



U.S. Army Corps of Engineers - Detroit District

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## DETAILED MAPPING AND CLASSIFICATION OF SHORELINE PROTECTION STRUCTURES

OTTAWA AND ALLEGAN COUNTIES, MICHIGAN  
OZAUKEE, SHEBOYGAN AND MANITOWOC COUNTIES,  
WISCONSIN

### LAKE MICHIGAN POTENTIAL DAMAGES STUDY



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## DETAILED MAPPING AND CLASSIFICATION OF SHORELINE PROTECTION STRUCTURES

Ottawa and Allegan Counties, Michigan  
Ozaukee, Sheboygan and Manitowoc Counties, Wisconsin

### 1.0 Introduction

#### 1.1 Background

The U.S. Army Corps of Engineers - Detroit District has initiated an extensive and long-term assessment of potential shoreline damages over the next 50 years due to fluctuating lake levels along the Lake Michigan shoreline. This "Lake Michigan Potential Damages Study" (LMPDS) will ultimately lead to the development of a series of state-of-the-art engineering, mapping and coastal zone management tools that can be used for the accurate prediction of flood and erosion damages that might arise due to fluctuating lake levels.

A key task in this assessment is to determine the interdependence between coastal processes and the extent, type and quality of structural shore protection put in place along the Lake Michigan shoreline. Many coastal processes influence the effectiveness of shore protection structures over their design life. Alternatively, structural shore protection has a direct and measurable effect upon alongshore sediment transport interfering with natural processes of beach accretion and erosion.

There are three key activities associated with this task:

- Assessment of Future Structural Protection Trends
- Estimation of Future Costs for Structural Protection
- Analysis of Shore Protection Impacts

This report will partially address the assessment of future structural protection trends by providing insight into the history of shore protection construction along the shoreline in 5 prototype counties along the Lake Michigan shoreline. Such changes in the type, extent and quality of shore protection that have historically occurred in the past, will provide insight into the nature of shore protection that will be constructed in the future in these areas.



The information presented in this report is a starting point for a detailed assessment of shore protection impacts and will be used by others working on the LMPDS to make more detailed assessments of future costs of shore protection, as well as an assessment of the ultimate impact of different shore protection structures on erosion rates and potential damages to the shoreline.

## 1.2 Purpose of This Report

This report will provide detailed information on historical shore protection construction trends in 5 prototype counties along the Lake Michigan shoreline. These include Ottawa and Allegan Counties in Michigan, and Ozaukee, Sheboygan and Manitowoc Counties in Wisconsin (Figure 1). Assessments will be made of significant changes in the types, extent and quality of protection observed between two time periods - 1989-1999 for the Michigan Counties and 1978-1992 for the Wisconsin Counties. Assessments will also be made on the rate of shore protection construction in these areas.



Figure 1 - Lake Michigan Prototype Counties for Analysis (Shaded)



### **1.3 *Format of This Report***

The approach and methodology used in determining historical shore protection trends is presented in Section 2.0. Resulting statistical data and detailed analysis is presented in Section 3.0. Data has also been mapped in ArcView GIS and a summary of the mapping including examples is presented in Section 4.0. Recommendations and conclusions are presented in Section 5.0 and additional data and mapping are presented in a series of data Appendices.



## 2.0 Methodology

### 2.1 Aerial Photography

Shore protection trend analysis and mapping was conducted using 1:6000 scale 1989 and 1999 aerial photography for Ottawa and Allegan Counties, in Michigan and 1978 and 1992 air photography for Ozaukee, Sheboygan and Manitowoc Counties in Wisconsin.

At the outset of the project, attempts were made to locate, measure and map shore protection structures directly within the ArcView GIS environment using scanned air photos provided on CD by USACE Detroit. This soon became problematic as the resolution of the scanned image did not allow enough visible detail to differentiate between different shore protection types, or to differentiate shore protection structures from other linear features such as high water marks, fences, or hedgerows for example. It was also virtually impossible to say anything about the quality of the structure. Zooming in to the photo did not help, as this only enlarged the pixels of the image, with no resulting increase in the level of detail. It was also difficult on-screen to compare both sets of photography and accurately determine the start and end points of a structure from one year to the next.

As a result of these issues, it became necessary to acquire the actual air photos for the prototype counties from USACE Detroit. The clarity of the original photos, plus the ability to overlay stereo-pairs and examine them under stereoscopes allowed for a much more accurate determination of the structure types and a better definition of their start and end points and structure quality. Both sets of photos were also able to be viewed side-by-side, which allowed a much better comparison of an area from one year to the next.

### 2.2 Shoreline Delineation

The coastal zone database being developed in the LMPDS is predicated on a series of 1 kilometer reaches (2,436 in total) around the Lake Michigan shoreline. In a previous classification exercise (Stewart, 1998), shore protection structures present along the shoreline were captured at this 1 kilometer level. For the purposes of this exercise, there was a desire to capture shoreline protection structures at a finer level of detail. As such, the 1-kilometer reach segments in each county were further divided into 1/10<sup>th</sup> of a kilometer segments. This was accomplished within the ArcView GIS environment by first digitizing and plotting the start and end points of the 1 kilometer reach segments from tick-marked 1:24,000 USGS topographic maps that were previously prepared for



this purpose. Digital orthophotos were then brought in as a background reference image and ArcView's measuring tool was used to sub-divide each reach into 1/10<sup>th</sup> of a kilometer segments (see Section 4.0 for further detail). For each sub-reach, the latitude and longitude of the center point was determined for later mapping purposes. Plots of all the sub-reaches and their start-end points were also produced to assist in delineating the shoreline on the air photos.

### **2.3 Protection Structure Delineation and Measurement**

ArcView plots of the reach and sub-reach boundaries (using recent digital orthophotos as the backdrop) were utilized to accurately scribe reach and sub-reach boundaries on the glossy air photos using dry-erase marker. For measurement purposes, a measurement template (scale) was developed and calibrated by measuring a feature of known length on the photo (e.g. football field, tennis court). For each sub-reach, any structures present were first identified and classified, and then measured using the scale. This was done for both years of record at the same time so that changes between the years, for each reach, would be more apparent. Data was entered into a series of MS-Excel spreadsheets for later analysis.

Classification was done using the shoreline protection classification scheme developed for Lake Michigan in the first phases of the LMPDS study (Table 1). This classification includes a breakdown by structure purpose (e.g., Coastal Armoring), Structure Type (e.g., Revetment) and Structure Quality (e.g., 5-45 Year Lifespan).

### **2.4 Measurement Limitations**

While every effort was made to measure and classify structures in each sub-reach as accurately as possible, some limitations were present that need to be highlighted:

#### *Ottawa and Allegan Counties, Michigan*

1. 1989 photography was "leaf-on", 1999 was "leaf-off", thus some structures that may have been present in 1989 may have been obscured by the foliage, particularly those nearest the buildings or vegetation lines. This may result in some cases of reported increases in shore protection type where there was a structure visible in 1999.



**Table 1: Shore Protection Type Classification Legend**

**1. Coastal Armoring**

- 1A1 - Revetments >45 year lifespan
- 1A2 - Revetments 5-45 year lifespan
- 1A3 - Revetments 0-5 year lifespan
- 1A4 - Revetments 0 year lifespan (disrepair)
  
- 1B1 - Seawalls/Bulkheads >45 year lifespan
- 1B2 - Seawalls/Bulkheads 5-45 year lifespan
- 1B3 - Seawalls/Bulkheads 0-5 year lifespan
- 1B4 - Seawalls/Bulkheads 0 year lifespan (disrepair)

**2. Beach Erosion Control Devices**

- 2A1 - Groins >45 year lifespan
- 2A2 - Groins 5-45 year lifespan
- 2A3 - Groins 0-5 year lifespan
- 2A4 - Groins 0 year lifespan (disrepair)
  
- 2B1 - Jetties >45 year lifespan
- 2B2 - Jetties 5-45 year lifespan
- 2B3 - Jetties 0-5 year lifespan
- 2B4 - Jetties 0 year lifespan (disrepair)
  
- 2C1 - Offshore Breakwaters >45 year lifespan
- 2C2 - Offshore Breakwaters 5-45 year lifespan
- 2C3 - Offshore Breakwaters 0-5 year lifespan
- 2C4 - Offshore Breakwaters 0 year lifespan (disrepair)

**3. Non-Structural**

- 3A1 - Beach Nourishment >45 year lifespan
- 3A2 - Beach Nourishment 5-45 year lifespan
- 3A3 - Beach Nourishment 0-5 year lifespan
- 3A4 - Beach Nourishment 0 year lifespan (disrepair)
  
- 3B1 - Vegetation Planting >45 year lifespan
- 3B2 - Vegetation Planting 5-45 year lifespan
- 3B3 - Vegetation Planting 0-5 year lifespan
- 3B4 - Vegetation Planting 0 year lifespan (disrepair)
  
- 3C1 - Slope/Bluff Stabilization >45 year lifespan
- 3C2 - Slope/Bluff Stabilization 5-45 year lifespan
- 3C3 - Slope/Bluff Stabilization 0-5 year lifespan
- 3C4 - Slope/Bluff Stabilization 0 year lifespan (disrepair)

**4. Protected Wetlands**

**5. Ad-Hoc Structures**

- 5A1 - Concrete Rubble >45 year lifespan
- 5A2 - Concrete Rubble 5-45 year lifespan
- 5A3 - Concrete Rubble 0-5 year lifespan
- 5A4 - Concrete Rubble 0 year lifespan (disrepair)
  
- 5B1 - Other Materials >45 year lifespan
- 5B2 - Other Materials 5-45 year lifespan
- 5B3 - Other Materials 0-5 year lifespan
- 5B4 - Other Materials 0 year lifespan (disrepair)

**6 - Unclassified**

**7 - No Protection**





2. Beaches are much more prevalent in 1999 and thus may have buried and obscured some structures that were present in 1989 photography, especially some groin fields.
3. In some sandy dune/bank areas it was sometimes difficult to tell if the "line" at the toe of the dune was a vegetation line, a low erosion scarp, or a line of rubble or rip rap placed as minor toe protection.
4. Where groins were present in both years, they were given a quality qualifier of "2" (i.e., 2A2). In other words, they have been present in that location for over 10 years and thus fall into the "5-45 year lifespan" category.
5. Beach nourishment was recorded only when there were obvious signs of active nourishment occurring (e.g., pipes/hoses on beach, sediment plumes/fans visible).
6. In each 100 meter sub-reach, there was only one case where there were more than 3 SP types occurring in that 100m stretch.

*Ozaukee, Sheboygan and Manitowoc Counties*

1. While the 1978 and 1992 photos were both listed as a 1:6000 scale, there were slight differences in the scales between the two photos. As such, different measuring templates / scales had to be created for each. This may result in slight differences between measurements, between the 2 years.
2. Air photos were not available for Reaches 1265-1267. As such, the digital orthophotos were used to attempt shore classification in this area. While it appeared that there was generally no shore protection present, some structures may not have been recorded as they may not have been visible at the scale and resolution of the digital orthophoto.
3. In some areas, due to lighting and resolution of the photos, it was difficult to discern between natural cobbles/boulders and revetments, or concrete rubble. This may result in misclassification of actual conditions in these areas.



### 3.0 Data Presentation and Analysis

#### 3.1 Data Presentation

All data was entered into MS-Excel spreadsheets for analysis purposes. Three levels of data were developed from the "raw" measurement data taken from the air photos. These are described below.

##### 3.1.1 Sub-Reaches

The "**Sub-Reaches**" data is effectively the "raw" data as recorded from the aerial photography. It provides data at a 1/10<sup>th</sup> of a kilometer Sub-Reach level.

A sample portion of a Sub-Reach data table is presented below (Table 2). Full Sub-Reach data for each of the 5 counties are presented in Appendix 1. In the sample table below, the major reach number and sub-reach number are reflected in Columns 1 and 2. Latitude and longitude for the center points of the sub-reaches are provided for mapping and geo-referencing purposes.

**Table 2: Example of Sub-Reach Data Table**

REACH	SUB REACH	LONG	LAT	1989		1999		CHANGE (m and %)
				SP TYPE	LENGTH	SP TYPE	LENGTH	
684	684-1	43.566	87.236	2A2	100	2A2	100	0
	684-2	43.566	87.236	2A2	100	2A2	100	0
	684-3	43.566	87.236	2A2	100	2A2	100	0
	684-4	43.566	87.236	2A2	100	2A2	100	0
	684-5	43.566	87.236	2A2	100	2A2	100	0
	684-6	43.566	87.236	2A2	100	2A2	100	0
	684-7	43.566	87.236	2A2	100	2A2	100	0
	684-8	43.566	87.236	1B2	24	1B2	0	-24
				2A2	100	2A2	100	0
	684-9	43.566	87.236	1A1	0	1A1	100	100
			1B2	24	1B2	0	-24	
			2A2	100	2A2	100	0	
	684-10	43.566	87.236	1A1	0	1A1	100	100
				2A2	100	2A2	100	0

Note: Latitude and Longitude in this example are not accurate numbers





Columns 5 through 8 detail the type and lengths of shore protection occurring in 1989 and 1999 (Ottawa and Allegan County example) in each sub reach, and column 9 shows the change in both meters and % (since we are working with 100 meter sub-reaches). There is also a Comments column in the MS-Excel spreadsheet (not shown here).

It should be noted that some shore protection types can occur simultaneously within a sub-reach (e.g., groins and seawalls), thus *total* lengths for any sub-reach may, where this occurs, be more than 100m.

Reading these tables is straightforward. For example, Reaches 684-1 to 684-7 show an SP Type of 2A2 (Groins, 5-45 Year Lifespan) over the length of the entire reaches for both 1989 and 1999. In Reach 684-8, there are groins over the full length, but there is also some 1B2 (Seawall 5-45 year lifespan) that occurs for 24 m in 1989. In 1999, this 1B2 is not visible or has been removed and thus there is a -24 change for this shore type.

In 1989 in Reach 684-9, we see 24 m of 1B2 and 100m of 2A2. In 1999, there is now 100m of 1A1 (revetment) that has been added behind the groins (2A2 still present) and also a removal of the 1B2 (again a -24 in the change column).

### 3.1.2 Kilometer by Kilometer

The "**Kilometer x Kilometer**" data worksheets present the information on a major reach by major reach basis for each county. Sub-Reach data was basically reformatted to determine the different shore protection types occurring in each kilometer reach and the corresponding cumulative lengths over that kilometer. Sample Kilometer by Kilometer data is presented in Table 3.

**Table 3: Sample Kilometer by Kilometer Data**

REACH	Long	Lat	SP	1989 (m)	%Reach	1999 (m)	%Reach	CHG (M)	CHG (%)
682	-86.27049	43.11558	7	1000	100.00	1000	100.00	0	0.00
683	-86.26659	43.10709	1B2	0	0.00	36	3.60	36	3.60
			2A2	200	20.00	200	20.00	0	0.00
			7	800	80.00	764	76.40	-36	-3.60



For example (above) Reach 682 is completely unprotected (7) in 1989 and in 1999. Reach 683 shows that from 1989 to 1999 there was a 36m increase in 1B2 (seawall) and a corresponding decrease in unprotected shore (7) resulting in a 3.6% change in each of these shore types respectively. Note that percentages in this case are based on the length of a protection type occurring over 1000m.

Again, latitude and longitude are provided here for geo-referencing purposes and are the center points of major kilometer reach subdivisions.

### 3.1.3 County

The "**County Summary**" worksheets provide a "roll-up" of all data on a county level basis for each of the different shore types recorded. A portion of a County Summary table is presented below in Table 4.

**Table 4: County Level Summary Data Example**

Shore Protection Type	89 LENGTH(M)	%COUNTY	99 LENGTH(M)	%COUNTY	CHG(M)	CHG(%)
1A1 - Revetments >45 Year Lifespan	300	0.73	800	1.95	500	1.22
1A2 - Revetments 5-45 Year Lifespan	375	0.91	515	1.26	140	0.34
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1527	3.72	2270	5.54	743	1.81
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	1415	3.45	915	2.23	-500	-1.22

For example, in the Ottawa County summary above, in 1989 there was a total of 300 m of 1A1, representing 0.73% of the county shoreline (in this case the percentage is based over the entire 41 km that make up the county). In 1999, this total increased to 800, representing a 500m increase of 1A1, or a 1.22% increase in this shore protection type over the county. Similarly in 1989, there were over 1.5 km of 1B2 (3.72% of the county), which increased to over 2.2km in 1999 (an increase of 1.8%).

### 3.2 Data Analysis

Analysis of the data for each of the 5 prototype counties is presented below. Detailed data, along with reference maps of the reach boundaries and shore protection mapping (produced in ArcView GIS) are found in Appendix 1 (data) and Appendix 2 (maps).



### 3.2.1 Ottawa County, Michigan

Ottawa County consists of 41 kilometers of shoreline beginning at Reach 682 in the north and ending at Reach 722 in the south. County level shore protection summary statistics are presented below in Table 5.

Predominant shore protection types in Ottawa County consist of groins (SP 2A), seawalls/revetments (SP 1B) and revetments (SP 1A). Jetties occur at Grand Haven, Pigeon Lake and Lake Macatawa. Over 70% of the Ottawa County shoreline is unprotected in both 1989 and 1999. Shore protection occurs sporadically throughout the county but becomes more predominant in the southern portion, particularly Reaches 707-714, south of the Pigeon Lake jetty. Where protection exists, groins predominate and occupy over 6.3 km (or 15%) of the county shoreline in 1999.

**Table 5: Ottawa County Summary Statistics**

**Ottawa County Summary Statistics**

Shore Protection Type	89 LENGTH (M)	%COUNTY	99 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	300	0.73	800	1.95	500	1.22
1A2 - Revetments 5-45 Year Lifespan	375	0.91	515	1.26	140	0.34
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1527	3.72	2270	5.54	743	1.81
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	1415	3.45	915	2.23	-500	-1.22
2A2 - Groins 5-45 Year Lifespan	6585	16.06	6335	15.45	-250	-0.61
2A3 - Groins 0-5 Year Lifespan	1375	3.35	425	1.04	-950	-2.32
2A4 - Groins 0 Year Lifespan (Disrepair)	140	0.34	140	0.34	0	0.00
2B1 - Jetties	744	1.81	744	1.81	0	0.00
3A2 - Beach Nourishment	1100	2.68	1600	3.90	500	1.22
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	10	0.02	0	0.00	-10	-0.02
7 - Unprotected	30152	73.54	29561	72.10	-591	-1.44

Note: Percentages Expressed as a Percentage of 41km length for entire county

In the 10 years of record analyzed there has only been an addition of 590m of shore protection - a rate of approximately 60m per year. Of this, the largest changes are an increase in the number of revetments and higher quality seawalls. This occurs in a number of reaches, usually with a corresponding loss of unprotected shoreline. There was a small decrease in the number of groins, although some of the groin fields may have been buried by sand and thus not visible on the 1999 air photos.



Beach nourishment also occurs, but was only recorded as present if it was actively occurring in the photograph. For example, around the Grand Haven and Lake Macatawa jetties (Reach 691 and 722), active beach nourishment was occurring in 1989, but not in 1999. Thus for these reaches it appears that there is a decrease in this shore protection type and a corresponding increase in unprotected shoreline. On the other hand, the Pigeon Lake jetty (Reach 707-708) had no visible nourishment activities in the 1989 photo but did in the 1999 photo. Thus there was an increase in this shore protection type for these reaches.

### 3.2.2 Allegan County, Michigan

Allegan County consists of 40 kilometers of shoreline beginning at Reach 723 in the north and extending to Reach 762 in the south. County level shore protection summary statistics are presented below in Table 6.

**Table 6: Allegan County Summary Statistics**

Allegan County Summary Statistics

Shore Protection Type	89 Length (M)	%COUNTY	99 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	750	1.88	750	1.88	0	0.00
1A2 - Revetments 5-45 Year Lifespan	485	1.21	1065	2.66	580	1.45
1A3 - Revetments 0-5 Year Lifespan	765	1.91	65	0.16	-700	-1.75
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	0.00	75	0.19	75	0.19
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1570	3.93	2445	6.11	875	2.19
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	350	0.88	0	0.00	-350	-0.88
1B4 - Seawall/Bulkhead 0 Year Lifespan (Disrepair)	0	0.00	75	0.19	75	0.19
2A2 - Groins 5-45 Year Lifespan	1375	3.44	1855	4.64	480	1.20
2A4 - Groins 0 Year Lifespan (Disrepair)	0	0.00	35	0.09	35	0.09
2B1 - Jetties	100	0.25	100	0.25	0	0.00
3C1 - Slope/Bluff Stabilization >45 Year Lifespan	250	0.63	250	0.63	0	0.00
3C2 - Slope/Bluff Stabilization 5-45 Year Lifespan	0	0.00	400	1.00	400	1.00
5A2 - Ad Hoc, Concrete Rubble 5-45 Year Lifespan	210	0.53	210	0.53	0	0.00
5A3 - Ad Hoc, Concrete Rubble 0-5 Year Lifespan	200	0.50	100	0.25	-100	-0.25
5A4 - Ad Hoc, Concrete Rubble 0 Year Lifespan (Disrepair)	315	0.79	885	2.21	570	1.43
5B2 - AdHoc, Other Materials, 5-45 Year Lifespan	350	0.88	0	0.00	-350	-0.88
5B3 - AdHoc, Other Materials, 0-5 Year Lifespan	300	0.75	600	1.50	300	0.75
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	0.00	65	0.16	65	0.16
7 - Unprotected	33170	82.93	31550	78.88	-1620	-4.05

Note: Percentages Expressed as a Percentage of 40km length for entire county



Over 78% of the Allegan County shoreline remained unprotected in 1999 including one long section of the shore at Saugatuck Dunes State Park (Reach 729-731). Where shore protection does occur, there is a greater diversity of types than neighboring Ottawa County, primarily due to a greater reliance of ad-hoc shore protection structures. Concentration of shore protection structures (and associated development) is greater south of the Kalamazoo River jetties and is particularly prevalent between Douglas in the north and Glen Shores in the south (Reach 736-752).

Over the 10 year period of analysis, there has been an addition of over 1.6km of new shoreline protection, at a rate of 162m per year. Most of this has been in the form of high to medium quality revetments (~1.3km), as well as the addition of ad hoc materials and in one area, slope and bluff stabilization (grading). Most significant changes occurred in Reach 737 (over 320m of new protection), Reach 741 (450m of new protection), Reach 746 (330m of new protection), and Reach 761 (560m of new protection). Other changes included upgrades of lower quality structures to higher quality, particularly revetments and seawalls (e.g., Reach 724, 761). There were also some reaches where shore protection appeared to be removed in the 1999 photos. This included for example Reach 727 (removal of 500m SP 1A3) and Reach 736 (removal of 150m SP 1B2).

### 3.2.3 Ozaukee County, Wisconsin

Ozaukee County consists of 44 kilometers of shoreline beginning at Reach 1172 in the south and extending to Reach 1215 in the north. County level shore protection summary statistics are presented in Table 7.

Ozaukee County has a large amount of unprotected shoreline with almost 80% of the shoreline in 1992 falling in this category. This is especially true in the southern part of the county, except for pockets of shore protection near the Milwaukee County border (Reach 1172) and in Port Washington. This directly correlates to the presence of high bluff shoreline and low to moderate shoreline development. Most of the existing shore protection occurs in the northern portions of the county, particularly Reaches 1206-1215. This coincides with the presence of lower lying "beach" shore types and an associated increase in shoreline development. Of the existing shore protection, the majority consists of revetments and seawalls, with minor occurrences of ad-hoc materials (SP 5). Quality of these structures also varies and in some cases there are up to 7 different types of shore protection occurring in any one reach (e.g. Reach 1172).

Over the 14 year period of record analyzed, the biggest change on a county level basis was the addition of over 1.3km of medium quality revetments (SP 1A2). This came



largely at the expense of unprotected areas (SP 7), as over 1.9km of shoreline classed as unprotected in 1978 had some form of shore protection along it in 1992. This translates into a rate of approximately 142m of new shore protection added in each year. Areas of biggest change in this category included Reach 1172 (+390m of 1A2), Reach 1207 (+425m of 1A2) and Reach 1208 (+320m of 1A2). In Port Washington, the construction of a marina basin between 1978 and 1992 accounted for the majority of change in structures around these areas.

Table 7: Ozaukee County Summary Statistics

Ozaukee County Summary Statistics

Shore Protection Type	78 LENGTH (M)	%COUNTY	92 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	838	1.90	1038	2.36	200	0.45
1A2 - Revetments 5-45 Year Lifespan	1120	2.55	2450	5.57	1330	3.02
1A3 - Revetments 0-5 Year Lifespan	895	2.03	805	1.83	-90	-0.20
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	0.00	255	0.58	255	0.58
1B1 - Seawalls/Bulkheads >45 Year Lifespan	1682	3.82	2107	4.79	425	0.97
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	840	1.91	1050	2.39	210	0.48
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	230	0.52	260	0.59	30	0.07
2A2 - Groins 5-45 Year Lifespan	150	0.34	0	0.00	-150	-0.34
2B1 - Jetties	200	0.45	200	0.45	0	0.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	0.00	200	0.45	200	0.45
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	457	1.04	437	0.99	-20	-0.05
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	580	1.32	760	1.73	180	0.41
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	325	0.74	25	0.06	-300	-0.68
5B2 - Ad Hoc, Other Materials, 5-45 Year Lifespan	30	0.07	30	0.07	0	0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	0.00	25	0.06	25	0.06
7 - Unprotected	37153	84.44	35168	79.93	-1985	-4.51

Note: Percentages Expressed as a Percentage of 44km length for entire county

3.2.4 Sheboygan County, Wisconsin

Sheboygan County consists of 46 kilometers of shoreline beginning at Reach 1216 in the south and extending to Reach 1261 in the north. County level shore protection summary statistics are presented below in Table 8.

Sheboygan County is the most heavily protected of the 5 counties analyzed, having 45% of it's length protected with some type of structure in 1992. This is an almost 5% increase from the amount of protection present in 1978 and represents an addition of over 2.1km of shore protection at a rate of 150m per year. This county also has the greatest





Table 8: Sheboygan County Summary Statistics

Sheboygan County Summary Statistics

Shore Protection Type	78 LENGTH (M)	%COUNTY	92 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	3290	7.15	5440	11.83	2150	4.67
1A2 - Revetments 5-45 Year Lifespan	4235	9.21	5895	12.82	1660	3.61
1A3 - Revetments 0-5 Year Lifespan	3140	6.83	2070	4.50	-1070	-2.33
1A4 - Revetments 0 Year Lifespan (Disrepair)	255	0.55	0	0.00	-255	-0.55
1B1 - Seawalls/Bulkheads >45 Year Lifespan	3000	6.52	3320	7.22	320	0.70
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1125	2.45	1050	2.28	-75	-0.16
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	725	1.58	310	0.67	-415	-0.90
1B4 - Seawalls/Bulkheads 0 Year Lifespan (Disrepair)	0	0.00	75	0.16	75	0.16
2A1 - Groins >45 Year Lifespan	1600	3.48	0	0.00	-1600	-3.48
2A2 - Groins 5-45 Year Lifespan	275	0.60	400	0.87	125	0.27
2A3 - Groins 0-5 Year Lifespan	0	0.00	1475	3.21	1475	3.21
2B1 - Jetties >45 Year Lifespan	315	0.68	300	0.65	-15	-0.03
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	0.00	250	0.54	250	0.54
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	40	0.09	680	1.48	640	1.39
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	595	1.29	245	0.53	-350	-0.76
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	1250	2.72	1295	2.82	45	0.10
5B3 - Ad Hoc, Other Materials, 0-5 Year Lifespan	35	0.08	0	0.00	-35	-0.08
7 - Unprotected	27720	60.26	25595	55.64	-2125	-4.62

Note: Percentages Expressed as a Percentage of 46km length for entire county

range of structure types and qualities, although revetments and seawalls (as a base type) predominate. Shore protection is concentrated in the reaches south of and including the City of Sheboygan, except for a number of unprotected reaches around Terry Andrae State Park (Reaches 1229-1232). Shore development is more predominant in the southern part of the county in direct correlation with low lying "beach" shore types. North of Sheboygan, bluff shore types predominate and development tends toward low-density agricultural development right to the bluff edge.

The biggest changes in shore protection over the 14 year period of record are decreases in lower quality revetments and seawalls with corresponding increases in higher quality structures. On a county wide basis for example, there was an addition of over 3.7km of mid-high quality revetments (SP 1A1 1A2), with a decrease of over 1.2km of lower quality revetment types. Examples of reaches where this occurs include Reach 1226 (+430m 1A2, -430m 1A3) and Reach 1249 (+555m 1A2, -350m 1A3). Much of the addition of new revetments also came at the expense of previously unprotected shoreline. Examples of where this occur include Reach 1227 (+415m 1A1 and 1A2, -365m SP7), and Reach 1234 (+790m 1A1 and 1A2, -790m SP7).





A number of large groin fields are present, mainly within the City of Sheboygan. The statistics show a decrease in high quality (SP 2A1) structures and an increase in lower quality structures (SP 2A3). It should be noted that this does not represent any new construction or removal of groins, but only a deterioration in the quality of the groin structures over the 14 year period.

### 3.2.5 Manitowoc County, Wisconsin

Manitowoc County consists of 57 kilometers of shoreline beginning at Reach 1262 in the south and extending to Reach 1318 in the north. County level shore protection summary statistics are presented below in Table 9.

**Table 9: Manitowoc County Summary Statistics**

**Manitowoc County Summary Statistics**

Shore Protection Type	78 LENGTH (M)	%COUNTY	92 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	7880	13.82	9335	16.38	1455	2.55
1A2 - Revetments 5-45 Year Lifespan	1485	2.61	2965	5.20	1480	2.60
1A3 - Revetments 0-5 Year Lifespan	285	0.50	570	1.00	285	0.50
1A4 - Revetments 0 Year Lifespan (Disrepair)	45	0.08	0	0.00	-45	-0.08
1B1 - Seawalls/Bulkheads >45 Year Lifespan	30	0.05	30	0.05	0	0.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	45	0.08	110	0.19	65	0.11
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	25	0.04	0	0.00	-25	-0.04
2A2 - Groins 5-45 Year Lifespan	335	0.59	335	0.59	0	0.00
2B1 - Jetties >45 Year Lifespan	1070	1.88	1070	1.88	0	0.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	125	0.22	100	0.18	-25	-0.04
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	200	0.35	200	0.35	0	0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	225	0.39	100	0.18	-125	-0.22
7 - Unprotected	45485	79.80	42420	74.42	-3065	-5.38

Note: Percentages Expressed as a Percentage of 57km length for entire county

Manitowoc County is the longest of the 5 prototype counties (in terms of total reach length) and it is one of the least protected, with only 25% of it's shoreline being protected in 1992. This however represents an increase of over 5% from 1978, as over 3km of new shore protection was added in that time period at a rate of approximately 218m per year.

Shore protection in Manitowoc County is concentrated almost exclusively in the section of shoreline fronting the City of Manitowoc, the City of Two Rivers and the connecting shoreline between these two urban areas (highway). There are small pockets of shore protection at the mouth of Centerville Creek (Cleveland, Reach 1264-1265) and just north of Point Beach State Forest (Reach 1306-1308). The Point Beach nuclear facility is



also well-protected (Reach 1312-1313). Other than this, the rest of the shoreline remains unprotected.

Changes observed in the 14 year period of record are predominantly the addition of mid-high quality revetments at the expense of previously unprotected areas. On a county level basis, over 2.9km of mid-high quality revetment (SP 1A1, 1A2) were added. The bulk of this occurred along the highway between Manitowoc and Two Rivers as extensions to the revetment in this area were made (Reach 1289-1291).

### **3.3 Shore Protection Construction Costs**

As part of this task, there was a desire to generate estimates of the average costs per lineal meter for construction of the different shore protection types found within each county. This would serve as a starting point for a much fuller evaluation of anticipated costs, or avoided costs of future shore protection that are being evaluated by others within the LMPDS.

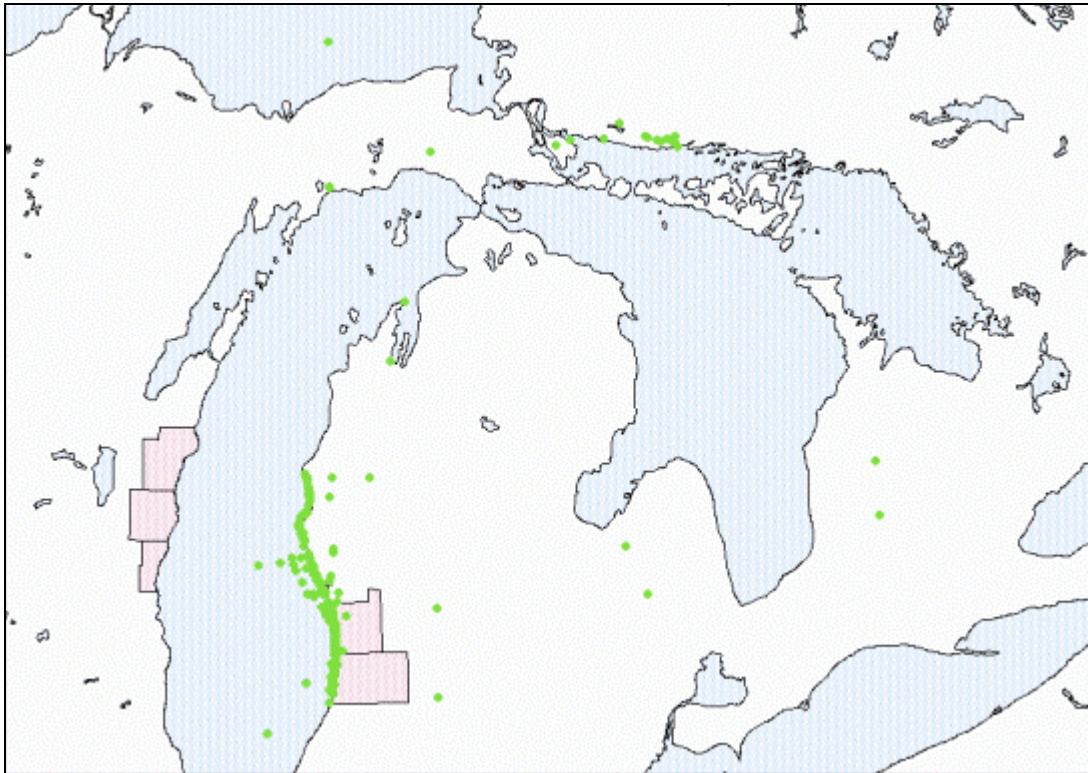
#### **3.3.1 RAMS Database Information**

As a first step in doing this, it was hoped that construction cost data and other relevant information (e.g., type of structure, length, year built, etc.) could be obtained from the USACE Regulatory Analysis and Management System (RAMS) database. In examining this database, it was found that the key information we were hoping to find was not readily available from RAMS. Data on construction cost is not recorded in the database. Structure type information is only recorded from the description of the structure found in the initial application letter. This data was inconsistent - for some properties it was very thorough and detailed, for others it was non-existent. Data on the year the structure was built was also not available. The only date information recorded is the date the structure was permitted. In many cases, permitted structures are not actually built until well after the permit issue date and in some cases, they do not get built at all.

Perhaps the most critical data required was accurate locational information (georeferencing) so that the RAMS data entry could be easily located and plotted relative to a specific property on a map or digital orthophoto, or at least to the closest 1/10<sup>th</sup> kilometer reach boundary used for our classification exercise. In our initial discussions with USACE Detroit staff, we were warned that the coordinate information entered in the RAMS database should be used with caution as there may be inconsistencies in whether the latitude and longitude data was entered as decimal degrees, or as hours, minutes and



seconds. To verify this, we performed a simple plot of the data for Ottawa and Allegan counties using the coordinate information provided in the database. The results of this are presented in Figure 2.



**Figure 2 - Plot of RAMS Database Locations (Light Gray Dots), Ottawa and Allegan Counties**

While a number of the plot locations fell along the Ottawa and Allegan County shorelines, there were a significant number that did not even come close, including a number in the middle of Lake Michigan, some in the middle of the State, one in Lake Superior, two points in Southern Ontario and a small cluster of points along the North Channel of Georgian Bay in Canada. In addition, of those points falling on the shoreline, many occurred outside of the Ottawa and Allegan County borders and were of no relevance to us. Given this uncertainty in location, and the general lack of useful information in the database (for our purposes) to begin with, we decided to abandon the RAMS data and not utilize it for analysis purposes within this task.



3.3.2 Representative Shore Protection Cost Information

Fortunately, other sources of shore protection costing information are available that will allow a basic level assessment of shore protection costs in the 5 counties. In 1989, the Southeast Wisconsin Regional Planning Commission developed typical costs for well-engineered protection structures along the Milwaukee County shoreline. In 1992, as part of the IJC Water Level Reference Study, Argiroff (1992) reviewed USACE permits and conducted field investigations along the Berrien County shoreline of Michigan to determine typical shore protection costs for a range of privately constructed structures. In 1993, again as part of the IJC Water Level Study, Baird & Associates (1993) developed similar costs for well-engineered structures in their examination of avoided costs of shore protection as part of the IJC Water Level Study. Table 10 presents a summary of these various dollar values as reported in Baird (1993). They have been adjusted to 1992 U.S. dollars.

Table 10: Comparison of Shore Protection Construction Cost Estimates

Source	Cost Per Lineal Meter (1992 U.S. Dollars)		
	Revetments	Seawalls	Groins
Argiroff, 1992	\$158	\$604	\$318
SEWRPC, 1989	\$717-2,510	\$2,330	\$1,076-3,585
Baird, 1993	\$547-1,053	\$1,228-1,906	\$930-1,312

The variation in costs in Table 10 is due to the fact that the SEWRPC and Baird data apply to well engineered shore protection structures, while the Argiroff data better represent privately constructed "non-engineered" structures.

For the purposes of our evaluation, we assigned a cost to a specific type and quality of structure in order to calculate some basic dollar values in the two years of record for the counties. This data is presented in Table 11. To assign the values, we have made a number of general assumptions:

1. High quality revetments and seawalls (1A1, 1B1) are assigned the highest value reported by Baird for the Michigan shoreline (\$1053 and \$1906) and the highest value reported by SEWRPC for the Wisconsin shoreline (\$2510 and \$2330). It is



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assumed that these structures generally represent institutional, well-engineered and maintained structures and are thus represented by the top cost in this category.

