



Ludington Area Shoreline Land Use and Resiliency Plan

2021





**WEST MI
SHORELINE**
Regional Development Commission

The West Michigan Shoreline Regional Development Commission is a federal and state designated regional planning and development agency serving 120 local governments in Lake, Mason, Muskegon, Newaygo, and Oceana counties. WMSRDC is also the planning agency for the metropolitan transportation planning (MPO) program for Muskegon and Northern Ottawa counties.

The Commission's mission is to promote and foster regional development in West Michigan through cooperation amongst local governments and regional partners.

The general regional goal of the West Michigan Shoreline Regional Development Commission is to provide assistance to member local governments in addressing regional and public policy issues, especially as they pertain to planning and development.



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EXECUTIVE SUMMARY

In the wake of major disruptions such as record-setting high water or a global pandemic, it is essential that a community reflects and take proactive measures to be prepared for the future. What steps can be taken to not only address matters at hand, but also mitigate costly repairs and investments in the future? What policies and practices can be put in place now that will enable the community to not only bounce back, but also bounce forward? Are there lessons that can be learned from the high-water crisis and applied in the future or to other areas such as community planning and private property management?

This ***Ludington Area Shoreline Land Use and Resiliency Plan*** has achieved the following:

- Established a diverse steering committee around the issue of shoreline resilience.
- Identified past and potential shoreline hazards.
- Identified strategies and resources to support resilient planning and decision making.
- Gathered perspectives and opinions from the community.
- Outlined a broad, multijurisdictional vision for the future land use surrounding Pere Marquette Lake.
- Presented broad recommendations to support a resilient shoreline.

Obstacles and Limitations

First, this planning process was designed to equip the communities of Ludington and Pere Marquette Township with tools and information to increase shoreline resilience. However, resilience planning is a rapidly growing discipline, and a truly comprehensive and community-wide resilience plan was beyond the scope of this project. It is hoped the contents of this document will support shoreline planning and serve as but one piece of resilient planning and development practices in the communities of Ludington and Pere Marquette Township.

Also, the COVID-19 pandemic created obstacles during the development of this study. By far, the biggest impacts were (1) the interruption of the planning process and engagement with the advisory committee, and (2) interference with engagement with the public. In lieu of an open house and public meeting intended to engage with and solicit input from members of the community, the planning team developed a community survey that was advertised and made available to the public on the Internet.

Finally, given the unprecedented period of high-water level that was occurring throughout the planning process, it is no surprise that it commanded most of the attention and comments from both the advisory committee and the public. There was a constant urge to respond to the ongoing crisis. However, there was a balance to be struck in acknowledging and responding to the current events with fostering a culture of resilient planning practices which, in the future, will enable the community to not only recover from adversity, but bounce back even stronger. It is the intent that the research, public and stakeholder input, and resources and references contained within this plan will be applicable to whatever shoreline adversities that may challenge the community in the future.

INTRODUCTION

The Port of Ludington at Pere Marquette Lake is a valuable deep-water harbor on Lake Michigan. This report seeks to help the communities of Ludington and Pere Marquette Charter Township develop a vision for the evolving land uses surrounding Pere Marquette Lake and seeks to advance efforts to create and maintain resilient waterfront areas within those communities.

Background

The Ludington area is amid a long-term economic shift, from a predominately manufacturing-based economy to one that is increasingly dependent upon the service and recreation industries. Pere Marquette Lake has a rich history of human activity and currently provides for a spectrum of uses and natural functions.

In 2019, the City of Ludington wished to develop a vision for future land uses along Pere Marquette Lake. At the same time, the Great Lakes were approaching record-high water levels. This period of high water was causing major disruptions along the city's developed shoreline. Facing many of the same issues regarding high water, as well as having shared interests regarding development and uses involving Pere Marquette Lake, the City of Ludington and Pere Marquette Township joined forces to commission this report.

Redevelopment Ready Communities

This report was developed by the West Michigan Shoreline Regional Development Commission (WMSRDC) with a grant from the Michigan Economic Development Corporation's (MEDC) Redevelopment Ready Communities (RRC) program. The City of Ludington and Pere Marquette Charter Township also provided a portion of the funding; not to mention the exemplary coordination and cooperation exhibited during the planning process.

The City of Ludington is engaged with the RRC program and working with the MEDC towards achieving Redevelopment Ready Certification. The RRC process is designed "to provide a consistent yet customized experience for each community, factoring in differences such as population, existing development patterns, staff capacity, financial capacity, and other local challenges or strengths." The RRC mission is to empower "communities to shape their future by building a foundation of planning, zoning, and economic development best practices and integrate them into their everyday functions."

Purpose

This report explores two separate, yet closely related aspects of the Ludington area: future land use surrounding the Port of Ludington, and the long-term resilience of the shoreline. At the time this report was being prepared, water levels on the Great Lakes were in the midst of an extended period of above average to record high water levels. The Lake Michigan water level flirted with record highs in 2019, reached record heights throughout most of 2020, and remained above average in early 2021.

This period of high water renewed a spirit of urgency within the community to not only respond to the near-term effects, but also to envision how to develop and/or redevelop the shoreline in resilient, cost-efficient ways.

This document is not intended to respond solely to current high-water conditions. Rather, it is a resource that may be helpful for continuing a multi-jurisdictional, cooperative framework for creating and maintaining resilient waterfronts in the Ludington area, both in the short and long terms. Similarly, this document is not intended to replace the official designs for the future which are held within the City of Ludington Master Plan, the Pere Marquette Charter Township Comprehensive Plan, and the Greater Ludington Waterfront Master Plan. Although those plans were due to be updated at the time of this report, they were valuable references of information for community planning. It is not the intent of this document to duplicate those efforts. Instead, it is intended to be a decision-making tool that provides factual information to community leaders and planners for communicating with the public and for developing strategies for the future development and general character of waterfronts in the Ludington area.

Leaders in the Ludington area have a strong reputation of proactive planning. This report references and seeks to build upon facts or assumptions that have been already established. Information presented herein is intended to support and inform the continuation of resilient planning and development practices in the Ludington area.

Planning Process

The Shoreline Land Use and Resiliency Plan (SLURP) for the Ludington area was designed to address shoreline land use and resilience matters in the communities of Ludington and Pere Marquette Township. Listed below is the planning process that was followed.

1. Community Tour & Fact-Finding Meeting
 - a. Define geographic boundaries of study
 - b. Identify previous studies/research
 - c. Identify candidates for Advisory Committee
 - d. Identify partner organizations
 - e. Develop meeting schedule
2. Assemble Advisory Group
3. Identify Current and Future Land Uses
 - a. Synthesize Ludington and Pere Marquette Township maps
4. Identify & Map Community Assets
5. Identify Shoreline Hazards & Risks
6. Review Previously Completed Studies
7. Online Community Survey
8. Develop Vision for Future Land Use & Shoreline Resilience
 - a. Recommendations for policy and action
 - b. Identify areas for potential for development/redevelopment
9. Review & Comment Period
10. Final Plan
 - a. Present to governing bodies in Ludington and Pere Marquette Township
 - b. Distribute final plan

Advisory Committee

A diverse collection of community stakeholders was invited to participate in the advisory committee. The committee played an important role throughout the planning process, such as identifying important shoreline characteristics, risks, and assets.

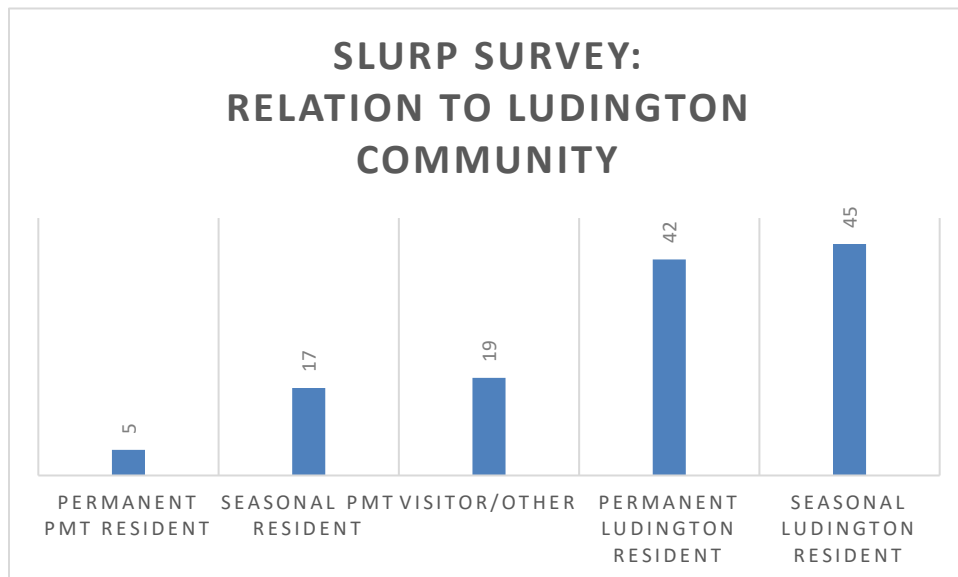
A kick-off meeting was held on December 12, 2019 at Ludington City Hall to introduce and discuss the overall scope of the project. A second meeting was held on February 18, 2020 at Pere Marquette Township Hall. This meeting included committee review of draft maps and a facilitated discussion to identify shoreline assets, weaknesses and hazards within the study area.

Due to the COVID-19 pandemic, the committee did not meet in person after March 2020. Committee members remained engaged through email communications and virtual meetings.

Public Input

Initial designs for this study included at least two charettes for engaging and interacting with the public. Alas, the COVID-19 pandemic eliminated that possibility. An online survey was developed as an alternative and made available throughout the month of January 2021. The advisory committee assisted with the survey design and with distributing the survey throughout the community and stakeholder networks.

The results of the survey are referenced throughout this study, and a survey report is included in the appendix section. Of the 129 survey responses, about two-thirds of respondents that shared their relation to the community were either permanent or seasonal City of Ludington residents. Twenty percent claimed Pere Marquette Township, and about fifteen percent hailed from elsewhere.



Study Area

The primary focus of this study is the Pere Marquette Lake shoreline and adjacent lands within the City of Ludington and Pere Marquette Township. Pere Marquette Lake is a dynamic setting that is host to numerous economic, social, and environmental activities and functions. It features one of the few deep-water ports on the eastern shore of Lake Michigan and is bounded by the City of Ludington to the north and Pere Marquette Charter Township to the south. Pere Marquette Lake is fed by the famed Pere Marquette River which subsequently flows into Lake Michigan. Future land uses surrounding Pere Marquette Lake as well as resilience of the immediate shoreline are the main issues driving this study.

The secondary focus area includes the Lake Michigan shoreline and Lincoln Lake southern shoreline. At the time this study was conducted, these areas were experiencing flooding, erosion, and other impacts associated with severe storm events during an extended period of record-high Great Lakes water levels. Planning for these areas was not the initial motivation for this study. However, the significant disruptions caused by high water drew attention to these areas as landowners and municipalities struggled to respond throughout the Great Lakes.

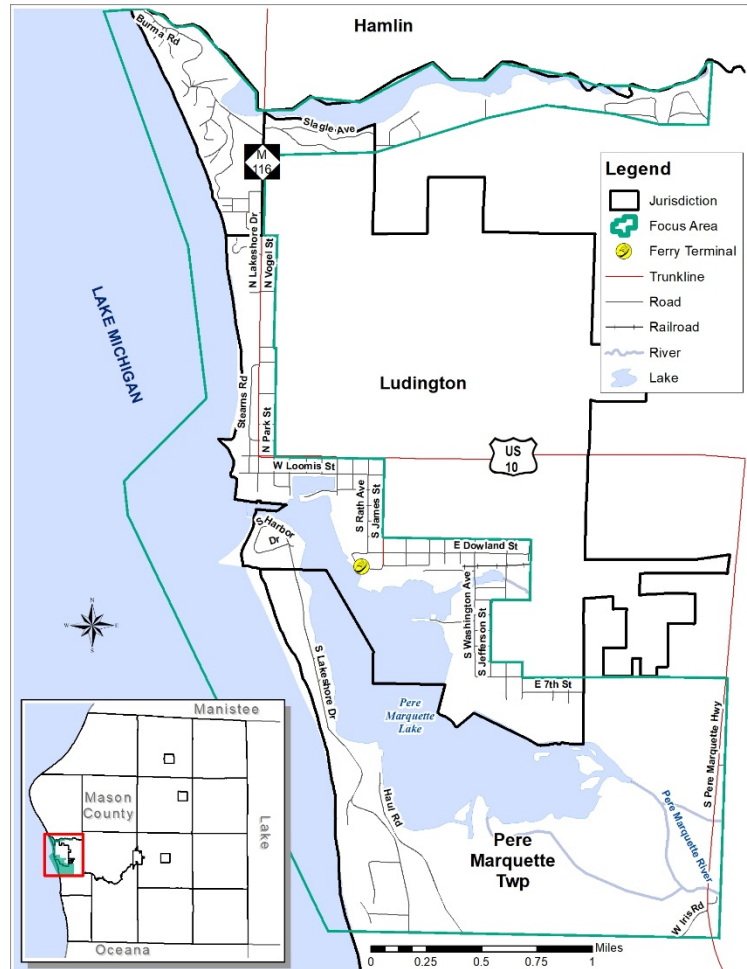
Community Profile

Detailed community profiles are contained within the City of Ludington Master Plan, the Pere Marquette Charter Township Comprehensive Plan, and the Greater Ludington Waterfront Master Plan. The following is provided to offer a cursory introduction to the community.

Ludington, the county seat of Mason County, was officially platted in 1867 and organized as a city in 1873. It is named after James Ludington, an investor who purchased much of the timberland region and built a sawmill in the area in the mid 1860's. Located along Lake Michigan's shoreline, currently Ludington sits within Pere Marquette Township in the southwest quarter of Mason County.

The 2019 American Community Survey 5-year Estimate population of the city was 8,069, which is similar to the population tallied for the 2010 Census. Important infrastructure within the study area includes

Study Area Map



municipal water and sewer systems, U.S. Coast Guard Station, S.S. Badger Car-ferry, Pere Marquette Shipping, highway US-10 and local roads, and Marquette Rail railroad. Major geographic features include Lake Michigan and the shoreline, coastal sand dunes, Lincoln Lake, Pere Marquette Lake, dense residential, and moderately dense commercial areas.

Pere Marquette Township is located in western Mason County. The township's borders include Lake Michigan and the City of Ludington to the west, Hamlin Township to the north, Summit Township to the south, and Amber and Riverton townships to the east. Pere Marquette is the most populated township in Mason County even though it is the second smallest in size. Its location; adjacent to Ludington, on Lake Michigan, and at the mouth of the Pere Marquette River; present attractive environments for urban development, tourism, and natural settings to coexist.

The 2019 estimated population of the township was 2,440, a slight increase from the 2010 Census population. Critical public or private facilities include the Pere Marquette Township Fire Department and the Pere Marquette Township Hall. There are several important employers in the township, primarily located in areas that are contiguous with the City of Ludington, north of the Pere Marquette River. Major geographic features include Lake Michigan and shoreline, coastal sand dunes, Pere Marquette Lake, Lincoln Lake, Pere Marquette River, and Lincoln River.

Watersheds

Lake Michigan Basin

The Ludington community lies squarely within the Lake Michigan basin. Lake Michigan is the third largest Great Lake by surface area, the sixth largest freshwater lake in the world, and the only Great Lake to be entirely within the United States. However, since Lake Michigan and Lake Huron are connected by the Straits of Mackinac, they are considered one lake hydrologically. Combined, lakes Michigan and Huron cover 45,000 square miles and would replace Lake Superior as the largest Great Lake. There are two sub-basins within the study area: the Pere Marquette River watershed and the Lincoln River watershed.

Pere Marquette Watershed

The Pere Marquette River is a state-designated *Natural River* and *Blue Ribbon Trout Stream*, and a federally-recognized *Wild and Scenic River*. The river flows through the Huron-Manistee National Forest and has no dams on its mainstem. The watershed encompasses an area of 755 square miles and contains 380 miles of stream including 69.4 miles of mainstem. The watershed is comprised of five

Lake Michigan Basin



major streams including the mainstem, Baldwin River, Middle Branch, Little South Branch, and Big South Branch, and over 75 small feeder creeks. (River Restoration, 11/4/19)

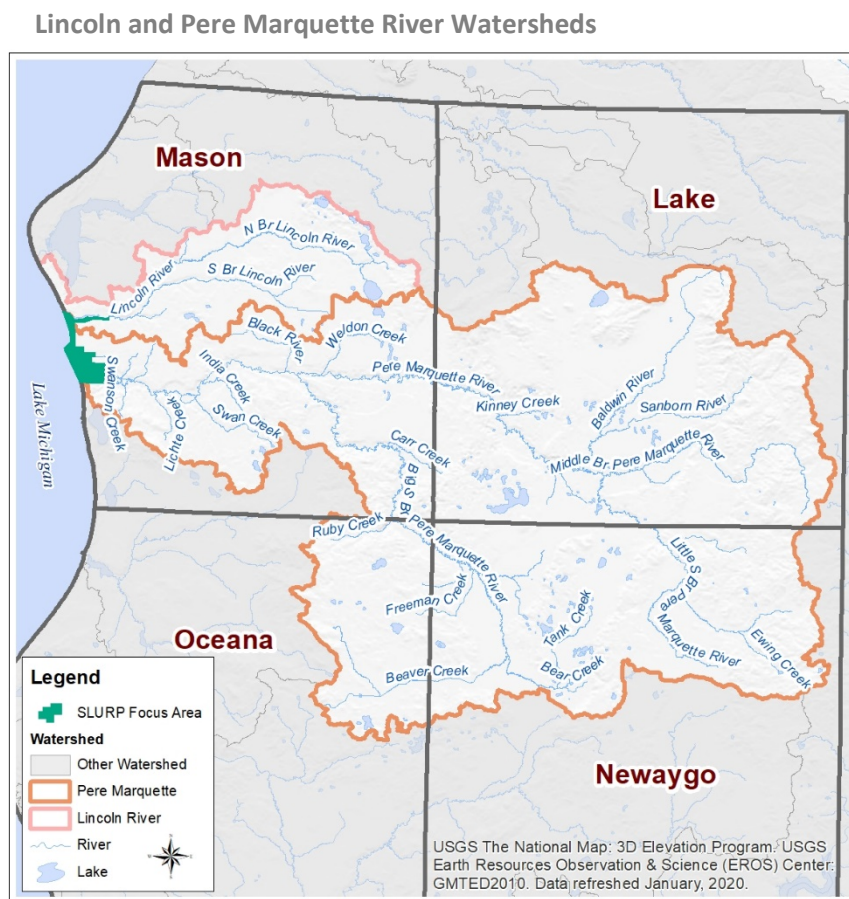
The Pere Marquette River Watershed Management Plan was completed in 2011 and approved by Michigan Department of Environmental Quality (MDEQ) to meet U.S. Environmental Protection Agency’s (EPA) standards. The Pere Marquette River Restoration Committee is an informal partnership of over a dozen state, federal, tribal and private entities that meet regularly and work together on conservation-based projects throughout the watershed. The Pere Marquette River Watershed Council is an active volunteer group that also meets regularly.

Pere Marquette Lake divides the City from Pere Marquette Township to the south, aside from a small isthmus within the City’s jurisdiction just south of the channel. Pere Marquette Lake provides the sheltered harbor for the Port of Ludington and offers both recreational and commercial facilities. At least eight public and private marinas are located on, or adjacent to, the lake. Charter fishing operations are located there as well. The Lake Michigan Carferry Service makes daily seasonal use of the commercial port facilities and brings thousands of tourists and visitors to Ludington every year during warm weather. Pere Marquette Lake serves as an industrial port and plays a vital role in the operation of many local industries. (City of Ludington, 2016, p. 12)

Lincoln River Watershed

The Lincoln River is a 7.8 mile-long largely cold-water stream and river with mainly sandy substrate within Mason County, Michigan. The Lincoln River is a popular fishing stream. The North Branch Lincoln River flows together with the South Branch Lincoln River in Victory Township, about five

miles northeast of Ludington where it continues westward into Lake Michigan at the Epworth Heights settlement. The watershed is a mixture of forested and agricultural land with some residential use. Water quality is generally good and healthy; however, agricultural land use and eroding road-stream crossings have impacted this to an extent. (River Restoration, 12/10/19)



Ludington Community Shoreline

The SLURP online survey asked participants to respond to the statement, “Shorelines and waterfront areas are critical to the identity and the long-term prosperity of the Ludington community.” Ninety nine percent of respondents agreed. While this is hardly an objective, actionable assessment, it remains clear that water features and shorelines are essential aspects of this community. In February 2020, the advisory committee participated in a facilitated exercise to identify assets, weaknesses, and hazards within the study area. The results, as outlined in the following tables, shed light upon many of the positive and negative components of the Ludington community shoreline.

Shoreline Assets		
Natural Resources -water quality -beaches -fishery -aesthetics -wildlife -solar power -green infrastructure +wetlands +tree canopy +dune vegetation +natural shoreline	Recreation & Public Access -fishing -parks -boating -boat launches -marinas -trails +Buttersville +Maritime Heritage Trail -camping -hunting/trapping -sailing school -yacht club	Cultural & Historic -White Pine Village -Breakwater Lighthouse -Father Marquette Shrine -Maritime Museum
Infrastructure & Services -transportation +road network +Ludington Mass Transit +non-motorized network -US Coast Guard -commercial port facilities -public water & sewer -private utilities	Economic -commercial shipping -deep water port -tourism -commerce -manufacturing	Built Environment -residential areas -commercial areas -industrial areas -breakwalls -piers -seawalls
Shoreline Vulnerabilities & Weaknesses		
-breakwater/pier +disrepair +pedestrian safety +no fishing during high water -widespread shoreline erosion -damage to docks/marinas	-public information on water safety -uninformed/misinformed visitors -water plant intake -invasive species -PFAS??	-lack infrastructure to accommodate cruise industry -OxyChem +low seawall/potential flooding -contaminated sediment -aesthetics of industry and abandoned buildings
Shoreline Stressors		
-erosion -high water -low water -ice -stormwater runoff -heavy rain/flash flood -wind -seiche	-rip current -unmarked boating hazards -wave action -SARA Title III sites -legacy pollution -Pere Marquette River flow -wildfire	-uninformed visitors -groundwater contamination +salt pond salinity or failure +sewage & septic -invasive species +zebra/quagga mussels +phragmites +Asian carp

PART ONE: SHORELINE HAZARDS

Throughout history, humans have settled near bodies of water for a variety of reasons, such as transportation, drinking water, fertile land, or aesthetics. However, natural forces such as wind, water, and ice are constantly reshaping the environment. Therefore, benefits of settling near bodies of water come with inherent risks presented by exposure to natural processes.

