Great Lakes Coastal Flood Hazard Mapping Methodology Update & Storm Data Development

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Proudly serving the Great Lakes Region and Nation since 1841

Presentation Overview

- Project Overview
- Major Project Events
- Key Changes to the Methodology
- Pilot Studies
- Project Schedule

Great Lakes Flood Hazard Mapping (GLFHM)

Collaborative Project Between:

FEMA Region 5 (Lead)

FEMA Region 2

FEMA Region 3

Detroit District USACE

Major Project Events

August 1996 – FEMA HQ publishes draft guidance "Wave Elevation Determination and V-Zone Mapping for the Great Lakes"

January 2005 – Corps hosts a 2-day workshop for the FEMA-Corps update of Appendix D.3 which was attended by State NFIP and CZM leads

November 2008 – FEMA HQ and Baker completes a third version of Appendix D.3 update and asks Corps and FEMA Region 5 to provide for review and comment

August 2009 – Corps holds a Stakeholder Workshop with FEMA Regions 2/3/5, State govt. officials, ASFPM, FEMA contractors and other interested parties

February 2010 – USACE ERDC holds an Executive Committee meeting with FEMA Region 5, Corps, ASFPM, and FEMA contractors

Key Changes to the Methodology

1. Run-up Computations

- Old method used the 100-year S.W.L. with a 3-year wave height
- New method uses a response-based analysis approach to run-up computations
- Water levels will be updated from the 1988 Open Coast Report.

Photo: *Timaru Herald*

Key Changes to the Methodology

2. New Run-up Methods Available for Structures and Revetments

- Updated methodology provides for the TAW run-up method at the structures and revetments
- Mean overtopping rates from Owen & Goda may be used

Photo: *Timaru Herald*

Key Changes to the Methodology

3. New Methods for Overland Wave Propagation

- Available for Embayments and Sheltered Shoreline Areas
- Discarding the use of ACES ⇒ Transitioning to CHAMP
- WHAFIS and STWAVE together can be better utilized

Key Changes to the Methodology

4. Ice Cover

- Currently examining multiple methods to include ice cover in wave height determination, run-up, and overland wave propagation calculations

Photo: Lori Niedenfuer

Photo: *Michigan Travel Bureau*

GLFHM "Technical" Sub-Committee

Goal

- Address V-Zone feasibility within the new Great Lakes Coastal Flood Hazard Mapping methodology

Objectives

- Incorporate the methodology both timely & seamlessly
- Prioritize the mapping to account for population density and potential risks
- Collect and organize spatial and tabular data to populate analysis for the GIS Enterprise System Subcommittee

GLFHM "GIS" Sub-Committee

Goal

- Obtain and manage all Great Lakes Coastal Flood Hazard Mapping GIS data

Objectives

- Establish a database architecture to ensure long-term utility for an array of datasets
- Create and implement a quality control protocol for the datasets
- Enable an innovative data sharing solution with federal/state partners and regional organizations

GLFHM "Education and Public Outreach" Sub-Committee

Goal

- Identify the target audiences and tools in order to communicate the new Great Lakes Coastal Flood Hazard Mapping methodology

Objectives

- Establish both a process and framework that will be able to communicate the GLFHM process to both technical and non-technical audiences
- Enable proactive tools to educate both the public and stakeholders
- Utilize existing conferences and/or workshops to facilitate speakers

GLFHM Pilot Studies

Old Methodology vs. the New Methodology

1. Review Old Methodology
2. Revise the Old Methodology Study
3. Conduct New Methodology Analysis Using Old Datasets
4. Perform a Comparison of Old and New Methodology Using the Old Datasets and Assumptions
5. Re-create Historical Flood Event

GLFHM Pilot Studies

Data Sensitivity Analysis

1. Identify & Compare Datasets that should be used for Sensitivity Analysis Comparing Data Resolution

2. Develop Matrix of Comparison

3. Conduct Flooding, Run-up & Overland Propagation Elevation Analysis

GLFHM Pilot Studies

Structure Sensitivity

1. Coastal Protection Structures will be examined by modeling the structures parcel by parcel and increased spacing in order to determine whether or not the high resolution mapping of structures has a large impact on the final results