**Table 11: Representative Shore Protection Costs for Structure Type (1992 Dollars)**

Shore Protection	Representative Dollar Value	Source
1A1 Revetment (Mich)	\$1053	Baird
1A1 Revetment (Wisc)	\$2510	SEWRPC
1A2 Revetment (Mich)	\$547	Baird
1A2 Revetment (Wisc)	\$717	SEWRPC
1A3 and 1A4 Revetment	\$158	Argiroff
1B1 Seawall (Mich)	\$1906	Baird
1B1 Seawall (Wisc)	\$2330	SEWRPC
1B2 Seawall (Mich)	\$1228	Baird
1B2 Seawall (Wisc)	\$2330	SEWRPC
1B3 and 1B4 Seawall	\$604	Argiroff
2A1 Groins (Mich)	\$1312	Baird
2A1 Groins (Wisc)	\$3585	SEWRPC
2A2 Groins (Mich)	\$930	Baird
2A2 Groins (Wisc)	\$1076	SEWRPC
2A3 and 2A4 Groins	\$318	Argiroff
2B Jetties (Mich)	\$1906	Baird
2B Jetties (Wisc)	\$2330	SEWRPC
2C Offshore Breakwaters (Mich)	\$1053	Baird
2C Offshore Breakwaters (Wisc)	\$2510	SEWRPC
3A Beach Nourishment	N/A	
3B Vegetation Planting	N/A	
3C Slope Stabilization	N/A	
4 Protected Wetlands (Mich)	N/A	
4 Protected Wetlands (Wisc)	N/A	
5A Ad Hoc Concrete	\$158	Argiroff
5B Ad Hoc Other	\$158	Argiroff



2. Medium quality revetments and seawalls (1A2, 1B2) are assigned the lowest value reported by Baird for the Michigan shoreline (\$547 and \$1228) and the lowest value reported by SEWRPC (\$717 and \$2330) for the Wisconsin shoreline. While these structures are of lesser quality, the assumption is that they are still properly engineered and can thus be represented by the lower cost in this category
3. Low quality revetments and seawalls (1A3, 1A4, 2B3, 2B4) are assigned the values reported for Argiroff for these categories (\$158 and \$604). These structures are generally private property structures and are poorly, if at all, engineered. They are thus represented by the Argiroff values.
4. High quality groins (2A1) are assigned the highest value reported by Baird for the Michigan shoreline (\$1312) and the highest value reported by SEWRPC for the Wisconsin shoreline (\$3585).
5. Medium quality groins (2A2) are assigned the lowest value reported by Baird for the Michigan shoreline (\$930) and the lowest value reported by SEWRPC for the Wisconsin shoreline (\$1076).
6. Low quality groins (2A3, 2A4) are assigned the value reported by Argiroff for this category (\$318).
7. Jetties (2Bx) are assigned the highest *seawall* class value reported by Baird (\$1906) for the Michigan shoreline and the highest *seawall* class value reported by SEWRPC for the Wisconsin shoreline (\$2330). The assumption here is that jetties consist predominantly of steel sheet pile seawall type construction and that they would always be of the highest quality as they are generally associated with harbor structures.
8. Offshore breakwaters (2Cx) are assigned the highest *revetment* class value reported by Baird for the Michigan shoreline (\$1053) and the highest *revetment* class value as reported by SEWRPC for the Wisconsin shoreline. The assumption here is that offshore breakwaters consist generally of engineered armorstone and revetment type construction and that they would always be of the highest quality as they are generally associated with marinas or harbour areas.
9. Ad Hoc structures have all been assigned the value for revetment as reported by Argiroff (\$158). The bulk of ad hoc structures recorded in the 5 counties, consisted of concrete rubble, placed in a poorly designed revetment format. This is generally represented by the Argiroff structure type.
10. Values are not provided for beach nourishment, vegetation planting, slope stabilization and protected wetlands. Where these categories occur, they are not factored into the cost calculations.



3.3.3 County-by-County Shore Protection Costs

Using the above representative costs, we have calculated very simple costs of shore protection (using 1992 dollars) for each of the 5 counties for both years of record examined. This also results in a net change in dollar value that can be reported between the periods of record. It should be cautioned that this analysis is extremely basic and hence not very economically rigorous. They are meant simply to provide a basic understanding of relative changes in cost of shore protection between the two periods. The costs represent costs for constructing new protection in both years of record - i.e., we are comparing the cost of building new, the total lengths of shore protection measured in Year A (1989-Michigan, 1978-Wisconsin), with the cost of building new, the total lengths of shore protection measured in Year B (1999-Michigan, 1992-Wisconsin). No allowances have been made for maintenance costs, structure depreciation/damage, or inflation.

Results for the 5 counties are presented in Tables 12-16.

Table 12: Ottawa County Shore Protection Costs

Shore Protection Type	89 LENGTH (M)	\$/M	Total Cost 89	99 LENGTH (M)	\$/M	Total Cost 99	Net Change \$
1A1 - Revetments >45 Year Lifespan	300	\$1,053.00	\$315,900.00	800	\$1,053.00	\$842,400.00	\$526,500.00
1A2 - Revetments 5-45 Year Lifespan	375	\$547.00	\$205,125.00	515	\$547.00	\$281,705.00	\$76,580.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1527	\$1,228.00	\$1,875,156.00	2270	\$1,228.00	\$2,787,560.00	\$912,404.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	1415	\$604.00	\$854,660.00	915	\$604.00	\$552,660.00	-\$302,000.00
2A2 - Groins 5-45 Year Lifespan	6585	\$930.00	\$6,124,050.00	6335	\$930.00	\$5,891,550.00	-\$232,500.00
2A3 - Groins 0-5 Year Lifespan	1375	\$318.00	\$437,250.00	425	\$318.00	\$135,150.00	-\$302,100.00
2A4 - Groins 0 Year Lifespan (Disrepair)	140	\$318.00	\$44,520.00	140	\$318.00	\$44,520.00	\$0.00
2B1 - Jetties	744	\$1,906.00	\$1,418,064.00	744	\$1,906.00	\$1,418,064.00	
3A2 - Beach Nourishment	1100			1600			
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	10	\$158.00	\$1,580.00	0	\$158.00	\$0.00	-\$1,580.00
7 - Unprotected	30152			29561			
			\$11,276,305.00			\$11,953,609.00	\$677,304.00

For Ottawa County, total cost for shore protection in 1989 was \$11,276,305. In 1999, total cost of shore protection was \$11,953,609. This represents an increase of \$677,304 over the 10 year period at a rate of \$67,730 per year. It should be noted that the beach nourishment shore protection type was not included in this analysis.

In Allegan County, total cost of shore protection in 1989 was \$5,001,875. In 1999, total cost of shore protection was \$6,662,945. This represents an increase of \$1,661,070 over the 10 year period at a rate of \$166,107 per year.



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### Table 13: Allegan County Shore Protection Costs

#### Allegan County Shore Protection Costs

Shore Protection Type	89 Length (M)	\$/M	Total Cost 89	99 LENGTH (M)	\$/M	Total Cost 99	Net Change \$
1A1 - Revetments >45 Year Lifespan	750	\$1,053.00	\$789,750.00	750	\$1,053.00	\$789,750.00	\$0.00
1A2 - Revetments 5-45 Year Lifespan	485	\$547.00	\$265,295.00	1065	\$547.00	\$582,555.00	\$317,260.00
1A3 - Revetments 0-5 Year Lifespan	765	\$158.00	\$120,870.00	65	\$158.00	\$10,270.00	-\$110,600.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00	75	\$158.00	\$11,850.00	\$11,850.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1570	\$1,228.00	\$1,927,960.00	2445	\$1,228.00	\$3,002,460.00	\$1,074,500.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	350	\$604.00	\$211,400.00	0	\$604.00	\$0.00	-\$211,400.00
1B4 - Seawall/Bulkhead 0 Year Lifespan (Disrepair)	0	\$604.00	\$0.00	75	\$604.00	\$45,300.00	\$45,300.00
2A2 - Groins 5-45 Year Lifespan	1375	\$930.00	\$1,278,750.00	1855	\$930.00	\$1,725,150.00	\$446,400.00
2A4 - Groins 0 Year Lifespan (Disrepair)	0	\$318.00	\$0.00	35	\$318.00	\$11,130.00	\$11,130.00
2B1 - Jetties	100	\$1,906.00	\$190,600.00	100	\$1,906.00	\$190,600.00	\$0.00
3C1 - Slope/Bluff Stabilization >45 Year Lifespan	250			250			
3C2 - Slope/Bluff Stabilization 5-45 Year Lifespan	0			400			
5A2 - Ad Hoc, Concrete Rubble 5-45 Year Lifespan	210	\$158.00	\$33,180.00	210	\$158.00	\$33,180.00	\$0.00
5A3 - Ad Hoc, Concrete Rubble 0-5 Year Lifespan	200	\$158.00	\$31,600.00	100	\$158.00	\$15,800.00	-\$15,800.00
5A4 - Ad Hoc, Concrete Rubble 0 Year Lifespan (Disrepair)	315	\$158.00	\$49,770.00	885	\$158.00	\$139,830.00	\$90,060.00
5B2 - AdHoc, Other Materials, 5-45 Year Lifespan	350	\$158.00	\$55,300.00	0	\$158.00	\$0.00	-\$55,300.00
5B3 - AdHoc, Other Materials, 0-5 Year Lifespan	300	\$158.00	\$47,400.00	600	\$158.00	\$94,800.00	\$47,400.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00	65	\$158.00	\$10,270.00	\$10,270.00
7 - Unprotected	33170			31550			
			\$5,001,875.00			\$6,662,945.00	\$1,661,070.00

### Table 14: Ozaukee County Shore Protection Costs

Shore Protection Type	78 LENGTH (M)	\$/M	Total Cost 78	92 LENGTH (M)	\$/M	Total Cost 92	Net Change \$
1A1 - Revetments >45 Year Lifespan	838	\$2,510.00	\$2,103,380.00	1038	\$2,510.00	\$2,605,380.00	\$502,000.00
1A2 - Revetments 5-45 Year Lifespan	1120	\$717.00	\$803,040.00	2450	\$717.00	\$1,756,650.00	\$953,610.00
1A3 - Revetments 0-5 Year Lifespan	895	\$158.00	\$141,410.00	805	\$158.00	\$127,190.00	-\$14,220.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00	255	\$158.00	\$40,290.00	\$40,290.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	1682	\$2,330.00	\$3,919,060.00	2107	\$2,330.00	\$4,909,310.00	\$990,250.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	840	\$2,330.00	\$1,957,200.00	1050	\$2,330.00	\$2,446,500.00	\$489,300.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	230	\$604.00	\$138,920.00	260	\$604.00	\$157,040.00	\$18,120.00
2A2 - Groins 5-45 Year Lifespan	150	\$1,076.00	\$161,400.00	0	\$1,076.00	\$0.00	-\$161,400.00
2B1 - Jetties	200	\$2,330.00	\$466,000.00	200	\$2,330.00	\$466,000.00	\$0.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	\$2,510.00	\$0.00	200	\$2,510.00	\$502,000.00	\$502,000.00
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	457	\$158.00	\$72,206.00	437	\$158.00	\$69,046.00	-\$3,160.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	580	\$158.00	\$91,640.00	760	\$158.00	\$120,080.00	\$28,440.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	325	\$158.00	\$51,350.00	25	\$158.00	\$3,950.00	-\$47,400.00
5B2 - Ad Hoc, Other Materials, 5-45 Year Lifespan	30	\$158.00	\$4,740.00	30	\$158.00	\$4,740.00	\$0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00	25	\$158.00	\$3,950.00	\$3,950.00
7 - Unprotected	37153			35168			
			\$9,910,346.00			\$13,212,126.00	\$3,301,780.00



**Table 15: Sheboygan County Shore Protection Costs**

Shore Protection Type	78 LENGTH (M)	\$/M Total Cost 78		92 LENGTH (M)	\$/M Total Cost 92		Net Change \$
1A1 - Revetments >45 Year Lifespan	3290	\$2,510.00	\$8,257,900.00	5440	\$2,510.00	\$13,654,400.00	\$5,396,500.00
1A2 - Revetments 5-45 Year Lifespan	4235	\$717.00	\$3,036,495.00	5895	\$717.00	\$4,226,715.00	\$1,190,220.00
1A3 - Revetments 0-5 Year Lifespan	3140	\$158.00	\$496,120.00	2070	\$158.00	\$327,060.00	-\$169,060.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	255	\$158.00	\$40,290.00	0	\$158.00	\$0.00	-\$40,290.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	3000	\$2,330.00	\$6,990,000.00	3320	\$2,330.00	\$7,735,600.00	\$745,600.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1125	\$2,330.00	\$2,621,250.00	1050	\$2,330.00	\$2,446,500.00	-\$174,750.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	725	\$604.00	\$437,900.00	310	\$604.00	\$187,240.00	-\$250,660.00
1B4 - Seawalls/Bulkheads 0 Year Lifespan (Disrepair)	0	\$604.00	\$0.00	75	\$604.00	\$45,300.00	\$45,300.00
2A1 - Groins >45 Year Lifespan	1600	\$3,585.00	\$5,736,000.00	0	\$3,585.00	\$0.00	-\$5,736,000.00
2A2 - Groins 5-45 Year Lifespan	275	\$1,076.00	\$295,900.00	400	\$1,076.00	\$430,400.00	\$134,500.00
2A3 - Groins 0-5 Year Lifespan	0	\$318.00	\$0.00	1475	\$318.00	\$469,050.00	\$469,050.00
2B1 - Jetties >45 Year Lifespan	315	\$2,330.00	\$733,950.00	300	\$2,330.00	\$699,000.00	-\$34,950.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	\$2,510.00	\$0.00	250	\$2,510.00	\$627,500.00	\$627,500.00
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	40	\$158.00	\$6,320.00	680	\$158.00	\$107,440.00	\$101,120.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	595	\$158.00	\$94,010.00	245	\$158.00	\$38,710.00	-\$55,300.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	1250	\$158.00	\$197,500.00	1295	\$158.00	\$204,610.00	\$7,110.00
5B3 - Ad Hoc, Other Materials, 0-5 Year Lifespan	35	\$158.00	\$5,530.00	0	\$158.00	\$0.00	-\$5,530.00
7 - Unprotected	27720			25595			
			\$28,949,165.00			\$31,199,525.00	\$2,250,360.00

In Ozaukee County, total cost of shore protection in 1978 was \$9,910,346. In 1992, total cost of shore protection was \$13,212,126. This represents an increase of \$3,301,780 over the 14 year period at a rate of \$235,841 per year.

In Sheboygan County, total cost of shore protection in 1978 was \$28,949,165. In 1992, total cost of shore protection was \$31,199,525. This represents an increase of \$2,250,360 over the 14 year period at a rate of \$160,740 per year.

**Table 16: Manitowoc County Shore Protection Costs**

Shore Protection Type	78 LENGTH (M)	\$/M Total Cost 78		92 LENGTH (M)	\$/M Total Cost 92		Net Change \$
1A1 - Revetments >45 Year Lifespan	7880	\$2,510.00	\$19,778,800.00	9335	\$2,510.00	\$23,430,850.00	\$3,652,050.00
1A2 - Revetments 5-45 Year Lifespan	1485	\$717.00	\$1,064,745.00	2965	\$717.00	\$2,125,905.00	\$1,061,160.00
1A3 - Revetments 0-5 Year Lifespan	285	\$158.00	\$45,030.00	570	\$158.00	\$90,060.00	\$45,030.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	45	\$158.00	\$7,110.00	0	\$158.00	\$0.00	-\$7,110.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	30	\$2,330.00	\$69,900.00	30	\$2,330.00	\$69,900.00	\$0.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	45	\$2,330.00	\$104,850.00	110	\$2,330.00	\$256,300.00	\$151,450.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	25	\$604.00	\$15,100.00	0	\$604.00	\$0.00	-\$15,100.00
2A2 - Groins 5-45 Year Lifespan	335	\$1,076.00	\$360,460.00	335	\$1,076.00	\$360,460.00	\$0.00
2B1 - Jetties >45 Year Lifespan	1070	\$2,330.00	\$2,493,100.00	1070	\$2,330.00	\$2,493,100.00	\$0.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	125	\$158.00	\$19,750.00	100	\$158.00	\$15,800.00	-\$3,950.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	200	\$158.00	\$31,600.00	200	\$158.00	\$31,600.00	\$0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	225	\$158.00	\$35,550.00	100	\$158.00	\$15,800.00	-\$19,750.00
7 - Unprotected	45485			42420			
			\$24,025,995.00			\$28,889,775.00	\$4,863,780.00





## U.S. Army Corps of Engineers - Detroit District

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In Manitowoc County, total cost of shore protection in 1978 was \$24,025,995. In 1992, total cost of shore protection was \$28,889,775. This represents an increase of \$4,863,780 over the 14 year period at a rate of \$347,412 per year.



## 4.0 ArcView Mapping

For visualization purposes shoreline protection classification at the 1/10<sup>th</sup> of a kilometer interval has been mapped in Arc View. This section describes the process by which the ArcView mapping was developed. Paper plots of the resulting maps and shore protection classification are presented in Appendix 2.

### 4.1 Reach Delineation

In order to develop the 1/10<sup>th</sup> of a kilometer reach breaks, the 1 kilometer reach breaks and the shoreline string were digitized from the topographic maps using ArcInfo. This reach break coverage was then brought into ArcView and each reach was subdivided into approximately 100m sub-reaches using ArcView's measuring tool. The total length of each reach was first measured (note, it was rare to find a reach exactly 100 meters in length – the great majority were within +/- 10m). The total length of the reach was then divided by 10 to get a number X (approximately 100). From the start of a reach, the distance X divided by 2 was measured to get the center-point of the first sub-reach (a point was digitized at this distance). A distance of X was then measured from this point (and every other point in the reach) to obtain the next center-point and so on until the 10<sup>th</sup> and final point of the reach had been plotted such that a reach might look like this:





This process was repeated for every subsequent reach. The center point of each sub-reach had its latitude and longitude coordinates recorded, as well as the reach and sub-reach number in the corresponding point theme table (database).

#### **4.2 Shore Protection Delineation**

Shore Protection Type data was collected for 2 different years from the air photos by sub-reach such that for example in reach X, sub-reach Y the following might be recorded:

- 10 meters of 1A1
- 35 meters of 2B3
- 30 meters of 7
- 50 meters of 5A2

All the Shore Protection Type data was transferred into the ArcView point theme database such that if the center-point of a sub-reach was queried the result would look similar to this example:

**Point ID:** 4364738 (assigned internally)

**Reach:** 681

**Sub-reach:** 7

**Latitude:** 45.25456

**Longitude:** -86.463672

**Shore Protection Type 1 (most dominant) for year 1992:** 5A2

**Length of SPT 1 for 1992:** 50 (meters)

**Shore Protection Type 2 (2nd most dominant) for year 1992:** 2B3

**Length of SPT 2 for 1992:** 35 (meters)

**Shore Protection Type 3 (3rd most dominant) for year 1992:** 7

**Length of SPT 3 for 1992:** 30 (meters)

**Shore Protection Type 4 (4th most dominant) for year 1992:** 1A1

**Length of SPT 4 for 1992:** 10 (meters)

**Shore Protection Type 5 (5th most dominant) for year 1992:** (nothing)

**Length of SPT 5 for 1992:** nothing

**Shore Protection Type 1 (most dominant) for year 1978:** 5A2

**Length of SPT 1 for 1978:** 50 (meters)

**Shore Protection Type 2 (2nd most dominant) for year 1978:** 2B3

**Length of SPT 2 for 1978:** 35 (meters)

**Shore Protection Type 3 (3rd most dominant) for year 1978:** 7

**Length of SPT 3 for 1978:** 30 (meters)

**Shore Protection Type 4 (4th most dominant) for year 1978:** 1A1



**Length of SPT 4 for 1978:** 10 (meters)

**Shore Protection Type 5** (5th most dominant) **for year 1978:** (nothing)

**Length of SPT 5 for 1978:** (nothing)

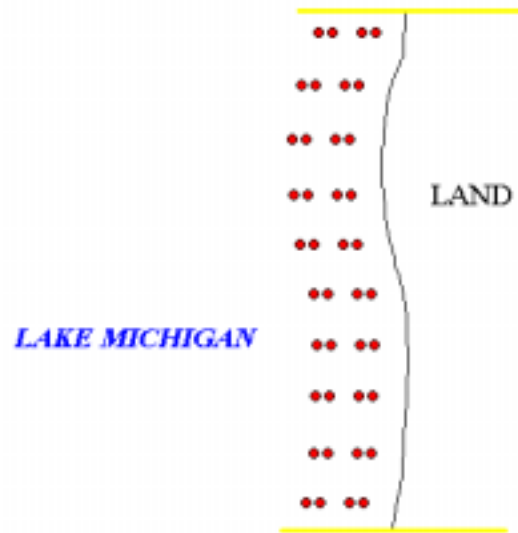
**Additional comments:** (for example, this sub-reach contains the county line between X county and Y county, or there is a nuclear power plant on the coastline within this sub-reach)

The ArcView (point) theme was edited such that every point along the coastline was selected, and then moved off the coastline along the horizontal to an appropriate distance:



The 3 files that make up the ArcView point theme (.SHP, .DBF, .SHX) were copied, renamed and brought back into the ArcView project as another point theme. This theme would then be edited, again such that every point would be selected and then moved along the horizontal to an appropriate location. This process was repeated 3 times so that in the end there were 4 rows of (center) points: the farthest row to the left would represent SPT 1 (the most dominant) for the earliest year, the second would represent SPT 2 (2nd most dominant) for the earliest year. The 3rd row from the left represents SPT 1 for the most recent year and the farthest row to the right represents SPT 2 for the most recent year.

Thus, for both sides of the lake, the first set of rows (from the left) represents the earliest year and the second set of rows (from the left) the most recent year:



A master legend was then created and applied to all 4 point themes. The scheme was such that different shore protection types (i.e., groins, seawalls, beach nourishment, etc.) were represented by different shapes and the quality of the SPT (numbered 1-4) was represented by color (different for each type) - the darker the shade (1 is the darkest) the better the quality. No shore protection type (Class 7) is represented by a white circle as SPT 1 for either year as it applies. If there is no other shore protection in the sub-reach (i.e. SPT 2 = nothing), other than SPT 1, the point representing SPT 2 for either year is simply left blank (it is not represented) as it applies along the coast.

Finally, for visualization purposes, DOQQs were placed underneath, yellow reach dividers were drawn out from the digitized shoreline and the reaches were visually numbered, to be viewed at a scale of approximately 1:35,000. These plots are found in Appendix 2. All associated ArcView project files are found on the CD associated with this report.



## 5.0 Summary and Conclusions

The shore protection mapping and classification exercise carried out in this task provides detailed information on the types, extent and quality of shore protection present in the 5 prototype counties and the trends and changes in the protection that have occurred over the last 10-14 years. As a result of this exercise, there are a number of conclusions and recommendations that should be considered during future exercises of this nature:

- 1) The scanned aerial photographs provided by USACE Detroit initially for use in this project have limited use when conducting detailed mapping of this nature. Their on-screen resolution was not of high enough quality to adequately discern and differentiate between structures. While these photos are excellent for a broader level of classification, and for use as backdrops to other mapped information, only the actual air photos (with stereo-pair coverage) should be used for detailed mapping application work.
- 2) Detailed shore protection information for all counties around Lake Michigan will ultimately be required at this level in order to conduct the level of potential damages modeling and FEPS modeling envisioned for the whole lake. As such, USACE should proceed, as budget permits, with an extension of this shore protection mapping for the remaining 29 counties along the Lake Michigan shoreline.
- 3) The shore protection classification data is presented on 1/10<sup>th</sup> of a kilometer basis and is not continuous, i.e., we know that there may be 75m of a particular shore protection type occurring over a 100m stretch, however we don't know where within that stretch the shore protection type starts or ends (i.e., the end point coordinates). There may be a desire within each county to carry out such detailed mapping, and create a "continuous" record of shore protection. This would likely require field mapping and verification of start and end points of the various structures, using GPS or other survey methods.
- 4) The base level kilometer reach sections as digitized from the topographic maps (see Section 4) were not true kilometer segments and were found to have errors of within +/- 10m. As such, our ultimate measurements which are also predicated on these 100m segments, may have potential errors in the total lengths of shore protection measured. Given that this error further confirms comments from Detroit USACE GIS staff that the original reach boundaries have inaccuracies in them, there may be a need to re-evaluate the shore protection lengths recorded (perhaps using GPS and field measurement outlined above) to better determine



- the lengths and to more accurately place them within specific reach boundaries should it be required.
- 5) The RAMS database data queried for this activity was found to be somewhat lacking in terms of the specific information we required in this project. USACE may wish to consider modifying required RAMS entries to explicitly include: 1) date of construction of permitted project; 2) description of final construction; and 3) final construction cost. In addition, the spatial coordinates of a data entry need to be better controlled and verified before entry to the database. Existing data points that are in error should also be corrected.
  - 6) The cost information presented in this report is meant as a very general and cursory examination of relative changes in shore protection costs between the two periods of record for each of the 5 counties. A more thorough and economically viable analysis should be performed to extend shore protection cost information over the 50 year period of record being examined in the overall LMPDS.



## REFERENCES

- Argiroff, C.A., 1992. Analysis and Report on Stage-Damage Relationships for Selected U.S. Shoreline Reaches. Consulting Report Prepared for U.S. Army Corps of Engineers, Detroit District, 125pp.
- Baird & Associates, 1993. Future Avoided Costs of Shore Protection - Final Report. Consulting Report Prepared for Working Committee 2, Potential Damages Task Group, IJC Great Lakes Water Levels Reference Study, 40pp., plus Appendices.
- Southeastern Wisconsin Regional Planning Commission, 1989. A Lake Michigan Shoreline Erosion Management Plan for Northern Milwaukee County, Wisconsin. Community Assistance Planning Report No. 155.
- Stewart, C.J., 1998. A Revised Geomorphic, Shore Protection and Nearshore Classification of the Lake Michigan Shoreline - Lake Michigan Potential Damages Study. VGI Vision Group International Inc. Consulting Report Submitted to U.S. Army Corps of Engineers - Detroit District, 19pp.



## APPENDIX 1

### SHORE PROTECTION STATISTICAL DATA

#### COUNTY LEVEL SUMMARY DATA

#### KILOMETER BY KILOMETER REACH DATA

#### 1/10<sup>TH</sup> OF A KILOMETER SUB-REACH DATA



## OTTAWA COUNTY

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Ottawa County Summary Statistics**

<b>Shore Protection Type</b>	<b>89 LENGTH (M)</b>	<b>%COUNTY</b>	<b>99 LENGTH (M)</b>	<b>% COUNTY</b>	<b>CHG (M)</b>	<b>CHG (%)</b>
1A1 - Revetments >45 Year Lifespan	300	0.73	800	1.95	500	1.22
1A2 - Revetments 5-45 Year Lifespan	375	0.91	515	1.26	140	0.34
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1527	3.72	2270	5.54	743	1.81
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	1415	3.45	915	2.23	-500	-1.22
2A2 - Groins 5-45 Year Lifespan	6585	16.06	6335	15.45	-250	-0.61
2A3 - Groins 0-5 Year Lifespan	1375	3.35	425	1.04	-950	-2.32
2A4 - Groins 0 Year Lifespan (Disrepair)	140	0.34	140	0.34	0	0.00
2B1 - Jetties	744	1.81	744	1.81	0	0.00
3A2 - Beach Nourishment	1100	2.68	1600	3.90	500	1.22
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	10	0.02	0	0.00	-10	-0.02
7 - Unprotected	30152	73.54	29561	72.10	-591	-1.44

Note: Percentages Expressed as a Percentage of 41km length for entire county

**Quick Analysis:**

0.5 km of new shore protection added in 10 years (I.e., loss of 591m of "unprotected)

Addition of 640 m of new revetments in 10 yrs...1.2% increase

Loss of over 1 km of groins

Increase in Beach Nourishment - Function of Snapshots in Time

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ottawa County**

REACH	Long	Lat	SP	1989 (m)	%Reach	1999 (m)	%Reach	CHG (M)	CHG (%)	Comments
682	-86.27049	43.11558	7	1000	100.00	1000	100.00	0	0.00	Ottawa County Begins
683	-86.26659	43.10709	1B2	0	0.00	36	3.60	36	3.60	
			2A2	200	20.00	200	20.00	0	0.00	
			7	800	80.00	764	76.40	-36	-3.60	
684	-86.26217	43.09874	1A1	0	0.00	200	20.00	200	20.00	
			1B2	48	4.80	0	0.00	-48	-4.80	
			2A2	1000	100.00	1000	100.00	0	0.00	
685	-86.25754	43.09043	1A1	0	0.00	300	30.00	300	30.00	
			7	1000	100.00	700	70.00	-300	-30.00	
686	-86.25423	43.08177	1B2	24	2.40	24	2.40	0	0.00	
			7	976	97.60	976	97.60	0	0.00	
687	-86.25171	43.07303	3A2	0	0.00	200	20.00	200	20.00	
				1000	100.00	800	80.00	-200	-20.00	
688	-86.25044	43.06411	7	1000	100.00	1000	100.00	0	0.00	
689	-86.24854	43.05569	2B1	144	14.40	144	14.40	0	0.00	Grand Haven Jetty Offshore Length =504m
			7	866	86.60	866	86.60	0	0.00	Grand Haven State Park
690	-86.24325	43.04768	1A1	200	20.00	200	20.00	0	0.00	
			7	800	80.00	800	80.00	0	0.00	
691	-86.24030	43.03898	1A2	100	10.00	100	10.00	0	0.00	
			3A2	400	40.00	0	0.00	-400	-40.00	Beach Nourishment in 1989
			7	600	60.00	900	90.00	300	30.00	None Visible in 1999
692	-86.23726	43.03030	7	1000	100.00	1000	100.00	0	0.00	
693	-86.23433	43.02163	1B2	100	10.00	100	10.00	0	0.00	
			7	900	90.00	900	90.00	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ottawa County**

REACH	Long	Lat	SP	1989 (m)	%Reach	1999 (m)	%Reach	CHG (M)	CHG (%)	Comments
694	-86.23212	43.01281	2A2	100	10.00	300	30.00	200	20.00	
			7	900	90.00	700	70.00	-200	-20.00	
695	-86.23000	43.00401	7	1000	100.00	1000	100.00	0	0.00	
696	-86.22781	42.99521	7	1000	100.00	1000	100.00	0	0.00	
697	-86.22562	42.98645	2A3	275	27.50	225	22.50	-50	-5.00	
			7	725	72.50	775	77.50	50	5.00	
698	-86.22436	42.97757	2A2	300	30.00	300	30.00	0	0.00	
			7	700	70.00	700	70.00	0	0.00	
699	-86.22258	42.96872	1A1	100	10.00	100	10.00	0	0.00	
			2A2	0	0.00	300	30.00	300	30.00	
			7	900	90.00	600	60.00	-300	-30.00	
700	-86.22125	42.95992	1B2	225	22.50	200	20.00	-25	-2.50	
			7	775	77.50	800	80.00	25	2.50	
701	-86.21979	42.95104	2A2	200	20.00	0	0.00	-200	-20.00	
			7	800	80.00	1000	100.00	200	20.00	
702	-86.21874	42.94226	1B2	500	50.00	500	50.00	0	0.00	Seawalls and Groynes Occur Simultaneously
			2A2	500	50.00	500	50.00	0	0.00	
			7	500	50.00	500	50.00	0	0.00	
703	-86.21750	42.93354	7	1000	100.00	1000	100.00	0	0.00	
704	-86.21655	42.92474	7	1000	100.00	1000	100.00	0	0.00	
705	-86.21543	42.91583	1A2	0	0.00	200	20.00	200	20.00	
			1B2	100	10.00	100	10.00	0	0.00	
			2A2	200	20.00	200	20.00	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ottawa County**

REACH	Long	Lat	SP	1989 (m)	%Reach	1999 (m)	%Reach	CHG (M)	CHG (%)	Comments
			7	700	70.00	500	50.00	-200	-20.00	
706	-86.21536	42.90892	7	1000	100.00	1000	100.00	0	0.00	
707	-86.21461	42.90104	2B1	200	20.00	200	20.00	0	0.00	Pigeon Lake Jetty Offshore Length 400m
			3A2	0	0.00	500	50.00	500	50.00	Active Beach Nourishment 1999
			7	800	80.00	400	40.00	-400	-40.00	None Visible 1989
708	-86.21365	42.89313	1A2	60	6.00	0	0.00	-60	-6.00	
			1 B3	600	60.00	400	40.00	-200	-20.00	
			2A3	600	60.00	0	0.00	-600	-60.00	
			3A2	0	0.00	900	90.00	900	90.00	Active Beach Nourishment 1999
			5B4	10	1.00	0	0.00	-10	-1.00	None Visible 1989
			7	400	40.00	0	0.00	-400	-40.00	
709	-86.21368	42.88418	1A2	100	10.00	100	10.00	0	0.00	
			1B3	400	40.00	200	20.00	-200	-20.00	
			2A3	400	40.00	200	20.00	-200	-20.00	
			7	500	50.00	700	70.00	200	20.00	
710	-86.21289	42.87522	2A2	500	50.00	500	50.00	0	0.00	
			7	500	50.00	500	50.00	0	0.00	
711	-86.21135	42.86636	1B2	30	3.00	30	3.00	0	0.00	
			2A2	600	60.00	600	60.00	0	0.00	
			7	400	40.00	400	40.00	0	0.00	
712	-86.21070	42.85739	1B2	380	38.00	380	38.00	0	0.00	
			2A2	920	92.00	920	92.00	0	0.00	
713	-86.21101	42.84843	1A2	115	11.50	115	11.50	0	0.00	
			1B2	60	6.00	60	6.00	0	0.00	
			1B3	315	31.50	315	31.50	0	0.00	
			2A2	715	71.50	715	71.50	0	0.00	
			2A4	140	14.00	140	14.00	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ottawa County**

REACH	Long	Lat	SP	1989 (m)	%Reach	1999 (m)	%Reach	CHG (M)	CHG (%)	Comments
			7	20	2.00	20	2.00	0	0.00	
714	-86.21111	42.83959	1B2	0	0.00	200	20.00	200	20.00	
			2A2	100	10.00	100	10.00	0	0.00	
			7	900	90.00	700	70.00	-200	-20.00	
715	-86.21170	42.83083	7	1000	100.00	1000	100.00	0	0.00	
716	-86.21153	42.82186	7	1000	100.00	1000	100.00	0	0.00	
717	-86.21074	42.81293	1B2	0	0.00	35	3.50	35	3.50	
			2A2	400	40.00	400	40.00	0	0.00	
			7	600	60.00	600	60.00	0	0.00	
718	-86.21099	42.80397	1B2	60	6.00	130	13.00	70	7.00	
			1B3	100	10.00	0	0.00	-100	-10.00	
			2A2	100	10.00	100	10.00	0	0.00	
			2A3	100	10.00	0	0.00	-100	-10.00	
			7	740	74.00	835	83.50	95	9.50	
719	-86.21056	42.79502	1B2	0	0.00	400	40.00	400	40.00	
			2A2	250	25.00	200	20.00	-50	-5.00	
			7	750	75.00	600	60.00	-150	-15.00	
720	-86.21069	42.78618	1B2	0	0.00	75	7.50	75	7.50	
			2A2	300	30.00	0	0.00	-300	-30.00	
			7	700	70.00	925	92.50	225	22.50	
721	-86.21117	42.77722	2A2	200	20.00	0	0.00	-200	-20.00	Lake Macatawa Jetty Offshore Length 275m
			2B1	200	20.00	200	20.00	0	0.00	
			7	600	60.00	800	80.00	200	20.00	
722	-86.20936	42.76989	2B1	200	20.00	200	20.00	0	0.00	Lake Macatawa Jetty Offshore Length 275m
			3A2	700	70.00	0	0.00	-700	-70.00	Active Beach Nourishment 1989
			7	300	30.00	800	80.00	500	50.00	None Visible 1999

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ottawa County**

<b>REACH</b>	<b>Long</b>	<b>Lat</b>	<b>SP</b>	<b>1989 (m)</b>	<b>%Reach</b>	<b>1999 (m)</b>	<b>%Reach</b>	<b>CHG (M)</b>	<b>CHG (%)</b>	<b>Comments</b>
--------------	-------------	------------	-----------	-----------------	---------------	-----------------	---------------	----------------	----------------	-----------------

Note: Longitude and Latitude are provided in decimal degrees for the center point of each reach.

Counts

1A1	4
1A2	5
1B2	15
1B3	4
2A2	18
2A3	4
2A4	1
2B1	4
3A2	5
5B4	1
7	39

## Ottawa County Shore Protection Costs

Shore Protection Type	89 LENGTH (M)	\$/M	Total Cost 89
1A1 - Revetments >45 Year Lifespan	300	\$1,053.00	\$315,900.00
1A2 - Revetments 5-45 Year Lifespan	375	\$547.00	\$205,125.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1527	\$1,228.00	\$1,875,156.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	1415	\$604.00	\$854,660.00
2A2 - Groins 5-45 Year Lifespan	6585	\$930.00	\$6,124,050.00
2A3 - Groins 0-5 Year Lifespan	1375	\$318.00	\$437,250.00
2A4 - Groins 0 Year Lifespan (Disrepair)	140	\$318.00	\$44,520.00
2B1 - Jetties	744	\$1,906.00	\$1,418,064.00
3A2 - Beach Nourishment	1100		
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	10	\$158.00	\$1,580.00
7 - Unprotected	30152		
			\$11,276,305.00

<b>99 LENGTH (M)</b>	<b>\$/M</b>	<b>Total Cost 99</b>	<b>Net Change \$</b>
800	\$1,053.00	\$842,400.00	\$526,500.00
515	\$547.00	\$281,705.00	\$76,580.00
2270	\$1,228.00	\$2,787,560.00	\$912,404.00
915	\$604.00	\$552,660.00	-\$302,000.00
6335	\$930.00	\$5,891,550.00	-\$232,500.00
425	\$318.00	\$135,150.00	-\$302,100.00
140	\$318.00	\$44,520.00	\$0.00
744	\$1,906.00	\$1,418,064.00	
1600			
0	\$158.00	\$0.00	-\$1,580.00
29561			
		\$11,953,609.00	\$677,304.00



## ALLEGAN COUNTY

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Allegan County Summary Statistics**

Shore Protection Type	89 Length (M)	%COUNTY	99 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	750	1.88	750	1.88	0	0.00
1A2 - Revetments 5-45 Year Lifespan	485	1.21	1065	2.66	580	1.45
1A3 - Revetments 0-5 Year Lifespan	765	1.91	65	0.16	-700	-1.75
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	0.00	75	0.19	75	0.19
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1570	3.93	2445	6.11	875	2.19
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	350	0.88	0	0.00	-350	-0.88
1B4 - Seawall/Bulkhead 0 Year Lifespan (Disrepair)	0	0.00	75	0.19	75	0.19
2A2 - Groins 5-45 Year Lifespan	1375	3.44	1855	4.64	480	1.20
2A4 - Groins 0 Year Lifespan (Disrepair)	0	0.00	35	0.09	35	0.09
2B1 - Jetties	100	0.25	100	0.25	0	0.00
3C1 - Slope/Bluff Stabilization >45 Year Lifespan	250	0.63	250	0.63	0	0.00
3C2 - Slope/Bluff Stabilization 5-45 Year Lifespan	0	0.00	400	1.00	400	1.00
5A2 - Ad Hoc, Concrete Rubble 5-45 Year Lifespan	210	0.53	210	0.53	0	0.00
5A3 - Ad Hoc, Concrete Rubble 0-5 Year Lifespan	200	0.50	100	0.25	-100	-0.25
5A4 - Ad Hoc, Concrete Rubble 0 Year Lifespan (Disrepair)	315	0.79	885	2.21	570	1.43
5B2 - AdHoc, Other Materials, 5-45 Year Lifespan	350	0.88	0	0.00	-350	-0.88
5B3 - AdHoc, Other Materials, 0-5 Year Lifespan	300	0.75	600	1.50	300	0.75
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	0.00	65	0.16	65	0.16
7 - Unprotected	33170	82.93	31550	78.88	-1620	-4.05

Note: Percentages Expressed as a Percentage of 40km length for entire county

**Quick Analysis:**

1.6km of New Shore Protection in 10 Years  
 Higher use of Ad Hoc Materials than Ottawa County  
 .8 km of seawalls added, plus reduction in lower quality walls...replacement?  
 Almost 0.5 km addition of groynes.

