

Lower Lake Michigan Regional Sediment Management

RSM Bi-Monthly Call Project Brief

28 June 2012

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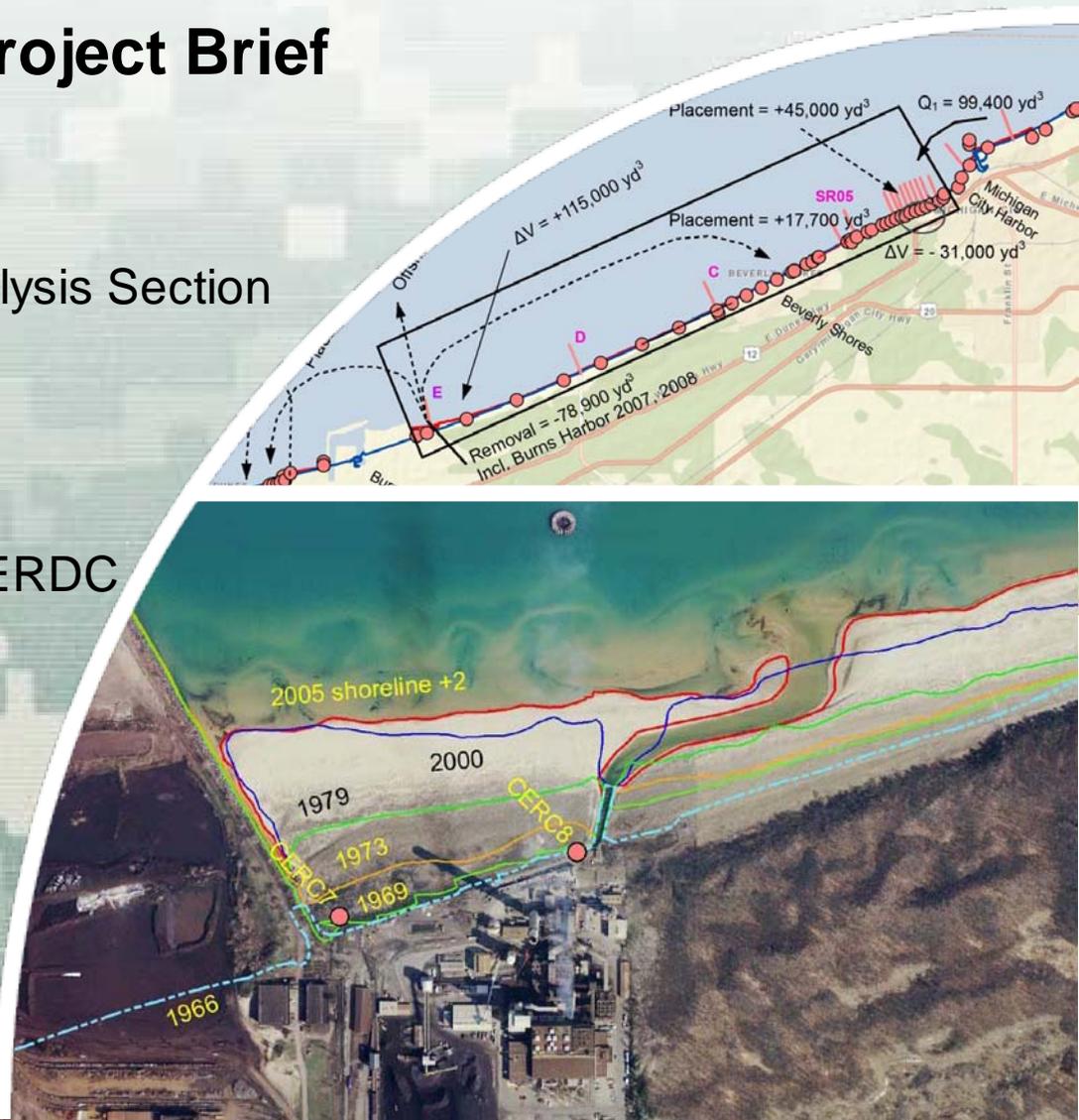
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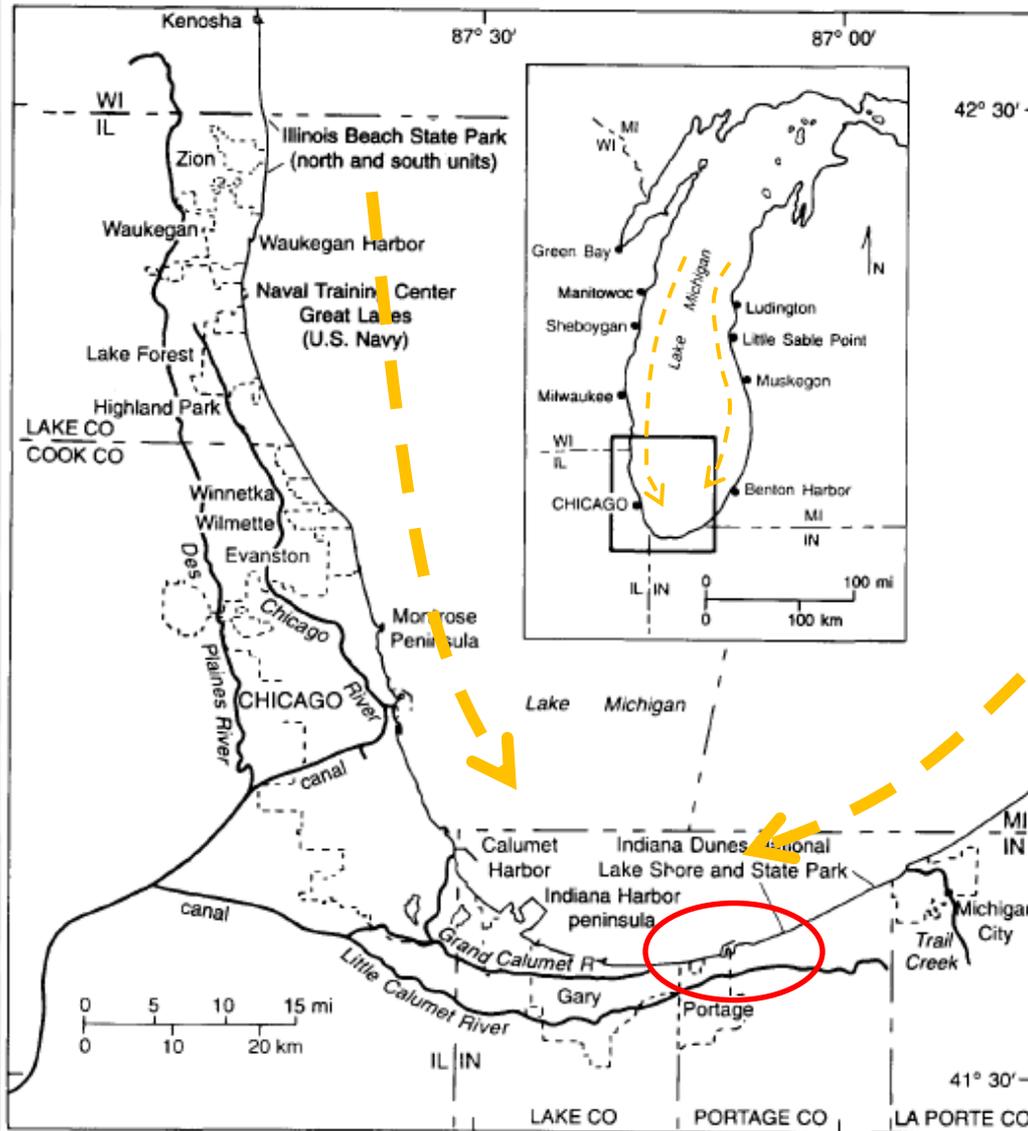
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Southwestern Lake Michigan