For man-made developments to be resilient, they must be strategically located and carefully designed. This not only helps mitigate the risk of future loss or damage, but it also can lessen the impacts of human development upon the environment and natural processes.

Natural hazards, like much of nature, are part of complex interconnected systems. While most hazard events seemingly occur independently, they are often correlated, and in some cases may greatly influence the probability, frequency, and magnitude of one another. This can be true even when specific hazard occurrences are separated by long distances or periods in time. (Planning for Hazards)

In terms of human development, many shoreline hazards and risks essentially result from the interaction between natural and built environments. Structures would generally face fewer hazards and less risk had they not been placed in hazards' way. Regardless of the potential for loss of life and/or property, homes and businesses currently exist in these enticing and attractive places. It should be remembered that it is humans who place themselves in harm's way by building structures in dynamic coastal areas. If that did not occur, the natural processes of flooding, erosion, and others might not necessarily be viewed as threats.

Not to be overlooked is the variable of an ever-changing climate. According to the U.S. Environmental Protection Agency (EPA), Michigan's climate is changing. Most of the state has warmed two to three degrees Fahrenheit in the last century. Heavy rainstorms are becoming more frequent, and ice cover on the Great Lakes is forming later or melting sooner. And although warmer temperatures are known to cause sea level to rise, the impact on water levels in the Great Lakes is not yet known. This uncertainty makes resilient community development both a challenge and a necessity.

Overview

This section describes many of the shoreline hazards that have been identified within the study area. The following excerpt from the Mason County Hazard Mitigation Plan provides a well-rounded perspective of many factors at play, many of which are explained in further detail later in this chapter.

Shoreline flooding and erosion are natural processes that are ongoing, regardless of water levels. However, during periods of high water, the effects of flooding and erosion are more evident, causing serious damage to homes and businesses, roads, water and wastewater treatment facilities, and other structures in coastal communities. Low water levels can also present hazards, such as shallow shipping and recreation channels or increased exposure of polluted lake-bottom debris. Other shoreline hazards include severe winds, seiches, and rip currents. These conditions can be life-threatening for boaters and

swimmers and are often exacerbated by the presence of structures such as breakwalls, piers, and river mouths. (Mason County HMP, p. 44)

Erosion

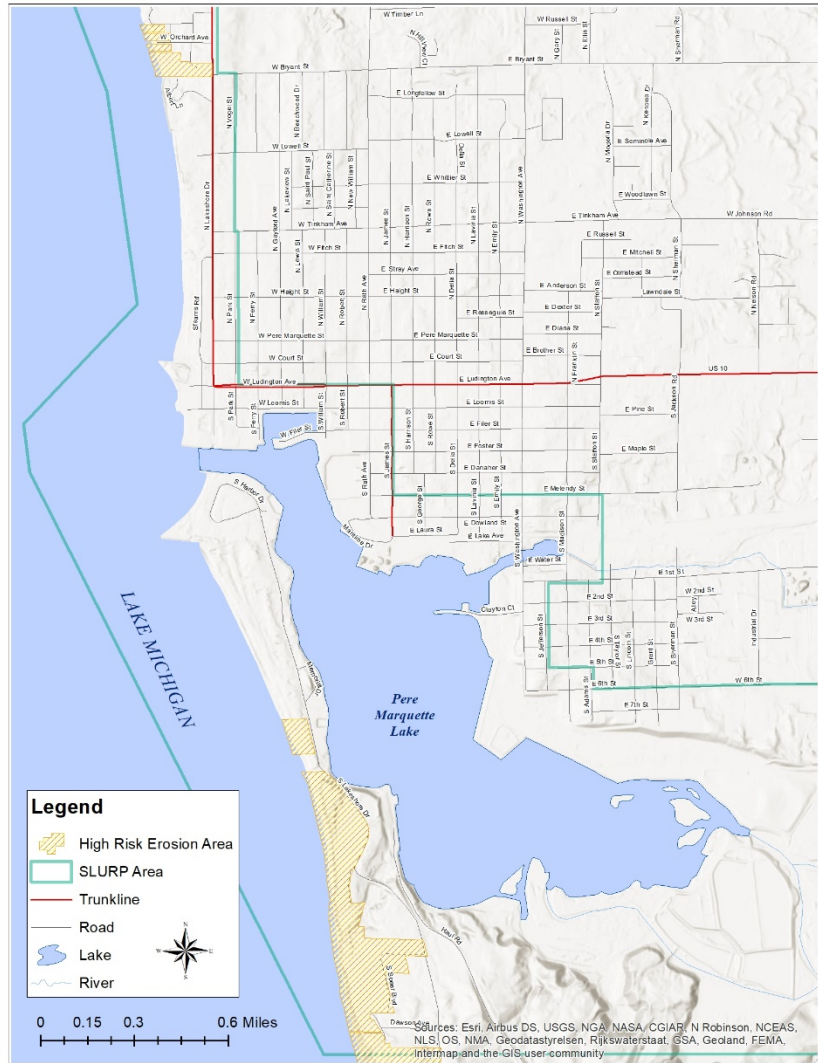
Shoreline erosion “is the wearing away of the shoreline by forces moving sand and soil from one area to another. Waves, water levels, rain, wind, groundwater, frost and people all contribute to eroding shorelines. While erosion is a natural and ongoing shoreline process, some shorelines erode more quickly than others. These are known as high-risk erosion areas (HREAs). The HREAs are eroding at an average rate of one foot or greater per year over at least 15 years.” (MDEQ, 2016) Pere Marquette Township has designated HREAs, while the City of Ludington does not.

History has shown that shoreline erosion does not move in a steady, linear fashion. Rather the process occurs in cycles. During periods of high water and stormy conditions, the lakes attack the shoreline more aggressively. As the waters recede, they often deposit sand back onshore, partially replacing what has been

lost. In addition, seawalls and riprap that are installed to reduce erosion disrupt that process which increases erosion overall. When waves encounter such obstacles, they redirect their energy to pull greater quantities of sand from neighboring beaches or scour it out from underneath the armor. In some cases, the sand is lost forever. Without a gradually sloping shoreline where the waves can deposit sand as they recede, sand is pulled out to ever-greater depths, where the force of incoming waves is too weak to carry it back ashore. (House, 2020)

Bluffs, beaches, and waterfront infrastructure are interconnected through regional sediment transport and nearshore processes like waves and currents. Oftentimes, actions taken to reduce risk at one

High Risk Erosion Areas



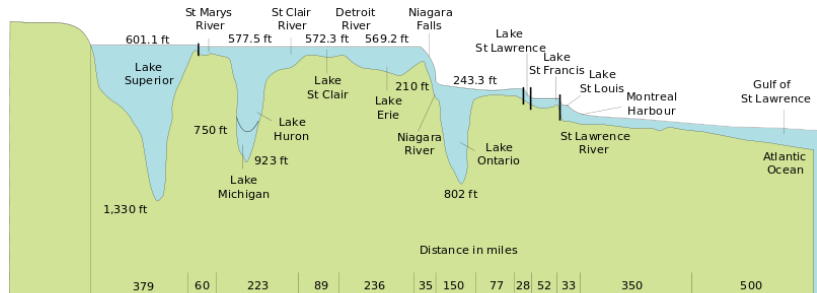
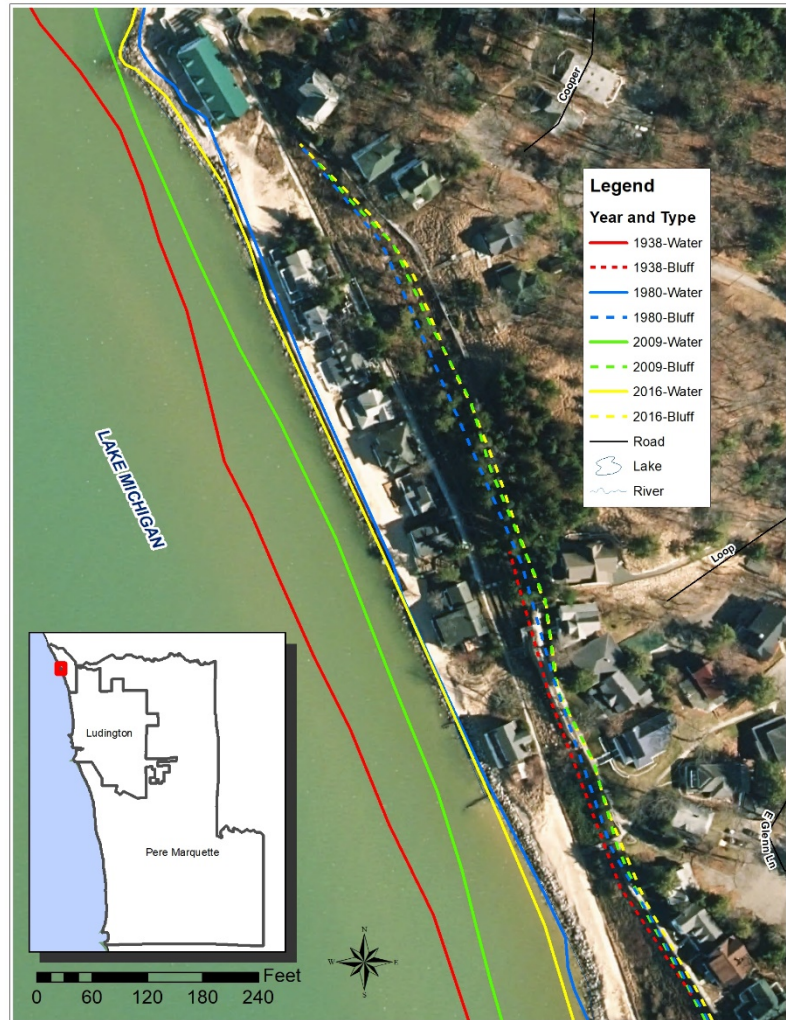
location on the coast can produce unintended negative consequences at surrounding areas. For example, armoring the shoreline at one property to protect against erosion changes the sediment and wave dynamics of the area and may cause an increase in erosion to nearby shorelines. Uncoordinated actions to reduce risk locally can lead to exacerbated issues regionally.

Waves can erode the shoreline causing it to recede landward. Shoreline recession along bluff coasts is caused by a cycle of erosion at the base of the bluff by waves, which can destabilize the bluff slope and cause failure, or collapse, of the bluff. High Lake Michigan water levels allow erosive waves to reach higher elevations on the shore, accelerating shoreline recession and bluff failure processes. Other factors that contribute to bluff failure include elevated groundwater (which reduces the stability of the slope), stormwater runoff (which erodes the bluff surface soil), and freeze-thaw cycles (which weaken the soil).

Great Lakes Water Level

The Great Lakes comprise the largest freshwater lake system by surface area on the planet. Water levels of the lakes fluctuate dramatically in response to a variety of factors. Key factors include over-lake precipitation, over-lake evaporation, and runoff. Changing water levels can have both positive and negative impacts on water-dependent industries such as shipping, fisheries, tourism, and coastal infrastructure including coastal roads, piers, and wetlands.

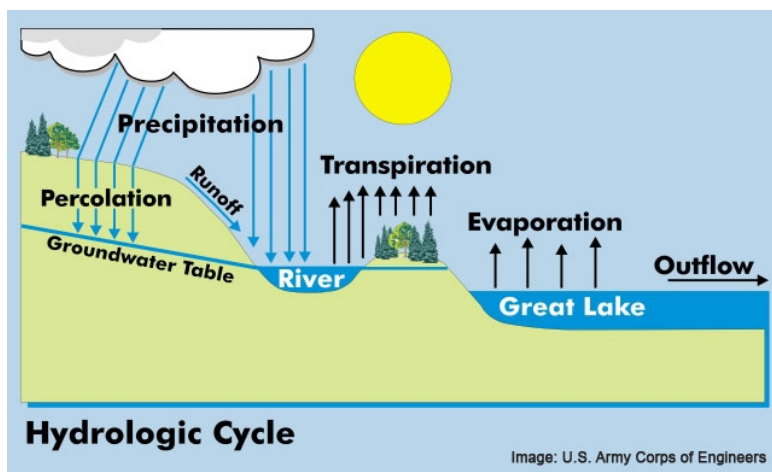
Example of Shoreline Recession



Source: US Army Corps of Engineers

High water levels generally exacerbate or increase the risk of flooding and erosion, which are each addressed separately in this chapter. Low water levels can cause significant economic impacts as well. Among those most affected by the low water levels are the shipping companies and ferry services that may be forced to lighten loads or shut down due to low water depths. Significant drops in water levels can also result in an increase in demand for dredging projects, which can be very expensive. In addition to the high cost of the dredging, homeowners and marina operators are faced with the cost of properly disposing of sediments that have been contaminated with heavy metals, pesticides, diesel fuel, and other toxic substances.

The Great Lakes coasts differ from ocean coasts in that water levels in the Great Lakes fluctuate in response to changes in available water supply, as well as in response to winds and storms. Changes in water supply (i.e. volume) are driven by climatic factors like precipitation and temperature. Due to the size and extent of the Great Lakes, these changes in supply produce gradual changes in water levels, most noticeable over periods of months and years. Winds and storms, however, can create dramatic, localized changes in levels in a very short period of time with no change in lake volume.



Weather-related events can cause water level fluctuations lasting from several hours to several days. For example, windstorms combined with differences in barometric pressure can temporarily tilt the surface of a lake up at one end as much as eight feet. This phenomenon, known as storm surge, can drive lake waters inland over large areas. After the storm surge, an oscillation phenomenon called a seiche (pronounced sigh-shh or saysh) is likely to take place. As the water level retreats on one shore, it then shifts back to the opposite side of the lake, but with less intensity. This oscillation is repeated until the body of water becomes calm again and water levels return to normal. Seiches can produce dangerous shoreline conditions called rip currents. (Mason County HMP, p. 47)

Climate model predictions for specific weather outcomes vary greatly throughout the Great Lakes Basin and include both higher and lower water level scenarios. However, all models seem to forecast an increase in both the number and intensity of major storm events. This combination can result in unanticipated water level change, larger waves, more dramatic seiches and greater storm surges than considered in original design parameters of Great Lakes infrastructure. (Great Lakes Coastal Resilience) This possibility must be considered, as Great Lakes communities including Ludington and Pere Marquette Township recover from the recent period of record high water levels.

Though water levels on the Great Lakes are known to be cyclical, the timing, extent, and duration of high and low periods can only be estimated. According to the Michigan Hazard Mitigation Plan, about 10

major periods of flooding/erosion occurred on the Great Lakes between 1918 and 2015, or approximately once per decade.

Water Level and Maritime Infrastructure

Ports, harbors, and marinas on the Great Lakes are vulnerable to several predicted climate change conditions. The most dangerous of these conditions are extreme water level variability and increased storm frequency and intensity. Both rising and falling water levels can impact infrastructure stability and strength and require additional dredging of harbor navigation channels and interior facility slips. A major impact of lower lake levels is the potential for decay of harbor infrastructure as wooden structural elements are exposed to oxygen. Projected increases in storm severity and precipitation levels, higher winds, and a greater number of storm events put harbor infrastructure at risk. More severe storms can damage port and harbor infrastructure, requiring costly rehabilitation or replacement. In addition, increased storm frequency and intensity may increase channel silting and sedimentation, compounding dredging problems and creating conditions analogous to those of lower water levels. (Great Lakes Coastal Resilience)

High Water Period 2019-2021

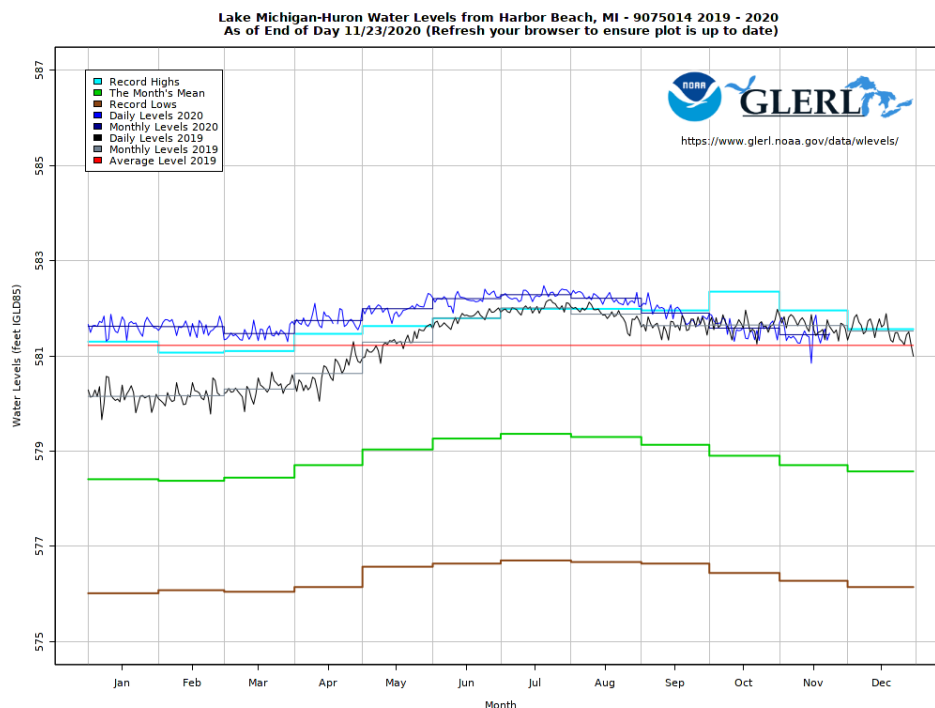
Over the last decade, the Great Lakes have seen dramatic changes in water levels. Between January 2013 and January 2020, the Great Lakes went from record low levels to record high levels. Monthly average water levels on Lake Michigan-Huron were observed to be above normal for the entire years 2019, 2020, and into 2021. During this period, record high monthly averages were exceeded in many months in 2020. This resulted in an

unprecedented period of disruption and destruction along the shoreline. Water levels began receding in early 2021 but continued to remain above the long-term average at the time this report was compiled.

Pere Marquette River Flow

Pere Marquette Lake is an extension of the Pere Marquette River known as a drowned river mouth. Water flows from the river into Pere Marquette Lake and then into Lake

Michigan. Because the channel to Lake Michigan has jetties and is dredged to allow for recreational boating and commercial shipping, Pere Marquette Lake could be defined as a “barred drowned river mouth.” This characteristic can create local effects, especially when the flow of Pere Marquette River is



high. For example, the water level can be locally elevated along the Pere Marquette Lake shoreline and along the Lake Michigan shoreline within the breakwater as water funnels into Lake Michigan. This may lead to a greater risk for localized shoreline flooding and erosion when combined with other conditions, such as high wind and high Lake Michigan water levels.

Great Lakes Flood Hazards

Coastal flooding is primarily caused by storm surge and waves, but many other factors have an influence. On the Great Lakes shorelines, flooding is dependent on local lake levels, which vary as a result of precipitation, evaporation, and other natural processes as well as anthropogenic activities. Ice cover impacts the flood hazard significantly. These phenomena distinguish the analysis of flood hazards on the Great Lakes from those for ocean coastal areas. (Great Lakes Coastal Flood Study)

Coastal storms with strong winds and atmospheric pressure gradients cause large waves and a “piling up” of water along the coast known as a storm surge, which can combine to inundate low-lying areas of the coast. High lake water levels will contribute to an increase in coastal flooding by allowing waves and storm surge inundation to reach higher elevations. (Southern Wisconsin Coastal Resilience)

The Federal Emergency Management Agency (FEMA) has initiated a coastal analysis and mapping study to produce updated Digital Flood Insurance Rate Maps (DFIRMs) for coastal counties along the Great Lakes, including Mason County. The new coastal flood hazard analyses will utilize updated one percent annual chance (100-year) flood elevations obtained from a comprehensive storm surge study being developed by the U.S. Army Corps of Engineers. The storm surge study is one of the most extensive coastal storm surge analyses to date, encompassing coastal floodplains in the eight states with coastlines on the Great Lakes.

Urban and Riverine Flooding

Flooding may not always be attributable to the overflowing of a natural water feature. It may also result from a combination of excessive rainfall and/or snowmelt, saturated or frozen ground, and inadequate drainage. Yet another potential source of flooding may come from a combined sewer system if it becomes overloaded by an excessive amount of water in a short time span, such as during a heavy thunderstorm. These sources of flooding typically result in flooded basements and ponding of water over roads or other low-lying areas because surface water of any kind will always gravitate to the lowest elevation. Flooding in such locations may lead to significant property damage, infrastructure failure, crop loss, and/or public health and safety concerns, even if it occurs outside a floodplain.

The City of Ludington and Pere Marquette Township are both participants in the National Flood Insurance Program (NFIP), which allows all landowners within those communities to purchase flood insurance.

Ludington Area Flood Zones



Zone A: Areas subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies. Because detailed hydraulic analyses have not been performed, no Base Flood Elevations (BFEs) or flood depths are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Zone AE: Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.

Note Regarding Flood Maps

The flood areas displayed are intended for general reference. Recent storm events during the high-water period have impacted areas that are not included in the delineated flood areas. Maps contained within this plan that show flood hazards are based upon digital flood insurance rate maps that became effective in July 2014, which was the most recent official information available. At the time of this study, maps were in the process of being revised and updated through the Great Lakes Coastal Flood Study. The revised maps will consider historic storm data gathered over the approximately last 50 years and are considered to be more methodologically sound than previous mapped flood areas along the Great Lakes coastline. One significant limitation to the impending coastal flood zone updates is that the unprecedented period of high-water level on the Great Lakes could not be incorporated into the coastal analysis. This is an inherent limitation of the Great Lakes Coastal Flood Study, and perhaps a reflection of the constantly changing coastal environment.