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary Statistics - Allegan County**

REACH	LONG	LAT	SP	1989 (m)	% Reach	1999 (m)	% Reach	CHG (M)	CHG (%)	Comments
723	-86.20809	42.76104	1A2	125	12.50	0	0.00	-125	-12.50	
			1B2	60	6.00	60	6.00	0	0.00	
			3C1	250	25.00	250	25.00	0	0.00	
			5A3	200	20.00	0	0.00	-200	-20.00	
			7	390	39.00	690	69.00	300	30.00	
724	-86.20830	42.75205	1A2	155	15.50	230	23.00	75	7.50	
			1A3	75	7.50	0	0.00	-75	-7.50	
			1B2	200	20.00	200	20.00	0	0.00	
			2A2	400	40.00	400	40.00	0	0.00	
			3C2	0	0.00	100	10.00	100	10.00	
7	235	23.50	135	13.50	-100	-10.00				
725	-86.20710	42.74357	3C2	0	0.00	100	10.00	100	10.00	
			7	1000	100.00	900	90.00	-100	-10.00	
726	-86.20712	42.73456	7	1000	100.00	1000	100.00	0	0.00	
727	-86.20685	42.72577	1A3	500	50.00	0	0.00	-500	-50.00	
			7	500	50.00	1000	100.00	500	50.00	
728	-86.20649	42.71681	1B3	100	10.00	0	0.00	-100	-10.00	
			2A2	90	9.00	90	9.00	0	0.00	
			7	810	81.00	910	91.00	100	10.00	
729	-86.20664	42.70782	7	1000	100.00	1000	100.00	0	0.00	
730	-86.20760	42.69886	7	1000	100.00	1000	100.00	0	0.00	
731	-86.20905	42.68994	7	1000	100.00	1000	100.00	0	0.00	
732	-86.21149	42.68127	7	1000	100.00	1000	100.00	0	0.00	
733	-86.21365	42.67259	2B1	100	10.00	100	10.00	0	0.00	Kalamazoo River Jetties Offshore Length 200m
			7	900	90.00	900	90.00	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary Statistics - Allegan County**

REACH	LONG	LAT	SP	1989 (m)	% Reach	1999 (m)	% Reach	CHG (M)	CHG (%)	Comments
734	-86.21614	42.66382	1A2	75	7.50	75	7.50	0	0.00	
			7	925	92.50	925	92.50	0	0.00	
735	-86.22029	42.65538	5A3	0	0.00	100	10.00	100	10.00	
			7	1000	100.00	900	90.00	-100	-10.00	
736	-86.22533	42.64720	1B2	190	19.00	40	4.00	-150	-15.00	
			5A2	35	3.50	35	3.50	0	0.00	
			7	775	77.50	925	92.50	150	15.00	
737	-86.22866	42.63858	1B2	0	0.00	125	12.50	125	12.50	
			2A2	0	0.00	200	20.00	200	20.00	
			3C2	0	0.00	200	20.00	200	20.00	
			7	1000	100.00	675	67.50	-325	-32.50	
738	-86.22871	42.62964	1A1	300	30.00	300	30.00	0	0.00	
			7	700	70.00	700	70.00	0	0.00	
739	-86.22890	42.62078	1A1	235	23.50	235	23.50	0	0.00	
			1B2	0	0.00	30	3.00	30	3.00	
			7	765	76.50	735	73.50	-30	-3.00	
740	-86.22845	42.61182	1A1	65	6.50	65	6.50	0	0.00	
			1A2	50	5.00	50	5.00	0	0.00	
			2A2	0	0.00	50	5.00	50	5.00	
			5A2	150	15.00	150	15.00	0	0.00	
			7	735	73.50	735	73.50	0	0.00	
741	-86.22702	42.60290	1B2	150	15.00	150	15.00	0	0.00	
			1B4	0	0.00	35	3.50	35	3.50	
			2A2	0	0.00	35	3.50	35	3.50	
			2A4	0	0.00	35	3.50	35	3.50	
			5A4	0	0.00	280	28.00	280	28.00	
			5B3	0	0.00	100	10.00	100	10.00	
			7	850	85.00	400	40.00	-450	-45.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary Statistics - Allegan County**

REACH	LONG	LAT	SP	1989 (m)	% Reach	1999 (m)	% Reach	CHG (M)	CHG (%)	Comments
742	-86.22638	42.59401	1B2	175	17.50	175	17.50	0	0.00	
			2A2	100	10.00	100	10.00	0	0.00	
			5A4	175	17.50	0	0.00	-175	-17.50	
			7	550	55.00	725	72.50	175	17.50	
743	-86.22799	42.58509	1B2	75	7.50	450	45.00	375	37.50	
			1B3	50	5.00	0	0.00	-50	-5.00	
			5B3	300	30.00	50	5.00	-250	-25.00	
			7	575	57.50	500	50.00	-75	-7.50	
744	-86.23103	42.57639	1B2	80	8.00	80	8.00	0	0.00	
			7	920	92.00	920	92.00	0	0.00	
745	-86.23489	42.56786	1B2	100	10.00	100	10.00	0	0.00	
			1B3	100	10.00	0	0.00	-100	-10.00	
			2A2	400	40.00	400	40.00	0	0.00	
			7	500	50.00	600	60.00	100	10.00	
746	-86.23676	42.55904	1A2	0	0.00	330	33.00	330	33.00	
			7	1000	100.00	670	67.00	-330	-33.00	
747	-86.23827	42.55012	1B2	0	0.00	120	12.00	120	12.00	
			2A2	0	0.00	60	6.00	60	6.00	
			5B4	0	0.00	65	6.50	65	6.50	
			7	1000	100.00	755	75.50	-245	-24.50	
748	-86.24070	42.54133	2A2	0	0.00	135	13.50	135	13.50	
			5B3	0	0.00	100	10.00	100	10.00	
			7	1000	100.00	765	76.50	-235	-23.50	
749	-86.24183	42.53237	2A2	80	8.00	80	8.00	0	0.00	
			7	920	92.00	920	92.00	0	0.00	
750	-86.24311	42.52342	1A2	80	8.00	80	8.00	0	0.00	
			1B2	40	4.00	115	11.50	75	7.50	
			2A2	305	30.50	305	30.50	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary Statistics - Allegan County**

REACH	LONG	LAT	SP	1989 (m)	% Reach	1999 (m)	% Reach	CHG (M)	CHG (%)	Comments
			5A2	25	2.50	25	2.50	0	0.00	
			7	550	55.00	550	55.00	0	0.00	
751	-86.24500	42.51458	5B2	350	35.00	0	0.00	-350	-35.00	
			5B3	0	0.00	350	35.00	350	35.00	
			7	650	65.00	650	65.00	0	0.00	
752	-86.24564	42.50570	1A4	0	0.00	35	3.50	35	3.50	
			5A4	0	0.00	205	20.50	205	20.50	
			7	1000	100.00	760	76.00	-240	-24.00	
753	-86.24671	42.49678	1A3	50	5.00	0	0.00	-50	-5.00	
			1A4	0	0.00	40	4.00	40	4.00	
			1B4	0	0.00	40	4.00	40	4.00	
			7	950	95.00	920	92.00	-30	-3.00	
754	-86.24779	42.48785	1B2	0	0.00	100	10.00	100	10.00	
			1B3	100	10.00	0	0.00	-100	-10.00	
			7	900	90.00	900	90.00	0	0.00	
755	-86.25008	42.47901	7	1000	100.00	1000	100.00	0	0.00	
756	-86.25272	42.47033	7	1000	100.00	1000	100.00	0	0.00	
757	-86.25527	42.46159	1A3	0	0.00	65	6.50	65	6.50	
			7	1000	100.00	935	93.50	-65	-6.50	
758	-86.25780	42.45280	1A1	100	10.00	100	10.00	0	0.00	
			1B2	0	0.00	200	20.00	200	20.00	
			7	900	90.00	700	70.00	-200	-20.00	
759	-86.26137	42.44421	1A1	50	5.00	50	5.00	0	0.00	
			5A4	140	14.00	0	0.00	-140	-14.00	
			7	810	81.00	950	95.00	140	14.00	
760	-86.26537	42.43574	7	1000	100.00	1000	100.00	0	0.00	

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary Statistics - Allegan County**

REACH	LONG	LAT	SP	1989 (m)	% Reach	1999 (m)	% Reach	CHG (M)	CHG (%)	Comments
761	-86.26971	42.42734	1A2	0	0.00	300	30.00	300	30.00	
			1A3	140	14.00	0	0.00	-140	-14.00	
			1B2	300	30.00	300	30.00	0	0.00	
			5A4	0	0.00	400	40.00	400	40.00	
			7	560	56.00	0	0.00	-560	-56.00	
762	-86.27409	42.41925	1B2	200	20.00	200	20.00	0	0.00	
			7	800	80.00	800	80.00	0	0.00	

Note: Longitude and Latitude are in Decimal Degrees for the Center Point of Each Reach

Counts

1A1	5
1A2	7
1A3	5
1A4	2
1B2	16
1B3	4
1B4	2
2A2	11
2A4	1
2B1	1
3C1	1
3C2	3
5A2	3
5A3	2
5A4	5
5B2	1
5B3	4
5B4	1
7	40

## Allegheny County Shore Protection Costs

Shore Protection Type	89 Length (M)	\$/M	Total Cost 89
1A1 - Revetments >45 Year Lifespan	750	\$1,053.00	\$789,750.00
1A2 - Revetments 5-45 Year Lifespan	485	\$547.00	\$265,295.00
1A3 - Revetments 0-5 Year Lifespan	765	\$158.00	\$120,870.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1570	\$1,228.00	\$1,927,960.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	350	\$604.00	\$211,400.00
1B4 - Seawall/Bulkhead 0 Year Lifespan (Disrepair)	0	\$604.00	\$0.00
2A2 - Groins 5-45 Year Lifespan	1375	\$930.00	\$1,278,750.00
2A4 - Groins 0 Year Lifespan (Disrepair)	0	\$318.00	\$0.00
2B1 - Jetties	100	\$1,906.00	\$190,600.00
3C1 - Slope/Bluff Stabilization >45 Year Lifespan	250		
3C2 - Slope/Bluff Stabilization 5-45 Year Lifespan	0		
5A2 - Ad Hoc, Concrete Rubble 5-45 Year Lifespan	210	\$158.00	\$33,180.00
5A3 - Ad Hoc, Concrete Rubble 0-5 Year Lifespan	200	\$158.00	\$31,600.00
5A4 - Ad Hoc, Concrete Rubble 0 Year Lifespan (Disrepair)	315	\$158.00	\$49,770.00
5B2 - AdHoc, Other Materials, 5-45 Year Lifespan	350	\$158.00	\$55,300.00
5B3 - AdHoc, Other Materials, 0-5 Year Lifespan	300	\$158.00	\$47,400.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00
7 - Unprotected	33170		
			\$5,001,875.00

99 LENGTH (M)	\$/M	Total Cost 99	Net Change \$
750	\$1,053.00	\$789,750.00	\$0.00
1065	\$547.00	\$582,555.00	\$317,260.00
65	\$158.00	\$10,270.00	-\$110,600.00
75	\$158.00	\$11,850.00	\$11,850.00
2445	\$1,228.00	\$3,002,460.00	\$1,074,500.00
0	\$604.00	\$0.00	-\$211,400.00
75	\$604.00	\$45,300.00	\$45,300.00
1855	\$930.00	\$1,725,150.00	\$446,400.00
35	\$318.00	\$11,130.00	\$11,130.00
100	\$1,906.00	\$190,600.00	\$0.00
250			
400			
210	\$158.00	\$33,180.00	\$0.00
100	\$158.00	\$15,800.00	-\$15,800.00
885	\$158.00	\$139,830.00	\$90,060.00
0	\$158.00	\$0.00	-\$55,300.00
600	\$158.00	\$94,800.00	\$47,400.00
65	\$158.00	\$10,270.00	\$10,270.00
31550			
		\$6,662,945.00	\$1,661,070.00



1/10<sup>th</sup> KM SUB-REACH DATA  
OTTAWA AND ALLEGAN COUNTY

Lake Michigan Potential Damages Study  
 Detailed Shoreline Protection Mapping and Classification - Ottawa and Allegan Counties

1/10th of a Kilometer Sub Reach Data

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
<b>Start Ottawa County</b>							
682	682-1	43.11951/-86.27209	7	100	7	100	0
	682-2	43.11866/-86.27166	7	100	7	100	0
	682-3	43.11786/-86.27122	7	100	7	100	0 Muskegon - Ottawa County Line
	682-4	43.11699/-86.27079	7	100	7	100	0
	682-5	43.11612/-86.27023	7	100	7	100	0
	682-6	43.11525/-86.26986	7	100	7	100	0
	682-7	43.11438/-86.26955	7	100	7	100	0
	682-8	43.11357/-86.26924	7	100	7	100	0
	682-9	43.11270/-86.26874	7	100	7	100	0
	682-10	43.11190/-86.26843	7	100	7	100	0
<b>683</b>							
683	683-1	43.11103/-86.26812	7	100	7	100	0
	683-2	43.11022/-86.26750	7	100	7	100	0
	683-3	43.10935/-86.26713	7	100	7	100	0
	683-4	43.10860/-86.26669	7	100	7	100	0
	683-5	43.10774/-86.26626	7	100	7	100	0
	683-6	43.10680/-86.26608	1B2	0	1B2	36	36
			7	100	7	64	-36
	683-7	43.10606/-86.26545	7	100	7	100	0
	683-8	43.10519/-86.26527	7	100	7	100	0
	683-9	43.10439/-86.26501	2A2	100	2A2	100	0
683-10	43.10352/-86.26458	2A2	100	2A2	100	0	
<b>684</b>							
684	684-1	43.10258/-86.26427	2A2	100	2A2	100	0
	684-2	43.10180/-86.26369	2A2	100	2A2	100	0
	684-3	43.10091/-86.26333	2A2	100	2A2	100	0
	684-4	43.10013/-86.26276	2A2	100	2A2	100	0
	684-5	43.09930/-86.26224	2A2	100	2A2	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	684-6	43.09852/-86.26172	2A2	100	2A2	100	0
	684-7	43.09768/-86.26119	2A2	100	2A2	100	0
	684-8	43.09674/-86.26083	1B2	24	1B2	0	-24
			2A2	100	2A2	100	0
	684-9	43.09597/-86.26052	1A1	0	1A1	100	100
			1B2	24	1B2	0	-24
			2A2	100	2A2	100	0
	684-10	43.09518/-86.25995	1A1	0	1A1	100	100
			2A2	100	2A2	100	0
<b>685</b>	685-1	43.09435/-86.25948	1A1	0	1A1	100	100
			7	100	7	0	-100
	685-2	43.09352/-86.25901	1A1	0	1A1	100	100
			7	100	7	0	-100
	685-3	43.09263/-86.25870	1A1	0	1A1	100	100
			7	100	7	0	-100
	685-4	43.09180/-86.25833	7	100	7	100	0
	685-5	43.09097/-86.25802	7	100	7	100	0
	685-6	43.09008/-86.25771	7	100	7	100	0
	685-7	43.08920/-86.25734	7	100	7	100	0
	685-8	43.08831/-86.25703	7	100	7	100	0
	685-9	43.08758/-86.25640	7	100	7	100	0
	685-10	43.08670/-86.25604	7	100	7	100	0
<b>686</b>	686-1	43.08581/-86.25570	7	100	7	100	0
	686-2	43.08498/-86.25536	7	100	7	100	0
	686-3	43.08410/-86.25497	7	100	7	100	0
	686-4	43.08327/-86.25462	7	100	7	100	0
	686-5	43.08239/-86.25423	7	100	7	100	0
	686-6	43.08151/-86.25394	7	100	7	100	0
	686-7	43.08068/-86.25375	7	100	7	100	0
	686-8	43.07975/-86.25350	1B2	24	1B2	24	0
			7	76	7	76	0
	686-9	43.07887/-86.25320	7	100	7	100	0
	686-10	43.07804/-86.25277	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
687	687-1	43.07716/-86.25243	7	100	7	100	0
	687-2	43.07628/-86.25223	3A2	0	3A2	100	100
			7	100	7	0	-100
	687-3	43.07541/-86.25204	3A2	0	3A2	100	100
			7	100	7	0	-100
	687-4	43.07452/-86.25188	7	100	7	100	0
	687-5	43.07360/-86.25179	7	100	7	100	0
	687-6	43.07272/-86.25155	7	100	7	100	0
	687-7	43.07188/-86.25140	7	100	7	100	0
	687-8	43.07101/-86.25121	7	100	7	100	0
687-9	43.07008/-86.25101	7	100	7	100	0	
687-10	43.06915/-86.25096	7	100	7	100	0	
688	688-1	43.06828/-86.25072	7	100	7	100	0
	688-2	43.06739/-86.25046	7	100	7	100	0
	688-3	43.06650/-86.25040	7	100	7	100	0
	688-4	43.06561/-86.25035	7	100	7	100	0
	688-5	43.06471/-86.25031	7	100	7	100	0
	688-6	43.06382/-86.25025	7	100	7	100	0
	688-7	43.06293/-86.25035	7	100	7	100	0
	688-8	43.06204/-86.25046	7	100	7	100	0
	688-9	43.06115/-86.25062	7	100	7	100	0
	688-10	43.06029/-86.25082	7	100	7	100	0
689	689-1	43.05931/-86.25098	7	100	7	100	0
	689-2	43.05847/-86.25051	2B1	44	2B1	44	0 Grand Haven Jetty Offshore Length =504m
			7	66	7	66	0
	689-3	43.05769/-86.24993	2B1	100	2B1	100	0 Grand Haven Jetty Offshore Length =504m
	689-4	43.05690/-86.24931	7	100	7	100	0 Grand Haven State Park
	689-5	43.05611/-86.24878	7	100	7	100	0 Grand Haven State Park
	689-6	43.05527/-86.24820	7	100	7	100	0 Grand Haven State Park
	689-7	43.05464/-86.24757	7	100	7	100	0 Grand Haven State Park
	689-8	43.05386/-86.24699	7	100	7	100	0 Grand Haven State Park
	689-9	43.05312/-86.24637	7	100	7	100	0 Grand Haven State Park
689-10	43.05249/-86.24579	7	100	7	100	0 Grand Haven State Park	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
690	690-1	43.05161/-86.24522	7	100	7	100	0
	690-2	43.05075/-86.24467	7	100	7	100	0
	690-3	43.04996/-86.24424	7	100	7	100	0
	690-4	43.04904/-86.24393	7	100	7	100	0
	690-5	43.04824/-86.24368	7	100	7	100	0
	690-6	43.04738/-86.24344	1A1	100	1A1	100	0
	690-7	43.04646/-86.24319	1A1	100	1A1	100	0
	690-8	43.04560/-86.24271	7	100	7	100	0
	690-9	43.04475/-86.24240	7	100	7	100	0
	690-10	43.04389/-86.24209	7	100	7	100	0
691	691-1	43.04297/-86.24197	7	100	7	100	0
	691-2	43.04271/-86.24154	7	100	7	100	0
	691-3	43.04131/-86.24129	3A2	100	3A2	0	-100 Beach Nourishment in 1989
			7	0	7	100	100 None Visible in 1999
	691-4	43.04039/-86.24087	1A2	100	1A2	100	0
			3A2	100	3A2	0	-100
	691-5	43.03953/-86.24055	3A2	100	3A2	0	-100
			7	0	7	100	100
	691-6	43.03867/-87.24037	3A2	100	3A2	0	-100
			7	0	7	100	100
691-7	43.03775/-86.24007	7	100	7	100	0	
691-8	43.03690/-86.23964	7	100	7	100	0	
691-9	43.03604/-86.23933	7	100	7	100	0	
691-10	43.03518/-86.23902	7	100	7	100	0	
692	692-1	43.03425/-86.23867	7	100	7	100	0
	692-2	43.03342/-86.23840	7	100	7	100	0
	692-3	43.03246/-86.23819	7	100	7	100	0
	692-4	43.03164/-86.23785	7	100	7	100	0
	692-5	43.03074/-86.23767	7	100	7	100	0
	692-6	43.02985/-86.23743	7	100	7	100	0
	692-7	43.02895/-86.23716	7	100	7	100	0
	692-8	43.02813/-86.23688	7	100	7	100	0
	692-9	43.02723/-86.23653	7	100	7	100	0
	692-10	43.02634/-86.23626	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
693	693-1	43.02545/-86.23578	7	100	7	100	0
	693-2	43.02462/-86.23544	7	100	7	100	0
	693-3	43.02380/-86.23516	7	100	7	100	0
	693-4	43.02283/-86/23495	7	100	7	100	0
	693-5	43.02194/-86.23468	7	100	7	100	0
	693-6	43.02111/-86.23420	7	100	7	100	0
	693-7	43.02036/-86.23392	7	100	7	100	0
	693-8	43.01940/-86.23372	7	100	7	100	0
	693-9	43.01850/-86.23365	7	100	7	100	0
	693-10	43.01761/-86.23344	1B2	100	1B2	100	0
694	694-1	43.01669/-86.23309	7	100	7	100	0
	694-2	43.01583/-86.23290	2A2	100	2A2	100	0
	694-3	43.01488/-86.23271	7	100	7	100	0
	694-4	43.01402/-86.23252	7	100	7	100	0
	694-5	43.01312/-86.23258	7	100	7	100	0
	694-6	43.01222/-86.23215	7	100	7	100	0
	694-7	43.01131/-86.23196	7	100	7	100	0
	694-8	43.01046/-86.23181	7	100	7	100	0
	694-9	43.00956/-86.23181	2A2	0	2A2	100	100
	694-10	43.00870/-86.23148	7	100	7	0	-100
		2A2	0	2A2	100	100	
		7	100	7	0	-100	
695	695-1	43.00775/-86.23115	7	100	7	100	0
	695-2	43.00685/-86.23086	7	100	7	100	0
	695-3	43.00599/-86.23062	7	100	7	100	0
	695-4	43.00514/-86.23034	7	100	7	100	0
	695-5	43.00423/-86.23019	7	100	7	100	0
	695-6	43.00347/-86.23005	7	100	7	100	0
	695-7	43.00257/-86.22987	7	100	7	100	0
	695-8	43.00176/-86.22968	7	100	7	100	0
	695-9	43.00091/-86.22948	7	100	7	100	0
	695-10	43.00010/-86.22915	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
696	696-1	42.99934/-86.22894	7	100	7	100	0
	696-2	42.99844/-86.22874	7	100	7	100	0
	696-3	42.99753/-86.22853	7	100	7	100	0
	696-4	42.99672/-86.22833	7	100	7	100	0
	696-5	42.99581/-86.22797	7	100	7	100	0
	696-6	42.99501/-86.22758	7	100	7	100	0
	696-7	42.99410/-86.22742	7	100	7	100	0
	696-8	42.99324/-86.22707	7	100	7	100	0
	696-9	42.99238/-86.22681	7	100	7	100	0
	696-10	42.99147/-86.22662	7	100	7	100	0
697	697-1	42.99047/-86.22656	7	100	7	100	0
	697-2	42.98956/-86.22646	2A3	50	2A3	50	0
			7	50	7	50	0
	697-3	42.98870/-86.22631	2A3	100	2A3	100	0
	697-4	42.98784/-86.22606	2A3	25	2A3	75	50
			7	75	7	25	-50
	697-5	42.98698/-86.22591	7	100	7	100	0
	697-6	42.98608/-86.22575	7	100	7	100	0
	697-7	42.98522/-86.22565	2A3	100	2A3	0	-100
			7	0	7	100	100
697-8	42.98436/-86.22546	7	100	7	100	0	
697-9	42.98350/-86.22530	7	100	7	100	0	
697-10	42.98259/-86.22525	7	100	7	100	0	
698	698-1	42.98168/-86.22507	7	100	7	100	0
	698-2	42.98079/-86.22489	7	100	7	100	0
	698-3	42.97993/-86.22481	2A2	100	2A2	100	0
	698-4	42.97904/-86.22462	2A2	100	2A2	100	0
	698-5	42.97815/-86.22454	2A2	100	2A2	100	0
	698-6	42.97729/-86.22440	7	100	7	100	0
	698-7	42.97640/-86.22423	7	100	7	100	0
	698-8	42.97555/-86.22414	7	100	7	100	0
	698-9	42.97470/-86.22391	7	100	7	100	0
	698-10	42.97385/-86.22387	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
699	699-1	42.97300/-86.22369	7	100	7	100	0
	699-2	42.97211/-86.22359	7	100	7	100	0
	699-3	42.97121/-86.22346	1A1	100	1A1	100	0
	699-4	42.97036/-86.22320	7	100	7	100	0
	699-5	42.96951/-86.22306	7	100	7	100	0
	699-6	42.96857/-86.22289	7	100	7	100	0
	699-7	42.96772/-86.22266	2A2	0	2A2	100	100
			7	100	7	0	-100
	699-8	42.96678/-86.22266	2A2	0	2A2	100	100
			7	100	7	0	-100
699-9	42.96584/-86.22243	2A2	0	2A2	100	100	
		7	100	7	0	-100	
699-10	42.96495/-86.22221	7	100	7	100	0	
700	700-1	42.96402/-86.22211	7	100	7	100	0
	700-2	42.96313/-86.22204	7	100	7	100	0
	700-3	42.96220/-86.22192	1B2	25	1B2	0	-25
			7	75	7	100	25
	700-4	42.96135/-86.22176	7	100	7	100	0
	700-5	42.96045/-86.22153	7	100	7	100	0
	700-6	42.95956/-86.22130	7	100	7	100	0
	700-7	42.95871/-86.22134	7	100	7	100	0
	700-8	42.95778/-86.22126	1B2	100	1B2	100	0
	700-9	42.95689/-86.22118	1B2	100	1B2	100	0
700-10	42.95599/-86.22118	7	100	7	100	0	
701	701-1	42.95510/-86.22091	7	100	7	100	0
	701-2	42.95425/-86.22072	7	100	7	100	0
	701-3	42.95332/-86.22044	7	100	7	100	0
	701-4	42.95247/-86.22037	7	100	7	100	0
	701-5	42.95157/-86.22021	2A2	100	2A2	0	-100
			7	0	7	100	100
	701-6	42.95068/-86.22014	2A2	100	2A2	0	-100
			7	0	7	100	100
701-7	42.94979/-86.22002	7	100	7	100	0	
701-8	42.94890/-86.21986	7	100	7	100	0	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	701-9	42.94801/-86.21975	7	100	7	100	0
	701-10	42.94711/-86.21979	7	100	7	100	0
<b>702</b>	702-1	42.94618/-86.21960	7	100	7	100	0
	702-2	42.94531/-86.21948	7	100	7	100	0
	702-3	42.94440/-86.21940	7	100	7	100	0
	702-4	42.94352/-86.21928	7	100	7	100	0
	702-5	42.94270/-86.21907	7	100	7	100	0
	702-6	42.94186/-86.21894	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	702-7	42.94099/-86.21873	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	702-8	42.94816/-86.21865	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	702-9	42.93937/-86.21857	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	702-10	42.93842/-86.21844	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
<b>703</b>	703-1	42.93750/-86.21832	7	100	7	100	0
	703-2	42.93663/-86.21824	7	100	7	100	0
	703-3	42.93576/-86.21815	7	100	7	100	0
	703-4	42.93489/-86.21807	7	100	7	100	0
	703-5	42.93398/-86.21795	7	100	7	100	0
	703-6	42.93310/-86.21786	7	100	7	100	0
	703-7	42.93227/-86.21770	7	100	7	100	0
	703-8	42.93140/-86.21758	7	100	7	100	0
	703-9	42.93057/-86.21749	7	100	7	100	0
	703-10	42.92970/-86.21749	7	100	7	100	0
<b>704</b>	704-1	42.92881/-86.21713	7	100	7	100	0
	704-2	42.92793/-86.21723	7	100	7	100	0
	704-3	42.92709/-86.21707	7	100	7	100	0
	704-4	42.92621/-86.21691	7	100	7	100	0
	704-5	42.92537/-86.21675	7	100	7	100	0
	704-6	42.92445/-86.21663	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	704-7	42.92358/-86.21659	7	100	7	100	0
	704-8	42.92770/-86.21651	7	100	7	100	0
	704-9	42.92182/-86.21635	7	100	7	100	0
	704-10	42.92086/-86.21631	7	100	7	100	0
<b>705</b>	705-1	42.91994/-86.21615	2A2	100	2A2	100	0
	705-2	42.91906/-86.21599	7	100	7	100	0
	705-3	42.91826/-86.21595	2A2	100	2A2	100	0
	705-4	42.91738/-86.21587	7	100	7	100	0
	705-5	42.91654/-86.21583	7	100	7	100	0
	705-6	42.91562/-86.21579	7	100	7	100	0
	705-7	42.91478/-86.21575	1A2	0	1A2	100	100
			7	100	7	0	-100
	705-8	42.91394/-86.21563	1A2	0	1A2	100	100
			7	100	7	0	-100
	705-9	42.91307/-86.21555	1B2	100	1B2	100	0
	705-10	42.91223/-86.21547	7	100	7	100	0
<b>706</b>	706-1	42.91143/-86.21545	7	100	7	100	0
	706-2	42.91072/-86.21533	7	100	7	100	0
	706-3	42.91001/-86.21525	7	100	7	100	0
	706-4	42.90929/-86.21525	7	100	7	100	0
	706-5	42.90858/-86.21529	7	100	7	100	0
	706-6	42.90786/-86.21545	7	100	7	100	0
	706-7	42.90715/-86.21545	7	100	7	100	0
	706-8	42.90643/-86.21541	7	100	7	100	0
	706-9	42.90575/-86.21533	7	100	7	100	0
	706-10	42.90496/-86.21545	7	100	7	100	0
<b>707</b>	707-1	42.90421/-86.21561	7	100	7	100	0
	707-2	42.90349/-86.21569	7	100	7	100	0
	707-3	42.90282/-86.21569	7	100	7	100	0
	707-4	42.90210/-86.21553	7	100	7	100	0
	707-5	42.90142/-86.21545	2B1	100	2B1	100	0 Pigeon Lake Jetty Offshore Length 400m
	707-6	42.90071/-86.21541	2B1	100	2B1	100	100 Pigeon Lake Jetty Offshore Length 400m
			3A2	0	3A2	100	-100 Active Beach Nourishment 1999

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	707-7	42.90004/-86.21537	3A2	0	3A2	100	100
			7	100	7	0	-100
	707-8	42.89932/-86.21521	3A2	0	3A2	100	100
			7	100	7	0	-100
	707-9	42.89869/-86.21497	3A2	0	3A2	100	100
			7	100	7	0	-100
	707-10	42.89797/-86.21481	3A2	0	3A2	100	100
			7	100	7	0	-100
<b>708</b>	708-1	42.89712/-86.21470	3A2	0	3A2	100	100
			7	100	7	0	-100
	708-2	42.89627/-86.21443	3A2	0	3A2	100	100
			7	100	7	0	-100
	708-3	42.89535/-86.21428	3A2	0	3A2	100	100
			7	100	7	0	-100
	708-4	42.89446/-86.21404	3A2	0	3A2	100	100
			7	100	7	0	-100
	708-5	42.89362/-86.21389	1B3	100	1B3	100	0
			2A3	100	2A3	0	-100
			3A2	0	3A2	100	100
	708-6	42.89269/-86.21374	1B3	100	1B3	100	0
			2A3	100	2A3	0	-100
			3A2	0	3A2	100	100
	708-7	42.89182/-86.21371	1B3	100	3A2	100	0
			2A3	100	2A3	0	-100
	708-8	42.89092/-86.21366	1B3	100	3A2	100	0
			2A3	100	2A3	0	-100
	708-9	42.89003/-86.21378	1A2	60	1A2	0	-60
			1B3	100	1B3	100	0
			2A3	100	2A3	0	-100
			3A2	0	3A2	100	100
			5B4	10	5B4	0	-10
	708-10	42.88914/-86.21385	1B3	100	1B3	100	0
			2A3	100	2A3	0	-100
<b>709</b>	709-1	42.88826/-86.21385	1B3	100	1B3	0	-100
			2A3	100	2A3	0	-100

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments	
			SP TYPE	LENGTH	SP TYPE	LENGTH		
				7	0	7	100	100
	709-2	42.88737/-86.21393	1B3	100	1B3	0	-100	
			2A3	100	2A3	0	-100	
			7	0	7	100	100	
	709-3	42.88649/-86.21404	1B3	100	1B3	100	0	
			2A3	100	2A3	100	0	
	709-4	42.88560/-86.21404	7	100	7	100	0	
	709-5	42.88467/-86.21416	1A2	100	1A2	100	0	
	709-6	42.88379/-86.21404	7	100	7	100	0	
	709-7	42.88286/-86.21389	7	100	7	100	0	
	709-8	42.88194/-86.21397	7	100	7	100	0	
	709-9	42.88101/-86.21400	1B3	100	1B3	100	0	
			2A3	100	2A3	100	0	
	709-10	42.88013/-86.21397	7	100	7	100	0	
<b>710</b>	710-1	42.87920/-86.21389	2A2	100	2A2	100	0	
	710-2	42.87833/-86.21394	2A2	100	2A2	100	0	
	710-3	42.87744/-86.21364	2A2	100	2A2	100	0	
	710-4	42.87660/-86.21335	2A2	100	2A2	100	0	
	710-5	42.87571/-86.21335	2A2	100	2A2	100	0	
	710-6	42.87487/-86.21318	7	100	7	100	0	
	710-7	42.87394/-86.21288	7	100	7	100	0	
	710-8	42.87306/-86.21280	7	100	7	100	0	
	710-9	42.87217/-86.21272	7	100	7	100	0	
	710-10	42.87128/-86.21250	7	100	7	100	0	
<b>711</b>	711-1	42.87040/-86.21221	7	100	7	100	0	
	711-2	42.86947/-86.21187	7	100	7	100	0	
	711-3	42.86863/-86.21158	7	100	7	100	0	
	711-4	42.86770/-86.21149	7	100	7	100	0	
	711-5	42.86682/-86.21136	2A2	100	2A2	100	0	
	711-6	42.86597/-86.21120	1B2	30	1B2	30	0	
			2A2	100	2A2	100	0	
	711-7	42.86504/-86.21111	2A2	100	2A2	100	0	
	711-8	42.86412/-86.21098	2A2	100	2A2	100	0	
	711-9	42.86327/-86.21082	2A2	100	2A2	100	0	
	711-10	42.86243/-86.21061	2A2	100	2A2	100	0	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
712	712-1	42.86156/-86.21061	2A2	100	2A2	100	0
	712-2	42.86063/-86.21057	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	712-3	42.85975/-86.21054	2A2	100	2A2	100	0
	712-4	42.85886/-86.21050	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	712-5	42.85797/-86.21047	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	712-6	42.85708/-86.21047	2A2	100	2A2	100	0
	712-7	42.85619/-86.21047	2A2	100	2A2	100	0
	712-8	42.85527/-86.21061	2A2	100	2A2	100	0
	712-9	42.85437/-86.21057	1B2	60	1B2	60	0
			2A2	40	2A2	40	0
	712-10	42.85345/-86.21061	1B2	20	1B2	20	0
2A2			80	2A2	80	0	
713	713-1	42.85246/-86.21068	1A2	80	1A2	80	0
			1B3	20	1B3	20	0
			2A2	80	2A2	80	0
	713-2	42.85157/-86.21078	2A4	100	2A4	100	0
			1B2	20	1B2	20	0
			1B3	30	1B3	30	0
	713-3	42.85068/-86.21085	1B2	40	1B2	40	0
			2A4	40	2A4	40	0
			7	20	7	20	0
	713-4	42.84979/-86.21095	1B3	65	1B3	65	0
			2A2	35	2A2	35	0
	713-5	42.84894/-86.21101	2A2	100	2A2	100	0
	713-6	42.84805/-86.21091	2A2	100	2A2	100	0
	713-7	42.84719/-86.21101	1B3	100	1B3	100	0
2A2			100	2A2	100	0	
713-8	42.84630/-86.21105	1B3	100	1B3	100	0	
		2A2	100	2A2	100	0	
713-9	42.84541/-86.21098	1A2	35	1A2	35	0	
		2A2	100	2A2	100	0	
713-10	42.84451/-86.21089	2A2	100	2A2	100	0	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
714	714-1	42.84363/-86.21083	1B2	0	1B2	100	100
			7	100	7	0	-100
	714-2	42.84276/-86.21107	1B2	0	1B2	100	100
			7	100	7	0	-100
	714-3	42.84185/-86.21100	7	100	7	100	0
	714-4	42.84098/-86.21103	2A2	100	2A2	100	0
	714-5	42.84011/-86.21097	7	100	7	100	0
	714-6	42.83921/-86.21080	7	100	7	100	0
	714-7	42.83834/-86.21093	7	100	7	100	0
	714-8	42.83747/-86.21117	7	100	7	100	0
714-9	42.83657/-86.21120	7	100	7	100	0	
714-10	42.83566/-86.21127	7	100	7	100	0	
715	715-1	42.83479/-86.21133	7	100	7	100	0
	715-2	42.83389/-86.21150	7	100	7	100	0
	715-3	42.83302/-86.21150	7	100	7	100	0
	715-4	42.83211/-86.21150	7	100	7	100	0
	715-5	42.83121/-86.21163	7	100	7	100	0
	715-6	42.83034/-86.21153	7	100	7	100	0
	715-7	42.82943/-86.21150	7	100	7	100	0
	715-8	42.82856/-86.21153	7	100	7	100	0
	715-9	42.82766/-86.21153	7	100	7	100	0
	715-10	42.82679/-86.21149	7	100	7	100	0
716	716-1	42.82586/-86.21150	7	100	7	100	0
	716-2	42.82494/-86.21143	7	100	7	100	0
	716-3	42.82407/-86.21143	7	100	7	100	0
	716-4	42.82319/-86.21143	7	100	7	100	0
	716-5	42.82231/-86.21128	7	100	7	100	0
	716-6	42.82140/-86.21121	7	100	7	100	0
	716-7	42.82052/-86.21114	7	100	7	100	0
	716-8	42.81964/-86.21107	7	100	7	100	0
	716-9	42.81873/-86.21110	7	100	7	100	0
	716-10	42.81781/-86.21099	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
717	717-1	42.81694/-86.21092	7	100	7	100	0
	717-2	42.81598/-86.21088	7	100	7	100	0
	717-3	42.81514/-86.21095	7	100	7	100	0
	717-4	42.81427/-86.21074	7	100	7	100	0
	717-5	42.81339/-86.21062	7	100	7	100	0
	717-6	42.81251/-86.21081	7	100	7	100	0
	717-7	42.81163/-86.21081	2A2	100	2A2	100	0
	717-8	42.81072/-86.21070	2A2	100	2A2	100	0
	717-9	42.80980/-86.21074	2A2	100	2A2	100	0
	717-10	42.80885/-86.21077	1B2	0	1B2	35	35
		2A2	100	2A2	100	0	
718	718-1	42.80799/-86.21074	1B2	0	1B2	65	65
			2A2	100	2A2	100	0
	718-2	42.80708/-86.21069	1B2	0	1B2	65	65
			7	100	7	35	-65
	718-3	42.80622/-86.21074	7	100	7	100	0
	718-4	42.80531/-86.21074	1B2	35	1B2	0	-35
			7	65	7	100	35
	718-5	42.80436/-86.21074	7	100	7	100	0
	718-6	42.80349/-86.21074	7	100	7	100	0
	718-7	42.80259/-86.21083	7	100	7	100	0
718-8	42.80164/-86.21092	1B2	25	1B2	0	-25	
		7	75	7	100	25	
718-9	42.80068/-86.21097	1B3	100	1B3	0	-100	
		2A3	100	2A3	0	-100	
		7	0	7	100	100	
718-10	42.79977/-86.21092	7	100	7	100	0	
719	719-1	42.79889/-86.21072	7	100	7	100	0
	719-2	42.79798/-86.21066	7	100	7	100	0
	719-3	42.79709/-86.21057	7	100	7	100	0
	719-4	42.79620/-86.21037	7	100	7	100	0
	719-5	42.79532/-86.21033	7	100	7	100	0
	719-6	42.79440/-86.21033	7	100	7	100	0
	719-7	42.79351/-86.21022	1B2	0	1B2	100	100

