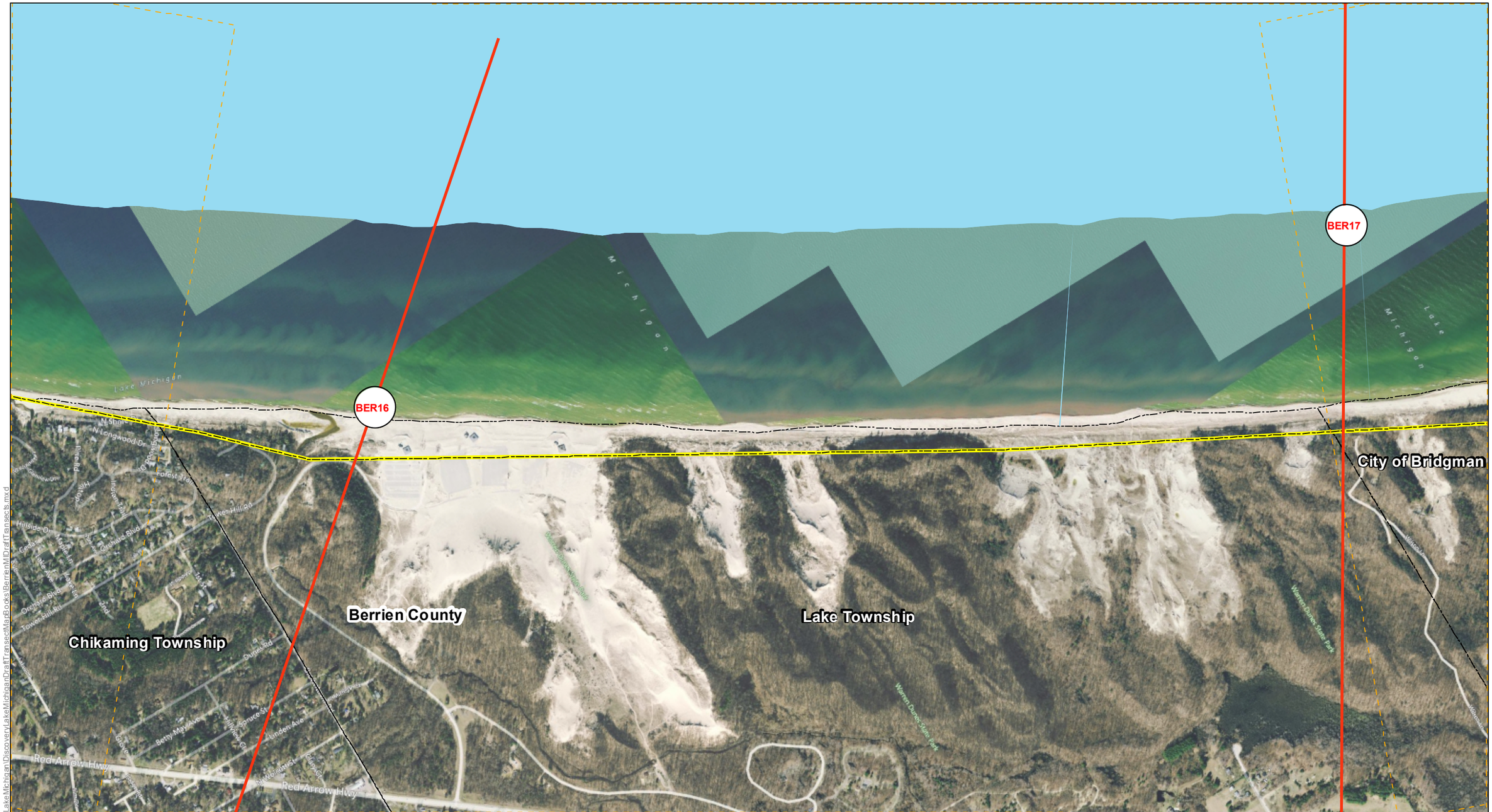

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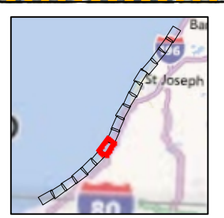

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 7 of 17

Path: C:\Users\17752\Desktop\DiscoveryLakeMichigan\DiscoveryLakeMichiganDraftTransectMapBooks\BerrienMIDraftTransects.mxd

BER17

BER18

Berrien County

City of Bridgman

Lake Township

Lake Michigan

Lake Michigan

1 inch = 1,001 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 8 of 17

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1 inch = 1,002 feet

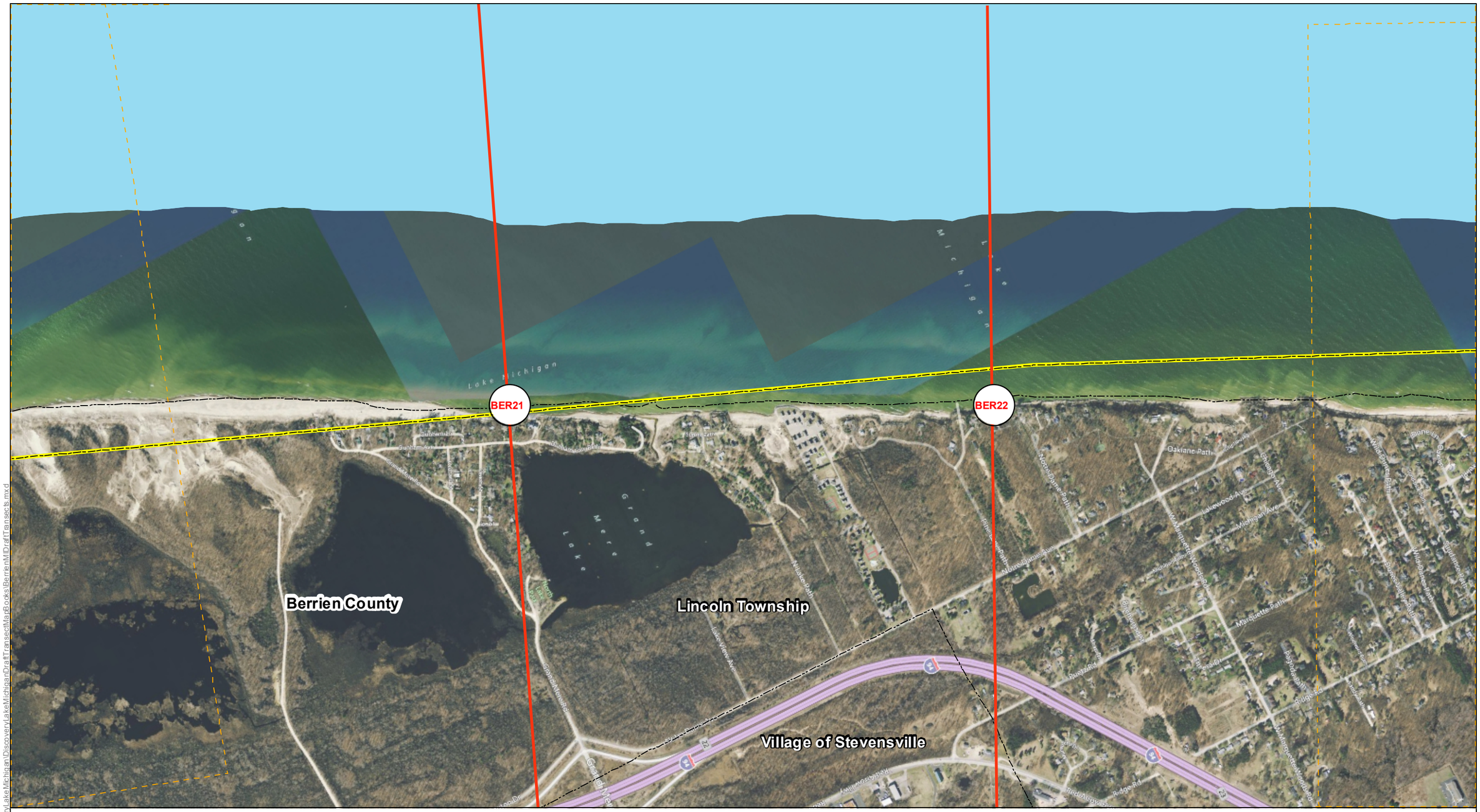
Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

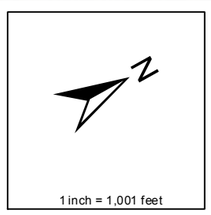
Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 9 of 17





- Draft Transects
- County Boundary
- Municipal Boundary
- Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor	Township of Hagar	Township of St. Joseph Charter
City of Benton Harbor	Township of Lake Charter	Village of Stevensville
City of Bridgman	Township of Lincoln	City of St. Joseph
Township of Chikaming	Village of Michiana	Township of Weesaw
City of Coloma	City of New Buffalo	Township of Three Oaks
Township of Coloma	Township of New Buffalo	Village of Three Oaks
Village of Grand Beach	Village of Shoreham	

Berrien County, Michigan
DRAFT TRANSECTS
Panel 10 of 17

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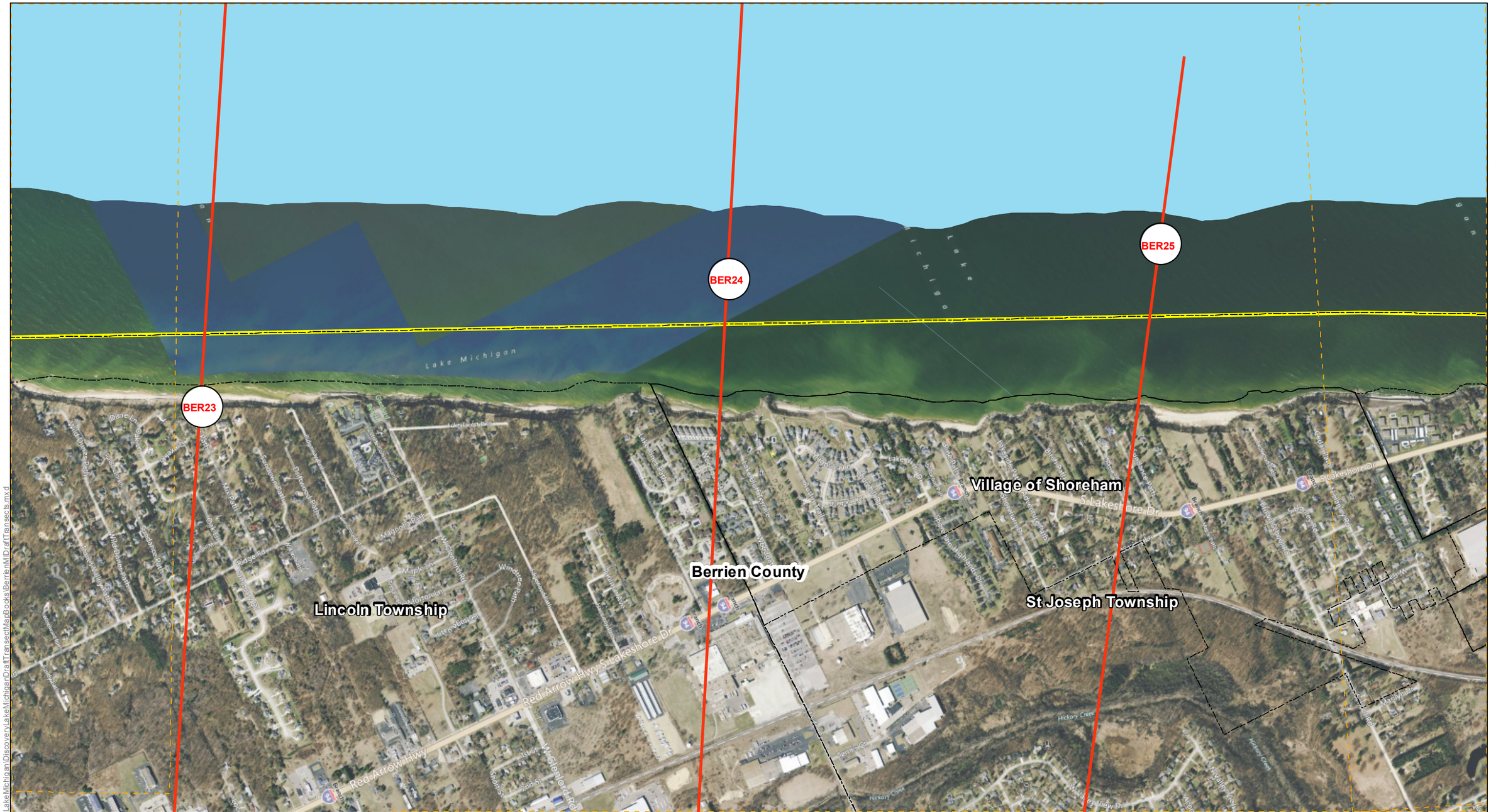

1 inch = 1,002 feet

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 11 of 17

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1 inch = 1,003 feet

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 12 of 17

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BER29

BER30

BER31

BER28

City of St Joseph

Berrien County

City of Benton Harbor

Benton Township

Lake Michigan

Main St

M-63

1 inch = 1,002 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 13 of 17

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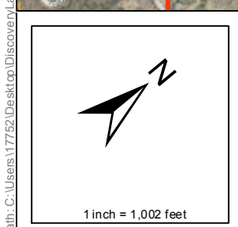

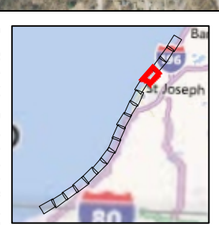

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 14 of 17

Path: C:\Users\17752\Desktop\DiscoveryLakeMichigan\DiscoveryLakeMichiganDraftTransectMapBooks\BerrienMIDraftTransects.mxd

BER34

BER35

BER36

Berrien County

Hagar Township

1 inch = 1,002 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 15 of 17

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1 inch = 1,003 feet

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 16 of 17

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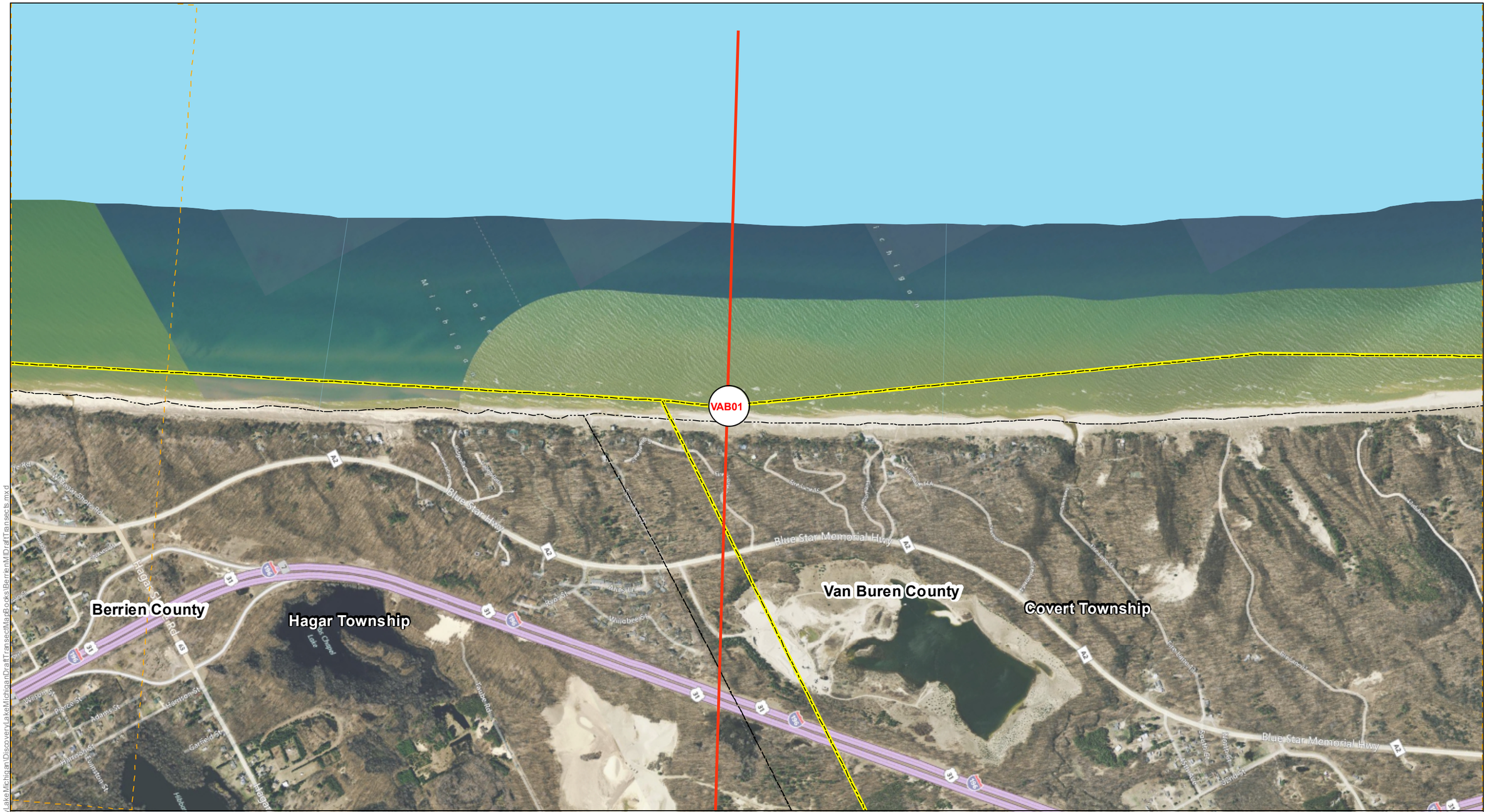

1 inch = 1,001 feet

Draft Transects
County Boundary
Municipal Boundary
Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Benton Harbor
City of Benton Harbor
City of Bridgman
Township of Chikaming
City of Coloma
Township of Coloma
Village of Grand Beach
Township of Hagar
Township of Lake Charter
Township of Lincoln
Village of Michiana
City of New Buffalo
Township of New Buffalo
Village of Shoreham
Township of St. Joseph Charter
Village of Stevensville
City of St. Joseph
Township of Weesaw
Township of Three Oaks
Village of Three Oaks

Berrien County, Michigan
DRAFT TRANSECTS
Panel 17 of 17

VAB01

Berrien County

Hagar Township

Van Buren County

Covert Township

Blue Star Memorial Hwy

1 inch = 1,001 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert

Township of Charter South Haven

Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 1 of 6

Path: C:\Users\17752\Desktop\DiscoveryLakeMichigan\DiscoveryLakeMichiganDraftTransectMapBooks\VanBurenMIDraftTransects.mxd

VAB02

VAB03

Van Buren County

Covert Township

Blue Star Memorial Hwy

1 inch = 1,003 feet

South Haven

Covert

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert
Township of Charter South Haven
Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 2 of 6

Path: C:\Users\17752\Desktop\DiscoveryLakeMichigan\DiscoveryLakeMichiganDraftTransectMapBooks\VanBurenMIDraftTransects.mxd

VAB03

VAB04

Van Buren County

Covert Township

South Haven Township

Blue Star Memorial Hwy

Blue Star Memorial Hwy

Blue Star Memorial Hwy

Lake Michigan

Lake Michigan

Path: C:\Users\17752\Desktop\Discovery\LakeMichigan\Discovery\LakeMichiganDraftTransectMapBooks\VanBuren\MIDraftTransects.mxd

N

1 inch = 1,003 feet

Milwaukee

Chicago

South Haven

Covert

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert

Township of Charter South Haven

Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 3 of 6

VAB05

VAB06

Van Buren County

South Haven Township

Blue Star Memorial Hwy

Rogers Rd

1 inch = 1,002 feet

South Haven

Covert

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert

Township of Charter South Haven

Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 4 of 6

Path: C:\Users\17752\Desktop\Discovery\LakeMichigan\Discovery\LakeMichigan\DraftTransectMapBooks\VanBuren\MIDraftTransects.mxd

VAB07

VAB08

VAB09

VAB10

Van Buren County

South Haven Township

City of South Haven

1 inch = 1,002 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert

Township of Charter South Haven

Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 5 of 6

Path: C:\Users\17752\Desktop\DiscoveryLakeMichigan\DiscoveryLakeMichiganDraftTransectMapBooks\VanBurenMIDraftTransects.mxd

VAB10

VAB11

ALL01

Van Buren County

City of South Haven

Allegan County

Casco Township

North Shore Dr

Blvd

Blue Star Hwy

74th St

1 inch = 1,002 feet

Draft Transects

County Boundary

Municipal Boundary

Adjoining Panel Edge

Basemap Source: Microsoft BING map service

STUDY COMMUNITIES

Township of Covert

Township of Charter South Haven

Township of Geneva

Van Buren County, Michigan

DRAFT TRANSECTS

Panel 6 of 6

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Attachment F.

Berrien and Van Buren Counties Discovery Meeting Documents

U.S. Department of Homeland Security
536 S. Clark St. 6th Floor
Chicago, IL 60605
FEMA

July 13, 2012

«Salutation» «First_Name» «Last_Name»
«Title», «Organization»
«Street_1» «Street_2»
«City», «State_Province» «Zip_Code»

Re: Invitation to Attend Community Meetings Regarding Lake Michigan Coastal Flood Risk

Dear «Salutation» «Last_Name»:

The Federal Emergency Management Agency (FEMA) is conducting a comprehensive study of flood hazards for Lake Michigan and the rest of the United States Great Lakes through FEMA's Risk Mapping, Assessment, and Planning (MAP) Program. Data from this study will eventually be used to convey coastal flood hazard risk through revised Flood Insurance Rate Maps (FIRMs), also known as regulatory products, and new risk planning and assessment products and datasets, also referred to as non-regulatory products and datasets. Please see enclosed Risk MAP Flood Risk Products Fact Sheet. More information about the Great Lakes Coastal Flood Study may be found at http://www.greatlakescoast.org.

The goal of Risk MAP is to support actions that make communities safer from flooding. The Risk MAP program wants to achieve continued improvement of flood hazard information for the National Flood Insurance Program (NFIP); to promote increased awareness and understanding of flood risk; to increase community engagement; and to identify and support actions that local stakeholders can take to reduce natural hazard risks. For additional information on the Risk MAP Program, please visit http://www.fema.gov/plan/prevent/fhm/rm_main.shtm.

The first phase of the Risk MAP process is Discovery. Through Discovery, input provided by communities will help FEMA to better understand local coastal flood risk data and needs, and characterize local conditions that contribute to coastal flood risk.

Your Discovery Meeting is scheduled to occur:

Date:	Monday, September 10, 2012
Time:	2:00pm – 4:00pm
Location:	Berrien County Administrative Building
Address:	701 Main Street, St. Joseph, Michigan 49085

Please save this date on your calendar. At the meeting, we will review the coastal flood risk data we have gathered to date and discuss your community's coastal floodplains, mitigation plan and projects, coastal flood risk concerns, and coastal floodplain management activities. This discussion will allow us to better identify your community's coastal flood hazard needs and subsequent Risk MAP regulatory and non-regulatory products and datasets that can be delivered during the Risk MAP project. We will also discuss how the coastal flood risks and needs are related to mapping, risk assessment, Hazard Mitigation planning, and grant programs available to eligible communities. To best facilitate this discussion, we would like to request your help in inviting community leaders, emergency managers, GIS specialists, engineers, outreach specialists, and local planners to the meeting. Please RSVP to FEMA's study contractor (STARR) Holly Davis at (904) 363-8451 or email to GreatLakesFloodStudy@starr-team.com no later than **August 17, 2012.** Please reference the Discovery Meeting date and time in your RSVP.

So that we can better prepare for the upcoming Discovery Meeting, we are asking local communities to participate in an Information Exchange conference call and WebEx. This call will provide an overview of

FEMA's Risk MAP program and the Discovery process, and will allow us to review with you our request for the exchange of coastal flood risk and hazard mitigation data, and to learn more about your community's coastal flood hazard risks and needs, in advance of the Discovery Meeting. The partnership and exchange of data between FEMA, the State, and your community is vital to the success of identifying flood risks and needs that may impact your citizens.

The Information Exchange conference call is scheduled to occur:

Date:	Monday, August 6, 2012
Time:	1:00pm – 2:00pm EST
Link to WebEx:	https://www.webex.com/login/attend-a-meeting
Meeting No:	658 935 489
Call in number:	877-537-6647
Participant Code:	31578

If you or another community representative is unable to attend the Information Exchange conference call, we ask that you fill out and return the enclosed data request form by **August 17, 2012.** This is the same data request form that will be discussed during the conference call. The completed form can be sent to:

Via e-mail:	GreatLakesFloodStudy@starr-team.com
By mail:	Holly Davis Atkins/STARR 7406 Fullerton Street, Suite 350 Jacksonville, Florida 32256

We look forward to working with you to reduce the risks associated with coastal flooding and increase your community's resiliency for the long term. To learn more about Discovery, please visit http://www.fema.gov/library and search keywords "Discovery brochure" or contact Ken Hinterlong, FEMA Region V Senior Engineer, at (312) 408-5529, or by email at ken.hinterlong@fema.dhs.gov . We look forward to discussing this with you during the Information Exchange call and/or seeing you at the upcoming Discovery Meeting.

Sincerely,

Christine Stack

Christine Stack
Division Director
Mitigation Division, FEMA Region V

Enclosures: Risk MAP Flood Risk Products Fact Sheet
Community Discovery Coastal Data Request Form

cc: Community FPA
Linda Burke, Michigan Department of Environmental Quality
Les Thomas, Michigan Department of Environmental Quality
Byron Lane, Michigan Department of Environmental Quality

Monday, September 10, 2012
2:00pm - 4:00pm ET
Berrien County Administrative Building
701 Main Street
St. Joseph, MI 49085

No.	Sign Intials	Affiliation	Title	Name First	Name Last	Street Address	Phone	Email Address
1		Berrien County	GIS Director	Lex	Winans	701 Main Street St. Joseph, MI 49085	(269) 983-7111	lwinans@berriencounty.org
1		City of St. Joseph	Community Development Director	John	Hodgson	700 Broad Street St. Joseph, MI 49085	(269) 983-1212	jhodgson@sjcity.com
2		City of St. Joseph	City Engineer	Tim	Zebell	700 Broad Street St. Joseph, MI 49085	(269) 983-1212	tzebell@sjcity.com
3		City of St. Joseph	Chief Building Official	Cecil	Derringer	700 Broad Street St. Joseph, MI 49085	(269) 983-1212	cderringer@sjcity.com
4		St. Joseph Charter Township	Building Official	Jerry	Jones	3000 Washington Ave., P.O. Box 147 St. Joseph MI 49085	(269) 429-7703	jjones@sjct.org
5		St. Joseph Charter Township	Township Manager	Tim	Fenderbosch	3000 Washington Ave., P.O. Box 147 St. Joseph MI 49085	(269) 429-7703	tfenderbosch@sjct.org
6		Southwest Michigan Planning Commission	Senior Planner	Marcy	Colclough	185 East Main Street, Suite 701 Benton Harbor, MI 49022	(269) 925-1137	colcloughm@swmpc.org
7		FEMA	FEMA Region V	Ken	Hinterlong	536 S. Clark Street, 6th Floor Chicago, IL 60605	(312) 408-5529	Ken.Hinterlong@fema.dhs.gov
8		FEMA	FEMA Region V Risk Analysis	Erin	Maloney	536 S. Clark Street, 6th Floor Chicago, IL 60605	(312) 408-5435	erin.maloney@fema.dhs.gov
9		STARR	Project Manager/Coastal Engineer	Stacey	Roberts		(850) 580-7896	stacey.roberts@starr-team.com

Monday, September 10, 2012
2:00pm - 4:00pm ET
Berrien County Administrative Building
701 Main Street
St. Joseph, MI 49085

No.	Sign Intials	Affiliation	Title	Name First	Name Last	Street Address	Phone	Email Address
10	AD	STARR	Outreach Coordinator	Holly	Davis		(904) 363-8451	holly.davis@atarr-team.com
11	JL	STARR	Sr. Technical Coordinator	Janet	Luce		(321) 242-4942	janet.luce@atkinsglobal.com
12	CB	BERRIEN COUNTY	BERRIEN COUNTY EMERGENCY MANAGEMENT	COREY	BURKS	2100 E. EMPIRE BENTON HARBOR, MI 49022	269-983-7111 x.4916	cburks@berriencounty.org
13	JL	Berrien County	Berrien County Commissioner	Jeanette	Leahey	B County Administration St. Joseph	269-369-1225	jeanettekeahey@hotmail.com
14	MM	EDGEWATER RESOURCES/ ST. JOE	ENGINEER	MIKE	MORPHEY	518 BROADSTREET, SUITE 200 ST. JOSEPH, MI	269-408-6389	Mmorphey@edgewaterresources.com
15	ES	MDEQ	ENGINEER	ERNIE	SARKIPATO	7953 ADOBE RD KALAMAZOO MI 49009	269-567-3564	sarkipatoe@mi.gov
16	[illegible]	SOUTHWEST MI PLANNING COMMISSION	GIS SPECIALIST	JILL	PLESCHER	185 E. MAIN STREET BENTON HARBOR, MI 49022	269 925 1137 x 22	plescherj@swmpc.org
17	AH	Berrien County Drain Commissioner's Office	Chief Deputy	Anne	Hendrix	701 main street St Joseph, MI 49085	269.983-7111 ext 8260	ahendrix@berriencounty.org
18	JT	B. C. Drain Comm Office	Deputy	Jeannine Totzke		701 Main St St Joe MI 49085	269-983-7111 x 8255	jtotzke@berriencounty.org
19	JJ	SAINT JOSEPH TOWNSHIP	BUILDING OFFICIAL	JERRY	JONES	3000 WASHINGTON AVE ST. JOSEPH MI.	269-429-7703	JJones@SJCT.ORG

Monday, September 10, 2012
2:00pm - 4:00pm ET
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701 Main Street
St. Joseph, MI 49085

No.	Sign Intials	Affiliation	Title	Name First	Name Last	Street Address	Phone	Email Address
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Monday, September 10, 2012
2:00pm - 4:00pm ET
Berrien County Administrative Building
701 Main Street
St. Joseph, MI 49085

No.	Sign Intials	Affiliation	Title	Name First	Name Last	Street Address	Phone	Email Address
30								

Meeting Schedule: Monday, September 10, 2012 2:00 – 4:00 pm (ET)
Meeting Location: Berrien County Administrative Building, St. Joseph, MI

PARTICIPANTS

FEMA
Ken Hinterlong, FEMA Region V
Erin Maloney, FEMA Region V

Michigan DEQ
Ernie Sarkipato

STARR Contractor
Stacey Roberts, STARR
Wayne Lasch, STARR
Holly Davis, STARR
Janet Luce, STARR

Discovery Meeting Agenda

1. Why are we here?
- Great Lakes Coastal Flood Study Overview and Schedule
- Discovery Process and Outcomes

2. Coastal mapping (Regulatory) flood risk products (Non Regulatory)

3. How does this apply to my community?

4. Hazard mitigation opportunities and grant funding

5. Interactive Session
- View and Discuss Local Coastal Areas of Concern Using the Discovery Map
- Introduce the Mitigation Action Form and Mitigation Action Tracker
- Discuss Mitigation Action Opportunities

7. Wrap Up
- Review of action items and next steps

Optional Interactive Stations (30 minutes - 1hr following meeting)
- *Draft Transect* Map *Station: Talk to technical staff about draft transects and view draft transects in GIS*
- *Mitigation* Resources*, Strategies, and Actions Station: Talk with FEMA and State staff about areas of concern and potential mitigation actions to help reduce risk. Fill out Mitigation Action Form.*

INTERACTIVE DISCUSSION:

A. Questions asked during the presentations *(summary of answers provided in italics)*

1. Is the USACE doing a separate analysis of lake levels for the new coastal study? *Ken Hinterlong said yes, FEMA has funded the USACE to do a new analysis based on 50 years of record. 150 storms are being modeled. The data generated from this analysis is being stored on CSTORM at a large number of save points; this creates many "virtual gauges". This data will be available to the public. FEMA has spent about $11 million on the Great Lakes program so far; much of the results of this work can be found at www.greatlakescoast.org.*
2. When will the Coastal Flood Risk Report and Maps be complete? *The Coastal Flood Study Maps will be completed in the next 18-24 months.*

B. Questions/comments raised during the discussion and break out session

1. Potential person to contact for additional information:
    a. Marcy Colchough (suggested by Jill Plesher who attended the 9/10 Discovery meeting). Mary has been involved with local planning and environmental work for the past 15 years. Among other interests, she wants to promote a Lake Michigan kayak and canoe trail. Mary's contact information is:

        Southwest Michigan Regional Planning Commission
        185 East Main Street
        Benton Harbor, MI 49022
        Telephone: 269-925-1137
2. Transect VA B05 is in an interesting area with a very unusual transient dune system that moves several feet each year and has buried numerous homes. Keep this transect as placed.
3. Open house to review preliminary maps is scheduled for 2014. Work maps will be released prior to open house.
4. The USACE Oblique Photo Viewer is currently being used for regulatory purposes.
5. The 2006 Michigan Building Code currently includes VE zones.
6. Berrien County Commissioner, Jeanette Leahey, and Emergency Manager, Corey Burks - Very supportive of efforts. Recommends contact with the local Police and Fire Chiefs to seek out historical information on past flood events and high water marks.
7. St. Joseph Township – No new development in this area in past four years.
8. Harbor Shores - Located on St. Joseph River relatively near the coast. Only engineered basements permitted by code. They are about to be taken out of the floodplain because an area to be developed will be filled as part of development of a nearby marina.