2. Comparison of structure stability
   - Total Loss
   - Partial Loss
   - No Loss - Total Stability

GLFHM Pilot Studies

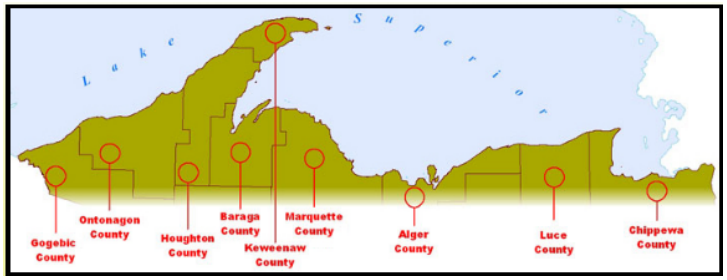
Coastal Erosion

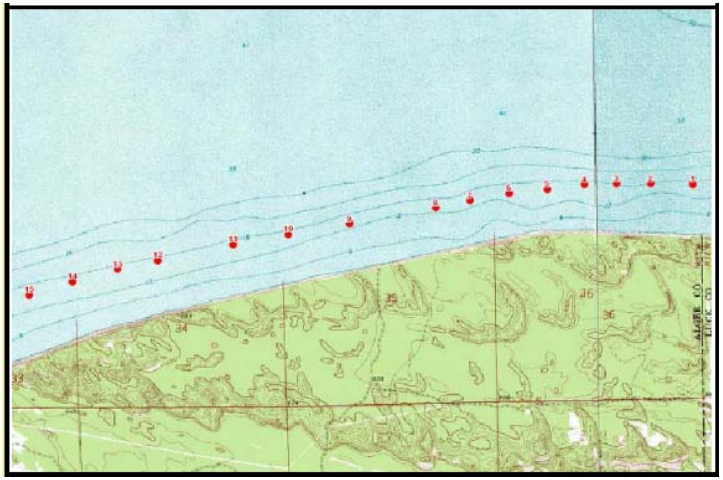
1. The topic of Coastal Erosion as it is explained in the new methodology will be examined by the contractor

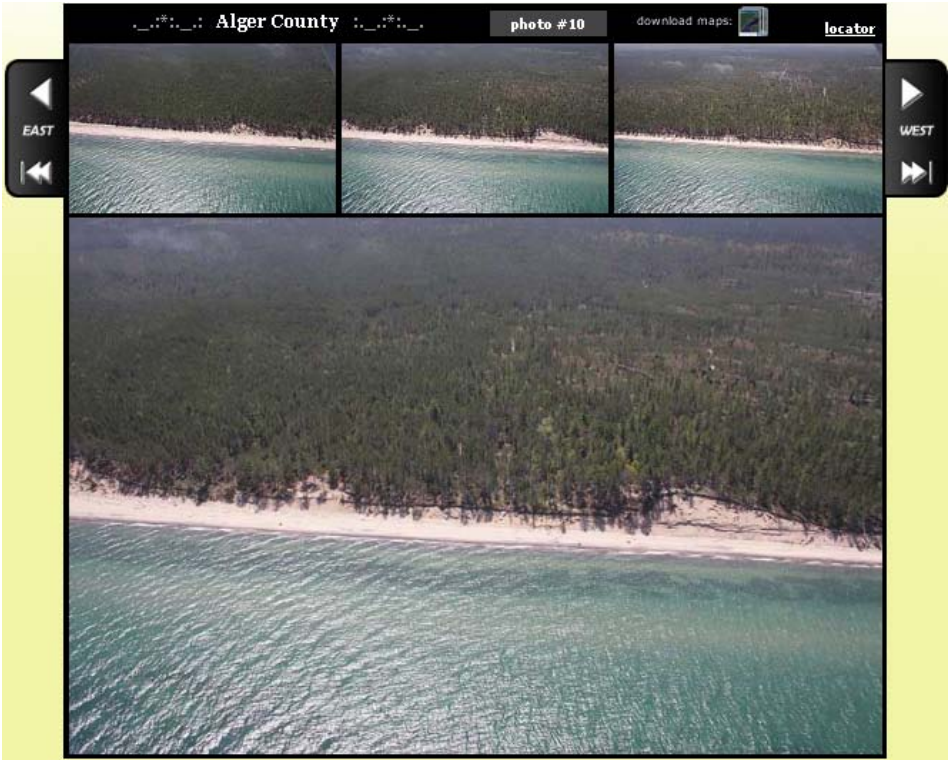
2. This topic is discussed in flood mapping arenas, so the results from the pilot studies for bluff erosion, dune erosion etc will be helpful in finalizing the methodology