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
			2A2	100	2A2	100	0
	719-8	42.79263/-86.21016	1B2	0	1B2	100	100
			2A2	100	2A2	100	0
	719-9	42.79168/-86.21019	1B2	0	1B2	100	100
			7	100	7	0	-100
	719-10	42.79071/-86.21022	1B2	0	1B2	100	100
			2A2	50	2A2	0	-50
			7	50	7	0	-50
<b>720</b>	720-1	42.78979/-86.21022	1B2	0	1B2	75	75
			2A2	100	2A2	0	-100
			7	0	7	25	25
	720-2	42.78891/-86.21038	7	100	7	100	0
	720-3	42.78803/-86.21046	7	100	7	100	0
	720-4	42.78714/-86.21035	2A2	100	2A2	0	-100
			7	0	7	100	100
	720-5	42.78626/-86.21040	2A2	100	2A2	0	-100
			7	0	7	100	100
	720-6	42.78538/-86.21043	7	100	7	100	0
	720-7	42.78449/-86.21054	7	100	7	100	0
	720-8	42.78361/-86.21054	7	100	7	100	0
	720-9	42.78270/-86.21046	7	100	7	100	0
	720-10	42.78181/-86.21038	7	100	7	100	0
<b>721</b>	721-1	42.78090/-86.21070	2A2	100	2A2	0	-100
			7	0	7	100	100
	721-2	42.78002/-86.21075	2A2	100	2A2	0	-100
			7	0	7	100	100
	721-3	42.77194/-86.21081	7	100	7	100	0
	721-4	42.77825/-86.21081	7	100	7	100	0
	721-5	42.77737/-86.21091	7	100	7	100	0
	721-6	42.77649/-86.21078	7	100	7	100	0
	721-7	42.77565/-86.21110	7	100	7	100	0
	721-8	42.77488/-86.21161	7	100	7	100	0
	721-9	42.77400/-86.21188	2B1	100	2B1	100	0
	721-10	42.77329/-86.21257	2B1	100	2B1	100	0 Lake Macatawa Jetty Offshore Length 275m

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
722	722-1	42.77264/-86.21205	2B1	100	2B1	100	0 Lake Macatawa Jetty Offshore Length 275m
			3A2	100	3A2	0	-100 Active Beach Nourishment 1989
	722-2	42.77226/-86.21095	2B1	100	2B1	100	-100 None Visible 1999
			3A2	100	3A2	0	
	722-3	42.77157/-86.21021	3A2	100	3A2	0	-100
			7	0	7	100	100
	722-4	42.77075/-86.20968	3A2	100	3A2	0	-100
			7	0	7	100	100
	722-5	42.76991/-86.20927	3A2	100	3A2	0	-100
			7	0	7	100	100
722-6	42.76907/-86.20894	3A2	100	3A2	0	-100 Ottawa - Allegan County Line	
		7	0	7	100	100	
722-7	42.76815/-86.20871	3A2	100	3A2	0	-100	
		7	0	7	100	100	
722-8	42.76721/-86.20889	7	100	7	100	0	
722-9	42.76629/-86.20876	7	100	7	100	0	
722-10	42.76540/-86.20858	7	100	7	100	0	
<b>End Ottawa County</b>							
723	723-1	42.76456/-86.20827	7	100	7	100	0
	723-2	42.76369/-86.20809	1A2	50	1A2	0	-50
			7	50	7	100	50
	723-3	42.76282/-86.20792	1A2	75	1A2	0	-75
			7	50	7	100	50
	723-4	42.76196/-86.20776	7	100	7	100	0
	723-5	42.76106/-86.20776	5A3	100	5A3	0	-100
			7	0	7	100	100
	723-6	42.76019/-86.20782	5A3	100	5A3	0	-100
			7	0	7	100	100
723-7	42.75930/-86.20782	3C1	100	3C1	100	0	
723-8	42.75843/-86.20786	3C1	100	3C1	100	0	
723-9	42.75754/-86.20789	3C1	50	3C1	50	0	
		7	50	7	50	0	
723-10	42.75667/-86.20799	1B2	60	1B2	60	0	
		7	40	7	40	0	
<b>724</b>							
724-1	42.75588/-86.20805	1B2	65	1B2	0	-65	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
			7	35	7	100	65
	724-2	42.75508/-86.20808	7	100	7	100	0
	724-3	42.75427/-86.20816	3C2	0	3C2	100	100
			7	100	7	0	-100
	724-4	42.75348/-86.20793	7	100	7	100	0
	724-5	42.75266/-86.20790	2A2	100	2A2	100	0
	724-6	42.75186/-86.20808	1B2	65	1B2	65	0
			2A2	100	2A2	100	0
	724-7	42.75107/-86.20801	1A2	50	1A2	50	0
			1B2	50	1B2	50	0
			2A2	100	2A2	100	0
	724-8	42.75027/-86.20782	1A2	40	1A2	40	0
			2A2	100	2A2	100	0
	724-9	42.74946/-86.20767	1A2	65	1A2	65	0
			7	35	7	35	0
	724-10	42.74856/-86.20765	1A2	0	1A2	75	75 Improvement to 1a3
			1A3	75	1A3	0	-75
			1B2	85	1B2	85	0
<b>725</b>	725-1	42.74744/-86.20744	3C2	0	3C2	100	100
			7	100	7	0	-100
	725-2	42.74687/-86.20724	7	100	7	100	0
	725-3	42.74598/-86.20726	7	100	7	100	0
	725-4	42.74508/-86.20724	7	100	7	100	0
	725-5	42.74421/-86.20724	7	100	7	100	0
	725-6	42.74332/-86.72026	7	100	7	100	0
	725-7	42.74242/-86.20731	7	100	7	100	0
	725-8	42.74153/-86.20729	7	100	7	100	0
	725-9	42.74060/-86.20729	7	100	7	100	0
	725-10	42.73973/-86.20724	7	100	7	100	0
<b>726</b>	726-1	42.73877/-86.20720	7	100	7	100	0
	726-2	42.73785/-86.20716	7	100	7	100	0
	726-3	42.73701/-86.20720	7	100	7	100	0
	726-4	42.73608/-86.20712	7	100	7	100	0
	726-5	42.73520/-86.20705	7	100	7	100	0
	726-6	42.73431/-86.20701	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	726-7	42.73343/-86.20708	7	100	7	100	0
	726-8	42.73254/-86.20716	7	100	7	100	0
	726-9	42.73162/-86.20712	7	100	7	100	0
	726-10	42.73074/-86.20712	7	100	7	100	0
<b>727</b>	727-1	42.72981/-86.20712	1A3	100	1A3	0	-100
			7	0	7	100	100
	727-2	42.72893/-86.20716	1A3	100	1A3	0	-100
			7	0	7	100	100
	727-3	42.72805/-86.20720	1A3	100	1A3	0	-100
			7	0	7	100	100
	727-4	42.72720/-86.20716	1A3	100	1A3	0	-100
			7	0	7	100	100
	727-5	42.72631/-86.20708	1A3	100	1A3	0	-100
			7	0	7	100	100
	727-6	42.72543/-86.20689	7	100	7	100	0
	727-7	42.72454/-86.20670	7	100	7	100	0
	727-8	42.72366/-86.20674	7	100	7	100	0
	727-9	42.72278/-86.20667	7	100	7	100	0
	727-10	42.72189/-86.20670	7	100	7	100	0
<b>728</b>	728-1	42.72103/-86.20662	7	100	7	100	0
	728-2	42.72011/-86.20659	1B3	100	1B3	0	-100
			7	0	7	100	100
	728-3	42.71922/-86.20666	7	100	7	100	0
	728-4	42.71834/-86.20672	2A2	40	2A2	40	0
			7	60	7	60	0
	728-5	42.71745/-86.20672	2A2	50	2A2	50	0
			7	50	7	50	0
	728-6	42.71653/-86.20675	7	100	7	100	0
	728-7	42.71654/-86.20675	7	100	7	100	0
	728-8	42.71476/-86.20762	7	100	7	100	0
	728-9	42.71387/-86.20672	7	100	7	100	0
	728-10	42.71295/-86.20672	7	100	7	100	0
<b>729</b>	729-1	42.71203/-86.20679	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	729-2	42.71114/-86.20675	7	100	7	100	0
	729-3	42.71025/-86.20675	7	100	7	100	0
	729-4	42.70937/-86.20669	7	100	7	100	0
	729-5	42.70849/-86.20669	7	100	7	100	0
	729-6	42.70756/-86.20675	7	100	7	100	0
	729-7	42.70667/-86.20699	7	100	7	100	0
	729-8	42.70578/-86.20718	7	100	7	100	0
	729-9	42.70490/-86.20721	7	100	7	100	0
	729-10	42.70401/-86.20715	7	100	7	100	0
<b>730</b>	730-1	42.70316/-86.20731	7	100	7	100	0
	730-2	42.70222/-86.20722	7	100	7	100	0
	730-3	42.70131/-86.20734	7	100	7	100	0
	730-4	42.70042/-86.20746	7	100	7	100	0
	730-5	42.69954/-86.20757	7	100	7	100	0
	730-6	42.69866/-86.20778	7	100	7	100	0
	730-7	42.69775/-86.20795	7	100	7	100	0
	730-8	42.69690/-86.20798	7	100	7	100	0
	730-9	42.69596/-86.20810	7	100	7	100	0
	730-10	42.69508/-86.20807	7	100	7	100	0
<b>731</b>	731-1	42.69420/-86.20827	7	100	7	100	0
	731-2	42.69332/-86.20842	7	100	7	100	0
	731-3	42.69244/-86.20854	7	100	7	100	0
	731-4	42.69156/-86.20872	7	100	7	100	0
	731-5	42.69067/-86.20904	7	100	7	100	0
	731-6	42.68976/-86.20916	7	100	7	100	0
	731-7	42.68891/-86.20937	7	100	7	100	0
	731-8	42.68800/-86.20930	7	100	7	100	0
	731-9	42.68709/-86.20960	7	100	7	100	0
	731-10	42.68615/-86.20992	7	100	7	100	0
<b>732</b>	732-1	42.68526/-86.21021	7	100	7	100	0
	732-2	42.68439/-86.21048	7	100	7	100	0
	732-3	42.68356/-86.21071	7	100	7	100	0
	732-4	42.68269/-86.21097	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	732-5	42.68182/-86.21124	7	100	7	100	0
	732-6	42.68099/-86.21161	7	100	7	100	0
	732-7	42.68020/-86.21203	7	100	7	100	0
	732-8	42.67937/-86.21248	7	100	7	100	0
	732-9	42.67857/-86.21304	7	100	7	100	0
	732-10	42.67775/-86.21350	7	100	7	100	0
<b>733</b>	733-1	42.67684/-86.21362	2B1	100	2B1	100	0 Kalamazoo River Jetties Offshore Length 200r
	733-2	42.67597/-86.21362	7	100	7	100	0
	733-3	42.67510/-86.21358	7	100	7	100	0
	733-4	42.67420/-86.21376	7	100	7	100	0
	733-5	42.67333/-86.21380	7	100	7	100	0
	733-6	42.67239/-86.21369	7	100	7	100	0
	733-7	42.67140/-86.21376	7	100	7	100	0
	733-8	42.67050/-86.21403	7	100	7	100	0
	733-9	42.66959/-86.21437	7	100	7	100	0
	733-10	42.66869/-86/21471	7	100	7	100	0
<b>734</b>	734-1	42.66784/-86.21497	7	100	7	100	0
	734-2	42.66695/-86.21519	7	100	7	100	0
	734-3	42.66610/-86.21543	7	100	7	100	0
	734-4	42.66521/-86.21579	7	100	7	100	0
	734-5	42.66433/-86.21593	7	100	7	100	0
	734-6	42.66345/-86.21618	7	100	7	100	0
	734-7	42.66260/-86.21648	1A2	75	1A2	75	0
			7	25	7	25	0
	734-8	42.66174/-86.21684	7	100	7	100	0
	734-9	42.66083/-86.21714	7	100	7	100	0
	734-10	42.65992/-86.21748	7	100	7	100	0
<b>735</b>	735-1	42.65912/-86.21819	7	100	7	100	0
	735-2	42.65830/-86.21861	7	100	7	100	0
	735-3	42.65750/-86.21915	7	100	7	100	0
	735-4	42.65664/-86.21965	7	100	7	100	0
	735-5	42.65582/-86.22009	7	100	7	100	0
	735-6	42.65499/-86.22054	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	735-7	42.65419/-86.22112	7	100	7	100	0
	735-8	42.65339/-86.22172	7	100	7	100	0
	735-9	42.65259/-86.22224	7	100	7	100	0
	735-10	42.65179/-86.22279	5A3	0	5A3	100	100
			7	100	7	0	-100
<b>736</b>	736-1	42.65097/-86.22327	7	100	7	100	0
	736-2	42.65012/-86.22373	7	100	7	100	0
	736-3	42.64933/-86.22427	7	100	7	100	0
	736-4	42.64849/-86.22477	5A2	35	5A2	35	0
			7	65	7	65	0
	736-5	42.64767/-86.22523	7	100	7	100	0
	736-6	42.64682/-86.22569	1B2	40	1B2	40	0
			7	60	7	60	0
	736-7	42.64598/-86.22597	1B2	100	1B2	0	-100
			7	0	7	100	100
	736-8	42.64513/-86.22640	1B2	50	1B2	0	-50
			7	50	7	100	50
	736-9	42.64429/-86.22681	7	100	7	100	0
	736-10	42.64341/-86.22717	7	100	7	100	0
<b>737</b>	737-1	42.64254/-86.22744	7	100	7	100	0
	737-2	42.64170/-86.22782	7	100	7	100	0
	737-3	42.64083/-86.22812	7	100	7	100	0
	737-4	42.63995/-86.22845	7	100	7	100	0
	737-5	42.63908/-86.22872	7	100	7	100	0
	737-6	42.63818/-86.22866	2A2	0	2A2	100	100
			3C2	0	3C2	100	100
			7	100	7	0	-100
	737-7	42.63728/-86.22899	2A2	0	2A2	100	100
			3C2	0	3C2	100	100
			7	100	7	0	-100
	737-8	42.63641/-86.22916	1B2	0	1B2	100	100
			7	100	7	0	-100
	737-9	42.63551/-86.22932	1B2	0	1B2	25	25
			7	100	7	75	-25
	737-10	42.63458/-86.22935	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
738	738-1	42.63366/-86.22931	7	100	7	100	0
	738-2	42.63279/-86.22926	7	100	7	100	0
	738-3	42.63188/-86.22913	7	100	7	100	0
	738-4	42.63102/-86.22890	7	100	7	100	0
	738-5	42.63010/-86.22872	7	100	7	100	0
	738-6	42.62934/-86.22863	7	100	7	100	0
	738-7	42.62833/-86.22849	7	100	7	100	0
	738-8	42.62751/-86.22836	1A1	100	1A1	100	0
	738-9	42.62650/-86.22831	1A1	100	1A1	100	0
	738-10	42.62559/-86.22822	1A1	100	1A1	100	0
739	739-1	42.62472/-86.22813	1A1	100	1A1	100	0
	739-2	42.62390/-86.22808	1A1	100	1A1	100	0
	739-3	42.62313/-86.22799	1A1	35	1A1	35	0
			7	65	7	65	0
	739-4	42.62231/-86.22808	7	100	7	100	0
	739-5	42.62140/-86.22808	7	100	7	100	0
	739-6	42.62062/-86.22826	7	100	7	100	0
	739-7	42.61980/-86.22840	7	100	7	100	0
	739-8	42.61898/-86.22836	7	100	7	100	0
	739-9	42.61811/-86.22826	1B2	0	1B2	30	30
7			100	7	70	-30	
739-10	42.61729/-86.22822	7	100	7	100	0	
740	740-1	42.61642/-86.22822	1A1	65	1A1	65	0
			7	35	7	35	0
	740-2	42.61560/-86.22803	7	100	7	100	0
	740-3	42.61464/-86.22781	7	100	7	100	0
	740-4	42.61378/-86.22776	7	100	7	100	0
	740-5	42.61287/-86.22776	7	100	7	100	0
	740-6	42.61200/-86.22762	7	100	7	100	0
	740-7	42.61113/-86.22739	7	100	7	100	0
	740-8	42.61022/-86.22730	7	100	7	100	0
	740-9	42.60931/-86.22721	5A2	100	5A2	100	0
740-10	42.60839/-86.22712	1A2	50	1A2	50	0	

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
			2A2	0	2A2	50	50
			5A2	50	5A2	50	0
<b>741</b>	741-1	42.60750/-86.22702	7	100	7	100	0
	741-2	42.60662/-86.22688	5B3	0	5B3	100	100
			7	100	7	0	-100
	741-3	42.60575/-86.22672	7	100	7	100	0
	741-4	42.60487/-86.22653	1B4	0	1B4	35	35
			2A4	0	2A4	35	35
			7	100	7	30	-70
	741-5	42.60399/-86.22633	7	100	7	100	0
	741-6	42.60312/-86.22614	1B2	55	1B2	55	0
			5A4	0	5A4	80	80
			7	45	7	0	-45
	741-7	42.60224/-86.22604	1B2	30	1B2	30	0
			7	70	7	70	0
	741-8	42.60139/-86.60139	1B2	65	1B2	65	0
			2A2	0	2A2	35	35
			7	35	7	0	-35
	741-9	42.60044/-86.22579	5A4	0	5A4	100	100
			7	100	7	0	-100
	741-10	42.59951/-86.22568	5A4	0	5A4	100	100
			7	100	7	0	-100
<b>742</b>	742-1	42.59860/-86.22565	2A2	100	2A2	100	0
	742-2	42.59770/-86.22565	1B2	75	1B2	75	0
			7	25	7	25	0
	742-3	42.59682/-86.22557	7	100	7	100	0
	742-4	42.59592/-86.22560	7	100	7	100	0
	742-5	42.59502/-86.22562	5A4	50	5A4	0	-50
			7	50	7	100	50
	742-6	42.59411/-86.22579	5A4	100	5A4	0	-100
			7	0	7	100	100
	742-7	42.59324/-86.22593	5A4	25	5A4	0	-25
			7	75	7	100	25
	742-8	42.59233/-86.22598	7	100	7	100	0
	742-9	42.59146/-86.22609	7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	742-10	42.59055/-86.22636	1B2	100	1B2	100	0
<b>743</b>	743-1	42.58967/-86.22665	1B2	50	1B2	50	0
			7	50	7	50	0
	743-2	42.58874/-86.22665	1B2	0	1B2	50	50 Improvements to 1B3
			1B3	50	1B3	0	-50
			7	50	7	50	0
	743-3	42.58785/-86.22683	7	100	7	100	0
	743-4	42.58696/-86.22707	7	100	7	100	0
	743-5	42.58610/-86.22736	7	100	7	100	0
	743-6	42.58521/-86.22754	1B2	25	1B2	100	75
			7	75	7	0	-75
	743-7	42.58435/-86.22787	1B2	0	1B2	100	100
			5B3	100	5B3	0	-100
	743-8	42.58349/-86.22808	1B2	0	1B2	100	100
			5B3	100	5B3	0	-100
	743-9	42.58256/-86.22840	1B2	0	1B2	50	50
			5B3	100	5B3	50	-50
	743-10	42.58163/-86.22865	7	100	7	100	0
<b>744</b>	744-1	42.58066/-86.22904	1B2	40	1B2	40	0
			7	60	7	60	0
	744-2	42.57980/-86.22929	1B2	40	1B2	40	0
			7	60	7	60	0
	744-3	42.57895/-86.22965	7	100	7	100	0
	744-4	42.57809/-86.22997	7	100	7	100	0
	744-5	42.57723/-86.23037	7	100	7	100	0
	744-6	42.57641/-86.23087	7	100	7	100	0
	744-7	42.57555/-86.23130	7	100	7	100	0
	744-8	42.57473/-86.23173	7	100	7	100	0
	744-9	42.57391/-86.23215	7	100	7	100	0
	744-10	42.57301/-86.23244	7	100	7	100	0
<b>745</b>	745-1	42.57212/-86.23282	7	100	7	100	0
	745-2	42.57123/-86.23321	1B3	100	1B3	0	-100
			7	0	7	100	100

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	745-3	42.57038/-86.23342	7	100	7	100	0
	745-4	42.56953/-86.23381	2A2	100	2A2	100	0
	745-5	42.56875/-86.23434	7	100	7	100	0
	745-6	42.56790/-86.23452	1B2	100	1B2	100	0
			2A2	100	2A2	100	0
	745-7	42.56697/-86.23460	7	100	7	100	0
	745-8	42.56612/-86.23484	2A2	100	2A2	100	0
	745-9	42.56524/-86.23527	2A2	100	2A2	100	0
	745-10	42.56428/-86.23537	7	100	7	100	0
<b>746</b>	746-1	42.56332/-86.23559	7	100	7	100	0
	746-2	42.56244/-86.23573	7	100	7	100	0
	746-3	42.56151/-86.23587	7	100	7	100	0
	746-4	42.56066/-86.23615	1A2	0	1A2	25	25
			7	100	7	75	-25
	746-5	42.55977/-86.23630	1A2	0	1A2	60	60
			7	100	7	40	-60
	746-6	42.55889/-86.23654	7	100	7	100	0
	746-7	42.55803/-86.23690	1A2	0	1A2	45	45
			7	100	7	55	-45
	746-8	42.55715/-86.23722	1A2	0	1A2	100	100
			7	100	7	0	-100
	746-9	42.55622/-86.23725	1A2	0	1A2	100	100
			7	100	7	0	-100
	746-10	42.55534/-86.23725	7	100	7	100	0
<b>747</b>	747-1	42.55445/-86.23730	7	100	7	100	0
	747-2	42.55350/-86.23744	1B2	0	1B2	40	40
			2A2	0	2A2	40	40
			7	100	7	20	-80
	747-3	42.55266/-86.23776	1B2	0	1B2	20	20
			2A2	0	2A2	20	20
			7	100	7	60	-40
	747-4	42.55174/-86.23787	7	100	7	100	0
	747-5	42.55087/-86.55087	7	100	7	100	0
	747-6	42.54998/-86.23826	7	100	7	100	0
	747-7	42.54907/-86.23836	1B2	0	1B2	60	60

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments	
			SP TYPE	LENGTH	SP TYPE	LENGTH		
				7	100	7	40	-60
	747-8	42.54819/-86.23861	5B4	0	5B4	65	65	65
				7	100	7	35	-65
	747-9	42.54731/-86.23885	7	100	7	100	0	0
	747-10	42.54643/-86.23903	7	100	7	100	0	0
<b>748</b>	748-1	42.54555/-86.23931	7	100	7	100	0	0
	748-2	42.54467/-86.23952	7	100	7	100	0	0
	748-3	42.54379/-86.54379	5B3	0	5B3	60	60	60
				7	100	7	40	-60
	748-4	42.54291/-86.23998	5B3	0	5B3	40	40	40
				7	100	7	60	-40
	748-5	42.54203/-86.24026	7	100	7	100	0	0
	748-6	42.54115/-86.24051	7	100	7	100	0	0
	748-7	42.54027/-86.24068	7	100	7	100	0	0
	748-8	42.53939/-86.24075	7	100	7	100	0	0
	748-9	42.53848/-86.24086	2A2	0	2A2	100	100	100
				7	100	7	0	-100
	748-10	42.53749/-86.24104	2A2	0	2A2	35	35	35
				7	100	7	65	-35
<b>749</b>	749-1	42.53658/-86.24110	2A2	40	2A2	40	0	0
				7	60	7	60	0
	749-2	42.53565/-86.24117	2A2	40	2A2	40	0	0
				7	60	7	60	0
	749-3	42.53479/-86.24132	7	100	7	100	0	0
	749-4	42.53389/-86.24147	7	100	7	100	0	0
	749-5	42.53299/-86.24155	7	100	7	100	0	0
	749-6	42.53209/-86.24158	7	100	7	100	0	0
	749-7	42.53119/-86.24166	7	100	7	100	0	0
	749-8	42.53029/-86.24177	7	100	7	100	0	0
	749-9	42.52943/-86.24196	7	100	7	100	0	0
	749-10	42.52853/-86.24214	7	100	7	100	0	0
<b>750</b>	750-1	42.52763/-86.24226	7	100	7	100	0	0
	750-2	42.52673/-86.24229	7	100	7	100	0	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
	750-3	42.52587/-86.52587	7	100	7	100	0
	750-4	42.52497/-86.24263	7	100	7	100	0
	750-5	42.52407/-86.24282	2A2	40	2A2	40	0
			7	60	7	60	0
	750-6	42.52317/-86.24294	2A2	100	2A2	100	0
	750-7	42.52227/-86.24327	1B2	0	1B2	75	75
			2A2	100	2A2	100	0
	750-8	42.52141/-86.24349	2A2	65	2A2	65	0
			5A2	25	5A2	25	0
			7	10	7	10	0
	750-9	42.52047/-86.24361	1A2	15	1A2	15	0
			1B2	40	1B2	40	0
			7	45	7	45	0
	750-10	42.51954/-86.24383	1A2	65	1A2	65	0
			7	35	7	35	0
<b>751</b>	751-1	42.51858/-86.24406	7	100	7	100	0
	751-2	42.51783/-86.24454	7	100	7	100	0
	751-3	42.51690/-86.24454	7	100	7	100	0
	751-4	42.51601/-86.24440	7	100	7	100	0
	751-5	42.51512/-86.24451	7	100	7	100	0
	751-6	42.51427/-86.24484	7	100	7	100	0
	751-7	42.51337/-86.24477	5B2	50	5B2	0	-50
			5B3	0	5B3	50	50 Deterioration of AdHoc
			7	50	7	50	0
	751-8	42.51248/-86.24458	5B2	100	5B2	0	-100
			5B3	0	5B3	100	100
	751-9	42.51159/-86.24454	5B2	100	5B2	0	-100
			5B3	0	5B3	100	100
	751-10	42.51077/-86.24470	5B2	100	5B2	0	-100
			5B3	0	5B3	100	100
<b>752</b>	752-1	42.50984/-86.24480	7	100	7	100	0
	752-2	42.50895/-86.24484	5A4	0	5A4	40	40
			7	100	7	60	-40
	752-3	42.50806/-86.24484	1A4	0	1A4	35	35
			5A4	0	5A4	65	65

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments	
			SP TYPE	LENGTH	SP TYPE	LENGTH		
				7	100	7	0	-100
	752-4	42.50717/-86.24500	5A4	0	5A4	100	100	100
				7	100	7	0	-100
	752-5	42.50628/-86.24525		7	100	7	100	0
	752-6	42.50538/-86.24540		7	100	7	100	0
	752-7	42.50449/-86.24555		7	100	7	100	0
	752-8	42.50360/-86.24566		7	100	7	100	0
	752-9	42.50767/-86.24574		7	100	7	100	0
	752-10	42.50185/-86.24588		7	100	7	100	0
<b>753</b>	753-1	42.50090/-86.24623		7	100	7	100	0
	753-2	42.50000/-86.24638		7	100	7	100	0
	753-3	42.49910/-86.24648		7	100	7	100	0
	753-4	42.49819/-86.24641		7	100	7	100	0
	753-5	42.49729/-86.24644		7	100	7	100	0
	753-6	42.49635/-86.24652		7	100	7	100	0
	753-7	42.49545/-86.24670		7	100	7	100	0
	753-8	42.49455/-86.24677		7	100	7	100	0
	753-9	42.49361/-86.24673		7	100	7	100	0
	753-10	42.49268/-86.24684	1A3	50	1A3	0	-50	
			1A4	0	1A4	40	40	
			1B4	0	1B4	40	40	
			7	50	7	20	-30	
<b>754</b>	754-1	42.49174/-86.24690		7	100	7	100	0
	754-2	42.49087/-86.24706		7	100	7	100	0
	754-3	42.48994/-86.24713	1B2	0	1B2	100	100	Improvement to Seawall
			1B3	100	1B3	0	-100	
	754-4	42.48903/-86.24742		7	100	7	100	0
	754-5	42.48817/-86.24757		7	100	7	100	0
	754-6	42.48734/-86.24786		7	100	7	100	0
	754-7	42.48644/-86.24811		7	100	7	100	0
	754-8	42.48553/-86.24836		7	100	7	100	0
	754-9	42.48463/-86.24857		7	100	7	100	0
	754-10	42.48373/-86.24883		7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
755	755-1	42.48293/-86.24908	7	100	7	100	0
	755-2	42.48207/-86.24934	7	100	7	100	0
	755-3	42.48122/-86.24957	7	100	7	100	0
	755-4	42.48047/-86.24960	7	100	7	100	0
	755-5	42.47961/-86.24979	7	100	7	100	0
	755-6	42.47883/-86.25042	7	100	7	100	0
	755-7	42.47802/-86.25042	7	100	7	100	0
	755-8	42.47720/-86.25064	7	100	7	100	0
	755-9	42.47638/-86.25094	7	100	7	100	0
	755-10	42.47559/-86.25113	7	100	7	100	0
756	756-1	42.47470/-86.25146	7	100	7	100	0
	756-2	42.47380/-86.25176	7	100	7	100	0
	756-3	42.47295/-86.25198	7	100	7	100	0
	756-4	42.47205/-86.25232	7	100	7	100	0
	756-5	42.47112/-86.25254	7	100	7	100	0
	756-6	42.47030/-86.25281	7	100	7	100	0
	756-7	42.46941/-86.25291	7	100	7	100	0
	756-8	42.46855/-86.25325	7	100	7	100	0
	756-9	42.46766/-86.25366	7	100	7	100	0
	756-10	42.46627/-86.25404	7	100	7	100	0
757	757-1	42.46589/-86.25425	7	100	7	100	0
	757-2	42.46503/-86.25455	7	100	7	100	0
	757-3	42.46413/-86.25471	7	100	7	100	0
	757-4	42.46323/-86.25489	7	100	7	100	0
	757-5	42.46238/-86.25519	7	100	7	100	0
	757-6	42.46152/-86.25532	1A3	0	1A3	65	65
			7	100	7	35	-65
	757-7	42.46062/-86.25553	7	100	7	100	0
	757-8	42.45972/-86.25592	7	100	7	100	0
	757-9	42.45891/-86.25626	7	100	7	100	0
757-10	42.45797/-86.25656	7	100	7	100	0	
758	758-1	42.45711/-86.25681	7	100	7	100	0
	758-2	42.45625/-86.25707	1B2	0	1B2	100	100

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments	
			SP TYPE	LENGTH	SP TYPE	LENGTH		
				7	100	7	0	-100
	758-3	42.45536/-86.25729	1B2	0	1B2	100	100	100
				7	100	7	0	-100
	758-4	42.45446/-86.25750		7	100	7	100	0
	758-5	42.45364/-86.25776		7	100	7	100	0
	758-6	42.45279/-86.25793		7	100	7	100	0
	758-7	42.45107/-86.25874		7	100	7	100	0
	758-8	42.45018/-86.25912		7	100	7	100	0
	758-9	42.44936/-86.25955		7	100	7	100	0
	758-10	42.44842/-86.25986	1A1	100	1A1	100	100	0
<b>759</b>	759-1	42.44846/-86.25987	1A1	50	1A1	50	50	0
				7	50	7	50	0
	759-2	42.44759/-86.26019	5A4	75	5A4	0	0	-75
				7	25	7	100	75
	759-3	42.44671/-86.26051	5A4	65	5A4	0	0	-65
				7	35	7	100	65
	759-4	42.44588/-86.26088		7	100	7	100	0
	759-5	42.44501/-86.26121		7	100	7	100	0
	759-6	42.44414/-86.26139		7	100	7	100	0
	759-7	42.44322/-86.26171		7	100	7	100	0
	759-8	42.44244/-86.26208		7	100	7	100	0
	759-9	42.44152/-86.26244		7	100	7	100	0
	759-10	42.44074/-86.26314		7	100	7	100	0
<b>760</b>	760-1	42.43987/-86.26355		7	100	7	100	0
	760-2	42.43904/-86.26405		7	100	7	100	0
	760-3	42.43821/-86.26442		7	100	7	100	0
	760-4	42.43734/-86.26474		7	100	7	100	0
	760-5	42.43626/-86.26516		7	100	7	100	0
	760-6	42.43563/-86.26557		7	100	7	100	0
	760-7	42.43481/-86.26603		7	100	7	100	0
	760-8	42.43403/-86.26662		7	100	7	100	0
	760-9	42.43311/-86.26695		7	100	7	100	0
	760-10	42.43224/-86.26746		7	100	7	100	0

REACH	SUB REACH	LAT/LONG	1989		1999		CHANGE (m and %) Comments
			SP TYPE	LENGTH	SP TYPE	LENGTH	
761	761-1	42.43137/-86.26785	5A4	0	5A4	100	100
			7	100	7	0	-100
	761-2	42.43053/-86.26820	5A4	0	5A4	100	100
			7	100	7	0	-100
	761-3	42.42967/-86.26856	5A4	0	5A4	100	100
			7	100	7	0	-100
	761-4	42.42883/-86.26896	5A4	0	5A4	100	100
			7	100	7	0	-100
	761-5	42.42797/-86.26942	1A2	0	1A2	100	100
			1A3	40	1A3	0	-40
		7	60	7	0	-60	
761-6	42.42716/-86.26992	1A2	0	1A2	100	100	
		7	100	7	0	-100	
761-7	42.42636/-86.27042	1A2	0	1A2	100	100	
		1A3	100	1A3	0	-100	
761-8	42.42555/-86.27088	1B2	100	1B2	100	0	
761-9	42.42471/-86.27129	1B2	100	1B2	100	0	
761-10	42.42385/-86.27158	1B2	100	1B2	100	0	
<hr/>							
762	762-1	42.42302/-86.27200	1B2	100	1B2	100	0
	762-2	42.42222/-86.27256	1B2	100	1B2	100	0
	762-3	42.42141/-86.27313	7	100	7	100	0
	762-4	42.42059/-86.27352	7	100	7	100	0
	762-5	42.41971/-86.27379	7	100	7	100	0 Allegan - Van Buren County Line
	762-6		7	100	7	100	0 Note: Reach Statistics Calculated Over
	762-7		7	100	7	100	0 Entire 1km reach.
	762-8		7	100	7	100	0
	762-9		7	100	7	100	0
	762-10		7	100	7	100	0
<hr/>							
<b>End Allegan County</b>							



1/10<sup>TH</sup> KM SUB-REACH DATA  
OZAUKEE, SHEBOYGAN, MANITOWOC  
COUNTIES

Lake Michigan Potential Damages Study

Detailed Shoreline Protection Mapping and Classification for Wisconsin - Ozaukee, Sheboygan and Manitowoc Counties

1/10th of a Kilometer Sub Reach Data (units: Length = meters / Coordinates = decimal degrees)