C. General notes

a. A separate meeting was held with the City of St. Joseph at the conclusion of this Discovery meeting. (Notes from this meeting have been compiled and inserted at the conclusion of this meeting summary.)
b. No other general notes for this meeting.

FEATURES NOTED ON MAPS:

State	County	Community	FIPS	CID	Comment	Type
Michigan	Berrien	City of Benton Harbor	26021	260032	Refer to City of St. Joseph Coastal Study for areas north and south of Benton Harbor.	General Comment

State	County	Community	FIPS	CID	Comment	Type
Michigan	Berrien	City of Benton Harbor	26021	260032	Shift transect to the south.	Transect Comment
Michigan	Berrien	City of Benton Harbor	26021	260032	Suggest adding a transect between BER22 and BER23.	Transect Comment

ACTIONS:

- STARR will send out the discovery presentation as well as contact information to attendees.

City of St. Joseph Meeting Summary:

Meeting schedule: Monday, September 10, 2012 4:00 – 5:00 pm (ET)
Meeting Location: Berrien County Administrative Building, St. Joseph, MI

PARTICIPANTS

FEMA
Ken Hinterlong, FEMA Region V
Erin Maloney, FEMA Region V

City of St. Joseph
John Hodgson, Community Development Director
Cecil Derringer, Building Official

STARR Contractor
Stacey Roberts, STARR
Wayne Lasch, STARR
Holly Davis, STARR
Janet Luce, STARR

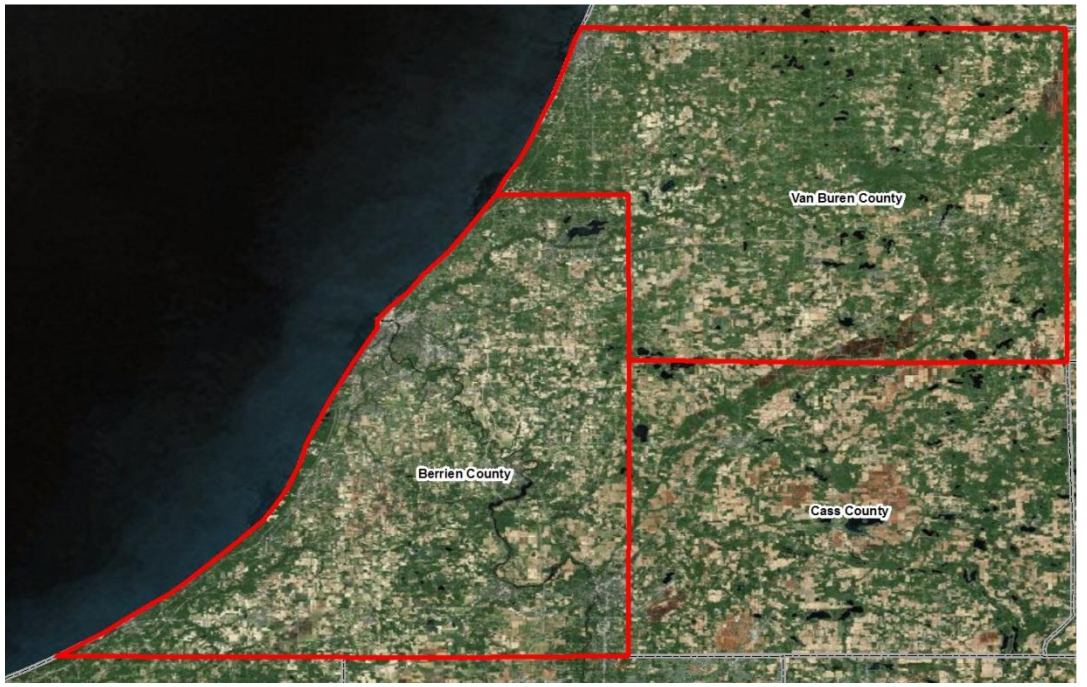
A. Discussion and action items

1. The City recently completed a study of management options for its shoreline – "City of St. Joseph Coastal Engineering Study", dated August 17, 2012. A copy of this study was provided to FEMA and STARR. In this study, the shoreline was divided into several areas and management recommendations were provided for each area.
2. The City is very interested in new floodplain maps and tools, especially for Areas 1 and 2. Not much can be done in Area 3 due to bluffs and existing coastal structures.
3. Transect locations should be adjusted as requested by John and Cecil (see marked up maps – shift transect from the north slightly to the south to cover this area better). Make sure to cover the area to the north of the jetty/pier where big homes are being built. Some of these homeowners have removed the dunes along the lakeside.
4. Communicate with St. Joseph as the pilot study results and final transect locations are generated. These results will then be used in discussions to help decide which (if any) non-regulatory products can help the City best manage the coastal floodplain. Erosion maps may be very helpful.
5. The City has a variety of recent aerial photography and topo (1' and 2' contours) and will provide this to STARR (Holly Davis).
6. John expressed concern with damages from ice events. Ken indicated that, since these are pretty limited in scope and are very rare events, they will not be included in the new study by FEMA.
7. Sand is moving from north to south along the shoreline of the community. The beach north of the jetty has been building since the pier/jetty was tightened in 1980, while the area to the south is being starved of sand and is eroding. The USACE dredges the basin each year and puts this material on the south/eroding beach. This is roughly maintaining the shoreline position. The dredged material is very fine and erodes quickly.
8. The City has built a substantial rock revetment to protect its water treatment plant which is located on the lake. The basic configuration of this revetment will be required for any new structures built in Area 2. The City is dealing with how to write this ordinance and whether they should require that each new project cover several properties to help address problems with structures being flanked.

FEMA

Lake Michigan Discovery

Berrien County, MI
Van Buren County, MI



September 10, 2012
2pm to 4pm ET
Berrien County Administrative Building
St. Joseph, Michigan

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Great Lakes Coastal Flood Study
greatlakescoast.org

Introductions

Who's here?

- **State Representatives**
  - MDEQ
- **Risk MAP Project Team**
  - FEMA
  - STARR
- **Local Stakeholders**
  - CEOs
  - Floodplain Administrators
  - Planners
  - Engineers
  - Emergency Managers
  - Community Leaders
  - Regional Planning Agencies
  - Coastal Organizations
  - Property Owner Associations and Other Key Stakeholders

Discovery Meeting Agenda

- Why are we here?
  - Risk MAP Program, Great Lakes Study, and Discovery Overview
- Coastal mapping (regulatory products)
- Flood risk products (non-regulatory products)
- How does this apply to my community?
  - NFIP compliance, local impacts of coastal study, hazard mitigation, and grant funding
- Interactive Sessions
  - View and Discuss Local Coastal Areas of Concern Using the Discovery Map and Community Risk MAP Questionnaire
  - Discuss Mitigation Action Opportunities and Introduce the Mitigation Action Form
- Wrap Up
- Optional Interactive Stations

Risk Mapping, Assessment and Planning
Risk MAP

FEMA

Through collaboration with State, Local, and Tribal entities, Risk MAP aims to deliver quality data that increases public awareness and leads to action that reduces risk to life and property

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greatlakescoast.org

Great Lakes Coastal Flood Study

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Great Lakes Coastal Flood Study Overview

- Latest models, data, and technology
- Deliver updated flood maps and flood risk datasets
- Equip Federal Agencies, eight States and hundreds of coastal communities with data and planning tools to facilitate flood risk actions to enhance resiliency along the Great Lakes
- Partners Involved:
  - FEMA
  - USACE
  - ERDC
  - ASFPM
  - States
  - FEMA Contractors

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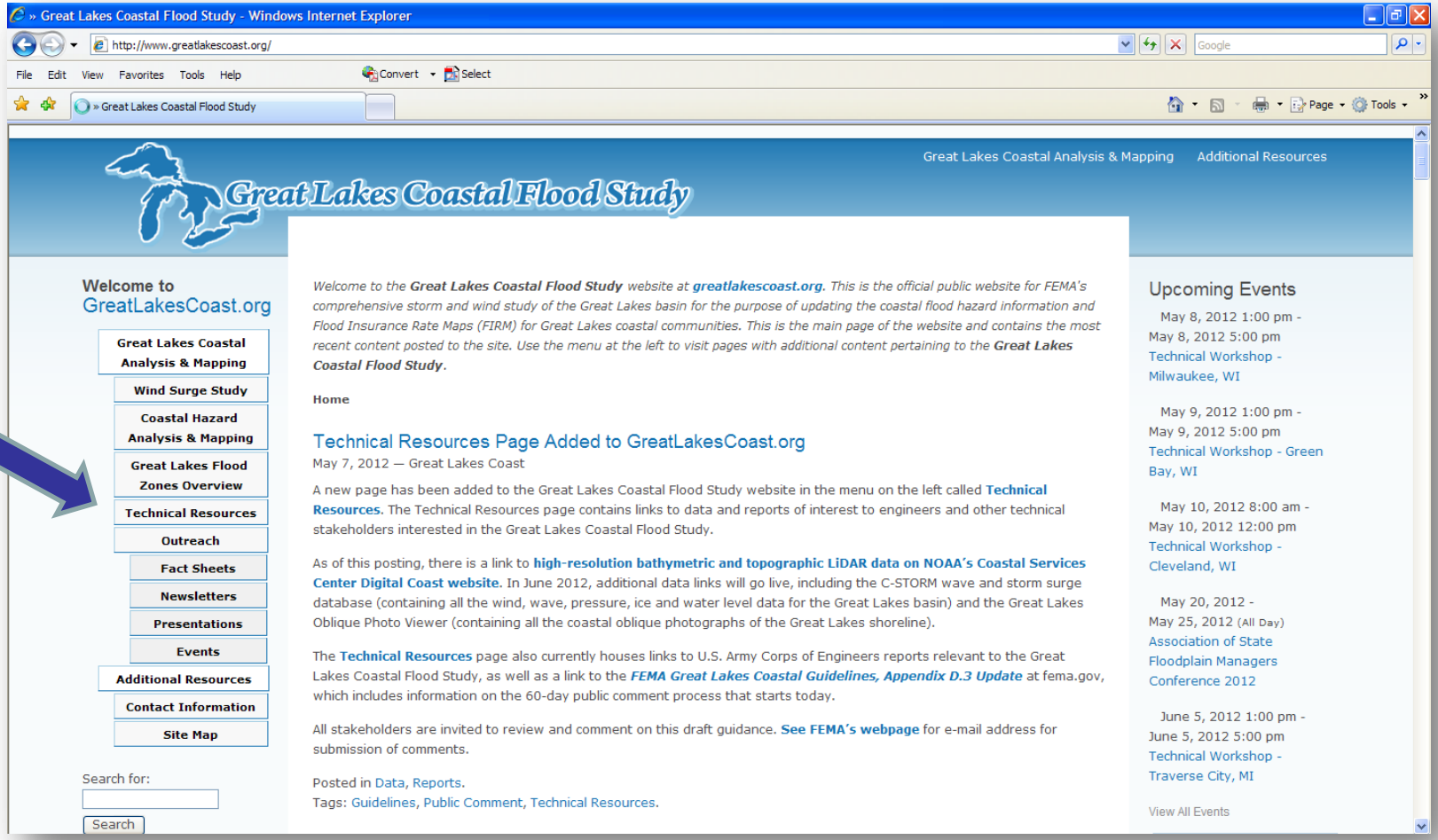
Technical Resources



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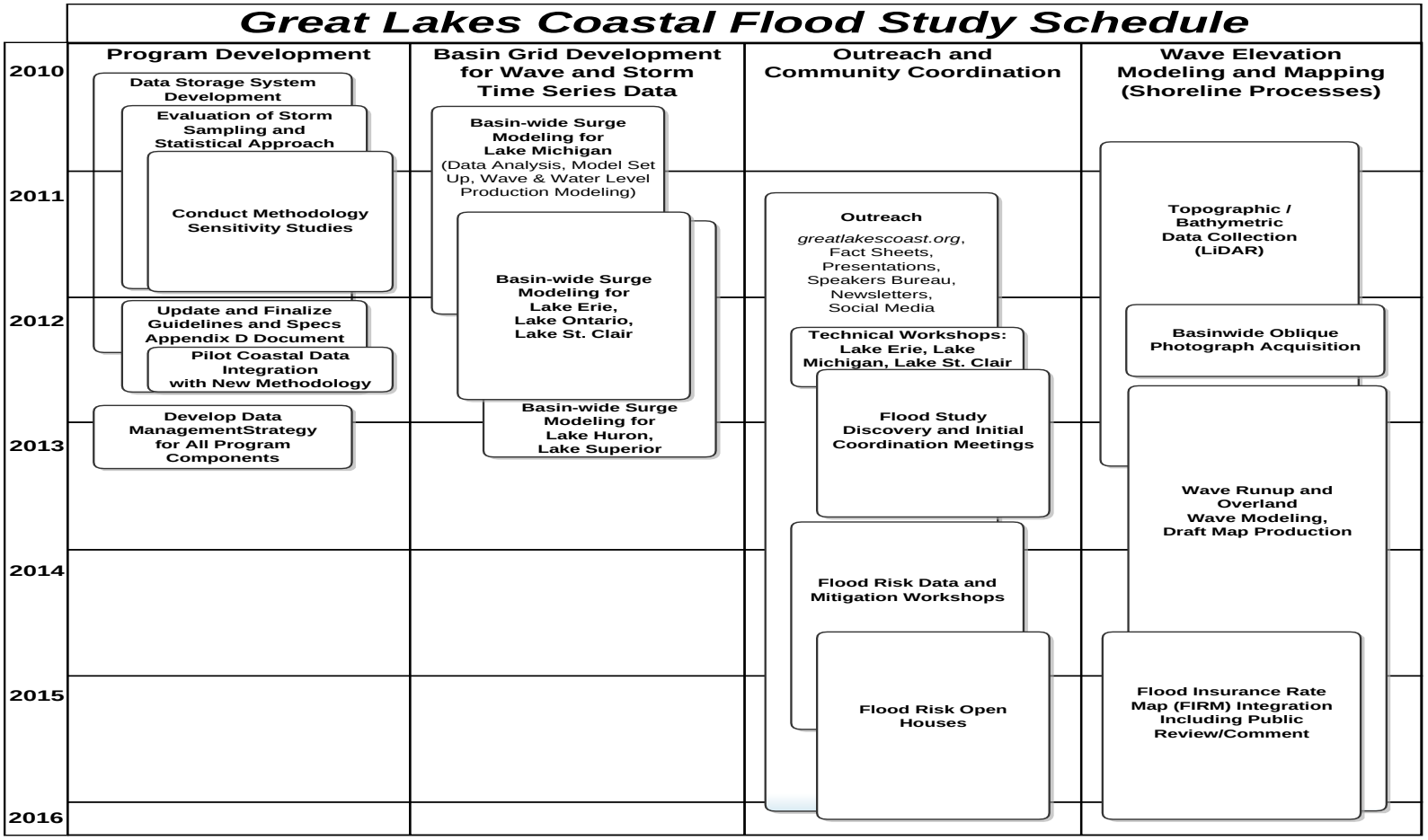
Great Lakes Coastal Flood Study Schedule

FEMA



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Lake Michigan Discovery

- 34 counties in total
  - 4 counties in UP Michigan
  - 11 counties in Wisconsin
  - 2 counties in Illinois
  - 3 counties in Indiana
  - 14 counties in lower Michigan
- 226 coastal communities

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Great Lakes Coastal Flood Study Discovery Study Area

FEMA

Lake Michigan coastal communities in Berrien and Van Buren Counties:

Berrien County	Berrien County (cont.)
Benton Charter, Township of	New Buffalo, Township of
Benton Harbor, City of	Shoreham, Village of
Bridgman, City of	St. Joseph Charter, Township of
Chikaming, Township of	St. Joseph, City of
Coloma, City of	Stevensville, Village of
Coloma, Township of	Three Oaks, Township of
Grand Beach, Village of	Three Oaks, Village of
Hagar, Township of	
Lake Charter, Township of	**Van Buren County**
Lincoln, Township of	Covert, Township of
Michiana, Village of	South Haven Charter, Township of
New Buffalo, City of	

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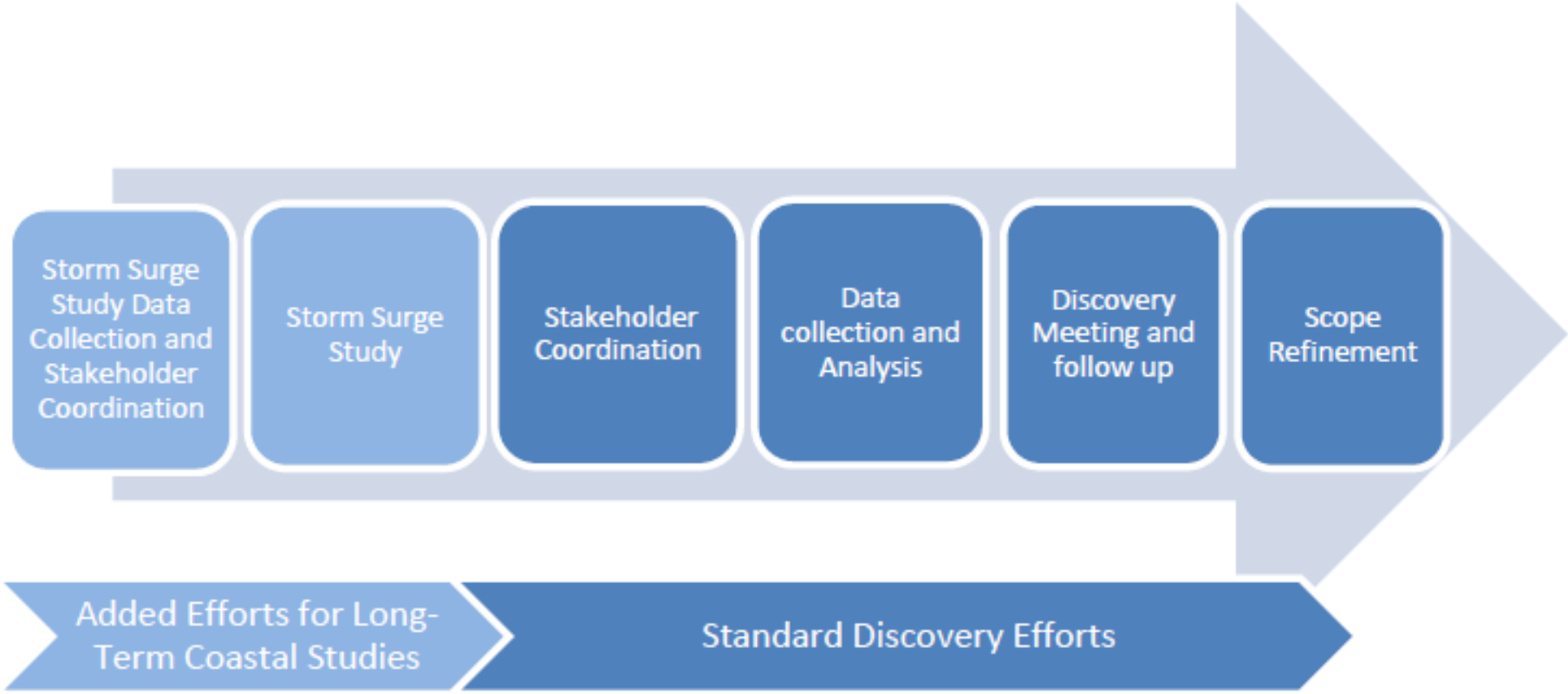
Discovery Schedule Overview



Lake Michigan Discovery

Schedule of Activities

- Identify Draft Transect Locations – Completed
- Research available data – Ongoing
- Information Exchange with Community Stakeholders – August 2012
- Prepare draft Discovery Maps and Reports – September 2012
- Discovery Meetings – September 2012
- Final Discovery Report and Maps – November/December 2012
- Create library of digital data – November/December 2012

Discovery Outcomes

- **Explain the Project**
  - Regulatory and non-regulatory products/datasets
  - Analysis, concepts, timelines
- **Encourage Community Participation**
  - Transect Locations
  - Areas of concern and need
  - Data to improve upon products and datasets
- **Introduce Mitigation Action**
  - Mitigation Action Form
  - Action Tracker
  - Mitigation strategies for coastal flood and erosion

Great Lakes Coastal Flood Study Discovery Products

- **Final Discovery Report**
  - Single, comprehensive report for all of Lake Michigan, with appendices for each Discovery meeting
  - Includes pre-discovery data, meeting agenda, sign-in sheets, discussion topics, decisions made, etc.
- **Final Discovery Maps**
  - Including feedback from participants
  - Visual representation of meeting outcomes
  - Delivered in digital format

Data Collection in Progress

- New high quality USACE Topographic – Light Detection and Ranging (LiDAR) and Bathymetry Data
- Base data – boundaries, streams, census blocks, etc.
- Average Annualized Loss data
- Shoreline Classification Dataset
- Dams
- Federal and State disaster information
- Repetitive loss data
- Hazard Mitigation plans
- Hazard Mitigation Grants Program (HMGP) projects
- Stream, wave, and water level gage locations
- Pre-Disaster Mitigation Program projects
- Draft Transects

FEMA

Coastal Mapping

- Draft Transects
- VE Zone Mapping
- Limit of Moderate Wave Action (LiMWA)

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Draft Transect Layout
Berrien and Van Buren Counties

County	# Shoreline Miles	# Transects
Berrien	39	30
Van Buren	13	9

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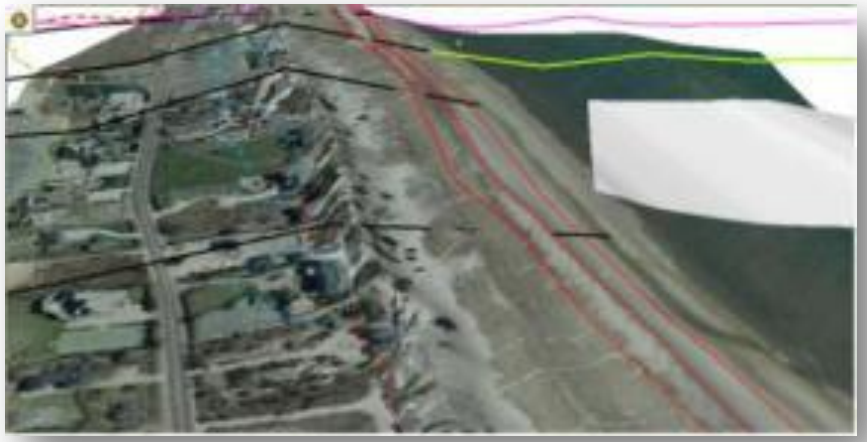
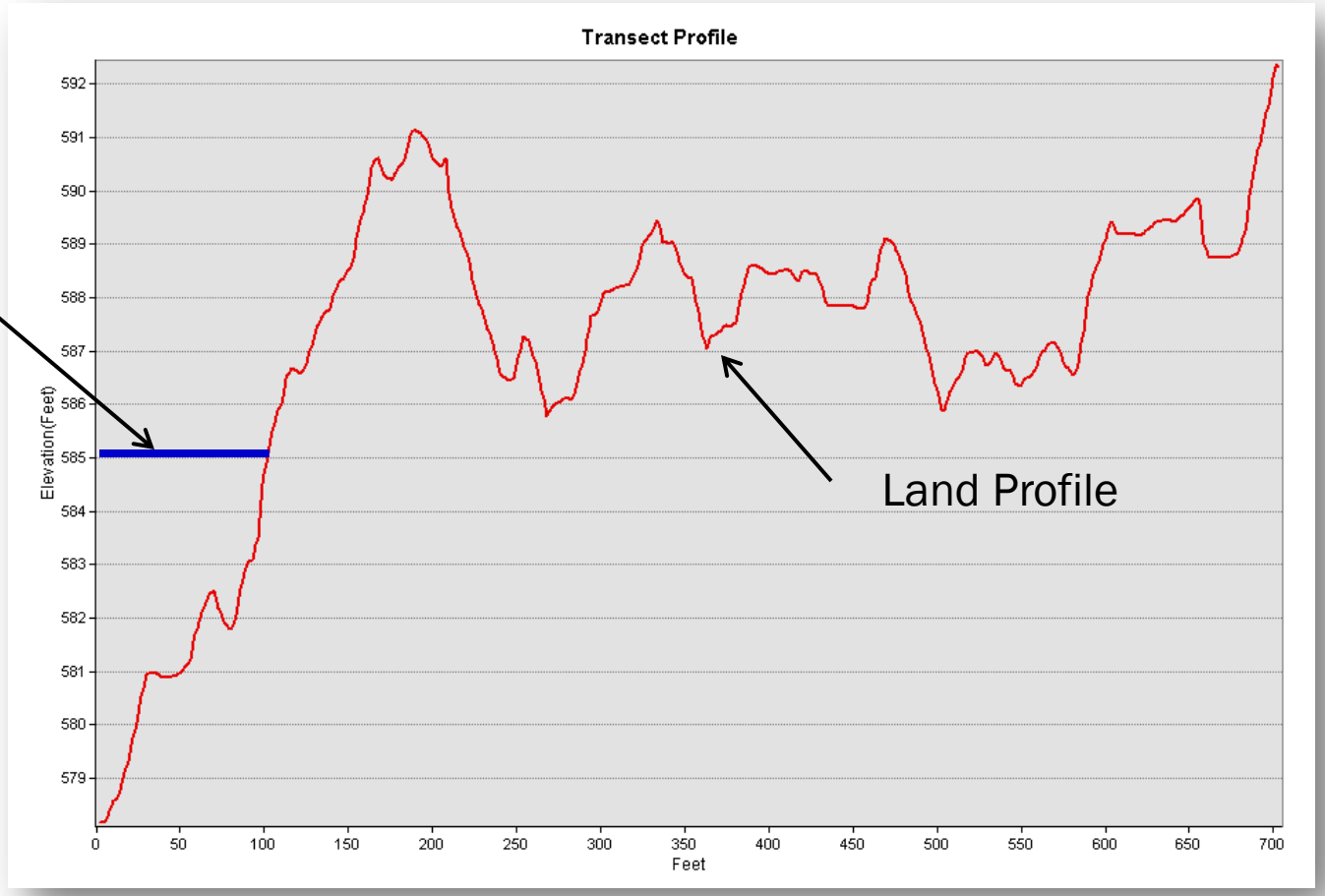
Transect Placement

- Transects are placed to define representative profiles for a shoreline reach
- Transect spacing depends on upland development
  - Developed areas – As dense as 1,000 ft
  - Rural areas – Spacing can be 1-2 miles
- Transects are:
  - Profiles along which flooding analysis is performed
  - Used to transform offshore conditions to shoreline
  - Use to define coastal flood risks inland of shoreline



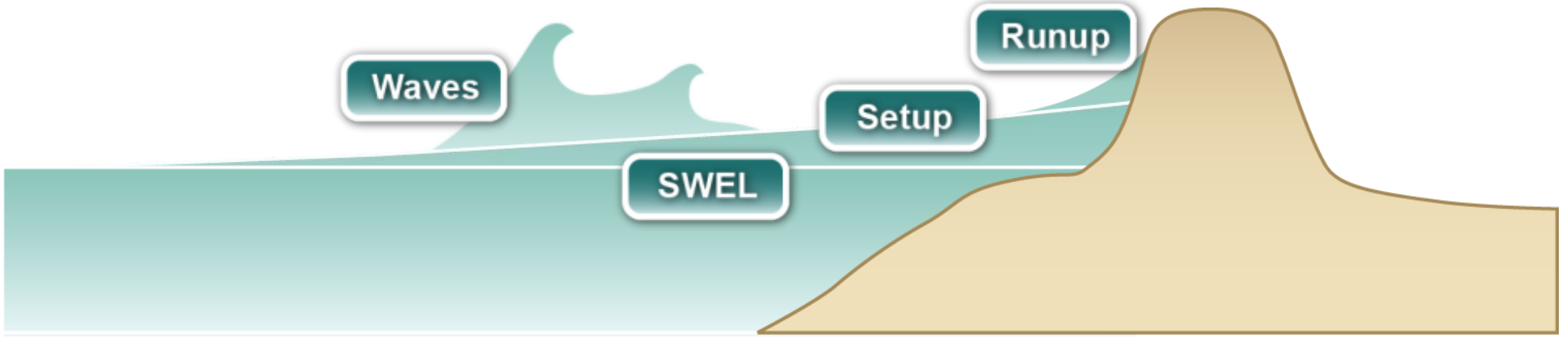
Coastal Transect



Basic Elements of a Coastal Hazard Analysis

Base Flood Elevation (BFE) on FIRM includes 4 components:

1. Stillwater elevation (SWEL) – determined from storm surge model
2. Amount of wave setup
3. Wave height above storm surge (stillwater) elevation
4. Wave runup above storm surge elevation (where present)



Coastal Flood Hazard Zones

- **Hazard Zones**
  - Zone AE – Areas expected to be flooded by inundation in 100-year event
    - BFE established (wave heights/runup less than 3 feet)
    - Limit of Moderate Wave Action (LiMWA) – Areas subject to wave heights of at least 1.5 feet
  - Zone X – Areas not expected to be flooded in 100-year event
    - Shaded X – Areas expected to be flooded in 500-year event
    - BFE not established
  - Zone VE – Areas expected to be affected by high velocity wave impact in 100-year event (wave heights or runup depth greater than or equal to 3 feet)
    - Base Flood Elevation (BFE) established
- **Gutters**
  - Internal zone breaks where BFE changes
  - VE/AE Gutter - Location where risk of damage due to wave action diminishes

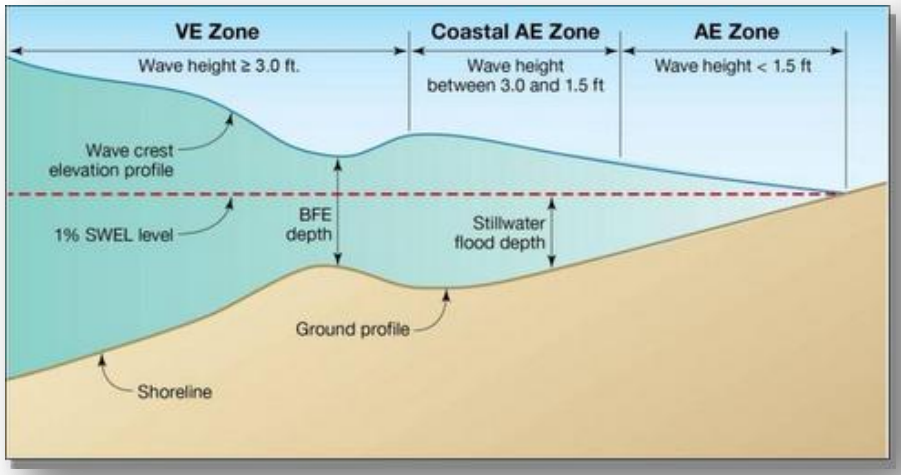
How is Limit of Moderate Wave Acton (LiMWA) Defined?