Ice

The extent of winter ice on Great Lakes can have complex consequences for shoreline flooding, erosion, and commercial shipping. Ice cover also impacts the Great Lakes ecosystem and climate. Less ice on the Great Lakes means more open water and moisture that can be picked up and turned into lake effect precipitation for downwind communities. It also means that more water evaporates from the surface of the lakes.

On one hand, the extent of ice cover can be an important factor in mitigating coastal flooding during the winter. On the other hand, coastal ice does not protect the coast but enhances erosion by displacing severe winter wave energy from the beach to the shoreface and by entraining and transporting sediment alongshore and offshore. (Barnes, et al)

From 1973 through 2018, the annual maximum ice cover averaged over all the Great Lakes has trended downward. The decreasing maximum ice extent of Great Lakes ice is due to a combination of natural climate influences as well as influences from man-made climate change. This may be good news for shipping across the Great Lakes, which is a multi-billion-dollar industry and employs tens of thousands of people. Every year freighters get stuck in the ice delaying deliveries and costing money. (Di Liberto, 7/9/18)

Lake Michigan ice cover was at 10% in early 2020, whereas ice cover was 35% in 2019. The lack of ice cover in 2020 occurred during a period of record high water levels on Lake Michigan. Many believed this to leave beaches and dunes more exposed and vulnerable to erosion. (Haenni, 2/13/2020)

Wildfire

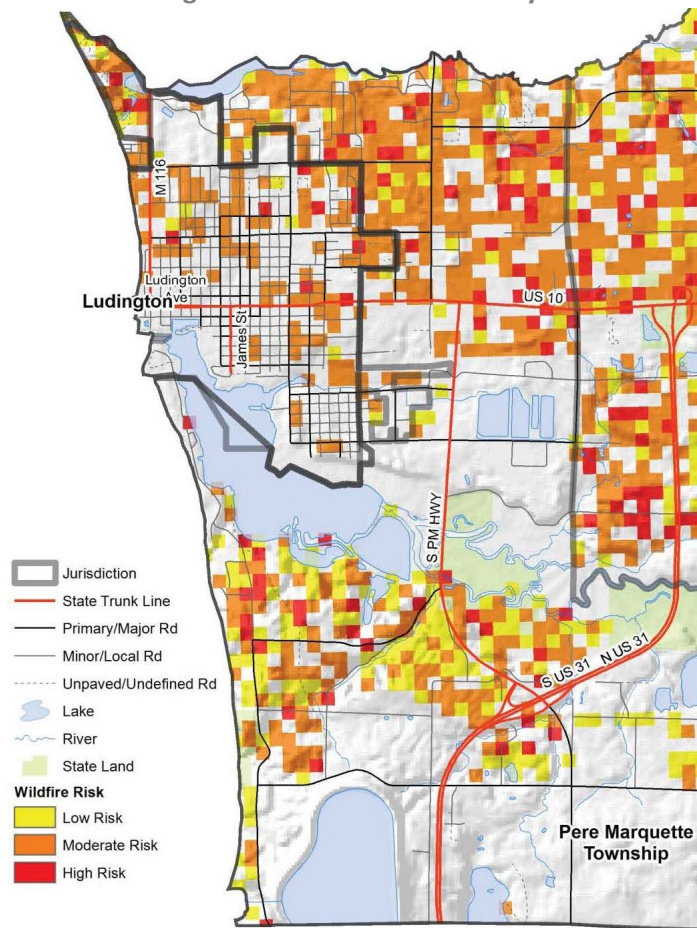
Most Michigan wildfires occur close to where people live and recreate, which puts people, property, and the environment at risk. Development within and around forested areas often increases the potential for loss of life and property from wildfires, since most fires are caused by human activities, such as outdoor burning. The negative impacts and immediate danger from wildfires are destruction of timber, property, wildlife, and injury or loss of life to persons who live in the affected area or who are using recreational facilities in the area. Other long-term and corollary effects of wildfire may include: increased erosion or flooding, due to the disappearance of vegetation that would otherwise protect soils and slow surface runoff of water; and structural fires, particularly near outdoor recreation areas and wildland-urban interfaces.

A wildland urban interface (WUI) can be defined as *“the line, area, or zone where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels.”* (WMSRDC, 2014) The accompanying map showing potential wildfire risk map for the Ludington area was generated for the Mason County Wildfire Protection Plan. Although it is not intended to reflect exact conditions at exact locations, it does demonstrate that varying degrees of wildfire risk are present within the study area.

In general, the WUI is an area that is subject to the natural conditions of the wildland. When conditions are right for fire in the wildland, there is a corresponding threat to structures, life, and property. The presence of human inhabitants also poses a special risk in these areas by way of non-natural ignition sources. In general, the threat of fire increases in the area designated as the WUI due to this human activity. In dune environments, primarily along the Lake Michigan shoreline, dune grass is a highly flammable and widely available fuel. The issue of emergency access (or lack thereof) increases the threat to human development in these areas as firefighters often face significant impediments in dune environments.

Portions of the study area that may be more at risk for wildfire include along the Lake Michigan coastline (Ludington and Epworth Heights) due to the intersection of vegetation (fuel) and human development.

Ludington Area Wildfire Risk Analysis



Beach and Boating Hazards

A rip current is a strong flow of water returning seaward from the shore. When wind and waves push water towards the shore, the previous backwash is often pushed sideways. This water streams along the shoreline until it finds an exit back to the sea. The resulting rip current is usually narrow and located between sandbars, under piers, or along jetties. The current is strongest at the surface, and can dampen incoming waves, leading to the illusion of a particularly calm area. Rip currents cause approximately 100 deaths annually in the United States, more than all other natural hazards except excessive heat.

From 2002 through 2012, Lake Michigan had the highest number of rip current-related fatalities and rescues of all the Great Lakes, with 77 fatalities and at least 230 rescues. Most of these incidents occurred along the eastern and southern shoreline. While there are numerous factors, the primary explanation is that the prevailing wind direction is westerly, or onshore, across the eastern shore of Lake Michigan, making it more prone to rip current development. Additionally, there are a higher number of recreational locations on the Michigan side of the lake; therefore, more people are at risk. Rip currents occur less frequently on the western side of Lake Michigan. The main type of rip current on Lake Michigan is the structural rip current, where the longshore current interacts with a pier or breakwall

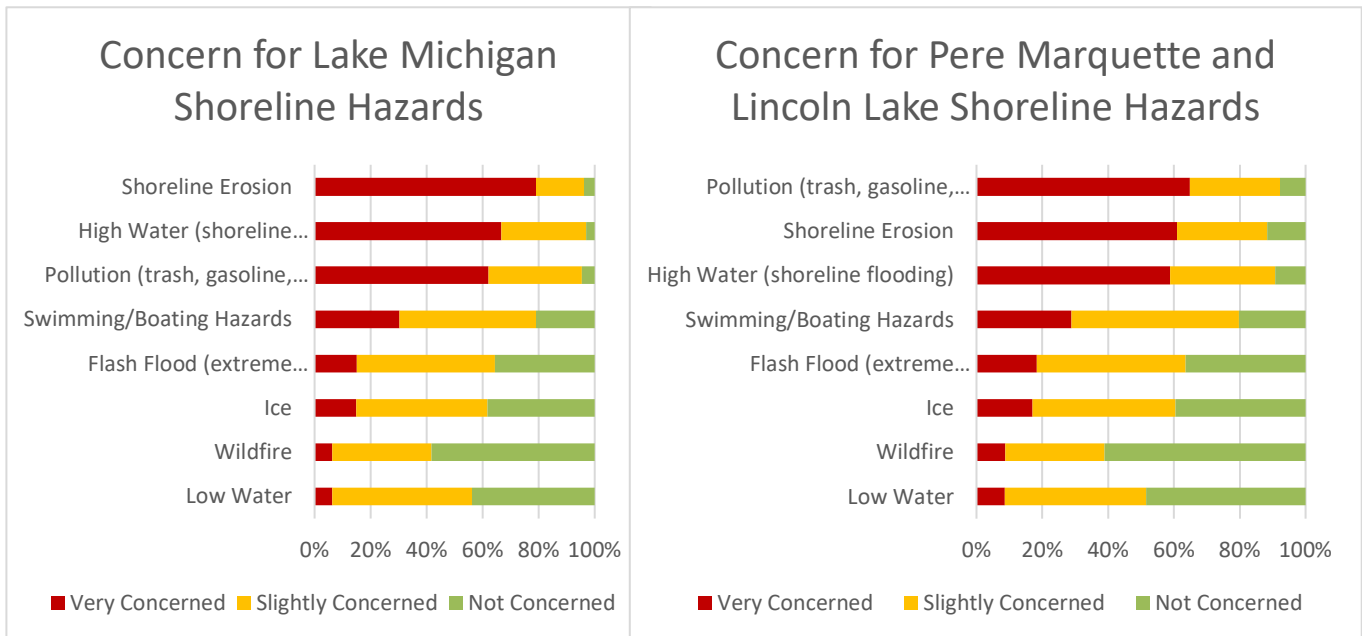
extending out into the lake, such as the piers at Pere Marquette Lake. The typical weather pattern for the development of these rip currents is any that involves onshore flow or flow parallel to the shore, which enhances the longshore current. This typically manifests itself as an approaching or exiting cold front, where onshore winds are either southwesterly (ahead of the front) or northwesterly (behind the front). Lastly, seiches can cause uneven distributions of water in the nearshore environment, leading to rip current development.

Boating hazards are yet another public health and safety concern for the Ludington community. In June 2020, in response to the effects of high Great Lakes water levels, the Michigan Department of Environment, Great Lakes, and Energy (EGLE) issued a press release entitled “Boaters should be aware of hidden debris in lakes, rivers from high water levels, erosion.” The release highlights several tips and reminders to help keep recreational boaters safe, such as:

- Erosion and storms have undermined docks, decks, stairs and trees and washed the debris away from the shoreline;
- High water can inundate marinas, yards or public property, making it difficult to see structures in the water; and
- Be aware of any floating items which could damage hulls or engine propellers, or injure anyone who is being towed on flotation devices behind boats.

Public Input

Perspectives from the public were gathered using an online survey in January 2021. The survey invited participants to rate their level of concern for past and potential shoreline hazards. The significant proportion of responses indicating a high level of concern for shoreline erosion and flooding is understandable, given recent events. It is notable that pollution is also among the top hazards of concern as well.



A separate, open-ended question provided an opportunity for respondents to identify some of the impacts observed because of the recent and prolonged period of high water on the lakes. Over one hundred responses were submitted to this question, the majority of which related to the impacts of shoreline erosion. The following table samples the variety of responses that were submitted.

SLURP SURVEY	
Noted Impacts of High Water	
<p>Damage to the Built Environment</p> <ul style="list-style-type: none"> - Marinas - Roads - Storm sewers - Pier/breakwall - Lost/relocated homes - Public parks/access - Sink holes undermining shoreline structures - Flooded shoreline properties <p>Financial</p> <ul style="list-style-type: none"> - Property devaluation - Mitigation costs (property protection) <p>Unknown impacts upon underground utilities</p>	<p>Damage to the Natural Environment</p> <ul style="list-style-type: none"> - Dune erosion - Beach loss - Beach/floating debris - Poor water quality (sedimentation) <p>Boating hazards</p> <ul style="list-style-type: none"> - Submerged/hidden structures - Floating debris <p>Safety</p> <ul style="list-style-type: none"> - Unstable piers - Beach debris - Standing water & pests <p>Additional fortified/hardened shoreline</p> <p>Increased vulnerability to wave action and ice</p>

Summary

The descriptions in this section shed light on the complex nature of the Ludington community shorelines, and the many aspects that should be considered when weighting future investments, both public and private. Additional shoreline risks identified by the advisory committee included invasive species (such as phragmites, autumn olive, Asian carp, and zebra/quagga mussels) and water quality (including stormwater runoff, legacy pollution, and groundwater).

PART TWO: SHORELINE LAND USE

Human activity along developed shorelines can contribute to a resilient community if they are built, operated, and maintained in harmony with the natural environment. Otherwise, shoreline developments face the prospect of eventual demise or disrepair, and risk causing damage to the environment and disruption of beneficial natural processes.

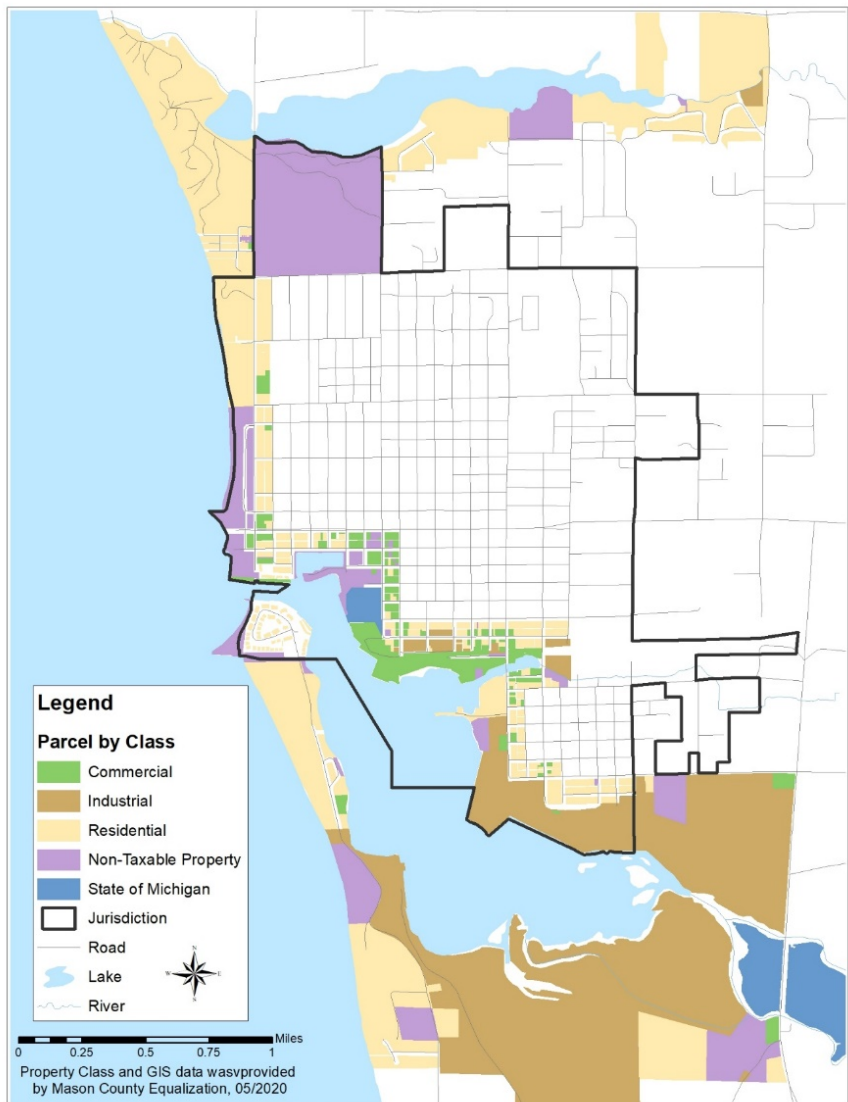
The discussion of land use in this chapter is intended to provide a high-level overview of the multi-functional nature of the Ludington port, develop a consensus for the general character of land use around the port, and highlight potential areas for development, redevelopment, and conservation.

Existing Land Use

A spectrum of land uses co-exist around Pere Marquette Lake, ranging from natural settings and recreation to industry and commercial shipping.

In a nutshell, land use around Pere Marquette Lake has been influenced by the Pere Marquette River and channel to Lake Michigan. The northern and eastern shore of Pere Marquette lake is developed, or developable, with access to municipal utilities which are owned and operated by the City of Ludington. These areas are characterized by a mix of residential, commercial, and industrial uses. The southern and western shore is much less developed, lacks municipal sewer and water services, and is better suited to various types of outdoor recreation at this time. One exception on the western shore is the Crosswinds development located at the tip of the Buttersville Peninsula. This location is served by municipal water and sewer infrastructure that extends under the channel to Lake Michigan. Fishbeck, a civil engineering

Land Use by Tax Classification, 2020



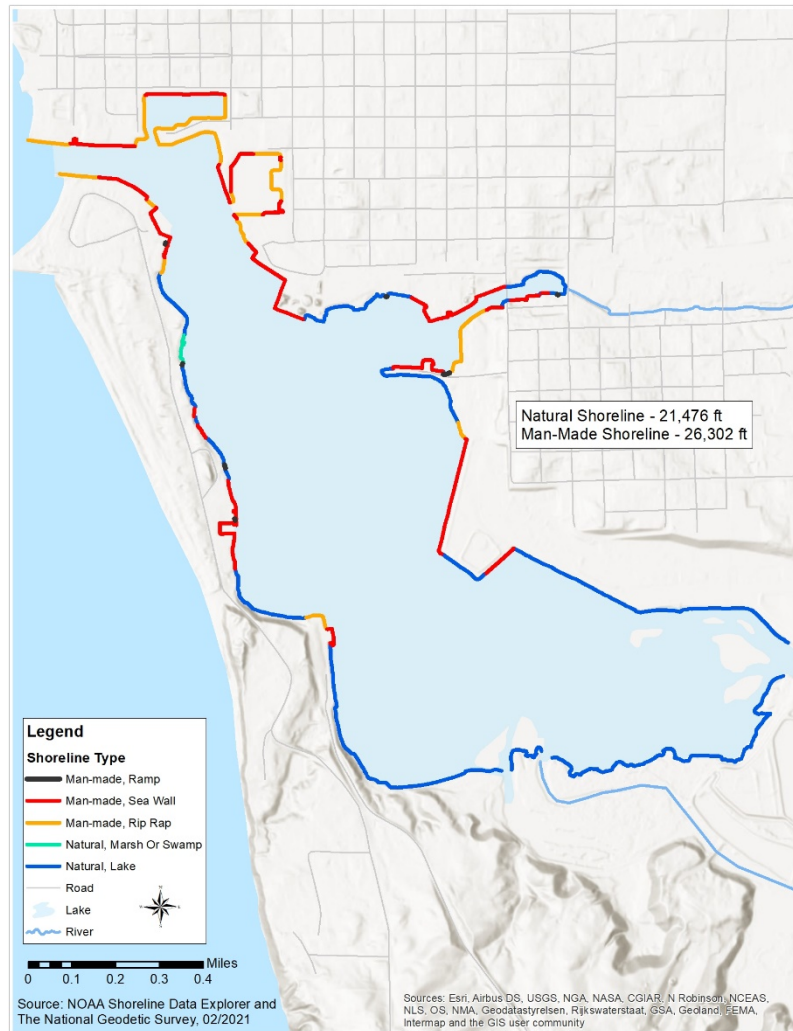
firm, is collecting and maintaining Ludington’s utility GIS data. As of 2020, Fishbeck had documented sanitary sewer and water utilities shown on a map contained within the Map Suite Appendix.

Sections of Lake Michigan and Lincoln Lake shoreline that lie within the scope of this study are primarily characterized by low density residential, natural, and parkland uses. Subdivisions with relatively higher density, including Epworth Heights, Linlook Park, and Crosswinds Estates, are the exception rather than the rule along the Lake Michigan shoreline.

Port of Ludington

Pere Marquette Lake is an active, deep-water port used for commercial shipping, transportation, and recreation. An additional potential use of the lake is as a cruise ship port of call. Overall, the Pere Marquette Lake shoreline has been heavily influenced by human activity. Approximately five miles of shoreline are considered man-made, and four miles are natural shoreline. Most of the Pere

Pere Marquette Lake Shoreline Type



Marquette Lake shoreline within the City of Ludington is hardened with seawalls, rip rap, and the like. This information, illustrated on the adjacent map, was published in 2011 and retrieved from the NOAA Shoreline Data Explorer in 2021. This may be used for mapping and charting applications, developing models for tsunamis, storm surge, and coastal flooding as well as predicting sea level change and forecasting pollution trajectories. It can assist decision-makers in developing comprehensive coastal-ready community plans, managing coastal resources, delineating and mitigating hazard events, making projections for wave and wind energy utilization, conducting environmental analyses and monitoring, and more.

Lake Michigan Shoreline

The Great Lakes shoreline is a dynamic environment with unique systems. The shoreline is constantly changing and has been observed to consistently retreat away from Lake Michigan over time (see erosion

section for additional information). Shoreline communities must determine appropriate guidelines for development in these areas to ensure a more resilient built environment and mitigate the risk of damage or loss well into the future.

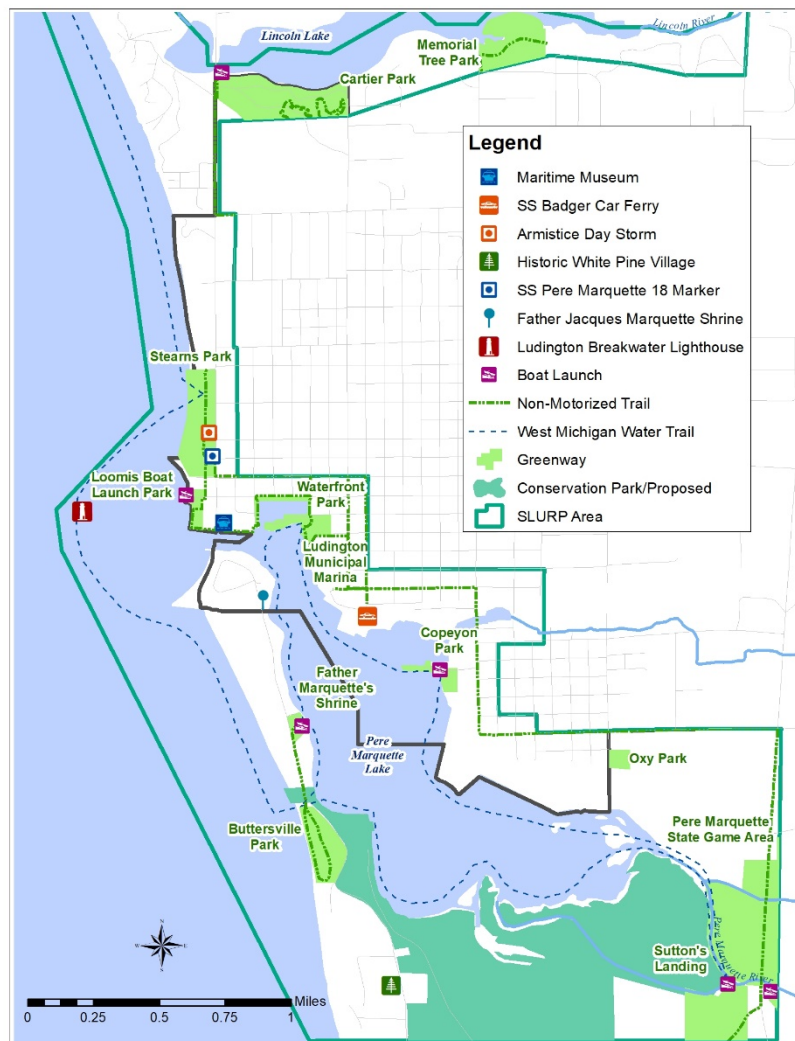
The Ludington area Lake Michigan shoreline sustained significant damage from erosion due to high water levels in 2019-2021. The period placed a tremendous burden on homeowners who may have experienced shoreline flooding or saw property washed away including land and structures. Many stretches of shoreline were hardened by any means available to desperate landowners. It is assumed that in many cases these efforts were extremely expensive to landowners; and the ecological costs of additional hardened Lake Michigan shoreline, if any, are yet unknown.