3. Perform a sensitivity analysis using SBEACH to determine the effects coastal erosion may have on the results.

Oblique Image Collection

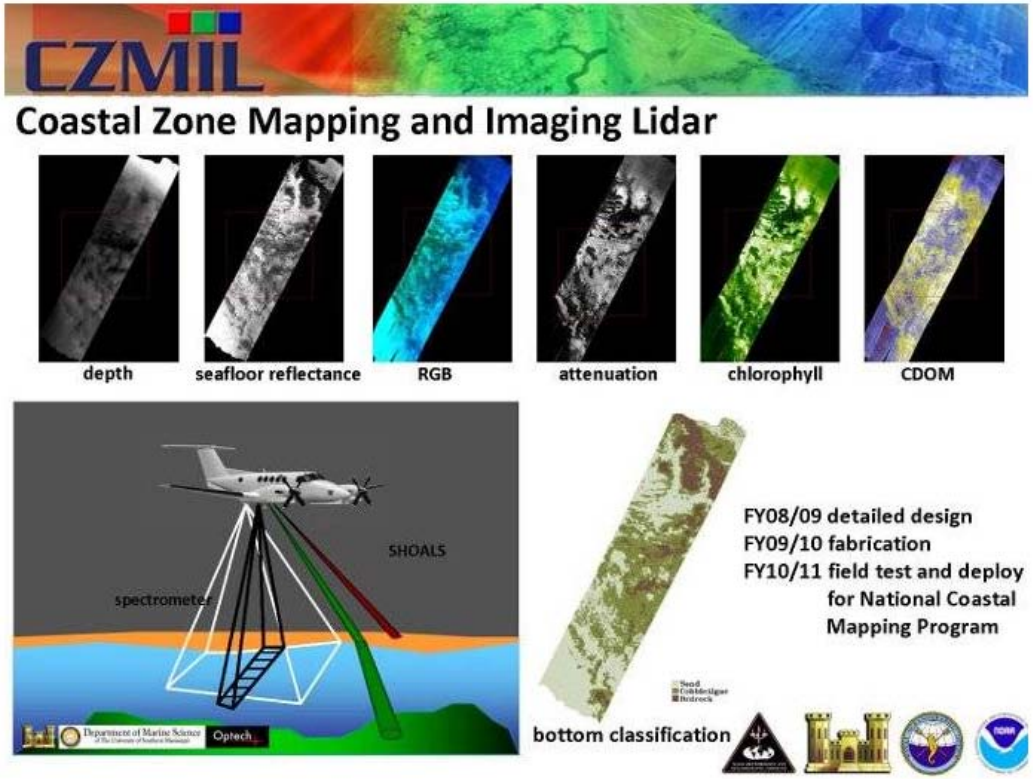






LiDAR Collection

- **LiDAR - Li**ght **D**etection **A**nd **R**anging
- JALBTCX - Joint Airborne Lidar Bathymetry Technical Center of Expertise



Project Schedule

July 31, 2010 – Oblique Photography Pilot Flight of 20 miles of the Lake Michigan Shoreline

August 23-26, 2010 – FY09 Executive Committee meeting in Chicago with LRE, FEMA, ERDC, state stakeholders, ASFPM, etc.

September 2010 – Oblique Photography full scale collection effort

FY 10 – Model the waves and water levels on the Great Lakes, map select counties on Lake Michigan

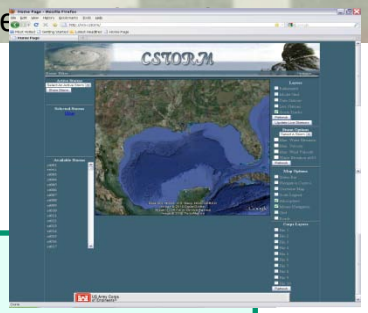
FY 11 – Start full scale map production mode

FY 11 & FY 12 – Great Lakes Basin Wide LiDAR Collection


US Army Corps
of Engineers
Detroit District
Thank you for your time!

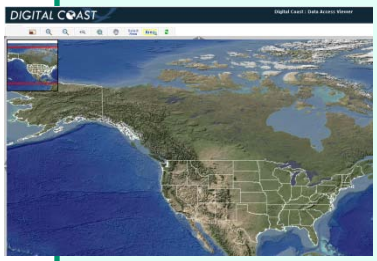
Flood Risk Mapping Process

USACE C-STORM Surge and Wave Database for Extreme Eve



Local Landscape and Structure Data

USACE Probabilistic Analysis Tools



Coastal Topo/Bathy LIDAR Data from NOAA Digital Coast Web Service

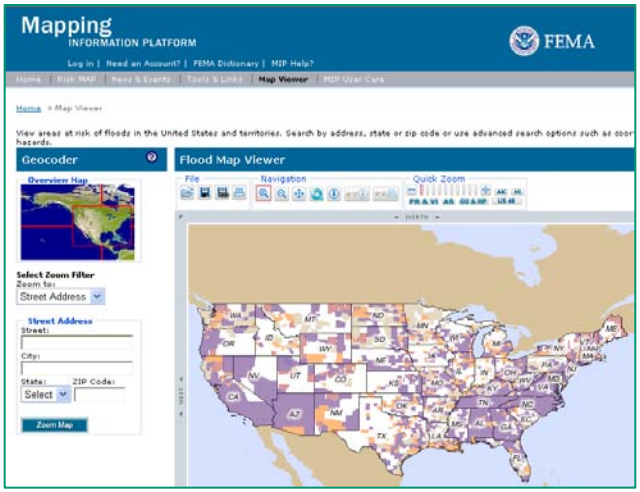
USACE Web Service for Oblique Aerial Photos