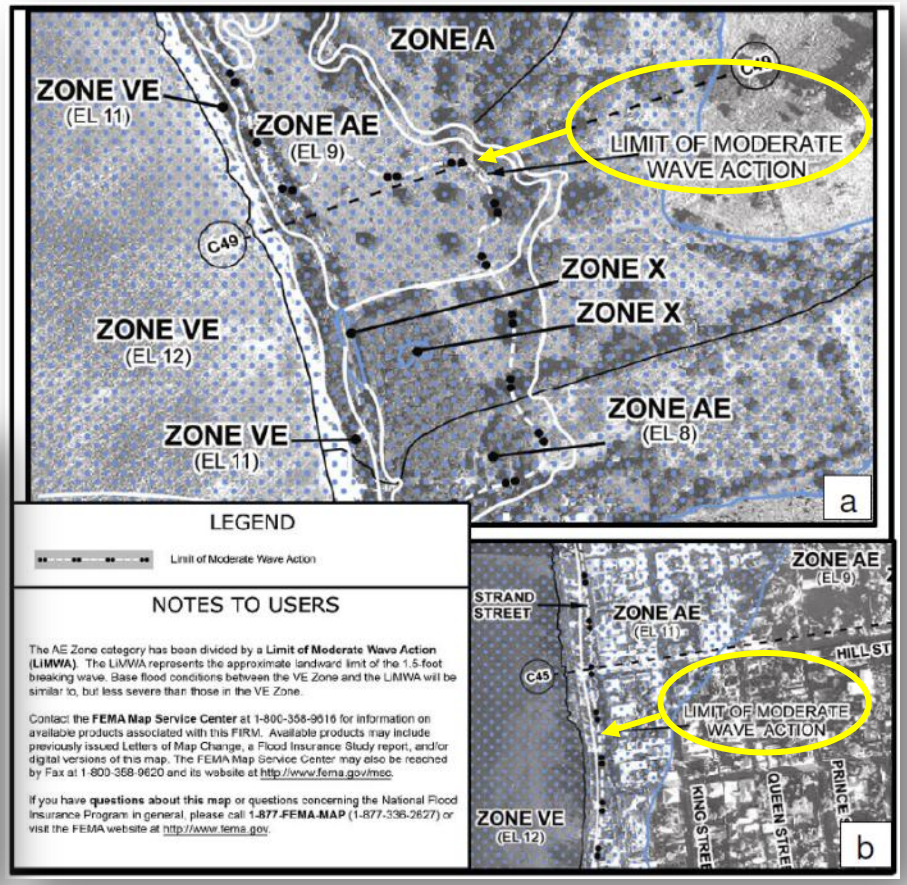
- LiMWA is the line mapped to delineate the inland extent of wave heights of at least 1.5 feet
  - Wave heights as small as 1.5 feet can cause significant damage to structures
- LiMWA is the same as coastal AE zones and can trigger coastal building codes for certain communities
- Community Rating System (CRS) benefits for communities implementing higher construction standards

Limit of Moderate Wave Action (LiMWA)

FEMA Procedure Memorandum No. 50, 2008

- Not a regulatory requirement
- No Federal Insurance requirements tied to LiMWA





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Wave Action – Structural Risk

- **US Army Corps of Engineers – 1973**
  - Breaking wave height of 3 feet
  - "area subject to high velocity waters, including but not limited to hurricane wave wash"
- **FEMA – 2000**
  - Coastal Construction Manual
  - Additional post-storm damage assessments identified 1.5 wave also can knock a structure off a foundation

http://www.fema.gov/pdf/rebuild/mat/coastal_a_zones.pdf

V Zones for Lake Michigan?

- Lake Michigan communities currently do not have V/VE Zones. Majority of the communities have coastal A/AE zones.
- If coastal AE and VE Zones are added on maps where they did not exist before, all affected communities must update regulations to include coastal requirements.
  - State will provide regulations assistance and technical support if/when coastal flood zones are added.

FEMA

Coastal Flood Risk Products

- Coastal Depth Grids and HAZUS
- Changes Since Last FIRM
- Coastal Non-Regulatory Products

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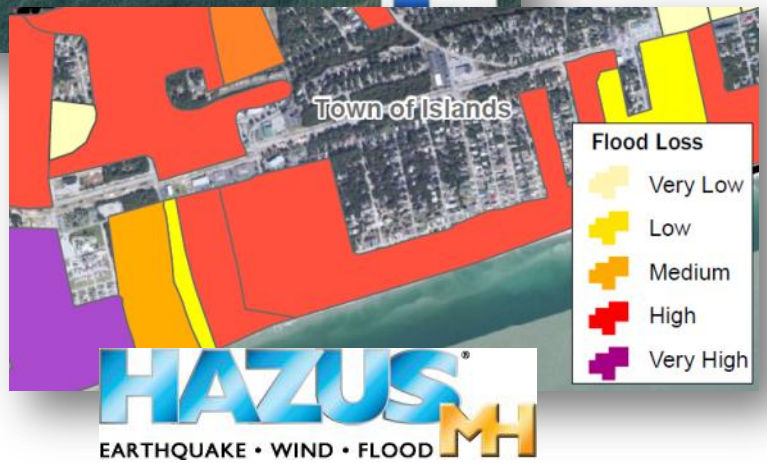
Standard Flood Risk Products

- Coastal Depth Grids
- Flood Risk Assessment (HAZUS)
- Changes since last FIRM

Data Fields Include	Example Data Values
Old Study Date	e.g. 1985
Old Model Type(s)	e.g. HEC-1 / HEC-2
Old Zone Type	e.g. Zone A
Old Topography	e.g. USGS 10-ft
New Study Info/Methods	Dates, Models, etc.
New Study Zone	e.g. Zone AE
New Topography	e.g. LiDAR 2-ft
New Study Engineering Factors / Changes	e.g. new structures, gages, topo, landuse, etc.
Estimated Structures	e.g. 9
Estimated Population	e.g. 27



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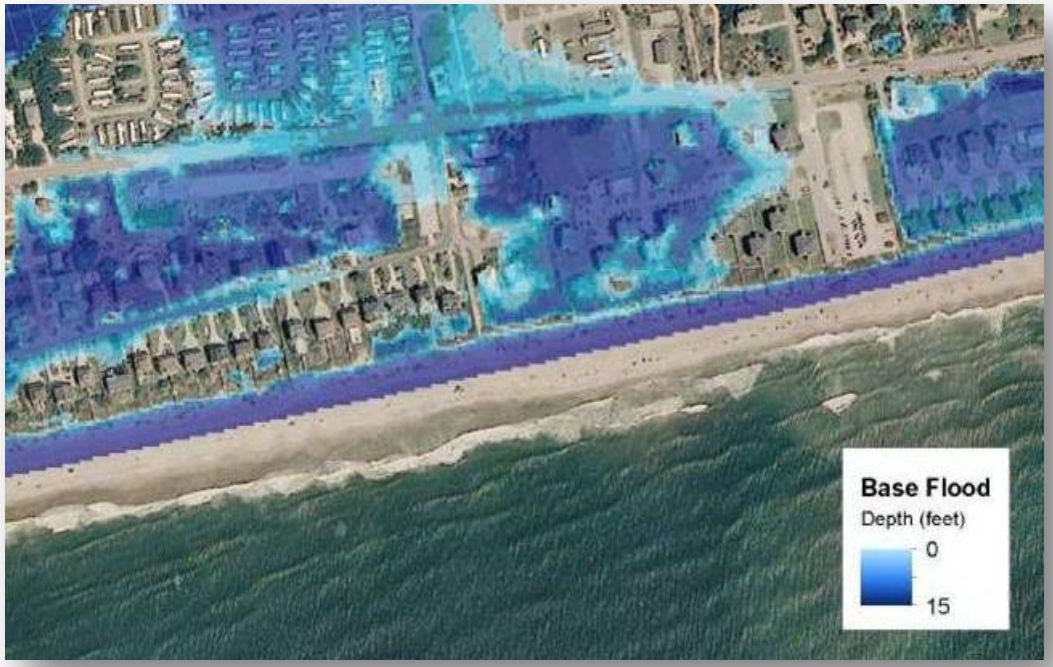
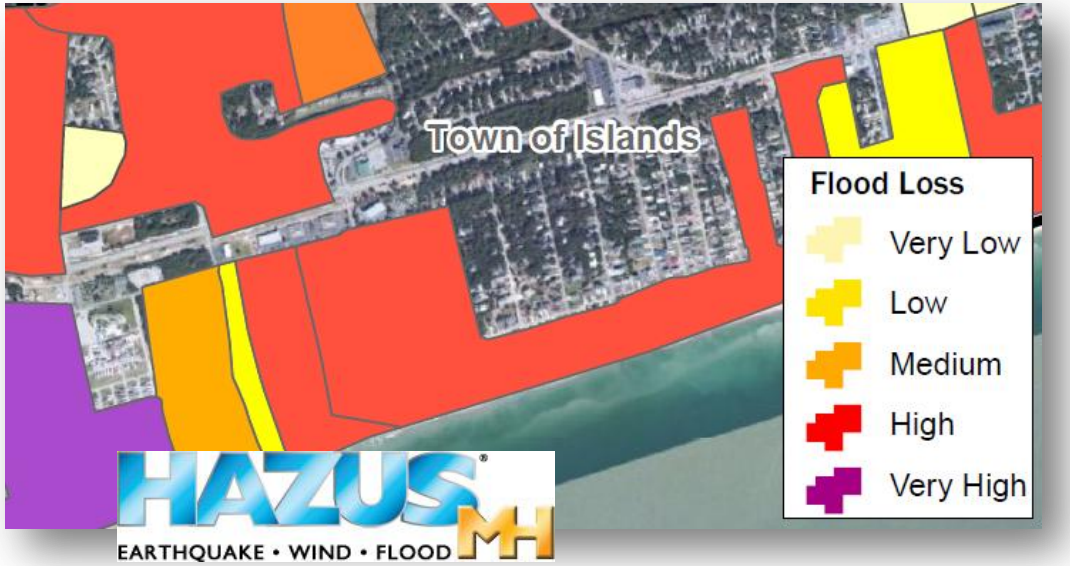
Coastal Depth Grid

- Should reflect total depth (i.e. stillwater and waves) – typically only produced for the 1% annual chance flood
- Created using the regulatory mapping and associated zone breaks as input



Coastal Flood Risk Assessments

- Similar to Flood Risk Assessments for riverine, but using the coastal depth grids as input for the refined analysis
- Hazus analysis and data can support adoption of higher regulatory standards for structures in high loss areas
- Provides justification to fund mitigation actions



Changes Since Last FIRM

Data Fields Include	Example Data Values
Old Study Date	e.g. 1985
Old Model Type(s)	e.g. HEC-1 / HEC-2
Old Zone Type	e.g. Zone A
Old Topography	e.g. USGS 10-ft
New Study Info/Methods	Dates, Models, etc.
New Study Zone	e.g. Zone AE
New Topography	e.g. LiDAR 2-ft
New Study Engineering Factors / Changes	e.g. new structures, gages, topo, landuse, etc.
Estimated Structures	e.g. 9
Estimated Population	e.g. 27

Coastal Non-Regulatory Products in Development

FEMA

Erosion

Red Lantern Restaurant, Lake Michigan, IN

Lake Levels

Lake Michigan Shoreline
Reference

Shoreline Feature Dataset

Upper Peninsula Shoreline
Reference

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Shoreline Features Database

Shoreline Material
Sand
Cohesive
Cobble
Diamicton*
Shingle
Bedrock
Artificial

Primary Land Use
High Density Residential
Moderate Density Residential
Low Density Residential
Commercial/Industrial
Park Land
Farm Land
Forested

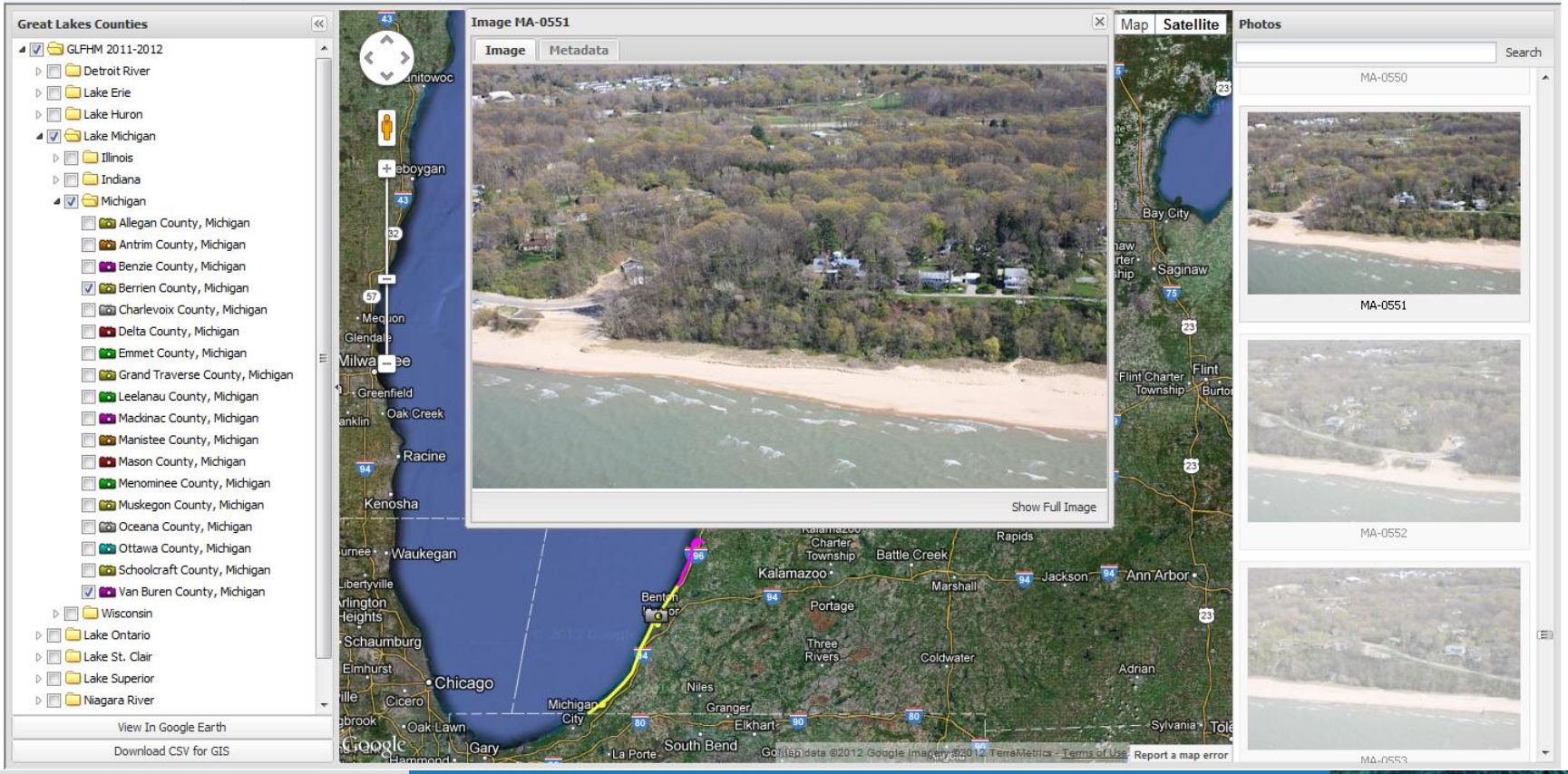
Primary Coast Type
High Dune, 10'+
Dune, 2' - 10'
High Bluff, 10'+
Bluff, 2' - 10'
Coastal Wetland
Flat Coast

Primary Vegetation
None
High Density Shrubs/Trees
Moderate Density Shrubs/Trees
Low Density Shrubs/Trees
Manicured Lawn
Native Vegetation

- Contains primary and secondary Land Use tables – same for coast type and vegetation
- Current project collects data at one-mile spacing, for scoping and cost
- Current project does not include field-based reconnaissance or sediment/subsurface soils collection

USACE Oblique Aerial Photo Viewer

http://greatlakes.usace.army.mil/



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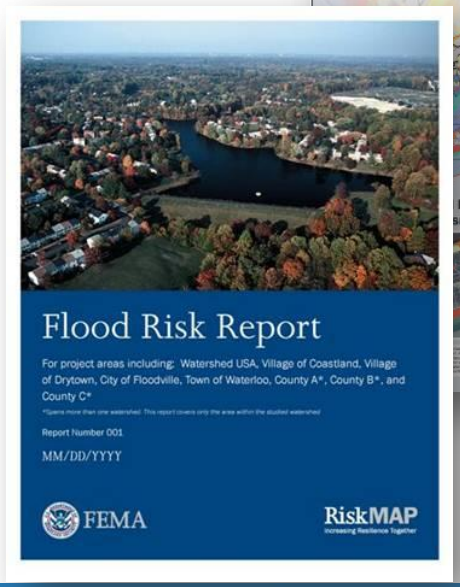
Coastal Flood Risk Map and Report

- Highlights area where datasets were produced
- Use of callout boxes
- Should drive the conversation towards mitigation



RiskMAP
Increasing Resilience Together

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greatlakescoast.org

How Can You Use These (Non-Regulatory) Products?

- Risk MAP Products and Datasets help communities make good decisions to reduce flood risk:
  - Hazard Mitigation Planning
  - Floodplain Management and Community Rating System
  - Community Comprehensive or General Planning
  - Community Investment - Capital Improvement Planning
  - Public Outreach
  - Hazard Mitigation Assistance Grant Application Prioritization and Support
  - Other Non-FEMA Grants to Reduce Flood Risk
  - Response and Recovery Planning
- Mitigation Action Form

FEMA

How does this apply to my community?

- NFIP Compliance
- Local impacts of coastal study

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National Flood Insurance Program (NFIP)

- Allows property owners to purchase flood insurance at reduced rates
- Community responsibilities
  - Adopt and enforce compliant regulations
- FOCUS is in building the local floodplain management capability

Coastal Zones and NFIP Compliance

- Must meet minimum NFIP and community coastal requirements
- V Zones will be treated as floodways for ordinance purposes and construction will be restricted in these areas.
- Recommendations for exceeding the minimum NFIP requirements (Coastal A Zones)
  - Can obtain CRS credits for Coastal A Zone Requirements
- Resources Available

Community Rating System (CRS)

- Flood insurance premium rates discounted to reward community actions that reduce flood losses, facilitate accurate insurance ratings, and promote the awareness of flood insurance
- Class rating system from 1 to 10
- Each Class improvement (500 point increments) results in additional 5% discount, up to 45% in SFHAs for Class 1 communities
- Uniform minimum credits give you points for activities on the state level (state laws) and make achieving a Class 9 relatively easy
- 18 creditable activities organized under four categories:

Public Information	Mapping and Regulations
Flood Damage Reduction	Flood Preparation

- http://training.fema.gov/EMIWeb/CRS/

FEMA

Hazard Mitigation

- Opportunities
- Grant Funding

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Great Lakes Coastal Flood Study
HM Resources, Strategies & Actions

FEMA

- The right action (or mix of actions) will be based on recent community experiences and level of complexity in existing infrastructure
  - *Public Works*
  - *Building Standards*
  - *Community Planning and HM Plan Update / Integration processes*
  - *Communication Processes, GIS, etc.*
- Get the right people to the table: Integrated vs. Discipline-specific
- Document ideas and actions through the FEMA Action Tracking form

Land Use Ordinances	Local Building Codes	Mitigation Projects	Community Identified Mitigation Programs	Management Best Practices
Zoning, Setbacks, Floodplain Management, etc.	IBC, IRC, Local Regulations, etc.	Acquisition, Elevation, Floodproofing, etc.		Integration of natural hazards into other planning mechanisms

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Example Mitigation Actions

STRUCTURAL /NON-STRUCTURAL PROJECTS

Detention
Drainage
Acquisition
Elevation
Retrofits

PLANNING MECHANISMS

Zoning
Building Codes
Ordinances
Open Space Plan

EDUCATION & OUTREACH

Public Awareness
Outreach
Educational programs

NATURAL RESOURCE PROTECTION

Stream and wetland restoration
Erosion control

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Local Hazard Mitigation Plans

Risk MAP
Risk MAP products and Datasets

Hazard Mitigation Plan
- Uses Risk Information
- Identifies Projects/Actions
- Integrated with Other Community Plans

Other Community Plans
- Comprehensive plans
- Land Use Plans
- Capital Improvement
- Stormwater
- Management Plans
- Emergency Operations

Mitigation Actions/Projects

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Mitigation Actions

- Address specific **existing** assets (e.g., elevate critical facility, enlarge a culvert, acquisition of floodplain properties, floodproof floodproone properties)
- Address **future** risks (e.g., update building codes)
- Based on local capabilities
  - Build on current strengths, ongoing efforts (add-on to stormwater management regulations)
  - Coordinate with Federal programs (e.g., NFIP, CRS)

FEMA Funding Opportunities

- Hazard Mitigation Assistance includes both post-disaster and pre-disaster grants

HMGP is a post-disaster grant program.

PDM, FMA, RFC and SRL are available annually, subject to Congressional appropriations.

- Mitigation Plan Requirement
- Local/State Cost Share
- States Manage Programs and Set Funding Priorities
- State Hazard Mitigation Officer (SHMO) is contact

Mitigation Grants/Programs: Other Federal Agencies (OFA)

FEMA

US Army Corps of Engineers®

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Meet the Action Form

Mitigation Action Form

Contact Information

Please enter the primary contact assc

1. **Full Name:**

2. **Title and Organization :**

3. **Jurisdiction Name(s) :**

Mitigation Action Information

4. **Mitigation Activity Name**

5. **Describe the natural hazard and mitigati**

6. **Hazard Type?**

☐ *Flood* ☐ *Erosion* ☐*Storm Sur*
☐ *Landslide* ☐ *Lighting* ☐ *Seve*
☐ *Wind* ☐ *Multiple Hazards* ☐

7. **What is the Mitigation Category?**

☐ *Local Plans and Regulations*
*Category*_____

8. **How was this action/strategy identi**

☐ *Risk Map Process*
☐ *Comprehensive Land Use Plan*
☐ *Capital Improvement Plan*

9. **Who is the Responsible Agency?**

☐ *Building Code Department*
☐ *Community Development*
☐ *Emergency Management*

9. **Who is the Responsible Agency?**

☐ *Building Code Department* ☐ *Planning* *Other*_____
☐ *Community Development* ☐ *Public Works*
☐ *Emergency Management* ☐ *State DOT*

10. **What is the expected/potential funding source?**

☐ *Community* ☐ *FEMA*
☐ *Private Sector, including Foundations* ☐ *Other Federal Agency*
☐ *Regional Water Management District* ☐ *Property Owner*
☐ *County* ☐ *Other*_____
☐ *State*

11. **What is the commitment for this action?**

☐ *new* ☐ *strengthen existing* ☐ *maintain existing*

12. **What is the status of this action?**

☐ *identified* ☐ *scoped* ☐ *in progress* ☐ *complete*

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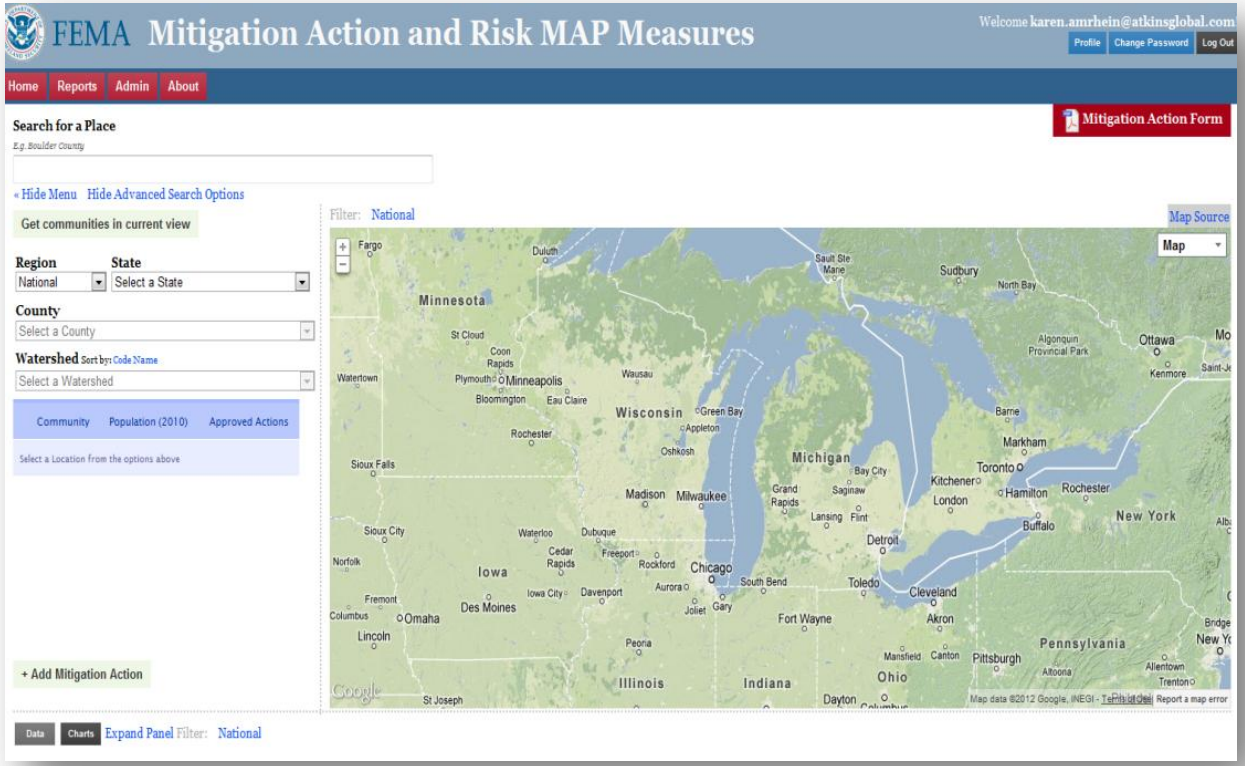
Action Tracker



We will input your community's action into the Action Tracker and send you a report and a link - http://fema.starr-team.com

- New mitigation tool
- Houses community-identified mitigation actions
- Actions can be edited by community officials
- A tool for communities to support future mitigation planning efforts

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Next Steps

- **Communities:**
  - Provide data and Mitigation Action Forms to STARR with a target date of September 28, 2012

- **STARR/FEMA will:**
  - Assess data and information provided
  - Email summary of today's Discovery Meeting to you within one month
  - Prepare final Discovery Maps and Discovery Report
  - Follow-up regarding Risk MAP Project

FEMA

Questions?