Public Access and Recreation

The Ludington community shoreline is graced with natural resources and opportunities for active and passive outdoor recreation. During this study, shoreline recreation, public parks and waterfront access were frequently a focus of attention. On one hand, these assets are essential to a unique sense of place and contribute to a desirable quality of life. On another hand, these assets require public resources to meet standards of safety, quality, and expectations of residents and visitors. Public places and opportunities for recreation along the shoreline will be increasingly important if tourism and service industries continue to grow the Ludington community.

Ludington and Pere Marquette Township have taken proactive steps to plan for community parks and recreation. Pere Marquette Township updated its community recreation plan in 2020, while Ludington did the same in early 2021. The Michigan Department of Natural Resources (MDNR) requires that a community have an

Public Access, Recreation and Points of Interest



MDNR-approved recreation plan on file to be eligible to apply for recreation grants. Recreation plans must be updated every five years for a community to maintain eligibility.

Pere Marquette Conservation Park

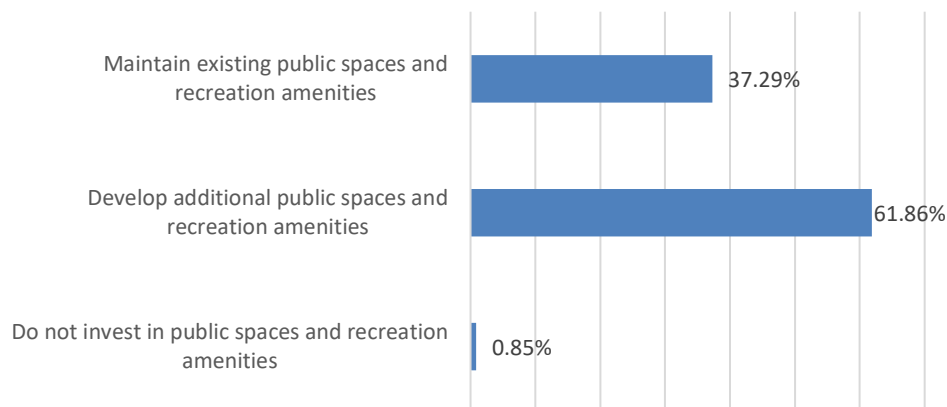
For several years, Pere Marquette Township worked closely with the Land Conservancy of West Michigan and the Michigan Department of Natural Resources to acquire a sizable property from DOW Chemical Company for the purpose of public recreation and conservation. At the time this was written, the township had already purchased several parcels totaling 254 acres from Lake Michigan on the Buttersville peninsula, to near Sutton’s Landing Park at the mouth of the Pere Marquette River. This property, which has come to be known as the Pere Marquette Conservation Park, includes approximately one mile of Pere Marquette Lake shoreline and 300 feet of Lake Michigan frontage.

In the fall of 2020, the township completed a planning and visioning process for recreation development and conservation of the property. Next steps will include an official presentation of the master plan to the Pere Marquette Township board, acquisition of additional parcels, creation of a friends group, and applications to additional grants toward the first phase of development. The Pere Marquette Conservation Park Master Plan will be available to view on the Pere Marquette Township website. Implementation of this plan will significantly increase the amount of public outdoor recreation space, waterfront access, and forestry management in the Ludington community. Public feedback gathered for this study strongly suggests community support for development of recreation opportunities and natural conservation within Pere Marquette Conservation Park.

Attitudes Toward Recreation Spending

The online survey for this study posed a question to gauge appetite for investment in public recreation within the community: *“In general, which strategy do you prefer the most over the next five years regarding recreation and public spaces along waterfront areas?”* The results are outlined in the accompanying graph.

Preferred 5-Year Strategy for Recreation and Public Spaces



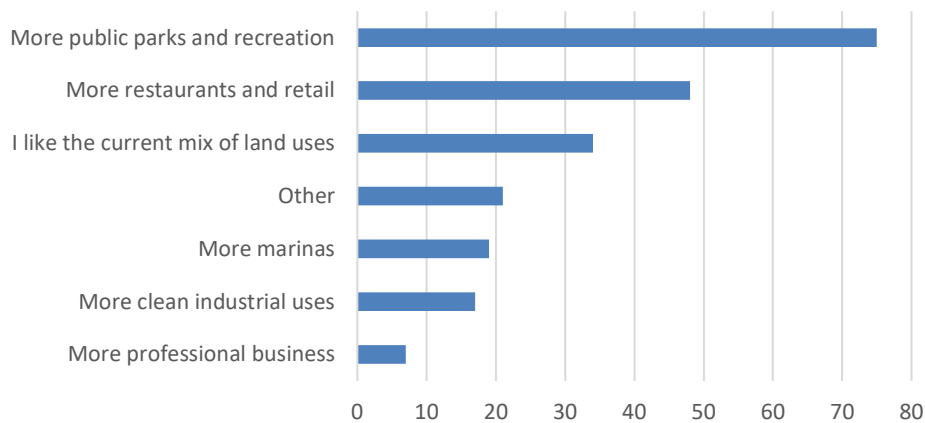
Vision for the Future

When asked what the future waterfront looks like in 15 to 20 years, most responses to the online survey boiled down to improvements in place-making. Overall, community and stakeholder input gathered during this study reflected a general preference for maintaining the current diverse mix of waterfront land uses around Pere Marquette Lake, but with improved aesthetics and more greenspace, open areas, and restaurants. Members of the community recognize the importance of industry to the history and future prosperity of the Ludington community. However, there is a desire to relocate industry away from the Pere Marquette Lake shoreline, or at the very least, improve the appearance or hide industrial operations along the waterfront. It is telling that, among the 84 survey responses to this question, the most frequently used word was “industry.” The word cloud shown here was created using the responses to this question.



The chart below outlines specific preferences for land use changes along the Ludington community waterfront. It is worth noting, the “Other” category elicited a wide range of suggestions for changes to land use around Pere Marquette Lake, which in and of itself, generally supports the existing overall character of the area. The most common theme reflected a desire for less industry along the lake. Other common comments included developing recreation opportunities along the southern shore (especially a biking trail), creating more open green spaces, and adding more residential uses.

Desired Land Use Changes Along the Pere Marquette Lake Shoreline



Composite Map

The city of Ludington and Pere Marquette Township each have a vision for waterfront land use outlined in respective master plans and illustrated on individual future land use maps. At best, these neighboring visions would be coordinated and complementary; at worst, the two visions would be competitive and contradictory.

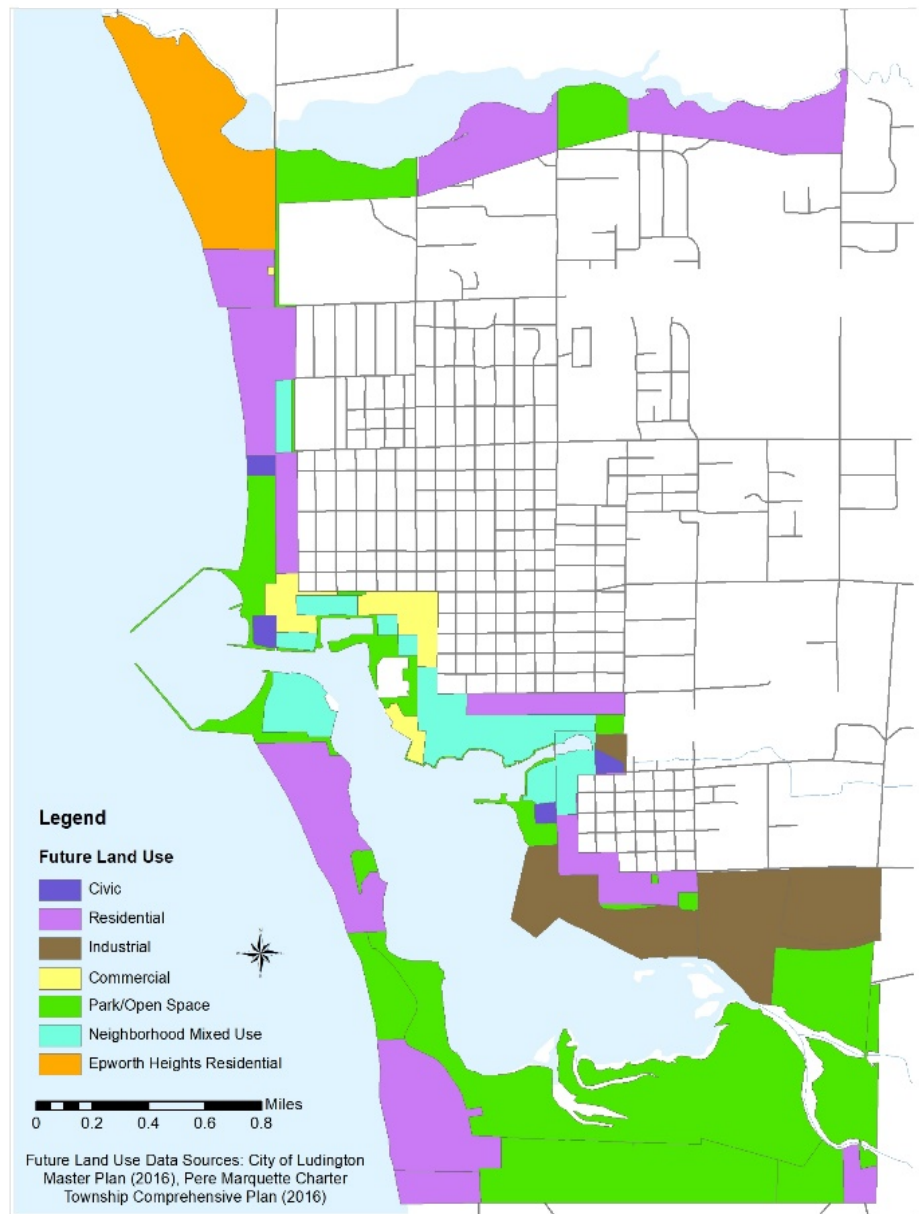
The map shown on this page is a composite of the future land use maps for the two communities. Land use categories were simplified to enable a generalized “apples to apples” perspective of future land use along the shoreline in the two communities.

Fortunately, the vision conveyed on the composite map generally aligns with input gathered for this study. This includes a healthy mix of land uses around the Pere Marquette shoreline, as well as an increase in public space and recreation opportunities.

Opportunities for Development

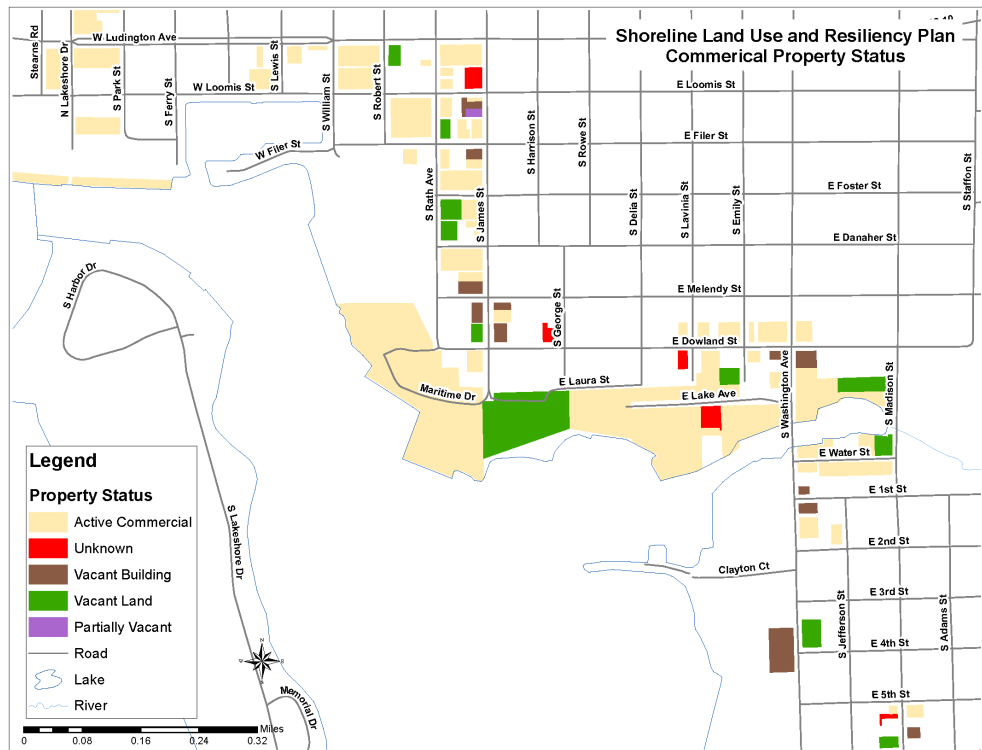
Anecdotally, it is known that many potential opportunities for development or redevelopment exist along the Pere Marquette Lake waterfront. A GIS analysis was conducted utilizing Mason County equalized property class codes to provide clues to the actual scale and character of commercial development opportunities.

Future Land Use Composite



First, an inventory was created to identify approximate types of existing businesses and differentiate them from vacant commercial buildings or land. The inventory was created by using Mason County parcel data and researching each commercial property for active business by searching for information via internet searches, phone calls, and using google street view to look at the physical

Development Opportunities on Commercial Property



properties for structures, signage, retail activity, building condition or usage, and other attributes. Once the inventory was created and mapped it could be overlaid with other features like zoning or future land use. The next step of the analysis was to compare the inventory to the future land use map to generally estimate the desired future character of the vacant or underutilized properties.

By estimating the potential for future commercial property development or redevelopment, the community can take stock and adjust the future land use strategy as desired. This demonstration analysis was only conducted for commercial-classified properties within the downtown Ludington portion of the study area. Similar analyses could be conducted for other land use classifications. Because property use and ownership are constantly changing, the analysis only provides a snapshot for general planning purposes and for maintaining awareness of the general availability of various land use types. If conducted at regular intervals, the analysis could be used to monitor land use trends over time.

Inventory of Commercial Properties Along the Ludington Waterfront		
In Use Buildings	103	
Unknown Use Buildings	8	
Vacant Buildings	12	
Vacant Land	13 parcels	9.59 acres
Commercial Development or Redevelopment Opportunities per Future Land Use Type		
Future Land Use Type	Acres	
Residential	1.13	
Park/Open Space	1.28	
Commercial	2	
Neighborhood Mixed Use	10.58	
Industrial	0.2	
Total Acreage	15.19	

PART THREE: RESILIENCE & RECOMMENDATIONS

Resilience

Planning for resilience empowers diverse stakeholders to evaluate plans, set strategic policies, and implement projects that will enable communities to adapt and thrive when faced with challenges. Natural and human-caused hazards constitute some of the acute “shocks” to which a community can be vulnerable. Other disruptive threats include longer-term societal “stresses,” such as unemployment, poor access or barriers to education, crime, or homelessness. Resiliency planning can include updating land use codes, zoning, development standards, incentive programs, and other plans or policies to better prepare for likely shocks and stresses while also developing measures that allow for action in the face of uncertainty or unexpected events.

According to the Ludington Master Plan, resilience can be described as the capability of a person or community to withstand and recover from a shock or serious misfortune without permanent disruption. Although technically true, this definition fails to include the ability of a community to adapt, and even thrive, amidst changing conditions or challenging circumstances. In some cases, simply rebounding from (i.e., responding to) a disruption is not enough. A community must also be flexible (i.e., proactive) to adapt to changing circumstances and mitigate disruptions. A community must invite input and participation from a wide range of stakeholders.

The following are some characteristics of resiliency planning, according to the American Planning Association:

- Collaboration and coordination are essential.
- Efforts must include planning for the most vulnerable populations.
- Resiliency is not a “plan.” It is layered into every part of a city and every department of its government.



Infrastructure Asset Management

Asset management is an integrated approach, involving all organization departments, to effectively manage existing and new assets to deliver services to customers. The intent is to maximize benefits, reduce risks, and provide satisfactory levels of service to the community in a sustainable manner – providing an optimum balance. Good asset management practices are fundamental to achieving sustainable communities. Asset management provides communities with the opportunity to do more with less, by providing a structured way of tracking performance, costs, and risks to meet service objectives in the most efficient and effective manner. (CNAM, 2018) In other words, the asset management approach can lay the foundation for resilient community planning, development, and management.

Community services require resources. However, unforeseen disruptions such as the recent high-water episode (which was subsequently compounded by the COVID-19 global pandemic) can stretch a community's resources thin, putting strain on the services it is able to provide to citizens. The asset management approach assures coordination and communication across all departments of a community. It objectively assesses the community's services and rationally plans for their maintenance and upkeep. This approach allows for transparent processes and earnest communication about realistic community capabilities to its citizens.

The concept of infrastructure asset management is gaining traction in the state of Michigan. The Michigan Infrastructure Council (MIC) exists to define a vision for Michigan's infrastructure that provides the foundation for public and environmental health, economic prosperity, and quality of life. Additional information and asset management tools are available at <https://www.michigan.gov/mic/>.

Recommendations

The broad recommendations provided in this section are provided within the context of assumptions developed or collected during the creation of this study.

- Shorelines are dynamic environments that are constantly shifting in response to a variety of natural forces.
- The Lake Michigan shoreline will continue documented trends to retreat over time.
- Water levels will continue to fluctuate between high and low periods.
- Shoreline armoring disrupts natural processes and defers energy (often damaging) to adjacent areas.
- Human development in a floodplain or along an immediate shoreline is inherently vulnerable to damage from natural hazards.
- Natural shorelines and green infrastructure provide defense against damage from high water and erosion.
- The Redevelopment Ready Communities (RRC) Best Practices provide proven strategies for community development.

Citizens and visitors are emotionally connected to the waterfront and there are many opposing opinions within the Ludington community. For example, a variety of suggestions for enhancing shoreline

resilience were submitted through the online survey regarding Lake Michigan shoreline setbacks, ranging from “allow people to use their own judgement” to suggesting “rigorous zoning and enforcement.” Therefore, engagement and communication with stakeholders, paired with objective fact-based decision making, will be key to fostering community buy-in and successful implementation.

The following general recommendations are presented for consideration as the communities of Ludington and Pere Marquette Township strive to recover from recent disruptions, mitigate future risk and damage, and develop towards an achievable and shared vision for the future.

Governance

- Continue multi-jurisdictional planning and cooperation.
- Maintain engagement with a diverse stakeholder group.
- Seek cross-sector partnerships.
- Prioritize planned maintenance of existing infrastructure and facilities before considering expansions.
- Incorporate review of shoreline hazards when waterfront investments are considered.
- Rely upon and communicate objective analyses to justify resilient, hazard-resistant designs.
- Consider and prepare for both high and low water scenarios.
- Formalize infrastructure asset management to maximize community services.

Land Use

- View land use around Pere Marquette Lake through a multi-jurisdictional lens.
- Review policies related to Lake Michigan shoreline setbacks, leveraging facts and recent experiences to justify reform.
- Encourage natural shoreline preservation and restoration.
- Emphasize place-making and aesthetic improvements.
- Maintain variety of land uses around Pere Marquette Lake.
- Plan for natural greenspace between shorelines and development.

Shoreline Resilience

- Prioritize projects and designs that achieve multiple benefits along the shoreline.
- Utilize green infrastructure.
- Consider removable barriers for shoreline protection during high-water periods.
- Retain expertise to conduct a comprehensive shoreline assessment and develop long-term recommendations to minimize impacts from erosion.
- Enforce no wake zones (including Badger escort vessels).
- Repair channel and breakwall for pedestrian access and safety.
- Engage with the US Army Corp of Engineers.