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
<b>Start Ozaukee County</b>									
1172	1172-1	43.19107	-87.89180	1A2	0	1A2	75	75	
				1B1	0	1B1	25	25	
				7	100	7	0	-100	
1172-2	43.19191	-87.89250	1A2	0	1A2	80	80	80	Z wall
			1B2	0	1B2	20	20		
			5A3	40	5A3	0	-40		
			7	60	7	0	-60		
1172-3	43.19273	-87.89310	1B2	0	1B2	100	100		
			5A3	30	5A3	0	-30		
			7	70	7	0	-70		
1172-4	43.19352	-87.89360	1A2	0	1A2	100	100		
			1B2	0	1B2	20	20		
			7	100	7	0	-100		
1172-5	43.19432	-87.89420	1A2	0	1A2	60	60		
			1B2	0	1B2	40	40		
			7	100	7	0	-100		
1172-6	43.19507	-87.89470	1A2	0	1A2	75	75		
			5A4	0	5A4	25	25		
			7	100	7	0	-100		
1172-7	43.19588	-87.89530	5B4	0	5B4	25	25		
			7	100	7	75	-25		
1172-8	43.19677	-87.89560	5B2	30	5B2	30	0		
			7	70	7	70	0		
1172-9	43.19759	-87.89610	7	100	7	100	0		
1172-10	43.19845	-87.89650	7	100	7	100	0		
1173	1173-1	43.19927	-87.89690	7	100	7	100	0	
	1173-2	43.20024	-87.89710	7	100	7	100	0	
	1173-3	43.20108	-87.89730	7	100	7	100	0	
	1173-4	43.20197	-87.89730	7	100	7	100	0	
	1173-5	43.20292	-87.89740	7	100	7	100	0	
	1173-6	43.20361	-87.89740	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1173-7	43.20478	-87.89720	7	100	7	100	0	
	1173-8	43.20548	-87.89680	7	100	7	100	0	
	1173-9	43.20641	-87.89640	7	100	7	100	0	
	1173-10	43.20729	-87.89610	7	100	7	100	0	
<b>1174</b>	1174-1	43.20816	-87.89580	7	100	7	100	0	
	1174-2	43.20915	-87.89570	7	100	7	100	0	
	1174-3	43.21008	-87.89580	7	100	7	100	0	
	1174-4	43.21096	-87.89600	7	100	7	100	0	
	1174-5	43.21189	-87.89620	7	100	7	100	0	
	1174-6	43.21270	-87.89630	7	100	7	100	0	
	1174-7	43.21370	-87.89630	7	100	7	100	0	
	1174-8	43.21457	-87.89650	7	100	7	100	0	
	1174-9	43.21521	-87.89730	7	100	7	100	0	
	1174-10	43.21603	-87.89750	7	100	7	100	0	
								0	
<b>1175</b>	1175-1	43.21708	-87.89800	7	100	7	100	0	
	1175-2	43.21777	-87.89880	7	100	7	100	0	
	1175-3	43.21853	-87.89960	7	100	7	100	0	
	1175-4	43.21929	-87.90020	7	100	7	100	0	
	1175-5	43.22005	-87.90080	7	100	7	100	0	
	1175-6	43.22092	-87.90140	7	100	7	100	0	
	1175-7	43.22174	-87.90190	7	100	7	100	0	
	1175-8	43.22243	-87.90260	7	100	7	100	0	
	1175-9	43.22319	-87.90320	7	100	7	100	0	
	1175-10	43.22395	-87.90370	7	100	7	100	0	
								0	
<b>1176</b>	1176-1	43.22477	-87.90420	7	100	7	100	0	
	1176-2	43.22570	-87.90480	7	100	7	100	0	
	1176-3	43.22653	-87.90540	7	100	7	100	0	
	1176-4	43.22739	-87.90590	7	100	7	100	0	
	1176-5	43.22811	-87.90650	7	100	7	100	0	
	1176-6	43.22897	-87.90690	1A2	0	1A2	75	75	
				7	100	7	25	-75	
	1176-7	43.22986	-87.90720	1A2	0	1A2	35	35	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1B2	100	1B2	100	0	
	1176-8	43.23061	-87.90760	1A2	0	1A2	35	35	
				1B2	100	1B2	65	-35	
	1176-9	43.23154	-87.90790	1A2	0	1A2	25	25	
				1B2	25	1B2	0	-25	
				7	75	7	75	0	
	1176-10	43.23233	-87.90830	7	100	7	100	0	
<b>1177</b>	1177-1	43.23319	-87.90880	1B3	40	1B3	0	-40	
				7	60	7	100	40	
	1177-2	43.23408	-87.90920	7	100	7	100	0	
	1177-3	43.23494	-87.90950	7	100	7	100	0	
	1177-4	43.23583	-87.90990	1B3	0	1B3	65	65	
				7	100	7	35	-65	
	1177-5	43.23665	-87.91010	1B3	0	1B3	50	50	
				7	100	7	50	-50	
	1177-6	43.23758	-87.91040	7	100	7	100	0	
	1177-7	43.23837	-87.91060	7	100	7	100	0	
	1177-8	43.23926	-87.91080	7	100	7	100	0	
	1177-9	43.24022	-87.91090	1B3	35	1B3	35	0	
				7	65	7	65	0	
	1177-10	43.24108	-87.91090	7	100	7	100	0	
<b>1178</b>	1178-1	43.24190	-87.91120	7	100	7	100	0	
	1178-2	43.24269	-87.91130	7	100	7	100	0	
	1178-3	43.24341	-87.91140	7	100	7	100	0	
	1178-4	43.24434	-87.91140	7	100	7	100	0	
	1178-5	43.24526	-87.91150	7	100	7	100	0	
	1178-6	43.24598	-87.91160	7	100	7	100	0	
	1178-7	43.24682	-87.91160	7	100	7	100	0	
	1178-8	43.24791	-87.91140	7	100	7	100	0	
	1178-9	43.24882	-87.91140	7	100	7	100	0	
	1178-10	43.24955	-87.91120	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1179	1179-1	43.25045	-87.91090	7	100	7	100	0	
	1179-2	43.25148	-87.91100	7	100	7	100	0	
	1179-3	43.25227	-87.91080	7	100	7	100	0	
	1179-4	43.25324	-87.91060	7	100	7	100	0	
	1179-5	43.25415	-87.91040	7	100	7	100	0	
	1179-6	43.25505	-87.91020	7	100	7	100	0	
	1179-7	43.25591	-87.91020	7	100	7	100	0	
	1179-8	43.25687	-87.91000	7	100	7	100	0	
	1179-9	43.25784	-87.90990	7	100	7	100	0	
	1179-10	43.25863	-87.90950	7	100	7	100	0	
1180	1180-1	43.25954	-87.90890	7	100	7	100	0	
	1180-2	43.26051	-87.90870	7	100	7	100	0	
	1180-3	43.26111	-87.90820	7	100	7	100	0	
	1180-4	43.26202	-87.90820	7	100	7	100	0	
	1180-5	43.26305	-87.90770	7	100	7	100	0	
	1180-6	43.26393	-87.90750	7	100	7	100	0	
	1180-7	43.26476	-87.90740	7	100	7	100	0	
	1180-8	43.26564	-87.90720	7	100	7	100	0	
	1180-9	43.26652	-87.90690	7	100	7	100	0	
	1180-10	43.26740	-87.90670	7	100	7	100	0	
1181	1181-1	43.26836	-87.90630	7	100	7	100	0	
	1181-2	43.26912	-87.90620	7	100	7	100	0	
	1181-3	43.27007	-87.90600	1B3	0	1B3	30	30	
				7	100	7	70	-30	
	1181-4	43.27115	-87.90570	7	100	7	100	0	
	1181-5	43.27179	-87.90550	7	100	7	100	0	
	1181-6	43.27287	-87.90520	7	100	7	100	0	
	1181-7	43.27362	-87.90500	7	100	7	100	0	
	1181-8	43.27462	-87.90460	7	100	7	100	0	
1181-9	43.27530	-87.90430	7	100	7	100	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1181-10	43.27610	-87.90400	7	100	7	100	0	
<b>1182</b>	1182-1	43.27714	-87.90370	7	100	7	100	0	
	1182-2	43.27790	-87.90330	7	100	7	100	0	
	1182-3	43.27882	-87.90330	7	100	7	100	0	
	1182-4	43.27969	-87.90310	1A2	0	1A2	35	35	
				7	100	7	65	-35	
	1182-5	43.28045	-87.90260	1A2	0	1A2	50	50	
				7	100	7	50	-50	
	1182-6	43.28129	-87.90230	1A2	0	1A2	65	65	
				7	100	7	35	-65	
	1182-7	43.28221	-87.90200	7	100	7	100	0	
	1182-8	43.28308	-87.90190	7	100	7	100	0	
	1182-9	43.28392	-87.90150	7	100	7	100	0	
	1182-10	43.28484	-87.90110	7	100	7	100	0	
<b>1183</b>	1183-1	43.28572	-87.90070	7	100	7	100	0	
	1183-2	43.28660	-87.90030	7	100	7	100	0	
	1183-3	43.28752	-87.89990	7	100	7	100	0	
	1183-4	43.28843	-87.89950	7	100	7	100	0	
	1183-5	43.28927	-87.89910	7	100	7	100	0	
	1183-6	43.29016	-87.89870	7	100	7	100	0	
	1183-7	43.29096	-87.89810	7	100	7	100	0	
	1183-8	43.29181	-87.89750	7	100	7	100	0	
	1183-9	43.29261	-87.89690	7	100	7	100	0	
	1183-10	43.29354	-87.89670	7	100	7	100	0	
<b>1184</b>	1184-1	43.29434	-87.89610	7	100	7	100	0	
	1184-2	43.29514	-87.89550	7	100	7	100	0	
	1184-3	43.29595	-87.89500	7	100	7	100	0	
	1184-4	43.29675	-87.89460	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1184-5	43.29756	-87.89400	7	100	7	100	0	
	1184-6	43.29840	-87.89350	7	100	7	100	0	
	1184-7	43.29916	-87.89290	7	100	7	100	0	
	1184-8	43.29993	-87.89250	7	100	7	100	0	
	1184-9	43.30082	-87.89210	7	100	7	100	0	
	1184-10	43.30166	-87.89180	7	100	7	100	0	
<b>1185</b>	1185-1	43.30254	-87.89130	7	100	7	100	0	
	1185-2	43.30331	-87.89070	7	100	7	100	0	
	1185-3	43.30431	-87.89010	7	100	7	100	0	
	1185-4	43.30520	-87.88950	7	100	7	100	0	
	1185-5	43.30604	-87.88920	7	100	7	100	0	
	1185-6	43.30677	-87.88910	7	100	7	100	0	
	1185-7	43.30761	-87.88860	7	100	7	100	0	
	1185-8	43.30862	-87.88840	7	100	7	100	0	
	1185-9	43.30930	-87.88810	7	100	7	100	0	
	1185-10	43.31026	-87.88810	7	100	7	100	0	
<b>1186</b>	1186-1	43.31115	-87.88820	7	100	7	100	0	
	1186-2	43.31199	-87.88790	7	100	7	100	0	
	1186-3	43.31292	-87.88830	7	100	7	100	0	
	1186-4	43.31372	-87.88830	7	100	7	100	0	
	1186-5	43.31466	-87.88800	7	100	7	100	0	
	1186-6	43.31553	-87.88790	7	100	7	100	0	
	1186-7	43.31630	-87.88770	7	100	7	100	0	
	1186-8	43.31721	-87.88730	7	100	7	100	0	
	1186-9	43.31801	-87.88700	7	100	7	100	0	
	1186-10	43.31898	-87.88650	7	100	7	100	0	
<b>1187</b>	1187-1	43.31972	-87.88630	7	100	7	100	0	
	1187-2	43.32069	-87.88600	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1187-3	43.32174	-87.88560	7	100	7	100	0	
	1187-4	43.32251	-87.88560	7	100	7	100	0	
	1187-5	43.32359	-87.88550	7	100	7	100	0	
	1187-6	43.32439	-87.88530	7	100	7	100	0	
	1187-7	43.32526	-87.88530	7	100	7	100	0	
	1187-8	43.32613	-87.88530	7	100	7	100	0	
	1187-9	43.32714	-87.88550	7	100	7	100	0	
	1187-10	43.32805	-87.88570	7	100	7	100	0	

<b>1188</b>	1188-1	43.32895	-87.88560	7	100	7	100	0	
	1188-2	43.33000	-87.88540	7	100	7	100	0	
	1188-3	43.33080	-87.88530	7	100	7	100	0	
	1188-4	43.33184	-87.88530	7	100	7	100	0	
	1188-5	43.33268	-87.88520	7	100	7	100	0	
	1188-6	43.33345	-87.88500	7	100	7	100	0	
	1188-7	43.33439	-87.88480	7	100	7	100	0	
	1188-8	43.33523	-87.88450	7	100	7	100	0	
	1188-9	43.33601	-87.88420	7	100	7	100	0	
	1188-10	43.33696	-87.88420	7	100	7	100	0	

<b>1189</b>	1189-1	43.33795	-87.88420	7	100	7	100	0	
	1189-2	43.33873	-87.88400	7	100	7	100	0	
	1189-3	43.33975	-87.88390	7	100	7	100	0	
	1189-4	43.34047	-87.88360	7	100	7	100	0	
	1189-5	43.34135	-87.88330	7	100	7	100	0	
	1189-6	43.34227	-87.88310	7	100	7	100	0	
	1189-7	43.34312	-87.88290	7	100	7	100	0	
	1189-8	43.34401	-87.88260	7	100	7	100	0	
	1189-9	43.34492	-87.88250	7	100	7	100	0	
	1189-10	43.34584	-87.88240	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1190	1190-1	43.34676	-87.88220	7	100	7	100	0	
	1190-2	43.34771	-87.88210	7	100	7	100	0	
	1190-3	43.34856	-87.88210	7	100	7	100	0	
	1190-4	43.34951	-87.88200	7	100	7	100	0	
	1190-5	43.35047	-87.88200	7	100	7	100	0	
	1190-6	43.35125	-87.88180	7	100	7	100	0	
	1190-7	43.35206	-87.88170	7	100	7	100	0	
	1190-8	43.35305	-87.88150	7	100	7	100	0	
	1190-9	43.35397	-87.88110	7	100	7	100	0	
	1190-10	43.35485	-87.88090	7	100	7	100	0	

1191	1191-1	43.35560	-87.88070	7	100	7	100	0	
	1191-2	43.35652	-87.88050	7	100	7	100	0	
	1191-3	43.35733	-87.88030	7	100	7	100	0	
	1191-4	43.35836	-87.88000	7	100	7	100	0	
	1191-5	43.35916	-87.87970	7	100	7	100	0	
	1191-6	43.36002	-87.87930	7	100	7	100	0	
	1191-7	43.36092	-87.87920	7	100	7	100	0	
	1191-8	43.36189	-87.87900	7	100	7	100	0	
	1191-9	43.36272	-87.87870	7	100	7	100	0	
	1191-10	43.36358	-87.87840	7	100	7	100	0	

1192	1192-1	43.36452	-87.87820	7	100	7	100	0	
	1192-2	43.36542	-87.87770	7	100	7	100	0	
	1192-3	43.36618	-87.87710	7	100	7	100	0	
	1192-4	43.36711	-87.87720	7	100	7	100	0	
	1192-5	43.36804	-87.87720	7	100	7	100	0	
	1192-6	43.36898	-87.87710	7	100	7	100	0	
	1192-7	43.36974	-87.87690	7	100	7	100	0	
	1192-8	43.37064	-87.87660	7	100	7	100	0	
	1192-9	43.37143	-87.87620	7	100	7	100	0	
	1192-10	43.37226	-87.87580	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments	
				SP Type	Length	SP Type	Length			
1193	1193-1	43.37312	-87.87550	7	100	7	100	0		
	1193-2	43.37378	-87.87490	7	100	7	100	0		
	1193-3	43.37489	-87.87450	7	100	7	100	0		
	1193-4	43.37565	-87.87390	7	100	7	100	0		
	1193-5	43.37651	-87.87350	7	100	7	100	0		
	1193-6	43.37724	-87.87310	7	100	7	100	0		
	1193-7	43.37807	-87.87280	7	100	7	100	0		
	1193-8	43.37886	-87.87230	7	100	7	100	0		
	1193-9	43.37974	-87.87200	7	100	7	100	0		
	1193-10	43.38055	-87.87160	7	100	7	100	0		
1194	1194-1	43.38125	-87.87120	7	100	7	100	0		
	1194-2	43.38180	-87.87070	7	100	7	100	0		
	1194-3	43.38232	-87.87020	7	100	7	100	0		
	1194-4	43.38272	-87.86970	5A2	100	5A2	100	0		
	1194-5	43.38320	-87.86930	5A2	100	5A2	100	0		
	1194-6				1A2	50	1A2	50	0	
					1B1	50	1B1	50	0	
	1194-7	43.38309	-87.86770	1B1	100	1B1	100	0		
	1194-8				1A1	88	1A1	88	0	
					1B1	12	1B1	12	0	
1194-9	43.38345	-87.86660	1A1	100	1A1	100	0			
1194-10	43.38390	-87.86600	1A1	100	1A1	100	0			
1195	1195-1	43.38401	-87.86530	1A1	100	1A1	100	0	Port Washington	
				1B1	100	1B1	100	0		
	1195-2	43.38375	-87.86440		1A1	100	1A1	100	0	
					1B1	60	1B1	60	0	
	1195-3	43.38437	-87.86400	1A1	100	1A1	100	0		
1195-4	43.38507	-87.86350		2B1	100	2B1	100	0	offshore length = 275	
				1B1	10	1B1	10	0		
1195-5	43.38537	-87.86430	1B1	100	1B1	100	0			

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1195-6	43.38573	-87.86540	1B1	100	1B1	100	0	
	1195-7	43.38610	-87.86640	1B1	100	1B1	100	0	
	1195-8	43.38636	-87.86720	1B1	100	1B1	100	0	
	1195-9	43.38647	-87.86820	1B1	100	1B1	100	0	
	1195-10	43.38647	-87.86890	1B1	100	1B1	100	0	

<b>1196</b>	1196-1	43.38684	-87.86960	1B1	100	1B1	100	0	City of Port Washington
	1196-2	43.38710	-87.86930	1B1	100	1B1	100	0	
	1196-3	43.38732	-87.86830	1B1	100	1B1	100	0	
	1196-4	43.38827	-87.86790	1B1	100	1B1	100	0	
	1196-5	43.38901	-87.86720	1B1	100	1B1	100	0	
	1196-6	43.38816	-87.86740	1B1	100	1B1	100	0	
	1196-7	43.38724	-87.86800	1B1	100	1B1	100	0	
	1196-8	43.38673	-87.86690	1A1	50	1A1	50	0	
				1B1	50	1B1	50	0	
				2C1	0	2C1	200	200	
	1196-9	43.38761	-87.86650	1A1	100	1A1	0	-100	
				1B1	0	1B1	100	100	
	1196-10	43.38842	-87.86610	1A1	100	1A1	0	-100	
					1B1	0	1B1	100	100

<b>1197</b>	1197-1	43.38923	-87.86560	1A2	50	1A2	0	-50	
				1B1	0	1B1	100	100	marina construction
				1B2	50	1B2	0	-50	
	1197-2	43.38930	-87.86470	1A2	40	1A2	0	-40	
				1B1	0	1B1	100	100	
				7	60	7	0	-60	
	1197-3	43.38982	-87.86380	2B1	100	2B1	100	0	offshore length =650 meters
	1197-4	43.39077	-87.86390	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				1A1	0	1A1	100	100	
1197-5	43.39158	-87.86400	1A2	100	1A2	0	-100		
			2A2	100	2A2	0	-100		
			1A1	0	1A1	100	100		
1197-6	43.39235	-87.86380	1A1	0	1A1	100	100		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1A2	100	1A2	0	-100	
				2A2	50	2A2	0	-50	
	1197-7	43.39324	-87.86350	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
	1197-8	43.39405	-87.86310	7	100	7	100	0	
	1197-9	43.39486	-87.86280	7	100	7	100	0	
	1197-10	43.39574	-87.86250	7	100	7	100	0	
<b>1198</b>	1198-1	43.39651	-87.86200	7	100	7	100	0	
	1198-2	43.39728	-87.86120	7	100	7	100	0	
	1198-3	43.39791	-87.86050	7	100	7	100	0	
	1198-4	43.39879	-87.85980	7	100	7	100	0	
	1198-5	43.39945	-87.85910	7	100	7	100	0	
	1198-6	43.40026	-87.85850	7	100	7	100	0	
	1198-7	43.40110	-87.85790	7	100	7	100	0	
	1198-8	43.40184	-87.85730	7	100	7	100	0	
	1198-9	43.40260	-87.85670	7	100	7	100	0	
	1198-10	43.40348	-87.85620	7	100	7	100	0	
<b>1199</b>	1199-1	43.40433	-87.85580	7	100	7	100	0	
	1199-2	43.40515	-87.85520	7	100	7	100	0	
	1199-3	43.40591	-87.85460	7	100	7	100	0	
	1199-4	43.40673	-87.85400	7	100	7	100	0	
	1199-5	43.40752	-87.85330	7	100	7	100	0	
	1199-6	43.40831	-87.85270	7	100	7	100	0	
	1199-7	43.40910	-87.85190	7	100	7	100	0	
	1199-8	43.40976	-87.85130	7	100	7	100	0	
	1199-9	43.41048	-87.85040	7	100	7	100	0	
	1199-10	43.41130	-87.84970	7	100	7	100	0	
<b>1200</b>	1200-1	43.41196	-87.84900	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1200-2	43.41272	-87.84840	7	100	7	100	0	
	1200-3	43.41339	-87.84770	7	100	7	100	0	
	1200-4	43.41408	-87.84690	7	100	7	100	0	
	1200-5	43.41474	-87.84610	7	100	7	100	0	
	1200-6	43.41537	-87.84530	7	100	7	100	0	
	1200-7	43.41607	-87.84450	7	100	7	100	0	
	1200-8	43.41679	-87.84400	7	100	7	100	0	
	1200-9	43.41758	-87.84330	7	100	7	100	0	
	1200-10	43.41837	-87.84250	1A2	0	1A2	100	100	
				1A3	35	1A3	0	-35	
				7	65	7	0	-65	

<b>1201</b>	1201-1	43.41903	-87.84180	7	100	7	100	0	
	1201-2	43.41973	-87.84100	7	100	7	100	0	
	1201-3	43.42048	-87.84020	7	100	7	100	0	
	1201-4	43.42115	-87.83940	1A2	0	1A2	65	65	
				1A3	65	1A3	0	-65	
				7	35	7	35	0	
	1201-5	43.42182	-87.83820	7	100	7	100	0	
	1201-6	43.42247	-87.83770	7	100	7	100	0	
	1201-7	43.42326	-87.83720	7	100	7	100	0	
	1201-8	43.42405	-87.83660	7	100	7	100	0	
	1201-9	43.42492	-87.83590	7	100	7	100	0	
	1201-10	43.42564	-87.83510	7	100	7	100	0	

<b>1202</b>	1202-1	43.42647	-87.83440	7	100	7	100	0	
	1202-2	43.42719	-87.83360	7	100	7	100	0	
	1202-3	43.42802	-87.83290	7	100	7	100	0	
	1202-4	43.42881	-87.83210	7	100	7	100	0	
	1202-5	43.42950	-87.83150	7	100	7	100	0	
	1202-6	43.43029	-87.83070	7	100	7	100	0	
	1202-7	43.43094	-87.83010	7	100	7	100	0	
	1202-8	43.43166	-87.82930	7	100	7	100	0	
	1202-9	43.43242	-87.82860	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1202-10	43.43328	-87.82790	7	100	7	100	0	
<b>1203</b>	1203-1	43.43400	-87.82710	7	100	7	100	0	
	1203-2	43.43472	-87.82640	7	100	7	100	0	
	1203-3	43.43544	-87.82580	7	100	7	100	0	
	1203-4	43.43631	-87.82520	7	100	7	100	0	
	1203-5	43.43717	-87.82470	7	100	7	100	0	
	1203-6	43.43797	-87.82420	7	100	7	100	0	
	1203-7	43.43879	-87.82370	7	100	7	100	0	
	1203-8	43.43959	-87.82320	7	100	7	100	0	
	1203-9	43.44038	-87.82260	7	100	7	100	0	
	1203-10	43.44117	-87.82200	7	100	7	100	0	
<b>1204</b>	1204-1	43.44204	-87.82140	7	100	7	100	0	
	1204-2	43.44279	-87.82080	7	100	7	100	0	
	1204-3	43.44351	-87.82010	7	100	7	100	0	
	1204-4	43.44420	-87.81950	7	100	7	100	0	
	1204-5	43.44503	-87.81870	7	100	7	100	0	
	1204-6	43.44575	-87.81810	7	100	7	100	0	
	1204-7	43.44650	-87.81730	7	100	7	100	0	
	1204-8	43.44726	-87.81660	7	100	7	100	0	
	1204-9	43.44798	-87.81600	7	100	7	100	0	
	1204-10	43.44862	-87.81520	7	100	7	100	0	
<b>1205</b>	1205-1	43.44923	-87.81430	7	100	7	100	0	
	1205-2	43.44975	-87.81330	7	100	7	100	0	
	1205-3	43.45039	-87.81260	7	100	7	100	0	
	1205-4	43.45131	-87.81270	7	100	7	100	0	
	1205-5	43.45219	-87.81250	7	100	7	100	0	
	1205-6	43.45292	-87.81210	7	100	7	100	0	
	1205-7	43.45384	-87.81170	7	100	7	100	0	
	1205-8	43.45468	-87.81120	7	100	7	100	0	
	1205-9	43.45552	-87.81080	5A2	75	5A2	75	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1205-10	43.45632	-87.81030	7	25	7	25	0	
				5A2	25	5A2	25	0	
				7	75	7	75	0	
<b>1206</b>	1206-1	43.45704	-87.80960	7	100	7	100	0	
	1206-2	43.45789	-87.80900	1A2	50	1A2	50	0	
				7	50	7	50	0	
	1206-3	43.45865	-87.80830	7	100	7	100	0	
	1206-4	43.45949	-87.80760	1A2	35	1A2	35	0	
				7	65	7	65	0	
	1206-5	43.46021	-87.80680	1A2	30	1A2	30	0	
				7	70	7	70	0	
	1206-6	43.46113	-87.80650	1A2	50	1A2	50	0	
				7	50	7	50	0	
	1206-7	43.46181	-87.80590	7	100	7	100	0	
	1206-8	43.46254	-87.80510	7	100	7	100	0	
	1206-9	43.46313	-87.80420	1B2	0	1B2	65	65	
				7	100	7	35	-65	
	1206-10	43.46390	-87.80380	7	100	7	100	0	
<b>1207</b>	1207-1	43.46478	-87.80360	1A2	0	1A2	25	25	
				7	100	7	75	-25	
	1207-2	43.46594	-87.80350	1A2	0	1A2	100	100	
				1A3	50	1A3	0	-50	
				7	50	7	0	-50	
	1207-3	43.46690	-87.80340	1A2	0	1A2	100	100	
				1A3	30	1A3	0	-30	
				7	70	7	0	-70	
	1207-4	43.46751	-87.80310	1A2	0	1A2	100	100	
				5A2	35	5A2	0	-35	
				7	65	7	0	-65	
	1207-5	43.46859	-87.80270	1A2	0	1A2	100	100	
				5A2	85	5A2	0	-85	
				7	15	7	0	-15	
	1207-6	43.46931	-87.80260	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1207-7	43.47019	-87.80220	1A2	75	1A2	75	0	
				7	25	7	25	0	
	1207-8	43.47095	-87.80190	7	100	7	100	0	
	1207-9	43.47192	-87.80180	7	100	7	100	0	
	1207-10	43.47276	-87.80130	7	100	7	100	0	

<b>1208</b>	1208-1	43.47356	-87.80100	1A2	0	1A2	50	50	
				7	100	7	50	-50	
	1208-2	43.47452	-87.80080	1B2	25	1B2	25	0	
				7	75	7	75	0	
	1208-3	43.47532	-87.80040	1B2	30	1B2	30	0	
				7	70	7	70	0	
	1208-4	43.47632	-87.80000	7	100	7	100	0	
	1208-5	43.47716	-87.79970	1A2	0	1A2	25	25	
				7	100	7	75	-25	
	1208-6	43.47808	-87.79910	1A2	0	1A2	100	100	
				1A3	55	1A3	0	-55	
				7	45	7	0	-45	
	1208-7	43.47879	-87.79880	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1208-8	43.47958	-87.79840	1A2	0	1A2	45	45	
				1A3	25	1A3	0	-25	
				7	75	7	55	-20	
	1208-9	43.48055	-87.79780	1B3	30	1B3	30	0	
				7	70	7	70	0	
	1208-10	43.48134	-87.79740	5A2	0	5A2	100	100	
				5A3	100	5A3	0	-100	
					1000				

<b>1209</b>	1209-1	43.48214	-87.79690	1A2	100	1A2	100	0	
				1B2	40	1B2	0	-40	
	1209-2	43.48298	-87.79640	1A2	100	1A2	100	0	
				1B2	40	1B2	40	0	
	1209-3	43.48377	-87.79580	1A2	0	1A2	50	50	
				1B2	100	1B2	100	0	
	1209-4	43.48473	-87.79550	1A2	50	1A2	50	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1B2	50	1B2	50	0	state park boundaru
				7	50	7	50	0	
	1209-5	43.48557	-87.79510	7	100	7	100	0	
	1209-6	43.48649	-87.79450	7	100	7	100	0	
	1209-7	43.48725	-87.79400	7	100	7	100	0	
	1209-8	43.48783	-87.79340	7	100	7	100	0	
	1209-9	43.48875	-87.79280	7	100	7	100	0	
	1209-10	43.48959	-87.79280	7	100	7	100	0	

<b>1210</b>	1210-1	43.49039	-87.79250	7	100	7	100	0	
	1210-2	43.49131	-87.79210	7	100	7	100	0	
	1210-3	43.49210	-87.79170	7	100	7	100	0	
	1210-4	43.49281	-87.79100	7	100	7	100	0	
	1210-5	43.49319	-87.79150	7	100	7	100	0	
	1210-6	43.49398	-87.79170	7	100	7	100	0	
	1210-7	43.49491	-87.79210	7	100	7	100	0	
	1210-8	43.49578	-87.79250	7	100	7	100	0	
	1210-9	43.49654	-87.79300	7	100	7	100	0	
	1210-10	43.49746	-87.79320	7	100	7	100	0	

<b>1211</b>	1211-1	43.49834	-87.79320	7	100	7	100	0	
	1211-2	43.49926	-87.79340	7	100	7	100	0	
	1211-3	43.50006	-87.79380	1A3	55	1A3	0	-55	
				1A4	0	1A4	55	55	
				7	45	7	45	0	
	1211-4	43.50077	-87.79380	1A4	0	1A4	100	100	
				7	100	7	0	-100	
	1211-5	43.50168	-87.79400	1A4	0	1A4	25	25	
				7	100	7	75	-25	
	1211-6	43.50258	-87.79380	1A4	0	1A4	75	75	
				7	100	7	25	-75	
	1211-7	43.50335	-87.79360	7	100	7	100	0	
	1211-8	43.50424	-87.79360	7	100	7	100	0	
	1211-9	43.50514	-87.79360	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1211-10	43.50604	-87.79360	7	100	7	100	0	
1212	1212-1	43.50700	-87.79350	7	100	7	100	0	
	1212-2	43.50777	-87.79350	7	100	7	100	0	
	1212-3	43.50860	-87.79360	7	100	7	100	0	
	1212-4	43.50956	-87.79360	1A3	40	1A3	40	0	
				7	60	7	60	0	
	1212-5	43.51046	-87.79360	1A3	100	1A3	100	0	
	1212-6	43.51149	-87.79380	1A2	40	1A2	40	0	
				7	60	7	60	0	
	1212-7	43.51245	-87.79400	7	100	7	100	0	
	1212-8	43.51341	-87.79390	1B2	25	1B2	25	0	
				7	75	7	75	0	
	1212-9	43.51418	-87.79370	7	100	7	100	0	
	1212-10	43.51514	-87.79380	5A2	37	5A2	37	0	
				7	63	7	63	0	
1213	1213-1	43.51617	-87.79360	7	100	7	100	0	
	1213-2	43.51700	-87.79370	1B3	0	1B3	50	50	
				5A3	0	5A3	50	50	
				7	100	7	0	-100	
	1213-3	43.51790	-87.79350	1A3	0	1A3	75	75	
				5A3	0	5A3	25	25	
				7	100	7	0	-100	
	1213-4	43.51873	-87.79350	1A3	0	1A3	25	25	
				5A3	0	5A3	75	75	
				7	100	7	0	-100	
	1213-5	43.51982	-87.79340	1B2	10	1B2	100	90	
				5A3	0	5A3	100	100	
				7	90	7	0	-90	
	1213-6	43.52066	-87.79340	1B2	100	1B2	100	0	
				5A3	50	5A3	100	50	
	1213-7	43.52149	-87.79340	7	100	7	100	0	
1213-8	43.52232	-87.79360	1A2	50	1A2	50	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				7	50	7	50	0	
	1213-9	43.52322	-87.79360	1B3	30	1B3	0	-30	
				7	70	7	100	30	
	1200-10	43.52405	-87.79360	1B3	25	1B3	0	-25	
				7	75	7	100	25	
<b>1214</b>	1214-1	43.52495	-87.79400	1B3	35	1B3	0	-35	
				7	65	7	100	35	
	1214-2	43.52598	-87.79400	1A2	0	1A2	25	25	
				1B3	35	1B3	0	-35	
				7	65	7	75	10	
	1214-3	43.52694	-87.79400	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1214-4	43.52784	-87.79390	7	100	7	100	0	
	1214-5	43.52867	-87.79380	1B2	45	1B2	45	0	
				5A3	0	5A3	100	100	
				5A4	25	5A4	0	-25	
				7	30	7	0	-30	
	1214-6	43.52957	-87.79380	5A3	0	5A3	100	100	
				5A4	100	5A4	0	-100	
	1214-7	43.53053	-87.79350	1A2	0	1A2	25	25	
				1B2	0	1B2	25	25	
				5A4	100	5A4	0	-100	
				7	0	7	50	50	
	1214-8	43.53123	-87.79340	5A4	100	5A4	0	-100	
				7	0	7	100	100	
	1214-9	43.53216	-87.79310	1B2	100	1B2	100	0	
	1214-10	43.53302	-87.79300	5A3	100	5A3	100	0	
<b>1215</b>	1215-1	43.53388	-87.79270	1A3	100	1A3	100	0	
	1215-2	43.53477	-87.79250	1A3	100	1A3	100	0	
	1215-3	43.53571	-87.79220	1A3	0	1A3	100	100	
				5A3	100	5A3	0	-100	
	1215-4	43.53657	-87.79210	1A3	40	1A3	25	-15	
				5A3	60	5A3	75	15	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1215-5	43.53739	-87.79190	1A3	100	1A3	100	0	
	1215-6	43.53832	-87.79160	1A3	0	1A3	65	65	
				5A3	65	5A3	0	-65	
				7	35	7	35	0	
	1215-7	43.53922	-87.79170	5A3	35	5A3	35	0	
				7	65	7	65	0	
	1215-8	43.54015	-87.79150	7	100	7	100	0	
	1215-9	43.54101	-87.79150	7	100	7	100	0	
	1215-10	43.54180	-87.79120	1A3	0	1A3	75	75	
				7	100	7	25	-75	

**End Ozaukee County - Start Sheboygan County**

<b>1216</b>	1216-1	43.54287	-87.79110	7	100	7	100	0	
	1216-2	43.54369	-87.79140	7	100	7	100	0	County Line (Ozaukee & Sheboygan)
	1216-3	43.54469	-87.79150	1B2	65	1B2	20	-45	
				7	35	7	80	45	
	1216-4	43.54552	-87.79200	1B2	20	1B2	100	80	
				7	80	7	0	-80	
	1216-5	43.54641	-87.79210	1B2	0	1B2	30	30	
				7	100	7	70	-30	
	1216-6	43.54720	-87.79240	7	100	7	100	0	
	1216-7	43.54824	-87.79280	1B3	65	1B3	0	-65	
				7	35	7	100	65	
	1216-8	43.54913	-87.79300	1A2	0	1A2	45	45	
				5A3	0	5A3	15	15	
				7	100	7	40	-60	
	1216-9	43.54996	-87.79300	1B3	55	1B3	60	5	
				5A3	0	5A3	40	40	
				7	45	7	0	-45	
	1216-10	43.55088	-87.79300	1B3	50	1B3	0	-50	
				7	50	7	100	50	

<b>1217</b>	1217-1	43.55178	-87.79290	7	100	7	100	0	
	1217-2	43.55254	-87.79280	7	100	7	100	0	
	1217-3	43.55350	-87.79270	7	100	7	100	0	
	1217-4	43.55432	-87.79250	7	100	7	100	0	
	1217-5	43.55509	-87.79250	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1217-6	43.55620	-87.79210	7	100	7	100	0	
	1217-7	43.55704	-87.79190	7	100	7	100	0	
	1217-8	43.55788	-87.79180	7	100	7	100	0	Amsterdam Park & boat launch
	1217-9	43.55878	-87.79150	7	100	7	100	0	
	1217-10	43.55969	-87.79150	7	100	7	100	0	

<b>1218</b>	1218-1	43.56053	-87.79130	1A2	65	1A2	65	0	
				7	35	7	35	0	
	1218-2	43.56137	-87.79070	7	100	7	100	0	
	1218-3	43.56248	-87.79050	7	100	7	100	0	
	1218-4	43.56318	-87.79010	7	100	7	100	0	
	1218-5	43.56422	-87.78970	1A2	35	1A2	35	0	
				7	65	7	65	0	
	1218-6	43.56492	-87.78930	7	100	7	100	0	
	1218-7	43.56569	-87.78880	7	100	7	100	0	
	1218-8	43.56646	-87.78860	7	100	7	100	0	
1218-9	43.56736	-87.78820	5A4	65	5A4	65	0		
			7	35	7	35	0		
1218-10	43.56827	-87.78770	5A4	40	5A4	100	60		
			7	60	7	0	-60		

<b>1219</b>	1219-1	43.56904	-87.78720	1B3	50	1B3	0	-50	
				5A2	0	5A2	100	100	
				5A3	50	5A3	0	-50	
1219-2	43.57001	-87.78670	1B3	10	1B3	0	-10		
			5A2	0	5A2	100	100		
			5A3	90	5A3	0	-90		
1219-3	43.57071	-87.78610	1B3	15	1B3	0	-15		
			5A2	0	5A2	100	100		
			7	85	7	0	-85		
1219-4	43.57169	-87.78580	5A2	0	5A2	100	100		
			7	100	7	0	-100		
1219-5	43.57260	-87.78500	5A2	0	5A2	30	30		
			7	100	7	70	-30		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1219-6	43.57330	-87.78450	1A2	0	1A2	10	10	
				7	100	7	90	-10	
	1219-7	43.57399	-87.78390	1A2	0	1A2	35	35	
				7	100	7	65	-35	
	1219-8	43.57483	-87.78330	1A3	0	1A3	25	25	
				1B2	80	1B2	0	-80	
				7	20	7	75	55	
	1219-9	43.57556	-87.78290	1A2	0	1A2	25	25	
				1B2	30	1B2	0	-30	
				1B3	25	1B3	35	10	
				7	45	7	40	-5	
	1219-10	43.57629	-87.78220	1A2	0	1A2	100	100	
				1B3	25	1B3	0	-25	
				7	75	7	0	-75	

<b>1220</b>	1220-1	43.57724	-87.78170	5A4	100	5A4	100	0	
	1220-2	43.57806	-87.78110	5A4	100	5A4	100	0	
	1220-3	43.57882	-87.78050	5A4	100	5A4	100	0	
	1220-4	43.57962	-87.78000	1A2	70	1A2	0	-70	
				1A3	0	1A3	70	70	
				5A4	30	5A4	30	0	
	1220-5	43.58047	-87.77940	5A4	100	5A4	100	0	
	1220-6	43.58133	-87.77890	5A4	100	5A4	100	0	
	1220-7	43.58200	-87.77830	5A4	100	5A4	100	0	
	1220-8	43.58286	-87.77780	5A4	100	5A4	100	0	
	1220-9	43.58365	-87.77730	1A2	0	1A2	50	50	
				1B2	50	1B2	50	0	
				5A4	50	5A4	50	0	
	1220-10	43.58432	-87.77690	5A4	100	5A4	100	0	