Wave Run-Up/Overtopping/Erosion Analyses

WHAFIS Overland Wave and Water Level Analyses

Detailed Local-Scale Inundation Modeling of Critical Areas

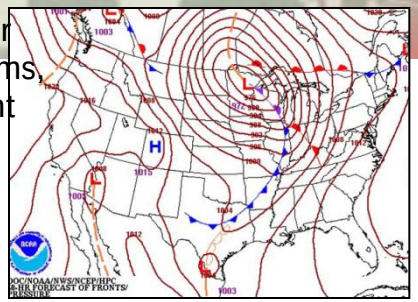
Flood Risk Map Production



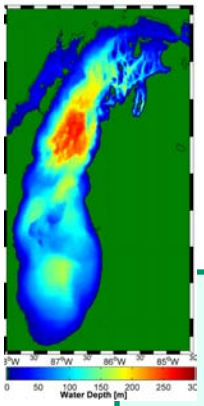
Map Delivery via FEMA Mapping Information Platform (MIP)

Extreme Event Storm Surge and Wave Modeling

Step 1.
Define Major Historical Storms, 1960-present

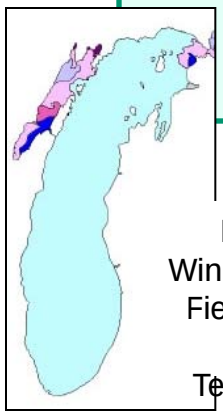


NOAA GLERL Bathymetry

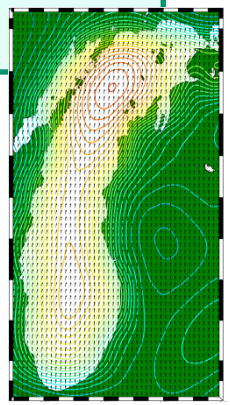


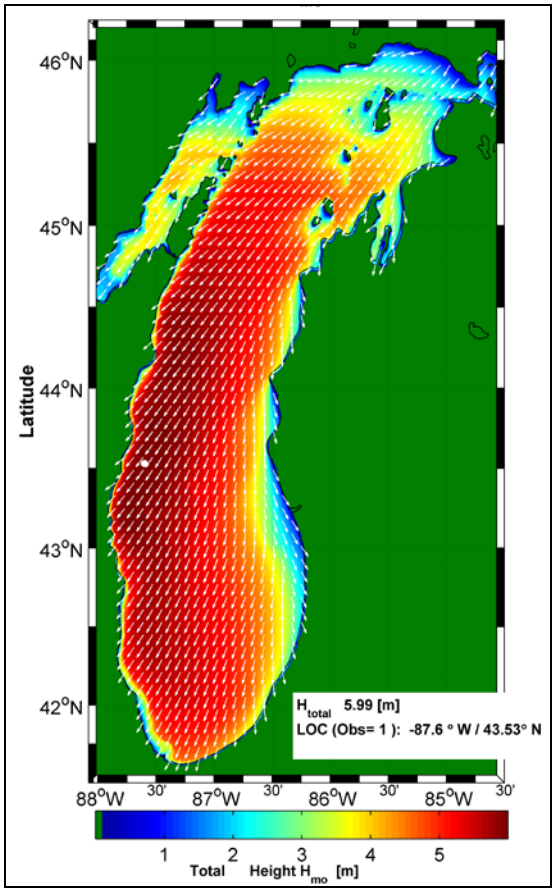
High Resolution Detailed Grid Meshes

Model Input



Ice and Wind/Pressure Fields Using NOAA Techniques





Storm Surge (ADCIRC) and Wave (WAM) Modeling on Regional Domain

Step 2.
Set Up and Validate Surge and Wave Models at the Regional Scale; Apply Model Coupling as Needed

Step 3.
Apply Models for Each Major Historical Storm; Applied at Synoptic Lake Level

Step 4. Archive Modeled Storm Data

C-STORM Coastal Storm Database