HELPFUL RESOURCES

City of Ludington

City of Ludington Website: <https://www.ludington.mi.us/>

City of Ludington Zoning Ordinance (2000) <https://www.ludington.mi.us/229/Planning-Zoning>

The Greater Ludington Area Waterfront Master Plan (1996) <https://www.ludington.mi.us/229/Planning-Zoning>

City of Ludington 5 Year Community Park & Recreation Plan (2021) <https://www.ludington.mi.us/228/Parks>

Ludington Demographic Data: <https://data.census.gov/cedsci/profile?g=1600000US2649640>

Pere Marquette Charter Township

Pere Marquette Charter Township Website: <http://www.pmtwp.org/>

Pere Marquette Charter Township Comprehensive Plan (2016)
http://www.pmtwp.org/township_board/departments/township_board/zoning/index.php

Pere Marquette Charter Township Zoning Ordinance (2019)
http://www.pmtwp.org/township_board/departments/township_board/zoning/index.php

Pere Marquette Charter Township Parks, Recreation & Open Space Plan (2020)
http://www.pmtwp.org/residents/recreational_parks.php

Pere Marquette Township Demographic Data: <https://data.census.gov/cedsci/profile?g=0600000US2610563600>

Mason County

Mason County Community Wildfire Protection Plan (2016)
<https://www.masoncounty.net/departments/emergency-management/community-wildfire-protection-plan.html>

Hazard Mitigation Plan for Mason County (2015)
<https://www.masoncounty.net/departments/emergency-management/hazard-mitigation-plan.html>

Pere Marquette Watershed

Pere Marquette Watershed Council: <https://www.peremarquette.org/>

Pere Marquette River Comprehensive River Management Plan (2008)
<https://www.pmtu.org/wp-content/uploads/2018/03/pere-marquette-plan.pdf>

Resilience

Planning for Hazards, Land Solutions for Colorado: <https://planningforhazards.com/home>

National Institute of Standards and Technology: <https://www.nist.gov/topics/community-resilience/planning-guide>

Geos Institute, Climate Ready Communities: <https://climateredycommunities.org/resilience-resources/>

Great Lakes Coastal Resilience Planning Guide: <http://greatlakesresilience.org/>

Hazards

Lake Level

NOAA Lake Level Viewer: <https://coast.noaa.gov/llv/#/lake/michigan>

NOAA Great Lakes Dashboard Project: <https://www.glerl.noaa.gov/data/dashboard/portal.html>

Erosion

Shoreline Erosion Processes: <https://www.mishorelinepartnership.org/erosion-at-the-shoreline.html>

Homeowners Brochure:

https://www.michigan.gov/documents/deq/deq-wrd-greatlakes-shorelands-highriskerosion-brochure_512877_7.pdf

Living on the Coast: Protecting Investments in Shore Property on the Great Lakes:

<https://publications.aqua.wisc.edu/product/living-on-the-coast-protecting-investments-in-shore-property-on-the-great-lakes/>

Beach Hazards

EGLE Beach Monitoring System <https://www.egle.state.mi.us/beach/>

Michigan Sea Grant: Rip Currents <https://www.michiganseagrant.org/topics/coastal-hazards-and-safety/dangerous-currents/>

Floodplain

FEMA Flood Maps: <https://msc.fema.gov/portal/home>

An Introduction to FEMA Coastal Floodplain Mapping:

<https://fema.maps.arcgis.com/apps/MapSeries/index.html?appid=89d2e393f2c64d7cae07264f4d00c19d>

Other Resources

Redevelopment Ready Communities: <https://www.miplace.org/programs/redevelopment-ready-communities/rrc-2.0/>

Michigan Infrastructure Council: <https://www.michigan.gov/mic/>

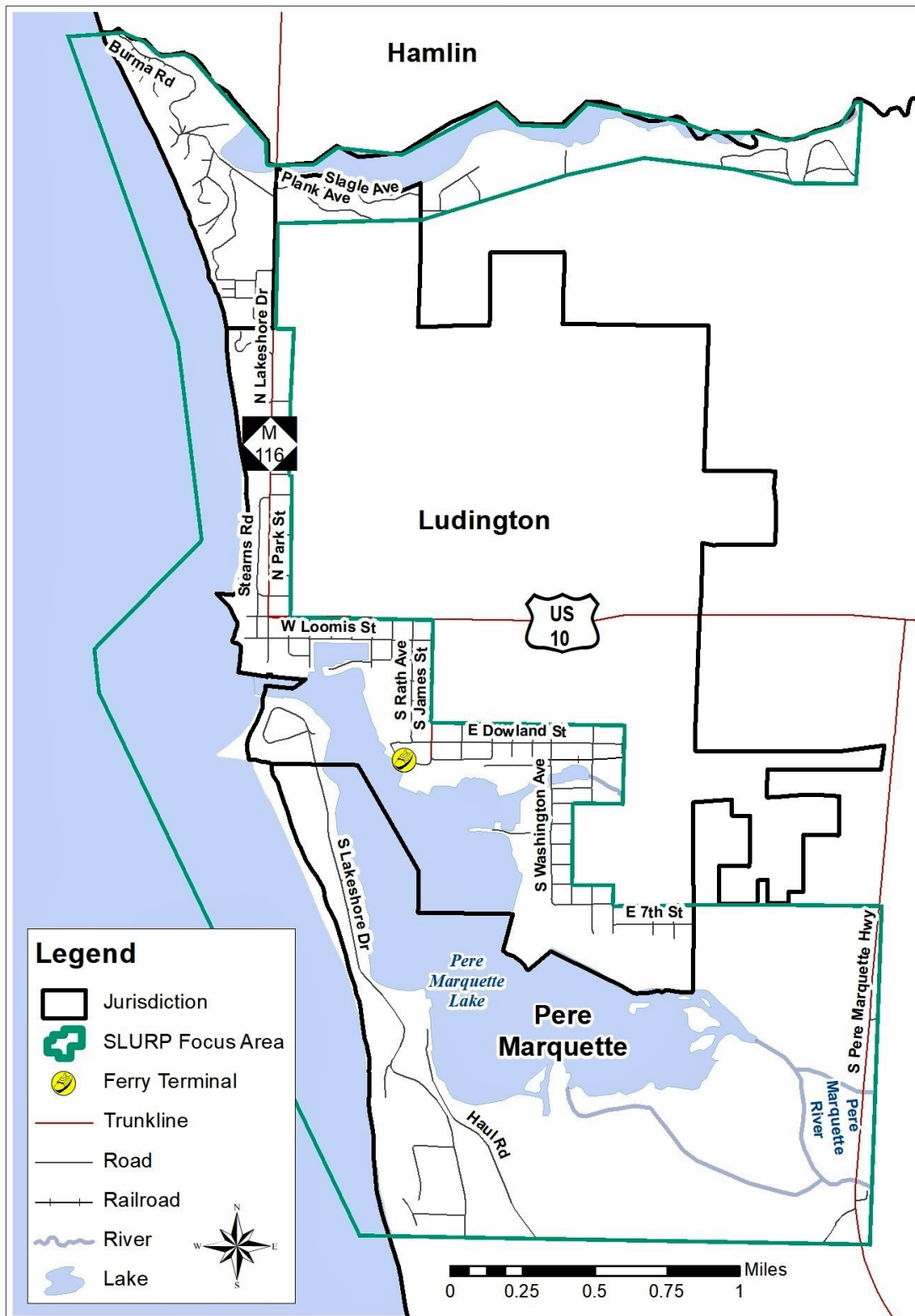
Master Planning for Tourism in Michigan <https://www.planningmi.org/tourism>

NOAA Shoreline Data Explorer: <https://www.ngs.noaa.gov/CUSP/>

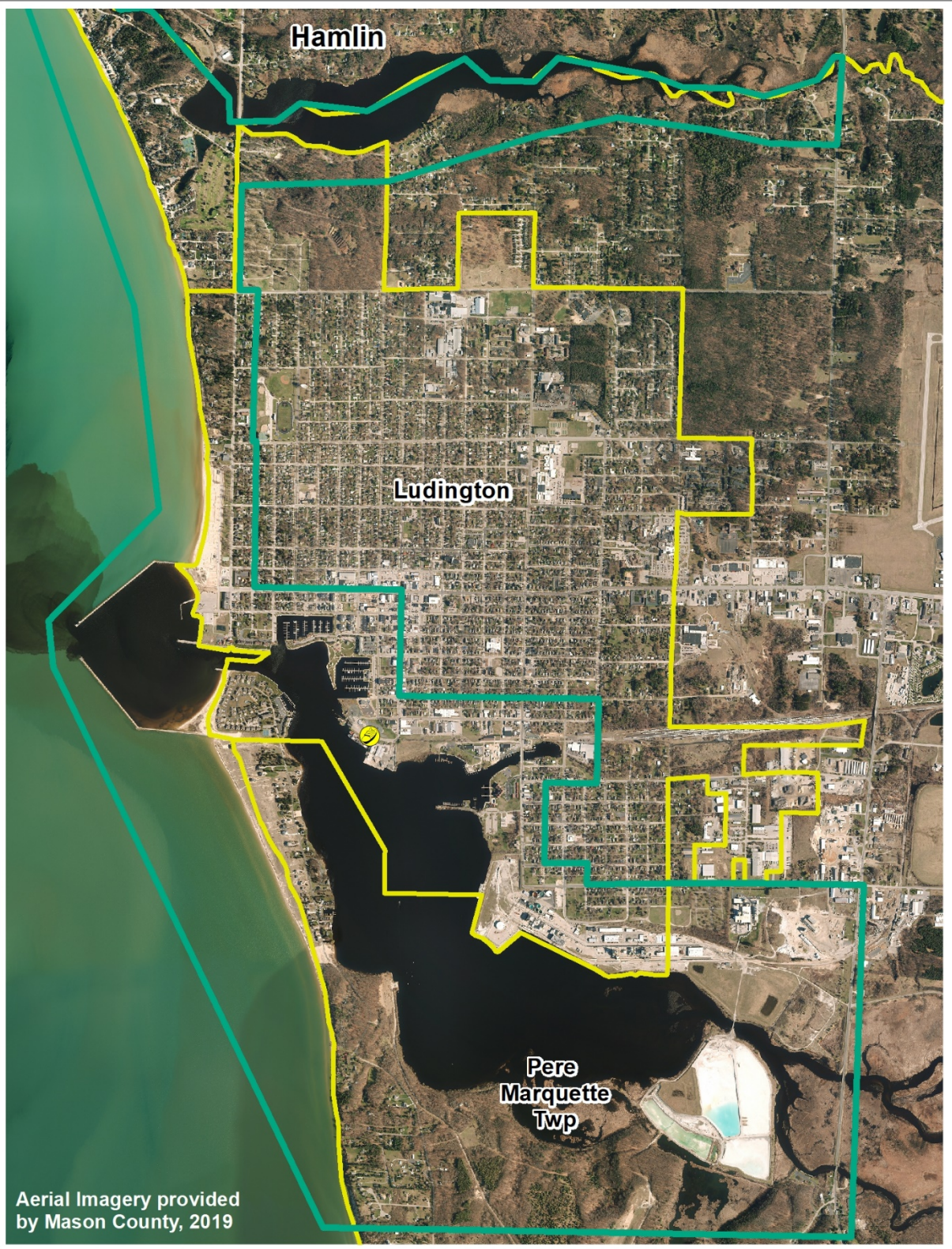
NOAA's Weather and Climate Toolkit: <https://www.ncdc.noaa.gov/wct/>

MAP SUITE

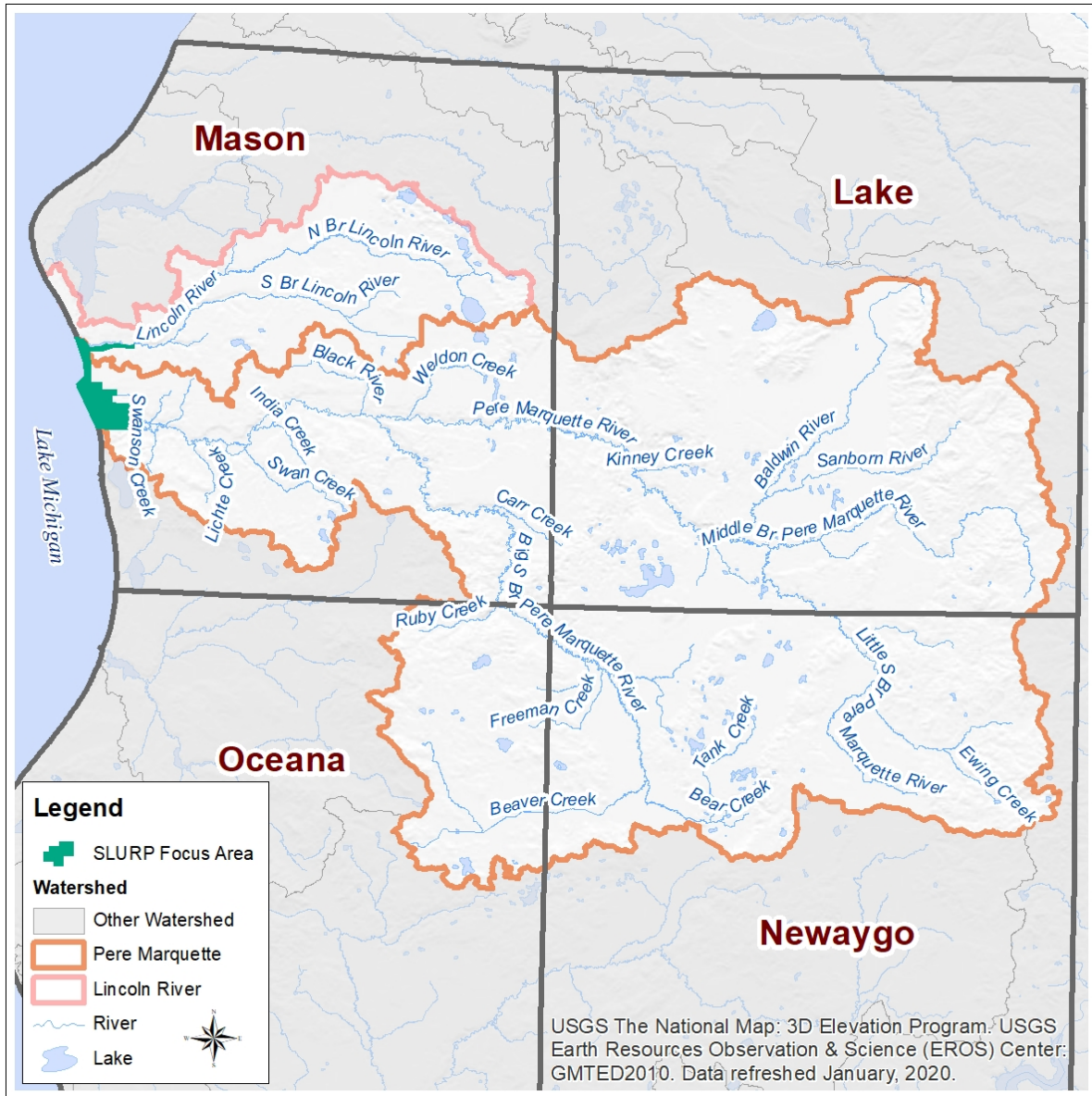
Map 1 Shoreline Land Use and Resiliency Plan Focus Area



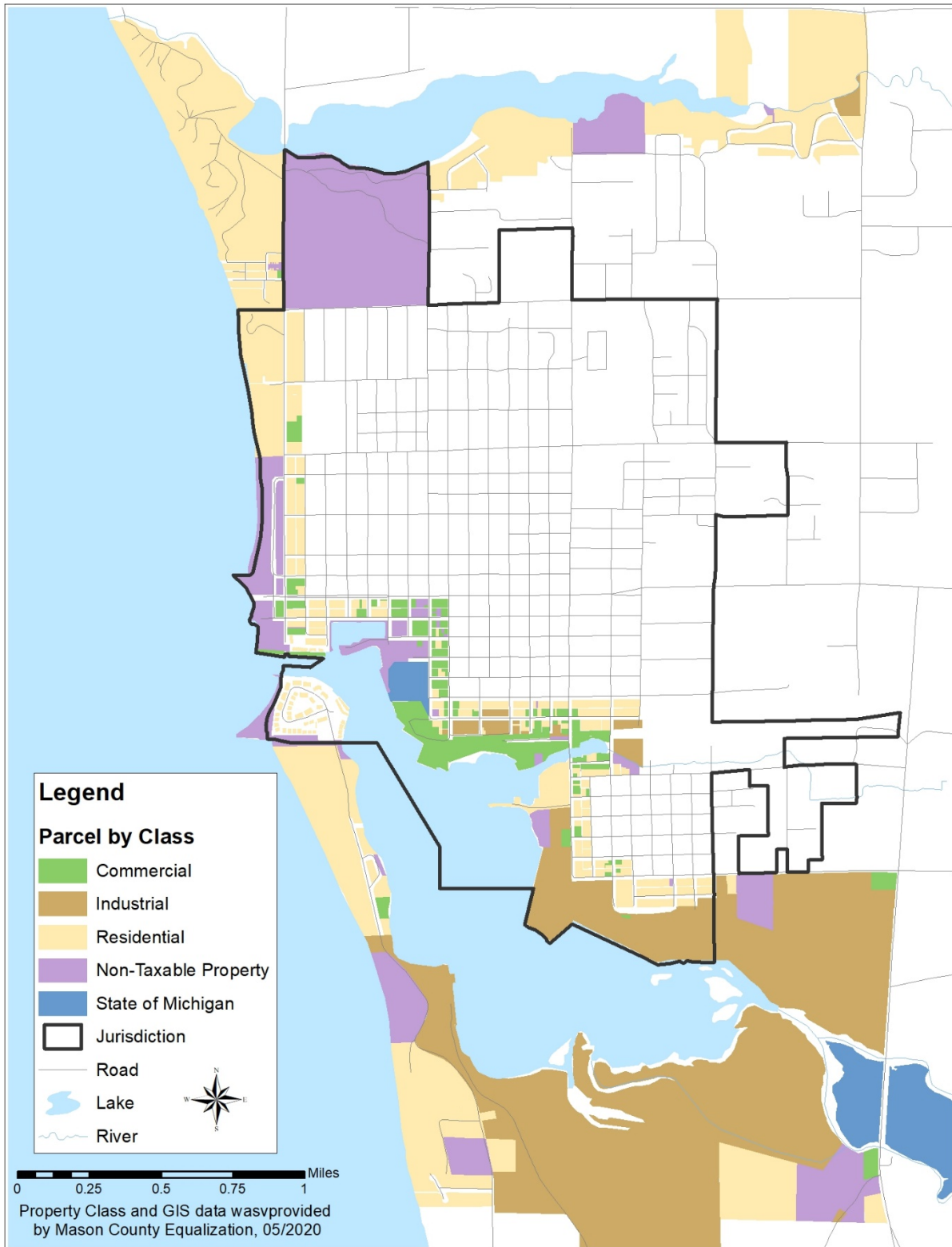
Map 2 Aerial Imagery



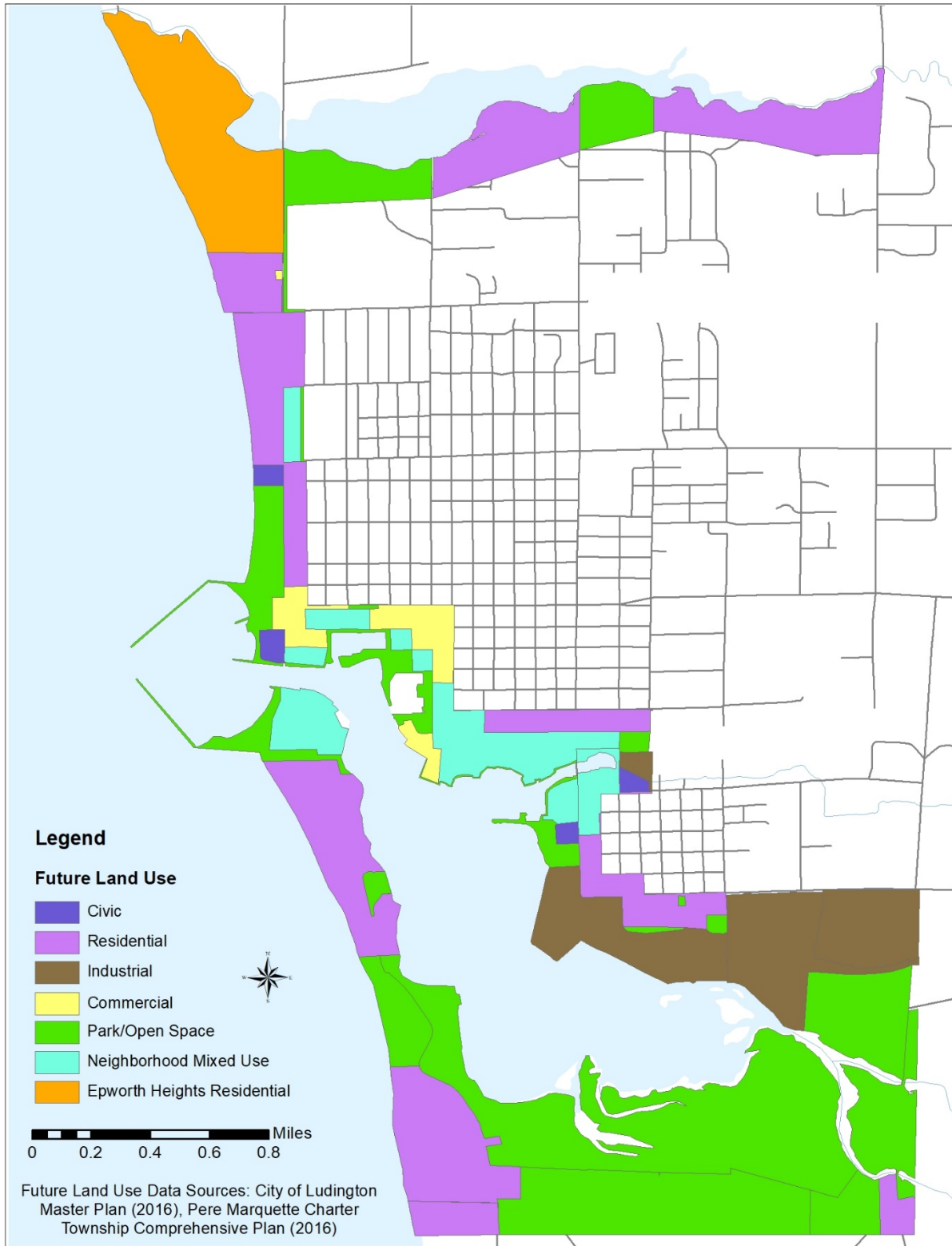
Map 3 Hydrology and Watersheds



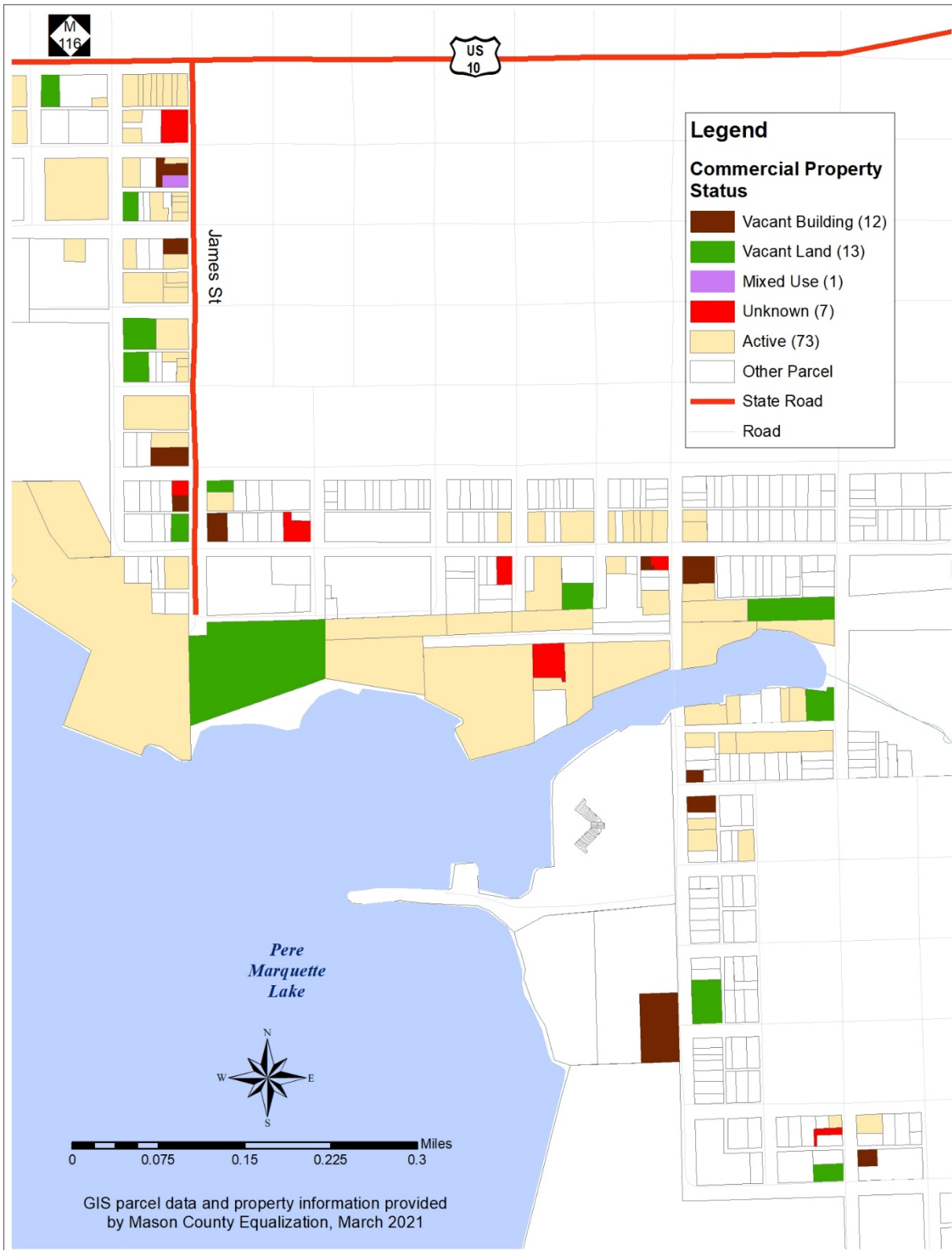
Map 4 Study Area Properties by Class Type