RiskMAP
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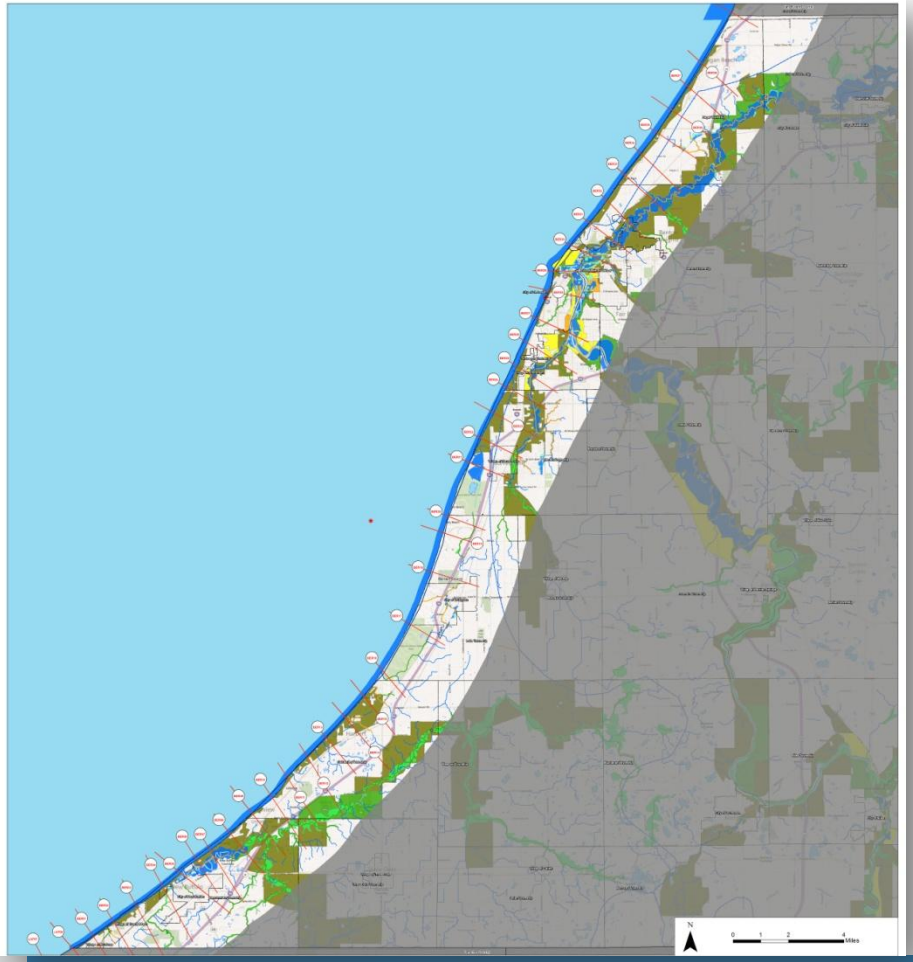
FEMA

Interactive Session

- View and Discuss Local Coastal Areas of Concern Using the Discovery Map
- Discuss Mitigation Action Opportunities and Introduce the Mitigation Action Form

Berrien County, MI
Discovery Map

FEMA



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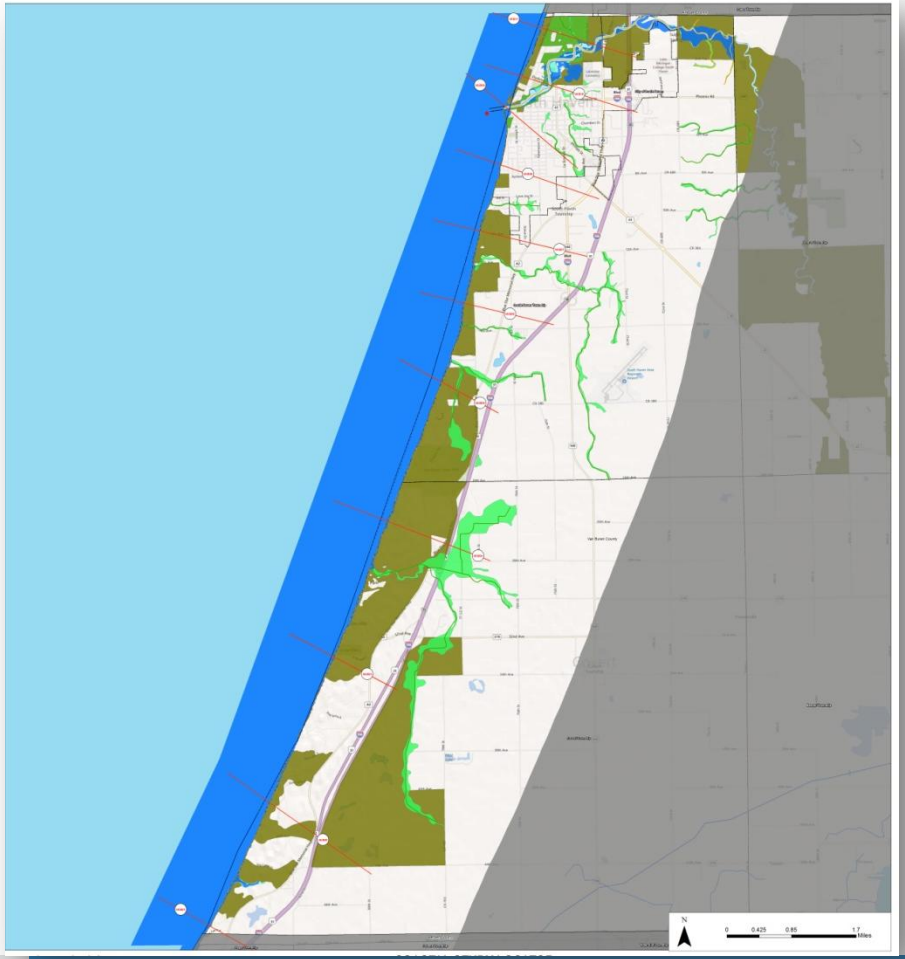
Van Buren County, MI Discovery Map

FEMA



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Data Gaps

Do you know of any:

- Building footprints
- Coastal Structures
- Critically eroded beach areas
- Coastal construction control/setback line
- Critical Facilities (in GIS format)
- High water marks
- Areas of recent or planned development
- Areas of high growth
- Recent land changes due to development, erosion, etc.
- Known flooding issues not represented on effective FIRMs

Contact

- FEMA Region V
  - Ken Hinterlong @ ken.hinterlong@fema.dhs.gov
  - Erin Maloney @ Erin.Maloney@fema.dhs.gov
- Michigan Partners
  - Linda Burke (MDEQ) @ BURKEL4@michigan.gov
- STARR
  - Stacey Roberts (technical) @ stacey.roberts@starr-team.com
  - Holly Davis (outreach) @ holly.davis@starr-team.com
- Online
  - info@greatlakescoast.org

Optional Interactive Stations

- **Draft Transect Map Station**
  - View draft transect locations and oblique imagery in data viewer http://greatlakes.usace.army.mil/
  - Discuss draft transect locations with technical staff
- **Mitigation Resources, Strategies, and Actions Station**
  - Talk with FEMA and State representatives about areas of concern and potential mitigation actions to help reduce risk
  - Fill out Mitigation Action Form

Attachment G.

Hazard Mitigation Actions for Berrien and Van Buren Counties, MI

Name of Plan	County	Hazard Mitigation Actions and Strategies
Berrien County Hazard Mitigation Plan 2012	Berrien County	Improve warning systems to adequately warn the public in high-risk areas.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Improve communication systems to better respond to disasters.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Better serve elderly, disabled and LEP (Limited English Proficiency) populations.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Maintain and protect essential public services, critical facilities and public infrastructure.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Require new development to pay the full cost of protection measures.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Protect floodplains, wetlands and other important natural areas. Limit building in high-risk areas.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Improve building construction.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Develop public/private partnerships to implement mitigation activities
Berrien County Hazard Mitigation Plan 2012	Berrien County	Leverage grant dollars by using county/municipal funds to implement mitigation activities.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Encourage people to assume some responsibility for their own protection.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Develop public outreach campaigns about priority hazards to make people aware of hazards and mitigation activities.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Involve local municipalities and general public in hazard mitigation planning.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Keep current siren systems functioning and in good repair.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Evaluate the need for expanded warning siren coverage.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Continue to improve weather forecasting abilities.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Explore the feasibility of utilizing the EAS (Emergency Alert System) to warn and provide instructions for residents during hazard events.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Purchase and install warning sirens on public beaches.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Continue to produce and distribute family preparedness information. Also, place information on county website.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Translate family preparedness information into Spanish and include on website.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Distribute Red Cross brochure on the need for homeowners and renters to purchase adequate insurance coverage.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Distribute Red Cross information regarding the need for home disaster plans.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Work with partners to develop methods for disseminating multi lingual hazard warnings for non- English speaking residents of the County.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Help partner agencies to publicize existing services for special populations
Berrien County Hazard Mitigation Plan 2012	Berrien County	Assist local businesses in planning for and responding to natural hazard events when they do occur.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Develop partnerships with business associations to develop a mechanism for assessing damages, estimating indirect losses and reporting information about local businesses after a disaster.

Name of Plan	County	Hazard Mitigation Actions and Strategies
Berrien County Hazard Mitigation Plan 2012	Berrien County	Examine local government master plans, zoning ordinances and other documents and policies for level of preventative and other measures to be a disaster resistant community
Berrien County Hazard Mitigation Plan 2012	Berrien County	Encourage local governments to include hazard mitigation concepts in the development of their comprehensive plans. Distribute progress report to all units of government, encouraging further involvement in mitigation planning. Integrate report into a comprehensive biannual plan evaluation. Assist interested local governments in pursuing hazard mitigation plans.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Ensure that adequate shelters (including warming/cooling places) are available to county residents.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Expand the County GIS capabilities to assess critical facilities that are affected by several hazards.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Purchase and install permanent generator for lift station #4 and one portable generator to prevent wastewater from backing up into houses during power outages.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Install protective measures to limit stream bank erosion on Red Bud Trail.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Replace undersized culverts to reduce flooding, increase accessibility for emergency vehicles and to lessen erosion and possible future failure of the road.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Replace undersized culverts to reduce flooding of property.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Continue to determine the feasibility of reducing the flow of floodwaters over roads by evaluating road elevation and culvert sizing standards for construction and upgrade for all county roads, but especially for roads in low lying or flood prone areas.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Develop comprehensive watershed management plans and policies for Berrien County, considering the connections between land-use, urban growth, and surface water, and ground water issues.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Update FEMA flood prone maps for Berrien County.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Identify (map), conserve, and restore land of potential flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Discuss formation of a policy that guides or further restricts development around flood prone areas and areas of high flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.

Name of Plan	County	Hazard Mitigation Actions and Strategies
Berrien County Hazard Mitigation Plan 2012	Berrien County	Evaluate the County's and other units of governments' erosion control and stormwater management, floodplain zoning, and shore land zoning ordinances, and NFIP status to determine regulatory deficiencies, necessary improvements, enforcement shortcomings in order to bring governments into compliance and to strengthen and maximize the benefits of current regulations.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Improve regional stormwater management practices to minimize localized flooding. Flood management and stormwater management should form a single integrated system over the entire watershed. The streams and waterways of a watershed must be capable of carrying present and future runoff loads generated by all of the existing and future planned development patterns within the watershed. The County is uniquely situated to coordinate and facilitate projects that involve watershed or multi-jurisdictional efforts.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Promote low impact development techniques that reduce stormwater run-off and lessens flooding.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Improve citizen and local elected officials understanding of floodplain maps and floodplain regulations, flood proofing options, development and stormwater management considerations, and other information to assist in good decision-making.
Berrien County Hazard Mitigation Plan 2012	Berrien County	The County should encourage local units of government to apply structural hazard mitigation and sustainability concepts when building or remodeling their facilities.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Encourage all critical facilities to employ hazard mitigation and sustainability concepts when building or remodeling their facilities. Encourage critical facilities to plan for power outages and install back up power supplies. This should include an assessment of the applicability of renewable energy sources as a potential power supply.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Encourage and promote homeland security training of responders and government officials.
Berrien County Hazard Mitigation Plan 2012	Berrien County	Conduct annual damage assessment training for local officials and other in need of training.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Improve warning systems to adequately warn the public in high-risk areas.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Develop public outreach campaigns about priority hazards to make people aware of hazards and mitigation actions.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Maintain and protect essential public services, critical facilities and public infrastructure.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Focus on preventative measures.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Develop public/private partnerships to implement mitigation activities.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Leverage grant dollars for county/municipality agencies to implement mitigation activities.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Keep current siren systems functioning and in good repair.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Evaluate the need for expanded warning siren coverage.

Name of Plan	County	Hazard Mitigation Actions and Strategies
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Continue to improve weather forecasting abilities.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Install and test EAS (Emergency Alert System) to warn an provide instructions for residents during hazard events.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Continue to produce and distribute family preparedness information. Also, place information on county website.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Translate family preparedness information into Spanish and include on website.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Distribute Red Cross brochure on the need for homeowners and renters to purchase adequate insurance coverage.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Distribute Red Cross information regarding the need for home disaster plans.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Work with partners to develop methods for disseminating multi lingual hazard warnings for non-English speaking residents of the County.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Help partner agencies to publicize existing services for special populations (elderly, LEP, etc.)
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Assist local businesses in planning for and responding to natural hazard events when they do occur.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Develop partnerships with business associations to develop a mechanism for assessing damages, estimating indirect losses and reporting information about local businesses after a disaster.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Examine local government master plans, zoning ordinances and policies for level of preventative and other measures to be a disaster resistant community.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Ensure that adequate shelters (including warming/cooling places) are available to county residents.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Encourage and promote homeland security training of responders and government officials
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Conduct annual damage assessment training for local officials and others in need of training.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Encourage local governments to include hazard mitigation concepts in the development of their comprehensive plans. Distribute progress report to all units of government, encouraging further involvement in mitigation planning. Integrate report into comprehensive biannual plan evaluation. Assist interested local governments in pursuing hazard mitigation plans.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	The County should encourage local units of government to apply structural hazard mitigation and sustainability concepts when building remodeling their facilities.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Encourage all critical facilities to employ hazard mitigation and sustainability concepts when building or remodeling their facilities. Encourage critical facilities to plan for power outages and install back up power supplies. This should include an assessment of the applicability of renewable emergency sources as a potential power supply.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Expand the County GIS capabilities to assess critical facilities that are affected by several hazards.

Name of Plan	County	Hazard Mitigation Actions and Strategies
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Install stormwater relief drains in Hartford City to mitigate serious flooding of several houses in an older neighborhood.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Continue to determine the feasibility of reducing the flow of floodwaters over roads by evaluating road elevation and culvert sizing standards for construction and upgrade for all County roads, but especially for roads in low lying or flood prone areas.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Develop comprehensive watershed management plans and policies for Van Buren County, considering the connections between land-use, urban growth, and surface water, and ground water issues.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Update FEMA flood prone maps for Van Buren County.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Identify (map), conserve, and restore land of potential flood mitigation value. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Discuss formation of a policy that guides or further restricts development around flood prone areas and areas of high flood mitigation clue. Lands of potential flood mitigation value are wetlands, floodplain corridors, upland storage, and areas of high infiltration potential.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Improve regional stormwater management practices to minimize localized flooding. Flood management and stormwater management should form a single integrated system over the entire watershed. The streams and waterways of a watershed must be capable of carrying present and future runoff loads generated by all of the existing and future planned development patterns within the watershed. The County is uniquely situated to coordinate and facilitate projects that involve watershed or multi-jurisdictional efforts.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Evaluate the County's and local units' erosion control and stormwater management, floodplain zoning, and shore land zoning ordinances, and NFIP status to determine regulatory deficiencies, necessary improvements, enforcement shortcomings in order to bring governments into compliance to strengthen and maximize the benefits of current regulations.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Promote low impact development techniques that reduce stormwater run-off and lessens flooding.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Improve citizen and local elected officials understanding of floodplain maps and floodplain regulations, flood proofing options, development and stormwater management considerations, and other information to assist in good decision-making.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Examine and if needed replace undersized culverts to reduce flooding, increase accessibility for emergency vehicles and to lessen erosion and possible future failure of the road.
Van Buren County 2005 Hazard Mitigation Plan	Van Buren County	Repair and alleviate flooding problems (road has been closed from May 2004 to October 2004).

Attachment H.

City of St. Joseph Coastal Engineering Study (August 17, 2012)

City of St. Joseph Coastal Engineering Study

August 17, 2012

Edgewater resources

ABONMARCHE
Confidence By Design

City of St. Joseph, Michigan
Coastal Engineering Study

Prepared for:

City of St. Joseph
700 Broad Street
St. Joseph, Michigan
August 17, 2012

Prepared by:

Edgewater Resources, LLC
518 Broad Street, Suite 200
St. Joseph, Michigan 49085

Abonmarche Consultants, Inc.
95 West Main Street
Benton Harbor, Michigan 49022

Table of Contents

PURPOSE

This report is intended to evaluate the Lake Michigan coast within the St. Joseph City Limits and to provide recommendations for shoreline management to best preserve the public trust property along the shoreline and protect private interests and property, taking into consideration the unique characteristics and circumstances of the shoreline in different areas of the city that will govern the shoreline management approach. The recommended shoreline management approach is intended to help city policy makers as they evaluate options to further public purposes such as protecting natural resources; preserving the Lake Michigan shoreline, advancing the economic and environmental well-being, health, safety, and general welfare of the City; and preserving/enhancing property values by preserving the natural character of the shoreline.

EXECUTIVE SUMMARY

AREA 1

Area 1 is bookended by public parks at either end that are connected by uninterrupted public trust property and to private property. To preserve this public trust property, reduce the risks of coastal hazards to private property, and maintain the natural shoreline, we recommend the implementation of a fixed setback line, based on coastal engineering principles. The setback line would prevent the construction of structures within a fixed area adjacent to Lake Michigan and prevent the need for shoreline protection structures that cause unnatural erosion and irreversible damage to the shoreline and adjacent property.

AREA 2

Area 2 contains public parks at both ends and publicly-owned shoreline along its entire length. The area is fully developed and shallow lots prevent structures from being built significantly further from the lake than existing structures. This area is already impacted by existing shore protection activity. To protect existing structures during periods of high water, more substantial shoreline protection structures may be required. We recommend the implementation of design guidelines to preserve public access, while allowing property owners to construct, if necessary, properly designed shoreline protection structures which could ultimately become one unified structure.

AREA 3

The entire shoreline of Area 3 contains existing shoreline protection structures, including stone revetments, sheet piling, groins, and timber structures. Steep bluffs containing cohesive soils line the shoreline and the structures are necessary for the protection of the bluffs against erosion. The steep bluffs and shoreline structures restrict public access. We do not recommend additional regulation of shoreline protection structures in Area 3.

STUDY AREAS

AREA 1

Area 1 includes the St. Joseph shoreline from the south limit of Jean Klock Park to the north line of the St. Joseph River. The public trust property in this area varies in width and extends from the water line to the Natural Ordinary High Water Mark (NOHWM). Structures in this area are generally located at least 300 feet inland from the Ordinary High Water Mark (OHWM), with a few exceptions that are as close as 70 feet from the OHWM.

Figure 1: Area 1 Aerial

Area 1 is bordered on both ends by public parks, with Jean Klock Park to the north and Tiscornia Beach to the south. Between the parks, private properties exist and many of the lots extend several hundred feet southeast to the street known as Ridgeway. Currently, no shore protection structures exist within Area 1, apart from the federal navigation structure at the southerly limit of the area. The entire shoreline here is sandy beach and the southern half of Area 1 is typically an accretion zone, but subject to erosion at times.

AREA 2

Area 2 includes the St. Joseph shoreline from the south pier of the St. Joseph River to the north limit of the St. Joseph Water Plant. This area includes two public parks, with Silver Beach located at the north end and Lions Park Beach located at the south end.

The entire shoreline here is publicly-owned with some existing federally-constructed shore protection structures and some private shore protection structures on adjacent private property. In some circumstances, the Lake Michigan water line can reach private property at the southern extents of the residential neighborhood.

Area 2 consists of sandy beach, with some coarse fill from past beach nourishment. This area receives beach nourishment from federal dredging operations on a regular basis, typically annually, because it is subject to erosion. Public access along the public trust property can vary, depending on lake conditions, erosion, and beach nourishment. Private properties that border Area 2 between Silver Beach and Lions Park Beach are fully developed and parcels are typically very shallow in comparison to those in Area 1, none exceeding 132 feet in depth.

Figure 2: Area 2 Aerial

AREA 3

Area 3 includes the St. Joseph shoreline from the north limit of the St. Joseph Water Plant to the south City Limit, just south of Orleans Circle.

Figure 3: Area 3 Aerial

Little to no meaningful public trust property exists here due to limited access, high bluffs, stone revetments, and other existing shoreline protection structures. The shores within Area 3, in contrast to Areas 1 and 2 are composed of cohesive material and the entire shoreline here contains shore protection of varying types and states of repair.

DEFINITIONS & COASTAL CONSIDERATIONS

VERTICAL DATUM

All elevations within this study are in reference to the International Great Lakes Datum, 1985 (IGLD 85), unless otherwise noted. Some elevations within the study are converted from other datums which were referenced in original documents. A table summary of the key elevations and conversions is located in Appendix 1.

WAVES

A wave is defined as the difference in elevation between the wave's crest to its neighboring trough. In order to standardize wave heights for statistical analysis, wave heights are generally referred to as significant wave heights. A significant wave height was originally defined as the average wave height of the largest third of the waves; it is now commonly defined as four times the standard deviation of the surface elevation of the water.

According to the U.S. Army Corps of Engineers Wave Information Studies (WIS) for St. Joseph, the 50-year event peak wave height is 7 meters, or 23 feet, and the 100-year event peak wave height is 7.5 meters, or 24.6 feet. A 50-year event has a 2% chance of being equaled or exceeded in any single year and a 100-year event has a 1% chance of being equaled or exceeded in any single year.

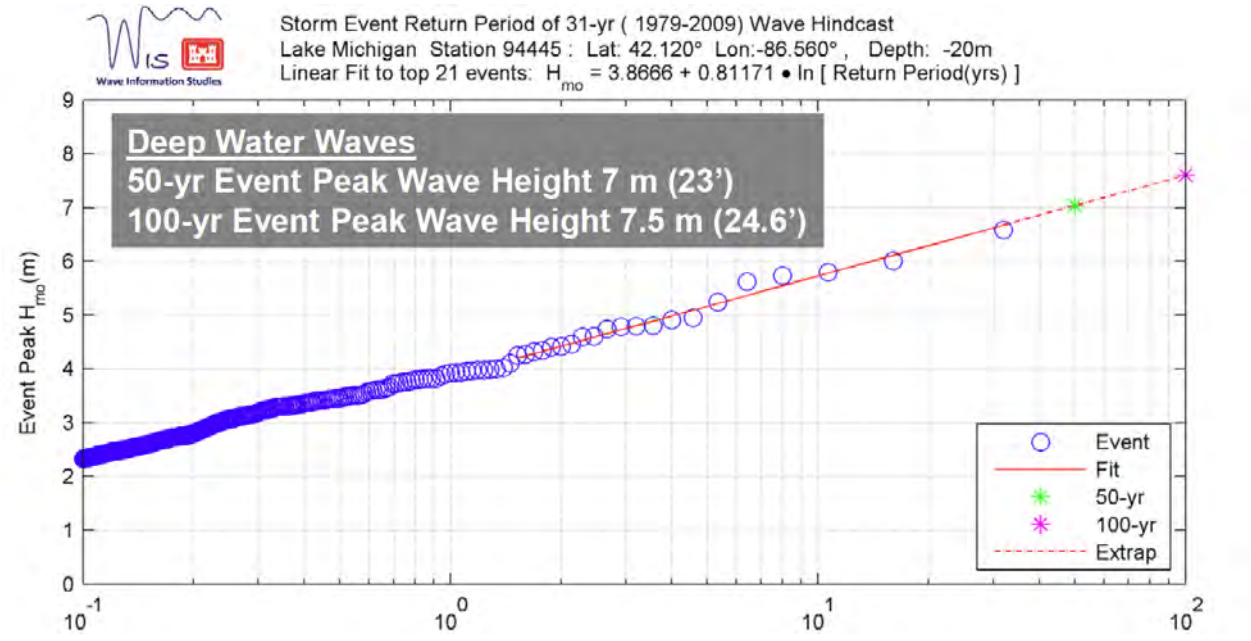


Figure 4: U.S. Army Corps of Engineers WIS Data

Also according to the Wave Information Studies, wind occurs most frequently from the south-southwest direction, and high frequencies of wind also occur from the southwest and north-northwest directions (Figure 6). The greatest frequency of wave occurrence, however, is from the north-northwest, due to the long wave fetch in the north-northwest direction (Figure 7). Wave fetch is the distance over which wave-generating winds travel. In St. Joseph, although winds come from the south-southwest most frequently, the fetch in that direction is only 25 miles, so waves have a relatively short distance to form. When winds come from the north-northwest, the fetch distance is 150 miles and extreme waves can be generated. Figure 5 illustrates the St. Joseph fetch distances for each of the two most predominant wind directions.

Figure 5: Fetch Distances for St. Joseph

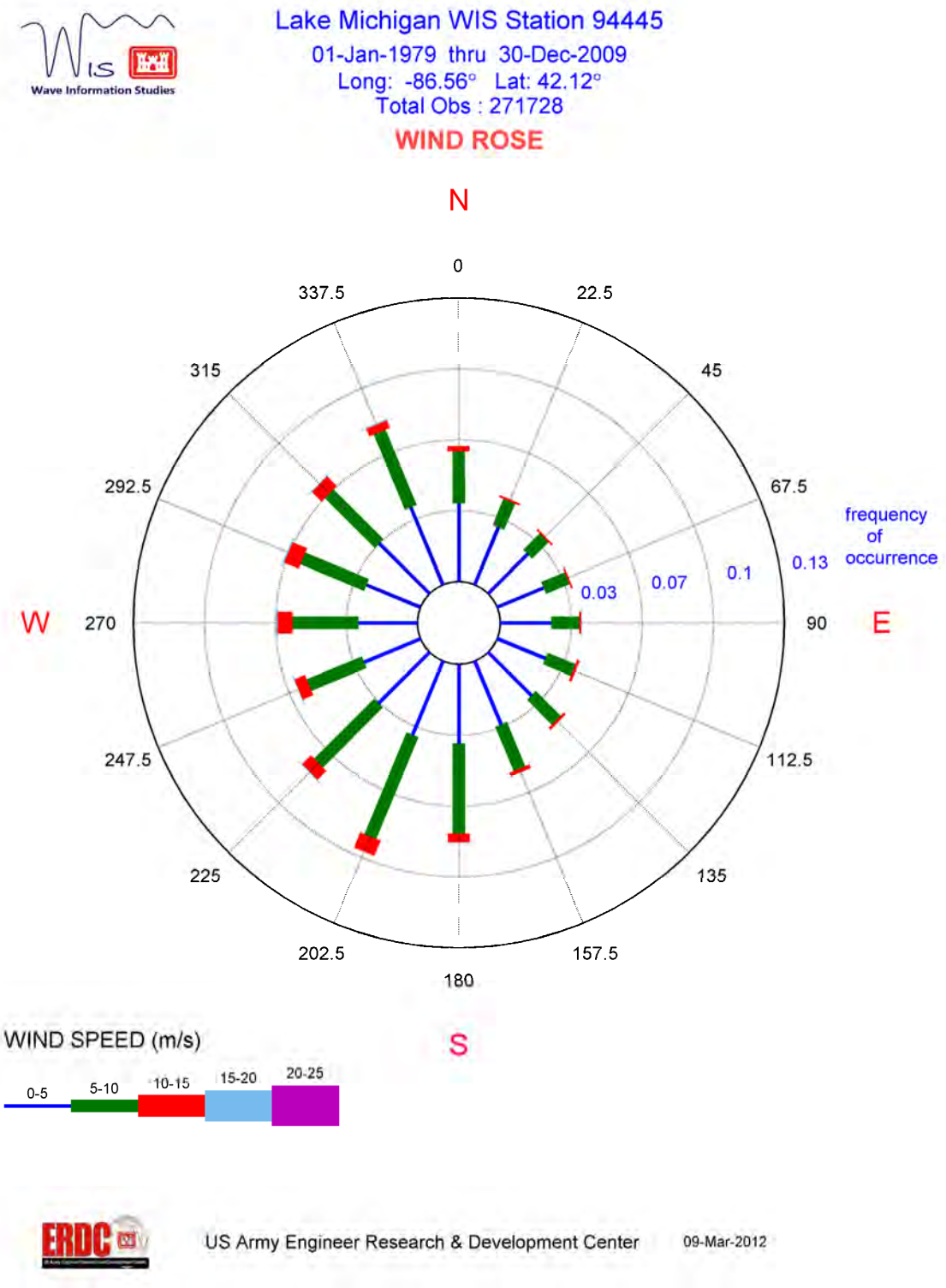


Figure 6: U.S. Army Corps of Engineers WIS Wind Rose

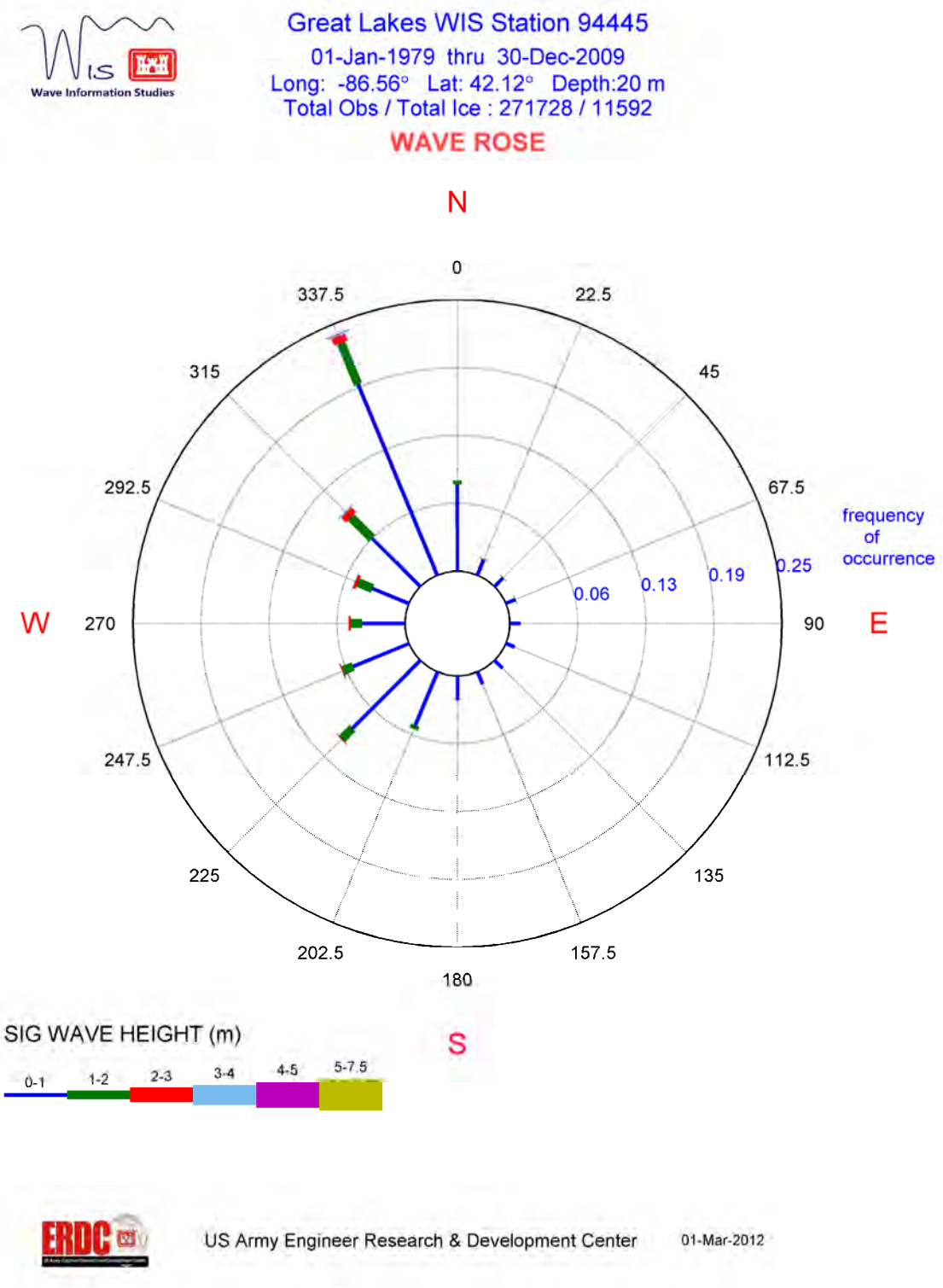


Figure 7: U.S. Army Corps of Engineers WIS Wave Rose

As a strong, sustained wind with a large fetch blows across open water, some of its energy is transferred to the water. This energy transfer causes water to be dragged with the wind, causing a storm surge, or set-up, to occur on the leeward (downwind) side of the water body. This set-up inversely causes a set-down on the windward (upwind) side of the water body. This relationship is shown in Figure 8. Set-ups and set-downs can also be caused by sudden changes in atmospheric pressure on the lake. Since it is located on the side of Lake Michigan that is typically leeward, St. Joseph is highly susceptible to wave set-ups ranging from two to three feet. These set-ups, combined with large wave heights during a storm event, can create extreme shoreline conditions.