<b>1221</b>	1221-1	43.58515	-87.77640	7	100	7	100	0	
	1221-2	43.58609	-87.77580	7	100	7	100	0	
	1221-3	43.58698	-87.77500	7	100	7	100	0	
	1221-4	43.58765	-87.77450	1B3	30	1B3	0	-30	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				5A3	10	5A3	100	90	
				7	60	7	0	-60	
	1221-5	43.58839	-87.77400	5A3	60	5A3	60	0	
				7	40	7	40	0	
	1221-6	43.58921	-87.77350	1A1	0	1A1	15	15	
				1B2	0	1B2	15	15	
				7	100	7	70	-30	
	1221-7	43.59013	-87.77280	5A3	30	5A3	30	0	
				7	70	7	70	0	
	1221-8	43.59083	-87.77230	1A2	0	1A2	50	50	
				5A3	25	5A3	0	-25	
				7	75	7	50	-25	
	1221-9	43.59150	-87.77170	1A2	0	1A2	100	100	
				5A4	65	5A4	0	-65	
				7	35	7	0	-35	
	1221-10	43.59248	-87.77120	5A4	100	5A4	100	0	
<b>1222</b>	1222-1	43.59330	-87.77060	1A2	0	1A2	60	60	
				1B3	60	1B3	0	-60	
				7	40	7	40	0	
	1222-2	43.59401	-87.76990	1A3	60	1A3	60	0	
				7	40	7	40	0	
	1222-3	43.59474	-87.76920	7	100	7	100	0	
	1222-4	43.59548	-87.76850	1B3	35	1B3	35	0	
				7	65	7	65	0	
	1222-5	43.59621	-87.76780	1A2	0	1A2	75	75	
				1B3	75	1B3	0	-75	
				1B4	0	1B4	75	75	
				7	25	7	25	0	
	1222-6	43.59703	-87.76730	1A2	0	1A2	35	35	
				7	100	7	65	-35	
	1222-7	43.59791	-87.76660	1A2	0	1A2	25	25	
				7	100	7	75	-25	
	1222-8	43.59860	-87.76610	1B3	60	1B3	60	0	
				7	40	7	40	0	
	1222-9	43.59945	-87.76560	1B3	35	1B3	35	0	
				7	65	7	65	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1222-10	43.60030	-87.76500	7	100	7	100 1075	0	
<b>1223</b>	1223-1	43.60112	-87.76450	1A2	0	1A2	30	30	
				7	100	7	70	-30	
	1223-2	43.60194	-87.76400	1A2	0	1A2	40	40	
				1B3	35	1B3	0	-35	
				7	65	7	60	-5	
	1223-3	43.60286	-87.76340	1A2	0	1A2	25	25	
				7	100	7	75	-25	
	1223-4	43.60358	-87.76280	7	100	7	100	0	
	1223-5	43.60424	-87.76220	1A2	0	1A2	35	35	
				5B3	35	5B3	0	-35	
				7	65	7	65	0	
	1223-6	43.60509	-87.76160	7	100	7	100	0	
	1223-7	43.60595	-87.76090	1B3	0	1B3	10	10	
				7	100	7	90	-10	
	1223-8	43.60680	-87.76050	1B3	0	1B3	25	25	
				7	100	7	75	-25	
	1223-9	43.60749	-87.75980	7	100	7	100	0	
	1223-10	43.60821	-87.75910	7	100	7	100	0	
<b>1224</b>	1224-1	43.60916	-87.75840	1B2	35	1B2	35	0	
				5A3	25	5A3	0	-25	
				7	45	7	65	20	
	1224-2	43.60995	-87.75800	7	100	7	65	-35	
						1A2	35	35	
	1224-3	43.61061	-87.75730	7	100	7	100	0	
	1224-4	43.61143	-87.75680	7	100	7	100	0	
	1224-5	43.61203	-87.75600	7	100	7	100	0	
	1224-6	43.61278	-87.75550	1B2	85	1B2	10	-75	
				7	15	7	90	75	
	1224-7	43.61354	-87.75480	1A2	50	1A2	85	35	
				1B2	50	1B2	15	-35	
	1224-8	43.61436	-87.75420	1A2	100	1A2	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1224-9	43.61505	-87.75360	1B2	0	1B2	25	25	
				7	100	7	75	-25	
	1224-10	43.61580	-87.75290	1A2	25	1A2	25	0	
				5A2	40	5A2	40	0	
				7	35	7	35	0	
<b>1225</b>	1225-1	43.61647	-87.75210	1A2	100	1A2	100	0	
	1225-2	43.61717	-87.75150	1A2	100	1A2	100	0	
	1225-3	43.61784	-87.75100	1A2	100	1A2	100	0	
	1225-4	43.61841	-87.75040	1A2	100	1A2	100	0	
	1225-5	43.61928	-87.74980	1A2	75	1A2	75	0	
				7	25	7	25	0	
	1225-6	43.61992	-87.74940	1A2	100	1A2	100	0	
	1225-7	43.62052	-87.74880	1A2	100	1A2	100	0	
	1225-8	43.62126	-87.74820	1A2	100	1A2	100	0	
	1225-9	43.62196	-87.74760	1A2	100	1A2	100	0	
	1225-10	43.62260	-87.74710	1A2	40	1A2	40	0	
				7	60	7	60	0	
<b>1226</b>	1226-1	43.62354	-87.74640	1A2	50	1A2	50	0	
				7	50	7	50	0	
	1226-2	43.62418	-87.74580	1A2	55	1A2	100	45	
				1A3	45	1A3	0	-45	
	1226-3	43.62505	-87.74510	1A3	100	1A2	100	0	
	1226-4	43.62592	-87.74460	1A3	100	1A3	100	0	
	1226-5	43.62663	-87.74390	1A3	50	1A3	50	0	
				1B3	0	1B3	50	50	
				7	50	7	0	-50	
	1226-6	43.62746	-87.74340	1A2	0	1A2	85	85	
				1A3	85	1A3	0	-85	
				7	15	7	15	0	
	1226-7	43.62827	-87.74270	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1226-8	43.62901	-87.74200	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1226-9	43.62981	-87.74150	1A3	100	1A3	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1226-10	43.63058	-87.74090	1A2	25	1A2	25	0	
				7	75	7	75	0	
<b>1227</b>	1227-1	43.63139	-87.74030	1A2	15	1A2	100	85	
				1A3	85	1A3	0	-85	
	1227-2	43.63212	-87.73970	1A2	40	1A2	60	20	
				1A3	0	1A3	40	40	
				7	60	7	0	-60	
	1227-3	43.63289	-87.73910	1A2	40	1A2	100	60	
				1A3	35	1A3	0	-35	
				7	25	7	0	-25	
	1227-4	43.63380	-87.73860	7	100	7	0	-100	
				1A3	0	1A3	100	100	
	1227-5	43.63454	-87.73790	7	100	7	0	-100	
				1A3	0	1A3	100	100	
	1227-6	43.63524	-87.73730	7	100	7	70	-30	
				1A3	0	1A3	30	30	
	1227-7	43.63608	-87.73670	1A2	0	1A2	65	65	
				1A3	0	1A3	35	35	
				1B2	50	1B2	30	-20	
				7	50	7	0	-50	
	1227-8	43.63691	-87.73590	7	100	7	100	0	
	1227-9	43.63756	-87.73540	7	100	7	100	0	
	1227-10	43.63831	-87.73490	1A2	100	1A2	100	0	
<b>1228</b>	1228-1	43.63926	-87.73420	1A2	30	1A2	30	0	
				5A3	70	5A3	0	-70	
				7	0	7	70	70	
	1228-2	43.63998	-87.73360	1B3	35	1B3	0	-35	
				5A3	65	5A3	0	-65	
				7	0	7	100	100	
	1228-3	43.64077	-87.73310	1B2	35	1B2	35	0	
				1B3	65	1B3	0	-65	
				7	0	7	65	65	
	1228-4	43.64158	-87.73250	5A4	0	5A4	100	100	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				7	100	7	0	-100	
	1228-5	43.64243	-87.73190	5A4	0	5A4	50	50	
				7	100	7	50	-50	
	1228-6	43.64322	-87.73130	7	100	7	100	0	
	1228-7	43.64410	-87.73070	7	100	7	100	0	
	1228-8	43.64486	-87.73010	7	100	7	100	0	
	1228-9	43.64558	-87.72960	7	100	7	100	0	
	1228-10	43.64646	-87.72890	7	100	7	100	0	

<b>1229</b>	1229-1	43.64724	-87.72830	7	100	7	100	0	Terry Andrae State Park
	1229-2	43.64809	-87.72790	7	100	7	100	0	
	1229-3	43.64891	-87.72740	7	100	7	100	0	
	1229-4	43.64973	-87.72680	7	100	7	100	0	
	1229-5	43.65068	-87.72630	7	100	7	100	0	
	1229-6	43.65143	-87.72580	7	100	7	100	0	
	1229-7	43.65231	-87.72520	7	100	7	100	0	
	1229-8	43.65306	-87.72470	7	100	7	100	0	
	1229-9	43.65382	-87.72420	7	100	7	100	0	
	1229-10	43.65464	-87.72380	7	100	7	100	0	

<b>1230</b>	1230-1	43.65549	-87.72330	7	100	7	100	0	Terry Andrae State Park
	1230-2	43.65621	-87.72270	7	100	7	100	0	
	1230-3	43.65699	-87.72220	7	100	7	100	0	
	1230-4	43.65788	-87.72180	7	100	7	100	0	
	1230-5	43.65863	-87.72120	7	100	7	100	0	
	1230-6	43.65947	-87.72060	7	100	7	100	0	
	1230-7	43.66026	-87.72010	7	100	7	100	0	
	1230-8	43.66110	-87.71950	7	100	7	100	0	
	1230-9	43.66195	-87.71890	7	100	7	100	0	
	1200-10	43.66263	-87.71840	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1231	1231-1	43.66351	-87.71800	7	100	7	100	0	
	1231-2	43.66436	-87.71740	7	100	7	100	0	
	1231-3	43.66534	-87.71690	7	100	7	100	0	
	1231-4	43.66595	-87.71640	7	100	7	100	0	
	1231-5	43.66687	-87.71590	7	100	7	100	0	
	1231-6	43.66778	-87.71520	7	100	7	100	0	
	1231-7	43.66856	-87.71460	7	100	7	100	0	
	1231-8	43.66937	-87.71420	7	100	7	100	0	
	1231-9	43.67009	-87.71350	7	100	7	100	0	
	1231-10	43.67087	-87.71300	7	100	7	100	0	

1232	1232-1	43.67169	-87.71240	7	100	7	100	0	
	1232-2	43.67244	-87.71170	7	100	7	100	0	
	1232-3	43.67325	-87.71110	7	100	7	100	0	
	1232-4	43.67400	-87.71040	7	100	7	100	0	Camp Taswood
	1232-5	43.67485	-87.70970	7	100	7	100	0	
	1232-6	43.67566	-87.70920	7	100	7	100	0	
	1232-7	43.67648	-87.70860	7	100	7	100	0	
	1232-8	43.67716	-87.70790	7	100	7	100	0	
	1232-9	43.67805	-87.70730	7	100	7	100	0	
	1232-10	43.67888	-87.70670	7	100	7	100	0	

1233	1233-1	43.67971	-87.70620	7	100	7	100	0	
	1233-2	43.68054	-87.70570	7	100	7	100	0	
	1233-3	43.68127	-87.70530	7	100	7	100	0	
	1233-4	43.68217	-87.70470	7	100	7	100	0	
	1233-5	43.68300	-87.70430	7	100	7	100	0	
	1233-6	43.68383	-87.70370	7	100	7	100	0	
	1233-7	43.68476	-87.70350	7	100	7	100	0	
	1233-8	43.68565	-87.70320	7	100	7	100	0	
	1233-9	43.68652	-87.70320	7	100	7	100	0	
	1233-10	43.68748	-87.70300	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1234	1234-1	43.68841	-87.70290	1A2	0	1A2	80	80	
				1B2	20	1B2	20	0	
				7	80	7	0	-80	
	1234-2	43.68937	-87.70290	1A2	0	1A2	50	50	
				1B2	25	1B2	25	0	
				7	75	7	50	-25	
	1234-3	43.69037	-87.70280	1A3	25	1A3	75	50	
				1B2	0	1B2	25	25	
				7	75	7	0	-75	
	1234-4	43.69127	-87.70270	1A3	10	1A3	60	50	Black River Point
7				90	7	40	-50		
1234-5	43.69206	-87.70280	1A2	0	1A2	40	40		
			1A3	0	1A3	60	60		
			7	100	7	0	-100		
1234-6	43.69292	-87.70290	1A2	0	1A2	100	100		
			7	100	7	0	-100		
1234-7	43.69379	-87.70310	1A2	0	1A2	100	100		
			1A3	10	1A3	0	-10		
			7	90	7	0	-90		
1234-8	43.69462	-87.70330	1A2	0	1A2	100	100		
			1A3	30	1A3	0	-30		
			7	70	7	0	-70		
1234-9	43.69561	-87.70340	1A3	0	1A3	100	100		
			7	100	7	0	-100		
1234-10	43.69651	-87.70370	1A3	0	1A3	100	100		
			7	100	7	0	-100		
1235	1235-1	43.69744	-87.70380	7	100	7	100	0	
	1235-2	43.69830	-87.70370	7	100	7	100	0	
	1235-3	43.69921	-87.70350	7	100	7	100	0	
	1235-4	43.70018	-87.70330	7	100	7	100	0	
	1235-5	43.70090	-87.70300	7	100	7	100	0	
	1235-6	43.70190	-87.70290	1A2	0	1A2	40	40	
				1B2	60	1B2	60	0	
7				40	7	40	0		
1235-7	43.70274	-87.70290	1A3	0	1A3	60	60		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1A4	60	1A4	0	-60	
				7	40	7	40	0	
	1235-8	43.70374	-87.70290	1A2	20	1A2	20	0	
				1A4	80	1A4	0	-80	
				1B2	20	1B2	20	0	
				7	0	7	80	80	
	1235-9	43.70457	-87.70280	1A2	100	1A2	100	0	
				1B2	100	1B2	100	0	
	1235-10	43.70550	-87.70290	1A2	100	1A2	100	0	
				1B2	100	1B2	100	0	

<b>1236</b>	1236-1	43.70647	-87.70290	7	100	7	100	0	
	1236-2	43.70726	-87.70290	1A1	100	1A1	100	0	mouth of creek
	1236-3	43.70830	-87.70300	1A1	100	1A1	100	0	
	1236-4	43.70927	-87.70300	1A1	100	1A1	100	0	
	1236-5	43.71003	-87.70310	1A1	100	1A1	100	0	
	1236-6	43.71093	-87.70350	1A1	100	1A1	100	0	
	1236-7	43.71183	-87.70370	1A1	100	1A1	100	0	
	1236-8	43.71286	-87.70400	1A1	100	1A1	100	0	
	1236-9	43.71376	-87.70410	1A1	100	1A1	100	0	
	1236-10	43.71452	-87.70440	1A1	100	1A1	100	0	

<b>1237</b>	1237-1	43.71546	-87.70460	1A1	100	1A1	100	0	
	1237-2	43.71635	-87.70480	1A1	100	1A1	100	0	
	1237-3	43.71719	-87.70500	1A1	100	1A1	100	0	
	1237-4	43.71801	-87.70540	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-5	43.71888	-87.70570	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-6	43.71964	-87.70600	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-7	43.72047	-87.70640	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-8	43.72130	-87.70670	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-9	43.72213	-87.70710	1A1	0	1A1	100	100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1237-10	43.72292	-87.70750	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
<b>1238</b>	1238-1	43.72379	-87.70780	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1238-2	43.72468	-87.70790	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1238-3	43.72558	-87.70820	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1238-4	43.72648	-87.70840	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	
	1238-5	43.72738	-87.70850	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
				2A1	100	2A1	0	-100	
				2A3	0	2A3	100	100	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1238-6	43.72820	-87.70870	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
	1238-7	43.72913	-87.70880	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
	1238-8	43.73000	-87.70900	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
	1238-9	43.73086	-87.70920	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	
	1238-10	43.73172	-87.70940	1A1	0	1A1	100	100	
				1A2	100	1A2	0	-100	

<b>1239</b>	1239-1	43.73269	-87.70930	1A1	100	1A1	100	0	
	1239-2	43.73359	-87.70920	1A1	100	1A1	100	0	
	1239-3	43.73449	-87.70910	1A1	35	1A1	35	0	
				7	65	7	65	0	
	1239-4	43.73528	-87.70900	7	100	7	100	0	
	1239-5	43.73614	-87.70880	7	100	7	100	0	
	1239-6	43.73697	-87.70870	7	100	7	100	0	
	1239-7	43.73783	-87.70860	1A1	40	1A1	40	0	
				7	60	7	60	0	
	1239-8	43.73880	-87.70830	1A1	100	1A1	100	0	
	1239-9	43.73956	-87.70830	7	100	7	100	0	
	1239-10	43.74059	-87.70820	7	100	7	100	0	

<b>1240</b>	1240-1	43.74142	-87.70780	7	100	7	100	0	City of Sheboygan
	1240-2	43.74222	-87.70710	7	100	7	100	0	
	1240-3	43.74313	-87.70650	7	100	7	100	0	
	1240-4	43.74384	-87.70590	1A1	100	1A1	100	0	1A1 burried with sand in 1992
	1240-5	43.74459	-87.70530	1A1	100	1A1	100	0	
	1240-6	43.74556	-87.70460	1A1	100	1A1	100	0	
	1240-7	43.74632	-87.70420	1A1	100	1A1	100	0	1A1 burried with sand in 1992
	1240-8	43.74710	-87.70350	1A1	100	1A1	100	0	
	1240-9	43.74792	-87.70290	1A1	100	1A1	100	0	1A1 burried with sand in 1992
	1240-10	43.74857	-87.70270	2B1	100	2B1	100	0	offshore length = 700 meters

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1241	1241-1	43.74861	-87.70390	1B1	100	1B1	100	0	reach is within the mouth of the Sheboygan
	1241-2	43.74850	-87.70510	1B1	100	1B1	100	0	
	1241-3	43.74839	-87.70640	1B1	100	1B1	100	0	
	1241-4	43.74818	-87.70760	1B1	100	1B1	100	0	
	1241-5	43.74800	-87.70900	1B1	100	1B1	100	0	
	1241-6	43.74735	-87.70990	1B1	100	1B1	100	0	
	1241-7	43.74653	-87.71010	1B1	100	1B1	100	0	
	1241-8	43.74556	-87.71050	1B1	100	1B1	100	0	
	1241-9	43.74485	-87.71120	1B1	100	1B1	100	0	
	1241-10	43.74438	-87.71250	1B1	100	1B1	100	0	
1242	1242-1	43.74427	-87.71340	1B1	100	1B1	100	0	reach is within the mouth of the Sheboygan
	1242-2	43.74434	-87.71430	1B1	100	1B1	100	0	
	1242-3	43.74506	-87.71510	1B1	100	1B1	100	0	
	1242-4	43.74549	-87.71550	1B1	100	1B1	100	0	
	1242-5	43.74628	-87.71590	1B1	100	1B1	100	0	
	1242-6	43.74689	-87.71620	1B1	100	1B1	100	0	
	1242-7	43.74760	-87.71650	1B1	100	1B1	100	0	
	1242-8	43.74832	-87.71680	1B1	100	1B1	100	0	
	1242-9	43.74897	-87.71710	1B1	100	1B1	100	0	
	1242-10	43.74961	-87.71720	1B1	100	1B1	100	0	
1243	1243-1	43.74918	-87.71640	1B1	100	1B1	100	0	reach is within the mouth of the Sheboygan
	1243-2	43.74814	-87.71610	1B1	100	1B1	100	0	
	1243-3	43.74714	-87.71580	1B1	100	1B1	100	0	
	1243-4	43.74617	-87.71520	1B1	100	1B1	100	0	
	1243-5	43.74531	-87.71450	1B1	100	1B1	100	0	
	1243-6	43.74467	-87.71340	1B1	100	1B1	100	0	
	1243-7	43.74474	-87.71210	1B1	100	1B1	100	0	
	1243-8	43.74542	-87.71100	1B1	100	1B1	100	0	
	1243-9	43.74642	-87.71060	1B1	100	1B1	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1243-10	43.74735	-87.71030	1B1	100	1B1	100	0	
<b>1244</b>	1244-1	43.74814	-87.70950	1A3	100	1A3	0	-100	reach is within the mouth of the Sheboygan
				1B1	0	1B1	100	100	up to sub-reach 6
	1244-2	43.74875	-87.70870	1A3	100	1A3	0	-100	
				1B1	0	1B1	100	100	
	1244-3	43.74903	-87.70770	1A3	100	1A3	15	-85	
				1B1	0	1B1	85	85	
	1244-4	43.74903	-87.70650	1A3	50	1A3	65	15	
				1B1	0	1B1	35	35	
				1B2	50	1B2	0	-50	
	1244-5	43.74903	-87.70540	1B2	100	1B2	100	0	
	1244-6	43.74911	-87.70430	1B2	100	1B2	100	0	
	1244-7	43.74915	-87.70300	1A1	50	1A1	50	0	
				1B2	50	1B2	50	0	
	1244-8	43.74972	-87.70240	1A1	100	1A1	100	0	boat dock
	1244-9	43.75050	-87.70220	1A1	100	1A1	100	0	
	1244-10	43.75126	-87.70280	1A1	100	1A1	100	0	boat ramp
<b>1245</b>	1245-1	43.75204	-87.70250	1A1	100	1A1	100	0	
	1245-2	43.75276	-87.70180	1A1	65	1A1	0	-65	
				2C1	0	2C1	100	100	
				5A3	35	5A3	0	-35	
	1245-3	43.75348	-87.70090	2C1	0	2C1	100	100	
				5A3	100	5A3	0	-100	
	1245-4	43.75420	-87.70020	2B1	65	2B1	50	-15	
				2C1	0	2C1	50	50	
				5A3	35	5A3	0	-35	
	1245-5	43.75491	-87.70070	2B1	100	2B1	100	0	offshore length = 970 meters
	1245-6	43.75552	-87.70140	2B1	50	2B1	50	0	
				7	50	7	50	0	
	1245-7	43.75620	-87.70200	7	100	7	100	0	
	1245-8	43.75710	-87.70210	7	100	7	100	0	
	1245-9	43.75806	-87.70220	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1245-10	43.75911	-87.70230	1A1	0	1A1	100	100	
				7	100	7	0	-100	
<b>1246</b>	1246-1	43.75986	-87.70200	1A1	0	1A1	100	100	
				2A1	100	2A1	0	-100	
				2A2	0	2A2	100	100	
	1246-2	43.76054	-87.70120	1A1	0	1A1	100	100	
				2A1	100	2A1	0	-100	
				2A2	0	2A2	100	100	
	1246-3	43.76122	-87.70030	1A1	0	1A1	100	100	
				2A1	100	2A1	0	-100	
				2A2	0	2A2	100	100	
	1246-4	43.76172	-87.69930	1A1	0	1A1	100	100	
				2A1	100	2A1	0	-100	
				2A2	0	2A2	100	100	
	1246-5	43.76204	-87.69800	1A1	100	1A1	100	0	
	1246-6	43.76236	-87.69690	1A1	100	1A1	100	0	
	1246-7	43.76301	-87.69600	1A1	100	1A1	100	0	
	1246-8	43.76401	-87.69550	1A1	100	1A1	100	0	
	1246-9	43.76495	-87.69580	1A1	100	1A1	100	0	
	1246-10	43.76563	-87.69610	1A1	100	1A1	100	0	
<b>1247</b>	1247-1	43.76523	-87.69730	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1247-2	43.76543	-87.69850	7	100	7	100	0	
	1247-3	43.76611	-87.69900	1A2	100	1A2	100	0	
				2A2	25	2A2	0	-25	
				2A3	0	2A3	25	25	
	1247-4	43.76688	-87.69970	1A2	100	1A2	100	0	
				2A2	100	2A2	0	-100	
				2A3	0	2A3	100	100	
	1247-5	43.76752	-87.70050	1A2	100	1A2	100	0	
				2A2	100	2A2	0	-100	
				2A3	0	2A3	100	100	
	1247-6	43.76805	-87.70140	1A2	100	1A2	50	-50	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				2A2	50	2A2	0	-50	
				2A3	0	2A3	50	50	
				7	0	7	50	50	
	1247-7	43.76897	-87.70210	1A2	100	1A2	40	-60	
				7	0	7	60	60	
	1247-8	43.76957	-87.70270	1A2	100	1A2	65	-35	
				7	0	7	35	35	
	1247-9	43.77030	-87.70330	1A2	100	1A2	0	-100	
				1A3	0	1A3	20	20	
				7	0	7	80	80	
	1247-10	43.77110	-87.70380	1A2	100	1A2	0	-100	
				1A3	0	1A3	100	100	
<b>1248</b>	1248-1	43.77203	-87.70440	1A2	0	1A2	30	30	
				1A3	100	1A3	70	-30	
	1248-2	43.77275	-87.70490	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1248-3	43.77360	-87.70540	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1248-4	43.77444	-87.70590	1A3	100	1A3	100	0	
	1248-5	43.77533	-87.70630	1A3	100	1A3	100	0	
	1248-6	43.77626	-87.70660	1A2	0	1A2	25	25	
				1A3	100	1A3	0	-100	
				7	0	7	75	75	
	1248-7	43.77702	-87.70700	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1248-8	43.77787	-87.70730	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1248-9	43.77879	-87.70780	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1248-10	43.77948	-87.70820	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
<b>1249</b>	1249-1	43.78056	-87.70860	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1249-2	43.78133	-87.70900	1A2	0	1A2	100	100	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1A3	100	1A3	0	-100	
	1249-3	43.78217	-87.70960	1A2	0	1A2	100	100	
				1A3	100	1A3	0	-100	
	1249-4	43.78314	-87.71000	1A2	0	1A2	50	50	
				1A3	50	1A3	0	-50	
				7	50	7	50	0	
	1249-5	43.78391	-87.71040	1A2	0	1A2	20	20	
				7	100	7	80	-20	
	1249-6	43.78475	-87.71100	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1249-7	43.78563	-87.71140	1A2	0	1A2	85	85	
				1B2	0	1B2	15	15	
				5A2	0	5A2	15	15	
				7	100	7	0	-100	
	1249-8	43.78652	-87.71200	1B2	0	1B2	70	70	
				5A2	0	5A2	70	70	
				7	100	7	30	-70	
	1249-9	43.78728	-87.71250	7	100	7	100	0	
	1249-10	43.78817	-87.71280	5A4	100	5A4	0	-100	
				7	0	7	100	100	

<b>1250</b>	1250-1	43.78893	-87.71340	7	100	7	100	0	
	1250-2	43.78979	-87.71400	7	100	7	100	0	
	1250-3	43.79054	-87.71460	7	100	7	100	0	
	1250-4	43.79129	-87.71520	7	100	7	100	0	
	1250-5	43.79204	-87.71570	7	100	7	100	0	
	1250-6	43.79279	-87.71620	1A2	0	1A2	40	40	
				1A4	15	1A4	0	-15	
				7	85	7	60	-25	
	1250-7	43.79373	-87.71670	1A2	0	1A2	40	40	
				1A4	100	1A4	0	-100	
				7	0	7	60	60	
	1250-8	43.79462	-87.71720	7	100	7	100	0	
	1250-9	43.79537	-87.71750	7	100	7	100	0	
	1200-10	43.79636	-87.71800	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1251	1251-1	43.79715	-87.71850	7	100	7	100	0	
	1251-2	43.79800	-87.71910	7	100	7	100	0	
	1251-3	43.79865	-87.71940	7	100	7	100	0	
	1251-4	43.79964	-87.71990	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1251-5	43.80053	-87.72050	1A2	0	1A2	65	65	
				7	100	7	35	-65	
	1251-6	43.80138	-87.72100	7	100	7	100	0	
	1251-7	43.80227	-87.72150	7	100	7	100	0	
	1251-8	43.80306	-87.72210	1A2	0	1A2	65	65	
			1A3	70	1A3	0	-70		
			7	30	7	35	5		
1251-9	43.80377	-87.72250	7	100	7	100	0		
1251-10	43.80475	-87.72330	7	100	7	100	0		

1252	1252-1	43.80574	-87.72370	7	100	7	100	0	
	1252-2	43.80644	-87.72430	7	100	7	100	0	
	1252-3	43.80724	-87.72470	7	100	7	100	0	
	1252-4	43.80818	-87.72520	7	100	7	100	0	
	1252-5	43.80893	-87.72560	7	100	7	100	0	
	1252-6	43.80963	-87.72600	7	100	7	100	0	
	1252-7	43.81062	-87.72630	7	100	7	100	0	
	1252-8	43.81146	-87.72650	7	100	7	100	0	
	1252-9	43.81226	-87.72660	7	100	7	100	0	
	1252-10	43.81334	-87.72650	7	100	7	100	0	

1253	1253-1	43.81418	-87.72640	7	100	7	100	0	
	1253-2	43.81498	-87.72630	7	100	7	100	0	
	1253-3	43.81592	-87.72580	7	100	7	100	0	
	1253-4	43.81662	-87.72590	7	100	7	100	0	
	1253-5	43.81760	-87.72630	1A2	0	1A2	25	25	
				7	100	7	75	-25	
1253-6	43.81836	-87.72680	1A2	0	1A2	50	50		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				7	100	7	50	-50	
	1253-7	43.81915	-87.72730	7	100	7	100	0	
	1253-8	43.81998	-87.72770	7	100	7	100	0	
	1253-9	43.82082	-87.72810	7	100	7	100	0	
	1253-10	43.82167	-87.72840	7	100	7	100	0	
<b>1254</b>	1254-1	43.82251	-87.72840	7	100	7	100	0	
	1254-2	43.82347	-87.72840	7	100	7	100	0	
	1254-3	43.82425	-87.72840	7	100	7	100	0	
	1254-4	43.82515	-87.72830	7	100	7	100	0	
	1254-5	43.82600	-87.72840	7	100	7	100	0	
	1254-6	43.82701	-87.72860	7	100	7	100	0	
	1254-7	43.82768	-87.72870	7	100	7	100	0	
	1254-8	43.82869	-87.72910	7	100	7	100	0	
	1254-9	43.82948	-87.72920	7	100	7	100	0	
	1254-10	43.83038	-87.72920	7	100	7	100	0	
<b>1255</b>	1255-1	43.83117	-87.72930	7	100	7	100	0	
	1255-2	43.83218	-87.72940	7	100	7	100	0	
	1255-3	43.83308	-87.72940	7	100	7	100	0	
	1255-4	43.83403	-87.72950	7	100	7	100	0	
	1255-5	43.83488	-87.72950	7	100	7	100	0	
	1255-6	43.83578	-87.72950	7	100	7	100	0	
	1255-7	43.83679	-87.72950	7	100	7	100	0	
	1255-8	43.83769	-87.72940	7	100	7	100	0	
	1255-9	43.83853	-87.72940	7	100	7	100	0	
	1255-10	43.83960	-87.72910	7	100	7	100	0	
<b>1256</b>	1256-1	43.84033	-87.72890	7	100	7	100	0	
	1256-2	43.84129	-87.72880	7	100	7	100	0	
	1256-3	43.84207	-87.72850	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1256-4	43.84303	-87.72840	7	100	7	100	0	
	1256-5	43.84387	-87.72820	7	100	7	100	0	
	1256-6	43.84494	-87.72820	7	100	7	100	0	
	1256-7	43.84578	-87.72820	7	100	7	100	0	
	1256-8	43.84662	-87.72820	7	100	7	100	0	
	1256-9	43.84758	-87.72820	7	100	7	100	0	
	1256-10	43.84842	-87.72810	7	100	7	100	0	

<b>1257</b>	1257-1	43.84943	-87.72810	7	100	7	100	0	
	1257-2	43.85039	-87.72790	7	100	7	100	0	
	1257-3	43.85112	-87.72830	7	100	7	100	0	
	1257-4	43.85191	-87.72850	1A3	100	1A3	100	0	
	1257-5	43.85292	-87.72880	1A3	100	1A3	100	0	
	1257-6	43.85376	-87.72910	1A3	100	1A3	100	0	
	1257-7	43.85477	-87.72950	1A3	100	1A3	100	0	
	1257-8	43.85579	-87.72970	1A3	35	1A3	35	0	
				7	65	7	65	0	
	1257-9	43.85659	-87.72980	7	100	7	100	0	
	1257-10	43.85752	-87.73030	7	100	7	100	0	

<b>1258</b>	1258-1	43.85840	-87.73060	7	100	7	100	0	
	1258-2	43.85928	-87.73100	7	100	7	100	0	
	1258-3	43.86021	-87.73140	7	100	7	100	0	
	1258-4	43.86101	-87.73170	7	100	7	100	0	
	1258-5	43.86189	-87.73190	7	100	7	100	0	
	1258-6	43.86277	-87.73230	7	100	7	100	0	
	1258-7	43.86361	-87.73260	7	100	7	100	0	
	1258-8	43.86459	-87.73300	7	100	7	100	0	
	1258-9	43.86543	-87.73320	7	100	7	100	0	
	1258-10	43.86626	-87.73340	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1259	1259-1	43.86719	-87.73360	7	100	7	100	0	
	1259-2	43.86798	-87.73400	7	100	7	100	0	
	1259-3	43.86877	-87.73430	7	100	7	100	0	
	1259-4	43.86961	-87.73450	7	100	7	100	0	
	1259-5	43.87040	-87.73460	7	100	7	100	0	
	1259-6	43.87115	-87.73490	7	100	7	100	0	
	1259-7	43.87194	-87.73510	7	100	7	100	0	
	1259-8	43.87282	-87.73530	7	100	7	100	0	
	1259-9	43.87375	-87.73550	7	100	7	100	0	
	1259-10	43.87459	-87.73560	7	100	7	25	-75	
				5A2	0	5A2	75	75	
1260	1260-1	43.87547	-87.73560	5A2	0	5A2	50	50	
				7	100	7	50	-50	
	1260-2	43.87636	-87.73580	7	100	7	100	0	
	1260-3	43.87729	-87.73580	7	100	7	100	0	
	1260-4	43.87794	-87.73590	7	100	7	100	0	
	1260-5	43.87896	-87.73590	7	100	7	100	0	
	1260-6	43.87989	-87.73580	7	100	7	100	0	
	1260-7	43.88082	-87.73560	7	100	7	100	0	
	1260-8	43.88161	-87.73540	7	100	7	100	0	
	1260-9	43.88245	-87.73520	7	100	7	100	0	
1260-10	43.88338	-87.73490	7	100	7	100	0		
1261	1261-1	43.88417	-87.73440	7	100	7	100	0	
	1261-2	43.88506	-87.73390	7	100	7	100	0	
	1261-3	43.88603	-87.73360	7	100	7	100	0	
	1261-4	43.88682	-87.73340	7	100	7	100	0	
	1261-5	43.88773	-87.73300	7	100	7	100	0	
	1261-6	43.88861	-87.73270	7	100	7	100	0	
	1261-7	43.88948	-87.73250	7	100	7	100	0	
	1261-8	43.89040	-87.73210	7	100	7	100	0	
	1261-9	43.89123	-87.73180	7	100	7	100	0	
	1261-10	43.89211	-87.73150	7	100	7	100	0	0 end of Sheboygan county

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
<b>End Sheboygan County - Start Manitowoc County</b>									
<b>1262</b>	1262-1	43.89289	-87.73110	7	100	7	100	0	County Line (Sheboygan & Manitowoc)
	1262-2	43.89390	-87.73060	7	100	7	100	0	
	1262-3	43.89473	-87.73020	7	100	7	100	0	
	1262-4	43.89560	-87.72970	7	100	7	100	0	
	1262-5	43.89643	-87.72950	7	100	7	100	0	
	1262-6	43.89713	-87.72910	7	100	7	100	0	
	1262-7	43.89818	-87.72870	7	100	7	100	0	
	1262-8	43.89897	-87.72830	7	100	7	100	0	
	1262-9	43.89984	-87.72800	7	100	7	100	0	
	1262-10	43.90072	-87.72750	7	100	7	100	0	
<b>End Manitowoc County - Start Racine County</b>									
<b>1263</b>	1263-1	43.90150	-87.72720	7	100	7	100	0	
	1263-2	43.90238	-87.72670	7	100	7	100	0	
	1263-3	43.90334	-87.72660	7	100	7	100	0	
	1263-4	43.90417	-87.72640	7	100	7	100	0	
	1263-5	43.90517	-87.72620	7	100	7	100	0	
	1263-6	43.90609	-87.72620	7	100	7	100	0	
	1263-7	43.90714	-87.72610	7	100	7	100	0	
	1263-8	43.90789	-87.72600	7	100	7	100	0	
	1263-9	43.90880	-87.72590	7	100	7	100	0	
	1263-10	43.90981	-87.72600	7	100	7	100	0	
<b>End Racine County - Start Winnebago County</b>									
<b>1264</b>	1264-1	43.91055	-87.72570	7	100	7	100	0	
	1264-2	43.91160	-87.72560	7	100	7	100	0	
	1264-3	43.91235	-87.72510	7	100	7	100	0	
	1264-4	43.91322	-87.72470	7	100	7	100	0	
	1264-5	43.91409	-87.72420	7	100	7	100	0	
	1264-6	43.91488	-87.72400	1A3	0	1A3	15	15	
				1A4	15	1A4	0	-15	
			7	85	7	85	0		
1264-7	43.91574	-87.72370	1A3	0	1A3	30	30		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				1A4	30	1A4	0	-30	
				1B2	15	1B2	15	0	
				7	55	7	55	0	
	1264-8	43.91671	-87.72360	1A1	0	1A1	50	50	
				7	100	7	50	-50	
	1264-9	43.91753	-87.72350	7	100	7	100	0	
	1264-10	43.91839	-87.72350	1A2	50	1A2	50	0	
				7	50	7	50	0	
<b>1265</b>	1265-1	43.91931	-87.72340	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1265-2	43.92017	-87.72340	1A3	0	1A3	100	100	
				7	100	7	0	-100	
	1265-3	43.92104	-87.72310	1A3	0	1A3	100	100	
				7	100	7	0	-100	
	1265-4	43.92196	-87.72280	1A3	0	1A3	30	30	
				7	100	7	70	-30	
	1265-5	43.92287	-87.72250	1A3	0	1A3	40	40	
				7	100	7	60	-40	
	1265-6	43.92374	-87.72210	7	100	7	100	0	
	1265-7	43.92461	-87.72170	1A3	0	1A3	60	60	
				7	100	7	40	-60	
	1265-8	43.92542	-87.72150	7	100	7	100	0	
	1265-9	43.92629	-87.72120	7	100	7	100	0	
	1265-10	43.92720	-87.72110	7	100	7	100	0	
<b>1266</b>	1266-1	43.92812	-87.72090	7	100	7	100	0	Air photos missing
	1266-2	43.92904	-87.72080	7	100	7	100	0	Classified from Digital Orthos
	1266-3	43.92990	-87.72050	7	100	7	100	0	Shore Generally Unprotected
	1266-4	43.93082	-87.72040	7	100	7	100	0	
	1266-5	43.93178	-87.72000	7	100	7	100	0	
	1266-6	43.93269	-87.71990	7	100	7	100	0	
	1266-7	43.93366	-87.71970	7	100	7	100	0	
	1266-8	43.93448	-87.71940	7	100	7	100	0	
	1266-9	43.93534	-87.71930	5A4	0	5A4	100	100	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				7	100	7	0	-100	
	1266-10	43.93621	-87.71890	5A4	0	5A4	100	100	
				7	100	7	0	-100	
<b>1267</b>	1267-1	43.93708	-87.71880	7	100	7	100	0	Air photos missing
	1267-2	43.93794	-87.71860	1A2	0	1A2	100	100	Classified From Digital Orthos
				7	100	7	0	-100	
	1267-3	43.93895	-87.71820	7	100	7	100	0	
	1267-4	43.93987	-87.71790	7	100	7	100	0	
	1267-5	43.94064	-87.71750	7	100	7	100	0	
	1267-6	43.94146	-87.71710	7	100	7	100	0	
	1267-7	43.94242	-87.71660	1A2	0	1A2	25	25	
				7	100	7	75	-25	
	1267-8	43.94310	-87.71600	7	100	7	100	0	
	1267-9	43.94387	-87.71540	7	100	7	100	0	
	1267-10	43.94464	-87.71490	1A2	0	1A2	100	100	
				7	100	7	0	-100	
<b>1268</b>	1268-1	43.94541	-87.71420	7	100	7	100	0	
	1268-2	43.94637	-87.71350	7	100	7	100	0	
	1268-3	43.94715	-87.71280	7	100	7	100	0	
	1268-4	43.94790	-87.71210	7	100	7	100	0	
	1268-5	43.94868	-87.71140	7	100	7	100	0	
	1268-6	43.94937	-87.71070	7	100	7	100	0	
	1268-7	43.95016	-87.70990	7	100	7	100	0	
	1268-8	43.95090	-87.70910	7	100	7	100	0	
	1268-9	43.95142	-87.70840	7	100	7	100	0	
	1268-10	43.95227	-87.70770	7	100	7	100	0	
<b>1269</b>	1269-1	43.95306	-87.70710	7	100	7	100	0	
	1269-2	43.95374	-87.70630	7	100	7	100	0	
	1269-3	43.95459	-87.70580	7	100	7	100	0	
	1269-4	43.95538	-87.70500	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1269-5	43.95601	-87.70430	7	100	7	100	0	
	1269-6	43.95685	-87.70360	7	100	7	100	0	
	1269-7	43.95775	-87.70330	7	100	7	100	0	
	1269-8	43.95849	-87.70280	7	100	7	100	0	
	1269-9	43.95922	-87.70230	7	100	7	100	0	
	1269-10	43.96007	-87.70160	7	100	7	100	0	