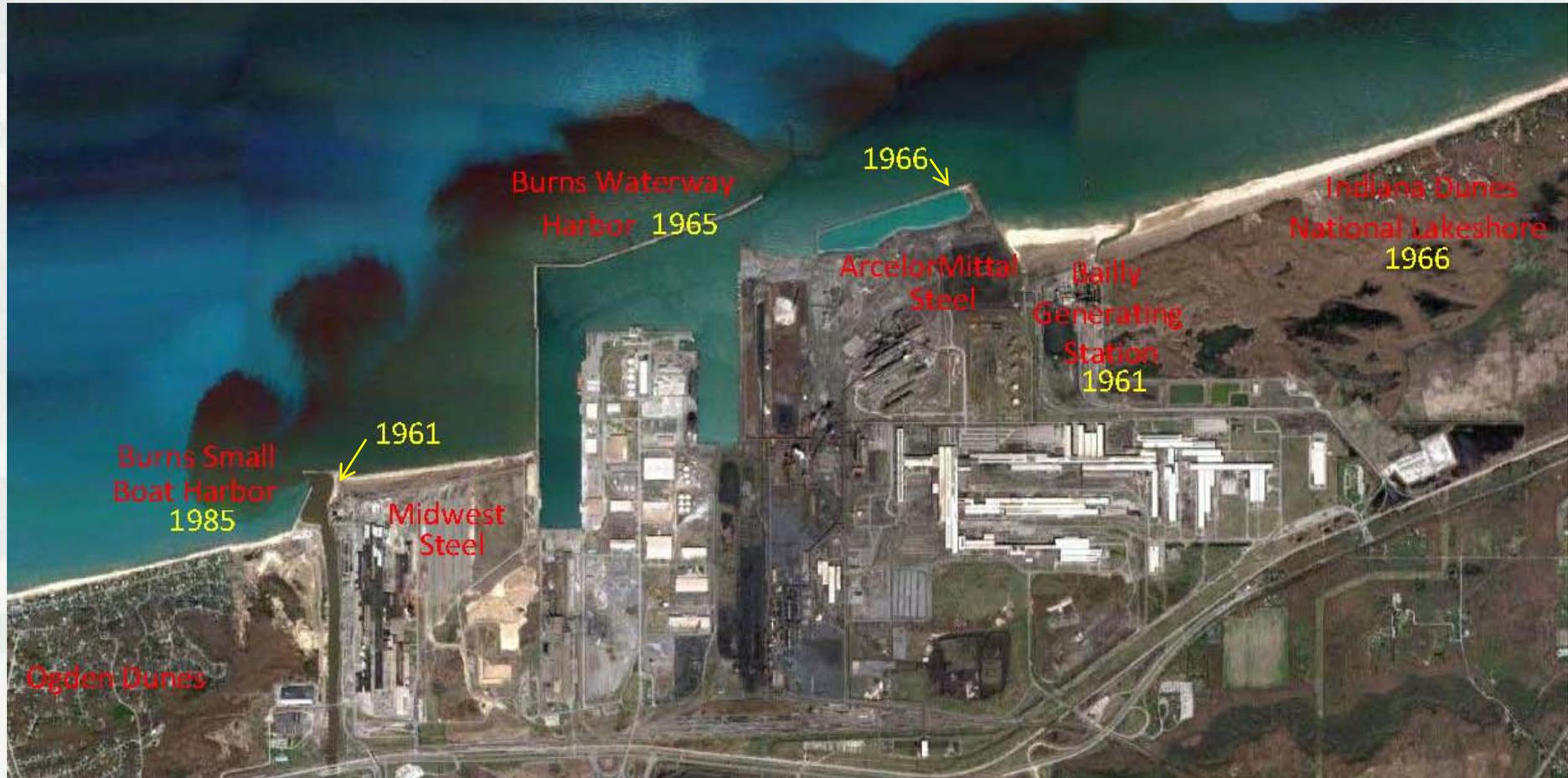


Federal Harbors

Waukegan, IL	1880
GL Naval Station, IL	1911
Chicago, IL	1833
Calumet, IL&IN	1870
Indiana, IN	1910
Burns, IN	1968
Michigan City, IN	1870