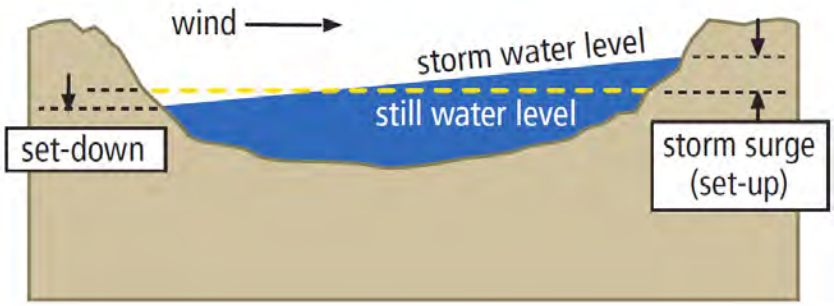


Figure 8: U.S. Army Corps of Engineers/University of Wisconsin. *Living on the Coast*. USA: U.S. Army Corps of Engineers/University of Wisconsin, 2003. Print.

WAVE RUNUP

Wave runup is defined as the landward extent of wave uprush measured vertically from the still water level (Figure 9). Runup is largely dependent on deep water wave height, wave period, slope of lake bottom, and slope of shoreline. The calculated 2% wave runup of a 50-year deep water wave that propagates to shore for Area 1 is 7.0 feet and the average calculated 2% wave runup for Area 2 is 6.0 feet, both relative to still water elevation. The primary difference in runup is attributed to slope/bathymetry differences between the areas.

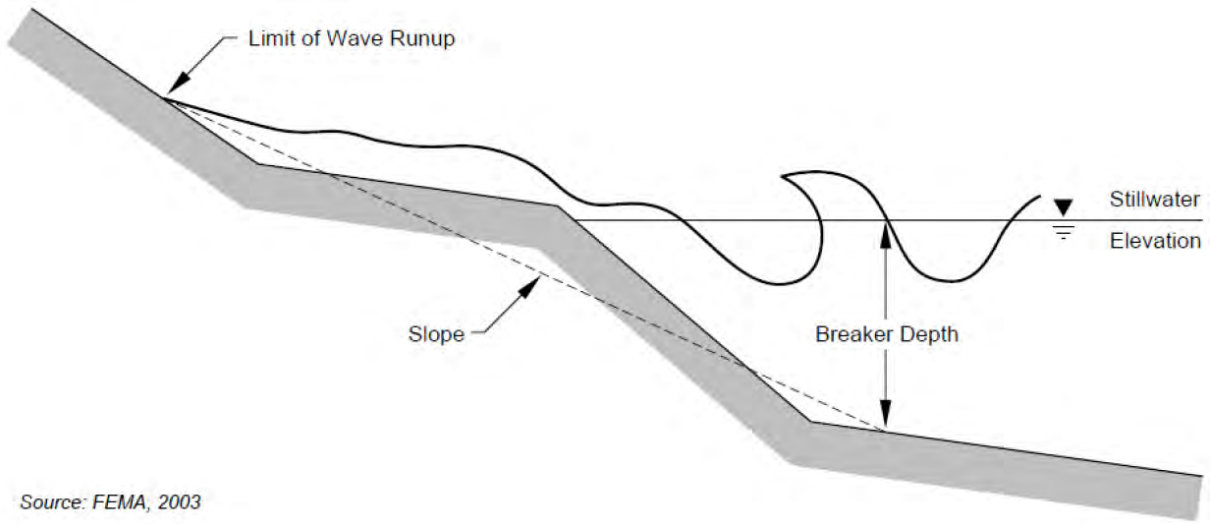


Figure 9: FEMA Wave Runup Graphic

LAKE MICHIGAN WATER LEVEL

Water levels are typically expressed in reference to a static elevation referred to as low water datum (LWD). The low water datum of Lake Michigan is elevation 577.5' IGLD 85. As of the August 2012 U.S. Army Corps of Engineers (USACE) Lakes Michigan-Huron Water Level Bulletin (see Appendix), the current water level is +0.2' LWD. The long-term average level for August is +1.8' LWD, meaning that Lake Michigan is currently in a low lake level condition.

The USACE has monitored and recorded Great Lakes water levels since 1918 (Figure 10). Over this period, the long term lake water level fluctuates between -1.3' LWD and +4.9' LWD, a range of 6.4 feet. The all-time high occurred in 1986 and the all-time low occurred in 1964. On the date of survey, the Lake Michigan water level was +0.4' LWD. Figure 10 illustrates the horizontal movement of the water line in Area 1resulting from long term water level fluctuations and accretion.

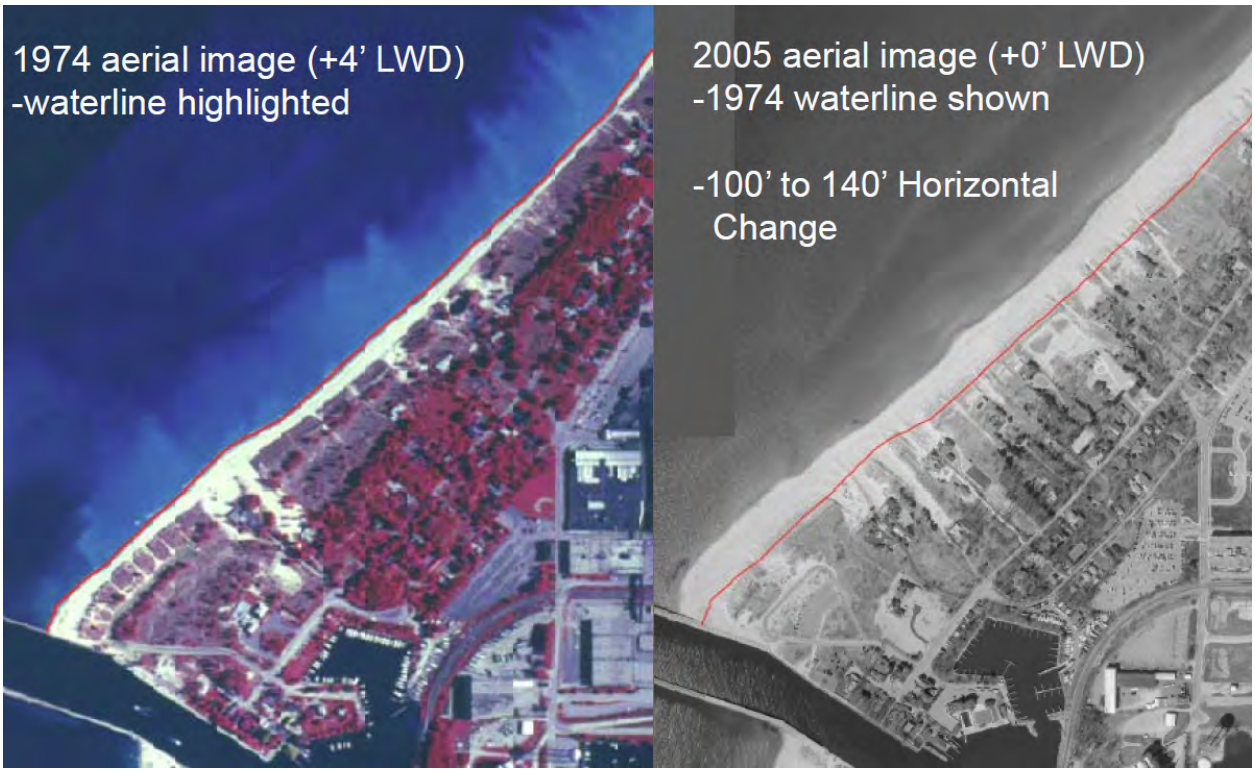


Figure 10: Aerial comparison of 1974 waterline and 2005 waterline

Although the records only extend back to 1918, they are still commonly referred to as "all-time high"/ "all-time low" and these terms will be used for the purposes of this study. However, prior to 1918, there are few records of Lake Michigan's long term water level fluctuations. Record data from Milwaukee, Wisconsin suggests that in 1838 Lake Michigan may have reached an even higher level than the 1986 "all-time high". The data indicates that a level of +6.6' LWD was reached in 1838, which is 1.7 feet higher than the 1986 level. Due to information such as the record from Milwaukee, a factor of safety is recommended as the basis of design is based on 90 years of water level data. Ideally, we would have additional/older historic data, but unfortunately this is not available. Therefore, it is important to

note that this report and its assumptions are based on the best information currently available (including existing studies, historic data, local, state and federal documentation) however there is no guarantee that unusual coastal conditions will not occur that could create conditions worse than projected herein.

Since 1918, data for Lake Michigan shows there have been three 10-year periods of low lake level, in which water levels are at least one foot below the long-term annual average (Figure 11). These periods occurred from approximately 1931 to 1942, from 1957 to 1967, and from 1999 to the present. Each of the two previously recorded low-level periods was followed by high water levels. Based on the long term fluctuations of the Lake Michigan water level, high water can be expected to occur again in the future.

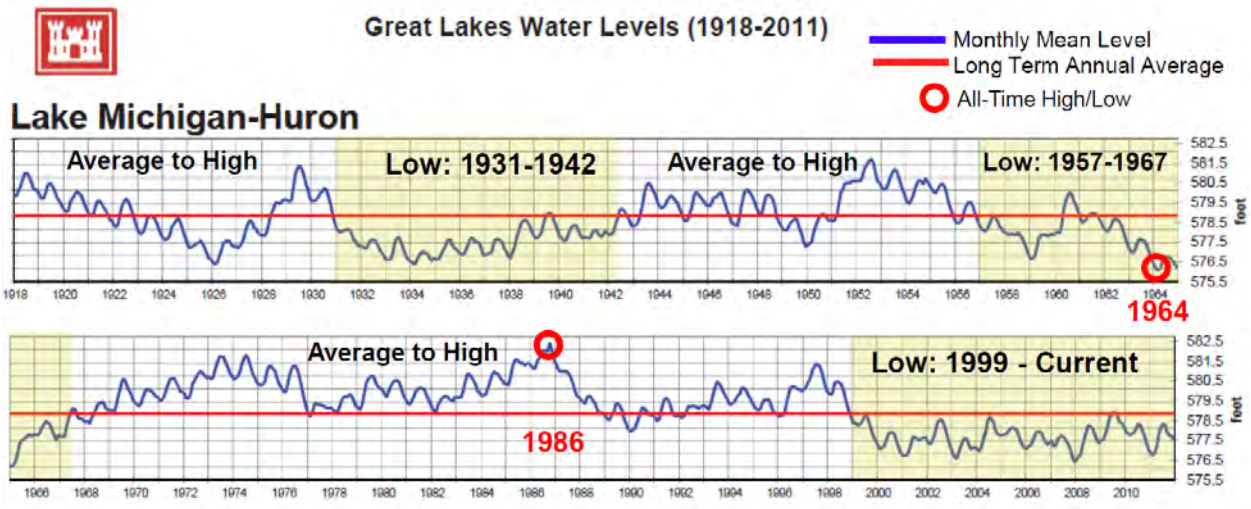


Figure 11: U.S. Army Corps of Engineers long term water level chart

In addition to long term fluctuations, Lake Michigan fluctuates on an annual cycle. Typically, water levels will fluctuate one to two feet per year, with lowest water levels in the winter and highest water levels in the summer. Figure 12 below depicts the annual cycle of the Lake Michigan water level and shows the relationship between the long term average water level, current water level, OHWM, all-time high water level, and all-time low water level.

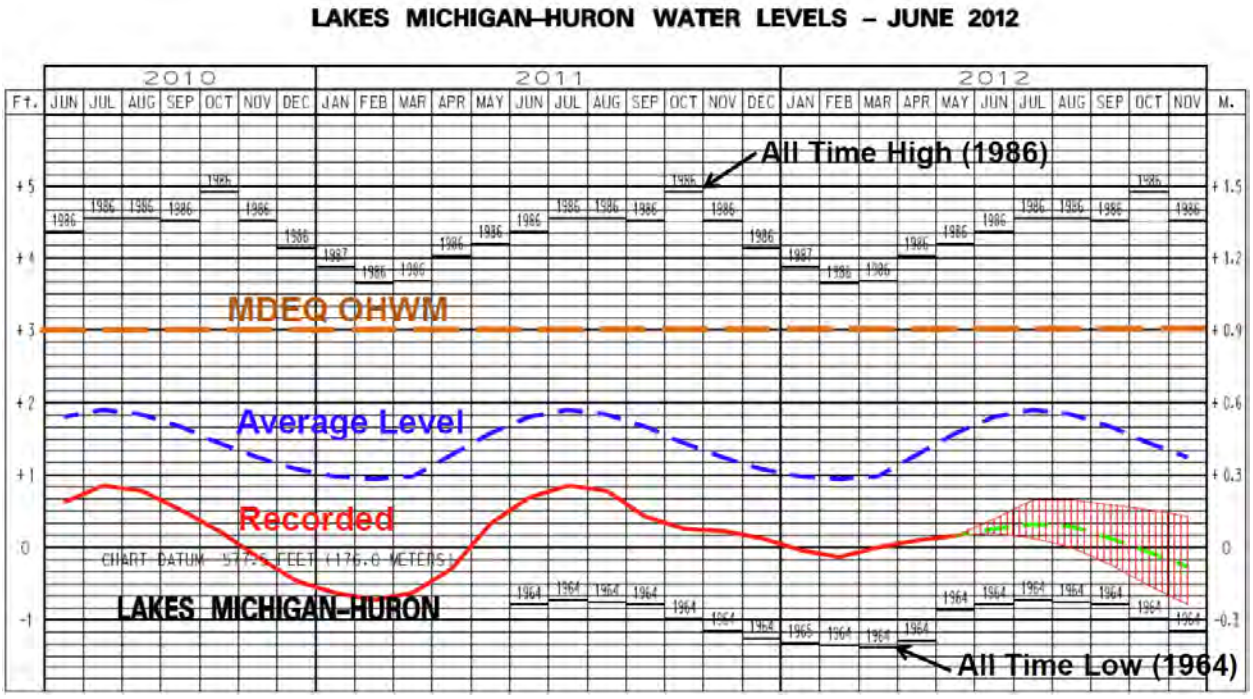


Figure 12: U.S. Army Corps of Engineers short term water level chart

FLOODPLAIN (FEMA)

According to the Federal Emergency Management Agency (FEMA), areas that will be inundated by the base flood, or 100-year flood, are identified as a Special Flood Hazard Area (SFHA). The base flood is the flood event that has "a 1-percent chance of being equaled or exceeded in any given year". The base flood is defined by FEMA as a base flood elevation using historical flood events and floodplain studies. The elevations are published by FEMA Flood Insurance Studies (FIS) and on Federal Insurance Rate Maps (FIRMs). These maps also show areas that are outside of the SFHA, but still susceptible to other flood risks.

FEMA recommends and the State of Michigan requires that structures built in the SFHA are constructed at least one foot of freeboard (height) above the base flood elevation to lower the risk of flooding. FEMA's freeboard recommendations increase when building near the coast to compensate for changing shoreline conditions, water levels and storm events. However, currently there are no FEMA requirements to account for these hazards on the Great Lakes beyond the base flood elevation, which is a still water level and does not account for waves, setup, or other coastal conditions.

Per the Berrien County Flood Insurance Study No. 26021CV000A, effective April 17, 2006, the 1% annual chance flood elevation is 584.0' south of the St. Joseph River and 583.8' north of the St. Joseph River (both elevations are IGLD 85, converted from NGVD 29). This document is the authoritative document for flood levels. FEMA Flood Insurance Rate Map Number 26021C0101C, revised March 1, 2007, indicates a Base Flood Elevation of 584.0' IGLD 1985 (converted from 585.0' NGVD 1929) along the shoreline, within the study limits. This map is shown as Figure 13.

FEMA is currently collaborating with the USACE, the Association of State Floodplain Managers (ASFPM), and state partners to conduct a Great Lakes Coastal Flood Study. The study began in 2010 and will provide updated flood risk information serving the U.S. communities with Great Lakes shorelines. Currently, data collection and the application of modern analysis of historic storm and high water events are ongoing. The study will result in updated Flood Rate Insurance Rate Maps along the shorelines of the Great Lakes, with anticipated release during the period of 2014 to 2016. Berrien County is one of seven counties selected as pilot counties, so updated information for St. Joseph may be available for review sooner. The FEMA study is intended to address high water along the Great Lakes Coast due to flooding and wave and wind effects. Currently, the FEMA Base Flood Elevation is 1.6 feet above the all-time high Lake Michigan Water level however neither elevation accounts for wind and waves. The FEMA study may have results that could impact the recommendations in this analysis. Therefore this analysis should be updated once the FEMA findings are known.

Figure 13: Part of FEMA Flood Insurance Rate Map Number 26021C0101C, Revised March 1, 2007

ORDINARY HIGH WATER MARK

The Michigan Department of Environmental Quality (MDEQ) provides a guidance document for clarifying the authority of the MDEQ under Part 325 of the Natural Resources and Environmental Protection Act, also referred to as the Great Lakes Submerged Lands Act (GLSLA), as it relates to the

Ordinary High Water Mark (OHWM). The document refers to Section 324.32502 of the Michigan legislature, which says:

> *"For the purposes of this part, the ordinary high-water mark shall be at the following elevations above sea level, international Great Lakes Datum of 1955; …Lakes Michigan and Huron 579.8 feet…"*

Although Section 324.32502 does not provide a conversion between IGLD 1955 and IGLD 1985, the MDEQ Guidance Document Number 325-06-02 does. It specifically names an elevation of 580.5' IGLD 1985 as the OHWM of Lakes Michigan and Huron. This elevation will be used as OHWM for the purposes of this study and it is this elevation that constitutes the limit of the MDEQ's jurisdiction under the GLSLA. The OHWM is +3 LWD, which is 1.9 feet below the all-time Lake Michigan high water level. The USACE defines the OHWM and limit of USACE jurisdiction of Lake Michigan as elevation 581.5' IGLD 1985, which is one foot higher than the MDEQ OHWM elevation.

Additional definitions are provided within the MDEQ guidance document to explain what is commonly referred to as the Natural Ordinary High Water Mark (NOHWM). The NOHWM is the upland boundary of the public trust property. According to the guidance document, "prior to 1968 amendments to the Part 325, the rules contained the following definition:

> *'Ordinary high water mark means the line between upland and bottomland which persists through successive changes in water levels, and below which the presence and action of the water is so common or recurrent as to mark upon the soil a character, distinct from that which occurs on the upland, as to the soil itself, the configuration of the surface of the soil and the vegetation. When the soil, configuration of the surface, or vegetation has been altered by man's activity, the ordinary high water mark shall be located where it would have been if this alteration had not occurred.'*

It is important to note that the horizontal locations of both OHWM and NOHWM change over time, depending on water level, waves, and coastal processes. For instance, after a period of erosion, although the determining elevation remains unchanged, the OWHM will intersect the shoreline at a more landward point than pre-erosion. After a period of accretion, the OWHM, likewise, will intersect the shoreline at a more lakeward point than pre-accretion. Figure 14 illustrates this concept.

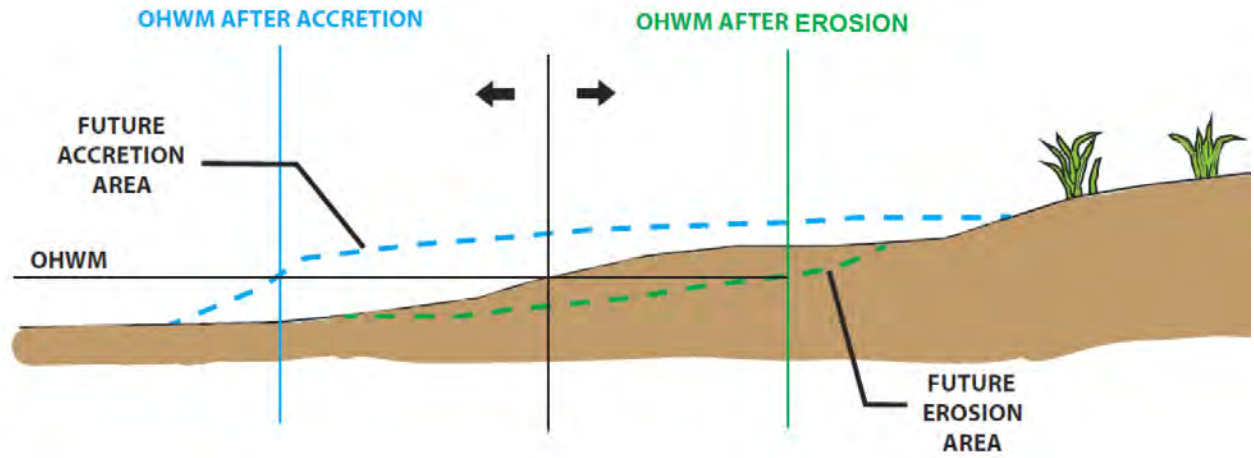


Figure 14: Illustration of OHWM movement

LITTORAL DRIFT

One of the key processes that affect the coastline of St. Joseph is littoral drift or longshore transport. Littoral drift is the transportation of sediment in the littoral zone of a water body. Littoral drift is a function of wind and wave direction, wind and wave amplitude, shoreline material, sediment supply, water circulation patterns, water level, and shoreline structures.

The creation of groins and piers create barriers that alter the sediment transportation process. This process has a major effect on a shoreline by adding material through accretion in some locations and by interrupting the supply of sediment in others, thereby resulting in an erosion-like process.

Generally, sandy shores are identified by what seems to be an unlimited supply of cohesionless beach material. Oppositely, cohesive shores are classified by having a cohesive sub layer (typically beneath a cohesionless surface) consisting of such materials as glacial till, soft rock and other various deposits. This cohesive sub layer determines the long-term shoreline condition. On cohesive shores, the thin surface layer of cohesionless (such as sand and gravel) material is eroded by coastal forces and replenished by littoral drift. When replenishment is interrupted, the cohesive sub layer can become exposed and susceptible to increased erosion.

Near the City of St. Joseph, the lake bed is comprised of cohesive material with a cohesionless surface layer with varying thickness of 0-4 meters (0-13 feet). Large deposits of sand accumulate near the mouth of the harbor and are dredged on a regular basis. Since the 1970s, this material has been deposited as beach nourishment on the designated feeder beach south of the St. Joseph River, typically south of Park Street, as shown in Figure 15. This material helps to protect the existing cohesive sub layer; however, since it is primarily fine to very fine grain, it is easily eroded by coastal forces. The quantity of dredging that is completed per year ranges from 20,000 to 150,000, cubic yards, although not all of the material is used for beach nourishment. It is important to consider that USACE funding is often an issue and that beach nourishment may not always be available. A summary of dredging quantities by year is included in Appendix 3.

Figure 15: 2012 photo of beach nourishment south of Park Street showing the dredge in background

Immediately north of the St. Joseph River, sand accumulates via littoral drift, creating an accretion zone. The piers act as a barrier, interrupting sediment as it is moved along the coast in a southerly direction. This accretion zone has grown during the recent 13-year period of low lake levels. This area, as well as Area 2, experiences short term erosion during significant storm events and is expected to experience erosion during the transition period from low to high water conditions (Figures 16-19).

Figure 16: January 24, 2012 - Area 1 short term beach erosion

Figure 17: January 29, 2012 - Area 1 short term beach erosion

Figure 18: October, 2004 - Area 2 short term erosion

Figure 19: December, 2004, Area 2 short term erosion

Based on the 1997 USACE study, "Effectiveness of Beach Nourishment on Cohesive Shores, St. Joseph, Lake Michigan", Figure 20 illustrates the modeled longshore transport of sediment in Area1 and Area 2 during the early 1990s. Net transport quantities are depicted, along with northerly and southerly components.

Figure 20: Graphic representation of longshore sediment transport

HIGH RISK EROSION AREA

The MDEQ identifies and designates High Risk Erosion Areas (HREAs) and defines them as:

> *Those shorelands of the Great Lakes and connecting waters where recession of the zone of active erosion has been occurring at a long-term average rate of one foot or more per year, over a minimum period of 15 years.*

Within the study area, only one designated HREA exists, located at the southern extent of Area 3. The HREA has a projected 30-year recession of 65 feet and a projected 60-year recession of 115 feet (Figure 21). Based on aerial imagery, shoreline protection has been constructed in this area within the past five years, so recession projections will likely be revised as the HREA studies are revisited and updated.

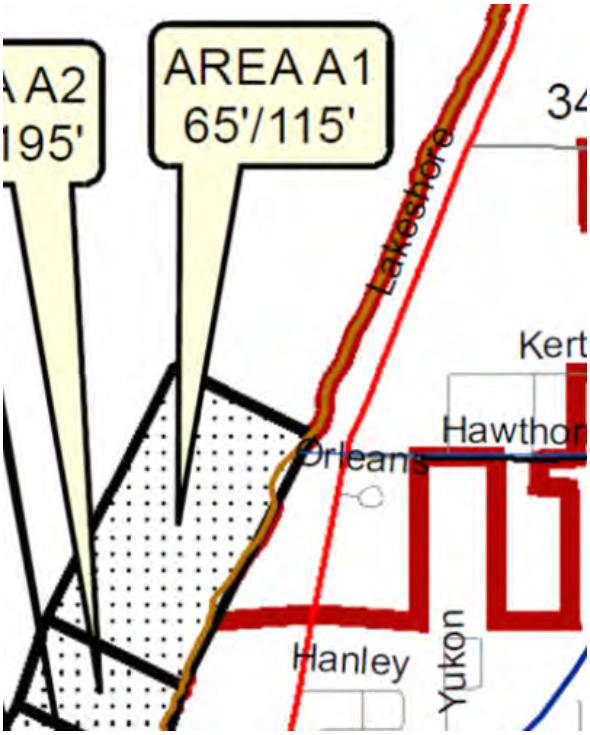


Figure 21: MDEQ High Risk Erosion Area Map


Figure 22: HREA Area A1 Aerial

SEICHES

According to the U.S. Army Corps of Engineers (Vol. 162 2006), a seiche is a periodic oscillation of lake levels caused by either a rapid change in air pressure or a rapid shift in wind direction as weather systems pass over the lakes. This process is often compared to water sloshing from side to side in a bathtub. A seiche can last anywhere from seconds to minutes, occurring at intervals of tens of minutes to multiple hours until stored energy is dissipated from the lake. In St. Joseph, seiches typically range from one to three feet in height.

Although data regarding seiche events is scarce, the following is a sample of events that have occurred in southern Lake Michigan since 1900:

- On August 24, 1900, a huge seiche like wave was reported hitting the shores of St. Joseph, washing away small boats and various other items along the shoreline. (1900 NY Times)
- In 1929, a seiche occurred in Grand Haven during a 4th of July Celebration with 20' waves sweeping people off of the piers. 10 people were killed by the event. (MSU Report)
- On August 3, 1960 a seiche temporarily raised the water levels in Chicago 2.5'-4' and St. Joseph residents were warned against 4'-6' waves. (1960 Lawrence Journal)
- On July 11, 2011, a seiche of unrecorded height hit near Holland causing significant damage. (2011 Holland Sentinel)

BERRIEN COUNTY COASTAL DAMAGE, 1957-1977

For the ten year period 1957 to 1967, Lake Michigan experienced low to average water levels, similar to the conditions experienced today. The ten year period that followed until 1977 saw water levels rise to high levels, reaching 581.8' (+4.3) in 1974, which is only 0.6' below the Lake Michigan all-time high water level. This water level fluctuation is part of the normal cycle of Lake Michigan as observed from 1918 to 2012 and discussed above.