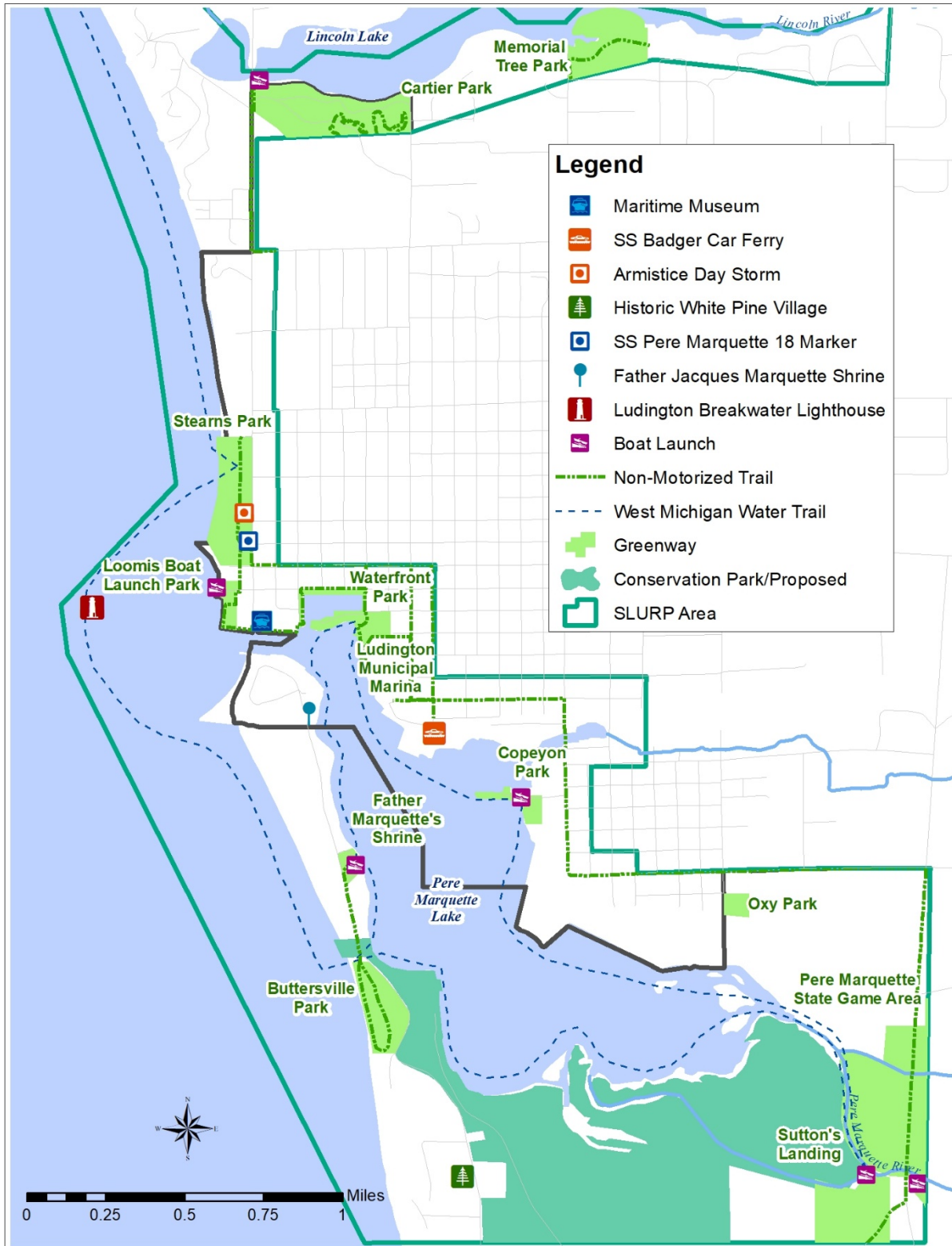
Map 5 Future Land Use Composite



Map 6 Commercial Properties by Tax Classification



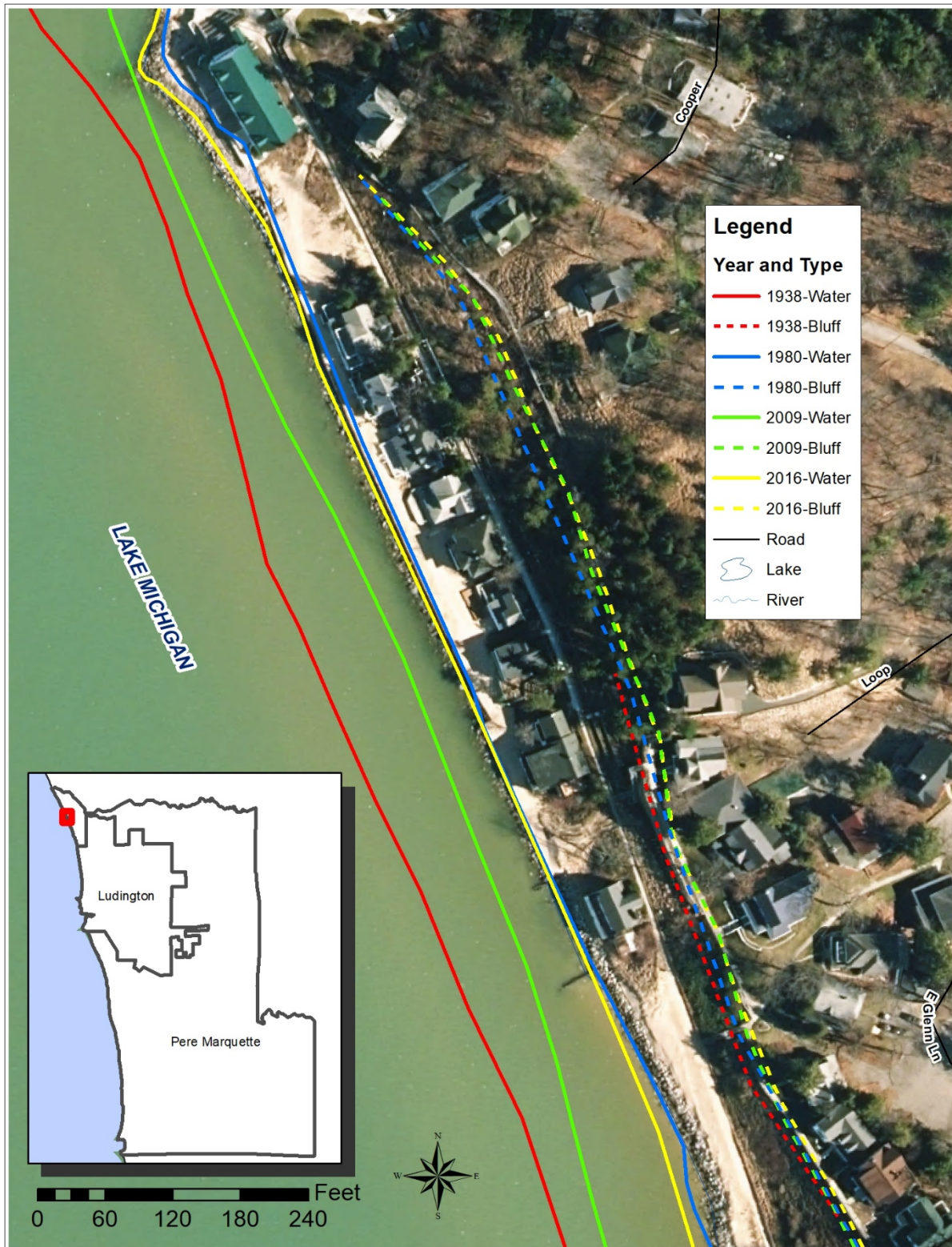
Map 7 Recreation and Points of Interest



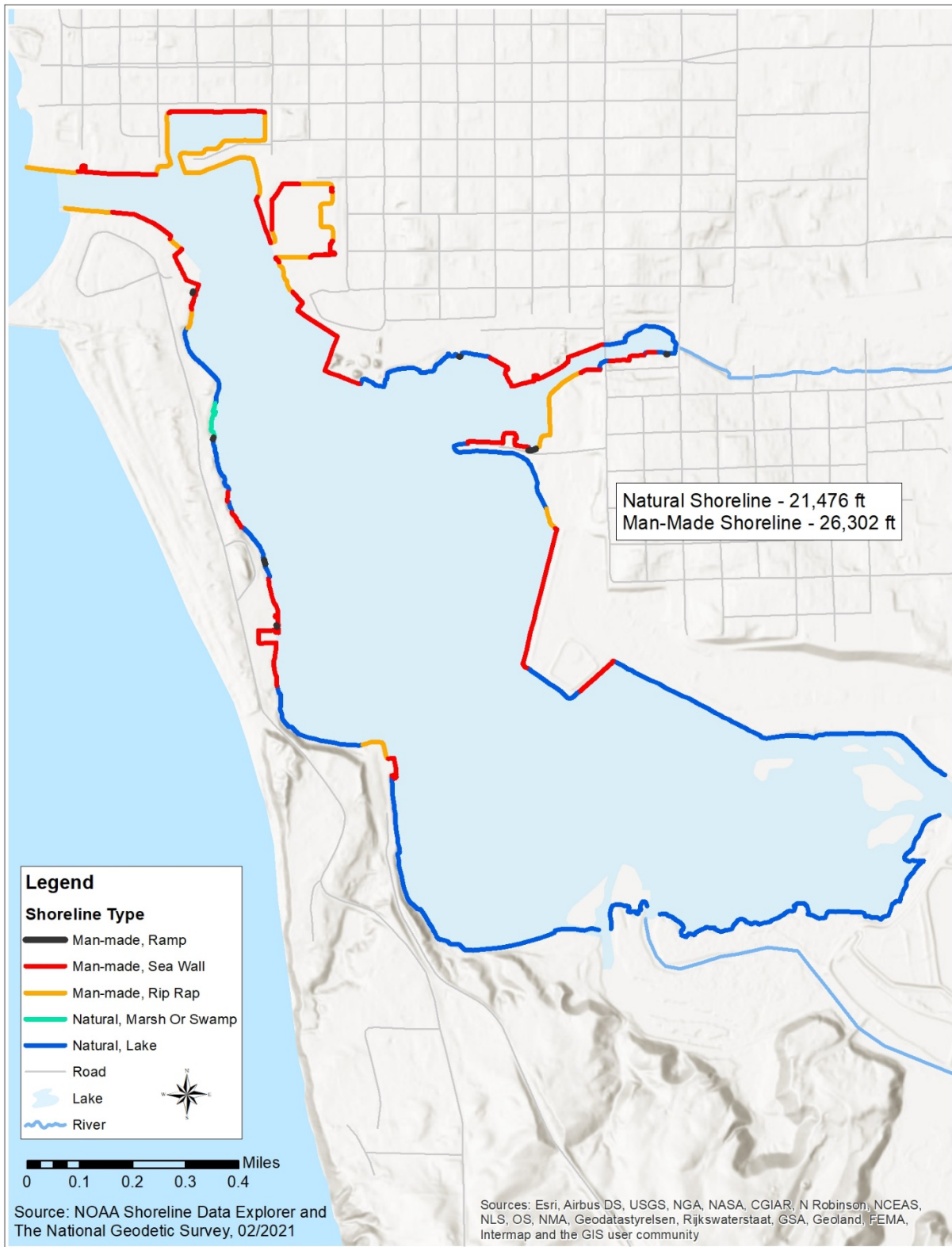
Map 8 FEMA Flood Zones



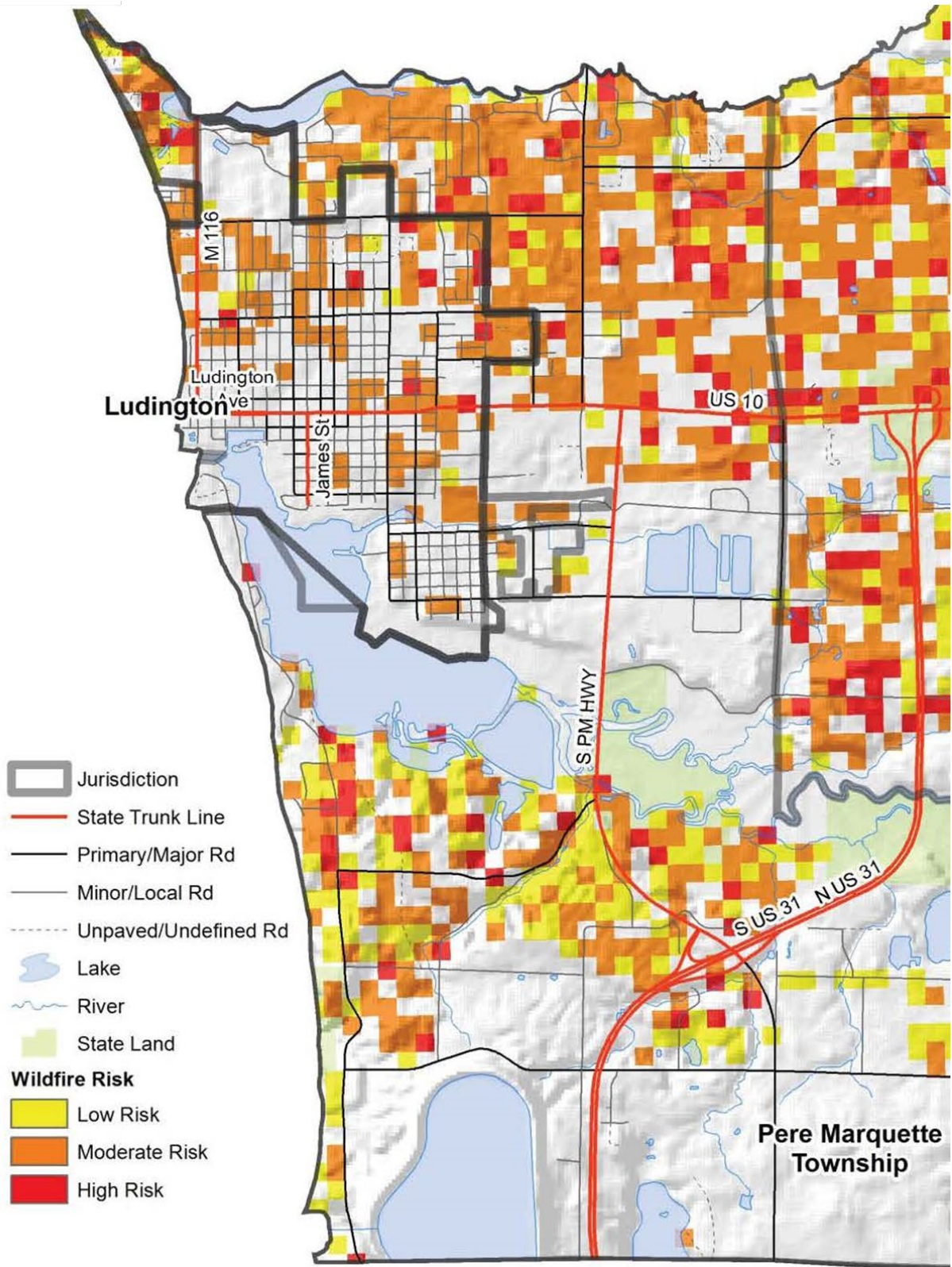
Map 9 Example of Shoreline Bluff Recession



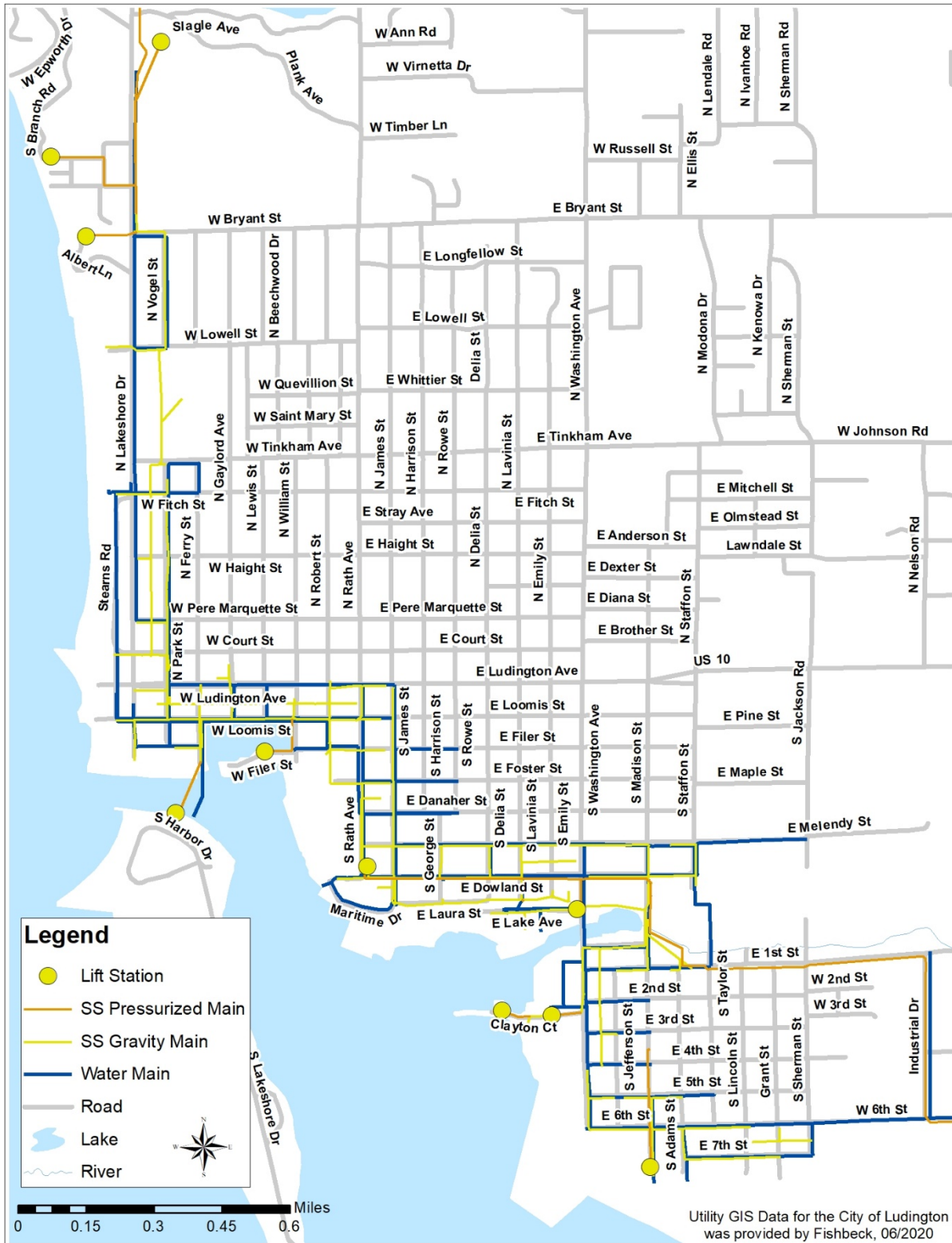
Map 10 Pere Marquette Lake Shoreline Type



Map 11 Wildfire Urban Area Interface



Map 12 Study Area Municipal Utilities



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Survey: Ludington Area Shoreline and Port Survey
Report: Default Report

Survey Status		Respondent Statistics		Points Summary
Status:	Closed	Total Responses:	129	No Points Questions used in this survey.
Deploy Date:	01/04/2021	Completes:	119	
Closed Date:	02/08/2021	Partials:	10	

1.

Please rate your level of concern for the following past or potential hazards along the Lake Michigan shoreline.