Burns Waterway Development



Years of authorization/permit granted



Study Area History

- Burns Waterway Harbor authorized in 1965
 - ▶ Anticipated impacts to shoreline
 - local interests agree to “hold and save the United States free from damage due to the construction and maintenance of the project, **including damages resulting from any shore erosion that may occur**”
 - ▶ Contingent on establishment of Indiana Dunes National Lakeshore
- Indiana Shoreline Erosion Project
 - ▶ USACE Feasibility Study to evaluate erosion (1976/1982)
 - ▶ Authorized periodic nourishment at Mt. Baldy to mitigate impacts of Michigan City Harbor (1986)



Dredging and Placement

Dredging

NIPSCO intake

Burns Waterway Harbor

Small Boat Harbor/Burns Ditch

Placement

Ogden Dunes

Open lake

NPS/Portage Lakefront



Recent USACE Actions

- 2006-2009, Energy & Water Appropriations Bills: Chicago District authorized to dredge around Bailly Generating Station Intake
- WRDA 2007, Section 1009: Section 111 investigation at Burns Waterway Harbor
 - “...investigate, study, plan, and implement projects of a justified level of work for the **prevention or mitigation of damages** to both non-Federal public and privately owned shores to the extent that such damages can be **directly identified and attributed to Federal navigation works...**”



Feasibility Study

- Section 905(b) Analysis
 - ▶ Approved November 2010
 - ▶ Federal interest for studying impact of federal navigation structures and/or coastal storm damages
- DOTS request to scope coastal analysis, Aug 2010
 - ▶ To determine portion of damages due to Federal structures
 - ▶ To model alternative plans



RSM Lower Lake Michigan Study

- Goals
 - ▶ Document historical changes in shoreline
 - ▶ Investigation littoral effects of harbor structures
- Tasks
 - ▶ Catalog and digitize historical data
 - ▶ Develop regional sediment budget
 - ▶ Develop regional data collection and monitoring plan



RSM Study



- From Michigan City to Burns Waterway Harbor
- Includes USACE nourishment project at Mt. Baldy (Indiana Dunes National Lakeshore)



Data analysis

- Recovery of cross-shore profiles
 - ▶ Recover, digitize, correct datums and lateral locations
- Aerial photography
 - ▶ Locate, scan, georeference
 - ▶ 1960s monitoring project
- Plot shorelines
- Interpret dredge volumes and placement locations
- Prepare ERDC TR