High water conditions and severe storms culminated in 1973, when President Nixon declared Berrien County a disaster area, according to articles from the Herald Palladium. Damage that occurred during the early 1970s included the loss of beach, bluff erosion, damage to structures, and the loss of structures. Figures 23-26 illustrate some of the damage that occurred.

Figure 23: 1973 Herald Palladium photo of Jean Klock Park

Figure 24: 1973 Herald Palladium photo of Jean Klock Park sidewalk

Figure 25: 1970s Herald Palladium photo of bluff erosion south of St. Joseph, MI

Figure 26: 1970s Herald Palladium photo of bluff erosion south of St. Joseph, MI

The period of 1957-1977 is an important example of what can happen as the conditions of Lake Michigan change. During times of low water, building structures closer to the lake is a dangerous temptation for many property owners and leaves structures exposed to the risk of erosion, wave action, and damage when water levels rise again. Based on 94 years of Lake Michigan water level records and the cycles that have occurred in the past, water levels will rise again and coastal communities must plan and prepare for these ever-changing conditions.

OTHER GREAT LAKES STATES

Other Great Lakes states have developed standard setbacks and/or guidelines for various reasons. These states provide valuable examples of setbacks and coastal guidelines. This study will focus on the setbacks and guidelines that have been implemented in Wisconsin and in Ohio.

WISCONSIN

The State of Wisconsin implemented setbacks to "…conform to health, safety and welfare requirements, preserve natural beauty, reduce flood hazards and avoid water pollution". Chapter NR 115 of the Wisconsin Administrative Code requires all buildings and structures to be setback a minimum of 75 feet from the OHWM of navigable lakes, rivers, and streams. This requirement applies to Wisconsin's coastline on both Lake Michigan and on Lake Superior. In addition to the statewide setback, some counties have increased minimum setbacks. For instance, the setback in Sheboygan County is 225 feet from OHWM. Michigan does not currently have a similar setback.

Additional methods are provided within NR 115 for the reduction of setbacks for lots with minimal depth or for vacant lots between lots that were developed before setbacks. Some counties require new structures to be setback as far as lots allow. Others average the setbacks of adjacent developed substandard lots to provide a requirement to an undeveloped lot. The third and most flexible method for reducing setbacks is what is called "the formula approach". This method allows limited reduction of a roadway setback first; then allows reduction of the shoreline setback until a 30 foot deep building envelope is created. Typically, when any setback reduction is allowed, mitigation measures are required to compensate for the reduction of buffers.

OHIO

In 2011, the Ohio Department of Natural Resources, Office of Coastal Management published the Ohio Coastal Design Manual to "promote better projects along the Ohio shore of Lake Erie". It provides guidance in the design of commonly constructed structures for engineers, surveyors, and landowners, while attempting to balance erosion control needs with lake access and protection of natural resources.

The manual does not provide specific setback requirements but does include guidance for the design of shoreline structures, including considerations such as erosion, existing structures, geology, habitat, near shore bathymetry, wave climate, submerged lands, water levels, littoral drift, revetment flanking, and revetment materials.

Based on conversations with the Ohio Office of Coastal Management, setbacks have not been implemented. However, where a proposed structure is within a designated Coastal Erosion Area, plans must be submitted to the Office of Coastal Management for review and approval before construction can commence. In Ohio, the Coastal Erosion Areas are updated every ten years and are based upon recession rates observed from aerial photos, similar to Michigan's High Risk Erosion Areas.

GREAT LAKES SHORELINE PROTECTION

According to the USACE Coastal Engineering Manual (Section III-5-13):

> *(1) The two most important issues in the planning and management of cohesive shores relate to* ***implementing setbacks for development*** *and to managing human influences on the sediment supply.*
>
> *(2) Many Jurisdictions along U.S. shorelines impose a setback for new development consisting of some multiple of the average annual recession rate (e.g., 30 to 100 times the average recession rate). The purpose of the setback is* ***to avoid the need for shore protection*** *within the life of the new development,* ***recognizing the irreversible and inevitable erosion that occurs*** *along cohesive shores (and some sandy shores as well).*
>
> **[emphasis added]**

Shoreline protection structures reflect and accelerate wave energy, causing unnatural erosion and resulting in irreversible changes to the shoreline. Where possible, it is recommended to avoid the need for shore protection and in Area 1this opportunity still exists. Most structures are set back from Lake Michigan and the public trust property is uninterrupted between two public parks.

However, in Area 2, structures are located closer to Lake Michigan, potentially requiring the construction of shoreline protection structures during periods of high water in addition to the existing shoreline protection structures.

In Area 3, cohesive bluffs would be exposed to erosion, were it not for the existing shoreline protection structures that line the shore. These structures are necessary to prevent erosion and protect property.

DESIGN CONSIDERATIONS

Shoreline protection must be designed with an awareness of the following considerations:

- Height: The top of the structure must be built to an elevation that will prevent wave overtopping.

- Surface: Irregular shapes and permeable materials absorb wave energy, whereas flat, planar surfaces reflect and accelerate wave energy.

- Toe Protection: Sufficient toe protection must be incorporated to prevent scour of the toe of the structure which can result in slip failure of the structure.

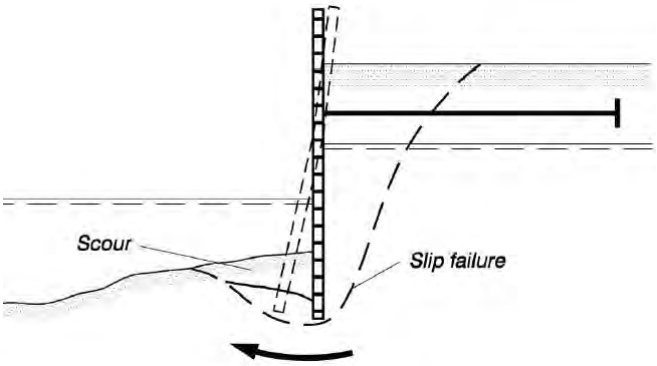
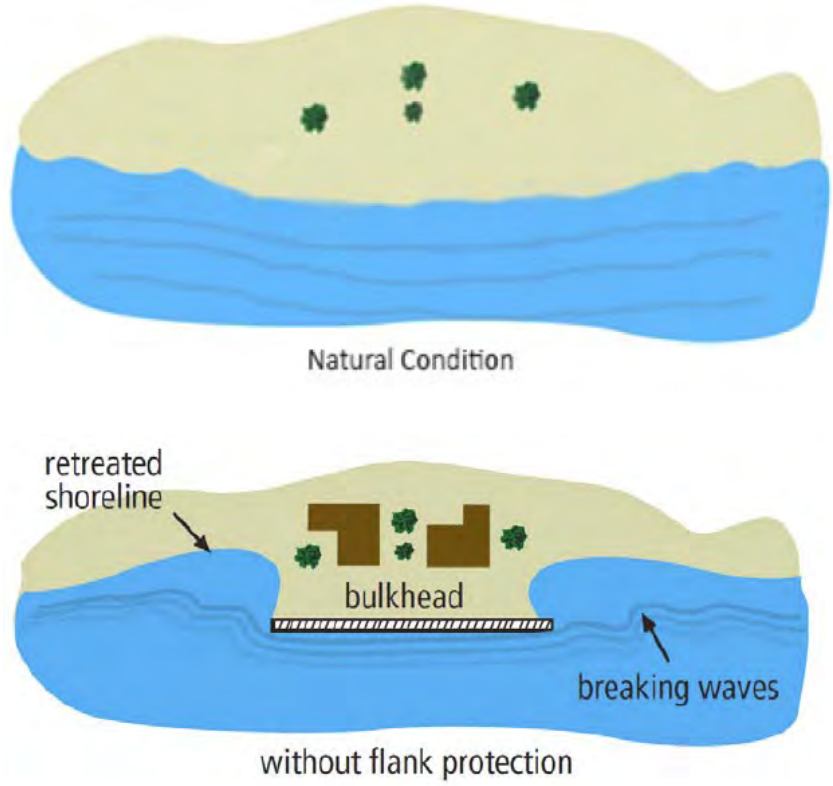
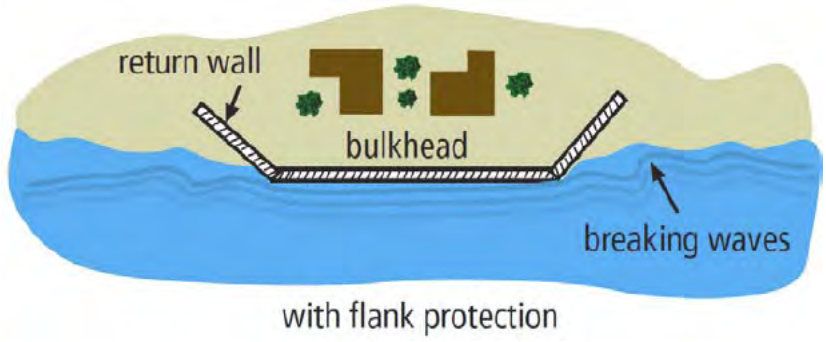


Figure 27: Graphic from USACE Coastal Engineering Manual

- Length: Sufficient structure length and/or return walls are required to prevent flanking of the structure and produce potential adverse effects on neighboring properties. As depicted in Figures 28-30, flanking is the erosion that occurs on either side of a shoreline structure caused by the reflection and acceleration of wave energy.





Figures 28-30: Graphics from USACE/University of Wisconsin, "Living with the Coast" Booklet

FAILURE EXAMPLES

Berrien County coastal structures are subjected to severe coastal conditions on a regular basis. Any weakness will be exposed by these conditions. The USACE Coastal Engineering Manual includes examples of the effects Lake Michigan can have on these structures in order to help guide the design process of future protection.

Figure 31: Example of flanking in southern Berrien County. Note how this failure has resulted in the loss of the public trust property lakeward of the NOHWM and public passage is only possible in the lake itself.

Figure 32: USACE CEM Photo, "A toppled concrete seawall along the Lake Michigan coast of Berrien County. Failure probably resulted from undermining of the underlying glacial till foundation, April 1991."

Figure 33: USACE CEM Photo, "A steel sheet-pile wall and groin field has been ineffective at protecting this section of cohesive shore along the Berrien County shore of Lake Michigan, south of the town of St. Joseph, April 1994."

SUCCESSFUL EXAMPLES

Within the study area, two successful examples of shore protection have been identified. The first is the shoreline that borders the St. Joseph Water Plant, located at the north end of Area 3. The structure consists of armor stone, laid on a slope of 1 vertical on 2 horizontal to a top elevation of 591.20 feet. The toe of the revetment extends several feet below the lake bottom to prevent scour.

Figure 34: St. Joseph Water Plant Revetment Oblique Photo

Figure 35: St. Joseph Water Plant Revetment, spring 2012

The stone revetment along South Lakeshore Drive provides another example of a successful shoreline protection structure. It is also comprised of armor stone set at a slope of approximately 1 vertical on 2 horizontal and protects the high bluffs on which South Lakeshore Drive is constructed.

Figure 36: Stone Revetment along South Lakeshore Drive Oblique Photo

However, although both of these stone revetments have been successful in protecting the water plant and South Lakeshore Drive bluff, respectively, from erosion, they have had a dramatic effect on the public trust property along the shoreline.

AREA 1 FINDINGS

CURRENT CONDITIONS

Area 1 is bordered by Jean Klock Park to the north and Tiscornia Beach to the south. Between the parks, private properties exist and many of the lots extend several hundred feet from the street known as Ridgeway to Lake Michigan. Currently, no shore protection structures exist within Area 1. The entire shoreline is sandy beach. The southern half of Area 1 is typically an accretion zone, but subject to erosion as well. The public trust property in this area varies in width and extends from the water line to the NOHWM, connecting the public parks.

Figure 36: Area 1 typical shoreline

SHORELINE MANAGEMENT RECOMMENDATION

We recommend that the City of St. Joseph prohibit the construction, erection, or expansion of Structures, as defined by the Zoning Ordinance of the City of St. Joseph, within Area 1 by a fixed setback line as shown on the attached exhibit, "Area 1 Proposed Setback Line". The definition of a Structure per the Zoning Ordinance of the City of St. Joseph is as follows:

> *"Anything fabricated, constructed or erected, the Use of which requires fixation or placement in, on or attachment to something having location on the ground including but not limited to all Buildings, independently supported Decks, satellite dishes and free-standing Signs; excepting anything lawfully in a public Right-Of-Way including but not limited to utility poles, sewage pumping stations, utility manholes, fire hydrants, electric transformers, telephone boxes, and related public facilities and utilities defined as essential public services. A paved, uncovered parking lot is not considered a structure."*

We recommend that the following Structure types be exempt from the setback ordinance:

- Walkways that are not attached to primary structures
- Staircases of wood construction only that are not attached to primary structures
- Free-standing signs

The location of the propose setback line is based upon the long-term cycles of Lake Michigan and therefore is a fixed line, not a line defined by elevation that may move during short term changes.

The setback would help preserve the public trust property along the shoreline, maintain the natural shoreline, and reduce the risk of coastal hazards to private structures. The location of the proposed setback is based upon the following factors:

- Lake Michigan all-time high water level *(Rounded from +4.9 LWD)* + 5.0 LWD
- Storm surge of two feet + 2.0'
- 2% wave runup, 50-year deep water wave + 7.0'

  + 14.0' LWD = Elevation 591.5'
- Factor of Safety
  - Factor of Safety of 1.3 applied to average offset of the calculated runup elevation from current still water level. (50') Engineering design utilizes a factor of safety ranging from 1.2 to over 4.0, depending on what is being designed, data quality/accuracy and consequences of failure. Most designs use a factor between 1.2 and 1.8.
  - Reduces the likelihood that structures will adversely affect the public trust property and the natural shoreline
  - Provides space to account for the constantly-changing shoreline

The location of the setback line should be reviewed, at minimum, every ten years or with a change in the Lake Michigan water level of four feet or more from the current water level of +0.2' LWD to ensure it is performing its intended function based on continuing experience and then current conditions.

This recommendation is based on 94 years of Lake Michigan water level data and less than fifty years of wave data. Recognizing that we do not have data extending beyond these time periods, an even more conservative approach could be considered to account for future unpredictable events such as a 500-year event, which would consider layered design waves and higher lake levels, if that data were available.

AREA 2 FINDINGS

CURRENT CONDITIONS

Area 2 is fully-developed by homes along the shoreline, with the exception of the two public parks at its ends. Under most lake levels, the entire shoreline is publicly-owned and consists of a sandy beach. Area 2 is an erosion zone, but typically receives beach nourishment from the USACE on an annual basis. Existing structures are built on shallow lots that do not allow structures to move significantly closer or further from Lake Michigan. In order to protect structures, in reasonably foreseeable coastal conditions, shore protection may be required because limited lot sizes restrict private property owners' options.

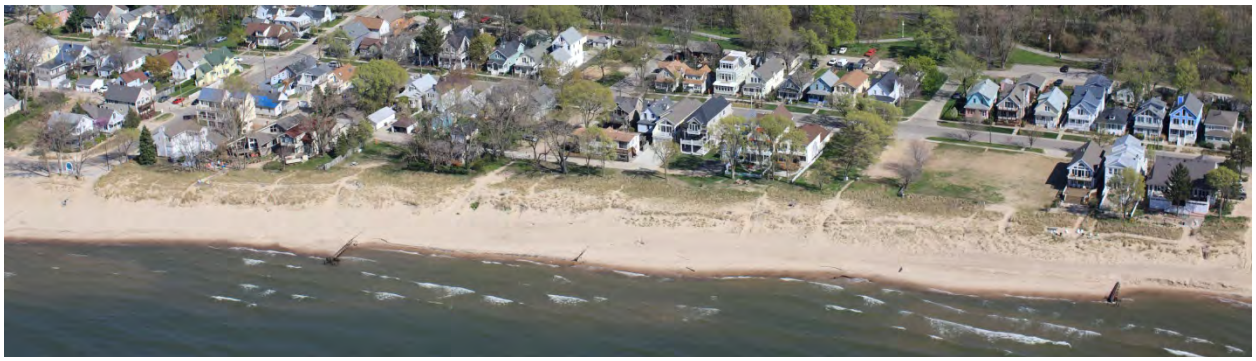


Figure 37: Area 2 typical shoreline

SHORELINE MANAGEMENT RECOMMENDATION

To provide the best protection to private property while maintaining meaningful public access along the shoreline, we recommend that future shoreline protection structures within the area bounded on the north by the St. Joseph River, on the east by Lions Park Drive, and on the south by the St. Joseph Water Plant be subject to the following requirements:

- Design must be prepared by a licensed professional engineer experienced in coastal engineering to account for coastal engineering factors including, but not limited to wave overtopping, scour protection, and flanking prevention.
- Approval must be granted by the City of St. Joseph City Engineer prior to construction
- Vertical walls are prohibited
- Perpetual public access landward of the structure must be provided to ensure continued public access along the coast regardless of lake levels.
- Structures must not adversely affect other/neighboring properties and must connect to adjacent shoreline protection structures, if present, to eventually create one unified structure

Furthermore, we recommend that any shoreline protection structures be of the same type that has been successfully constructed, such as the stone revetments at the St. Joseph Water Plant. The attached exhibit, "Typical Proposed Shoreline Protection Section" contains a typical cross section of this type of shoreline protection. This type of protection would require that private property owners be permitted to construct all or part of the structure within public property.

We recognize that there are likely a number of issues that the City must or may wish to consider before implementing this recommendation, including but not limited to issues regarding ownership, maintenance, liability, cost of the structures, as well as the appropriate mechanism or procedure for permitting the construction on public property. Such issues are beyond the scope of this study.

AREA 3 FINDINGS

CURRENT CONDITIONS

The entire shoreline of Area 3 contains existing shoreline protection structures, including stone revetments, sheet piling, groins, and timber structures. Steep bluffs containing cohesive soils line the shoreline and the structures are necessary for the protection of the bluffs against erosion.

Figure 38: Area 3 typical shoreline

SHORELINE MANAGEMENT RECOMMENDATIONS

We do not recommend additional regulation of shoreline protection within Area 3, beyond the regulation already administered by both the USACE and the MDEQ. Because Area 3 contains little to no public shoreline access and existing shoreline protection structures extend across its full shoreline, additional regulation is unnecessary.

REFERENCE LIST

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2. *High Risk Erosion Areas & Critical Dune Areas*. Digital image. *Great Lakes Shorelands Unit*. MDEQ, 3 Oct. 2007. Web.
3. Naim, Robert B., Peter Zuzek, and Andrew Morang. *Effectiveness of Beach Nourishment on Cohesive Shores, St. Joseph, Lake Michigan*. Rep. No. CHL-97-15. 1997. Print.
4. USA. Army Corps of Engineers. Detroit District. *Ordinary High Water Mark and Low Water Datum*. Great Lakes Information, 7 Oct. 2005. Web.
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6. USA. Army Corps of Engineers. Detroit District. *Great Lakes Water Levels*. USACE, 23 Mar. 2012. Web.
7. USA. Army Corps of Engineers. Engineering and Design. *Coastal Engineering Manual*. Vol. No. 1110-2-1100. 2002. Print.
8. USA. MDEQ. Land & Water Management Division. *Guidance Document 325-06-02*. 2006. Print.
9. USA. Wisconsin Department of Natural Resources. Wisconsin's Shoreline Protection Program. *Administrative Code*. Vol. NR 115. 2012. Print.

Appendices

APPENDIX 1

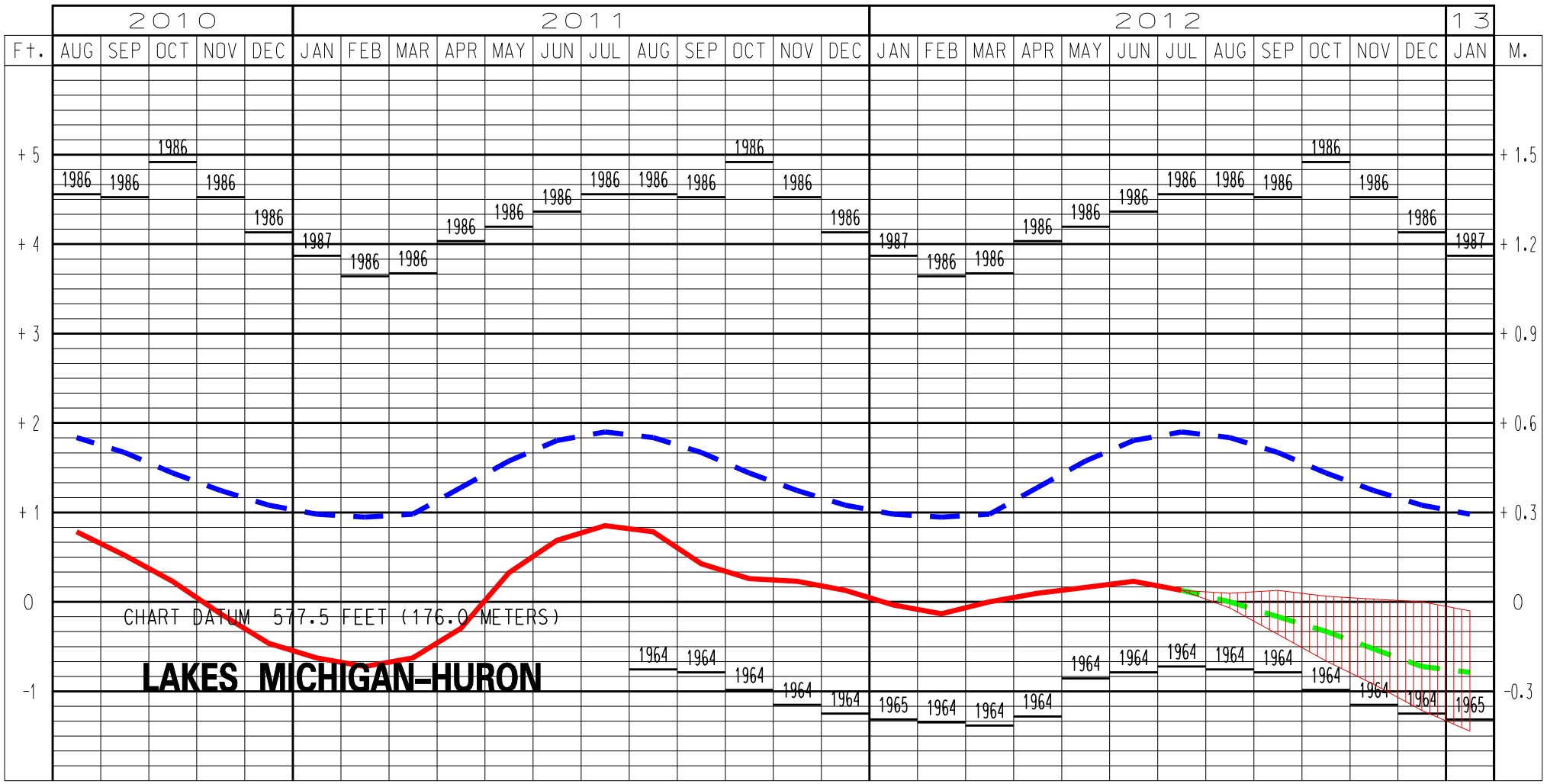
St. Joseph Coastal Study Datum Conversion Chart				
	IGLD 55	**IGLD 85**	**NAVD 88**	**NGVD 29**
Lake Michigan Base Flood Elevation, north of SJ River *(Berrien County FIS No. 26021CV000A, effective April 17, 2006)*	-	583.8	584.3	**584.8**
Lake Michigan Base Flood Elevation, south of SJ River *(Berrien County FIS No. 26021CV000A, effective April 17, 2006)*	-	584.0	584.5	**585.0**
Michigan Statutory OHWM for Lake Michigan (GLSLA Section 324.32502)	**579.8**	580.5	581.0	581.5
USACE OHWM for Lake Michigan	-	**581.5**	582.0	582.5
USACE Lake Michigan Low Water Datum	-	**577.5**	578.0	578.5
"All Time" record high water elevation (since 1918)	-	**582.4**	582.9	583.4
Study, Calculated elevation for Area 1 setback	-	**591.5**	592.0	592.5

Notes:

1.) Bold elevations indicate original/published elevation/datum.
2.) All elevations shown in feet.

APPENDIX 2

LAKES MICHIGAN–HURON WATER LEVELS – AUGUST 2012



LEGEND

LAKE LEVELS

RECORDED

PROJECTED

AVERAGE **				
MAXIMUM **	1985	1985	1973	1973
MINIMUM **	1936	1934	1926	1934

** Average, Maximum and Minimum for period 1918-2011

APPENDIX 3

ST JOSEPH HARBOR, MI

FY	START	COMPLETION	CUBIC YARDS	COST	CPY	CONTRACTOR	CONTRACT NUMBER	PLACEMENT/DREDGE AREA
1963			19,325	$27,917	$1.44	GOVT/TOMPKINS		
1963			81,412	$33,066	$0.41	GOVT/HAINS		
1964			71,078	$48,100	$0.68	GOVT/HAINS		
1965			34,500	$50,458	$1.46	GOVT/TOMPKINS		
1965			51,149	$22,543	$0.44	GOVT/HOFFMAN		
1965			79,643	$35,101	$0.44	GOVT/HAINS		
1966			13,800	$19,441	$1.41	GOVT/TOMPKINS		
1966	4/21/1966	5/19/1966	75,917	$51,546	$0.68	GOVT/HAINS		
1967	4/27/1967	5/11/1967	99,244	$48,639	$0.49	GOVT/HAINS		
1967			16,450	$20,319	$1.24	GOVT/TOMPKINS		
1968	5/13/1968	5/22/1968	48,186	$26,681	$0.55	GOVT/HAINS		
1969	5/7/1969	5/20/1969	73,316	$46,791	$0.64	GOVT/HAINS		
1969	4/21/1969	5/8/1969	20,350	$23,427	$1.15	GOVT/TOMPKINS		
1970	12/13/1969	12/17/1969	46,483	$37,539	$0.81	GOVT/HAINS		
1971	5/23/1971	6/1/1971	33,225	$24,557	$0.74	GOVT/HAINS		
1972	5/17/1972	5/27/1972	52,292	$46,611	$0.89	GOVT/HAINS		
1973	3/28/1973	4/11/1973	47,828	$59,222	$1.24	GOVT/HAINS		
1974	5/4/1974	5/15/1974	65,428	$54,040	$0.83	GOVT/HAINS		
1975	5/9/1975	5/20/1975	69,638	$89,754	$1.29	GOVT/HAINS		OPEN WATER (15,260) BEACH OVER S PIER (54,026) 1.5 MI SOUTH AT 20'CNTR (352)
1976	5/27/1976	6/30/1976	94,185	$86,477	$0.92	GOVT/HAINS		BEACH (SILVER BEACH) (87,810) AND 500' SOUTH AT 18'CNTR (6,375)
1977	4/19/1977	5/29/1977	181,097	$130,675	$0.72	GOVT/HAINS		OPEN WATER (19,101) BEACH (SILVER BEACH) (160,236) .5 MI SOUTH AT 18'CNTR (1,760)
1978	5/8/1978	6/15/1978	118,658	$345,055	$2.91	GOVT/HAINS		BEACH (SILVER BEACH) (84,565) 7 MI SOUTH AT 18'CNTR (4,928) WHIRLPOOL CDF (38,735)
1979	5/12/1979	6/26/1979	147,512	$365,958	$2.48	GOVT/HAINS		BEACH (SILVER BEACH) (108,233) WHIRLPOOL CDF (39,279)
1980	4/28/1980	6/1/1980	92,348	$387,338	$4.19	GOVT/HAINS		BEACH (SILVER BEACH) (91,905) WHIRLPOOL CDF(24,359)
1981	6/9/1981	6/23/1981	64,110	$262,083	$4.09	GOVT/HAINS		OPEN WATER (3,975) BEACH 150-1200' SOUTH (65,767) WHIRLPOOL CDF (21,094)
1982	5/28/1982	7/3/1982	152,981	$73,501	$0.48	GOVT/HAINS		OPEN WATER (18,136) BEACH 1000-3000'S OF S PIER (116,895) WHIRLPOOL CDF (17,900)
1983	5/22/1983	6/30/1983	140,040	$218,469	$1.56	GOVT/HAINS		BEACH 1000-3000' S OF S PIER
1984	8/21/1984	8/27/1984	17,010	$89,306	$5.25	LUEDTKE	DACW35-84-C-0014	WHIRLPOOL CDF 30+00E - 40+00E