	Not Concerned	Slightly Concerned	Very Concerned	Total
High water (shoreline flooding):	4(3.1%)	39(30.23%)	86(66.67%)	129
Low water:	56(43.75%)	64(50%)	8(6.25%)	128
Shoreline erosion:	5(3.88%)	22(17.05%)	102(79.07%)	129
Ice:	49(38.28%)	60(46.88%)	19(14.84%)	128
Wildfire:	74(58.27%)	45(35.43%)	8(6.3%)	127
Swimming/Boating hazards:	27(20.93%)	63(48.84%)	39(30.23%)	129
Flash flood (extreme precipitation):	45(35.71%)	62(49.21%)	19(15.08%)	126
Pollution (trash, gasoline, industrial activity, etc.):	6(4.65%)	43(33.33%)	80(62.02%)	129
Total Responded to this question:			129	100%
Total who skipped this question:			0	0%
Total:			129	100%

2.

Please rate your level of concern for the following past or potential hazards along the shoreline of Pere Marquette and Lincoln lakes.

	Not Concerned	Slightly Concerned	Very Concerned	Total
High water (shoreline flooding):	12(9.3%)	41(31.78%)	76(58.91%)	129
Low water:	62(48.44%)	55(42.97%)	11(8.59%)	128
Shoreline erosion:	15(11.72%)	35(27.34%)	78(60.94%)	128
Ice:	51(39.53%)	56(43.41%)	22(17.05%)	129
Wildfire:	77(61.11%)	38(30.16%)	11(8.73%)	126
Swimming/Boating hazards:	26(20.31%)	65(50.78%)	37(28.91%)	128
Flash flood (extreme precipitation):	46(36.51%)	57(45.24%)	23(18.25%)	126
Pollution (trash, gasoline, industrial activity, etc.):	10(7.81%)	35(27.34%)	83(64.84%)	128
		Total Responded to this question:	129	100%
		Total who skipped this question:	0	0%
		Total:	129	100%

3.

The recent period of high water on Lake Michigan has impacted the Ludington community in many ways. What impacts have you observed that concern you the most?

	Responses	Percent
Responses:	109	100%
Total Responded to this question:	109	84.5%
Total who skipped this question:	20	15.5%
Total:	129	100%

3.

The recent period of high water on Lake Michigan has impacted the Ludington community in many ways. What impacts have you observed that concern you the most?

Response	Response Text
1	Costs to marinas and the local govt managed retreat may be the best bet
2	Flooded docks
3	Erosion to the shoreline and ice damage.
4	Losing beach areas for recreation.
5	Loss of marina dock access.
6	High water levels have led to damage to our dock and shoreline.
7	Erosion.
8	High water levels and erosion of the cement blocks toward the beach on Lakeshore drive.
9	Erosion of our shoreline and yard. We had to build a sea wall to protect our properties.
10	Damage to roads and beach front (public and private)
11	The erosion around sea walls and other structures like marinas and parks.
12	Erosion along both shorelines
13	Erosion on lake Mi around Ludington. Erosion, dock damage, channel walkways impacted.
14	shoreline erosion, impact on shoreline infrastructure, storm surge from west winds.
15	Increasing sinkholes indicating extreme increase in water table, undermining the shore properties
16	Erosion of our beaches and dunes !
17	Erosion along the Buttersville peninsula
18	Sinkholes along the channel, requiring fill-in (Crosswinds Estates)
19	Safety of pedestrian traffic on the breakwalls. Impact on shoreline erosion.
20	Lake shore erosion and changes in the shoreline
21	Water quality has declined due to the erosion of the clay banks, murky water after a storm. Also a lot of debris washing up on the shoreline and floating on the lake, hazard to boat traffic and hikers.
22	Erosion
23	Shoreline erosion.
24	I am concerned for the residents on the lakes. The dredging and sand movement onto Buttersville beach was great.
25	Shoreline Errosion. Damage to marinas. Use of marinas due to high water.
26	High water levels every where, floating debris, muddy waters that are often turbulent. Health and safety concerns are abundant.
27	Erosion of the shoreline would be our most paramount concern.
28	Erosion/sink holes
29	Erosion of shoreline/damaging high water levels
30	Couldn't use my boat most of the summer due to high water; our condo grounds have been damaged and must be repaired; beach erosion has been unsightly and messy.
31	Erosion along the south channel wall. High water effect on storm sewers. Flooding on south Rath Street. Erosion at Watrfront Park.
32	Loss of beach and waterfront access for public use.
33	Some marinas unusable. Crosswinds channel sinkholes. Reduced beach size due to erosion. Proper sea walls needed in various places where only stones exist.
34	Beach erosion limits public access to the beach for walking. Marinas are under water limiting recreation. Swimming is impacted as the drop-offs are more abrupt and not gradual Walking the pier is interrupted, requiring additional oversight and expense by municipalities
35	Erosion on the shore in the Crosswinds condo association
36	Loss of shoreline and beach, trash and debris washed up. Lumber and hardware from beach stairs washed up on beaches.
37	*Water Table -- * Dock and Boat Slip Damage - * Erosion - * Sinkholes

38	Erosion, sinkholes, flooding, inability to use docks, beach shrinkage, expense to mitigate
39	Lost shoreline.
40	Erosion, damage to docks and facilities No wake in channel NOT being enforced all summer
41	Extreme erosion along the south side of the channel, lack of use of marina slips and devaluation of property values due to high water.
42	Flooded roads
43	Flooding on streets near the Badger docks, erosion on the beach observed on the road into Ludington State Park and erosion by Buttersville beach.
44	People looking for help because they are poor planners, when they build by the water..the records are there of the fluctuation
45	loss of beaches and standing water in the low lying areas that attract insects and rodents, particularly in the park areas
46	Shore erosion.
47	Sink holes, erosion, breakwall damage
48	Shoreline erosion.
49	The effects on the marinas meaning dock and facility damage
50	Several homes in our area have had to have their homes moved back from the shoreline or have had to put very expensive seawalls in. Our slip in Crosswinds was very close to being underwater and erosion issue near bath house. Boating hazards trees , junk , lumbar in the lake boats hitting these iteams.
51	Shoreline erosion, drifting pollution and vegetation, structural damage.
52	The high water and erosion The loss of Beaches the condition of the piers and sheet piling.
53	High water levels at docks
54	Loss of beach / waterfront for recreational purposes. Cost of high water damage and cost responsibility. Negative impact on home values. Loss to local business.
55	The amount of trash coming on shore
56	Erosion and compromised shoreline
57	The damages to the beachfront for walking and the damage to the piers for accessibility
58	Shoreline erosion. However, water levels are cyclical. Ten years ago we were worried about low water. The erosion problem is real but temporary.
59	Shoreline erosion, loss of beach areas, impact on marina areas, threats to shoreline homes
60	Beach erosion and trash that washes up onto the beach
61	High water over docks, etc.'
62	The high water is in the cycle of climate in which we are. The environment will change with the cycles and interfering with mechanical measures tends to hurt more than help the ecosystems.
63	Degradation of infrastructure (sewers in particular; I am concerned about gas and water mains as well but have no way to know about any potential damage). Destruction of hardscape (roadways in particular; repairs/replacements are costly and residents here are already heavily taxed particularly because of schools).
64	Erosion
65	Erosion Flooding Street closures Business closings
66	Shoreline erosion.
67	The Beaches are a vital part of our tourism and enjoyment. Property values are a concern also. Erosion along our walkway inside Crosswinds Condos are also a major concern.
68	Sinkholes along the channel. Beach erosion with water encroaching on homes.
69	Erosion and high water in Marina, unable to put boat in.
70	High water level and shoreline erosion on Lake Michigan
71	It would help if the police in Coast Guard would in force the no wake zone on the PM lake.
72	-
73	Sinkholes on the south peninsula. Also loss of beach.
74	Sink holes on the Crosswinds property and along the army Corp canal. High water and storms have also tore up the concrete walkway to the south light breakwater. Regarding safety, people have not stayed off the breakwaters and some have been swept into the water which also endangers rescue workers!
75	Erosion due high water and inadequate shore protection. Poorly designed protection and inadequate inspection.
76	Shoreline erosion had to spend thousands to fix one problem a d now another has occurred
77	Shore erosion on beachfront and along PR channel requires expensive repairs. Debris on beach is a hazard.
78	The soils erosion in beach areas.
79	Loss of beaches
80	Erosion and high water affecting docks and shoreline
81	Crosswinds marina under water. Sinkholes along channel caused by high water and large ship traffic.
82	Destruction of docks and inability to use some docks for boating.
83	Erosion Boat docks unusable as under water

84	loss of shoreline
85	Much less beach, and water over the breakwalls. Higher water level on the breakwalls. Erosion on the south side of the channel.
86	High water at Crosswinds Marina slips.
87	Loss of beach area along the coastline.
88	Shoreline erosion.
89	Shoreline erosion, increase of debris in water/beaches. Increase of pollutants into water.
90	Not taking into account that the lake level rises and falls.
91	Erosion along both PM lake as well as Lake Michigan.
92	Washout by loomis st boat ramps, high water at end od rath ave Erosion by first curve
93	Street closures and breakwater (north and south arrowhead piers) structural integrity due to high water levels.
94	Impacts to private properties built too close to the lakeshore.
95	Erosion, loss of beach and infrastructure.
96	Mother nature is in charge. And that the waters of all the big lakes have been high low and in between for the last 70 years that I have observed. I am more interested in observing the land and water changes over a 200 to 300 year observance.
97	Erosion everywhere I look. Houses and decks that are too close to the water are about to fall in or have fallen in. High water has caused many concerns on the pier waves and icing- it should have a guard rail added to it.
98	Road closures that could lead to longer response time from fire or police.
99	We had a large amount of waterfront erosion. To protect our waterfront the condo association had to have a seawall constructed to protect further erosion and damage.
100	Was not able to walk on break wall
101	damaged shorelines, impacts to homeowners, seeing houses and other structures are built too close the lake, shoreline flooding, inability for storm drains to drain due to low elevation drain structures, low bridges, recent Ludington Avenue shoreline street scape designed that it floods and will likely be damaged
102	Erosion
103	The lack of shoreline replenishment by natural processes. The harbor impedes the natural deposition of sand along the shoreline and governing bodies (City and State) appear paralyzed to address it.
104	Increased shoreline protection measures by residential homeowners to protect homes
105	diminished beachfront and bluff erosion
106	Loss of beach and erosion of shoreline
107	Traffic flow due to road closures.
108	The beach erosion along lake MI and Pere Marquette Lake. The impact of storm surges on the City of Ludington streets. Ludington is also impacted by the effects of a the water being pushed into the harbor area causing a river dam.
109	High water has made some docks unusable. Crosswinds Lakeside forced to install 175 ft. seawall. High water mixed with high winds has caused damage to Docks.

4.

Do you have any suggestions for the City of Ludington and Pere Marquette Township to enhance the resilience of waterfront areas and mitigate future risk/damage from shoreline hazards? Some examples might include green infrastructure, managed retreat, zoning to allow for shoreline recession (deep lots so structures have the room to relocate landward), planning for the relocation of infrastructure at risk, etc.

	Responses	Percent
Responses: 	68	100%
Total Responded to this question:	68	52.71%
Total who skipped this question:	61	47.29%
Total:	129	100%

4.

Do you have any suggestions for the City of Ludington and Pere Marquette Township to enhance the resilience of waterfront areas and mitigate future risk/damage from shoreline hazards? Some examples might include green infrastructure, managed retreat, zoning to allow for shoreline recession (deep lots so structures have the room to relocate landward), planning for the relocation of infrastructure at risk, etc.

Response	Response Text
1	Maintenance of concrete pier structures
2	Protect public service infrastructure such as telecom; power; water equipment that affects the entire community not just those that reside near the water. I am not concerned with mitigating the impact on private properties at the public's expense.
3	Lifeguards at Ludington Public Beach. Regulation enforcement along lakeshore.
4	Enforce NO WAKE zones.
5	Hire someone to come and evaluate the situation, call on the experts so that erosion is taken care of. Hire an architect and get an environmental engineer out there to make sure it is done correctly the first time. Doing things piece meal, should not be an option.
6	No ideas. Would need to know what is causing the high waters and from where.
7	Maintain a buffer from development
8	possibly underwater structures which absorb some of the energy of the waves before they impact the shoreline and also entering the channel
9	All of the above. But also the better building and monitoring appropriate sea walls along the entire (ferry) entrance from Lake Michigan to Pete Marquette lake. Also the emergency stairways along the channel need covers, breakaway (hinged) covers. They are an extreme danger for small children and creatures.
10	Protect the shoreline with walls and rock structures as required.
11	Zoning for deep lots would be a start. I am not sure if there is an ordinance of how far back from shoreline a home has to be, but it seems there are some being built that are already too close to the water.
12	All of the above.
13	Consider synthetic breakwaters for high-water line (removable would be ideal if lake levels lower)
14	Creation of wetlands and marshes to mitigate erosion, zoning to allow for shoreline recession
15	Work with the United States Corps of engineers to upgrade the channel wall along the south side of the channel from the cheap rip-rap structure that served its purpose when the channel's peninsula was undeveloped, to a seawall structure better equipped to protect the tax dollars that have developed along the channel. in addition, urgent attention needs to be given to the portion of the existing seawall that was damaged by the USS Badger, creating a hazardous condition along the channel walkway.
16	Hire sand and water consultants and follow their lead
17	Probably the biggest concern would be zoning to keep structures out of flood plains...allowing setbacks that assure a liberal margin of safety.
18	I wish I knew more about how to plan.
19	Not a suggestion- just a request to not overreact knowing that water levels will eventually decrease.
20	Better zoning and building setback rules and enforcement; prompt repair of impacted areas; additional shoreline barriers and vegetation to keep high waters from eroding property.
21	Lake levels are cyclical. High water levels cause many problems. I suggest that you move very quickly to improve planning, zoning and engineering for high water. It is very difficult to generate interest, legislation and funding when water levels are low.
22	Ludington should limit further shoreline development and protect green spaces for waterfront resilience. We should secure more public land in natural condition, where no artificial structures are at risk of rising water. Lake fluctuations are a natural historic occurrence, in spite of our preferences otherwise.
23	No suggestions. I'd say let people build where they want on a lot. Let them use their own good judgement.
24	Stop allowing building on high banks, do not allow steep stairs, no homes built within 500 ft of shoreline.
25	Zoning to prohibit homes being built closer to lakes than historic placement.
26	All of the above and work with the Corps of Engineering for a long term solution.
27	Deep lots would be good
28	All I see here is more Gov. restrictions.
29	along Lakeshore Dr. on the south side of the channel there seems to be a trend for homes to move closer to the lake ever since the township allowed the one house to be built less than 150' to the shore line. I don't think this is a good trend!
30	Living near Chicago we are well aware of the serious problem high water is causing. Communities along Lake Miciqan and especially

Chicago proper are spending millions to control the damage being done and yet have found no good solutions. This is not the traditional cycle of low, to high, and back to low that we are accustomed to. This is the result of climate change and high water is here to stay, So any infrastructure change you make will only be temporary. The states surrounding LM need to

31 Don't impede corrective action with excessive study and permitting requirements.

32 get with the core of engineers and see what they suggest and possibly update existing structures

33 Future planning, including providing or at least pointing the public toward resources to manage the most vulnerable areas. Deep lots and proper setbacks make sense on high bluff properties where measures such as revetment may not be possible or cost effective. We know the water levels go up and down in cycles and we should be working toward a way to plan ahead for the worst scenario before our backs are against the wall!

34 I am sure there are records so people don't build too close to the water's edge without proper protection.

35 Long range planning to take high water impact into account when determining set back for redevelopment or new development. There are multiple government agencies that govern, control or are responsible for water fronts. very difficult to navigate for residents or business.

36 Use common sense when issuing building permits

37 Take into account the possibility of high water in the future for zoning and planning.

38 Zoning to allow for future erosion is practical. Ending the current practice of building multi story condos that effectively block the public view of the water would allow more people to enjoy views and access. I will oppose any condo development in PM township.

39 Planning for these upsets of nature when building.....both residential, commercial and governmental.

40 All of the above suggestions are great, especially the green infrastructure and managed retreat from shoreline areas. If Dow Chemical would relinquish their ownership of the South shore of Pere Marquette Lake and donate it for a public park, the whole community and the environment would benefit.

41 Hire a Dutch hydrology management consultant (or some suitable world-class expert) to work with the Army Corps of Engineers to put together a 50 year plan for Mason County.

42 Make sure all future construction is a minimum of one foot above historical Lake Michigan record high water level.

43 Aggressive shoreline protection including sea walls and rip-rap

44 Read above

45 Require professional engineers seal on all developments adjacent to the water

46 More rigorous zoning ordinance and enforcement along Lake Michigan and Pete Marquette. The farm silo on PM is not only ugly, it is on a short, low lot with little frontage and has already had debris and soil going into the lake.

47 None

48 Help people protect their property.

49 None

50 Strictly enforce no wake zones. Too many boats both large and small do not bother to slow down. No wake is poorly enforced.

51 Make allowances for portions of our real estate taxes to go back into subsidies for infrastructure changes, such as floating docks, sea walls and riprap

52 Shoreline recession

53 No opinion.

54 Allowing people to build close to shoreline or on top of dunes. Educate tourist about their impact on shoreline erosion.

55 Regulations for future building in proximity to shoreline/bluffs, ensure others don't pay for someone else's property. Increase of native natural/green infrastructure. Natural wind breaks. Promotion to use on public and private property. Increased education of not going into water/breakwalls/not walking on re-vegetated areas.

56 See above.

57 Shoreline erosion is a natural occurring process and zoning laws need to provide adequate set backs to allow for the safety of structures. Accelerated shoreline erosion due to climate change should be factored in. Green belts where feasible should be encouraged to help prevent eutrophication of Lakes. Sanitary sewer and storm water drainage systems should be studied to see if appropriate.

58 Private landowners concerned for their property/safety and willing to consider selling their property should be able to sell their property to a govt entity funded to purchase such properties and then 1) remove infrastructure, 2) allow public access to the lake over what would then be public lands. This would further help attract tourism and drive the economy

59 Create a long range development plan for the waterfront and adhere to it.

60 Do things with a multidisciplinary group. Land use experts, hydrologists, geologists, ecologists as well as residents.

61 Look into a sea wall and walkway system like they have in Muskegon. Add another layer of concrete, rock, and a rail to pier.

62 Yes to all your suggestions. Don't let people build where flooding could damage structures. Put in green areas that CAN be flooded without loss of structures. Retain the natural plants/shoreline that can help alleviate the impact of high water.

63 setback limits for shoreline construction higher design elevations for drainage structures replacing drainage structures in flooded areas to reduce damage to home owners and fix the longterm problem supporting beach nourishment on the north shore

64 Green infrastructure. Need a wide natural area between shoreline and human activities

65 Harbor dredging should promote shoreline replenishment on the side of the harbor that scours most and does not replenish. Green belt zoning burdens property owners for conditions caused or significantly contributed to by the Corps of Engineers and the City.

66 pump sand from the harbor to the north

67 I don't understand why the City of Ludington did not put in a higher retaining wall along the Loomis Street parking / park area. I also do not understand when the City constructed the event area at the end of Ludington Avenue they did not elevate the area. These were both recent projects that appear to have been completed at elevation levels that did not take into effect higher lake levels. Local

municipalities need to increase their reserve funds to be able to deal with future water levels.




68

Above good thoughts. Possibly extending south channel seawall further into Pere Marquette lake to move wave action formed further into the lake. West winds drive channel water into calm Marquette Lake forming large swells on impact which in turn pound the west shore. This may sound a little extreme, but is a problem that would need some study.

5.

Please respond to the following statement:

Shorelines and adjacent waterfront areas are critical to the identity and the long-term prosperity of the Ludington community.

	Responses	Percent
Agree: 	121	99.18%
Disagree: 	1	0.82%
Additional Comments: 	10	8.2%
Total Responded to this question:	122	94.57%
Total who skipped this question:	7	5.43%
Total:	129	100%

5.








Please respond to the following statement:

Shorelines and adjacent waterfront areas are critical to the identity and the long-term prosperity of the Ludington community.

Response	Comments
1	ABSOLUTELY
2	Tourism, tourism, tourism
3	Strongly agree. There's need for improvement!
4	even tributaries shore not jus tthe lake front shore
5	Strongly agree
6	Wildlife restoration for Pere Marquette Lake and its shoreline areas will be a gift for the whole region.
7	glad we have the wetlands to buffer high water table years, heavy rains
8	Public access is critical to future economy
9	Shorelines and waterfront change over the years
10	We have camped, boated and owned in this area for 59 years.

6.

The Ludington waterfront along Pere Marquette Lake has a variety of land uses. What, if any, changes would you like to see in this area? Please check all that apply.

	Responses	Percent
More public parks and recreation: 	75	61.98%
More marinas: 	19	15.7%
More restaurants and stores: 	48	39.67%
More professional business: 	7	5.79%
More clean industrial uses: 	17	14.05%
I like the current mix of land uses: 	34	28.1%
If other, please specify: 	21	17%
Total Responded to this question:		121 93.8%
Total who skipped this question:		8 6.2%
Total:		129 100%

6.

The Ludington waterfront along Pere Marquette Lake has a variety of land uses. What, if any, changes would you like to see in this area? Please check all that apply.

Response	Comments
1	More residential units and less industry would beautify the lakeshore.
2	More open, unplanned areas
3	Biking/walking path along shore
4	Less commercial/industrial more vacant land for community use
5	A few waterfront restaurants would be nice.
6	less chemical and/or manufacturing plants on the waterfront
7	A nice hiking park would be great on the south side. Just open up the city and let's take care of the restaurants and businesses we have now. No future without them!
8	More résidentiel , NO commercial on the water fronts
9	i like a mixed use complex there, although it shouldn't been a dense development
10	I would like to see less industrial use along PM Lake.
11	Any additional development should include ample parking
12	The closing of the chemical plant and demolition and removal of the infrastructure of that plant. Mediation of the polluted property, especially the salt ponds will give new life to the area.
13	Bike trail
14	Develop the southern end of the lake into a recreation area
15	residential
16	Require trees, shrubbery and other natural screening to at least partially hide the industry around the lake
17	Enforce parking restrictions at Butterville Park.
18	A buffer of land between wat
19	We have a great balance of parkland around the shoreline. it would be great to see better use of the deep draft harbor, a unique feature in Ludington
20	Fewer high rise buildings screening the lake.
21	Wildlife Refuge or Birding Sanctuary with Walking Trails

7.