Beaches



NPS Portage
Lakefront



Indiana Dunes
State Park

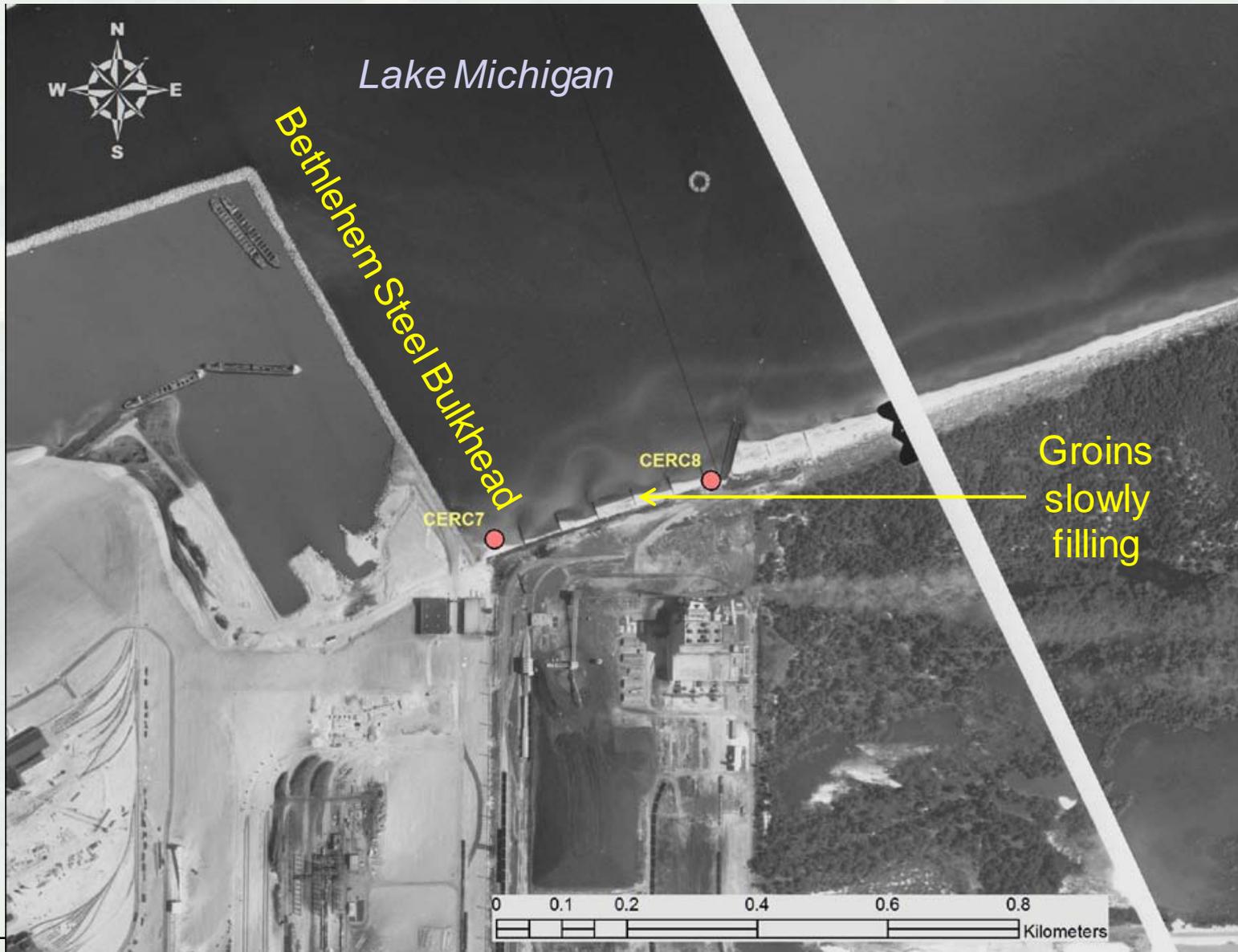


Warm-water outflow,
NIPSCO Bailly power plant

Shoreline Impacts – 1966 Nov.



Shoreline Impacts – 1969 June



Shoreline Impacts – 1971 April



Shoreline Impacts – 1973 Dec.



Shoreline Impacts – 2005 March



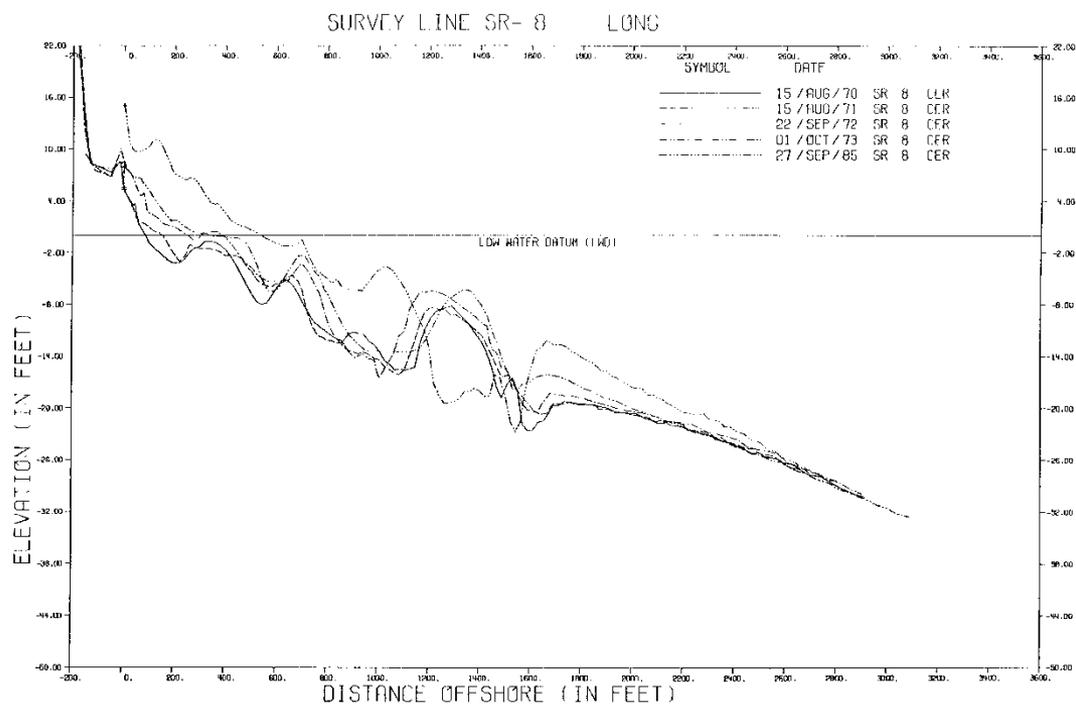
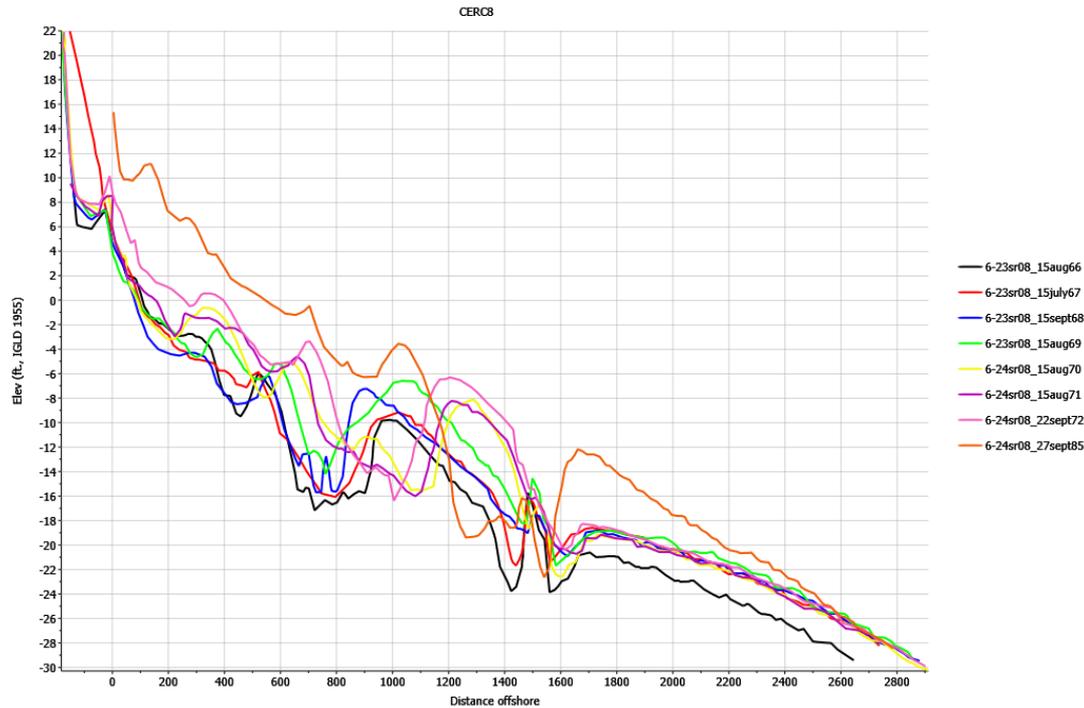