<b>1270</b>	1270-1	43.96086	-87.70110	7	100	7	100	0	
	1270-2	43.96175	-87.70070	7	100	7	100	0	
	1270-3	43.96265	-87.70020	7	100	7	100	0	
	1270-4	43.96344	-87.69990	7	100	7	100	0	
	1270-5	43.96418	-87.69950	7	100	7	100	0	
	1270-6	43.96518	-87.69920	7	100	7	100	0	0 point creek
	1270-7	43.96592	-87.69900	7	100	7	100	0	
	1270-8	43.96692	-87.69870	7	100	7	100	0	
	1270-9	43.96766	-87.69880	7	100	7	100	0	
	1270-10	43.96866	-87.69870	7	100	7	100	0	

<b>1271</b>	1271-1	43.96961	-87.69850	7	100	7	100	0	
	1271-2	43.97045	-87.69830	7	100	7	100	0	
	1271-3	43.97124	-87.69830	7	100	7	100	0	
	1271-4	43.97235	-87.69800	7	100	7	100	0	
	1271-5	43.97325	-87.69790	7	100	7	100	0	
	1271-6	43.97398	-87.69770	7	100	7	100	0	
	1271-7	43.97493	-87.69760	7	100	7	100	0	
	1271-8	43.97593	-87.69750	7	100	7	100	0	
	1271-9	43.97672	-87.69730	7	100	7	100	0	
	1271-10	43.97762	-87.69720	7	100	7	100	0	

<b>1272</b>	1272-1	43.97852	-87.69710	7	100	7	100	0	
	1272-2	43.97941	-87.69710	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1272-3	43.98032	-87.69700	7	100	7	100	0	
	1272-4	43.98120	-87.69690	7	100	7	100	0	
	1272-5	43.98204	-87.69670	7	100	7	100	0	
	1272-6	43.98288	-87.69660	7	100	7	100	0	
	1272-7	43.98372	-87.69640	7	100	7	100	0	
	1272-8	43.98476	-87.69610	7	100	7	100	0	
	1272-9	43.98555	-87.69600	7	100	7	100	0	
	1272-10	43.98639	-87.69600	7	100	7	100	0	

<b>1273</b>	1273-1	43.98738	-87.69570	7	100	7	100	0	
	1273-2	43.98827	-87.69540	7	100	7	100	0	
	1273-3	43.98916	-87.69520	7	100	7	100	0	
	1273-4	43.99000	-87.69490	7	100	7	100	0	
	1273-5	43.99094	-87.69470	7	100	7	100	0	
	1273-6	43.99183	-87.69440	7	100	7	100	0	
	1273-7	43.99272	-87.69410	7	100	7	100	0	
	1273-8	43.99361	-87.69380	7	100	7	100	0	
	1273-9	43.99439	-87.69350	7	100	7	100	0	
	1273-10	43.99528	-87.69320	7	100	7	100	0	

<b>1274</b>	1274-1	43.99617	-87.69290	7	100	7	100	0	
	1274-2	43.99701	-87.69260	7	100	7	100	0	
	1274-3	43.99780	-87.69240	7	100	7	100	0	
	1274-4	43.99853	-87.69200	7	100	7	100	0	
	1274-5	43.99931	-87.69160	7	100	7	100	0	
	1274-6	44.00010	-87.69120	7	100	7	100	0	
	1274-7	44.00077	-87.69070	7	100	7	100	0	
	1274-8	44.00161	-87.69030	7	100	7	100	0	
	1274-9	44.00229	-87.69010	7	100	7	100	0	
	1274-10	44.00313	-87.68980	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1275	1275-1	44.00402	-87.68940	7	100	7	100	0	
	1275-2	44.00486	-87.68910	7	100	7	100	0	
	1275-3	44.00580	-87.68880	7	100	7	100	0	
	1275-4	44.00658	-87.68840	7	100	7	100	0	
	1275-5	44.00753	-87.68810	7	100	7	100	0	
	1275-6	44.00842	-87.68800	7	100	7	100	0	
	1275-7	44.00941	-87.68770	7	100	7	100	0	
	1275-8	44.01004	-87.68720	7	100	7	100	0	
	1275-9	44.01093	-87.68670	7	100	7	100	0	
	1275-10	44.01197	-87.68650	7	100	7	100	0	
1276	1276-1	44.01276	-87.68600	7	100	7	100	0	
	1276-2	44.01363	-87.68570	7	100	7	100	0	
	1276-3	44.01450	-87.68540	7	100	7	100	0	
	1276-4	44.01537	-87.68520	7	100	7	100	0	
	1276-5	44.01624	-87.68510	7	100	7	100	0	
	1276-6	44.01718	-87.68470	7	100	7	100	0	
	1276-7	44.01802	-87.68430	7	100	7	100	0	
	1276-8	44.01896	-87.68410	7	100	7	100	0	
	1276-9	44.01966	-87.68350	7	100	7	100	0	
	1276-10	44.02053	-87.68330	7	100	7	100	0	
1277	1277-1	44.02143	-87.68270	7	100	7	100	0	
	1277-2	44.02230	-87.68230	7	100	7	100	0	
	1277-3	44.02300	-87.68180	7	100	7	100	0	
	1277-4	44.02391	-87.68120	7	100	7	100	0	
	1277-5	44.02471	-87.68090	7	100	7	100	0	
	1277-6	44.02548	-87.68040	7	100	7	100	0	
	1277-7	44.02635	-87.67970	7	100	7	100	0	
	1277-8	44.02708	-87.67930	7	100	7	100	0	
	1277-9	44.02802	-87.67880	7	100	7	100	0	
	1277-10	44.02872	-87.67830	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1278	1278-1	44.02953	-87.67770	7	100	7	100	0	
	1278-2	44.03040	-87.67710	7	100	7	100	0	
	1278-3	44.03123	-87.67670	7	100	7	100	0	
	1278-4	44.03204	-87.67610	7	100	7	100	0	
	1278-5	44.03281	-87.67550	7	100	7	100	0	
	1278-6	44.03348	-87.67480	7	100	7	100	0	
	1278-7	44.03433	-87.67420	7	100	7	100	0	
	1278-8	44.03500	-87.67360	7	100	7	100	0	
	1278-9	44.03579	-87.67300	7	100	7	100	0	
	1278-10	44.03662	-87.67220	7	100	7	100	0	
1279	1279-1	44.03737	-87.67160	7	100	7	100	0	
	1279-2	44.03809	-87.67090	7	100	7	100	0	
	1279-3	44.03895	-87.67010	7	100	7	100	0	
	1279-4	44.03963	-87.66930	7	100	7	100	0	
	1279-5	44.04019	-87.66850	7	100	7	100	0	
	1279-6	44.04105	-87.66760	7	100	7	100	0	
	1279-7	44.04177	-87.66690	7	100	7	100	0	
	1279-8	44.04248	-87.66630	7	100	7	100	0	
	1279-9	44.04316	-87.66540	7	100	7	100	0	
	1279-10	44.04395	-87.66480	7	100	7	100	0	
1280	1280-1	44.04478	-87.66400	7	100	7	100	0	
	1280-2	44.04534	-87.66320	7	100	7	100	0	
	1280-3	44.04605	-87.66240	7	100	7	100	0	
	1280-4	44.04677	-87.66160	7	100	7	100	0	
	1280-5	44.04741	-87.66100	7	100	7	100	0	
	1280-6	44.04805	-87.66020	7	100	7	100	0	
	1280-7	44.04880	-87.65930	7	100	7	100	0	
	1280-8	44.04955	-87.65880	1A2	50	1A2	50	0	
				7	50	7	50	0	
1280-9	44.05038	-87.65790	7	100	7	100	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1280-10	44.05102	-87.65710	7	100	7	100	0	
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1281	1281-1	44.05184	-87.65630	7	100	7	100	0	
	1281-2	44.05260	-87.65560	7	100	7	100	0	
	1281-3	44.05331	-87.65490	7	100	7	100	0	
	1281-4	44.05421	-87.65450	7	100	7	100	0	
	1281-5	44.05496	-87.65430	7	100	7	100	0	
	1281-6	44.05579	-87.65410	7	100	7	100	0	
	1281-7	44.05688	-87.65380	7	100	7	100	0	
	1281-8	44.05763	-87.65360	7	100	7	100	0	
	1281-9	44.05846	-87.65350	1B2	30	1B2	30	0	
					7	70	7	70	
	1281-10	44.05936	-87.65370	7	100	7	100	0	
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1282	1282-1	44.06023	-87.65370	1A3	35	1A3	35	0	
				7	65	7	65	0	
	1282-2	44.06114	-87.65370	7	100	7	100	0	
	1282-3	44.06209	-87.65370	7	100	7	100	0	
	1282-4	44.06292	-87.65360	7	100	7	100	0	
	1282-5	44.06383	-87.65360	7	100	7	100	0	
	1282-6	44.06474	-87.65370	7	100	7	100	0	
	1282-7	44.06565	-87.65380	7	100	7	100	0	
	1282-8	44.06648	-87.65410	7	100	7	100	0	
	1282-9	44.06743	-87.65430	7	100	7	100	0	
	1282-10	44.06826	-87.65450	7	100	7	100	0	
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1283	1283-1	44.06925	-87.65480	7	100	7	100	0	
	1283-2	44.07012	-87.65500	7	100	7	100	0	
	1283-3	44.07095	-87.65540	7	100	7	100	0	
	1283-4	44.07190	-87.65540	7	100	7	100	0	
	1283-5	44.07273	-87.65570	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1283-6	44.07364	-87.65580	7	100	7	100	0	
	1283-7	44.07440	-87.65600	7	100	7	100	0	
	1283-8	44.07542	-87.65600	7	100	7	100	0	Red Arrow Park
	1283-9	44.07637	-87.65600	7	100	7	100	0	
	1283-10	44.07712	-87.65600	7	100	7	100	0	

<b>1284</b>	1284-1	44.07803	-87.65580	1A2	0	1A2	35	35	
				1B1	5	1B1	5	0	
				7	95	7	60	-35	
	1284-2	44.07879	-87.65540	1A2	0	1A2	100	100	
1A3				25	1A3	0	-25		
7				75	7	0	-75		
	1284-3	44.07973	-87.65520	1A2	0	1A2	75	75	
1A3				25	1A3	0	-25		
1B1				25	1B1	25	0		
7				50	7	0	-50		
	1284-4	44.08065	-87.65470	1A2	35	1A2	100	65	
7				65	7	0	-65		
	1284-5	44.08152	-87.65430	1A2	100	1A2	100	0	
	1284-6	44.08225	-87.65380	1A2	100	1A2	100	0	
	1284-7	44.08309	-87.65310	1A2	100	1A2	100	0	
	1284-8	44.08378	-87.65260	1A2	100	1A2	100	0	
	1284-9	44.08458	-87.65190	1A2	100	1A2	100	0	
	1284-10	44.08535	-87.65120	1A1	35	1A1	35	0	
				1A2	65	1A2	65	0	

<b>1285</b>	1285-1	44.08600	-87.65080	1A1	100	1A1	100	0	the city of Manitowoc
	1285-2	44.08680	-87.65020	1A1	100	1A1	100	0	
	1285-3	44.08743	-87.64970	1A1	100	1A1	100	0	
	1285-4	44.08819	-87.64920	1A1	100	1A1	100	0	
	1285-5	44.08884	-87.64880	1A1	75	1A1	75	0	
2B1				25	2B1	25	0	jettie offshore length = 450 meters	
1285-6	44.08913	-87.64790	2B1	100	2B1	100	0	jettie offshore length = 450 meters	
1285-7	44.08928	-87.64680	2B1	100	2B1	100	0	jettie offshore length = 450 meters	
1285-8	44.08961	-87.64570	2B1	100	2B1	100	0	jettie offshore length = 450 meters	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1285-9	44.09027	-87.64500	2B1	100	2B1	100	0	jettie offshore length = 450 meters
	1285-10	44.09096	-87.64440	2B1	100	2B1	100	0	jettie offshore length = 450 meters
<b>1286</b>	1286-1	44.09174	-87.64410	2B1	35	2B1	35	0	jettie entrance
				7	65	7	65	0	
	1286-2	44.09263	-87.64430	2B1	85	2B1	85	0	jettie entrance
				7	15	7	15	0	
	1286-3	44.09352	-87.64450	2B1	100	2B1	100	0	jettie offshore length = 450 meters
	1286-4	44.09446	-87.64460	1A1	100	1A1	100	0	CDF
	1286-5	44.09538	-87.64480	1A1	100	1A1	100	0	CDF
	1286-6	44.09633	-87.64490	1A1	100	1A1	100	0	CDF
	1286-7	44.09711	-87.64460	1A1	100	1A1	100	0	CDF
	1286-8	44.09790	-87.64410	1A1	100	1A1	100	0	CDF
	1286-9	44.09883	-87.64390	1A1	100	1A1	100	0	CDF
	1286-10	44.09936	-87.64490	1A1	100	1A1	100	0	CDF
<b>1287</b>	1287-1	44.09962	-87.64600	1A1	100	1A1	100	0	CDF
	1287-2	44.09948	-87.64710	1A1	50	1A1	100	50	marina construction and landfill
				7	50	7	0	-50	
	1287-3	44.09974	-87.64810	7	100	7	0	-100	marina construction and landfill
				1A1	0	1A1	100	100	
	1287-4	44.10035	-87.64870	1A1	45	1A1	100	55	marina construction and landfill
				7	55	7	0	-55	
	1287-5	44.10112	-87.64840	1A1	100	1A1	100	0	
	1287-6	44.10178	-87.64790	1A1	100	1A1	100	0	
	1287-7	44.10247	-87.64720	1A1	100	1A1	100	0	
	1287-8	44.10318	-87.64750	1A1	100	1A1	100	0	
	1287-9	44.10404	-87.64740	1A1	100	1A1	100	0	
	1287-10	44.10464	-87.64690	1A1	100	1A1	100	0	
<b>1288</b>	1288-1	44.10510	-87.64580	1A1	100	1A1	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1288-2	44.10576	-87.64500	1A1	100	1A1	100	0	
	1288-3	44.10652	-87.64400	1A1	100	1A1	100	0	
				2A2	100	2A2	100	0	
	1288-4	44.10712	-87.64330	1A1	100	1A1	100	0	
				2A2	100	2A2	100	0	
	1288-5	44.10793	-87.64250	1A1	100	1A1	100	0	
				2A2	100	2A2	100	0	
	1288-6	44.10864	-87.64160	1A1	100	1A1	100	0	
				2A2	35	2A2	35	0	
	1288-7	44.10925	-87.64090	1A1	100	1A1	100	0	
	1288-8	44.10991	-87.64000	1A1	100	1A1	100	0	
	1288-9	44.11061	-87.63940	1A1	100	1A1	100	0	
	1288-10	44.11147	-87.63850	1A1	100	1A1	100	0	

<b>1289</b>	1289-1	44.11208	-87.63760	7	100	7	100	0	
	1289-2	44.11269	-87.63670	1A2	0	1A2	15	15	
				7	100	7	85	-15	
	1289-3	44.11314	-87.63580	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1289-4	44.11370	-87.63490	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1289-5	44.11423	-87.63400	1A2	0	1A2	100	100	
				7	100	7	0	-100	
	1289-6	44.11473	-87.63290	1A2	0	1A2	50	50	
				7	100	7	50	-50	
	1289-7	44.11522	-87.63190	1A2	0	1A2	65	65	
				7	100	7	35	-65	
	1289-8	44.11575	-87.63100	1B2	0	1B2	65	65	
				7	100	7	35	-65	
	1289-9	44.11625	-87.63000	1A2	0	1A2	70	70	
				7	100	7	30	-70	
	1289-10	44.11681	-87.62910	1A2	40	1A2	100	60	
				7	60	7	0	-60	

<b>1290</b>	1290-1	44.11731	-87.62810	1A2	50	1A2	100	50	
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Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
				5B4	50	5B4	0	-50	
	1290-2	44.11792	-87.62720	1A2	25	1A2	100	75	
				5B4	75	5B4	0	-75	
	1290-3	44.11845	-87.62620	1A2	100	1A2	100	0	
	1290-4	44.11908	-87.62530	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1290-5	44.11964	-87.62440	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1290-6	44.12021	-87.62350	1A1	0	1A1	100	100	
				1A2	60	1A2	0	-60	
				7	40	7	0	-40	
	1290-7	44.12083	-87.62270	1A1	0	1A1	100	100	
				1A2	25	1A2	0	-25	
				7	75	7	0	-75	
	1290-8	44.12149	-87.62180	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1290-9	44.12198	-87.62090	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1290-10	44.12254	-87.61990	1A1	0	1A1	100	100	
				7	100	7	0	-100	
<b>1291</b>	1291-1	44.12305	-87.61890	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1291-2	44.12361	-87.61790	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1291-3	44.12414	-87.61690	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1291-4	44.12468	-87.61590	1A1	0	1A1	100	100	
				7	100	7	0	-100	
	1291-5	44.12519	-87.61480	1A1	100	1A1	100	0	
	1291-6	44.12574	-87.61370	1A1	100	1A1	100	0	
	1291-7	44.12614	-87.61270	1A1	100	1A1	100	0	
	1291-8	44.12666	-87.61170	1A1	100	1A1	100	0	
	1291-9	44.12723	-87.61060	1A1	100	1A1	100	0	
	1291-10	44.12757	-87.60940	1A1	100	1A1	100	0	



Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1292	1292-1	44.12809	-87.60840	1A1	100	1A1	100	0	
	1292-2	44.12860	-87.60730	1A1	100	1A1	100	0	
	1292-3	44.12895	-87.60630	1A1	100	1A1	100	0	
	1292-4	44.12946	-87.60530	1A1	100	1A1	100	0	
	1292-5	44.12997	-87.60420	1A1	100	1A1	100	0	
	1292-6	44.13060	-87.60320	1A1	100	1A1	100	0	
	1292-7	44.13095	-87.60210	1A1	100	1A1	100	0	
	1292-8	44.13135	-87.60100	1A1	100	1A1	100	0	
	1292-9	44.13186	-87.59990	1A1	100	1A1	100	0	
	1292-10	44.13229	-87.59890	1A1	100	1A1	100	0	
1293	1293-1	44.13269	-87.59780	1A1	100	1A1	100	0	
	1293-2	44.13309	-87.59680	1A1	100	1A1	100	0	
	1293-3	44.13335	-87.59570	1A1	100	1A1	100	0	
	1293-4	44.13375	-87.59460	1A1	100	1A1	100	0	
	1293-5	44.13421	-87.59350	1A1	100	1A1	100	0	
	1293-6	44.13461	-87.59240	1A1	100	1A1	100	0	
	1293-7	44.13495	-87.59120	1A1	100	1A1	100	0	
	1293-8	44.13535	-87.59010	1A1	100	1A1	100	0	
	1293-9	44.13586	-87.58900	1A1	100	1A1	100	0	
	1293-10	44.13618	-87.58790	1A1	100	1A1	100	0	
1294	1294-1	44.13659	-87.58680	1A1	100	1A1	100	0	
	1294-2	44.13702	-87.58570	1A1	100	1A1	100	0	
	1294-3	44.13741	-87.58460	1A1	100	1A1	100	0	
	1294-4	44.13779	-87.58340	1A1	100	1A1	100	0	
	1294-5	44.13821	-87.58230	1A1	100	1A1	100	0	
	1294-6	44.13857	-87.58110	1A1	100	1A1	100	0	
	1294-7	44.13898	-87.57990	1A1	100	1A1	100	0	
	1294-8	44.13935	-87.57880	1A1	100	1A1	100	0	
	1294-9	44.13977	-87.57760	7	100	7	100	0	
	1294-10	44.14008	-87.57640	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1295	1295-1	44.14044	-87.57530	7	100	7	100	0	
	1295-2	44.14087	-87.57430	7	100	7	100	0	
	1295-3	44.14113	-87.57320	7	100	7	100	0	
	1295-4	44.14145	-87.57210	7	100	7	100	0	
	1295-5	44.14177	-87.57110	7	100	7	100	0	
	1295-6	44.14202	-87.57020	1A1	100	1A1	100	0	
	1295-7	44.14234	-87.56910	1A1	100	1A1	100	0	
	1295-8	44.14271	-87.56790	7	100	7	100	0	
	1295-9	44.14302	-87.56680	1A3	100	1A3	0	-100	
				7	0	7	100	100	
1295-10	44.14318	-87.56570	1A3	100	1A3	0	-100		
			7	0	7	100	100		
1296	1296-1	44.14371	-87.56460	7	100	7	100	0	the city of Two Rivers
	1296-2	44.14397	-87.56370	2B1	25	2B1	25	0	jettie offshore length = 230 meters
				7	75	7	75	0	
	1296-3	44.14450	-87.56310	2B1	100	2B1	100	0	jettie offshore length = 425 meters
	1296-4	44.14529	-87.56290	2B1	100	2B1	100	0	jettie offshore length = 425 meters
	1296-5	44.14597	-87.56260	2B1	100	2B1	100	0	jettie offshore length = 425 meters
	1296-6	44.14629	-87.56160	7	100	7	100	0	
	1296-7	44.14666	-87.56080	7	100	7	100	0	
	1296-8	44.14713	-87.55990	7	100	7	100	0	
	1296-9	44.14755	-87.55920	7	100	7	100	0	
1296-10	44.14813	-87.55840	7	100	7	100	0		
1297	1297-1	44.14870	-87.55750	7	100	7	100	0	
	1297-2	44.14913	-87.55650	7	100	7	100	0	
	1297-3	44.14976	-87.55560	7	100	7	100	0	
	1297-4	44.15012	-87.55450	7	100	7	100	0	Neshotah Park
	1297-5	44.15065	-87.55360	7	100	7	100	0	Neshotah Park
	1297-6	44.15123	-87.55260	7	100	7	100	0	Neshotah Park
	1297-7	44.15181	-87.55170	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments	
				SP Type	Length	SP Type	Length			
	1297-8	44.15252	-87.55070	7	100	7	100	0		
	1297-9	44.15309	-87.54970	7	100	7	100	0		
	1297-10	44.15362	-87.54880	1A3	0	1A3	85	85		
				7	100	7	15	-85		
<b>1298</b>	1298-1	44.15431	-87.54790	1A3	0	1A3	75	75		
				1B3	25	1B3	0	-25		
				7	75	7	25	-50		
		1298-2	44.15464	-87.54680	7	100	7	100	0	
		1298-3	44.15549	-87.54570	7	100	7	100	0	
		1298-4	44.15614	-87.54470	7	100	7	100	0	
		1298-5	44.15679	-87.54380	7	100	7	100	0	
		1298-6	44.15748	-87.54300	7	100	7	100	0	
		1298-7	44.15805	-87.54200	7	100	7	100	0	
		1298-8	44.15874	-87.54120	7	100	7	100	0	
		1298-9	44.15947	-87.54030	7	100	7	100	0	
	1298-10	44.16008	-87.53930	7	100	7	100	0		
<b>1299</b>	1299-1	44.16073	-87.53840	7	100	7	100	0	Point Beach State Forest	
	1299-2	44.16138	-87.53770	7	100	7	100	0		
	1299-3	44.16211	-87.53690	7	100	7	100	0		
	1299-4	44.16277	-87.53610	7	100	7	100	0		
	1299-5	44.16346	-87.53530	7	100	7	100	0		
	1299-6	44.16402	-87.53450	7	100	7	100	0		
	1299-7	44.16479	-87.53360	7	100	7	100	0		
	1299-8	44.16553	-87.53290	7	100	7	100	0		
	1299-9	44.16618	-87.53210	7	100	7	100	0		
	1299-10	44.16683	-87.53140	7	100	7	100	0		
<b>1300</b>	1300-1	44.16756	-87.53060	7	100	7	100	0	Point Beach State Forest	
	1300-2	44.16821	-87.52990	7	100	7	100	0		
	1300-3	44.16898	-87.52920	7	100	7	100	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1300-4	44.16963	-87.52830	7	100	7	100	0	
	1300-5	44.17028	-87.52770	7	100	7	100	0	
	1300-6	44.17113	-87.52700	7	100	7	100	0	
	1300-7	44.17191	-87.52620	7	100	7	100	0	
	1300-8	44.17268	-87.52570	7	100	7	100	0	
	1300-9	44.17333	-87.52490	7	100	7	100	0	
	1300-10	44.17410	-87.52430	7	100	7	100	0	

<b>1301</b>	1301-1	44.17504	-87.52350	7	100	7	100	0	Point Beach State Forest
	1301-2	44.17573	-87.52290	7	100	7	100	0	
	1301-3	44.17662	-87.52230	7	100	7	100	0	
	1301-4	44.17736	-87.52170	7	100	7	100	0	
	1301-5	44.17805	-87.52110	7	100	7	100	0	
	1301-6	44.17898	-87.52040	7	100	7	100	0	
	1301-7	44.17975	-87.51970	7	100	7	100	0	
	1301-8	44.18053	-87.51910	7	100	7	100	0	
	1301-9	44.18134	-87.51870	7	100	7	100	0	
	1301-10	44.18207	-87.51820	7	100	7	100	0	

<b>1302</b>	1302-1	44.18296	-87.51760	7	100	7	100	0	Point Beach State Forest
	1302-2	44.18383	-87.51710	7	100	7	100	0	
	1302-3	44.18471	-87.51670	7	100	7	100	0	
	1302-4	44.18542	-87.51620	7	100	7	100	0	
	1302-5	44.18629	-87.51590	7	100	7	100	0	
	1302-6	44.18713	-87.51540	7	100	7	100	0	
	1302-7	44.18800	-87.51500	7	100	7	100	0	
	1302-8	44.18879	-87.51460	7	100	7	100	0	
	1302-9	44.18959	-87.51420	7	100	7	100	0	
	1302-10	44.19051	-87.51380	7	100	7	100	0	

<b>1303</b>	1303-1	44.19142	-87.51340	7	100	7	100	0	Point Beach State Forest
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Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1303-2	44.19230	-87.51300	7	100	7	100	0	
	1303-3	44.19313	-87.51270	7	100	7	100	0	
	1303-4	44.19405	-87.51220	7	100	7	100	0	
	1303-5	44.19480	-87.51190	7	100	7	100	0	
	1303-6	44.19568	-87.51150	7	100	7	100	0	
	1303-7	44.19659	-87.51120	7	100	7	100	0	
	1303-8	44.19751	-87.51090	7	100	7	100	0	
	1303-9	44.19830	-87.51070	7	100	7	100	0	
	1303-10	44.19931	-87.51050	7	100	7	100	0	

<b>1304</b>	1304-1	44.20014	-87.51020	7	100	7	100	0	Point Beach State Forest
	1304-2	44.20102	-87.50990	7	100	7	100	0	
	1304-3	44.20185	-87.50970	7	100	7	100	0	
	1304-4	44.20281	-87.50930	7	100	7	100	0	
	1304-5	44.20373	-87.50910	7	100	7	100	0	
	1304-6	44.20452	-87.50900	7	100	7	100	0	
	1304-7	44.20548	-87.50870	7	100	7	100	0	
	1304-8	44.20631	-87.50830	7	100	7	100	0	
	1304-9	44.20719	-87.50810	7	100	7	100	0	
	1304-10	44.20798	-87.50790	7	100	7	100	0	

<b>1305</b>	1305-1	44.20897	-87.50770	7	100	7	100	0	
	1305-2	44.20987	-87.50740	7	100	7	100	0	
	1305-3	44.21082	-87.50730	7	100	7	100	0	
	1305-4	44.21169	-87.50710	7	100	7	100	0	Rawley Point
	1305-5	44.21259	-87.50710	7	100	7	100	0	
	1305-6	44.21349	-87.50700	7	100	7	100	0	
	1305-7	44.21436	-87.50700	7	100	7	100	0	
	1305-8	44.21529	-87.50700	7	100	7	100	0	
	1305-9	44.21619	-87.50700	7	100	7	100	0	
	1305-10	44.21703	-87.50700	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1306	1306-1	44.21796	-87.50700	7	100	7	100	0	
	1306-2	44.21886	-87.50700	7	100	7	100	0	
	1306-3	44.21973	-87.50710	7	100	7	100	0	
	1306-4	44.22068	-87.50720	7	100	7	100	0	
	1306-5	44.22160	-87.50720	7	100	7	100	0	
	1306-6	44.22242	-87.50730	1A1	0	1A1	50	50	
				7	100	7	50	-50	
	1306-7	44.22332	-87.50720	1A1	100	1A1	100	0	
	1306-8	44.22422	-87.50740	1A1	100	1A1	100	0	
	1306-9	44.22505	-87.50750	7	100	7	100	0	
1306-10	44.22600	-87.50760	7	100	7	100	0		
1307	1307-1	44.22686	-87.50780	7	100	7	100	0	
	1307-2	44.22781	-87.50800	7	100	7	100	0	
	1307-3	44.22873	-87.50810	7	100	7	100	0	
	1307-4	44.22959	-87.50840	7	100	7	100	0	
	1307-5	44.23045	-87.50860	1A1	75	1A1	75	0	
				7	25	7	25	0	
	1307-6	44.23131	-87.50900	1A1	100	1A1	100	0	
	1307-7	44.23220	-87.50930	7	100	7	100	0	
	1307-8	44.23303	-87.50970	1A2	0	1A2	100	100	
				7	100	7	0	-100	
1307-9	44.23387	-87.50990	1A2	100	1A2	100	0		
1307-10	44.23476	-87.51020	1A2	75	1A2	100	25		
			7	25	7	0	-25		
1308	1308-1	44.23562	-87.51060	1A2	70	1A2	100	30	
				7	30	7	0	-30	
	1308-2	44.23639	-87.51100	1A2	100	1A2	100	0	
	1308-3	44.23743	-87.51140	1A2	40	1A2	40	0	
				7	60	7	60	0	
	1308-4	44.23820	-87.51170	7	100	7	100	0	Rahr Memorial School Forest
1308-5	44.23909	-87.51200	7	100	7	100	0		
1308-6	44.23993	-87.51240	7	100	7	100	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1308-7	44.24067	-87.51280	7	100	7	100	0	
	1308-8	44.24150	-87.51330	1A2	0	1A2	50	50	
				7	100	7	50	-50	
	1308-9	44.24245	-87.51350	1A2	0	1A2	75	75	
				7	100	7	25	-75	
	1308-10	44.24328	-87.51400	7	100	7	100	0	

<b>1309</b>	1309-1	44.24413	-87.51430	7	100	7	100	0	
	1309-2	44.24488	-87.51470	7	100	7	100	0	
	1309-3	44.24576	-87.51520	7	100	7	100	0	
	1309-4	44.24655	-87.51560	7	100	7	100	0	
	1309-5	44.24734	-87.51600	7	100	7	100	0	
	1309-6	44.24809	-87.51660	7	100	7	100	0	
	1309-7	44.24891	-87.51700	7	100	7	100	0	
	1309-8	44.24967	-87.51760	7	100	7	100	0	
	1309-9	44.25040	-87.51800	7	100	7	100	0	
	1309-10	44.25121	-87.51850	7	100	7	100	0	

<b>1310</b>	1310-1	44.25206	-87.51890	7	100	7	100	0	
	1310-2	44.25300	-87.51920	7	100	7	100	0	
	1310-3	44.25376	-87.51960	7	100	7	100	0	
	1310-4	44.25463	-87.51990	5A3	100	5A3	100	0	
	1310-5	44.25564	-87.52000	7	100	7	100	0	
	1310-6	44.25652	-87.52030	7	100	7	100	0	
	1310-7	44.25730	-87.52070	7	100	7	100	0	
	1310-8	44.25824	-87.52090	5B4	100	5B4	100	0	
	1310-9	44.25912	-87.52130	7	100	7	100	0	
	1310-10	44.25991	-87.52160	7	100	7	100	0	

<b>1311</b>	1311-1	44.26073	-87.52190	7	100	7	100	0	
	1311-2	44.26160	-87.52250	7	100	7	100	0	
	1311-3	44.26243	-87.52300	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1311-4	44.26323	-87.52360	7	100	7	100	0	
	1311-5	44.26408	-87.52400	7	100	7	100	0	
	1311-6	44.26498	-87.52440	7	100	7	100	0	
	1311-7	44.26573	-87.52490	7	100	7	100	0	
	1311-8	44.26658	-87.52540	7	100	7	100	0	
	1311-9	44.26743	-87.52590	7	100	7	100	0	
	1311-10	44.26814	-87.52640	7	100	7	100	0	

<b>1312</b>	1312-1	44.26894	-87.52690	7	100	7	100	0	
	1312-2	44.26984	-87.52750	7	100	7	100	0	
	1312-3	44.27064	-87.52830	7	100	7	100	0	
	1312-4	44.27144	-87.52860	7	100	7	100	0	
	1312-5	44.27238	-87.52920	7	100	7	100	0	
	1312-6	44.27319	-87.52980	7	100	7	100	0	
	1312-7	44.27399	-87.53030	1A1	100	1A1	100	0	
	1312-8	44.27474	-87.53090	1A1	100	1A1	100	0	
	1312-9	44.27564	-87.53140	1A1	100	1A1	100	0	
	1312-10	44.27649	-87.53190	1A1	100	1A1	100	0	

<b>1313</b>	1313-1	44.27729	-87.53240	1A1	100	1A1	100	0	Point Beach Nuclear Power Plant
	1313-2	44.27814	-87.53290	1A1	100	1A1	100	0	
	1313-3	44.27896	-87.53350	1A1	100	1A1	100	0	
	1313-4	44.27977	-87.53400	1A1	100	1A1	100	0	
	1313-5	44.28059	-87.53440	1A1	100	1A1	100	0	
	1313-6	44.28149	-87.53450	2B1	100	2B1	100	0	Intakes
	1313-7	44.28236	-87.53520	1A2	100	1A2	100	0	
	1313-8	44.28312	-87.53570	5A4	100	5A4	0	-100	
				7	0	7	100	100	
	1313-9	44.28385	-87.53630	5A4	100	5A4	0	-100	
				7	0	7	100	100	
	1313-10	44.28469	-87.53680	7	100	7	100	0	

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
1314	1314-1	44.28552	-87.53730	7	100	7	100	0	
	1314-2	44.28632	-87.53780	7	100	7	100	0	
	1314-3	44.28720	-87.53820	7	100	7	100	0	
	1314-4	44.28800	-87.53860	7	100	7	100	0	
	1314-5	44.28889	-87.53910	7	100	7	100	0	
	1314-6	44.28967	-87.53950	7	100	7	100	0	
	1314-7	44.29057	-87.53980	7	100	7	100	0	
	1314-8	44.29142	-87.54020	7	100	7	100	0	
	1314-9	44.29226	-87.54050	7	100	7	100	0	
	1314-10	44.29310	-87.54090	7	100	7	100	0	
1315	1315-1	44.29401	-87.54120	7	100	7	100	0	
	1315-2	44.29490	-87.54140	7	100	7	100	0	
	1315-3	44.29579	-87.54170	7	100	7	100	0	
	1315-4	44.29668	-87.54200	7	100	7	100	0	
	1315-5	44.29754	-87.54240	7	100	7	100	0	
	1315-6	44.29845	-87.54270	7	100	7	100	0	
	1315-7	44.29932	-87.54290	7	100	7	100	0	
	1315-8	44.30023	-87.54320	7	100	7	100	0	
	1315-9	44.30117	-87.54350	7	100	7	100	0	
	1315-10	44.30206	-87.54370	7	100	7	100	0	
1316	1316-1	44.30294	-87.54390	7	100	7	100	0	
	1316-2	44.30383	-87.54400	7	100	7	100	0	
	1316-3	44.30477	-87.54410	1A1	0	1A1	50	50	Two Creeks County Park & Boat Ramp
				5A3	25	5A3	0	-25	
				7	75	7	50	-25	
	1316-4	44.30560	-87.54410	7	100	7	100	0	
	1316-5	44.30643	-87.54440	7	100	7	100	0	
	1316-6	44.30732	-87.54460	7	100	7	100	0	
	1316-7	44.30811	-87.54470	7	100	7	100	0	
1316-8	44.30912	-87.54490	7	100	7	100	0		
1316-9	44.31013	-87.54490	7	100	7	100	0		

Reach	SubReach	Lat	Long	1978		1992		Change (m & %)	Comments
				SP Type	Length	SP Type	Length		
	1316-10	44.31084	-87.54490	7	100	7	100	0	
<b>1317</b>	1317-1	44.31177	-87.54490	7	100	7	100	0	
	1317-2	44.31265	-87.54500	7	100	7	100	0	
	1317-3	44.31353	-87.54500	7	100	7	100	0	
	1317-4	44.31441	-87.54500	7	100	7	100	0	
	1317-5	44.31525	-87.54510	7	100	7	100	0	
	1317-6	44.31626	-87.54510	7	100	7	100	0	
	1317-7	44.31706	-87.54510	7	100	7	100	0	
	1317-8	44.31811	-87.54520	7	100	7	100	0	
	1317-9	44.31899	-87.54520	7	100	7	100	0	
	1317-10	44.31987	-87.54520	7	100	7	100	0	
<b>1318</b>	1318-1	44.32075	-87.54520	7	100	7	100	0	
	1318-2	44.32172	-87.54520	7	100	7	100	0	
	1318-3	44.32260	-87.54520	7	100	7	100	0	
	1318-4	44.32336	-87.54500	7	100	7	100	0	
	1318-5	44.32441	-87.54480	7	100	7	100	0	
	1318-6	44.32524	-87.54460	7	100	7	100	0	
	1318-7	44.32608	-87.54430	7	100	7	100	0	
	1318-8	44.32692	-87.54390	7	100	7	100	0	County Line (Manitowoc & Kewaunee)
	1318-9	44.32768	-87.54360	7	100	7	100	0	
	1318-10	44.32852	-87.54310	7	100	7	100	0	

**End Manitowoc County**



## OZAUKEE COUNTY

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Ozaukee County Summary Statistics**

<b>Shore Protection Type</b>	<b>78 LENGTH (M)</b>	<b>%COUNTY</b>	<b>92 LENGTH (M)</b>	<b>% COUNTY</b>	<b>CHG (M)</b>	<b>CHG (%)</b>
1A1 - Revetments >45 Year Lifespan	838	1.90	1038	2.36	200	0.45
1A2 - Revetments 5-45 Year Lifespan	1120	2.55	2450	5.57	1330	3.02
1A3 - Revetments 0-5 Year Lifespan	895	2.03	805	1.83	-90	-0.20
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	0.00	255	0.58	255	0.58
1B1 - Seawalls/Bulkheads >45 Year Lifespan	1682	3.82	2107	4.79	425	0.97
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	840	1.91	1050	2.39	210	0.48
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	230	0.52	260	0.59	30	0.07
2A2 - Groins 5-45 Year Lifespan	150	0.34	0	0.00	-150	-0.34
2B1 - Jetties	200	0.45	200	0.45	0	0.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	0.00	200	0.45	200	0.45
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	457	1.04	437	0.99	-20	-0.05
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	580	1.32	760	1.73	180	0.41
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	325	0.74	25	0.06	-300	-0.68
5B2 - Ad Hoc, Other Materials, 5-45 Year Lifespan	30	0.07	30	0.07	0	0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	0.00	25	0.06	25	0.06
7 - Unprotected	37153	84.44	35168	79.93	-1985	-4.51