Please describe what your vision of the Pere Marquette Lake waterfront looks like 15 to 20 years in the future.

	Responses	Percent
Responses:	84	100%
Total Responded to this question:	84	65.12%
Total who skipped this question:	45	34.88%
Total:	129	100%

7.

Please describe what your vision of the Pere Marquette Lake waterfront looks like 15 to 20 years in the future.





Response	Response Text
1	More user friendly
2	Tastefully developed
3	The elimination of industry or a tree line to hide industry.
4	1. Enhancing the industrial complex by creating view barriers. 2. The low lands on the east end of the lake could have elevated river walks with shops and eateries. 3. The power distribution system could be relocated away from Copeyon Park.
5	Positive Economic impact from tax zones. Clean water for recreational uses. Healthy aquatic life.
6	I would like to see lakefront bars and restaurants that are accessible via boat. I would also like Occidental chemical to be gone and replaced with a park or residential housing because it is an eyesore.
7	Clean water, less construction and more parks.
8	Not qualified to say
9	Public parks, public water access, beaches,
10	Pretty much the same. We need the industry to stay in town and grow. Just do things to make it attractive.
11	Definitely maintained and updated when needed.
12	It should be the centerpiece of the Port of Ludington and be developed into a vibrant tourist attraction/vacation destination.
13	Natural shoreline , no commercial or industrial business. Open land in it's natural habitat
14	Resort towns dotting all along north & east shores; would be great if chemical company could be relocated & that waterfront used for new housing/marina
15	Much as it is now. Quiet, quaint.
16	Conservation of the area to allow for more recreational uses this would involve more designated low awake areas for boating
17	More public walkways and parklands.
18	More public access and parks.
19	Personally, I'd love to see unused industrial buildings gone including the ship next to the Badger. Also, anyway we can eliminate the pollution from the Badger? We love her, but I think Mariners are forced to seek other marinas? Not a boater, but lots of our friends moved out.
20	Chemical plant is gone and turned into green space.
21	More public accessible areas with limited structures. If there is a structure it is well back from rising waters and parcels without structures have easily replaceable landscape.
22	More restaurants and other tourist related attractions along with greater access for the public.
23	Add some multi unit housing choices along with restaurants and shopping.
24	Substantially preserved
25	I think the Washington Street bridge area could be developed into a more attractive residential and retail district.
26	The south shore of Pere Marquette Lake is prime space for a nature preserve. Dow Corp. should turn over the land to the city for protection and public enjoyment. Visitor use should be light impact, such as hiking and cross-country skiing. Many acres need to be restored after decades of industrial impact.
27	The old Spartan removed. Remove chemical plant and gravel piles. Make Ludington a fun place for restaurants with outdoor seating overlooking pere marquette lake. It's a pretty lake but most of it is rather unsightly and underdeveloped for visitors. It has great potential tho! The city just needs to address whether the industrial element is worth having or not.
28	A few more entry points for boaters, jet skiers, sailing lessons beyond kids - to include adults too. Limited waterfront restaurants as there are none on this side of PM highway. A flat bike trail as the steep hills along lakeshore drive make cycling not practical. A big vision would be a bridge and / or a Ferry from Lakeshore to downtown Ludington to encourage walking or cycling etc.
29	Less industry, more natural landscape
30	Vibrant, mixed use with green spaces, retail and restaurants, non-industrial businesses.
31	Park-like atmosphere with additional public parking and green spaces.
32	The Buttersville peninsula land from Dow being fully developed for walking, biking, recreation.
33	A sustainable multi use lake
34	More green spaces with clean industrial.

35	Résidentiel développement on the south side and less industries on the waters edge..
36	i know the industrial complex is a bit of an eyesore, i am assuming it give the area a good tax base. i believe parks and some retail or possibly even a hotel in the area would be nice with a small conference center
37	continued from #4, change the existing no sell water policy and start selling the billions of barrels of excess water to states that are having droughts. Otherwise in 15 years the water level will have only gotten higher and we will sill be moving infrastructure inland.
38	Natural vegetation. Continued fishing. Wooded land
39	Continued public access through parks, ramps and public access.
40	fewer industrial sites
41	N/A
42	A deep water port known to bring visitors to the area while providing a beautiful place for locals to enjoy the natural resources. Recreational opportunity is key to the success of area tourism and we have some of the best land and water in the state of Michigan, but need enhanced access and amenities.
43	I would like to see the Dow property preserved.
44	Green way around industrial areas
45	Future development should be a function of growth and ratios maintained. (Open space, residential, business, etc.)
46	Clean and well maintained structures
47	Multi use development with marina that can accommodate access to development.
48	Clean air and less pollutants from the Badger and other freighters
49	Cleanup of the Thompson dock area and removal of the Spartan would improve the overall appearance of the shoreline. Overall, the mix is far more appropriate than additional condos.
50	Nice resort area appearance
51	My vision of the Pere Marquette Lake waterfront is for it to be given or sold to a nature conservancy, the city of Ludington or other entity that will give access to the public for fishing. It would be great to have the area as a sanctuary for birds, deer and other wildlife and the flora and fauna of a healthy wetland.
52	Less industrial. More recreational. Better zoning control regarding building architecture.
53	One long, continuous park running from Buttersville to Old 31 on the south side of the PM Lake.
54	Removal of the Spartan eyesore. Making the Badger a cleaner run operation. The chemical plant is a big eyesore as well that could be improved upon with landscaping. Walking paths around the lake would be great and get people out and about. The addition of coffee shops/restaurants would be nice along the way.
55	Bike Trails
56	A mixture of recreational, business, industrial and public access in a cooperative environment
57	More environmental friendly land use.
58	Relatively similar to current. Seems to have a good mix of residential, common/park greenspace and industry (which is maybe not scenic or popular, but needed to help provide jobs for a strong local and year round economy) as well as undeveloped lands. Industry also provides interest and activity to watch with the shipping involved.
59	I would just like it to remain unspoiled and clean.
60	Similar to what it is now, with the south end of the lake developed into a winter - summer recreation complex. Great area for ice fishing, skating, sledding and hiking. Possibly camping and swimming.
61	expensive homes all around
62	Nice walking trails, possibly a boardwalk, and wildlife refuge area along the south shore. Keep the natural state. No more houses, No mobile homes or camping facilities. No more industry.
63	Keeping a small town atmosphere.
64	The Dow property is turned into a first class recreational and entertainment venue. What a beautiful spot for an outdoor venue to see concerts and events while enjoying a beautiful view of the city
65	Normal water level. Erosion and beach's restored.
66	Development of Dow area property.
67	Continued car fairy use with improvements to natural surroundings, parks and ways to blend industry in nature, making the industry less obtrusive.
68	Beautiful park on empty land less industrial sites
69	I think it will be almost the same.
70	An area that is not overdeveloped. A nature area with trails for hikers. Similar to properties local land conservacys manager.
71	Cleaner industry, increased natural use areas, ensure blighted areas are reduced.
72	I hope that there will be more public access.
73	Pere Marquette Lake is (was) one of two seaway depth ports on the east shore of Lake Michigan. The harbor needs to provide for a healthy mix of clean industrial, commercial and recreational uses. Because multiple governmental jurisdictions consider the feasibility of creating a port authority.
74	More public lands and access
75	Cleaned up, more residential and retail/industrial uses but in a welcoming and environmentally safe atmosphere
76	No more high rises.

77	Park setting with bike and walking trails. Picnic areas that could be rented. A gazebo perhaps used for weddings. Kids playground. Dog park. Volleyball. Random sitting benches for people to take tin lake views, plant nice trees and bushes
78	While I think Ludington lacks waterfront restaurants, let's not create a problem we don't need by putting structures in a flood plain. A more green, walker-friendly waterfront would be better than just marinas.
79	Similar to what it does today. I would hope no more wind turbines are constructed because from of our condo we can see very little of them and cannot hear them. It is nice to have a natural shoreline.
80	A well-cared for shoreline with a mix of uses.
81	Clean up and recovery of the areas that were substantially affected by the industrial operations of Dow Chemical / Occidental Chemical Corp as well as a fishing/parking area to keep vehicles off the side of the road on S. PM Hwy in the river flat area.
82	thriving, similar to downtown
83	Maintain or further develop natural areas for beautification.
84	Additional recreational access making the area even more attractive.

8.

In general, which strategy do you prefer the most over the next five years regarding recreation and public spaces along waterfront areas?

	Responses	Percent
Maintain existing public spaces and recreation amenities.: 	44	37.29%
Develop additional public spaces and recreation amenities.: 	73	61.86%
Do not invest in public spaces and recreation amenities.: 	1	0.85%
Additional Comments: 	16	13.56%
Total Responded to this question:		118 91.47%
Total who skipped this question:		11 8.53%
Total:		129 100%

8.

In general, which strategy do you prefer the most over the next five years regarding recreation and public spaces along waterfront areas?

Response	Comments
1	I don't see over crowding to be an issue. With PM TWP developing a park on the south end of PM will be a nice addition.
2	Keep green areas and trees
3	Limit public use of green spaces and make more
4	With upgrades
5	Ludington's downtown is not as quaint and pedestrian friendly as most other beach towns. We recommend finding ways to make downtown more quaint with slower and less road traffic.
6	Enhance the recreational fish structure in Pere Marquette lake
7	Who pays for public areas
8	i beleive a good mix of public and private would be a good idea.
9	But build them to account for continued rising water levels.
10	Spend money on maintenance of what we already have!
11	Maintain the existing wetlands and dunes and restore areas to their natural state.
12	Seems ample, as there are multiple water access points, a few parks
13	Funding for maintenance must be part of plan.
14	See above
15	Unsure the value of area developed across from putt putt
16	It would be nice to have a more dog friendly environment in the parks.

9.

Please note any public infrastructure needs or deficiencies you are aware of along or adjacent to lakes Michigan, Pere Marquette, and Lincoln?

	Responses	Percent
Responses:	46	100%
Total Responded to this question:	46	35.66%
Total who skipped this question:	83	64.34%
Total:	129	100%

9.

Please note any public infrastructure needs or deficiencies you are aware of along or adjacent to lakes Michigan, Pere Marquette, and Lincoln?

Response	Response Text
1	A true water front restaurant would add a lot for both residents and tourists. Perhaps the new owner of the Spartan might consider building a restaurant on board.
2	Badger speed/wake and wakes of the public escort vessels....any private vessel would get a ticket! Also need to clearly mark the no wake boundary on PM. (Polka dot house???)
3	None.
4	I know nothing about the infracture of the defienices or needs of the lakes. An expert needs to be hired.
5	NA
6	Maintain Ludington's channel and breakwater infrastructure and the adjacent green spaces
7	The emergency steps out of the channel are dangerous. They result in interval spaced openings along the walkway that small children, pets and other creatures call fall into. Hinged kids need to constructed immediately.
8	Not aware of any
9	Sinkholes along southern end of channel (Crosswinds). Removable/temporary breakwaters would be ideal solution to high-water levels (not physically attractive, but if made temporary, would be worth it)
10	Concerns with sinkholes along the walkways of the Pere Marquette channel.
11	Overdeveloped and too industrial
12	There is a lot of undeveloped land. Some of that can be developed and put to good use observing strong limitations as to what and where things can be developed.
13	It could use more recreation and commercial developement.
14	Do not plant Autumn olive! Are you folks aware that the introduction of this invasive shrub at Pumped Water Project in the 1970's is the biggest ecological disaster in the history of our region? And it keeps getting worse. The species has spread from Mason Co to all of West Michigan, following the power line easements. Never mind the fish kill, we need superfund status to reverse fifty years of olive invasion. https://www.invasivespeciesinfo.gov/terrestrial/plants/autumn-olive
15	People have to walk thru the huge parking lot to get from stearns park to the channel. No proper walkway. It's ugly and unsafe. This area should be connected with an attractive walkway for seamless walking from one beautiful place to another. Not dodging cars in the existing parking lot.
16	Maybe a public restroom
17	The public walkway adjacent to Pere Marquette lake located in crosswinds in being damage by the hish water
18	Despite considerable cost and effort we are losing the battle of south shore erosion
19	this isn't about the shoreline but reworking US 10 into a 3 lane road would do wonders for the City's development and enhance the lake shore greatly
20	The South brakewall will soon be under water.
21	Land erosion and breakwall damage along the channel.
22	Dog park on the south side...
23	up keep of existing structures or repair - if repair don't go the cheep route as we have seen in the past.
24	Additional day use park and recreation areas for those traveling by boat or by land. More transient dockage. Ludington has some wonderful restaraunts and breweries, but nothing along waterfront other than PM Steamers which only has a marina view, so a waterfront restaraunt seems like a nice addition, especially if it could be accessed by boat.
25	The Thompson Marina property needs the waters edge stabilized.
26	None at this time
27	As previously stated, parking, in season, is a concern.
28	Maintain the Spartan so it doesn't look like a rusty wreck
29	South pier and its access to walk is becoming dangerous
30	Other than erosion, the appearance of the Spartan is an eyesore. If it stays a coat of paint would be an improvement.
31	Additional canoe and kayak docks, boat landings and hiking trails would be welcome.
32	Public walkway along Pere Marquette Highway adjacent to Pere Marquette River north and south branches. Better parking adjacent to Buttersville beach.

33	Lack of cost sharing between all entities involved. Too much expectations for private property owners to pay their own way with help or assistance financially
34	I am extremely concerned about the continued operation of Line 5 in the Straits of Mackinac. It is not a robust installation after 67 years, and has been damaged many times. Alternative fuel supplies to the areas in need should be explored. Ludington and the entire west coast of Michigan could be impacted.
35	The Badger is cool but dirty, unhealthy breathing the air. The Spartan is an eyesore, rusty, bird poop, not a good image. The waterfront land is so industrial that people drive right by to go to Manistee or Onkama.
36	None
37	A safe way to walk or ride a bike from Buttersville to the city. The current system of no real right of way is an accident waiting to happen.
38	None
39	Erosion at Crosswinds.
40	Take measures to protect the shoreline, and reduce erosion and damage caused by high water. Although history seems to indicate it is cyclical - so would not want to take measures that increase the negative impact of low water years either..
41	Year round public use facilities
42	The fishing dock on Lincoln lake needs repair.
43	None
44	flooded drains, low elevations along the lakeshore streets, Rath Avenue has been closed off for so long. It needs a solution shoreline erosion threatens the water plant
45	The Epworth dummy bridge should be rebuilt to permit Lake Michigan access.
46	Kayak launches along Pere Marquette and Lincoln lakes. Additional boardwalks and bicycle paths along or close to the lakes.

10.

Let us know your relation to the Ludington community.

	Responses	Percent
Permanent resident - City of Ludington:	42	35%
Permanent resident - Pere Marquette Township:	5	4.17%
Seasonal resident - City of Ludington:	45	37.5%
Seasonal resident - Pere Marquette Township:	17	14.17%
Visitor:	1	0.83%
If other, please specify:	18	15%
Total Responded to this question:		120 93.02%
Total who skipped this question:		9 6.98%
Total:		129 100%

10.

Let us know your relation to the Ludington community.

Response	Comments
1	our retirement home is in Ludington. We will be moving here permanently within 2 years.
2	Part-time year-round resident City of Ludington
3	season as we speak but within a year or two permanenet resident
4	Own boat slip in area
5	My wife and I have a condo in Crosswinds and spend a substantial amount of time there every month of the year.
6	Getting closer to permanent every year
7	Boat slip owner
8	Summer and winter
9	Seasonal resident who is taxed at permanent resident status. Work with State government to be able to Homestead our choice of property
10	Own a slip at Crosswinds Marina, live in Illinois.
11	I live in Scottville, so Ludington is where I go the most.
12	Resident of Mason County who uses Ludington beach, parks and trails ofyen
13	Permanent Hamlin Township
14	Permanent resident Hamlin township.
15	Previous resident
16	Live in Grant Township, Mason County
17	Permanent resident mason county
18	Permanent resident - Riverton Township

11.

Thank you for your time and input!

Please use the space below if you would like to add any final comments or concerns regarding the shorelines and waterfront land uses in the City of Ludington and Pere Marquette Township.

	Responses	Percent
Responses:	42	100%
Total Responded to this question:	42	32.56%
Total who skipped this question:	87	67.44%
Total:	129	100%

11.

Thank you for your time and input!

Please use the space below if you would like to add any final comments or concerns regarding the shorelines and waterfront land uses in the City of Ludington and Pere Marquette Township.

Response Response Text

- 1 Whatever route is decided, maintain public access
- 2 Non emergency wakes from police & coe vessels are unnecessary and dangerous! Meeting the Badger is a planned activity, never an emergency!
- 3 As a resident of Crosswinds Lakeside Condominiums, we recently incurred the expense of a seawall to thwart existing and future erosion due to high water. Boaters ignoring the no wake rule have contributed to erosion due to the lake level. Can something be done to make it clearer where the no wake portions of the lake are? We see little enforcement from the Marine Patrol.
- 4 We applaud good governance and foresight.
- 5 Make sure it is done correctly the first time. Sign a contract and stick to it!
- 6 connect with trained, experienced professionals to help determine strategies for addressing the problems and planning for the future.
- 7 Currently there are several revetment projects along the shoreline on private property, which should be funded by public and government resources to insure continuity and the long term goals of the port of Ludington.
- 8 This is a beautiful area and resource. I think way too much beachfront has been allotted to businesses and corporations. I realize the income from taxes (I hope) we are getting from them, but much of the city beachfront is wasted. We should have restaurants along the beachfront for tourism
- 9 Make it BEAUTIFUL !
- 10 I am favor if minimal commercial and industrial development on the shorelines and waterfront land uses in the City of Ludington and Pere Marquette Township.
- 11 The shoreline is our most valued asset -- Lake Michigan first, Pere Marquette Lake second, Lincoln third
- 12 We need a restaurant or more on the lake! Sad the museum couldn't have been one. People come here for the beach. Eating on the lake is a big attraction. Many lake towns gave them.
- 13 Development has to be planned with high water in mind even to the point of times with 'low water' land not looking developed to it's potential.
- 14 Seawalls and rip rap are attempts to slow down the natural cycle of high water and shoreline erosion. It would make more sense to me to plan for future high water cycles rather than spend more money adreesing the symptoms of the current cycle.
- 15 Ludington is a wonderful community. We arrived in thirty years ago and we've enjoyed this area during every season of the year. Thank you for seeking our feedback on your next actions. Keep safe and God bless.
- 16 Some neighbors have told us the city council is often resistant to change and resistant to investing money into the future. That's unfortunate. The downtown and Pere Marquette Lake could be so much more quaint and friendly for both locals and visitors to enjoy. Nobody wants to see Ludington be a tacky tourist town. Think classy, not tacky. The city planners can invest wisely to make Ludington THE place for families to live and visit. That's what we'd like to see. It will pay for itself in time.
- 17 Keep it natural, less traffic
- 18 Thanks for requesting our feedback!
- 19 i believe the city has had some great vision for the waterfront, if the opportunity is presenting itself. i would like to see similar vision put forth along the shore line of Pere Marquette waterfront for the DOW property. i think some additional park and private development mix would be great there. Parks are great but don't bring any taxes. A well planned, small private development would enhance the area along with a public area.
- 20 In my opinion the only long term solution is to get surrounding states to agree to sell off the water (which should be our oil)!
- 21 People love to visit Ludington because it is unpretentious and family friendly. I would like to keep it that way.
- 22 N/A
- 23 It is very unique and I think both government bodies realize this and want to keep as much public use as possible as it should be. This is a very special draw to the area don't spoil that.
- 24 Pere Marquette Township and Ludington should work more together on development and design strategies to protect and enhance property values.
- 25 Maintain what we have. Resist the temptation to give up shoreline for tax revenue (no more condo towers).

26	Probably the most effective course of action would be prayer.....we can't spend enough money to thwart Mother Nature when extremes occur!
27	My hope is that no residential or commercial development is in the plan that is developed. Thank you for this survey and best wishes in the process of your work. Sincerely, Dennis Remenschneider, therevdennis60@gmail.com
28	I would like to see more resources allotted to clean up around the lakeshore. I know last year was rough with storms and erosion but the coastline needs to be maintained to keep people in the area.
29	Revive grants to help pay for the erosion in our area.
30	Water is being influenced by climate change now more than ever. Water does not respond to wishful thinking and water problems don't get better on their own. The longer you wait to tackle a water problem of any kind the harder and more expensive the problem is to solve. We need to adopt new thinking. One is that we know how to solve every water problem that exists in engineering terms. Two is that all water problems are local and that is where they must be solved!!!! The water problem is NOW and it needs to be solved NOW!!! We can not keep it in committee for the next 5 years or longer.
31	Establish a parking lot at base of hill PM lake side across from township beach.
32	Protect and preserve the shoreline and natural areas. Enforce boating and fishing regulations. Maintain the parks and recreation areas.
33	Let's not over develop. Keep Ludington a great place to live and enjoy.
34	We need some kind of winter attraction to help the local businesses thrive year round.
35	Doing a good job, but could do better. High water is a big issue
36	Lake Michigan and other lakes, natural surroundings, the shoreline make Ludington what it is. It needs to be preserved and augmented to maintain and improve the vibrancy of the city.
37	Strongly enforce recreation park rules. Do not allow dogs at Butterville as the majority of dogs are not leashed when I visit. This survey should allow for me to print my responses, with appropriate page breaks so I can refer to it in the future. Food trucks should not be allowed/or equally taxed as they are unfair to brick and mortar restaurants. Thank you for this opportunity. The details needs to include the due date of this survey. And what are the next steps? ie when will the results be posted - then what? Is there an opportunity for residents to sit on a committee to review? On the first page of this survey, ie More information on the plan should be a clickable link. Include Stephen Carlson's email address on the introduction email request to complete this survey for additional followup/questions related but not on this survey. In "If other, please specify, should allow me to see my entire response, like this space, so I don't have to scroll over to see all
38	I love the way Ludington continues to evolve into a beautiful, friendly community that we are we are fortunate to be a part of and thank you for the opportunity to have input!!
39	While I agree tourism is very important to the local economy, please don't forget local residents. We love what the area has to offer and care about preserving it. Probably more than visitors. Thanks
40	Let's work with Nature rather than battling it. She'll win every time.
41	Thank you for your efforts to improve the shoreline in Ludington
42	The more places to walk and enjoy the scenery is what we would utilize, and appreciate, the most. Thank you!