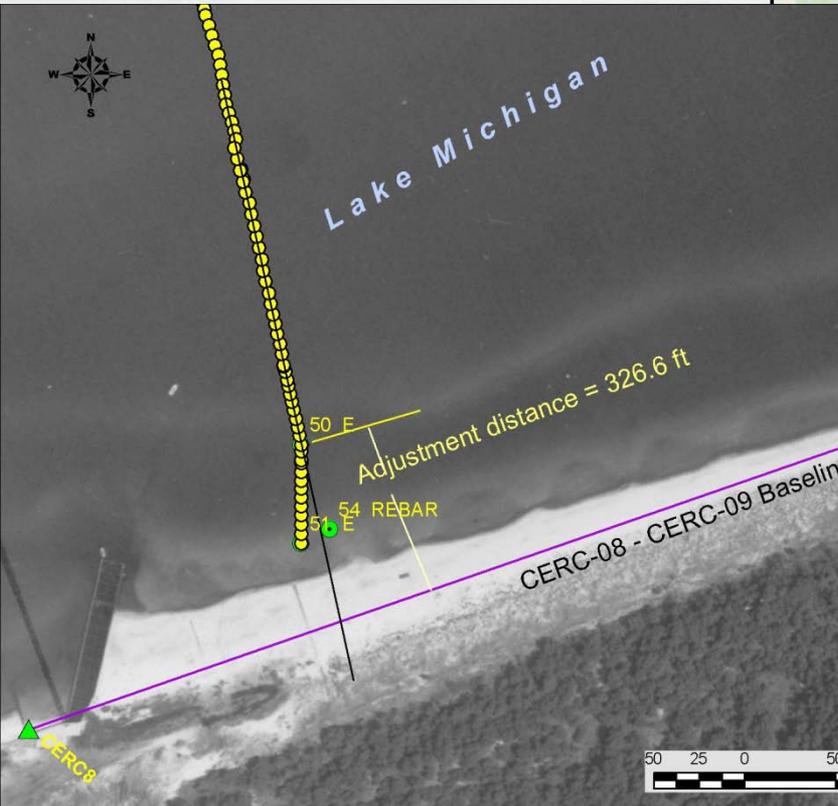
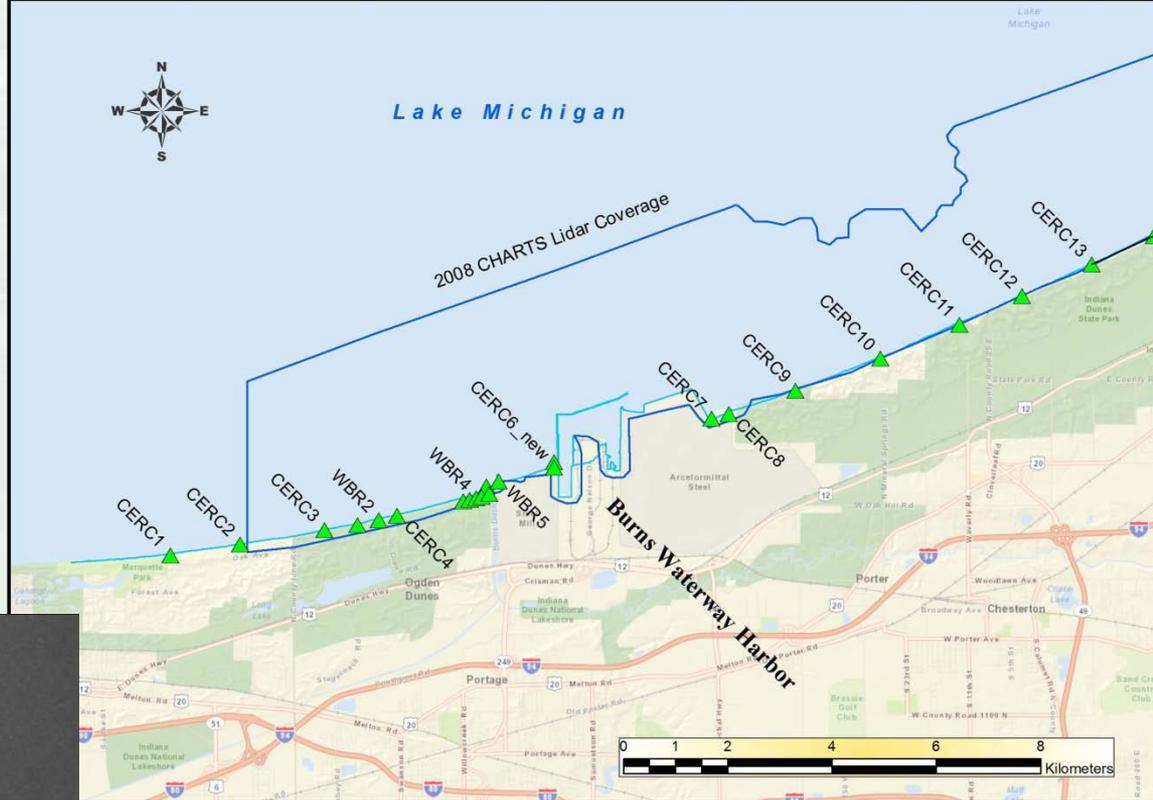
Figure 6-24. Coastal Profiles CERC-8 (SR-8), 1970-1985.