FY	START	COMPLETION	CUBIC YARDS	COST	CPY	CONTRACTOR	CONTRACT NUMBER	PLACEMENT/DREDGE AREA
ST JOSEPH HARBOR, MI								
1984	8/4/1984	9/14/1984	68,533	$246,719	$3.60	LUEDTKE	DACW35-84-C-0014	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 3400'S 8'CNTR-OHWM
								OUTER FLARE AREA
1985	7/17/1985	8/5/1985	37,701	$209,405	$5.55	HARBOR MARINE	DACW35-85-C-0006	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 3400'S
								OUTER CONTOUR - 2+00E
1985	8/17/1985	8/26/1985	15,446	$92,796	$6.01	HARBOR MARINE	DACW35-85-C-0031	WHIRLPOOL CDF
								52+00 - 43+00 AND 38+00 - 32+00
1986	7/24/1986	8/15/1986	14,564	$195,001	$13.39	KING	DACW35-86-C-0028	WHIRLPOOL CDF
								35+00N - 38+00N 28+00N - 17+00N
1986	6/16/1986	8/14/1986	14,533	$101,004	$6.95	KING	DACW35-86-C-0013	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 3400'S 4'CNTR-OHWM
								25+00W - 0+00
1987	6/27/1987	7/11/1987	24,227	$131,910	$5.44	KING	DACW35-87-C-0025	WHIRLPOOL CDF
								30+00E - 52+00E INCL TB 52+00 - 44+00 OUTER
1987	6/26/1987	7/11/1987	3,320	$36,636	$11.03	KING	DACW35-87-C-0025	UPLAND - SHORELINE SOUTH OF HARBOR AT LECO CORP
								52+00 - 44+00
1988	5/31/1988	7/28/1988	43,725	$291,446	$6.67	KING	DACW35-88-C-0016	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 3100'S 8'CNTR-OHWM
								27+84W-16+50W
1989	5/24/1989	6/22/1989	18,745	$147,725	$7.88	LUEDTKE	DACW35-89-C-0021	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 2700'S 8'CNTR-OHWM
								0+00-27+00W
1990	5/22/1990	6/22/1990	58,314	$317,067	$5.44	KING	DACW35-90-C-0009	BEACH SOUTH CL OF PARK STREET EXTENDED THENCE 2700'S 7'CNTR-OHWM
								CRITICAL SHOALS 0+00 - 28+00W
1991	5/3/1991	5/22/1991	10,225	$35,519	$3.47	KING	DACW35-91-C-0010	WHIRLPOOL CDF
								31+00-43+00 AREA NEAR TURNING BASIN
1991	5/3/1991	5/22/1991	52,513	$278,160	$5.32	KING	DACW35-91-C-0010	BEACH CL OF PARK STREET EXTENDED THENCE 2700'S 7'CNTR-OHWM
								0+00 - 28+00W 3' ALLOWABLE OVERDEPTH
1992	5/22/1992	6/9/1992	33,644	$123,324	$3.67	ANDRIE	DACW35-92-C-0018	BEACH CENTERLINE OF PARK STREET EXTENDED THENCE 2700' SOUTHWARD 7'CNTR-OHWM
								28+00W-32+00W
1992	6/23/1992	6/30/1992	24,182	$293,097	$12.12	KING	DACW35-92-C-0021	WHIRLPOOL CDF
								16+66-52+00
1993	6/18/1993	6/30/1993	2,360	$13,185	$5.59	MCM MARINE	DACW35-93-C-0017	BEACH 50' SOUTH OF THE CENTERLINE OF PARK STREET EXTENDED THENCE 2700' SOUTHWARD 7'CNTR-OHWM
								0+00-32+00W
1994	6/3/1994	7/8/1994	31,469	$439,744	$13.97	KING	DACW35-94-C-0023	BEACH AT SHOREHAM COMMENCING AT OHWM-8'CNTR
								0+00-28+00W
1995	5/3/1995	5/10/1995	33,335	$185,008	$5.55	KING	DACW35-95-C-0010	BEACH 50'-2550'S OF PARK STREET 8'CNTR-OHWM
								0+00-32+00W
1996	6/10/1996	6/28/1996	24,918	$199,738	$8.02	TNT	DACW35-96-C-0008	BEACH 50'-3050'S OF CL OF PARK STREET 4'CNTR-OHWM
								0+00-32+00
1997	5/14/1997	6/6/1997	35,042	$158,877	$4.53	KING	DACW35-97-C-0004	BEACH 50'-1550'S OF PARK STREET 4'CNTR-OHWM
								12+50W-30+00W 24' + 1' OD
1997	5/27/1997	6/17/1997	30,696	$373,870	$12.18	MCM MARINE	DACW35-97-C-0002	WHIRLPOOL CDF
								17+00-54+50
1998	4/30/1998	5/7/1998	24,285	$147,154	$6.06	MCM MARINE	DACW35-98-C-0003	BEACH 500'-3300'S OF PARK STREET 4'CNTR-OHWM
								31+00W-20+00W 23'+1'OD & 6+00W-2+00W 21'+1'OD
1999	4/27/1999	5/7/1999	22,482	$171,376	$7.62	MCM MARINE	DACW35-99-C-0005	BEACH 500'-3200'S OF CL OF PARK STREET 4'CNTR-OHWM
								0+00-32+00
1999	6/28/1999	7/11/1999	23,189	$157,413	$6.79	MCM MARINE	DACW35-99-C-0005	WHIRLPOOL CDF
								CRITICAL SHOALS

ST JOSEPH HARBOR, MI

FY	START	COMPLETION	CUBIC YARDS	COST	CPY	CONTRACTOR	CONTRACT NUMBER	PLACEMENT/DREDGE AREA
2000	4/28/2000	5/5/2000	39,472	$258,931	$6.56	MCM MARINE	DACW35-99-C-0005	BEACH 100'-2800'S OF PARK STREET OHWM TO SHORELINE WHEN POSSIBLE 32+00-0+00
2001	6/8/2001	6/20/2001	36,897	$262,709	$7.12	MCM MARINE	DACW35-99-C-0005	BEACH
2001	8/5/2001	8/15/2001	29,498	$168,614	$5.72	MCM MARINE	DACW35-99-C-0005	WHIRLPOOL CDF
2002	6/15/2002	6/24/2002	27,117	$193,587	$7.14	MCM MARINE	DACW35-02-C-0007	BEACH 1200'-1300'S OF PARK STREET CENTERLINE 4'CNTR-OHWM 16+00E-20+00N
2003	5/28/2003	6/2/2003	10,440	$126,885	$12.15	MCM MARINE	DACW35-02-C-0007	BEACH CRITICAL SHOALS
2004	6/28/2004	7/13/2004	35,774	$286,336	$8.00	MCM MARINE	DACW35-02-C-0007	BEACH CRITICAL SHOALS
2005	4/13/2005	5/9/2005	48,089	$325,445	$6.77	KING	W911XK-04-D-0002	BEACH 1200'-2500'S OF PARK STREET 0+00-32+00W
2005	9/18/2005	10/3/2005	14,322	$333,776	$23.31	LUEDTKE	W911XK-04-D-0004	CONFINED SOUTHWEST REGIONAL AIRPORT 31+00-43+00 DREDGING TO 20+1FT OVERDEPTH
2006	4/14/2006	4/30/2006	24,612	$510,100	$20.73	LUEDTKE	W911XK-06-D-0002	UPLAND AT SOUTHWEST REGIONAL AIRPORT 39+89-51+92
2006	4/10/2006	4/22/2006	52,120	$278,188	$5.34	KING	W911XK-06-D-0001	BEACH 1200'-2500' S OF PARK STREET ALONG EXISTING SHORELINE 32+00W-0+00
2007	3/29/2007	4/30/2007	35,565	$257,850	$7.25	KING	W911XK-06-D-0001	BEACH 50'-1350'S OF PARK STREET 32+00w-0+00
2008	5/30/2008	10/17/2008	113,190	$1,974,614	$17.45	GREAT LAKES DOCK	W911XK-08-C-0012	UPLAND AT SOUTHWEST MICHIGAN REGIONAL AIRPORT AND HARBOR SHORES DEVELOPMENT 9+00-51+00 TO 22' +1 AND 51+00-53+00 TO 18' +1'
2009	4/16/2009	5/8/2009	120,093	$1,081,609	$9.01	KING	W911XK-08-D-0001	BEACH 50-1350' S OF PARK STREET 4'CNTR-EXISTING SHORELINE 0+00-32+00W
2010	3/26/2010	5/7/2010	59,478	$0	$0.00	MORRISH-WALLACE	W911XK-09-D-0010	BEACH CRITICAL SHOALS
2010	5/10/2010	5/22/2010	64,433	$0	$0.00	KING	W911XK-09-D-0003	BEACH 50'-1,350' SOUTH OF PARK ST CL 4'CNTR-EXIST SHORELINE 32+00W-16+00W
2011	7/14/2011	7/30/2011	0	$0	$0.00	MCM MARINE	W911XK-09-D-0011	BEACH CRITICAL SHOALS
	TOTAL		3,365,753	$13,129,432				

APPENDIX 4

CITY OF ST. JOSEPH
BERRIEN COUNTY, MICHIGAN
ORDINANCE NO. 39-1-2
SPECIAL ORDINANCE

THE CITY OF ST. JOSEPH ORDAINS:

Chapter 39 of the Code of Ordinances of the City of St. Joseph, Michigan is hereby amended by amending Special Ordinance No. 39-1-2 to read as follows:

AN ORDINANCE TO IMPOSE A TEMPORARY MORATORIUM ON ANY SHORE PROTECTION STRUCTURES, SEAWALLS OR SIMILAR IMPROVEMENTS FOR CERTAIN PARCELS ABUTTING LAKE MICHIGAN.

Sec. 1. Intent and Purpose.
Consistent with its adopted Comprehensive Master Plan, the City desires to preserve and encourage open space along Lake Michigan and to maintain the integrity and character of the Lake Michigan shoreline. The City recognizes that the beach areas adjacent to the Ridgeway neighborhood and the south end of Lions Park Drive have distinctive characteristics and locations within the City, each with a large, open beach area along Lake Michigan and each located between and connects two public parks upon which the public has a right to unimpeded pedestrian use of as part of the public trust. The south end of the Lions Park Drive area also contains some public land located between the shore of Lake Michigan and private properties.

The City intends to conduct a review of various City regulations to further the maintenance and encouragement of open space, preservation of private property, and preservation of public trust areas along Lake Michigan in the above described neighborhoods. That review will include an analysis of the placement of, shore protection structures, seawalls, or other like improvements in this area and may include a request that the City Planning Commission also review this issue and make recommendations regarding possible zoning or other regulations.

The City Commission finds that there is a need to enact a temporary moratorium and that it is necessary for the preservation of the public safety and private property. Failure to enact this Ordinance while the City Commission and/or the Planning Commission actively reviews this matter will likely result in irreparable harm to the welfare of City residents and their properties given the domino-like impact that will occur if improvements adversely change erosion, etc. on the beach, the likely adverse impacts upon neighboring properties and the rights of the public to use the public portions of the beach due to the placement of, shore protection structures, seawalls, or similar fixed improvements along this area, and the fact that once such improvements are made and the public beach areas are impacted, such effects cannot be undone.

Sec. 2. Moratorium.

1. A moratorium is hereby adopted until July 30, 2012, prohibiting the construction, erection or expansion of all shore protection structures, seawalls, and similar fixed improvements on parcels of property located within the following boundaries: (1) all properties located on the west side of the street known as Ridgeway within the area bounded on the south by the St. Joseph River and on the north by the northerly boundary of the City of St. Joseph and (2) those properties that are located on the west side of Lions Park Drive within the area bounded on the north by Silver Beach County Park, on the north by Park Street, and on the south by Lions Park.. This moratorium includes, without limitation, all shore protection structures, seawalls, retaining walls, break walls, groins and jetties along or parallel to the shore of Lake Michigan within the above-described area.

2. In addition, a moratorium is hereby adopted until July 30, 2012, prohibiting the construction, erection or expansion of any Structure as defined by the Zoning Ordinance of the City of St. Joseph, within two hundred feet landward of the Ordinary High Water Mark for all parcels of property located on the west side of the street known as Ridgeway within the area bounded on the south by the St. Joseph River and on the north by the northerly boundary of the City of St. Joseph. Pursuant to the Natural

Resources and Environmental Protection Act, Public Act 451 of 1994, Part 325, as amended, the Ordinary High Water Mark for Lake Michigan is 580.5 feet above sea level, International Great Lakes Datum of 1985.

3. These moratoria may be extended by resolution of the City Commission for a period up to six (6) additional months if the City Commission determines it necessary to protect and promote the public health, safety and welfare.

Sec. 3. Effective Date.
This Ordinance shall be effective 10 days from the date of its final passage.

CERTIFICATION

The Mayor and Clerk of the City of St. Joseph, Berrien County, certify that this ordinance was passed by the St. Joseph City Commission on March 26, 2012, and that notice of its adoption or a copy of the ordinance was published in *The Herald-Palladium* newspaper on April 1, 2012.

ROBERT L. JUDD, Mayor

DEBORAH S. KOROCH, Clerk

APPENDIX 5

CITY OF ST. JOSEPH
BERRIEN COUNTY, MICHIGAN

AN ORDINANCE TO AMEND THE ZONING ORDINANCE OF
THE CITY OF ST. JOSEPH, MICHIGAN

THE CITY OF ST. JOSEPH ORDAINS:

The Zoning Ordinance of the City of St. Joseph, Michigan, is hereby amended by adding the following Section 9.7 to Article IX of the Ordinance:

"**SECTION 9.7 "EB-OD" EDGEWATER BEACH OVERLAY DISTRICT**

9.7.1 Intent. The Edgewater Beach Overlay District (EB-OD) is an overlay District intended to preserve the character of the public trust land along the shore of Lake Michigan, which is found to be a valuable public resource of the community, to prevent damage to the public trust land and to prevent damage to private property.

Based on the record presented the City finds that during periods of low Lake Michigan water levels, sand accretion in this District tends to significantly enlarge the beach and to enlarge affected parcels in this District. This additional land area can be seen by property owners as permanent and attractive for development. The character of the public trust land along the Lake Michigan shoreline, as well as viewsheds along the shoreline from public parks included in and adjacent to this District, is compromised by development in immediate proximity to the public trust land.

Based on the record presented the City further finds that the beach and property area near the shoreline is subject to submergence and erosion during periods of higher Lake Michigan water levels and resulting from weather conditions. It has been demonstrated that current state and federal development standards for the Lake Michigan shoreline, such as the Ordinary High Water Mark (OHWM) and the Base Flood Elevation, do not ensure that property shoreward of those locations is protected from erosion, inundation, or damage during such periods of time and/or weather events. The OHWM is not intended to reflect these periods of peril, and the Base Flood Elevation is a still water elevation that does not take into account the effect of wave action. The City further understands that revised federal floodplain regulations are being developed to take into account additional environmental factors such as waves and to provide an improved standard of floodplain development protection, but implementation of these regulations will not likely occur for several years.

When erosion threatens a Structure legally built near the shoreline, a natural reaction for the owner is to attempt to construct a seawall or other shore protection structure. Shore protection structures in this District would diminish significantly the character of the public trust land and pose an increased threat of erosion and damage to the public trust land as well as to adjacent private property.

The City has long experience with the detrimental effects of seawalls and shore protection structures constructed over a period of many years in response to erosion south of the St. Joseph River. These shore protection structures were and are necessary to protect previously developed areas of the City which are otherwise subject to regular and ongoing erosion. However, given the physical, environmental, and developmental characteristics of the EB-OD, including generally large lots which need not be developed near to the water's edge to be economically viable and that the area is generally benefitting from accretion rather than persistent erosion, the City believes that shore protection structures should not be necessary in this area and that would be detrimental to the public health, safety and welfare for reasons further identified and set forth in the City of St. Joseph, Michigan Coastal Engineering Study, dated August 17, 2012, a copy of which is on file with the City.

The City believes the most appropriate, effective and reasonable method to further the public interests of protecting natural resources; preserving the economic and environmental well-being of the community; to protect the health, safety and general welfare of the community; and the general preservation or enhancement of property values is to restrict the construction of structures so near to the water's edge as to be detrimental to the character of the public trust property and/or the vistas from neighboring public parks; and/or to be susceptible to damage resulting from inundation or erosion or to create an apparent future need for seawalls or other shore protection structures in order to protect these structures from damage resulting from inundation or erosion; and/or to be potentially built in a location that will render the structure nonconforming under the future federal floodplain protection regulations currently under development.

These regulations are intended to preserve the character of the public trust property along the shoreline, protect the vistas from neighboring public parks, and prevent the construction of structures and shore protection structures which would have deleterious effects on the public trust property as well as neighboring private property.

These regulations are also supported by the Comprehensive Plan, as the Future Land Use Map indicates lakefront property in this area should be used as open space and the supporting text indicates that open space areas should be maintained and encouraged along the shoreline.

9.7.2 Description of District. The EB-OD includes all lands in any zoning District located north of the St. Joseph River and situated lakeward of a line sequentially connecting the following points described by Michigan State Plane Grid Coordinates, South Zone, Grid, NAD 83, U.S. Survey Feet and as illustrated in Map 9-3, Area of Edgewater Beach Overlay District:

Point	Northing	Easting
A	231408.65'	12547511.47'
B	231835.41'	12547625.92'
C	232647.21'	12548673.22'
D	232952.85'	12549032.86'
E	233537.35'	12549657.47'
F	233846.96'	12549969.52'
G	234468.24'	12550591.09'
H	234820.85'	12550921.86'

9.7.2.1 Area of Edgewater Beach Overlay District

Map 9-3 Area of Edgewater Beach Overlay District

9.7.3 Structure Development. For the reasons set forth in Subsection 9.7.1 and elsewhere in this Ordinance, the installation, construction and operation of Structures, which for the purpose of this section includes seawalls and shore protection structures, within the EB-OD shall be subject to the following:

A. No Structure shall be installed or constructed in the EB-OD. The following are not considered a Structure for purposes of this section only:

1. Public recreational equipment in public parks;
2. Open, unroofed walkways, including those constructed of pavers or similar objects;
3. Stairs and similar open, unroofed structures that are set on the surface of the ground and which are not attached to a Structure; and
4. Freestanding signs.

B. In the event the provisions of the EB-OD prevents the development or use of a Lot existing on the effective date of this amendment for the purposes permitted in the Zoning District, or creates practical difficulties or unnecessary hardship for the use of such a Lot, the property owner may seek a Hardship Planned Unit Development or Variance under the terms of this Ordinance.

C. If any Lot within or partially within the EB-OD is divided or the subject of a boundary adjustment after the effective date of this amendment such that any resulting parcel is nonbuildable due to the regulations of this section, except for a boundary adjustment that has the effect of lessening a Nonconformity with respect to this section, it will be deemed a voluntary action of the property owner and will disqualify the resulting nonbuildable parcel from receiving a Variance or Hardship Planned Unit Development.

D. In the event the provisions of the EB-OD render Nonconforming any Structure which is existing or which is the subject of a valid building permit and under construction on the effective date of this amendment, this shall not be deemed a voluntary action of the property owner and will not disqualify the parcel from receiving a Variance or Hardship Planned Unit Development under the procedures described in this Ordinance.

E. To the extent of any conflict between the regulatory provisions contained in this section and other provisions of the Zoning Ordinance, the restrictions contained in this section shall control.

This ordinance shall take effect 10 days after its final passage.

The Mayor and Clerk of the City of St. Joseph, Berrien County, certify that this ordinance was passed by the St. Joseph City Commission on _____, 2012, and that notice of its adoption or a copy of the ordinance was published in *The Herald-Palladium* newspaper on _____, 2012.

_____
ROBERT L. JUDD, Mayor

_____
DEBORAH S. KOROCH, Clerk

APPENDIX 6

BLOOM SLUGGETT MORGAN

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August 19, 2012

Robert L. Judd, Mayor
City Commission
City of St. Joseph
City Hall
700 Broad Street
St. Joseph, MI 49085

Re: Coastal Study Review and Implementation

Dear Mayor Judd and Members of the City Commission:

The City of St. Joseph ("City") has asked for our opinion concerning the legality of adopting and enforcing potential new ordinances regulating designated areas of the Lake Michigan shoreline, specifically with regard to setbacks and the construction of shoreline protection structures.

In preparing this opinion, we have reviewed the report and recommendations for shoreline management prepared by the City's consultants. It is our understanding after reviewing the "St. Joseph Coastal Study" ("Report") that the City's consultants are recommending separating the Lake Michigan shorefront into three distinct areas based on identifying characteristics: Area 1 (Jean Klock Park to North Pier), Area 2 (South Pier to the St. Joseph Water Plant), and Area 3 (St. Joseph Water Plant South to City Limits). The consultants have recommended the following:

- Area 1: An ordinance (proposed by the City to be a zoning ordinance amendment) prohibiting all structures, including shoreline protection structures (i.e., seawalls or similar structures), within a fixed setback of 130' to 180' (depending on location) landward of the statutory ordinary high water mark.
- Area 2: An ordinance establishing the location where shoreline protection structures may be constructed, and setting forth certain design standards (e.g., stone revetment) for such structures.
- Area 3: No ordinances are proposed for this area because no further regulation is recommended.

In the course of its review of these recommendations, an assertion was made to the City that such regulations would constitute a "taking" of private property by, presumably, unduly restricting the ability of a property owner to develop or protect his or her property. The remainder of this letter addresses this and similar issues.

Initially, it must be noted that as of the date of this letter, the only proposed ordinance language that we have reviewed is a draft ordinance amending the City's Zoning Ordinance to add Section 9.7, entitled "EB-OD" Edgewater Beach Overlay District. We previously provided our comments and revisions regarding the proposed ordinance language to the City, and our opinion, as expressed in this letter, is based in part on the proposed language. Our opinion is subject to change depending upon the language that is actually proposed or adopted by the City (whether it be a zoning ordinance, regulatory ordinance or both), or if the facts conveyed to us are later discovered to be incomplete or incorrect.

I. PRELIMINARY ISSUES

A. General Authority to Adopt Local Ordinances

As a home rule city, the City has broad powers under the Michigan Constitution to enact ordinances for the benefit of municipal concerns. Const. 1963, art. 7, §§ 22. The Home Rule City Act ("HRCA"), MCL 117.1 *et seq.*, further defines the authority of cities to enact and enforce local ordinances. Laws (such as the HRCA) that concern local governments "shall be liberally construed in their favor." Const. 1963, art. 7, §§ 34.

"Among the powers that may properly be exercised by a home rule city is the police power." *Belle Isle Grill Corp v Detroit*, 256 Mich App 463, 481; 666 NW2d 271 (2003); see also MCL 117.3(j) (requiring city charters to include provisions for the "public peace and health and for the safety of persons and property"). It is clear that the City has the authority to enact ordinances for the public health, safety, and welfare of its citizens.

Zoning regulations constitute a valid exercise of governmental authority when they have a rational relation to the public health, safety, welfare and prosperity of the community. *Comer v City of Dearborn,* 342 Mich 471, 477; 70 NW2d 813 (1955); see also MCL 125.3201 (authorizing a local unit of government to adopt zoning ordinances regulating the use of land and structures "to promote public health, safety, and welfare"). The Michigan Zoning Enabling Act, being MCL 125.3201 *et seq.*, ("MZEA") specifically allows a local unit of government to regulate land development "to achieve specific land management objectives and avert or solve specific land use problems, **including the regulation of land development and the establishment of districts in areas subject to damage from flooding or beach erosion.**" MCL 125.3201(3) (emphasis added).

Michigan courts further recognize that local governments are generally permitted to regulate water or riparian rights (such as the right to erect docks and moor boats) as part of their zoning power. *Twp of Yankee Springs v Fox,* 264 Mich App 604, 606; 692 NW2d 728 (2005). In fact, the Michigan Supreme Court has recognized that in order to accomplish the goals of zoning, riparian rights cannot be excluded:

> In a state such as Michigan, with its abundant bodies of water, there would be no way to ensure that land uses are compatible with surrounding properties unless water activities are evaluated. Similarly, the conservation of natural resources, which clearly includes water, cannot be undertaken if there is no means for

regulating riparian rights. [*Hess v W Bloomfield Twp*, 439 Mich 550, 563; 486 NW2d 628 (1992).]

The Court has recognized that by granting the authority to municipalities to promote the public health, safety, and general welfare through enactment of zoning ordinances, the Legislature was complying with a "*constitutional mandate* to protect the environment, including bodies of water, from impairment or destruction." *Id.* at 564 (emphasis added).[1]

Thus, in our opinion, the City has the authority to adopt local ordinances—both police power and zoning ordinances—that promote public health, safety, and welfare, even if the ordinances impact riparian rights or other property rights of lakeshore owners.

As indicated, we have reviewed a proposed Zoning Ordinance amendment that would be applicable to Area 1. We understand that the City may be considering a stand-alone police power ordinance that would be applicable to Area 2; however, we cannot express an opinion at this time regarding whether the proposed regulations for Area 2 are more properly considered zoning or police power ordinances,[2] as we have not reviewed any proposed language. ("The question whether or not a particular ordinance is a zoning ordinance may be determined by a consideration of the substance of its provisions and terms, and its relation to the general plan of zoning in the city." *Square Lake Hills Condo Ass'n v Bloomfield Twp*, 437 Mich 310, 233; 471 NW2d 321 [1991].)

B. Ordinary High Water Mark

Because the Report's recommendations implicate the statutory ordinary high water mark ("OHWM"), a brief discussion of the OHWM is relevant.

The OHWM constitutes the limit of the Department of Environmental Quality's ("DEQ's") jurisdiction under Part 325 of the Natural Resources Environmental Protection Act ("NREPA"), MCL 324.32501 *et seq.*[3] Thus, the DEQ has jurisdiction to require permits under Part 325 concerning lands "lying below and lakeward of the natural ordinary high-water mark...." MCL 324.32502.

In the recent case of *Burleson v Dep't of Environmental Quality*, 292 Mich App 544, 549; 808 NW2d 792 (2011), the Michigan Court of Appeals affirmed that the scope of the DEQ's regulatory authority under Part 325 is set by the statutorily-defined elevations. For example, the

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[1] Article 4, §52 of the Michigan Constitution states:

> The conservation and development of the natural resources of the state are hereby declared to be of paramount public concern in the interest of the health, safety and general welfare of the people. The legislature shall provide for the protection of the air, water and other natural resources of the state from pollution, impairment and destruction.

[2] Zoning ordinances are generally recognized as such if they regulate the use of land and buildings according to districts, areas, or locations. In contrast, an ordinance that regulates an "activity" is generally considered a police power ordinance. *Square Lake Hills Condo Ass'n v Bloomfield Twp*, 437 Mich 310, 323-25; 471 NW2d 321 (1991).

[3] Part 325 of NREPA is sometimes referred to as the Great Lakes Submerged Lands Act, or GLSLA. It regulates the use of land below or lakeward of the statutorily-defined ordinary high water mark.

OHWM for Lake Michigan is statutorily set at 579.8 feet of elevation above sea level. MCL 324.32502. Thus, for example, when the water recedes below the OHWM, the riparian owner may not generally place any permanent structures or do any dredging or filling on that land without a permit from the DEQ. Part 325; OAG, 1977-1978, No. 5327.

The OHWM should not be confused with the common law natural ordinary high water mark ("NOHWM") discussed in *Glass v Goeckel*, 473 Mich 667, 683; 703 NW2d 58, 67 (2005). In *Glass*, the Court held that the boundaries of the public trust are not limited by the statutory elevations in MCL 324.32502. Instead, the public trust (which permits, for example, pedestrians to walk along the Great Lakes) extends to the common law NOHWM, which the Court defined as where "the presence and action of the water is so continuous as to leave a distinct mark either by erosion, destruction of terrestrial vegetation, or other easily recognized characteristic." *Id.* at 674.[4] The NOHWM would generally need to be determined on a property-by-property basis.

Because the statutorily-defined OHWM differs from the common law NOHWM, the City should use caution in incorporating one or both terms into its ordinances so that the City's intent is clear from the chosen language. In addition, the OHWM used in the Coastal Engineering Study ("Study") is 580.5 feet, which is different from the statutory OHWM of 579.8 feet in MCL 324.32502.[5] Thus, for clarity's sake, we recommend that any references to an OHWM in the ordinance(s) be clearly defined. Further, to the extent the City chooses to reference a NOHWM in one or more of the ordinances, the City must be aware that the NOHWM varies and that the location of the NOHWM on a particular property may be subject to debate.[6]

C. Preemption

Because the OHWM delineates the primary landward limit of the DEQ's permit jurisdiction, it raises a question as to whether a local ordinance intended to regulate land between the OHWM and the water's edge would be preempted (i.e., precluded) by state law. (This issue does not arise with regard to an ordinance that applies only to property landward of the OHWM.)

In Michigan, a municipality may not enact an ordinance if (a) the ordinance directly conflicts with the state statutory scheme, or (b) the state statutory scheme preempts the ordinance by occupying the field of regulation, even where there is no direct conflict between the two schemes of regulation. *Frericks v Highland Twp*, 228 Mich App 575, 585-86; 579 NW2d 441, 447 (1998). In that regard, preemption may be established "(1) where state law is expressly preemptive; (2) by examination of the legislative history; (3) by the pervasiveness of the state regulatory scheme, although this factor alone is not generally sufficient to infer preemption; or

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[4] The State of Michigan holds in trust the navigable waters of the state in behalf of its citizens, and riparian owners hold "the right to use and enjoy" their riparian property "subject to the public right of navigation...." *Hall v Alford*, 114 Mich 165, 167; 72 NW 137 (1897). "As trustee, the state must preserve and protect specific public rights below the ordinary high water mark and may permit only those private uses that do not interfere with these traditional notions of the public trust." *Glass v Goeckel*, 473 Mich 667, 694; 703 NW2d 58 (2005).

[5] The Study uses 580.5 feet as the OHWM based upon DEQ Guidance Document No. 325-06-02, which provides a conversion between IGLD 1955 (utilized in MCL 324.32502) and IGLD 1985 (utilized in the study).

[6] "[I]t is abundantly clear that 'the precise location of the ordinary high water mark at any given site on the shores of our Great Lakes remains a question of fact.'" *United States v Marion L Kincaid Trust*, 463 F Supp 2d 680, 694 (ED Mich, 2006), quoting *Glass, supra* at 694.

(4) where the nature of the subject matter regulated demands exclusive state regulation to achieve the uniformity necessary to serve the state's purpose or interest." *Id.* at 585-586.

We have not located any appellate court decisions addressing whether local units of government have concurrent jurisdiction involving the Great Lakes with the DEQ lakeward of the OHWM or whether local ordinances pertaining to such land are preempted. However, in our opinion, a court would likely find that such a local ordinance is not preempted as a matter of law.

Part 325 is not expressly preemptive in that nothing in the statutory scheme expressly prohibits a local unit of government from adopting or enforcing local ordinances regulating land, uses or activities that that fall within the scope of the state's regulatory jurisdiction. In fact, the state administrative rules promulgated under NREPA state that the DEQ "may require such permit conditions as it deems reasonable and necessary to protect the public trust and private riparian interests, including any of the following conditions:...(e) That the project be in compliance with local zoning ordinances." R 322.1011(1)(e). In addition, the rules explicitly state that the issuance of a permit under Part 325 (i.e., for a seawall, bulkhead, or other permanent revetment structures) "does not obviate the necessity of receiving approval from the United States army corps of engineers and, where applicable, other federal, state, or local units of government." R 322.1011(4).

Furthermore, the types of regulations recommended in the Report would not be preempted as a matter of law by federal law. Under federal law, the Great Lakes are considered navigable waters. 33 CFR § 328.3(a)(3). The federal government's jurisdiction over the Great Lakes (in the absence of adjacent wetlands) "extends to the ordinary high water mark", 33 CFR § 328.4; *United States v Rands*, 389 US 121, 123 (1967). The federal regulations define the "ordinary high water mark" as:

> that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas. [33 CFR § 328.3(e).]