Note: Percentages Expressed as a Percentage of 44km length for entire county

**Quick Analysis:**

Almost 2 km of New Shore Protection Added

1.3km of 1a2 Revetment Added

Next biggest addition is 425m of seawall

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Ozaukee County**

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
1172	-87.89460	43.19477	1A2	0	0.00	390	39.00	390	39.00	South Border of County
			1B1	0	0.00	25	2.50	25	2.50	
			1B2	0	0.00	180	18.00	180	18.00	
			5A3	70	7.00	0	0.00	-70	-7.00	
			5A4	0	0.00	25	2.50	25	2.50	
			5B2	30	3.00	30	3.00	0	0.00	
			5B4	0	0.00	25	2.50	25	2.50	
			7	900	90.00	345	34.50	-555	-55.50	
1173	-87.89750	43.20338	7	1000	100.00	1000	100.00	0	0.00	
1174	-87.89641	43.21220	7	1000	100.00	1000	100.00	0	0.00	
1175	-87.90116	43.22037	7	1000	100.00	1000	100.00	0	0.00	
1176	-87.90677	43.22837	1A2	0	0.00	170	17.00	170	17.00	
			1B2	225	22.50	165	16.50	-60	-6.00	
			7	775	77.50	700	70.00	-75	-7.50	
1177	-87.91047	43.23695	1B3	75	7.50	150	15.00	75	7.50	
			7	925	92.50	850	85.00	-75	-7.50	
1178	-87.91180	43.24588	7	1000	100.00	1000	100.00	0	0.00	
1179	-87.91061	43.25483	7	1000	100.00	1000	100.00	0	0.00	Notre Dame of the Lake School
1180	-87.90781	43.26356	7	1000	100.00	1000	100.00	0	0.00	
1181	-87.90543	43.27239	1B3	0	0.00	30	3.00	30	3.00	
			7	1000	100.00	970	97.00	-30	-3.00	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
1182	-87.90270	43.28114	1A2	0	0.00	150	15.00	150	15.00	
			7	1000	100.00	850	85.00	-150	-15.00	
1183	-87.89894	43.28971	7	1000	100.00	1000	100.00	0	0.00	
1184	-87.89385	43.29790	7	1000	100.00	1000	100.00	0	0.00	
1185	-87.88928	43.30620	7	1000	100.00	1000	100.00	0	0.00	
1186	-87.88818	43.31510	7	1000	100.00	1000	100.00	0	0.00	
1187	-87.88563	43.32388	7	1000	100.00	1000	100.00	0	0.00	
1188	-87.88507	43.33284	7	1000	100.00	1000	100.00	0	0.00	
1189	-87.88319	43.34172	7	1000	100.00	1000	100.00	0	0.00	
1190	-87.88200	43.35065	7	1000	100.00	1000	100.00	0	0.00	
1191	-87.87973	43.35947	7	1000	100.00	1000	100.00	0	0.00	
1192	-87.87729	43.36826	7	1000	100.00	1000	100.00	0	0.00	
1193	-87.87354	43.37680	7	1000	100.00	1000	100.00	0	0.00	
1194	-87.86764	43.38333	1A1	288	28.80	288	28.80	0	0.00	
			1A2	50	5.00	50	5.00	0	0.00	
			1B1	162	16.20	162	16.20	0	0.00	
			5A2	200	20.00	200	20.00	0	0.00	
			7	300	30.00	300	30.00	0	0.00	
1195	-87.86539	43.38562	1A1	300	30.00	300	30.00	0	0.00	Port Washington
			1B1	770	77.00	770	77.00	0	0.00	
			2B1	100	10.00	100	10.00	0	0.00	Jetty Offshore Length = 275m

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments	
1196	-87.86720	43.38883	1A1	250	25.00	50	5.00	-200	-20.00	Port Washington	
			1B1	750	75.00	950	95.00	200	20.00		
			2C1	0	0.00	200	20.00	200	20.00		
1197	-87.86489	43.39231	1A1	0	0.00	400	40.00	400	40.00	Port Washington	
			1A2	490	49.00	0	0.00	-490	-49.00		
			1B1	0	0.00	200	20.00	200	20.00		
			1B2	50	5.00	0	0.00	-50	-5.00		
			2A2	150	15.00	0	0.00	-150	-15.00		
			2B1	100	10.00	100	10.00	0	0.00		Jetty Offshore Length = 650m
			7	360	36.00	300	30.00	-60	-6.00		
1198	-87.85903	43.40007	7	1000	100.00	1000	100.00	0	0.00		
1199	-87.85313	43.40796	7	1000	100.00	1000	100.00	0	0.00		
1200	-87.84567	43.41514	1A2	0	0.00	100	10.00	100	10.00		
			1A3	35	3.50	0	0.00	-35	-3.50		
			7	965	96.50	900	90.00	-65	-6.50		
1201	-87.83823	43.42228	1A2	0	0.00	65	6.50	65	6.50		
			1A3	65	6.50	0	0.00	-65	-6.50		
			7	935	93.50	935	93.50	0	0.00		
1202	-87.83135	43.42975	7	1000	100.00	1000	100.00	0	0.00		
1203	-87.82478	43.43733	7	1000	100.00	1000	100.00	0	0.00		
1204	-87.81873	43.44517	7	1000	100.00	1000	100.00	0	0.00		
1205	-87.81276	43.45241	5A2	100	10.00	100	10.00	0	0.00		
			7	900	90.00	900	90.00	0	0.00		

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
1206	-87.80697	43.46034	1A2	165	16.50	165	16.50	0	0.00	
			1B2	0	0.00	65	6.50	65	6.50	
			7	835	83.50	770	77.00	-65	-6.50	
1207	-87.80300	43.46862	1A2	75	7.50	500	50.00	425	42.50	
			1A3	80	8.00	0	0.00	-80	-8.00	
			5A2	120	12.00	0	0.00	-120	-12.00	
			7	725	72.50	500	50.00	-225	-22.50	
1208	-87.79974	43.47729	1A2	0	0.00	320	32.00	320	32.00	
			1A3	180	18.00	0	0.00	-180	-18.00	
			1B2	55	5.50	55	5.50	0	0.00	
			1B3	30	3.00	30	3.00	0	0.00	
			5A2	0	0.00	100	10.00	100	10.00	
			5A3	100	10.00	0	0.00	-100	-10.00	
1209	-87.79526	43.48567	7	635	63.50	495	49.50	-140	-14.00	
			1A2	250	25.00	300	30.00	50	5.00	
			1B2	230	23.00	190	19.00	-40	-4.00	
1210	-87.79153	43.49328	7	650	65.00	650	65.00	0	0.00	State Park
			7	1000	100.00	1000	100.00	0	0.00	State Park
			7	945	94.50	745	74.50	-200	-20.00	
1211	-87.79423	43.50197	1A3	55	5.50	0	0.00	-55	-5.50	
			1A4	0	0.00	255	25.50	255	25.50	
			7	945	94.50	745	74.50	-200	-20.00	
1212	-87.79397	43.51093	1A2	40	4.00	40	4.00	0	0.00	
			1A3	140	14.00	140	14.00	0	0.00	
			1B2	25	2.50	25	2.50	0	0.00	
			5A2	37	3.70	37	3.70	0	0.00	
			7	758	75.80	758	75.80	0	0.00	
1213	-87.79380	43.51989	1A2	50	5.00	50	5.00	0	0.00	
			1A3	0	0.00	100	10.00	100	10.00	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
			1B2	110	11.00	200	20.00	90	9.00	
			1B3	55	5.50	50	5.00	-5	-0.50	
			5A3	50	5.00	350	35.00	300	30.00	
			7	785	78.50	450	45.00	-335	-33.50	
1214			1A2	0	0.00	150	15.00	150	15.00	
	-87.79414	43.52885	1B2	145	14.50	170	17.00	25	2.50	
			1B3	70	7.00	0	0.00	-70	-7.00	
			5A3	100	10.00	300	30.00	200	20.00	
			5A4	325	32.50	0	0.00	-325	-32.50	
			7	360	36.00	425	42.50	65	6.50	
1215			1A3	340	34.00	565	56.50	225	22.50	
	-87.79255	43.53777	5A3	260	26.00	110	11.00	-150	-15.00	
			7	400	40.00	325	32.50	-75	-7.50	

Total of 44 Reaches

Counts

Count of SP TYPE	
SP TYPE	Total
7	42
1A1	4
1A2	14
1A3	8
1A4	1
1B1	5
1B2	9
1B3	5
2A2	1
2B1	2
2C1	1
5A2	5
5A3	5



<b>Shore Protection Type</b>	<b>78 LENGTH (M)</b>	<b>\$/M Total Cost 78</b>	
1A1 - Revetments >45 Year Lifespan	838	\$2,510.00	\$2,103,380.00
1A2 - Revetments 5-45 Year Lifespan	1120	\$717.00	\$803,040.00
1A3 - Revetments 0-5 Year Lifespan	895	\$158.00	\$141,410.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	1682	\$2,330.00	\$3,919,060.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	840	\$2,330.00	\$1,957,200.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	230	\$604.00	\$138,920.00
2A2 - Groins 5-45 Year Lifespan	150	\$1,076.00	\$161,400.00
2B1 - Jetties	200	\$2,330.00	\$466,000.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	\$2,510.00	\$0.00
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	457	\$158.00	\$72,206.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	580	\$158.00	\$91,640.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	325	\$158.00	\$51,350.00
5B2 - Ad Hoc, Other Materials, 5-45 Year Lifespan	30	\$158.00	\$4,740.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	0	\$158.00	\$0.00
7 - Unprotected	37153		
			\$9,910,346.00

<b>92 LENGTH (M)</b>	<b>\$/M Total Cost 92</b>		<b>Net Change \$</b>
1038	\$2,510.00	\$2,605,380.00	\$502,000.00
2450	\$717.00	\$1,756,650.00	\$953,610.00
805	\$158.00	\$127,190.00	-\$14,220.00
255	\$158.00	\$40,290.00	\$40,290.00
2107	\$2,330.00	\$4,909,310.00	\$990,250.00
1050	\$2,330.00	\$2,446,500.00	\$489,300.00
260	\$604.00	\$157,040.00	\$18,120.00
0	\$1,076.00	\$0.00	-\$161,400.00
200	\$2,330.00	\$466,000.00	\$0.00
200	\$2,510.00	\$502,000.00	\$502,000.00
437	\$158.00	\$69,046.00	-\$3,160.00
760	\$158.00	\$120,080.00	\$28,440.00
25	\$158.00	\$3,950.00	-\$47,400.00
30	\$158.00	\$4,740.00	\$0.00
25	\$158.00	\$3,950.00	\$3,950.00
35168			
		\$13,212,126.00	\$3,301,780.00



## SHEBOYGAN COUNTY

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Sheboygan County Summary Statistics**

Shore Protection Type	78 LENGTH (M)	%COUNTY	92 LENGTH (M)	% COUNTY	CHG (M)	CHG (%)
1A1 - Revetments >45 Year Lifespan	3290	7.15	5440	11.83	2150	4.67
1A2 - Revetments 5-45 Year Lifespan	4235	9.21	5895	12.82	1660	3.61
1A3 - Revetments 0-5 Year Lifespan	3140	6.83	2070	4.50	-1070	-2.33
1A4 - Revetments 0 Year Lifespan (Disrepair)	255	0.55	0	0.00	-255	-0.55
1B1 - Seawalls/Bulkheads >45 Year Lifespan	3000	6.52	3320	7.22	320	0.70
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1125	2.45	1050	2.28	-75	-0.16
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	725	1.58	310	0.67	-415	-0.90
1B4 - Seawalls/Bulkheads 0 Year Lifespan (Disrepair)	0	0.00	75	0.16	75	0.16
2A1 - Groins >45 Year Lifespan	1600	3.48	0	0.00	-1600	-3.48
2A2 - Groins 5-45 Year Lifespan	275	0.60	400	0.87	125	0.27
2A3 - Groins 0-5 Year Lifespan	0	0.00	1475	3.21	1475	3.21
2B1 - Jetties >45 Year Lifespan	315	0.68	300	0.65	-15	-0.03
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	0.00	250	0.54	250	0.54
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	40	0.09	680	1.48	640	1.39
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	595	1.29	245	0.53	-350	-0.76
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	1250	2.72	1295	2.82	45	0.10
5B3 - Ad Hoc, Other Materials, 0-5 Year Lifespan	35	0.08	0	0.00	-35	-0.08
7 - Unprotected	27720	60.26	25595	55.64	-2125	-4.62

Note: Percentages Expressed as a Percentage of 46km length for entire county

**Quick Analysis:**

Changes in Groins due to deterioration of one large group  
 Largest change addition of mid to high quality revetments  
 Revetments and Seawalls Predominate  
 Largest range in quality for structures found  
 27.7km unprotected in 1978...25.5 unprotected in 1992...loss of 152m per year

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Sheboygan County**

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
1216	-87.79303	43.54663	1A2	0	0.00	45	4.50	45	4.50	
			1B2	85	8.50	150	15.00	65	6.50	
			1B3	170	17.00	60	6.00	-110	-11.00	
			5A3	0	0.00	55	5.50	55	5.50	
			7	745	74.50	690	69.00	-55	-5.50	
1217	-87.79240	43.55557	7	1000	100.00	1000	100.00	0	0.00	
1218	-87.78980	43.56435	1A2	100	10.00	100	10.00	0	0.00	
			5A4	105	10.50	165	16.50	60	6.00	
			7	795	79.50	735	73.50	-60	-6.00	
1219	-87.78526	43.57273	1A2	0	0.00	170	17.00	170	17.00	
			1A3	0	0.00	25	2.50	25	2.50	
			1B2	110	11.00	0	0.00	-110	-11.00	
			1B3	125	12.50	35	3.50	-90	-9.00	
			5A2	0	0.00	430	43.00	430	43.00	
			5A3	140	14.00	0	0.00	-140	-14.00	
			7	625	62.50	340	34.00	-285	-28.50	
1220	-87.77987	43.58084	1A2	70	7.00	50	5.00	-20	-2.00	
			1A3	0	0.00	70	7.00	70	7.00	
			1B2	50	5.00	50	5.00	0	0.00	
			5A4	880	88.00	880	88.00	0	0.00	
1221	-87.77393	43.58871	1A1	0	0.00	15	1.50	15	1.50	
			1A2	0	0.00	150	15.00	150	15.00	
			1B2	0	0.00	15	1.50	15	1.50	
			1B3	30	3.00	0	0.00	-30	-3.00	
			5A3	125	12.50	190	19.00	65	6.50	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
			5A4	165	16.50	100	10.00	-65	-6.50	
			7	680	68.00	530	53.00	-150	-15.00	
1222	-87.76769	43.59649	1A2	0	0.00	195	19.50	195	19.50	
			1A3	60	6.00	60	6.00	0	0.00	
			1B3	265	26.50	130	13.00	-135	-13.50	
			1B4	0	0.00	75	7.50	75	7.50	
			7	675	67.50	615	61.50	-60	-6.00	
1223	-87.76211	43.60450	1A2	0	0.00	130	13.00	130	13.00	
			1B3	35	3.50	35	3.50	0	0.00	
			5B3	35	3.50	0	0.00	-35	-3.50	
			7	930	93.00	835	83.50	-95	-9.50	
1224	-87.75603	43.61234	1A2	175	17.50	245	24.50	70	7.00	
			1B2	170	17.00	85	8.50	-85	-8.50	
			5A2	40	4.00	40	4.00	0	0.00	
			5A3	25	2.50	0	0.00	-25	-2.50	
			7	595	59.50	630	63.00	35	3.50	
1225	-87.74930	43.61989	1A2	915	91.50	915	91.50	0	0.00	
			7	85	8.50	85	8.50	0	0.00	
1226	-87.74320	43.62772	1A2	130	13.00	560	56.00	430	43.00	
			1A3	680	68.00	250	25.00	-430	-43.00	
			1B3	0	0.00	50	5.00	50	5.00	
			7	190	19.00	140	14.00	-50	-5.00	
1227	-87.73717	43.63558	1A2	195	19.50	425	42.50	230	23.00	
			1A3	120	12.00	305	30.50	185	18.50	
			1B2	50	5.00	30	3.00	-20	-2.00	
			7	635	63.50	270	27.00	-365	-36.50	
1228	-87.73119	43.64346	1A2	30	3.00	30	3.00	0	0.00	
			1B2	35	3.50	35	3.50	0	0.00	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
			1B3	100	10.00	0	0.00	-100	-10.00	
			5A3	135	13.50	0	0.00	-135	-13.50	
			5A4	0	0.00	150	15.00	150	15.00	
			7	700	70.00	785	78.50	85	8.50	
1229	-87.72557	43.65149	7	1000	100.00	1000	100.00	0	0.00	Terry Andrae State Park
1230	-87.72035	43.65965	7	1000	100.00	1000	100.00	0	0.00	Terry Andrae State Park
1231	-87.71507	43.66777	7	1000	100.00	1000	100.00	0	0.00	
1232	-87.70903	43.67565	7	1000	100.00	1000	100.00	0	0.00	
1233	-87.70393	43.68384	7	1000	100.00	1000	100.00	0	0.00	
1234	-87.70285	43.69275	1A2	0	0.00	470	47.00	470	47.00	
			1A3	75	7.50	395	39.50	320	32.00	
			1B2	45	4.50	70	7.00	25	2.50	
			7	880	88.00	90	9.00	-790	-79.00	
1235	-87.70306	43.70161	1A2	220	22.00	260	26.00	40	4.00	
			1A3	0	0.00	60	6.00	60	6.00	
			1A4	140	14.00	0	0.00	-140	-14.00	
			1B2	280	28.00	280	28.00	0	0.00	
			7	580	58.00	660	66.00	80	8.00	
1236	-87.70343	43.71058	1A1	900	90.00	900	90.00	0	0.00	
			7	100	10.00	100	10.00	0	0.00	
1237	-87.70688	43.71920	1A1	300	30.00	1000	100.00	700	70.00	
			1A2	600	60.00	0	0.00	-600	-60.00	
			2A1	700	70.00	0	0.00	-700	-70.00	
			2A3	0	0.00	700	70.00	700	70.00	
1238	-87.70927	43.72800	1A1	0	0.00	1000	100.00	1000	100.00	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
			1A2	1000	100.00	0	0.00	-1000	-100.00	
			2A1	500	50.00	0	0.00	-500	-50.00	
			2A3	0	0.00	500	50.00	500	50.00	
1239	-87.70953	43.73698	1A1	375	37.50	375	37.50	0	0.00	
			7	625	62.50	625	62.50	0	0.00	
1240	-87.70568	43.74500	1A1	600	60.00	600	60.00	0	0.00	Sheboygan
			2B1	100	10.00	100	10.00	0	0.00	Jetty Offshore Length = 700m
			7	300	30.00	300	30.00	0	0.00	
1241	-87.70946	43.74754	1B1	1000	100.00	1000	100.00	0	0.00	Mouth of Sheboygan River
1242	-87.71647	43.74719	1B1	1000	100.00	1000	100.00	0	0.00	Mouth of Sheboygan River
1243	-87.71405	43.74528	1B1	1000	100.00	1000	100.00	0	0.00	Mouth of Sheboygan River
1244	-87.70513	43.74925	1A1	350	35.00	350	35.00	0	0.00	
			1A3	350	35.00	80	8.00	-270	-27.00	
			1B1	0	0.00	320	32.00	320	32.00	
			1B2	300	30.00	250	25.00	-50	-5.00	
1245	-87.70337	43.75511	1A1	165	16.50	200	20.00	35	3.50	
			2B1	215	21.50	200	20.00	-15	-1.50	Jetty Offshore Length = 970m
			2C1	0	0.00	250	25.00	250	25.00	
			5A3	170	17.00	0	0.00	-170	-17.00	
			7	450	45.00	350	35.00	-100	-10.00	
1246	-87.69811	43.76205	1A1	600	60.00	1000	100.00	400	40.00	
			2A1	400	40.00	0	0.00	-400	-40.00	
			2A2	0	0.00	400	40.00	400	40.00	
1247	-87.70116	43.76771	1A2	800	80.00	555	55.50	-245	-24.50	
			1A3	0	0.00	120	12.00	120	12.00	
			2A2	275	27.50	0	0.00	-275	-27.50	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
			2A3	0	0.00	275	27.50	275	27.50	
			7	200	20.00	325	32.50	125	12.50	
1248	-87.70696	43.77563	1A2	0	0.00	655	65.50	655	65.50	
			1A3	1000	100.00	270	27.00	-730	-73.00	
			7	0	0.00	75	7.50	75	7.50	
1249	-87.71095	43.78414	1A2	0	0.00	555	55.50	555	55.50	
			1A3	350	35.00	0	0.00	-350	-35.00	
			1B2	0	0.00	85	8.50	85	8.50	
			5A2	0	0.00	85	8.50	85	8.50	
			5A4	100	10.00	0	0.00	-100	-10.00	
			7	550	55.00	360	36.00	-190	-19.00	
1250	-87.71606	43.79231	1A2	0	0.00	80	8.00	80	8.00	
			1A4	115	11.50	0	0.00	-115	-11.50	
			7	885	88.50	920	92.00	35	3.50	
1251	-87.72087	43.80061	1A2	0	0.00	230	23.00	230	23.00	
			1A3	70	7.00	0	0.00	-70	-7.00	
			7	930	93.00	770	77.00	-160	-16.00	
1252	-87.72582	43.80880	7	1000	100.00	1000	100.00	0	0.00	
1253	-87.72661	43.81743	1A2	0	0.00	75	7.50	75	7.50	
			7	1000	100.00	925	92.50	-75	-7.50	
1254	-87.72881	43.82613	7	1000	100.00	1000	100.00	0	0.00	
1255	-87.72984	43.83507	7	1000	100.00	1000	100.00	0	0.00	
1256	-87.72859	43.84402	7	1000	100.00	1000	100.00	0	0.00	
1257	-87.72908	43.85294	1A3	435	43.50	435	43.50	0	0.00	
			7	565	56.50	565	56.50	0	0.00	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
1258	-87.73229	43.86162	7	1000	100.00 0.00	1000	100.00 0.00	0 0	0.00 0.00	
1259	-87.73477	43.87043	5A2 7	0 1000	0.00 100.00	75 925	7.50 92.50	75 -75	7.50 -7.50	
1260	-87.73596	43.87935	5A2 7	0 1000	0.00 100.00	50 950	5.00 95.00	50 -50	5.00 -5.00	
1261	-87.73307	43.88805	7	1000	100.00	1000	100.00	0	0.00	

Count of SP TYPE	
SP TYPE	Total
	7
1A1	9
1A2	22
1A3	13
1A4	2
1B1	4
1B2	11
1B3	7
1B4	1
2A1	3
2A2	2
2A3	3
2B1	2
2C1	1
5A2	5
5A3	6
5A4	5
5B3	1
(blank)	

REACH	Long	Lat	SP TYPE	78 Length	%REACH	92 LENGTH	% REACH	CHG (M)	CHG (%)	Comments
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Grand Total	135
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<b>Shore Protection Type</b>	<b>78 LENGTH (M)</b>	<b>\$/M Total Cost 78</b>	
1A1 - Revetments >45 Year Lifespan	3290	\$2,510.00	\$8,257,900.00
1A2 - Revetments 5-45 Year Lifespan	4235	\$717.00	\$3,036,495.00
1A3 - Revetments 0-5 Year Lifespan	3140	\$158.00	\$496,120.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	255	\$158.00	\$40,290.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	3000	\$2,330.00	\$6,990,000.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	1125	\$2,330.00	\$2,621,250.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	725	\$604.00	\$437,900.00
1B4 - Seawalls/Bulkheads 0 Year Lifespan (Disrepair)	0	\$604.00	\$0.00
2A1 - Groins >45 Year Lifespan	1600	\$3,585.00	\$5,736,000.00
2A2 - Groins 5-45 Year Lifespan	275	\$1,076.00	\$295,900.00
2A3 - Groins 0-5 Year Lifespan	0	\$318.00	\$0.00
2B1 - Jetties >45 Year Lifespan	315	\$2,330.00	\$733,950.00
2C1 - Offshore Breakwaters, > 45 Year Lifespan	0	\$2,510.00	\$0.00
5A2 - Ad Hoc, Concrete, 5-45 Year Lifespan	40	\$158.00	\$6,320.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	595	\$158.00	\$94,010.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	1250	\$158.00	\$197,500.00
5B3 - Ad Hoc, Other Materials, 0-5 Year Lifespan	35	\$158.00	\$5,530.00
7 - Unprotected	27720		
			\$28,949,165.00

92 LENGTH (M)		\$/M Total Cost 92	Net Change \$
5440	\$2,510.00	\$13,654,400.00	\$5,396,500.00
5895	\$717.00	\$4,226,715.00	\$1,190,220.00
2070	\$158.00	\$327,060.00	-\$169,060.00
0	\$158.00	\$0.00	-\$40,290.00
3320	\$2,330.00	\$7,735,600.00	\$745,600.00
1050	\$2,330.00	\$2,446,500.00	-\$174,750.00
310	\$604.00	\$187,240.00	-\$250,660.00
75	\$604.00	\$45,300.00	\$45,300.00
0	\$3,585.00	\$0.00	-\$5,736,000.00
400	\$1,076.00	\$430,400.00	\$134,500.00
1475	\$318.00	\$469,050.00	\$469,050.00
300	\$2,330.00	\$699,000.00	-\$34,950.00
250	\$2,510.00	\$627,500.00	\$627,500.00
680	\$158.00	\$107,440.00	\$101,120.00
245	\$158.00	\$38,710.00	-\$55,300.00
1295	\$158.00	\$204,610.00	\$7,110.00
0	\$158.00	\$0.00	-\$5,530.00
25595			
		\$31,199,525.00	\$2,250,360.00



## MANITOWOC COUNTY

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Manitowoc County Summary Statistics**

<b>Shore Protection Type</b>	<b>78 LENGTH (M)</b>	<b>%COUNTY</b>	<b>92 LENGTH (M)</b>	<b>% COUNTY</b>	<b>CHG (M)</b>	<b>CHG (%)</b>
1A1 - Revetments >45 Year Lifespan	7880	13.82	9335	16.38	1455	2.55
1A2 - Revetments 5-45 Year Lifespan	1485	2.61	2965	5.20	1480	2.60
1A3 - Revetments 0-5 Year Lifespan	285	0.50	570	1.00	285	0.50
1A4 - Revetments 0 Year Lifespan (Disrepair)	45	0.08	0	0.00	-45	-0.08
1B1 - Seawalls/Bulkheads >45 Year Lifespan	30	0.05	30	0.05	0	0.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	45	0.08	110	0.19	65	0.11
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	25	0.04	0	0.00	-25	-0.04
2A2 - Groins 5-45 Year Lifespan	335	0.59	335	0.59	0	0.00
2B1 - Jetties >45 Year Lifespan	1070	1.88	1070	1.88	0	0.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	125	0.22	100	0.18	-25	-0.04
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	200	0.35	200	0.35	0	0.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	225	0.39	100	0.18	-125	-0.22
7 - Unprotected	45485	79.80	42420	74.42	-3065	-5.38

Note: Percentages Expressed as a Percentage of 57km length for entire county

**Quick Analysis:**

~80% of county unprotected in 1978, 74%in 1992...armoring rate of 218m per year

Where SP exists it is primarily revetment

>5% increase in construction/improvements to revetments

**Lake Michigan Potential Damages Study  
Detailed Shoreline Protection Mapping and Classification**

**Reach by Reach Summary - Manitowoc County**

REACH	LONG	LAT	SP	1978 (m)	%Reach	1992 (m)	%Reach	CHG (M)	CHG (%)	COMMENTS
1262	-87.72940	43.89665	7	1000	100.00	1000	100.00	0	0.00	
1263	-87.72651	43.90539	7	1000	100.00	1000	100.00	0	0.00	
1264	-87.72438	43.91421	1A1	0	0.00	50	5.00	50	5.00	
			1A2	50	5.00	50	5.00	0	0.00	
			1A3	0	0.00	45	4.50	45	4.50	
			1A4	45	4.50	0	0.00	-45	-4.50	
			1B2	15	1.50	15	1.50	0	0.00	
			7	890	89.00	840	84.00	-50	-5.00	
1265	-87.72254	43.92299	1A2	0	0.00	100	10.00	100	10.00	
			1A3	0	0.00	330	33.00	330	33.00	
			7	1000	100.00	570	57.00	-430	-43.00	
1266	-87.72028	43.9318	5A4	0	0.00	200	20.00	200	20.00	Air photos missing
			7	1000	100.00	800	80.00	-200	-20.00	Classified from Digital Orthos
1267	-87.71175	43.94848	1A2	0	0.00	225	22.50	225	22.50	Air photos missing
			7	1000	100.00	775	77.50	-225	-22.50	Classified from Digital Orthos
1268	-87.70467	43.95588	7	1000	100.00	1000	100.00	0	0.00	
1269	-87.69973	43.9641	7	1000	100.00	1000	100.00	0	0.00	
1270	-87.69817	43.97296	7	1000	100.00	1000	100.00	0	0.00	
1271	-87.69703	43.98191	7	1000	100.00	1000	100.00	0	0.00	
1272	-87.69506	43.9908	7	1000	100.00	1000	100.00	0	0.00	

REACH	LONG	LAT	SP	1978 (m)	%Reach	1992 (m)	%Reach	CHG (M)	CHG (%)	COMMENTS
1273	-87.69157	43.99941	7	1000	100.00	1000	100.00	0	0.00	
1274	-87.6881	44.00801	7	1000	100.00	1000	100.00	0	0.00	
1275	-87.68491	44.0167	7	1000	100.00	1000	100.00	0	0.00	
1276	-87.68059	44.02511	7	1000	100.00	1000	100.00	0	0.00	
1277	-87.67507	44.03317	7	1000	100.00	1000	100.00	0	0.00	
1278	-87.6682	44.04065	7	1000	100.00	1000	100.00	0	0.00	
1279	-87.66057	44.04776	7	1000	100.00	1000	100.00	0	0.00	
1280	-87.65457	44.05543	1A2	50	5.00	50	5.00	0	0.00	
			7	950	95.00	950	95.00	0	0.00	
1281	-87.65379	44.0639	1B2	30	3.00	30	3.00	0	0.00	
			7	970	97.00	970	97.00	0	0.00	
1282	-87.6557	44.07272	1A3	35	3.50	35	3.50	0	0.00	
			7	965	96.50	965	96.50	0	0.00	
1283	-87.65463	44.08164	7	1000	100.00	1000	100.00	0	0.00	
1284	-87.64927	44.08892	1A1	35	3.50	35	3.50	0	0.00	
			1A2	600	60.00	875	87.50	275	27.50	
			1A3	50	5.00	0	0.00	-50	-5.00	
			1B1	30	3.00	30	3.00	0	0.00	
			7	285	28.50	60	6.00	-225	-22.50	
1285	-87.64525	44.09491	1A1	475	47.50	475	47.50	0	0.00	City of Manitowoc
			2B1	525	52.50	525	52.50	0	0.00	Jetty Offshore Length = 450m

REACH	LONG	LAT	SP	1978 (m)	%Reach	1992 (m)	%Reach	CHG (M)	CHG (%)	COMMENTS
1286	-87.64851	44.10081	1A1	700	70.00	700	70.00	0	0.00	CDF
			2B1	120	12.00	120	12.00	0	0.00	Jetty Offshore Length = 450m
			7	80	8.00	80	8.00	0	0.00	Jetty Entrance
1287	-87.64223	44.10802	1A1	795	79.50	1000	100.00	205	20.50	Marina Construction
			7	205	20.50	0	0.00	-205	-20.50	
1288	-87.63348	44.11434	1A1	1000	100.00	1000	100.00	0	0.00	
			2A2	335	33.50	335	33.50	0	0.00	
1289	-87.62405	44.12024	1A2	40	4.00	600	60.00	560	56.00	
			1B2	0	0.00	65	6.50	65	6.50	
			7	960	96.00	335	33.50	-625	-62.50	
1290	-87.61412	44.12563	1A1	0	0.00	700	70.00	700	70.00	
			1A2	260	26.00	300	30.00	40	4.00	
			5B4	125	12.50	0	0.00	-125	-12.50	
			7	615	61.50	0	0.00	-615	-61.50	
1291	-87.60374	44.13046	1A1	600	60.00	1000	100.00	400	40.00	
			7	400	40.00	0	0.00	-400	-40.00	
1292	-87.59293	44.13455	1A1	1000	100.00	1000	100.00	0	0.00	
1293	-87.58172	44.13852	1A1	1000	100.00	1000	100.00	0	0.00	
1294	-87.57051	44.14152	1A1	800	80.00	800	80.00	0	0.00	
			7	200	20.00	200	20.00	0	0.00	
1295	-87.56284	44.14574	1A1	200	20.00	200	20.00	0	0.00	
			1A3	200	20.00	0	0.00	-200	-20.00	
			7	600	60.00	800	80.00	200	20.00	
1296	-87.55298	44.151	2B1	325	32.50	325	32.50	0	0.00	Jetties Offshore Length = 230m(south), 425m(north)
			7	675	67.50	675	67.50	0	0.00	

REACH	LONG	LAT	SP	1978 (m)	%Reach	1992 (m)	%Reach	CHG (M)	CHG (%)	COMMENTS
1297	-87.54358	44.15692	1A3	0	0.00	85	8.50	85	8.50	
			7	1000	100.00	915	91.50	-85	-8.50	
1298	-87.53519	44.16359	1A3	0	0.00	75	7.50	75	7.50	
			1B3	25	2.50	0	0.00	-25	-2.50	
			7	975	97.50	925	92.50	-50	-5.00	
1299	-87.52735	44.17059	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1300	-87.52093	44.17827	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1301	-87.51567	44.18644	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1302	-87.51183	44.19501	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1303	-87.50916	44.2038	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1304	-87.50712	44.21267	7	1000	100.00	1000	100.00	0	0.00	Point Beach State Forest
1305	-87.50715	44.22166	7	1000	100.00	1000	100.00	0	0.00	
1306	-87.50877	44.23055	1A1	200	20.00	250	25.00	50	5.00	
			7	800	80.00	750	75.00	-50	-5.00	
1307	-87.51216	44.23907	1A1	175	17.50	175	17.50	0	0.00	
			1A2	175	17.50	300	30.00	125	12.50	
			7	650	65.00	525	52.50	-125	-12.50	
1308	-87.51655	44.24749	1A2	210	21.00	365	36.50	155	15.50	
			7	790	79.00	635	63.50	-155	-15.50	
1309	-87.52013	44.25594	7	1000	100.00	1000	100.00	0	0.00	
1310	-87.52435	44.2644	5A3	100	10.00	100	10.00	0	0.00	

REACH	LONG	LAT	SP	1978 (m)	%Reach	1992 (m)	%Reach	CHG (M)	CHG (%)	COMMENTS
			5B4	100	10.00	100	10.00	0	0.00	
			7	800	80.00	800	80.00	0	0.00	
1311	-87.52964	44.27251	7	1000	100.00	1000	100.00	0	0.00	
1312	-87.53468	44.28074	1A1	400	40.00	400	40.00	0	0.00	
			7	600	60.00	600	60.00	0	0.00	
1313	-87.53929	44.28903	1A1	500	50.00	500	50.00	0	0.00	Point Beach Nuclear Power Plant
			1A2	100	10.00	100	10.00	0	0.00	
			2B1	100	10.00	100	10.00	0	0.00	Intake Structures
			5A4	200	20.00	0	0.00	-200	-20.00	
			7	100	10.00	300	30.00	200	20.00	
1314	-87.54261	44.2977	7	1000	100.00	1000	100.00	0	0.00	
1315	-87.54473	44.30639	7	1000	100.00	1000	100.00	0	0.00	
1316	-87.54538	44.31538	1A1	0	0.00	50	5.00	50	5.00	Two Creeks County Park Boat Ramp
			5A3	25	2.50	0	0.00	-25	-2.50	
			7	975	97.50	950	95.00	-25	-2.50	
1317	-87.54475	44.32431	7	1000	100.00	1000	100.00	0	0.00	
1318	-87.5405	44.33273	7	1000	100.00	1000	100.00	0	0.00	

Count of SP TYPE	
SP TYPE	Total
7	53
1A1	17
1A2	10
1A3	7
1A4	1

**REACH      LONG      LAT   SP   1978 (m)   %Reach   1992 (m)   %Reach   CHG (M)   CHG (%)   COMMENTS**

1B1	1
1B2	3
1B3	1
2A2	1
2B1	4
5A3	2
5A4	2
5B4	2
(blank)	
Grand Total	104

<b>Shore Protection Type</b>	<b>78 LENGTH (M)</b>	<b>\$/M Total Cost 78</b>	
1A1 - Revetments >45 Year Lifespan	7880	\$2,510.00	\$19,778,800.00
1A2 - Revetments 5-45 Year Lifespan	1485	\$717.00	\$1,064,745.00
1A3 - Revetments 0-5 Year Lifespan	285	\$158.00	\$45,030.00
1A4 - Revetments 0 Year Lifespan (Disrepair)	45	\$158.00	\$7,110.00
1B1 - Seawalls/Bulkheads >45 Year Lifespan	30	\$2,330.00	\$69,900.00
1B2 - Seawalls/Bulkheads 5-45 Year Lifespan	45	\$2,330.00	\$104,850.00
1B3 - Seawalls/Bulkheads 0-5 Year Lifespan	25	\$604.00	\$15,100.00
2A2 - Groins 5-45 Year Lifespan	335	\$1,076.00	\$360,460.00
2B1 - Jetties >45 Year Lifespan	1070	\$2,330.00	\$2,493,100.00
5A3 - Ad Hoc, Concrete, 0-5 Year Lifespan	125	\$158.00	\$19,750.00
5A4 - Ad Hoc, Concrete, 0 Year Lifespan (Disrepair)	200	\$158.00	\$31,600.00
5B4 - AdHoc, Other Materials, 0 Year Lifespan (Disrepair)	225	\$158.00	\$35,550.00
7 - Unprotected	45485		
			\$24,025,995.00

<b>92 LENGTH (M)</b>	<b>\$/M Total Cost 92</b>		<b>Net Change \$</b>
9335	\$2,510.00	\$23,430,850.00	\$3,652,050.00
2965	\$717.00	\$2,125,905.00	\$1,061,160.00
570	\$158.00	\$90,060.00	\$45,030.00
0	\$158.00	\$0.00	-\$7,110.00
30	\$2,330.00	\$69,900.00	\$0.00
110	\$2,330.00	\$256,300.00	\$151,450.00
0	\$604.00	\$0.00	-\$15,100.00
335	\$1,076.00	\$360,460.00	\$0.00
1070	\$2,330.00	\$2,493,100.00	\$0.00
100	\$158.00	\$15,800.00	-\$3,950.00
200	\$158.00	\$31,600.00	\$0.00
100	\$158.00	\$15,800.00	-\$19,750.00
42420			
		\$28,889,775.00	\$4,863,780.00



## APPENDIX 2

### SHORE PROTECTION CLASSIFICATION MAPPING ARC VIEW MAP PLOTS

OTTAWA COUNTY  
ALLEGAN COUNTY  
OZAUKEE COUNTY  
SHEBOYGAN COUNTY  
MANITOWOC COUNTY



## OTTAWA COUNTY



## ALLEGAN COUNTY



## OZAUKEE COUNTY



## SHEBOYGAN COUNTY



## MANITOWOC COUNTY