Profile Data

- Profiles digitized from paper records (1980s digital files lost!)
- Various dates accumulated
- Plotted with RMAP software



Profile Data Adjustments

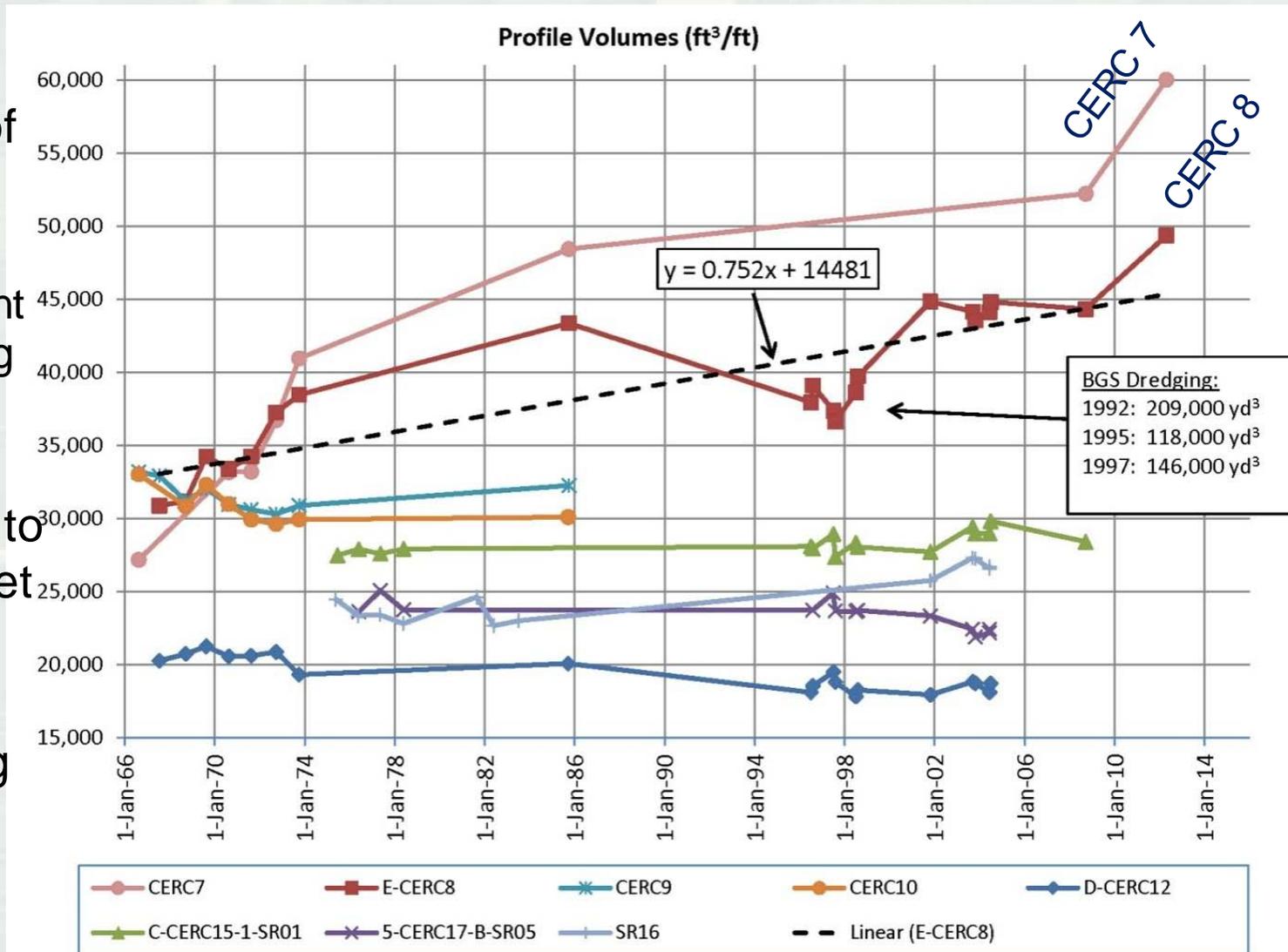


- Locations supplied by IN DNR based on field notebooks (never monumented in field)
- Lateral adjustment for different surveys
- Plotted with ArcMap software



Profile Volumes

- Eastern end of study area is stable
 - ▶ Nourishment is protecting Mt. Baldy
- Significant accumulation to the west in fillet
- Fillet may be almost full = sed. migrating into Federal harbor



Fillet Volume

Table 10

Increase in fillet sediment volume east of Burns Waterway Harbor (post-construction era 1966-2012)