While we believe local regulations that interfere with the federal navigational servitude may be preempted, it does not appear on the face of the Report that the regulations recommended in the Report would interfere with the construction or maintenance of federal navigational structures such as piers. Further, in our opinion, because the federal and state laws represent a coordinated effort between the state and federal government, and because the state law allows for more restrictive regulations on the local level, federal law does not *per se* preempt local regulation of the Lake Michigan shoreline.

In fact, the Coastal Engineering Manual published by the Army Corps of Engineers ("ACOE") recognizes several alternatives for shore protection, including but not limited to armoring (i.e., seawalls, protective revetments) and the "do nothing" approach. The ACOE manual states that "[n]ational plans for beach management and shore protection do not exist" and that each project must consider several factors, including but not limited to public health, safety and social well-being, community cohesion, and state, regional and *local* plans for coastal zones.

The ACOE manual recognizes that "[s]everal states have established construction setback lines to reduce damage in areas subject to coastal erosion and shoreline retreat." Further, as stated in the manual:

> Some states (North Carolina, Maine) have passed laws banning the use of armored structures (seawalls, bulkheads, revetments) and shore protection on their ocean coasts. South Carolina only bans armored structures and other coastal states are considering similar laws. Florida and California have adopted sand mitigation policies and procedures to permit seawall construction but require the annual placement of sand to compensate for that trapped behind the structure.

The ACOE manual does not suggest in any way that these types of state regulations are preempted by federal law, nor does it suggest that similar local regulations would be preempted by federal law.

Based on the above, it our opinion that a local ordinance regulating land, use or activities between the OHWM and the water's edge would not be preempted as a matter of law. Whether a specific ordinance would be preempted for the reason that it creates a direct conflict with state or federal law would need to be determined after a review of the proposed ordinance language.

II. CONSTITUTIONAL ISSUES

As discussed above, one issue already raised is whether the recommended regulations could withstand constitutional scrutiny. Below is our analysis of the proposed regulations under the three primary types of constitutional challenges to land-use ordinances.

At the outset, it is important to note that all ordinances are presumed to be constitutional and are construed so unless their unconstitutionality is clearly apparent. *Kenefick v City of Battle Creek,* 284 Mich App 653, 654-655; 774 NW2d 925 (2009). "The foundation for this presumption is our recognition that elected officials generally act in a constitutional manner when regulating within their particular sphere of government." *Truckor v Erie Twp,* 283 Mich App 154, 162; 771 NW2d 1 (2009). Thus, the party challenging the ordinance has the burden of rebutting the presumption that the ordinance is constitutional. *Id.* The Michigan Court of Appeals has recognized that zoning ordinances come clothed "with every presumption of validity." *Adams Outdoor Advertising, Inc v City of Holland,* 234 Mich App 681, 692; 600 NW2d 339 (1999).[7]

A. Substantive Due Process

Both the United States and Michigan Constitutions guarantee that no state shall deprive any person of "life, liberty or property, without due process of law." *People v Sierb*, 456 Mich 519, 522; 581 NW2d 219 (1998). The due process provisions encompass procedural fairness, but also have a substantive component that protects individual liberty and property interests

[7] See also *Rental Prop Owners Ass'n of Kent Co v Grand Rapids,* 455 Mich 246, 253; 566 NW2d 514 (1997) ("enforcement of ordinances related to municipal concerns is a valid exercise of municipal police powers as long as the ordinance does not conflict with the constitution or general laws").

against certain government actions. "The underlying purpose of substantive due process is to secure the individual from the arbitrary exercise of governmental power." *Id.* at 523.

A party arguing that an ordinance violates his or her substantive due process rights has the burden of showing that the ordinance is arbitrary and unreasonable. *Conlin v Scio Twp,* 262 Mich App 379, 390; 686 NW2d 16 (2004). This is a high burden, as the challenger must negate "every conceivable basis which might support the legislation." *TIG Ins Co v Dep't of Treasury,* 464 Mich 548, 558; 629 NW2d 402 (2001). Under a substantive due process analysis, an ordinance will be upheld if it is "rationally related to a legitimate government interest." *Conlin, supra,* 262 Mich App at 389.[8]

The government interests advanced by the City to justify the proposed ordinances include, among others, the protection of natural resources, preservation of the public way, and protection of property. Presumably, the City would further contend that the economic and environmental well-being, health, safety and general welfare of the City is dependent upon and related to the preservation of the Lake Michigan shoreline within the City's boundaries; that property values will generally be enhanced by the preservation of the natural features of the shoreline; and that it is obligated to prevent or help minimize the impairment or destruction of the shoreline and the adjacent bottomlands.

In our opinion, these interests are legitimate government interests and should be sufficient to justify the constitutionality of the proposed regulations, as long as the regulations are rationally related to one or more of these interests.

By way of example, in the recent case of *Grucz v City of New Baltimore,* Michigan Court of Appeals Docket No. 302860; 2012 WL 2402011 (June 26, 2012), a property owner challenged a city ordinance that prohibited fences within 30 feet of water, after the city stopped her from erecting a fence on the lake side of her waterfront property. The Court found that the ordinance was constitutional, even though it impacted the owner's property rights.

In the *Grucz* case, the Court of Appeals reaffirmed that aesthetics and public safety are legitimate governmental interests that are sufficient to justify the constitutionality of a zoning ordinance. *Id.,* slip op at 3, citing *Adams Outdoor Advertising, supra* at 693. The Court held that "protecting and promoting public health, safety, and general welfare are legitimate governmental interests...and protecting aesthetic value is included in the concept of the general welfare." *Norman Corp v City of East Tawas,* 263 Mich App 194, 200-201; 687 NW2d 861 (2004).

In our opinion, the interests advanced by the City in this matter are significantly stronger than a government's interest in protecting only aesthetic value. Thus, in our opinion, it is unlikely that a court would strike down the proposed regulations on substantive due process grounds unless there was no rational basis between the City's stated interests and the adopted

[8] Property owners sometimes argue that they have a fundamental right to develop their property. However, the United States Supreme Court has consistently applied the reasonable and legitimate state interest test to land-use decisions and has not treated land-use issues as involving fundamental rights. *Dolan v City of Tigard,* 512 US 374; 114 S Ct 2309 (1994); *Euclid v Ambler Realty Co,* 272 US 365, 395; 47 S Ct 114 (1926) (stating that before a zoning ordinance can be declared unconstitutional, the provision must be clearly arbitrary and unreasonable, having no substantial relation to the public health, safety, morals, or general welfare).

ordinances. See *e.g.*, *Young v American Mini Theatres, Inc,* 427 US 50, 71; 96 S Ct 2440; 49 L Ed 2d 310 (1976) (stating that a municipality's interest in attempting to preserve quality of life is accorded high respect). See also *Bevan v Brandon Twp,* 438 Mich 385, 399-400; 475 NW2d 37 (1991) (upholding an ordinance restricting lakefront property, finding that it was rationally related to the legitimate government purpose of ensuring access for emergency personnel); *Cummins v Robinson Twp*, 283 Mich App 677, 702; 770 NW2d 421 (2009) (the township's enforcement of flood-resistant building code requirements advanced legitimate state interests in protecting the health, safety, and welfare of the public and protected property located in flood-prone areas).

This conclusion is consistent with cases in other jurisdictions as well. For example, in the case of *Samson v City of Bainbridge Island,* 202 P3d 334, 349 (2009), the Court of Appeals for the State of Washington upheld an amendment to city's shoreline master program that prohibited the construction of single-family private docks in a harbor. The court noted that the amendment was adopted "to protect the aesthetic, navigational, and recreational values that would be diminished by multiple docks in the harbor" and that the amendment did not violate due process rights because "[i]t defies logic to suggest an ordinance is unduly oppressive when it regulates only the activity which is directly responsible for the harm."

Nevertheless, it is not the municipality that is obligated to justify an ordinance by affirmatively showing that it has a reasonable governmental interest in the ordinance—which we believe the City would have in this case—rather, "it is plaintiff who is required to affirmatively prove that defendant does not have a reasonable governmental interest." *Grucz, supra* at 4. Moreover, courts are not to sit as a "superzoning commission," *Brae Burn, Inc v Bloomfield Hills,* 350 Mich 425, 430; 86 NW2d 166 (1957), and will not adjudicate the wisdom of zoning ordinances beyond evaluating them for a rational basis. Thus, the Due Process Clause cannot be invoked by a disgruntled property owner simply because he or she disagrees with the regulation. "The Due Process Clause is not a guarantee against incorrect or ill-advised [governmental] decisions." *Cummins v Robinson Twp,* 283 Mich App 677, 702; 770 NW2d 421 (2009) (citations omitted).

Further, the fact that the local ordinance(s) may impose restrictions that exceed federal or state regulations would not necessarily render the ordinance(s) unconstitutional. In *Frericks v Highland Twp*, 228 Mich App 575, 599; 579 NW2d 441 (1998), the Court of Appeals upheld a township zoning ordinance requiring septic tanks and tile fields to be constructed at least 125 feet from the high water mark of any subaqueous area. The plaintiffs argued that the setback regulation was unreasonable and unnecessary because county and state regulations were adequate. The Court noted there was testimony in the case that the township generally had extremely porous soil, which justified adopting a setback requirement greater than county or state standards as an additional "safety" measure to protect water resources. The Court said, "[g]iven this evidence, while there may be a difference of opinion concerning the need for a 'safety' factor, we are not persuaded that the trial court erred in finding that the setback regulation...was reasonable."[9]

[9] To the extent the City seeks to adopt regulations that are more stringent or restrictive than the state (or federal) requirements, it would be beneficial for the City to be able to present (prior to enactment of the regulations)

Based on the information presented to date, it is our opinion that the proposed ordinances would likely withstand a constitutional challenge under a substantive due process argument because they appear to directly advance legitimate government interests—as long as the ordinances that the City adopts are rationally related to those interests.

B. Equal Protection

Property owners sometimes challenge ordinances arguing that the ordinance violates his or her right to equal protection.[10] In determining whether application of an ordinance violates equal protection, courts apply the following principles set forth in *Shepherd Montessori Center Milan v Ann Arbor Charter Twp,* 486 Mich 311, 318-319; 783 NW2d 695 (2010):

> When reviewing the validity of state legislation or other official action that is challenged as denying equal protection, the threshold inquiry is whether plaintiff was treated differently from a similarly situated entity. The general rule is that legislation that treats similarly situated groups disparately is presumed valid and will be sustained if it passes the rational basis standard of review: that is, the classification drawn by the legislation is rationally related to a legitimate state interest. Under this deferential standard, "the burden of showing a statute to be unconstitutional is on the challenging party, *not* on the party defending the statute[.]" [Citations omitted; emphasis in original.][11]

Based upon our understanding of the proposed regulations, it does not appear that there would be any disparate treatment among similarly situated property owners. The ordinances would be generally applicable, would not single out any waterfront property owners for special treatment, and would treat all persons of the same class alike. In other words, no immunities or privileges would be extended to an arbitrary or unreasonable class while denied to others of like kind.

If a challenger is unable to meet his or her burden of proving different treatment, and as long as there is no evidence of discriminatory intent in the enforcement of the ordinance, then a court would not even apply the rational basis test to determine whether the ordinance is rationally related to a legitimate state interest. *Shephard, supra* at 323 ("because plaintiff has

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evidence or testimony, if necessary, that there are factors or characteristics unique to the area that justify the additional "safety measures."

[10] The Equal Protection Clause requires that all persons similarly situated be treated alike under the law.

[11] When legislation treats similarly situated groups differently on the basis of a suspect classification (e.g., race, alienage, or national origin), or infringes on a fundamental right protected by the Constitution (e.g., the free exercise of religion), "the legislation must pass the rigorous strict scrutiny standard of review: that is, the government bears the burden of establishing that the classification drawn is narrowly tailored to serve a compelling governmental interest." *Shephard, supra* at 319. If legislation treats similarly situated groups differently on the basis of a quasi-suspect classification (e.g., gender), then the intermediate scrutiny test is applied and "the burden is on the government to show that "the classification serves important governmental objectives and that the means employed are substantially related to the achievement of those objectives." *Id.* Where, as here, an ordinance is facially neutral, the burden is on the challenging party—not the government—to show that the challenging party "was actually treated differently from others similarly situated and that no rational basis exists for the dissimilar treatment." *Id.* at 319-320.

failed to demonstrate that it was treated differently from similarly situated entities, we need not apply the rational basis test").

Even assuming for argument's sake that there was evidence of dissimilar treatment, courts will uphold legislation as long as it is "rationally related to a legitimate government purpose." A reviewing court need only determine if there is "any reasonably conceivable state of facts that could provide a rational basis for the classification." *Kenefick v City of Battle Creek,* 284 Mich App 653, 658; 774 NW2d 925 (2009). The finding may be based on "rational speculation unsupported by evidence or empirical data." *Id.*

The person challenging the ordinance has an extremely high burden—"the challenger must 'negative [sic] *every conceivable basis* which might support' the legislation." *Id.* (citation omitted). See also *Risko v Grand Haven Charter Twp Zoning Bd of Appeals,* 284 Mich App 453, 465; 773 NW2d 730 (2009) ("[T]he party raising the equal protection challenge has the burden of proving that the challenged law is arbitrary and thus irrational"); *Houdek v Centerville Twp,* 276 Mich App 568, 585; 741 NW2d 587 (2007) ("When an ordinance is challenged on the basis of equal protection guarantees, the ordinance is presumed constitutional, and the challenging party has the burden to show that the established classification is not rationally related to a legitimate state interest").

Lakefront property owners are not a protected class. Thus, based on the information presented to date, it is our opinion that the proposed ordinances would likely withstand a constitutional challenge under an equal protection argument, so long as the ordinances are rationally related (or bear a reasonable relationship) to a legitimate governmental interest, they treat similarly situated individuals alike, and they do not single out any property owner for special treatment. We believe that if the ordinances meet these requirements, it is unlikely that a court would conclude that the ordinances are arbitrary and irrational, or that a challenger could overcome the substantial burden to negate *every conceivable basis* which might support the ordinances.

C. Regulatory Taking

Finally, it is not unusual for property owners to challenge an ordinance claiming that the ordinance restricts the use of their property in an unreasonable manner, and, as a result, constitutes an impermissible "taking" of private property for public purposes without compensation.

The United States and Michigan Constitutions provide that private property shall not be taken for public use without just compensation. The government may effectively "take" a person's property by overburdening that property with regulations. However, a "land-use regulation does not effect a taking if it substantially advances legitimate state interests and does not deny an owner economically viable use of his land." *Nollan v California Coastal Comm,* 483 US 825, 834 (1987).

Courts have found that land use regulations effectuate a taking where the regulation denies an owner economically viable use of his land. *K & K Const, Inc v Dep't of Nat Res,* 456 Mich 570, 576-77; 575 NW2d 531(1998). This type of taking encompasses two types of

situations: (1) a "categorical" taking, where the owner is deprived of "all economically beneficial or productive use of land," *Lucas v South Carolina Coastal Council,* 505 US 1003, 1015 (1992); and (2) a taking recognized on the basis of the application of the traditional "balancing test" established in *Penn Central Transp Co v New York City,* 438 US 104 (1978).

Based upon our understanding of the proposed ordinances, it is highly unlikely that the ordinances would force a property owner to sacrifice *all economically beneficial uses* of his or her land, except perhaps if the proposed setback requirement rendered a currently buildable vacant lot *unbuildable* or would cause an existing building to be destroyed by coastal conditions without the ability to rebuild. Thus, before adopting any setback requirements, the City should investigate what effect the proposed setbacks would have on existing vacant lots (if any), as well as on any lots on which existing structures may be destroyed in the future by fire or natural disaster. Depending upon the results of the investigation, the City may determine that it is highly unlikely that a "categorical" taking would result.

With regard to the second type of "taking," courts analyze such a claim using three factors: (1) the character of the government's action, (2) the economic effect of the regulation on the property, and (3) the extent by which the regulation has interfered with distinct, investment-backed expectations. *Penn Central, supra* at 124.

The first factor evaluates whether a property owner is being singled out or whether an ordinance applies broadly and equally. *Chelsea Inv Group LLC v Chelsea,* 288 Mich App 239, 261; 792 NW2d 781 (2010). As discussed above, it appears based upon the information presented to date that the City has the authority to adopt the proposed ordinances, that the ordinances could be rationally related to legitimate governmental interests, and that the ordinances would apply broadly and equally. Assuming that to be true, this factor would weigh in favor of the City.

To the extent a challenger claims that the economic effect of the ordinances amounts to a taking under the second factor, it is well established that mere diminution in value is not enough to establish a taking. "The Taking Clause does not guarantee property owners an economic profit from the use of their land." *Frericks v Highland Twp*, 228 Mich App 575, 616; 579 NW2d 441, 460 (1998). Further, in applying a "taking" analysis, the full bundle of property rights associated with land is generally viewed in its entirety. *Bevan v. Brandon Twp.,* 438 Mich. 385, 395-397, 475 N.W.2d 37 (1991). As a result, restrictions on the use of only limited portions of a parcel, such as setback ordinances, are not generally considered regulatory takings. *Tahoe-Sierra Pres Council, Inc v Tahoe Regl Planning Agency*, 535 US 302, 327 (2002) ("where an owner possesses a full 'bundle' of property rights, the destruction of one 'strand' of the bundle is not a taking"); *Gorieb v Fox,* 274 US 603 (1927).[12]

Finally, under the third factor, courts consider whether the challenger has made any investments in the property that were subsequently lost because of the ordinance. To the extent a challenger contends that the ordinances interfere with distinct, investment-backed expectations

[12] Indeed, it is our understanding that one of the purposes for the proposed ordinances is to protect private property and to, in fact, enhance the value of that property. Enhancing property values serves legitimate governmental interests including but not limited to increasing the tax base and, therefore, property tax revenues.

concerning riparian rights, the expectations must be viewed in light of the public trust doctrine discussed above. Our Supreme Court has articulated the following standard with regard to the taking of riparian rights: "Riparian rights are property, for the taking or destruction of which by the State compensation must be made, *unless the use has a real and substantial relation to a paramount trust purpose.*" *Peterman v Dep't of Nat Resources,* 446 Mich 177, 213-214; 521 NW2d 499 (1994), citing *Hilt v Weber,* 252 Mich 198, 225; 233 NW 159 (1930).

In the Peterman case, landowners brought an action against the Department of Natural Resources ("DNR"), alleging that the DNR's construction of a boat launch and jetties—which resulted in the destruction of the plaintiffs' beachfront property as a result of erosion and filtration of sand—was an unconstitutional taking. The court found that

> defendant's [the DNR's] actions were the proximate cause of the destruction of plaintiffs' beachfront property. Assuming that defendant did not directly invade plaintiffs' land, it undoubtedly set into motion the destructive forces that caused the erosion and eventual destruction of the property. Defendant was forewarned that the construction of the jetties could very well result in the washing away of plaintiffs' property, and the evidence reveals that the destruction of plaintiffs' property was the natural and direct result of the defendant's construction of the boat launch. The effect of defendant's actions were no less destructive than bulldozing the property into the bay. [*Peterson, supra,* at 191.]

The court noted that as a result of erosion from the DNR's construction of the boat launch and jetties, the plaintiffs had lost a significant amount of "fast land." Fast land is property that is "above the high water mark." *Id.* at 181. The court then concluded—citing to several earlier court decisions—that fast land cannot be taken without just compensation. See also *United States v Rands*, 389 US 121, 123 (1967), in which the United States Supreme Court stated that "when fast lands are taken by the Government, just compensation must be paid."

In our opinion, regulations of the type proposed are distinguishable from government-caused erosion or flooding due to government improvements or construction. In the *Peterson* case, the government (there, the DNR) actually undertook activity that caused the property damage. In contrast, the City in this case is simply seeking to regulate and/or prevent the development of shoreline property by the property owner. And, in our opinion, prohibiting a property owner from constructing a seawall, in and of itself, does not amount to an unconstitutional taking.

However, we cannot conclude that the City would be insulated from an action by one or more property owners alleging that the City ordinances prohibiting the construction of certain shoreline protection structures caused increased erosion or the loss of fast land for which compensation must be paid. If such an action were to be filed against the City, expert testimony would, quite obviously, be critical with respect to the effects of building/prohibiting shoreline protection structures.

The case of *Shell Island Homeowners Association, Inc v Tomlinson*, 517 SE2d 406 (1999) is instructive on this issue. In that case, the Court of Appeals of North Carolina upheld a state regulation that prohibited permanent erosion control structures, including seawalls. The

court rejected the property owners' argument that the regulation amounted to a "taking," finding that the property owners failed to show that they had any legally cognizable property interest that had been taken by the state. The court explained:

> The invasion of property and reduction in value which plaintiffs allege clearly stems from the natural migration of Mason's Inlet, and plaintiffs have based their takings claim on their need for "a permanent solution to the erosion that threatens its property," and the premise that "[t]he protection of property from erosion is an essential right of property owners...." The allegations in plaintiffs' complaint have no support in the law, and plaintiffs have failed to cite to this Court any persuasive authority for the proposition that a littoral or riparian landowner has a right to erect hardened structures in statutorily designated areas of environmental concern to protect their property from erosion and migration. [*Id.* at 228.]

The court in the *Shell Island* case stressed that there was no actual interference with the plaintiffs' property rights. Rather, the alleged injuries were merely consequential or incidental and "allegations of mere incidental or consequential interferences with property rights are insufficient to maintain and action for inverse condemnation." *Id.* at 229. The court found that the alleged damages to the plaintiffs' property were not caused by the government's regulatory action, but by "naturally occurring phenomena" of the migration of the inlet and the resulting erosion of the property. *Id.* at 229-230.

Similarly here, the City's enforcement of the proposed regulations (i.e., a ban on shoreline protection structures in Area 1) would be incidental to naturally occurring events. Thus, as long as the regulations would not cause a property owner to lose all economically beneficial or productive use of their property (as opposed to suffering a mere reduction in value), we believe that the regulations could withstand constitutional scrutiny under a takings analysis, even if as a result of the regulations a property owner suffered incidental damage from naturally occurring phenomena.

In sum, it is our opinion that City has the legal authority under state law and federal law to enact and enforce the types of ordinances it is considering. Further, it is our opinion that such ordinances can withstand constitutional scrutiny if they apply broadly and equally, do not single out any property owners, and do not deprive a property owner of all economically viable uses of his or her property.[13]

[13] We note that depending on how the City decides to proceed with regard to the Area 2 recommendations, there may be additional areas requiring additional research. For example, what are the ramifications, if any, of requiring property owners to construct shoreline protection structures on public property (realizing that with regard to most parcels in Area 2, there may be no alternative)? This raises questions regarding ownership and maintenance of the structures, as well as governmental liability and the appropriate mechanism/procedure for granting property owners permission to construct the structures, while at the same time minimizing the City's exposure to liability.

Thank you for allowing us the opportunity to work with the City. If there are additional questions regarding these matters, or if we can be of further assistance, please do not hesitate to contact us.

Very truly yours,

Jeffrey V.H. Sluggett

Exhibits

EXHIBIT 1

Area 1 Proposed Setback Line

TISCORNIA PARK TO 2,650' NORTH

2,650' NORTH TO 4,575' NORTH

LEGEND:

PARCEL LINE
BUILDING LINE

POINT	NORTHING	EASTING
A	231408.65'	12547511.47'
B	231835.41'	12547625.92'
C	232647.21'	12548673.22'
D	232952.85'	12549032.86'
E	233537.35'	12549657.47'
F	233846.96'	12549969.52'
G	234468.24'	12550591.09'
H	234820.85'	12550921.86'

LINE	DISTANCE	BEARING
AB	441.84'	N 15° 00' 46" E
BC	1451.11'	N 52° 13' 10" E
CD	471.91'	N 49° 38' 27" E
DE	855.44'	N 46° 54' 01" E
EF	439.58'	N 45° 13' 29" E
FG	878.83'	N 45° 00' 48" E
GH	483.46'	N 43° 10' 12" E

NOTES:

- COORDINATES SHOWN ARE BASED ON MICHIGAN STATE PLANE COORDINATE SYSTEM (GRID, NAD 83, US SURVEY FEET)
- PARCEL LINES ARE ILLUSTRATIVE AND ARE BASED ON BERRIEN COUNTY G.I.S. RECORDS
- AERIAL PHOTOGRAPH WAS TAKEN IN 2011
- PROPOSED SETBACK LINE IS BASED ON COASTAL ENGINEERING PRINCIPLES (SEE 2012 ST. JOSEPH COASTAL STUDY) AND 2012 SURVEY DATA (ABONMARCHE)
- VERTICAL DATUM IS INTERNATIONAL GREAT LAKES DATUM 1985 (IGLD 85)

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100ft.

NO.	REVISION DESCRIPTION:	BY:	DATE:

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SHEET TITLE:
CITY OF ST. JOSEPH
COASTAL ENGINEERING STUDY
AREA 1 PROPOSED SETBACK LINE

DRAWN BY: CH
DESIGNED BY: MM
PM REVIEW:
QA/QC REVIEW:
DATE: AUGUST 2012

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HORZ: 1" = 100'
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12-06 SJC

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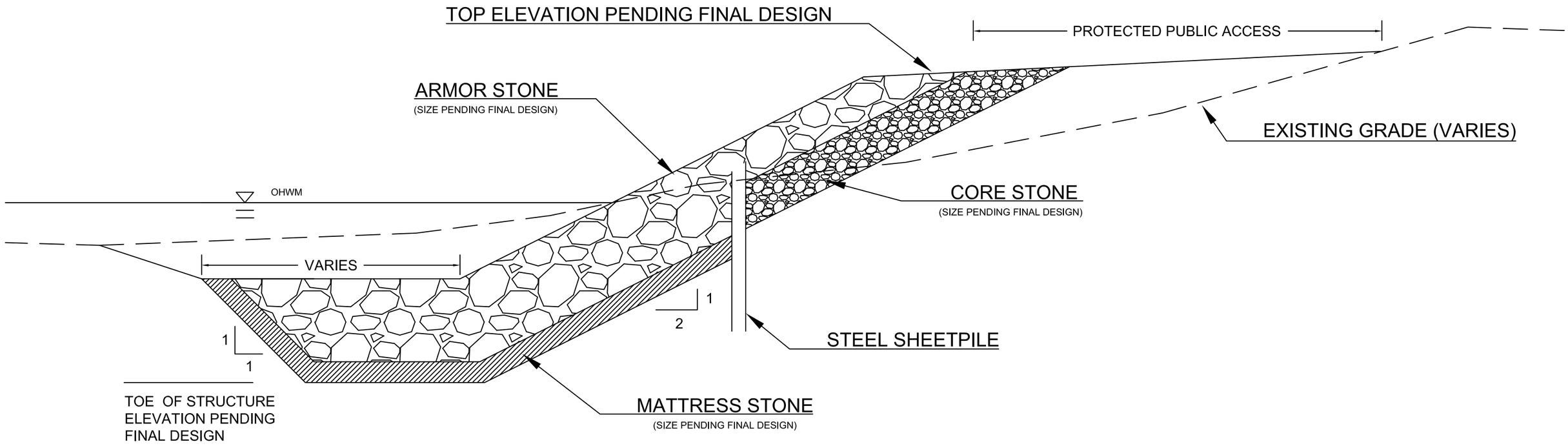
1 of 1

EXHIBIT 2

Area 2 Shoreline Protection Concept Section



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AREA 2 SHORELINE PROTECTION CONCEPT SECTION

DATE: 8/10/2012

SHEET: 1 OF 1

EXHIBIT 3

Working Overall Maps, Areas 1-3

TISCORNIA PARK TO 2,650' NORTH

2,650' NORTH TO 4,575' NORTH

LEGEND:

- EDGE OF WATER (578.0'(+.5' LWD) ON 4/19/2012)
- MDEQ O.H.W.M. (580.5')+3.0' LWD
- ALL TIME HIGH WATER(582.4')+4.9' LWD
- TEMP. MORATORIUM LIMIT PER ORDIN. 39-1-2
- VEGETATION LINE
- FEMA BASE FLOOD ELEVATION (584.1')+6.6' LWD
- PARCEL LINE
- BUILDING LINE

NOTES:

- VERTICAL DATUM IS INTERNATIONAL GREAT LAKES DATUM 1985 (IGLD85)
- PARCEL LINES ARE APPROXIMATE AND ARE BASED ON BERRIEN COUNTY G.I.S. RECORDS
- AERIAL PHOTOGRAPH WAS TAKEN IN 2011
- CONTOURS ARE APPROXIMATE AND BASED ON A COMBINATION OF DATA SPACED AT WIDE INTERVALS AND 2005 CONTOURS PROVIDED BY OTHERS
- STATE OF MICHIGAN ORDINARY HIGH WATER MARK ELEVATION 579.8' (IGLD55) (PER STATUTE) EQUALS ELEVATION 580.5'
- NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP 26021C0101C EFFECTIVE DATE: APRIL 17, 2006 (LOMR MARCH 1, 2007) BASE 100-YEAR FLOOD ELEVATION 585.0' (NGVD29) EQUALS ELEVATION 584.02' (IGLD85)

N

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100ft.

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SHEET TITLE:

CITY OF ST. JOSEPH
COASTAL ENGINEERING STUDY

AREA 1 OVERALL MAP

DRAWN BY: CH
DESIGNED BY: MM
PM REVIEW:
QA/QC REVIEW:
DATE: JUNE 2012
SEAL:

SIGNATURE:
DATE:

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SHEET NO.
1 of 3

SILVER BEACH TO LIONS PARK

LIONS PARK TO ST. JOSEPH WATER PLANT

LEGEND:

- · · — · · -	EDGE OF WATER (578.0'(+.5' LWD) ON 4/19/2012)
🟥	MDEQ O.H.W.M. (580.5')+3.0' LWD
	ALL TIME HIGH WATER(582.4')+4.9' LWD
	VEGETATION LINE
	FEMA BASE FLOOD ELEVATION (584.1')+6.6' LWD
	PARCEL LINE
	BUILDING LINE

NOTES:

- SEE SHEET 1

GRAPHIC SCALE

100 0 50 100 200 400

(IN FEET)
1 inch = 100ft.

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SHEET TITLE:

CITY OF ST. JOSEPH
COASTAL ENGINEERING STUDY

AREA 2 OVERALL MAP

DRAWN BY: CH

DESIGNED BY: MM

PM REVIEW:

QA/QC REVIEW:

DATE: JUNE 2012

SEAL:

SIGNATURE:

DATE:

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SCALE:
HORZ: 1" = 100'
VERT: N/A

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