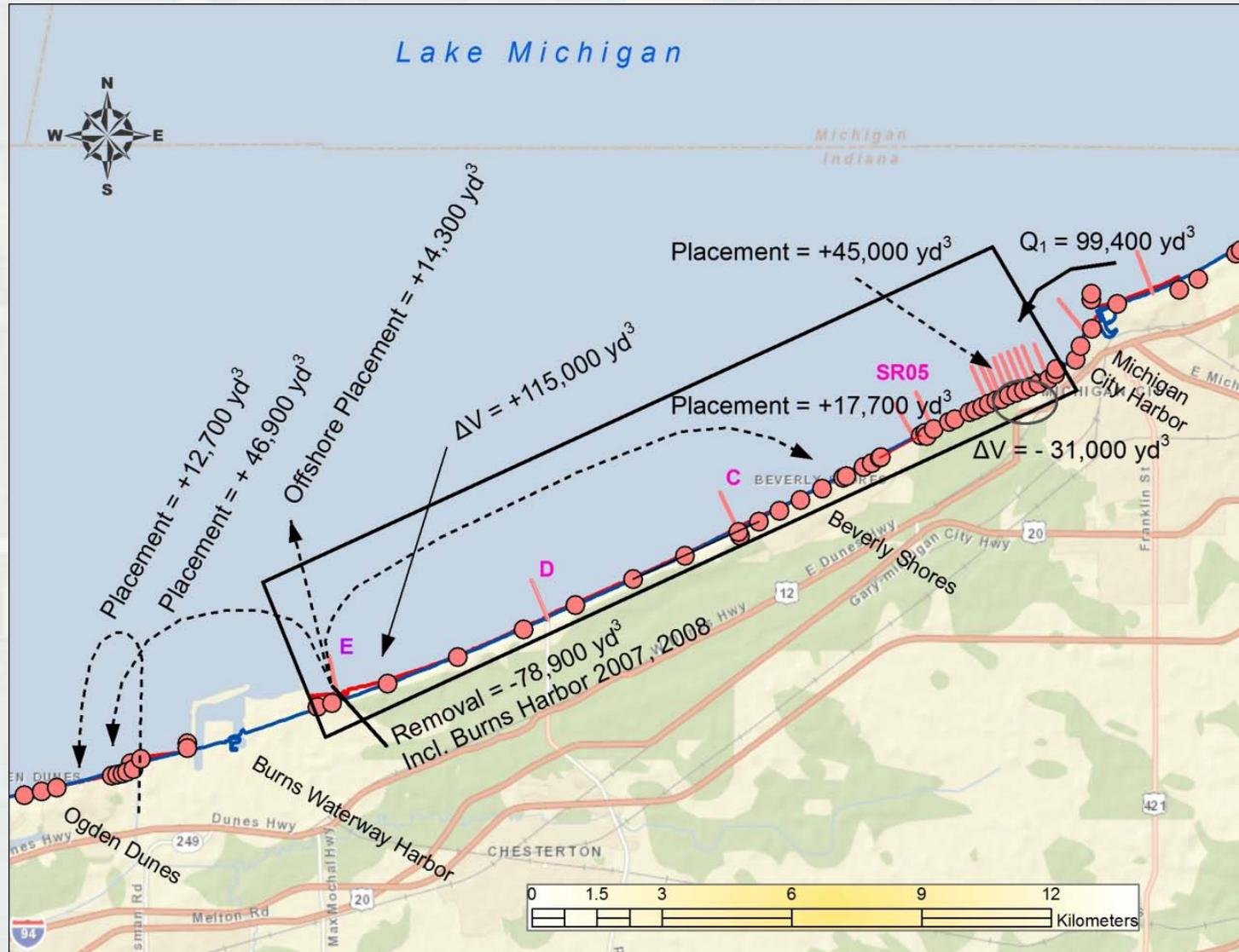
	CERC7		CERC8-Line E
Volume annual (ft ³ /ft/year)	583.4		274.7
Half distance CERC7 to E (ft)	862	Half distance E-D	8500
Dist. CERC7 to bulkhead (ft)	50	Half distance E to CERC7	862
Total distance multiplier (ft)	912		9362
Average annual vol. increase (ft ³ /year)	532,049		2,572,195
Average annual vol. increase (yd ³ /year)	19,700		95,300
Total annual increase fillet region (yd³/year)		115,000	

Increase in fillet vol = annual increase/year (slope) ×
half distance to adj. profile



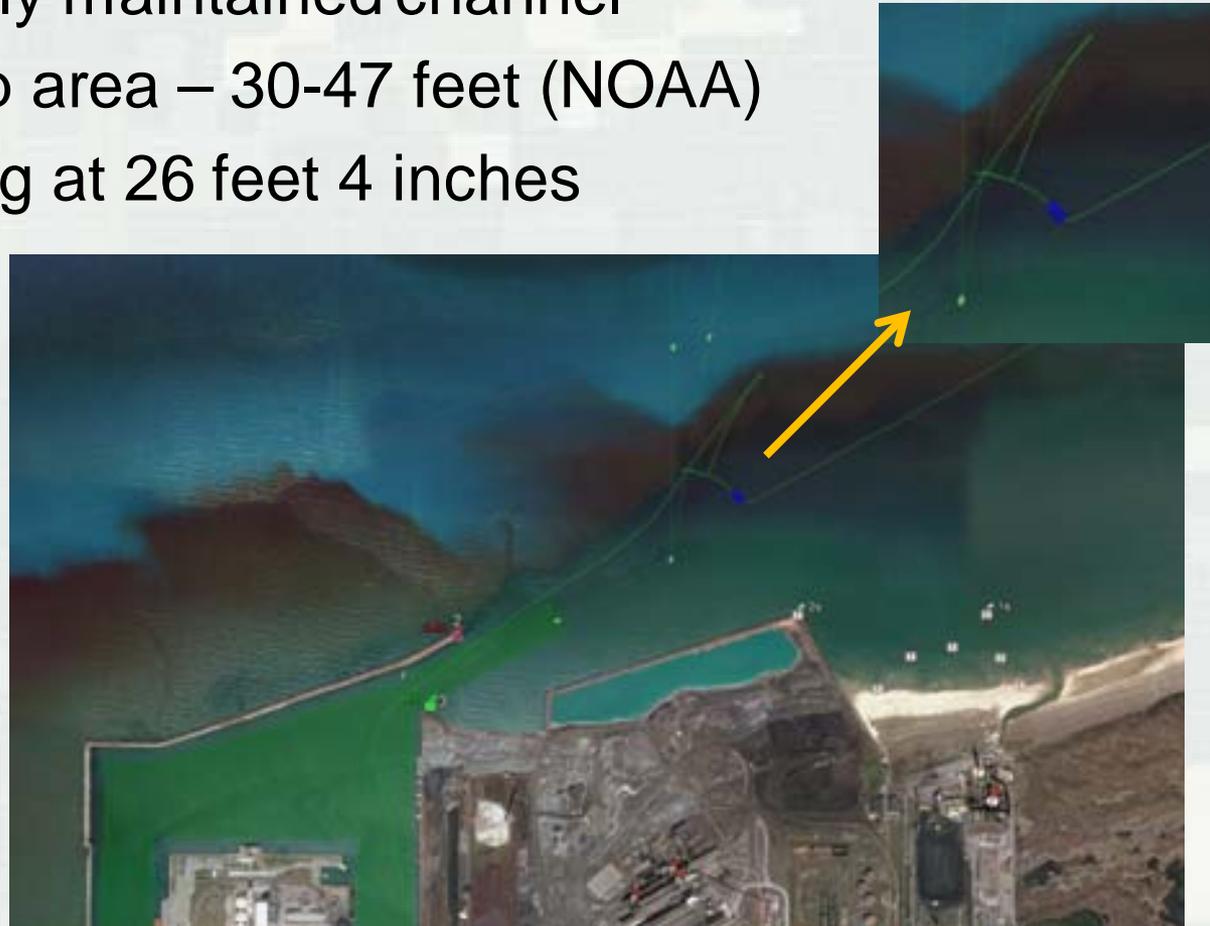
Sediment Budget 1980-2009

- Sediment enters cell
 - ▶ Bypassing Michigan City Harbor
 - ▶ USACE nourishment at Mt. Baldy
- Trapped at Burns Harbor
 - ▶ Removal by dredging
- New budget needed for post-2009 era (fillet full)



Support to District Operations

- April 2012 Ship Grounding
 - ▶ Outside Federally maintained channel
 - ▶ Historically deep area – 30-47 feet (NOAA)
 - ▶ Ship was drafting at 26 feet 4 inches
- RSM data
 - ▶ Projected future shoaling (86,000 cy/yr)
 - ▶ Identify optimal future dredging locations



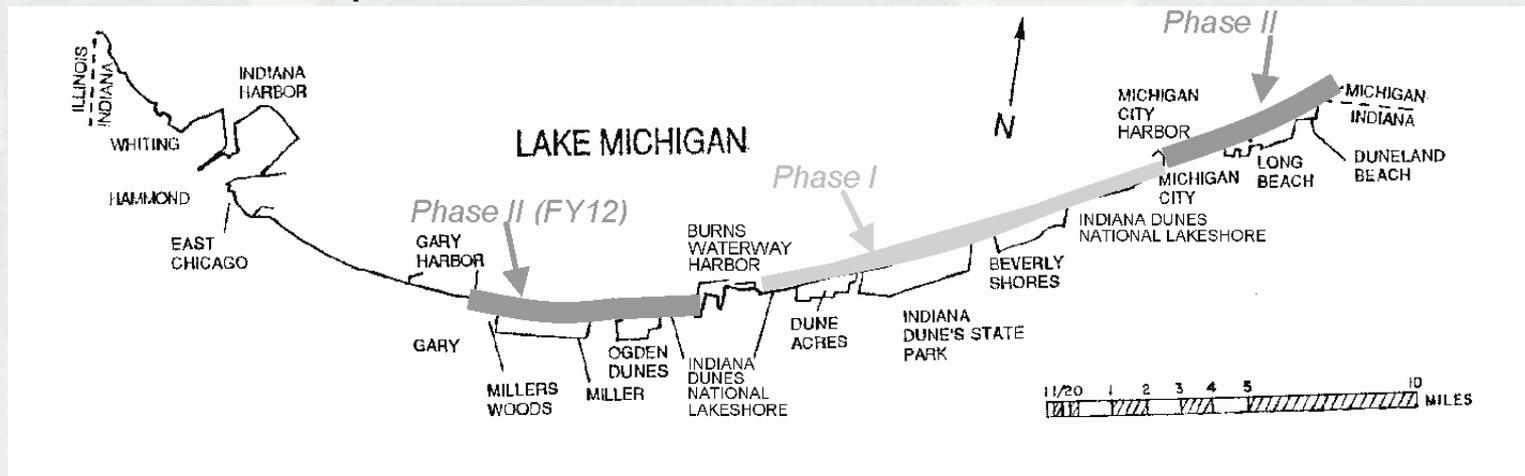
Support to Feasibility Study

- Quantify littoral effects of Harbor structures
- Estimate required bypass
 - ▶ Restore historical conditions
 - ▶ Prevent further accretion/erosion
- Assign proportionate damages to structures



Study Status

- Phase I (FY11)
 - ▶ Report publication FY12
- Phase II (FY12)
 - ▶ Include data from reaches to east and west
 - ▶ Improve understanding of regional littoral processes
 - Compile historical and current profiles east of Michigan City
 - Compile additional data for erosional area to west



Questions?

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